Proc. Assoc. Advmt. Anim. Breed. Genet. 22:61-64

GENETIC TRENDS IN THE ESTIMATED FEED INTAKE OF ANGUS CATTLE

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SUMMARY

Genetic trends are presented for the estimated feed intake of young Angus animals at pasture and in the feedlot, and of Angus cows at pasture for a self-replacing, 100d-finished production system. Increases in feed intake over time, both at pasture and in the feedlot, are estimated to have accompanied genetic gains in productivity traits in Angus cattle. The estimated increases are both in feed requirement and residual feed intake, with the latter being smaller in magnitude. The need for industry to record feed intake to facilitate selection for feed efficiency and, in the absence of this, for stocking rate to be managed in commercial herds to offset increases in feed intake, are factors briefly discussed in connection with industry realising benefits from genetic improvement.

INTRODUCTION

Feed intake has a major influence on beef production profitability, but it is difficult to measure in the grazing animal and consequently it is not easily included in genetic evaluation. In Australia, there is a protocol (eg. Exton 2001) for industry recording of residual or 'net' feed intake (ie. feed intake at the same liveweight and gain). The high cost of measuring feed intake has so far limited its recording. This paper examines genetic trends since 1985 in the estimated feed requirement and residual feed intake of young Angus cattle at pasture and in the feedlot, and in the feed requirement of Angus cows at pasture. Some implications for whether benefits from genetic gain are being realised in industry are briefly discussed.

METHODS

Breeding objectives. Breeding objectives for net return per cow were derived with BreedObject (Barwick *et al.* 2005) for pasture finished, 100d feedlot finished (self-replacing cow herd at pasture, steers finished at 640kg at 22m), and 220d feedlot finished animals. Results are presented only for the 100d-fed system, as patterns in results for other systems were similar. Traits in the breeding objective were sale weight, dressing %, saleable meat %, rump fat depth, marbling score, feedlot entry weight, weaning weight (direct & maternal), mature cow weight, cow weaning rate, residual feed intake-pasture, residual feed intake-feedlot, and cow condition score. The general form of the economic value for traits is Δ returns – Δ feed requirement cost – Δ non-feed management cost. The feed requirement associated with a unit change in each objective trait was estimated using the equation systems described by Freer *et al.* (2007).

Genetic trends in productivity traits. EBVs for the breeding objective traits were predicted from the January 2017 BREEDPLAN EBVs of 1,895,481 Angus animals born from 1985 through to 2015, and summarised by year of birth. Predictions used the relation $\hat{g} = \hat{\mu}\, \mathbf{G_{11}}^{-1}\mathbf{G_{12}}$, where $\hat{g}$ and $\hat{\mu}$ are EBVs for breeding objective traits and from BREEDPLAN, and $\mathbf{G_{11}}$ and $\mathbf{G_{12}}$ are genetic covariances among BREEDPLAN EBVs and between these and the objective traits, respectively. Genetic parameters employed were derived from industry and literature estimates and are those used for developing Angus indexes in Australia. The trends in Figure 1 are for selected objective traits of those listed above for the young animal or cow.

* AGBU is a joint venture of NSW Department of Primary Industries and University of New England

Genetic trends in feed intake. Genetic trends in feed intake were obtained as index trends by restricting the prices received and costs incurred in the breeding objective to zero except those for feed. Feed requirement and residual feed intake trends were obtained by omitting or retaining the residual trait in the objective. In principle, total feed intake is the sum of feed requirement and the residual trait. Because these components can be correlated, feed intake trends were derived with both components in the objective. The trends in Figure 2 are in terms of the estimated total feed intake (excluding any period of surplus feed) per animal (young animal, cow or cow/calf unit) for that segment of the production system (cow herd, backgrounding at pasture or feedlot finishing).

RESULTS AND DISCUSSION

Figure 1 demonstrates estimated genetic trends occurring in selected objective traits of Angus.

