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SUMMARY

The structure of the British Sheep industry is described in terms of the breed groups dominating production,the availability of pedigree and performance data,the factors limiting genetic improvement including the key structural issues of flock size and genetic linkage. Selection objectives for the various breed groups are discussed and increased leanness identified as the most important. The Meat and Livestock Commission objectives for the GB sheep industry and its main areas of activity are outlined. Specifically the removal of technical obstacles to accelerate the pace of genetic improvement, the development of successful sire reference and group breeding schemes, and the communication of the benefits of improved stock to commercial sheep producers are discussed. Cost benefit analysis indicates a significant return on investment in BLUP technology where it is linked to sire reference schemes and wide dissemination of improved crossing rams to the commercial sector of the industry. Funding for breed improvement in GB comes from two sources; direct payments from breeders and industry support through the MLC levy funds.

Key words: sheep,breeding,structures,BLUP,AI,linkage

BREEDING STRUCTURE

The industry is characterised by a stratified cross breeding structure which was described in an MLC survey (MLC, 1988) in which the contribution of different breed sectors to the slaughter generation was quantified. Ewes grown under harsh hill conditions are drafted after three to four years to kinder uplands where a significant proportion are crossed with longwool rams to provide halfbred ewes for use in the lowland sector. Cross bred ewes are finally mated to rams of the terminal sire breeds of which the Suffolk, Texel and Charollais dominate. Although there were over 60 pure breeds recorded in the MLC survey only a small number had a significant effect on the total slaughter generation.

The estimated influence of the three major breed groups on the dams of crossbred lambs and the slaughter generation in 1988 is presented in Table 1. The focus for improvements in leanness is the terminal sire sector, whilst ewe reproductive and maternal characteristics are the primary selection objectives for the hill and longwool sectors.

Table 1 Importance of breed groups in the British sheep industry (MLC,1988)

	% Contribution to genes of	
	Dams of slaughter lambs	Slaughter lambs
Hill	56	15
Longwool	27	5
Terminal	11	69

Availability of pedigree and performance data.

The organisation of breeds into breed societies is not as well advanced as the cattle breed societies in Great Britain. Because of the large number of animals involved the breed societies only tend to hold full pedigree details of registered rams and few have detailed accurate information on registered ewes.

Until December 1994, the Meat and Livestock Commission (MLC) operated a recording service for pedigree breeders, the Sheepbreeder scheme, operated by a team of regional consultants. Since January 1995, the service is now operated by Signet , a joint venture company between MLC and the Scottish Agricultural College (SAC). Sheepbreeder provides a comprehensive method of performance and pedigree record collection, record interpretation and advice through a bureau service backed up by Signet livestock consultants (MLC,1992). The MLC database is the most reliable single source of performance and pedigree data. Records are available from over 500 flocks per annum (Table 2).

Table 2 Sheepbreeder membership 1993/94

Breed type	No of flocks	No of ewes
Terminal	441	36,000
Hill	75	17,000
Longwool	6	1,000
Others	4	1,000
Total	526	55,000

MLC,1994

Since it was first offered as a service to the industry in 1970 to promote and encourage improvement for economic aims, the state of animal breeding knowledge and computer technology has advanced considerably. In 1986 Sheepbreeder was enhanced with a multi-trait indexing system, which made use of information on every trait from several important

pedigree sources. This allowed specific breeding objectives to be applied to each sector of the industry.

In 1988, with the advent of real-time ultrasonic scanners, scanning for terminal sire breeds was introduced and through measuring carcase traits on the live animal a lean index was offered to these breeders on the basis of MLC funded research work at SAC. Currently, records to compute lean indexes are taken and analysed on the farm on micro computers.

Factors Limiting Breed Improvement

A variety of physical factors constrain or inhibit performance recording and therefore improvement. Environment factors are particularly important in the hill sector, where flocks are large and run under extensive range conditions, often lambing in adverse weather and with severe labour limitations. Longwool flocks, in contrast, are small and well managed. Flock size has an important bearing; too large creates logistical problems for recording, whilst too small limits the quality of data and the use to which information can be put.

