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CLAYTON LIVESTOCK RESEARCH CENTER
*PROGRESS REPORT*

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# Predicting Intake by Beef Cattle - Relationship of Dry Matter Intake to Initial Weight

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In a previous report (Clayton Livestock Research Center Progress Report No. 79), we evaluated the relationship between dietary energy intake and dietary energy concentration (NEm). This evaluation indicated that, over a wide range in dietary NEm concentrations, there was a strong quadratic relationship between NEm concentration and total intake of NEm. Several factors other than dietary energy concentration can affect feed intake, including animal and environmental effects. With data from cattle fed mostly high-energy diets, initial weight on feed seems to have predictive ability (NRC, 1987). Our objective was to examine the relationship between initial weight and dry matter intake in data obtained from the published literature. In addition, data from feedlot cattle were used to evaluate the relationship within a narrower range of dietary energy concentrations.

The data used in this analysis were described in Progress Report No. 79. Briefly, data were extracted from experiments published in the Journal of Animal Science from 1980 to 1992 that were conducted with growing/finishing beef cattle. The 184 data points represented treatment means for average dry matter intake throughout a feeding period. Frame size, sex, age, and initial and final body weights were recorded. Dietary NEm concentration ranged from less than 1 to approximately 2.4 Mcal/kg. Dry matter intake (kg/day) was analyzed by stepwise regression procedures (SAS, 1987) with initial weight and dummy variables used to adjust the intercept and slope for effects of sex and frame classes as possible independent selections.

The relationship between initial weight (kg) and dry matter intake (kg/day) for the 184 data points taken from the literature is shown in Figure 1. Initial weight, with adjustments to the intercept for certain frame size/sex/age classes accounted for 59.78% of the variation in dry matter intake. The basic equation was: dry matter intake (kg/day) = 1.8545 + .01937 x IW, where IW is initial weight in kg. For large-framed steer calves, the intercept was 2.477, whereas for large-framed heifer calves and medium-framed yearling heifers, the intercept was 3.212. For medium-framed yearling steers, the intercept was 3.616. These equations were used to predict dry matter intake, and predicted intake was regressed on actual intake for the 184 data points. Predicted intake accounted for 57.82% of the variation in actual dry matter intake, with a bias of -2.1% (under prediction). For comparison, the intake equation in the NRC (1984) beef cattle requirements publication accounted for 62.35% of the variation in actual intake, with a bias of -2.2%.

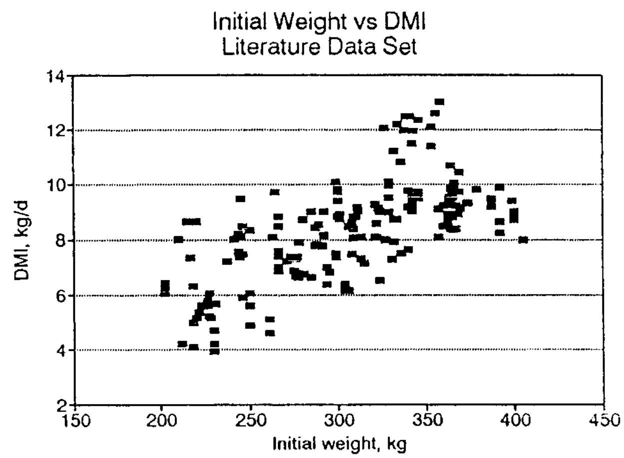


Figure 1. Relationship between initial body weight and dry matter intake. Data points were obtained from published literature and represent treatment means for average intake during a feeding period.

As noted above, the published data used to evaluate the relationship of initial weight to dry matter intake covered a wide range in energy concentrations. In an effort to examine the relationship within a narrower range of energy concentrations that might be typical of feedlots, we used initial weight and dry matter intake data obtained from commercial feedlots. The first set of commercial data was collected from feedlots in Texas, Arizona and California and included 929 pen means for dry matter intake by crossbred steers and heifers. Average initial weight in this data set ranged from approximately 76 to 454 kg. Most cattle in this data set had some degree of Brahman breeding. The second data set included 732 pen means for dry matter intake by crossbred steers collected from one feedlot in Kansas. Initial weight for this second data set ranged from to 201 to 528 kg. The degree of Brahman breeding was minimal in this second data set. Diets fed in both data sets were typical growing/finishing diets (NEg ranged from approximately 1.1 to 1.59 Mcal/kg). Cattle in the first data set were typically on feed longer than those in the Kansas data set, and, as a result, lower energy, growing diets made up a greater proportion of the dry matter intake than in the Kansas data set. For both commercial data sets, simple linear regression equations were developed with initial weight as an independent variable to predict dry matter intake. Results

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are shown in Table 1. For the first data set, which included both steer and heifer data, sex was not a significant factor, so the overall equation is presented.

Table 1. Relationship between initial weight on feed and dry matter intake by beef cattle in two sets of commercial feedlot data

| Data set[a] | Intercept | Slope | RMSE[b] | $R^2$ |
|---|---|---|---|---|
| A | 4.4498 | .01081 | .6217 | 57.1 |
| B | 4.6346 | .01422 | .6048 | 45.2 |

[a]Data set A was collected from commercial feedlots in Texas, Arizona and California and included both steer and heifer data (n = 929). Data set B was collected from one feedlot in Kansas and included only steer data (n = 732).

[b]Root mean square error.

The similarity of the relationship between initial weight and dry matter intake in these two sets of commercial feedlot data is somewhat remarkable. The slope of both equations in Table 1 differs somewhat from the slope derived from the literature data set, which might reflect the narrower range in dietary energy concentrations in the commercial data sets.

Our results suggest that initial weight on feed is related in a linear fashion to average dry matter intake during a feeding period. This finding confirms previous research (NRC, 1987) and suggests that feedlot managers and nutritionists should be able to use their own data base to derive equations to predict dry matter intake from initial weight. Other factors, like management, environment and cattle type could be factored into such equations for individual production situations. No single equation is likely to be effective in all production situations.

## Literature Cited

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