AGBU ANIMAL GENETICS AND BREEDING UNIT
A joint unit of NSW DPI and UNE

Technical Update NFI & IGF-I March 1997

Background

Feed efficiency is an economically important production trait in cattle. It affects the profitability of grazing and feedlot enterprises. Net Feed Intake was recommended by scientists as a measure of feed efficiency and is defined as 'the amount of feed an animal eats, under or over that expected for its weight and gain'.

Since 2002, the Animal Genetics and Breeding Unit, the principal developer of the BREEDPLAN analytical software, has calculated Trial-EBVs for net feed intake (NFI) for two breeds (Angus and Hereford) which are based on a few thousand records of NFI and a rapidly increasing number of insulin-like growth factor -I (IGF-I) records from blood samples collected by seedstock breeders and analysed by Primegro Limited. The original genetic parameters for IGF-I were developed from data collected as part of a research project which started in 2002 and were published in an independently peer-reviewed journal paper by Moore *et al.* (2005) Aust. J. Agric. Res. 56, 211-218. The NFI intake data was mainly collected as part of the NSW DPI research into NFI at Trangie Research Station and by the Beef CRC I at the cattle research facility "Tullimba". Here we report the latest research results and the decisions we have made after discussion with scientists involved in NFI research, MLA, breed societies, ABRI, and Primegro Limited.

NFI post weaning and NFI finishing

During the recent research into the NFI - IGF-I relationship it became obvious that the two main stations which provided the NFI records were measuring two different traits. At Trangie, animals were feed intake recorded post weaning (NFI-P) in a growing phase, when the large majority of the growth is lean tissue, while in the CRC Tullimba data, the animals (mainly steers) were considerably older and were feed intake recorded on a finishing ration (NFI-F) prior to slaughter. At that stage in life the daily growth rate of animals is often slowing and the animals are laying down much more fat than earlier in life. When treating the available Angus data as two separate traits, the heritabilities for NFI-P and NFI-F were estimated as 0.42 (4-0.05) and 0.39 (~=0.09) respectively. More importantly, the genetic correlation between the two NFI traits was estimated to be only 0.59 (4-0.17). Therefore, it appears that some genes controlling NFI-P and NFI-F are different and/or have a different impact on the traits. It should be noted that currently we have no data to determine which of the two NFI traits is more related to the maintenance efficiency of mature cows.

IGF-I

MLA and Primegro Limited supported the very first large-scale collection of blood samples for IGF-I measurements in seedstock herds between 2002 and 2004. A trained technician from NSW DPI collected the samples and recorded what was considered critical information: date of weaning, date of collection, management group. A reasonable number (N=38) of sires had progeny with NFI intake and progeny in seedstock herds with IGF-I data. We estimated the genetic correlation between NFI (p and f still combined) and IGF-I to be 0.57 (+0.25) for Angus in a dataset with common sires. Based on this estimate, which was also consistent with previous work in pigs, the industry was encouraged to test more animals for IGF-I and Trial EBVs for NFI were calculated for those herds in the hope it would encourage the continued recording of NFI and IGF-I. The aim

was to move from Trial EBVs to BREEDPLAN EBVs within a couple of years when sufficient NFI and IGF-1 data had been recorded. With the aim of moving the Trial EBV into the full multi-trait BREEDPLAN analysis, AGBU have re-estimated the genetic parameters for NFI and IGF-1 using the Angus data. In this process, we observed a much lower genetic correlation between IGF-I and NFI than in the original data. Considerable further analyses using all available data, including the most recent, have been conducted to produce the following new results. Hereford data was excluded from these analyses as there is currently insufficient Hereford feed intake data to draw meaningful conclusions.

Examination of the industry recorded IGF-I data revealed a large variation in age of recording and a large number of IGF-I records existed for animals whose ages were well outside the original guidelines (150-250 days). Analyses showed that keeping only records taken at or before weaning maintained a medium heritabflity (0.40 $\pm$ 0.03) and ranking of sires based on different year groups of progeny were very similar. We now believe that if we take the blood sample before or at weaning and restrict the age range to within the guidelines, we consistently record the same IGF-I genetic trait. While we realise that early weaning (calves younger than 150 days) is becoming more popular we have insufficient data to link an early weaning IGF-I to NFI. To collect this data will require a joint effort of breeders and researchers.

NFI and IGF-I

The current best estimates of the genetic correlations between IGF-I and the NFI-P and NFI-F from the accumulated data are now much lower than the original estimates, and are of opposite sign to each other, which makes selection rather difficult if only IGF-1 data is used in calculating EBVs. IGF-I and NFI-Phas a genetic correlation of 0.17 (+0.11), whilst for IGF-I and NFI-F this correlation is -0.22 ($\pm$0.16).

These much lower correlations mean that IGF-I is not as informative as a genetic indicator trait for NFI as originally estimated. However we have to stress that while we now have quite a large number of IGF-I records for Angus, the number of NFI records are still very limited and the standard errors of these estimates are still very large. In order to report the EBV in an appropriate manner, we must use the most recent correlations and therefore, from the current estimates of the genetic parameters based on Angus data we calculate the following expected accuracy for NFI EBVs given various combinations of data.

Data Source	**Accuracy of**	
	NFI-P EBV	**NFI-F EBV**
Animal's own NFI-P record	0.65	0.38
Animal's own NFI-F record	0.37	0.62
Animal's own NFI-I record	0.11	0.14
20 progeny with IGF-I	0.14	0.19
50 progeny with IGF-I	0.16	0.21
Own NFI-P plus 50 progeny with IGF-I	0.65	0.45

This latest analysis indicates that the accuracy ofNFI EBVs based on IGF-I alone are now significantly lower than originally estimated and using this information alone in making breeding decisions is likely to be more complex. Breeders considering using IGF-I testing will need to take this into account.

To utilise the latest knowledge and provide the best EBVs to industry the following changes to the Trial NFI EBVs will be made.

1. Using the correlations described above we will calculate two Trial NFI EBVs: NFI-P and NFI-F using all available NFI and IGF-I data which are within the guidelines.

2. The recommendation to Breed Societies that may wish to publish these Trial NFI-P and NFI-F EBVs onthe web and/or in publications is that only those Trial EBVs for NFI-P and NFI-F which have a minimum accuracy of 60% should be published.

3. Each breeder that records IGF-I or NFI information will receive a herd report with lists of Trial NFI-P andNFI-F EBVs and accuracies for those animals which have been either tested for NFI or IGF-I provided they meet minimum accuracy criteria. Parents whose accuracy for either EBV exceeds 0.20 will also be included in the list.

Research to increase our knowledge on feed efficiency in general is continuing in various projects in Australia and overseas. However further Australian research will also require an industry effort to record many more animals for feed intake from which NFI or similar traits are calculated. Not only will this give a better understanding of the relationship between IGF-I and NFI but this data collection will also assist in validating genetic markers for NFI which are currently marketed or being identified. Should those markers prove valuable, they could also be utilised to increase the accuracy of NFI EBVs. We are also exploring the value (genetic correlation) of other traits (e.g. fatness) to be utilised in the calculation of the Trial NFI EBVs. Significant investment in this research is continuing and is expected to result in further developments.

This technical update was prepared by AGBU in consultation with ABRI, the Angus and Hereford breed societies, NSW DPI and MLA.

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