Agriculture Notes

Net feed intake EBVs (A feed efficiency measure)

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This Agriculture Note covers understanding Net Feed Intake Estimated Breeding Values (EBVs) and their use as a selection tool to improve beef cattle feed efficiency. It includes the economic importance of this trait, how Net Feed Intake EBVs are calculated and interpreting Net Feed Intake EBVs.

Net feed intake and BREEDPLAN

Feed costs are the greatest cost component of beef production in Australia. Feed cost particularly affects profitability of feedlots, but is also significant for grazing enterprises. Imagine the benefits of being able to run even 5% more stock in a paddock or to be able to leave the current stock in a paddock 5% longer.

The NSW Department of Primary Industries research team at Trangie, with Meat and Livestock Australia funding assistance, commenced a major experiment in 1990 to gather information on how to measure feed efficiency. In 1994 the Co-operative Research Centre for Cattle and Beef Quality expanded this research program, using facilities at its "Tullimba" feedlot. This research showed that genetic differences in the feed efficiency of Australian animals are signficant. In 2002 BREEDPLAN **Net Feed Intake** (NFI) EBVs were introduced as a tool for breeders to use to select animals genetically superior for feed efficiency.

Net feed intake (NFI)

NFI is **the amount of feed an animal eats, under or over that expected for its weight and gain**. This measure has the important benefit of being independent of the animal's weight and gain, so feed intakes by cattle that differ in size and growth rate may be fairly compared.

In contrast, the common measure of FCR (Feed Conversion Ratio, calculated as feed intake / weight gain), was rejected because of its close link with gain and mature size. Selection on FCR would increase mature weight. With NFI, more efficient cattle can be found within any desired cattle size range, and selection will not increase mature size.

How is NFI measured?

The initial BREEDPLAN EBVs were based on measurement of individual animal feed intakes and weight gains. In 2004, data from blood tests for insulin-like growth factor-I (IGF-I) was included as a correlated trait.

Feed intake tests can either be conducted on farm or, more commonly, at central test stations. Individual feed intakes are currently measured over a set test period of 70 days. The test ration must contain sufficient energy and be offered in excess so cattle can express genetic differences in appetite and growth rate. Young bulls are most commonly tested, however some steer and heifer data is also used. Test cattle are weighed regularly and their intakes compared with their performance, to determine if they have eaten more (+) or less (-) than expected. Test protocols are set out in an accreditation manual, and only data from accredited systems is accepted by BREEDPLAN.

Interpreting NFI EBVs

NFI EBVs are reported as kilograms of feed eaten per day. Like most EBVs they can be positive or negative relative to the breed average. **The more negative, the less feed eaten and the more efficient** the animal.

For example, two bulls have the following NFI EBVs:

Bull A + 0.5kg/day

Bull B - 0.7kg/day

The breed average is 0.

A simple interpretation is that Bull B, having a more negative NFI EBV, would be expected to breed 'more efficient' progeny than Bull A or a breed average bull. If the two bulls have similar weight EBVs and are joined to average cows, progeny of bull B would be expected to eat 0.6kg less per day than the progeny of A (0.6 is half the 1.2kg difference between the Sire NFI EBVs, as the cows contribute half the genes).

Research results and correlations with other traits

Net Feed Intake, as measured on young bulls and heifers, has a similar heritability to weight gain. Research has

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shown that this trait responds to selection, with steers sired by negative NFI EBV bulls showing favourable changes in growth on pasture and in feed efficiency in the feedlot and on pasture.

Because NFI data is collected on young cattle, the question arises as to how this relates to cows. Research has shown that cows with negative NFI EBVs also appear to be more feed-efficient in a grazing system and to be more efficient in NFI tests conducted as mature cows. Selection of young cattle for improved feed efficiency based on NFI could be expected to produce a strong response in reduced cow feed intake with no change in cow weight. This is a significant result with commercial implications as it allows you to select for more feed efficient cows without making them bigger.

Low NFI (high efficiency) heifers retained for breeding at the Trangie Research Centre have, to date, shown no adverse effect on fertility or other production traits. Research to determine if there are any other traits significantly affected by selecting for NFI, in particular meat quality, is continuing. A **small link with leanness** has been reported (cattle with lower NFI EBVs being slightly leaner). This needs to be monitored for compliance to market specifications. The correlation between NFI and leanness is quite low, less than the birth to final weight link. It can therefore be managed by selecting for both traits.

Insulin-like growth factor-I (IGF-I) blood tests and NFI EBV

Measurement of NFI with automated feeding machines is expensive and time consuming, limiting the number of cattle tested and therefore the number of animals with NFI EBVs.

The IGF-I blood test is a complimentary test to assist identification of high efficiency bulls for NFI testing and can contribute to NFI EBVs.

IGF-I is a protein in blood. Australian research on British-bred cattle has shown that blood IGF-I has a genetic correlation with NFI (0.6) and blood IGF-I concentration of young cattle has been found to be moderately heritable (0.4). IGF-I blood test results from calves taken at or before weaning are being incorporated in BREEDPLAN analyses for calculation of NFI EBVs.

The lower cost of IGF-I blood tests has resulted in a much larger number of animals now having NFI EBVs published. However because it is an indirect measure of NFI it takes a lot more IGF-I blood test data to get the same accuracy than if NFI tests are conducted. For example, for a NFI EBV with 60% accuracy, 5 progeny NFI tests are required OR over 700 progeny IGF-I tests. NFI EBVs with greater than 60% accuracy can only be achieved with some progeny NFI tests.

Economic importance of NFI EBVs

Detailed economic studies show NFI EBVs will deliver significant net benefits to the industry.

A simple illustration of the economic benefit of this trait is to compare the dollar value of genetic differences for feed efficiency among two Hereford bulls. In the following example the amount of feed a feedlot pen of their progeny are expected to eat, under or over, that expected for their weight and gain in a shortfed feedlot situation is calculated.

Bull A: NFI EBV of -0.15 kg, in the top 10% of the Hereford breed.

Bull B: NFI EBV of +0.25 kg, in the bottom 10% of the Hereford breed.

Steers by bull A would be expected to eat half of the difference in their EBVs (only half of the genetics comes from the sire) = 0.2 kg less feed per day than steers by bull B.

Over a 70-day feeding period this totals 14 kg less feed eaten by steers by bull A than steers by bull B. If there are 150 steers in the pen the feed difference multiplies to 14 x 150 = 2100 kg or 2.1 tonnes less feed.

At $220/tonne, the expected feed value difference is $462 less spent on feed if you have a pen of steers by bull A compared to a pen of steers by bull B.

Availability of NFI EBV

Currently only two breeds (Angus and Hereford/Poll Hereford) have sufficient, well linked data, to have their data analysed to produce across herd GROUP BREEDPLAN EBVs. These are published in breed sire summaries and websites. As other breeds accumulate data, they will also be able to publish NFI EBVs.

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