Financial considerations influence the uptake of performance recording and selection programmes by the breeding sector. These relate to the cost and financial benefits received from the market place. At present Sheepbreeder fees are charged on the basis of flock size with additional charges levied for ultrasonic scanning according to time and volume i.e. without reference to the returns the breeder can expect from the market place. The costs of Sheepbreeder involvement and average returns per ram sold are summarised in Table 3.

Table 3 Recording costs and average returns per ram according to breed sector

	Breed sector		
	Hill	Longwool	Terminal
Average flock size	500	10	60
Average number rams sold	20	4	40
MLC Sheepbreeder fees (£)	607	229	401
Average ram sale price	250	450	220
MLC cost\ram sold (£)	30 (12)	57 (13)	10 (5)

() Expressed as % of average ram sale price

Returns from the hill and longwool sector are very low in relation to Sheepbreeder fees. There is relatively little use of Sheepbreeder by hill and longwool breeds despite the total number of flocks. In contrast, returns for the terminal sire sector are more promising and MLC Sheepbreeder costs relatively lower. Those Sheepbreeder members who can gain premiums from the market place over and above recording costs achieve realistic financial benefits and make investment in Sheepbreeder worthwhile.

The real benefits for all the recording and selection activity are long-term. Although there is this clear evidence that progress can be achieved the pace is inevitably slow and therefore

short-term decisions not to record are made on the basis of the physical and financial constraints.

Structural Issues

The breeding population consists of isolated flocks with only informal ram transfers among the breeding sector until 1990 and recording and selection was within flock. Unlike the beef sector AI is not common and therefore flocks are not closely genetically linked. Three distinct breeding structures for improvement now exist:- within flock, across flock and group breeding schemes.

Within flock selection

Breeders in isolation have the opportunity to record and select breeding stock through membership of and participation in the MLC Sheepbreeder scheme. Genetic improvement in a range of economic performance traits is achievable and has been independently demonstrated at a number of sites. Physical constraints are generally flock size (too small or too large) and environmental. The cost of recording inhibits many breeders with large hill breeds. However, in general, where tangible financial benefits can be seen, then cost is not an issue.

Across flock selection schemes

With the advent of intra-uterine AI techniques using frozen semen in 1988 came the ability to genetically link flocks in an efficient and structured manner. In 1989 MLC set-up Sire Reference Schemes with co-operating Suffolk and Charollais breeders followed in 1991 with the Texel breed. More recently other small breeder groups have become established, until in 1994 5 schemes were operating (Table 4).

Table 4 Summary of Sire Reference Schemes in Great Britain

Breeder Group	Date started	Number of flocks
Suffolk Sire Reference Scheme	1989	42
Charollais Sires	1989	18
Meatlinc	1990	3
Elite Texel Sires	1991	28
Elite Vendeen	1992	3

The use of common sires through AI provides the links between the flocks. When all the data is analysed for a given scheme, making use of the latest statistical analysis technique (BLUP) the Estimated Breeding Values (EBVs) derived are more accurate and selection progress considerably greater than breeders can achieve as individuals. Recent experiences with sire reference schemes which are most relevant to the terminal sire breed population in Great Britain have recently described by Guy and Croston (1994).

MLC's promotion and development of across flock improvement programmes is constrained by a number of key issues. In particular, the limitation of AI techniques to frozen semen and laparoscopic AI and the high cost of this technology hampers progress. There is also a lack of knowledge on the optimisation of scheme structures to yield maximum progress for minimal cost. Co-operative breeding involves a degree of mutual trust between breeders and naturally therefor their is cautious uptake of this new technology by eligible breeders. The development of handling large data files, analysis and presentation of results is expensive and demanding on limited computing and systems resources.

Group breeding schemes.

Group breeding schemes generally involve a group of co-operating breeders who invest all their recording and selection effort in a central nucleus flock. They are appropriate solutions to the problems of flock size faced by breeders who wish to pursue genetic improvement programmes. When average flock size is very low, as is the case with Bluefaced Leicesters, the major longwool breed or when very large, as is the case with most hill breeds the practicalities of within flock improvement in isolation are of little benefit or particularly difficult. Central nucleus flocks have successfully been established in Wales, but activity elsewhere in GB is limited (MLC,1993).

