OVERSEAS DEVELOPMENTS

Meat & Wool New Zealand and Massey University Net Feed Intake Trial

Meat & Wool New Zealand has funded a four year feed efficiency trial conducted at Massey University by Associate Professor Steve Morris. The objectives of the trial were:

- To validate, under N.Z. pastoral conditions, Breedplan estimated breeding values (EBVs) for net feed intake (NFI) on Australian bulls tested for NFI under feedlot conditions.
- To investigate whether there are any negative effects by selecting for NFI on other major production and meat quality traits, namely growth (600-day weight), milk production (200-day milk), fertility and meat characteristics.
- To determine if selection for NFI is beneficial under N.Z. pastoral conditions and if so to recommend a cost-effective method of measuring and commercialising it.

Angus progeny were generated from sires selected for either high (top 10% of breed) or low (bottom 10% of breed) for 600-day weight, milk production (200-day milk) and NFI. At least four bulls were used to represent each high or low EBV within each selection line and they were mated to at least 25 cows each using a synchronised oestrus and A.I. programme. The progeny were generated on four industry farms using two and three year old cows. Progeny were transferred to Massey University at weaning to generate feed intake and production data.

The steer progeny from the growth and milk-production-selection lines were split into two groups and managed to grow along fast and slow pathways. Slaughter was delayed due to drought, resulting in the 42 steers in the fast-growing group being slaughtered at 28 months of age and the slower group at 29 months. The 56 steers from the high and low feed-efficiency lines were slaughtered at 27 months.

The feed-efficiency line steers were weighed (unfasted) monthly and had feed intake measured on four occasions using the n-alkane technique (the main method used in the trial to assess group average feed intakes). At slaughter, carcass measurements (carcass weight, dressing percentage, live weight, carcass length, length of leg, fat depth, eye muscle area, intramuscular fat and 3-cut weight) were taken. Meat quality characteristics measured on a cube roll sample collected from each carcass included shear force values, meat colour and water-holding capacity as an indicator of juiciness. Sensory evaluations were carried out on steaks from the cube rolls of a subset of the high and low feed efficiency lines. Two steaks from each animal were evaluated by a taste panel.

Heifer calves from the growth and milk lines were run together as one mob from weaning through to mating, as were the high and the low feed-efficiency lines. Unfasted live weights were recorded monthly. The heifers were mated at 15 months of age with yearling Angus bulls (selected for below breed average birth weight EBVs) and calved at 2 years of age. At birth, calves were identified to their dams, weighed and then reweighed at weaning. Two calf crops (2003 and 2004) were recorded for growth and milk production but only one (2004) for feed efficiency.

Feed intake measurements on the heifers were made on three occasions using the n-alkane technique and on two occasions using a modified before-and-after grazing technique. This latter technique was used only on the growth and milk-production-heifer-selection lines as it is considered less accurate than the n-alkane method and therefore was not used on heifers from the feed-efficiency-selection lines.

Estimates of milk production (using the weigh-nurse-weigh method) were taken at days 50, 100 and 150 of first lactation, for the feed-efficiency selection lines and for first or second lactations for the growth and milk-selection lines.

Conclusions:

1. Comparison of steers from the growth and milk-selection lines.

On average the growth lines tended to have heavier live weights and hence carcass weights, while the low-milk lines had the lightest weights. Despite these differences in live weight no differences in feed intake were measured between the four selection lines. Based on the carcass measurements taken on the steers there were few clear differences in carcass or meat quality characteristics between the high and low-growth and high and low-milk lines. There were however suggestions that steers from the low-milk line produced longer carcasses and slightly more tender meat with a little more intramuscular fat.

2. Comparison of heifers from the growth and milk-selection lines.

The growth-selection line heifers were heavier on average but did not consume more feed than the milk-selection lines. Those heifers born to dams selected for low milk consumed the most feed. Heifers generated from low-milk lines also produced the lightest calves at weaning.
3. Comparison of steers from high and low feed-efficiency-selection lines.

The more feed-efficient (low Net Feed Intake EBVs) steers grew faster to reach heavier final live weights and carcass weights than the less feed-efficient (high Net Feed Intake EBVs) steers. They achieved this superior performance without any measurable increase in feed intake. This suggests they were more efficient at converting grass into live weight and ultimately carcass weight gain. An evaluation of the carcass and meat quality characteristics of steers from the feed-efficiency lines revealed no clear differences in characteristics associated with carcass composition or shape at a defined carcass weight, but did suggest that the eating quality of beef from the low-efficiency line was somewhat better.

