EGENES and BASCO
National Beef Evaluations in the UK

M. Coffey, T. Krzyzelewski, T. Roughsedge and R. Mrode
SAC, Sir Stephen Watson Building, Bush Estate, Penicuik, EH26 0PH, UK

Introduction
Performance recording and genetic evaluations for dairy and beef cattle and sheep in the UK have undergone significant changes in the last few years. This has resulted in consolidation of recording agencies (and thus data sources) and concentration of previously dispersed genetic evaluations into one site. This paper describes those changes and how the separate agencies are working together to bring added benefits to UK producers.

EGENES
Edinburgh Genetic Evaluations Services (EGENES) was set up in 2004, and is managed on a day to day basis by the Scottish Agricultural College (SAC) but is run overall in association with the Roslin Institute and the University of Edinburgh. The link among these three institutes means that EGENES benefits from the largest pool of livestock genetics research expertise in the UK, and one of the largest worldwide.

EGENES was first established to develop and conduct routine national genetic evaluations for dairy cattle in the UK on behalf of the Milk Development Council (MDC). The new dairy evaluation systems were developed using leading edge technology and test day model evaluation methods. Following the initial development phase, EGENES have been responsible for conducting routine national dairy evaluations every three months since May 2005.

Following successful implementation of dairy evaluations, EGENES have since been contracted by Signet, a company responsible for beef and sheep performance recording and owned by the Meat and Livestock Commission, to undertake genetic evaluations for all sheep breeds and those beef breeds that use the Signet performance recording system.

In both cases, the new evaluation service attempted to mimic exactly what the previous service providers had undertaken so as to prevent any changes in genetic evaluations during the transition. Any subsequent changes would therefore be a result of a documented and expected improvement in either the data extraction and preparation or in the models used.

EGENES implementation of the beef evaluation system has been in use since August 2006 with the evaluations for the Limousin breed the first to be published. Since that time a second publication for the Limousin breed and evaluations for a further ten beef breeds have been produced.

Sheep extraction and evaluation systems are currently being tested and expected to go live in the first week of May 2007.

BASCO
BASCO is the result of a unique collaboration between three of the largest breed societies in the UK, the British Limousin Cattle Society, the Suffolk Sheep Society and the British Texel Sheep Society. The partners were drawn together through a collective need to develop new database systems that would allow them to continue to operate and expand their businesses. The joint venture was formed in 2005 with the aim of developing a new state of the art database that would allow the partners to meet those needs and the expected additional needs as new technologies become available. By working together each society has benefited from:

- Sharing development and maintenance costs;
Developing a system than none could have afforded independently; and

Use of technology that will allow further expansion and will put the partners and the wider industry they serve in a good position to meet future recording needs.

The new system is based around a database that is accessed by each partner through a web interface. Each partner has their own secure designated area that is tailored specifically to their needs and allows them to operate independently of other partners.

BASCO has also benefited from receiving a large Agricultural Development Scheme (ADS) grant from the UK Department of the environment, food and rural affairs (Defra) that has allowed further developments to the database to:

- Record health and fertility traits;
- Incorporate Signet data;
- Enable non-BASCO farmers to access the database through a normal web browser.

The ADS grant has also allowed BASCO to increase activity in areas of

- Marketing of improved livestock;
- Promotion of performance recording;
- Increased contact with supermarkets and abattoirs.

The new developments have all been undertaken with the overall objective of improving information flows between the ultimate market (retailers) and breeders to enable breeders to be responsive to market signals in a timely and accurate way. The end result of that response is more product meeting market specification and the economic benefit that arises from this.

Future developments of the BASCO database envisaged include the creation of health recording and benchmarking in relation to health plans, automated member website generation, and on-line selling/buying of animals.

**Beef genetic evaluations**

The data used for genetic evaluations of beef cattle are held on the BASCO database housed in Glasgow, Scotland. EGENES have access to the database via a VPN and Internet access. This allows data to be extracted every night without any other user intervention. The data is copied onto a mirror database in SAC and then subjected to extraction and validation processes. Once evaluations and quality assurance are complete, the results are automatically uploaded into the BASCO database overnight and then made available to users when Signet provides the relevant signal. The overall process is shown in Diagram 1.
Clearly, once Interbeef evaluations are produced routinely the system is already specified to enable their incorporation.

Data is extracted and evaluated for the breeds listed in Table 1. A number of additional breeds are evaluated with much less data e.g. Highland Cattle, Red Poll, Galloway, Salers.

