Relationship between Feed Efficiency Measures during the Heifer Development Stage and Measures Taken During First Lactation in Purebred Angus – Progress Report

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Summary and Implications

Fifteen Angus first-calf heifers were evaluated for feed intake utilizing the Feed Intake Monitoring System developed at ISU. Average dry matter intake for the 142-day period was 4718 pounds with over a 3100 pound range in female feed intake. On a daily basis, the low to high spread in daily dry matter intake was 24.7 to 46.6 pounds.

Introduction

Feed costs represent about 60 percent of total costs to maintain a beef cow herd in the U.S. As land continues to escalate in value, a resulting increase occurs in grazing costs, stored feeds and supplementation procedures. Past studies in the feedlot industry show that improvements in feed efficiency reduce costs of production nearly five times more than improvements in growth rate. Current research in the genetics of feed efficiency centers predominantly around growth from weaning to harvest time and fewer projects address the implication of improvements with breeding females. Additionally, no U.S. projects currently involve cattle with a historical background of selection for feed efficiency. This project is meant to address the furthering of knowledge on feed utilization in Angus females following their first calving and subsequent weaning of the calf. The purpose of the current study is to determine if heifers evaluated for feed efficiency during their growth phase from weaning to yearling have similar rankings in feed utilization for continued developmental growth and milk production during the nursing stage with their first calves.

Material and Methods

Heifers used in 2008 of a three year project were evaluated at Wardens Farm, Council Bluffs, Iowa for feed intake, gain and resulting feed conversion and residual feed intake during the weaning to yearling development period. This was done using a pelletted ration fed through PinPointer 4000 feed intake systems. The pellet used contained net energy for maintenance and gain of .74 and .46 mcals per pound of dry matter, respectively, with a protein content of 14 percent. Long stem, predominantly brome grass, hay was offered at 3-4 pounds daily. This was not accounted for in the feed efficiency calculations. At yearling time all heifers were evaluated for carcass traits using certified ultrasound procedures. Heifers were artificially and naturally serviced to one bull, thus reducing calf genetic variation. Average weaning and yearling performance in addition to feed intake and efficiency data is shown in Table 1.

All heifers were calved by Wardens Farm and then transported post-calving to the Iowa State University Beef Nutrition Farm, Ames, Iowa. These first-calf heifers and their calves received Radio Frequency IDs which work in concert with the Feed Intake Monitoring System (FIMS) as described in AS Leaflet R R2279, 2008 ISU Animal Industry Report. In addition to the feeding facility barn, the first-calf heifer pairs were managed in two drylot areas adjacent to and with complete access to the FIMS barn. The drylot grass areas measured 181’ x 100’ and 181’ x 80’ for a total of 32,580 square feet. These were closely mowed utilizing a rotary mower to eliminate grass growth so an insignificant amount of grass was available for consumption, yet it provided a cleaner and drier area for sound nursing and calf rearing. All feed fed to the heifers was offered through the FIMS with it serving as a general loafing barn with all gates kept open. Heifer pairs were allowed access to any and all FIMS bunks within the seven pens.

A forage-based ration was fed ad libitum which met NRC requirements for maintenance, heifer growth and milk production levels associated with Angus genetics of this type (Table 2). All feedstuffs were analyzed utilizing a commercial feed testing laboratory. Heifers and calves were weighed at monthly intervals and during that activity, heifer milk production was measured via the weigh-suckle-weigh technique.

At approximately 60 days post-calving heifers were bred artificially using the Co-Synch+CIDR synchronization system and then exposed to a natural service sire for two estrus cycles or 45 days. Calves were weaned at an average age of 180 days.

Table 1. Performance of heifers up to yearling time.

Traits	Average	Minimum	Maximum
Feed intake test			
Total dry feed intake, lb	1898	1617	2219
Average daily dry matter intake	22.6	19.3	26.4
Test ADG	1.79	1.02	2.67
Unadjusted feed conversion	13.3	9.3	21.9
Adjusted feed conversion	13.2	9.0	20.9
Residual feed intake	0.0	-2.4	1.7
Growth			
Birth weight, lbs	75.9	68	86
Adjusted 205 weight, lbs	646.6	572	713
Adjusted 365 weight, lbs	932.3	799	1053
EPDs			
Birth weight, lbs	0.9	-1.7	2.5
Weaning weight, lbs	43.4	35	53
Maternal Milk, lbs	22.1	15	29
Yearling weight, lbs	75.2	57	87
Ultrasound Traits			
Adjusted Ribeye area, sq.in.	11.2	9.2	13.6
13th Rib fat cover, in.	0.52	0.21	0.76
Adjusted % Intramuscular Fat	5.46	3.81	7.35

Table 2. Composition of rations fed during feed intake measurement.