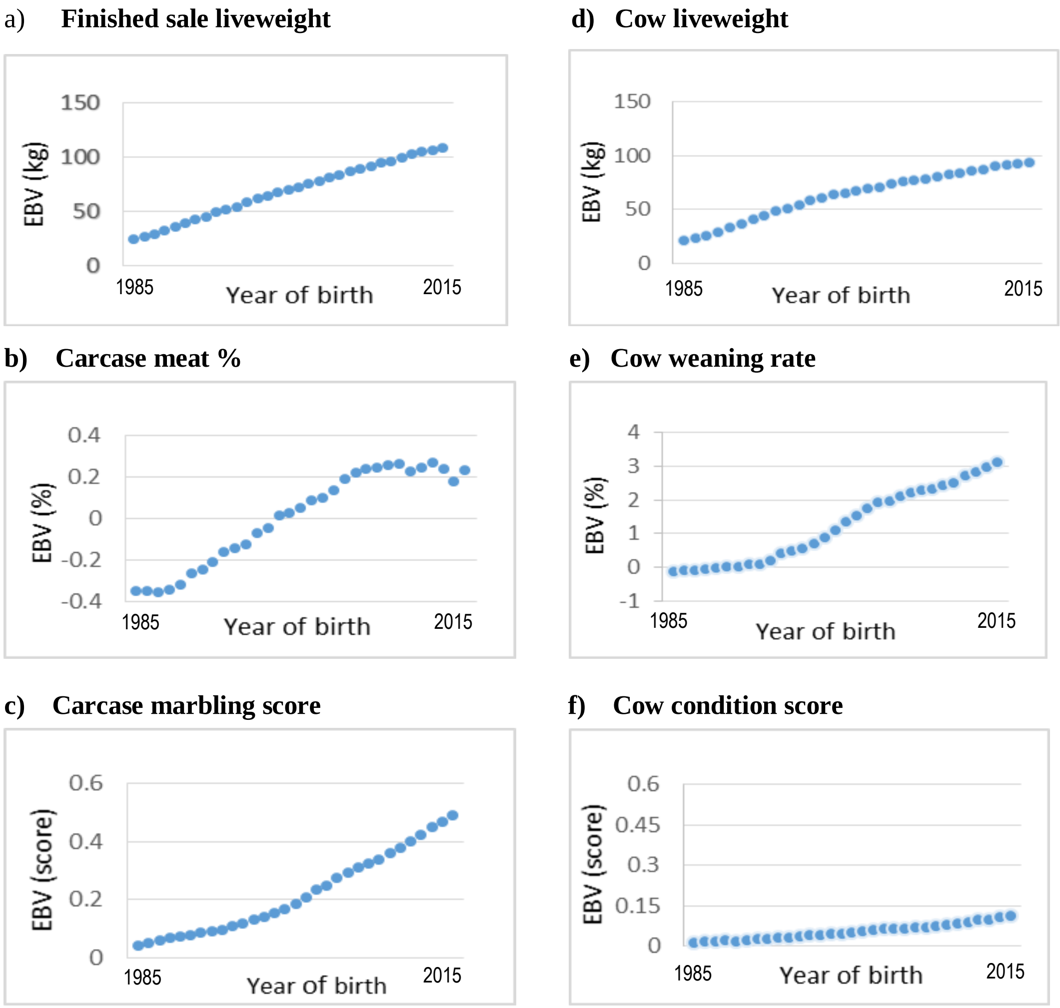

Figure 1. Genetic trends in breeding objective traits for the young animal or cow in Angus cattle for a self-replacing cow herd with steers 100-d feedlot finished after backgrounding.

