

REPEATABILITY OF RESIDUAL FEED INTAKE AND INTERACTION WITH LEVEL OF NUTRITION IN ANGUS COWS

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Residual (or net) feed intake (RFI) is measured in cattle fed *ad-libitum* over a defined test period, with those eating less than predicted on the basis of their liveweight and growth rate being considered more feed efficient. This experiment investigated the relationships between RFI of young heifers, and their efficiency at maintenance and on *ad-libitum* feeding as cows.

Cows studied were from 96 Angus heifers bred at the Trangie Agricultural Research Centre, N.S.W., and tested postweaning for RFI in 1994. After having had 2 calves, 56 remained in 1997 and as 4-year-old non-pregnant, non-lactating cows they were tested at maintenance and then under *ad-libitum* feeding. Procedures for the postweaning test and mature cow *ad-libitum* test are described in Arthur *et al.* (2001) and Archer *et al.* (2002). For the maintenance test the cows were weighed and then individually fed their predicted maintenance requirement (SCA 1990). After 3 weeks adaptation to restricted feeding, the maintenance test was 10-weeks in duration. Fat depth over the 12/13th ribs was measured ultrasonically at the start and end of each test to monitor variation in body composition. For each *ad-libitum* test, dry-matter intakes (DMI) of a pelleted ration were regressed against start-of-test metabolic weight and average daily gains (ADG), and RFI for the postweaning (RFI_{pw}) and mature test (RFI_{mature}) were calculated as the residual DMI. For the maintenance test, ADG was used as the measure of efficiency on the premise that an animal gaining (or losing) weight had lower (or higher) maintenance requirement than predicted. Estimated breeding values for RFI (EBV_{RFI}) were available for each animal and ranged from -0.45 to 0.77 kg/day.

Table 1. Means (SD) for growth, fatness, feed intake and RFI for 56 Angus heifers tested postweaning and as cows at maintenance and *ad-libitum* feeding

	Postweaning test	Maintenance test	<i>Ad-libitum</i> test
Start weight (kg)	321 (36)	535 (54)	606 (59)
Daily gain (kg/day)	1.03 (.14)	0.21 (.17)	1.30 (.21)
Start rib fat depth (mm)	4.2 (1.6)	8.5 (2.2)	7.6 (2.3)
Gain in rib fat (mm)	4.4 (2.1)	-0.9 (1.9)	8.1 (2.7)
Feed intake (kg/day)	11.7 (1.1)	5.41 (.41)	17.0 (1.4)
RFI (kg/day)	0.0 (.44)	-	0.0 (1.01)

Feed offered during the maintenance test was approximately one-third that consumed during the subsequent *ad-libitum* test (Table 1). RFI_{mature} was correlated with RFI_{pw} ($r=0.39$; $P<0.01$) showing that RFI was a repeatable measure of feed efficiency between young heifers and near-mature cows, when tested non-pregnant and on *ad-libitum* feeding, with a 0.91 kg/day change in RFI_{mature} observed per unit change in RFI_{pw}. RFI_{mature} was also correlated with the EBV_{RFI} ($r=0.29$; $P<0.05$) and provided evidence for genetic association with postweaning RFI. The observed 1.24 kg/day change in RFI_{mature} per unit EBV_{RFI} is in agreement with the genetic correlation of near-unity reported by Archer *et al.* (2002). Efficiency at maintenance (as ADG) was not correlated with RFI_{pw} or EBV_{RFI} ($r=-0.07$ and 0.01 ; $P>0.05$), nor was it correlated with RFI_{mature} ($r=-0.08$; $P>0.05$). Efficiency under near-maintenance feeding conditions was therefore not associated with variation in RFI or the EBV_{RFI} measured on the young heifers under *ad-libitum* feeding conditions or with variation in RFI by cows during *ad-libitum* feeding. Rib fat depth and gain in fat depth did not explain significant ($P>0.05$) variation in the efficiency traits. These results show that young cattle with low RFI are likely to grow to become more feed efficient adults when feed is available *ad-libitum*, but suggest an interaction with level of nutrition such that this advantage may be reduced under conditions of restricted feed availability which requires further investigation.

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