Feed ingredient	% on As Fed Basis May 28-June 22	% on As Fed Basis June 23-October 17
Fescue hay	44.8	33.6
Soybean hulls	11.3	36.3
Wet distillers grains	34.2	21.5
Molasses	9.4	8.1
Customized cow mineral	0.3	0.4

Results and Discussion

Fifteen first-calf heifers were transported to the ISU beef nutrition farm May 22, 2009, and were immediately started on feed in the FIMS system. Starting May 28th heifers were monitored for daily feed intake for 142 days or until October 17th. Early on in the trial (day 21) it was determined that ration sorting was occurring, so to alleviate that problem ration reformulation was done to allow a liquid molasses addition to take place (see Table 2). Considerable rain fell during the month of June making lot conditions challenging, yet persistent barn cleaning and bedding kept conditions acceptable. However, late in June coccidiosis went through the calves eventually causing the death of one nursing calf and weakening another such that it succumbed to respiratory disease in late August.

First-calf heifers gained on average 203 pounds of body weight and increased by 1.1 in body condition score during the 142 day feeding period for an average of 7.7. Milk production as determined by the calf weigh-suckle-weigh procedure averaged 9.9 lbs for a 12 hour period. The nursing calves gained on average 2.25 lbs daily.

Daily feed intakes varied a great deal on a day to day basis. Figure 1 shows the typical intake variation with the best fit line running through the points. This procedure was done on all cows to best analyze total and average daily dry matter intake. The average daily dry matter intake was 33.2 pounds with a total intake of 4718 pounds for the 142-day period. Of interest, of course, is the variation across the herd in total intake and how efficiently these cows convert feed into milk and calf gain. In this initial year there was over a 3100 pound difference in dry matter intakes from the lowest to the highest intake female. As more data are recorded in ensuing years' data will be analyzed for the relationship between how much feed was required for gain during the heifer development period and how much was needed for maintenance and calf production.

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Table 3. Performance of 1st calf heifers during lactation.

Traits	Average	Minimum	Maximum
Start weight, lbs	1267	1145	1360
End weight, lbs	1470	1345	1680
Weight change lbs	203	90	320
Start body condition score	6.6	5	9
End body condition score	7.7	6	9
12 hour milk production, lbs	9.9	4	14
Beginning calf weight, lbs	150.1	75	222
Ending calf weight, lbs	467.8	296	596
Calf weight gain, lbs	319	148	412
Calf ADG, lbs	2.25	1.04	2.90
Feed intake test			
142-day dry matter intake, lbs	4718	3507	6610
Daily dry matter intake, lbs	33.2	24.7	46.6

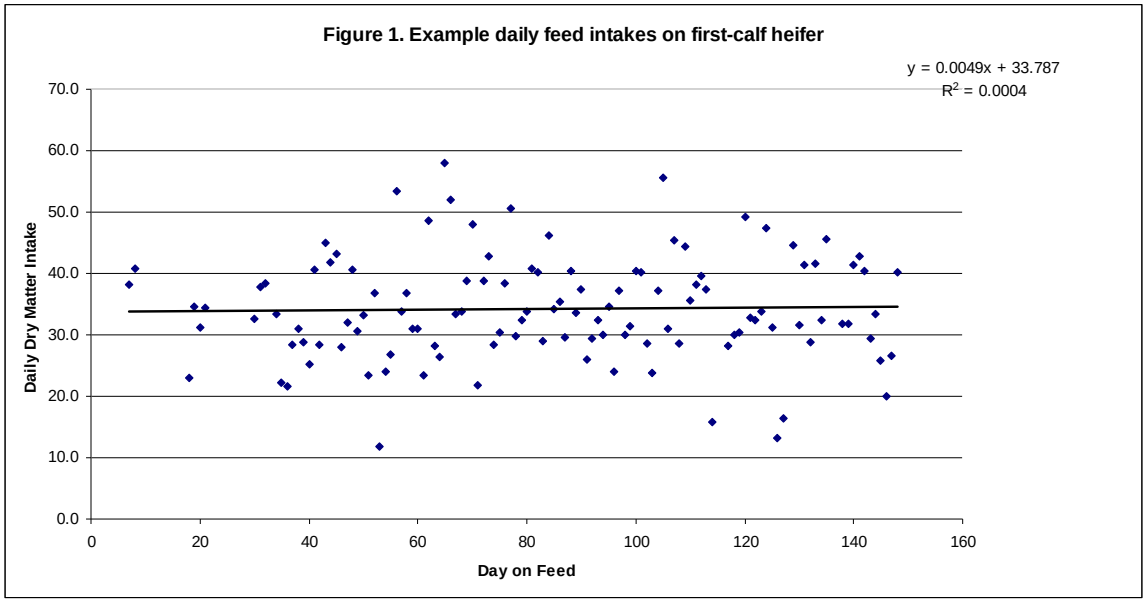

Figure 2. Cow eating out of FIMS bunk.

Figure 3. Cows and nursing calves in drylot loafing area.