The major constraint to the success of group breeding schemes is the need for financial support in the initial stages. Gathering together ewes into a central flock, and their subsequent recording can take some years before success becomes apparent and premiums can be obtained.

THE ROLE OF MLC

Objectives

MLC's sheep activities are funded from a levy collected on every slaughter sheep. The Corporate Plan for 1993-1996 set out the following key sheep industry objectives.

(1) To improve the leanness of British lamb by increasing the use of modern sheep breeding technology and ensuring that improvement in quality is rewarded

(2) To improve the uniformity in British lamb carcases particularly by selecting for conformation in intermediate crossing ram breeds (longwool and hill)

These two objectives are being persued in the following 5 ways:-

(1) To encourage the development of new techniques to speed the rate of genetic improvement

(2) To market the value of genetically improved stock to the industry

(3) To introduce sire reference schemes for all suitable breeds

(4) To encourage the development and successful exploitation of group breeding schemes as a means of propagating genetic improvement

(5) To encourage the greater use of high lean meat index rams on commercial farms

Funding

To justify levy support of activities in the breeding sector the effort going into the introduction of BLUP provided an opportunity to redirect industry levy support from a general underwriting of the Sheepbreeder scheme to more focused support for breeders on the basis of good selection practices and positive genetic progress. The genetic trends which can now be provided by BLUP are now the basis of detailed selection monitoring of participating flocks which forms a justification for subsidisation.

MLC invests £169,000 per annum with Signet to maintain its animal database and provide an ultrasonic scanning service, and a further £100,000 per annum for the direct costs of system development. Significant sums are also made available for near market research projects at university research centres and the SAC. Breeders spend around £200,000 in total with Signet to participate in the recording programmes, plus £30,000 with AI companies to for insemination services.

Breeding strategy

In order to achieve the industry objectives of increased leanness and better conformation, MLC strategic breeding activity is concentrated under three main headings:-

(1) Removal of technical obstacles to accelerate the pace of genetic improvement.

(2) Development of successful sire reference and group breeding schemes.

(3) Promotion and communication to commercial sheep producers.

Removal of Technical Obstacles

The need to use inter-uterine insemination with frozen semen in order to genetically link flocks is unsatisfactory from the image point of view. Work on trans-cervical AI has been commissioned with little success. Further work is therefore being considered on freezing techniques to overcome the low success rates with the conventional cervical technique and therefore wider uptake. A research contract was awarded to SAC to evaluate optimum reference sire scheme structures and some preliminary results have been made available for scheme use. Full results will not be available until April 1995, but early indications suggest the major changes to mating plans will not be required.

Regular evaluation of techniques for live animal evaluation are undertaken. A recent evaluation of ultrasonic measurement techniques for live sheep was completed and the accuracy of equipment already used by MLC in its Sheepbreeder scheme was confirmed. Conformation measurement of live sheep has been studied in a contract awarded to the University of North Wales, but results unlikely to yield practical reults in the short term.

Development of Successful Breeding Structures

Selection programmes within Group Breeding Schemes can be sustained with existing technology but to secure their success and long term viability a significant amount of MLC development time is required in the initial stages, coupled with some pump priming from MLC and other sources of commercial sponsorship to support the recording (and scanning

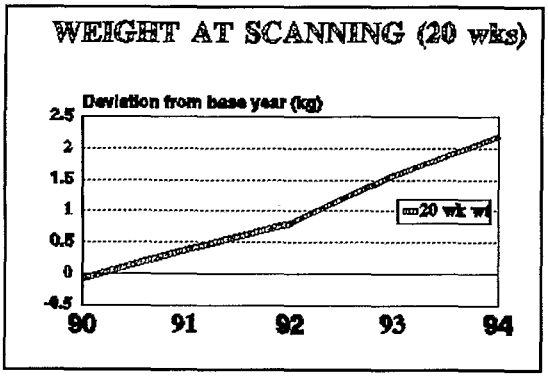
where relevant). The use of industry funds for sponsorship has to be linked to evidence that sound selection practice is being applied and results communicated to industry. There is a continual need for promotional material and press activity to communicate the benefits of improved stock from these group breeding schemes.This work is ongoing.