<table>
<thead>
<tr>
<th>Breed</th>
<th>Number of animals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limousin</td>
<td>176,647</td>
</tr>
<tr>
<td>Blonde Aquitaine</td>
<td>18,629</td>
</tr>
<tr>
<td>Sussex</td>
<td>18,543</td>
</tr>
<tr>
<td>Welsh Black</td>
<td>16,236</td>
</tr>
<tr>
<td>Lincoln Red</td>
<td>14,086</td>
</tr>
<tr>
<td>Devon</td>
<td>9847</td>
</tr>
<tr>
<td>Stabilisers</td>
<td>4615</td>
</tr>
</tbody>
</table>

**Traits analysed and model**

*Reproductive and functional traits*

These were calving difficulty, age at first calving, calving interval and longevity. Calving difficulty has been included in the UK beef BLUP evaluations since 1997. The trait is recorded as a score of 1 to 5 (with 1 = no assistance, 2 = easy pull, 3 = hard pull, 4 = veterinary assistance, 5 = caesarean section). Age at first calving was allocated a binary score based on the rules given by Roughsedge et al. (2005b). A calving at an earlier age, given the potential to calve at a later age, was scored as 0 and a calving later, given the opportunity to calve earlier, was scored as 1. If there had been no opportunity for a heifer to calve at more than one age then the record was assigned as missing. Fertility was predicted using calving interval with the interval between first and second calvings used in the analysis. Longevity was assigned as the parity the cow attained, or was predicted if data were
censored, following a set of rules developed for dairy cows (Brotherstone et al., 1997).

Carcass traits

Three carcass traits are included as indicators of carcass quality. The first, ultrasonic fat depth is measured at two positions, the 13th rib and the 3rd lumbar vertebra, the second, ultrasonic muscle depth, is measured at the 3rd lumbar and thirdly muscle score is a visual appraisal of muscularity scored on a 1 to 15 scale. These traits are evaluated at approximately 400 days of age.

Weight traits

Two weight traits were used in the analysis, 200 Day Weight (W200) and 400 Day Weight (W400). Crump et al. (1997) provided a description of the procedure for calculating 200 and 400 day weights. Animals have to have weights recorded between 170 and 300 days for W200 and between 300 and 500 days to qualify for W400.

Multivariate animal model is employed in the analysis of all traits, with direct effects fitted for 400 day weight, muscle score, fat depth, muscle depth, calving interval, age at first calving and longevity. However, both direct and maternal effects are included for birth weight, 200 day weight, gestation length and calving ease.

A number of economic indices are produced from these separate EBV’s. More recently Maternal Value has been made available and includes age at first calving, longevity, calving interval, maternal weaning weight and maternal calving ease each multiplied by their respective weights (Roughsedge et al., 2005a).

Maternal Value is then combined additively with Maternal Beef Value and Calving Value to produce an overall Maternal Production Value which provides breeders with an overall profit based measure of value.

Parameter estimation

Four breed data sets (Angus, Limousin, Simmental and South Devon) were used to estimate the genetic parameters used for UK beef evaluations (Roughsedge et al., 2005b). The parameters were estimated within breed using a series of overlapping trivariate sire or sire - maternal grandsire models using ASReml (Gilmour et al., 2002). For each breed animal and maternal (co)variance components were generated using the post processing capability of ASReml. All estimates for a breed were combined into a full (co)variance matrix. An iterative bending procedure was undertaken to make the resulting covariance matrices positive definite (Jorjani et al., 2003).

Future developments

The partnership between BASCO, Signet and EGENES was created to help users gain maximum benefit from new technologies, and the systems have been designed to allow ready integration of new sources of information or new routes of entry. These developments can be tailored expressly for the UK environment which may be distinctly different to overseas markets for certain traits.

Key developments being planned include:

- User-friendly software to allow breeders and their clients to customize selection decisions to suit their own priorities and farming circumstances/production system (Customised herd indices).
- Increasing use of data from commercial animals to increase the accuracy and commercial relevance of EBVs and indexes.
- Collaborating in the production of international beef genetic evaluations, to aid domestic selection decisions and export marketing – this issue is discussed in depth in another paper in these proceedings (Interbeef).
New technical developments under research by EGENES partners and others include:

- Optimal use of molecular genetic information in breeding programmes.
- Evaluating predictors of meat eating quality for use in breeding programmes.
- New traits that are potentially important indicators of welfare, ‘ease of care’ and robustness.
- Genetic evaluations for carcass data retrieved directly from slaughterhouses.

Conclusions

The formation of BASCO and EGENES and their partnership with Signet has been a notable success for the UK beef and sheep industries. It has provided a UK owned and controlled solution to performance recording and genetic improvement needs in these industries. This will help ensure that services continue to develop to meet local needs, and to help UK producers maintain a competitive advantage. The recent participation by the UK in Interbeef highlights the benefits of providing a local solution to performance recording and genetic evaluations. One day UK beef breeders may be so familiar with and understanding of genetic indices that performance recording could simply be sub-contracted to an international service provider. Until then a lot of knowledge transfer is required to enable optimal use to be made of records and this knowledge is transferred by those responsible for performance recording and genetic evaluation.

References


