STRATEGIES FOR INDUSTRY ADOPTION OF GENETIC IMPROVEMENT OF NET FEED EFFICIENCY IN BEEF CATTLE

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SUMMARY
Potential benefits exist for the beef industry to lower the costs of production through genetic improvement of Net Feed Efficiency (NFE). The ability to achieve this genetic improvement will be possible through the development of BREEDPLAN EBVs (estimated breeding values) for Net Feed Intake (NFI). These EBVs will be available following the establishment of nationally accredited on-farm and central-test facilities. Industry credibility will be maintained by these facilities documenting quality system procedures that will be audited.
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INTRODUCTION
Net Feed Efficiency (NFE) refers to variation in feed intake independent of body weight and growth rate, and is measured as Net Feed Intake (NFI). NFI is calculated as the difference between an animals actual feed intake and its expected feed intake for a given period based on its body weight and growth rate (Arthur et al. 1996). Selection for NFE will reduce feed intake with little change to body weight or growth performance (Archer et al.1998).

Research conducted at Trangie, NSW (Arthur et al. 1996) has shown that considerable variation exists between individual animals and between sire lines for NFE in British breed cattle, and that this variation has a strong genetic component. The opportunity exists for industry to identify and utilise sires with superior feed efficiency in breeding programs, thereby lowering the costs of production.

For commercial acceptance of selection for NFE, a financial advantage needs to be achieved in all sectors of the industry, including premiums paid to seedstock producers for superior genetics. Recent results (Richardson et al. 1998) have shown that the steer progeny of sires with superior NFE have superior feed conversion when finished under commercial feedlot conditions to domestic and export specifications. By selecting for improved NFE, it is expected that feed costs for maintenance will be reduced, hence lowering costs of production for the breeding sector as well (Parnell et al. 1995).

At present, there are no visual or other traits that can identify individual animals with superior NFE, and no structure whereby industry cattle can be tested for NFE. To enable industry to select for improved NFE, testing procedures need to be adopted that will accurately and consistently measure feed intake over a standard time period. A standard system also needs to be developed to present this information in a useful format to cattle breeders, such as an Estimated Breeding Value (EBV), which can ultimately be incorporated into a selection index.

The objective of this paper is to outline the strategies that have been developed in conjunction with industry to facilitate adoption of genetic improvement in net feed efficiency.

INDUSTRY ADOPTION OF NFE TESTING

Adoption strategies. BREEDPLAN EBVs are accepted as the most appropriate method of estimating genetic merit of an animal for a given trait (Sundstrom 1997). Initial focus of the marketing program developed by the NSW Agriculture research and extension team at Trangie has been on developing EBVs for those breeds already enrolled in GROUP BREEDPLAN, and particularly those that have begun testing cattle for NFE.

BREEDPLAN is increasingly dealing with breed societies, rather than individuals (Sundstrom 1997). The societies control the databases, and determine which traits will be included for analysis, accuracy levels for publication and cost structures for their members. As such, the Performance Beef Breeders Association (PBBA), a technical committee representing all breed societies who conduct annual Group BREEEDPLAN analyses, has become the steering group for implementing policy regarding testing for NFE and subsequent submission of data for development of EBVs.

NSW Agriculture have been responsible, in consultation with the beef industry, for establishing the guidelines for commercial testing procedures which include protocols for animal eligibility, testing procedures, data collection and data submission. The Performance Beef Breeders Association implements those guidelines to ensure integrity of data used in BREEDPLAN analyses.

Development and adoption of EBVs for NFI. Current BREEDPLAN EBVs are available for within herd analysis (BREEDPLAN) and across herd analysis (GROUP BREEDPLAN). GROUP BREEDPLAN is the most widely used system, with within-herd analyses used by only a small number of genetically unlinked herds in the larger breeds, and by members of the smaller breeds and some tropical breeds which have a lower use of AI and performance recording.

Breeds currently enrolled in GROUP BREEDPLAN are Angus, Belmont Red, Brahman, Charolais, Hereford, Limousin, Murray Grey, Poll Hereford, Santa Gertrudis, Shorthorn, Simmental and South Devon. These breeds collectively represent over 1,500 members and more than 85 % of the straightbred bulls sold in Australia. A further 12 breeds representing 280 members are enrolled in BREEDPLAN, with Devon, Droughtmaster and Gelbvieh, comprising 130 of these members, considered likely to enrol in GROUP BREEDPLAN in the near future.