4. Comparison of heifers from high and low feed-efficiency selection lines.

The evaluation of heifers from these selection lines indicated that the high efficiency heifers (generated from bulls with high Net Feed Intake EBVs) were heavier and grew faster than the low efficiency heifers (generated from bulls with low Net Feed Intake EBVs). This difference in live weight was generated with no increase in feed intake and there were no differences in pregnancy rates, calf birth or weaning weights.

Summary:

The trial confirms Australian research that selection of Angus steers for increased feed efficiency results in improved growth rates and heavier carcasses with little noticeable change in feed consumed and carcass or meat quality traits. Likewise with Angus heifers there were no significant differences recorded for maternal productivity traits such as calf weaning rate and pregnancy rates.

Earlier Australian research indicates that genetic variation in feed efficiency exists in Australian beef herds and that feed efficiency is moderately heritable. Therefore the potential exists to reduce the cost of beef production through selection for more feed-efficient cattle. Economic analysis has indicated substantial benefit from selection for this trait in New Zealand and Australia, however the high cost of identifying superior animals is a barrier to rapid adoption of this technology.

BREEDPLAN estimated breeding values have been developed for net feed intake for the Hereford and Angus breeds to identify the more feed-efficient animals. In order to generate these figures, bulls are placed on a grain and hay diet in a feedlot situation (NFI central performance test) where daily intakes can be accurately measured. Results from this Massey trial suggest likely bulls evaluated for net feed intake, on this diet, perform with a similar ranking on grass.

The technology to measure individual feed intake on pasture remains a major limitation to the adoption of feed-efficiency selection. The n-alkane method is reliable for detecting group differences in herbage intake but not for individual animal intakes. The challenge therefore is to perhaps refine the technology or develop new technologies that can be used to estimate individual pasture intake, by cattle, with a degree of accuracy that can be used for genetic purposes.

On-going research in the Australian Beef CRC II and III, of which Meat & Wool New Zealand is a partner, has indicated the existence of real potential for developing genetic and physiological markers for feed efficiency.

The relationship between feed efficiency and some blood constituents has been examined with the most promising physiological indicator evaluated being plasma Insulin-like Growth Factor-1 (IGF-1) concentration. The moderate to high heritability and relatively strong correlation with net feed intake makes IGF-1 a strong candidate for a physiological marker for feed efficiency. This is now being used as a screening test to detect the most likely candidates for inclusion in the much more expensive NFI central performance test, as is performed in Australia.

**Russell Priest**

Meat & Wool New Zealand

Beef Genetics Coordinator

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**NEW TBTS STAFF**

**Craig Croker**

Craig Croker has recently joined ABRI as a Technical Officer. Following extensive training at ABRI, Craig will be based at Rockhampton with Tropical Beef Technology Services.

Craig has a degree in Rural Science from the University of New England and considerable experience in rural industries. Originally from Taralga in the Southern Tablelands of NSW, Craig grew up on the family’s grazing property that encompasses beef cattle, merino sheep and prime lamb enterprises. The beef enterprise includes the Bolong Hereford Stud. Craig has also run his own rural contracting business.

Before coming to ABRI, Craig was the Cattle Events Manager for the Royal Agricultural Society of NSW (RAS). This role included the coordination of exhibitors, officials, sponsors, contractors, and breed societies into the beef, dairy, and steer sections of Sydney Royal Easter Show.

**Benita Davis**

Benita Davis joins the TBTS team as a Technical Officer from January 2006. She will be based on-farm near Murgon in the South Burnett area of Queensland where she is heavily involved with her family’s beef cattle business. Benita will be largely responsible for TBTS activities in the south-east corner of Queensland. Activities will include on farm visits, workshops and field days.

Prior to her TBTS role, Benita worked for three years as a BREEDPLAN Consultant at the Agricultural Business Research Institute in Armidale. Benita also undertook the role of Executive Officer of the Australian Wagyu Association between January 2004 and October 2005. She has a first-class honours degree in Rural Science majoring in meat science, animal genetics and nutrition and is currently completing a Graduate Diploma in Business Studies.

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