# PERFORMANCE OF PROGENY OF HIGH VS LOW NET FEED CONVERSION EFFICIENCY CATTLE

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## SUMMARY

Realised responses to one generation of divergent selection on net feed conversion efficiency (Net FCE) are presented. Progeny from high Net FCE parents were more efficient than those from low Net FCE parents, and consumed less feed. No significant difference between high and low groups was found for feed conversion ratio, average daily gain, adjusted 365-day weight, fat depth, change in fat depth and eye muscle area.
**Keywords:** Cattle, efficiency, growth, selection.

## INTRODUCTION

Feed efficiency is being increasingly recognised as an important trait in the beef industry. A project funded by the Meat Research Corporation and NSW Agriculture is being conducted at the Agricultural Research Centre, Trangie to determine the extent of genetic variation in feed efficiency. This project will provide knowledge of the relationships between feed intake, efficiency and other production traits which is important to predict the consequences of selection to improve efficiency. Initial results from the project suggest that genetic variation in Net FCE exists, and it should be possible to select for efficiency without changing other production traits. This paper reports early results on the realised responses in postweaning traits to selection based on Net FCE. Net FCE was measured as net feed intake (often called residual feed intake in the scientific literature), and animals with negative values are more efficient than those with positive values.

## MATERIALS AND METHODS

**Animals.** Data from the first progeny of high and low Net FCE animals which are part of the MRC funded project investigating variation in Net FCE described by Arthur *et al.* (1997) were used in this paper. As part of the design of this project, bulls and heifers are tested for postweaning net feed intake and the heifers are split into high and low Net FCE demonstration herds. The 4 most efficient bulls and the 3 least efficient bulls out of a total of 98 bulls were selected and used for joining in their respective herds. The progeny resulting from these joinings are then tested for efficiency after weaning. The progeny of the first animals tested for Net FCE (born in Winter/Spring of 1993 and tested in Autumn 1994) were born in Winter/Spring of 1995 and were tested for net feed intake in Autumn 1996. Records on 27 bulls and heifers from High Net FCE parents and 30 bulls and heifers from low Net FCE parents were available.

Details of the post-weaning test are given by Arthur *et al.* (1997). Animals were placed on test in April 1996 shortly after weaning. The test was conducted using an automated feeding system and consisted of a pre-test adjustment period of 21 days followed by a 120 day test. Animals had *ad libitum* access to a pelleted ration with an energy content of approximately 10.5 MJ/kg dry matter and 16% crude protein. Oaten straw was also provided in open troughs, at 0.5 kg/head/day. All animals were weighed weekly during the test, and measurements of subcutaneous fat depth and eye muscle area at the 12th/13th rib site and linear body dimensions were taken at the start, middle and end of the test.

**Derivation of traits.** Weight of each animal was regressed against time (SAS 1989), and the regression coefficients were used to calculate average daily gain, midweight (average of the start and end weights) and weight at 365 days. Feed intake over 120 days was calculated by adding the energy intake of the straw to the recorded energy intake of the pelleted ration and standardised to a concentration of 10 MJ/kg dry matter. Feed intake was regressed against average daily gain and midweight$^{0.73}$, with a separate regression fitted for heifers and bulls, and net feed intake was calculated as the residuals from the model. A net feed intake value therefore represents the difference between the amount of feed an animal consumed and the expected feed requirements based on its liveweight and growth rate. Thus the lower the net feed intake value, the more efficient the animal is. Other contemporary animals also tested in the same group were included in the regression, so that data for a total of 104 bulls and 97 heifers were used. Feed conversion ratio was calculated by dividing total feed intake by the total weight gain over the test.

**Analysis.** Data for each trait was analysed using a generalised linear model (SAS 1989) which included the fixed effects of sex, group (high Net FCE vs low Net FCE) and the interaction of sex and group. Least squares means by group were calculated.

## RESULTS

Least square means by group for each trait are presented in Table 1. The interaction of sex and group was not significant for any of the traits examined. Significant differences between the progeny of high and low Net FCE parents were found for net feed intake and feed intake. Animals from high efficiency parents had lower net feed intake (i.e. were more efficient) than animals from low efficiency parents, and consumed less feed over the 120 day test. No significant difference between the groups was found for feed conversion ratio, average daily gain, adjusted 365-day weight, fat depth at the 12th/13th rib at the end of the test, change in fat depth during the test and eye muscle area at the end of the test.

**Table 1. Least squares means for progeny of High Efficiency and Low Efficiency bulls and heifers**

| Trait | High Efficiency | Low Efficiency | Significance [a] |
|---|---|---|---|
| Number of animals | 27 | 30 | |
| Net feed intake (kg) | -19 ± 10 | 49 ± 9 | *** |
| Actual feed intake (kg) | 1262 ± 25 | 1354 ± 24 | ** |
| Feed conversion ratio (kg/kg) | 8.78 ± 0.15 | 9.05 ± 0.15 | n.s. |
| Average daily gain (kg/day) | 1.173 ± 0.026 | 1.213 ± 0.025 | n.s. |
| Adj. 365 day weight (kg) | 384 ± 7 | 384 ± 7 | n.s. |
| Rib fat (at end of test) (mm) | 7.4 ± 0.3 | 8.1 ± 0.3 | n.s. |
| Change in rib fat (mm) | 3.9 ± 0.3 | 4.3 ± 0.3 | n.s. |
| Eye muscle area (at end of test) ($cm^2$) | 66.1 ± 1.3 | 67.7 ± 1.2 | n.s. |

[a] n.s. means are not significantly different ($P>0.05$); **, *** means significantly different ($P<0.01$ and $P<0.001$ respectively).

## DISCUSSION

The realised response observed after one generation of selection on net feed intake confirms the results from parameter estimates which suggest that net feed intake has a genetic component with a medium heritability (Arthur *et al.* 1997). Net feed intake is calculated to be phenotypically independant of growth, but Kennedy *et al.* (1993) pointed out that it may still be genetically correlated with growth. The limited data available suggests that the observed response in net feed intake was not accompanied by a significant correlated response in growth or carcase traits, which indicates that its genetic correlation with growth may be low or near zero.

Progeny of high efficiency animals consumed 68 kg less feed than progeny of low efficiency animals over 120 days for the same level of performance. With feed valued at $200/tonne, this equates to a saving of $14 per animal over the 120 day test period. Before data on progeny from high and low efficiency demonstration herds (as used in this study) were available, Arthur *et al.* (1996) used the initial postweaning net feed intake data to evaluate the economic benefit of growing the top 50% efficient animals from 300 kg to meet the Korean market specifications at 450 kg liveweight. Compared to an unselected control, it was reported that feed costs were reduced by $10-$17 per animal in a normal season, and $14-$30 under drought conditions. These early results are encouraging and suggest that selection for net feed intake may be beneficial for the beef industry.

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