Trial EBVs for NFI based on the Trangie data set were published in the Angus 1999 sire summary. Potentially, following industry testing of sufficient numbers of animals with adequate genetic linkages, development of NFI BREEDPLAN EBVs for Angus and other breeds will be possible.

Roles of the breed societies. The Performance Beef Breeders Association (PBBA), representing the breeds enrolled in GROUP BREEDPLAN, has endorsed the development of EBVs for Net Feed Intake (NFI) and has become the steering group for implementing the procedures and requirements for testing NFE. The PBBA will also be responsible for implementing the requirements of the

Guidelines for Net Feed Efficiency Testing, and for accreditation and auditing of testing facilities to ensure that data submitted are suitable for inclusion in BREEDPLAN analyses.

Breed society technical staff will also have a significant role, jointly with State Department and BREEDPLAN extension staff, in industry education regarding both the development of EBVs for NFI, the subsequent inclusion of these EBVs in breeding programs and incorporation into a selection index, such as BREEDOBJECT, that will ensure a balanced breeding program can be implemented in the commercial beef industry

TESTING FOR NFE
Testing Protocols. Testing for NFE will be conducted either "on-farm", where all animals originate from the same property, or at a "central-test" facility where animals from a number of origins are assembled at a designated location for testing under uniform conditions. For either test, strict protocols are required to ensure that standardised and accurate data are generated to ensure suitability for inclusion in BREEDPLAN analyses.

The first of these protocols, "Recommended Guidelines for Net Feed Efficiency Testing in Beef Cattle", was developed by NSW Agriculture in conjunction with breed societies, AGBU, ABRI, Beef CRC, other State Departments of Agriculture and relevant scientists. Copies are available from NSW Agriculture, Trangie and relevant breed societies. They include guidelines for animal eligibility, conduct of tests, data processing and data submission.

The main aim of encouraging testing for NFE is to ensure EBVs can be developed to enable commercial producers to lower costs of production through genetic improvement in their herds. In order to calculate EBVs, sufficient data with adequate genetic linkage needs to be generated, which requires testing of large numbers of genetically linked groups. The testing procedures to be fostered should ideally be those which will facilitate the industry testing of adequate numbers of appropriate groups.

Central Testing. Central testing for growth performance is a common and accepted practice in North America, Europe and South Africa, but has not been widely used to date in the Australian beef industry. This procedure has the advantage of allowing close control of testing procedures and environment by technically competent operators, and ensures that the data collected are accurate and useful for the given purpose. However, central testing for NFI is expensive, and restrictive in terms of timing and location. Combined with a limited number of facilities likely to be available, central testing alone would restrict the total number of animals being tested. Central tests will provide a useful service, but the contemporary groups are likely to be small.

Central tests for NFI have been carried out by Agriculture Western Australia at Vasse, and have included Angus, Murray Grey, Hereford, Poll Hereford, Limousin and South Devon breeds. The Co-operative Research Centre for Meat Quality at Armidale has facilities for automated measurement of feed intake at their research feedlot "Tullimba", and has tested groups of industry animals when the feeders are not being used for research purposes. Agriculture Victoria have also developed testing facilities at Hamilton and Rutherglen Research Stations.

On-farm testing. The development of on-farm testing facilities, which will allow testing of larger contemporary groups with significant links across tests, will enhance the potential development of BREEDPLAN EBVs, which will greatly increase the rate of adoption within the industry. The rate of establishment of semi or fully-automatic facilities on-farm is being assisted by the development of commercially available feeding units. The feeding system developed by the Beef CRC at "Tullimba" is being manufactured under licence and is available from Ruddweigh International, Guyra, NSW.

Accreditation and auditing of testing facilities. To ensure the credibility and acceptance of data from testing facilities, an accreditation scheme has been developed and will be administered by the PBBA. This scheme will evolve on a national scale as further research determines how data generated from different systems, different breeds and in different environments can be compared.

A Standards Manual, incorporating the existing Guidelines for NFE testing, has been developed and forms the basis for the current accreditation procedures. Individual facility managers will be required to submit their own Quality Systems manual outlining the procedures they will adopt to comply with the requirements of the Standards Manual to ensure accreditation following an audit of their program.

Data Processing. For BREEDPLAN analyses, the analytical software developed by AGBU will only accept data from the ABRI database owned by breed societies, and not from individuals. The specifications for data input, and a suitable database at ABRI for input of data generated from commercial testing are being investigated. A consultative group representing NSW Agriculture, AGBU, Beef CRC and ABRI will ensure that the design of the database fields is suitable for use by BREEDPLAN analytical software.

ACKNOWLEDGEMENTS

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