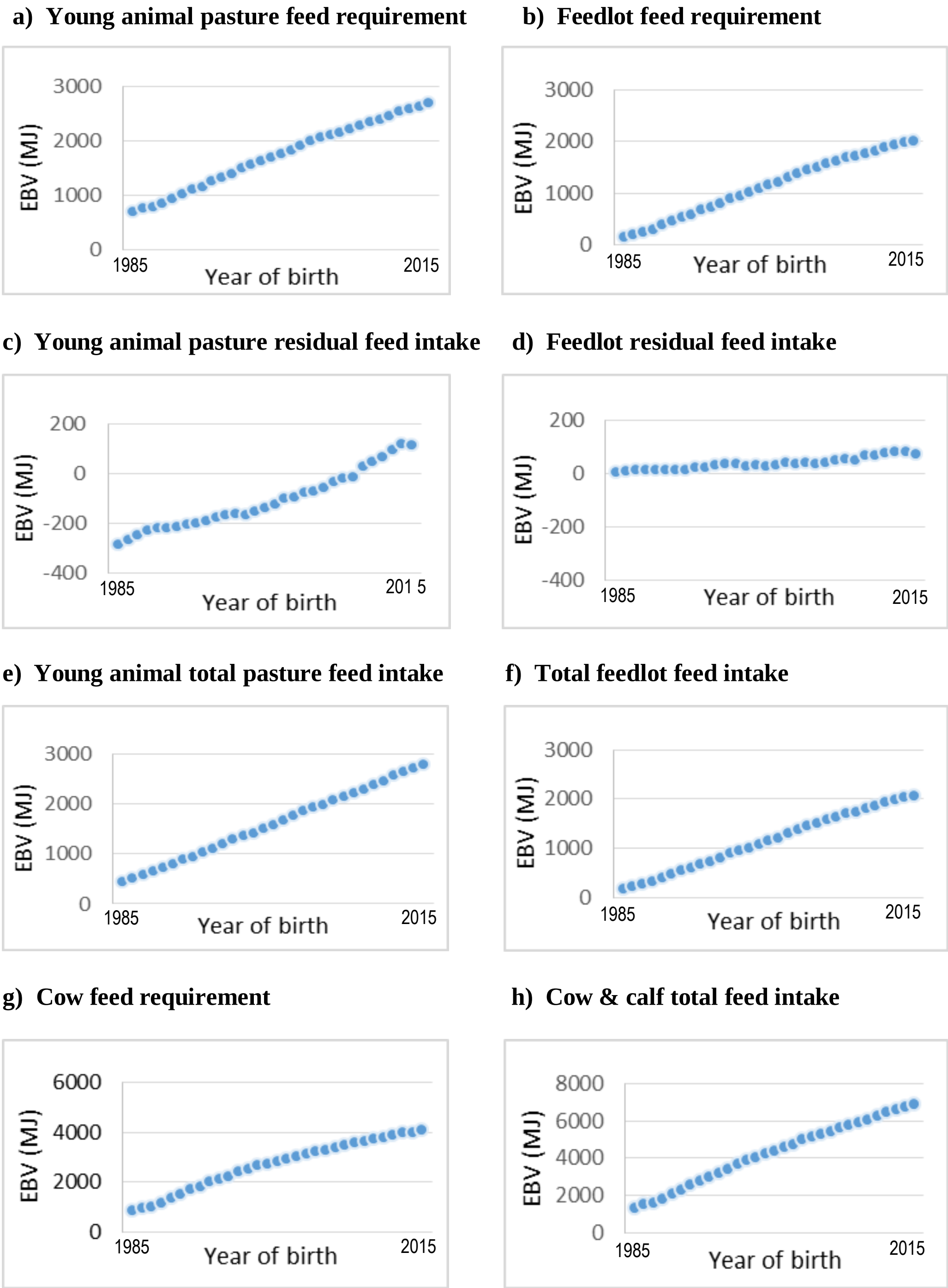

Figure 2. Genetic trends in the estimated feed intake of Angus cattle for a self-replacing cow herd with steers 100-d feedlot finished after backgrounding. The trends are in terms of total feed (excluding any period of surplus feed) for that production system component (cow plus calf to weaning, backgrounding or feedlot finishing).

Figure 2 shows the gains in productivity traits in Figure 1 have been accompanied by increases in estimated feed intake, involving both the animals' requirement for production and its residual. In the 100d-fed system, feed intake is estimated to have increased both at pasture and in the feedlot. In the 30 years between 1985 and 2015 the increase in the intake of cows at pasture (about 3000 MJ, Figure 2g) and the cow and calf unit at pasture (about 5000 MJ; calves at pasture from weaning at 7m until feedlot entry at 18.5m), means the expected DSE rating of Angus cows has also increased.

The estimated increases in feed intake (Figure 2), in particular residual feed intake, illustrate the need for industry recording of feed intake so feed efficiency can be improved along with productivity. Selection indexes derived for industry in the past with BreedObject (Barwick and Henzell 2005), that have increased over time (not presented), take account of the cost of the increased feed requirement but residual feed intake has only recently been included (released 2016). Figures 2c and 2d show residual feed intakes of Angus are increasing rather than decreasing (decreases are needed to increase feed efficiency), reflecting the existence of underlying low positive genetic correlations between feed requirement and residual feed traits. Given this correlation not recording feed intake to estimate residual feed intake EBVs and continued selection for increased growth and mature size will allow beef feed efficiency to continue to decrease.

The results also suggest that animal genetic improvement and pasture stocking rate management need to be considered jointly. In an earlier illustration (Barwick *et al.* 2011) it was shown that genetic improvement was likely to have the extra benefit of improving pasture utilisation when stocking rates are low. At high stocking rates, it was shown that benefits from genetic improvement may not be realised unless stocking rate is reduced or other feed is provided. Without this management change, there is environmental decline from the point of view of the animal, as individual feed demands have increased. This situation could also be occurring in other production systems and other grazing species. Graham *et al.* (2015) drew attention to the possibility of other forms of environmental decline limiting benefits from genetic improvement being realised.

Though data are scarce, it is commonly held that industry pasture utilisation rates are low. Anecdotal evidence from industry suggests this may be changing, though it is not clear if this is only at particular times of the year and in lower-rainfall seasons. The beef industry needs more recording of feed intake so feed efficiency can be improved. In the absence of efficiency improvement, when pasture utilisation is high, it is critical for benefits to be realised from genetic improvement that commercial producers are aware of the trends in feed intake that accompany genetically higher-performing animals. It may also help for industry selection indexes to be derived at two or more levels of feed availability/cost (eg. supplementary feed; $100/tonne vs $300/tonne).

ACKNOWLEDGEMENTS

We thank the Angus Society of Australia for data access, and NSW Dept. of Primary Industries and Meat & Livestock Australia for financial support.

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