There has been a rapid growth in the uptake of sire reference schemes and an understanding of their value. Sire reference schemes are fundamental to the Commission's objectives in the livestock improvement area. A formal procedure for data capture, processing, analysis and reporting is being developed as a matter of some urgency so that handling scheme data becomes a routine part of servicing by Signet, with the Commission's Genetics Adviser in support. BLUP, the data analysis method required for the analysis of sire reference scheme data is an essential component of the overall strategy.

The benefits of BLUP to the British sheep industry have been evaluated. Modest investment of £170,000 in the hardware, software and development over the three years ,1993-1995, linked to a long-term commitment to invest £1.3 million marginal cost (levy support) over the next 15 year period would give a net present value of £9.5 million after a 15 year period yielding 81% per annum and pay back after 3.7 years. The cost benefit assumes an increased proportion of improved recorded rams being marketed to the commercial sector.

MLC has produced bespoke BLUP software for the cattle industry where analysis is undertaken on a breed wide basis. In the sheep sector, of the shelf software was considered to be acceptable and a commercial copy of PEST was purchased to run on the MLC Aviion Unix system.

The introduction of BLUP into routine processing of performance data involved a concerted effort to ensure that the data, software package and hardware were developed satisfactorily to provide BLUP technology for the analysis of sire reference data in 1994. BLUP will also be available for the analysis of within flock data in 1995 replacing existing Fortran programmes. The more accurate analysis and availability of genetic time trends will increase breeders confidence in the benefits of selection. Results from the main reference sire schemes over the last five years illustrate the sort of progress that can be acheived (Fig.1).



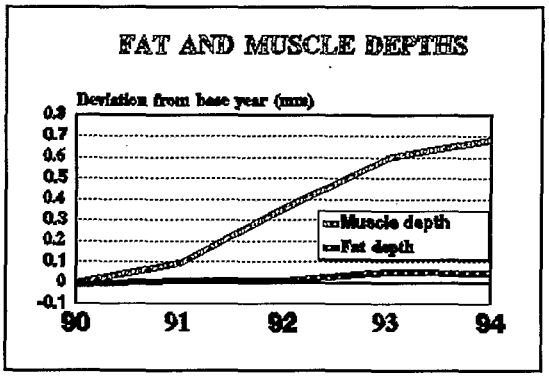


Fig 1 Five year genetic trends in the Suffolk Reference Sire Scheme

It is estimated that 17,000 rams from 440 MLC recorded terminal sire flocks are markete d annually onto a market with an annual demand for around 56,000 terminal sires per year - a penetration of recorded rams into the commercial sector of 31%. Wider penetration will increase the benefits, but it is accepted that the provision of data to the terminal sire breeders does not always produce any real genetic change because of its use for marketing rather than breeding. In the past, consultant support to help breeders has been focused on breeding and marketing better sheep.

Promotion and communication to commercial sheep producers

This will only be achieved if the promotion and marketing of improved stock continues at an increased pace. A series of progeny tests at key locations around the country are underway linked to open days, farm walks, articles and stories. In addition, the medium term lamb market development activities will enhance the benefits from the production of lean well fleshed lambs increasing the demand for recorded rams with high breed values for lean meat.

REFERENCES

Guy,D.R. & Croston,D.(1994). UK experience and progress with sheep sire referencing schemes.Proceedings of 5th World Congress on Genetics Applied to Livestock Production,Guelph, Canada.

MLC (1988) Sheep in Britain. Meat & Livestock Commission, Milton Keynes.

MLC (1992) Sheep Yearbook 1992.Meat & Livestock Commission, Milton Keynes.

MLC (1993) Sheep Yearbook 1993.Meat & Livestock Commission, Milton Keynes.

MLC (1994) Sheep Yearbook 1994.Meat & Livestock Commission, Milton Keynes.