1986

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BEEF REPORT

COW EFFICIENCY PRE- AND POSTWEANING

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CATTLE 86-12

Summary

Total energy intake of the cow for a year is not indicative of her efficiency at weaning or her net return to the enterprise. What is important is how she uses the energy she consumes.

Likewise, cow size is not indicative of efficiency or net return.

Breed differences probably exist, but they are not as important as individual differences in cow efficiency.

Breed differences in postweaning efficiency were found only when efficiency was calculated on a cow basis and the cow's annual intake was included. Remember this is a cow efficiency study and the effect of different sires or different breeds of sire was not evaluated.

Carcass trait differences between breeds primarily reflect weaning weight differences or dressing percentage proportion of this difference. When fed to a physiological end point (point where gain and efficiency of gain start to decline), no differences due to breed group in cutability or quality grade were found.

(Key Words: Cow Efficiency, Postweaning Efficiency, Carcass Traits, Breed Differences, Cow Size, Cow Energy Intake.)

Introduction

This is a progress report of a continuing experiment initiated in 1968 and designed as an in-depth study of cow efficiency. Objectives have included the evaluation of sources of variation in efficiency, development of prediction equations for efficiency, calculation of repeatability, evaluation of possible physiological predictors of efficiency and calculation of an estimate of heritability of efficiency. Information on all but the last objective has now been obtained. Additional data will be required before a dependable estimate of heritability can be achieved, and additional data would be desirable for evaluating physiological predictors. This report deals with additional information on sources of variation in pre- and postweaning cow efficiency.

Procedures

Facilities and procedures have been developed which allow accurate measurement of energy consumed by the cow and her calf individually during the cow year. Feeds fed are of a composition as nearly equivalent as drylot facilities will allow to those consumed by animals in a usual ranch situation. For example, the cow's main energy supply is alfalfa pellets and this is only supplemented when it is impossible to obtain the energy consumption equal to that obtained on green pastures. Cow traits measured in addition to energy intake are weight changes, condition changes, hip height and milk production. Calf traits measured are weight changes, energy consumption pre- and postweaning and individual carcass traits including yield of retail cuts. Cow efficiency at weaning is measured as the total TDN (energy) consumed by cow and calf during the year divided by the weaning weight of the calf. In other words, it is the energy consumption required to produce a pound of calf at weaning. Postweaning cow efficiency would include cow and calf TDN consumed to weaning plus TDN consumption of the calf postweaning divided by either live weight at slaughter or weight of retail cut yield, depending on the efficiency being calculated.

Results and Conclusions

Preweaning. The first experiment involved straight Angus, straight Charolais and the reciprocal crosses of those breeds and efficiency was measured on 333 calves produced over an 8-year period from 84 cows (table 1). This experiment did not indicate any cow size or breed differences as has been true of other experiments of this kind. The second experiment still in progress has involved 199 calves produced by breeding unselected straight Hereford, Simmental x Hereford, Angus x Hereford and Tarentaise x Hereford heifers to a Longhorn bull. The addition of the last calf crop to this data set has indicated for the first time significant breed differences (table 2). The Hereford and Angus x Hereford did not differ and the Simmental x Hereford did not differ from the Hereford but were different from the Angus x Hereford. The Tarentaise x Hereford were different from all others. While the analysis indicates these differences are not likely due to chance, the recommendations made previously do not change that much. Producers will still need to be careful to reduce carrying capacity when changing to larger and/or higher milking breed types and selection for efficiency within breed is still the most important way to improve cow efficiency. If future results support present findings, breed types similar to the more efficient breed groups in this study will need to receive some extra credit in carrying capacity when calculating net return to properly credit them with their higher efficiency when standard (use for all breeds) energy partitions are used. This experiment will provide data useful in developing energy requirements for each separate breed type which will be more accurate for net return calculations.

The breed differences indicated above have been adjusted for differences caused by year to year variations, sex of calf and age of calf. After these adjustments, breed differences in experiment 2 accounted for 12% of the differences in cow efficiency. Previous analyses of experiments 1 and 2 have indicated sex of calf accounted for 8.0 and 8.5% of the differences, respectively. Other sources of variation evaluated similarly in experiment 2 are weaning weight of calf (71%), milk production (27%), cow condition at weaning (16%), cow weight at weaning (10%), calf creep consumption (10%), cow condition at calving (1%), cow TDN consumption (1%) and cow height (frame size, 0%). (Researchers note: Squared correlation residual to model including year, age and sex of calf).

It is not unexpected that weaning weight of calf accounts for a high proportion of the variation in efficiency, since it is the divisor in the ratio that defines efficiency. On the other hand, it is a surprise to most people that cow TDN consumption does not control a similar amount of variation, since it makes up a large part of the numerator of that ratio. This can be explained by noting that each increase of one pound in weaning weight will always improve eficiency, while each increase of one pound of cow TDN will only improve efficiency if the cow uses it to wean a heavier calf but, if she does not, it will reduce efficiency. Thus, cow TDN intake is not a good indicator of her efficiency and it is not a good indicator of her contribution to net return to the enterprise. An example may help clarify this. The highest cow TDN consumption in experiment 2 was 7181 lb and most people would expect this cow to be inefficient. But this cow was average for efficiency (13.8 lb of TDN per pound of weaning weight). That means nearly half of the 199 cows were less efficient than this high energy consuming cow. Since efficiency is a ratio, one needs to consider the extra pounds of weaning weight this cow provided the herd and balance this with weaning calf price relative to cost per pound of cow TDN. That is, her 7181 lb of TDN produced 520 lb of calf. Since cow TDN is usually relatively cheap compared to calf weaning price, this cow would have an advantage over a cow of equal efficiency that consumed less TDN just as depositing more money at a given interest rate will return more dollars than a smaller investment. Of course, not all high TDN cows will be this efficient. In fact, the 1% reported above indicates no accuracy for predicting efficiency from TDN consumption. The figures just presented do indicate the need to evaluate cows not only on their individual efficiency but also on the basis of weaning weight produced and costs of production. Prediction equations based on weaning weight of calf and weight of cow at weaning which have been presented previously are still the most accurate method of predicting cow efficiency now available. However, these require that the cow wean a calf before we can predict her efficiency. What is needed is a method of prediction that is accurate at weaning or yearling ages when most heifers are selected for the herd.

Cow size affected efficiency more in experiment 2 (10%) than it did in experiment 1 (1%). This may be due to age of cow differences, since all cows in experiment 2 were 2 years old, while experiment 1 was conducted for the cows' lifetime. This might be expected since two-year-old heifers would have the extra energy requirement for growth in addition to the requirement for lactation.

Postweaning. Complete carcass data were collected on 169 of the calves which were weaned. Table 3 contains the live animal postweaning data and table 4 the carcass data. In both cases, the primary breed group differences were due to differences in rate of growth preweaning and to differences in cow efficiency at weaning. There are differences in slaughter weight and slaughter weight efficiency where TDN consumption of the cow was included, but no differences in efficiency of growth of the calf postweaning (table 3). Likewise for carcass traits (table 4), there were breed group differences for carcass weight, carcass weight per day of age, weight of retail cut yield, retail cut efficiency with cow and calf TDN included and weight of fat trim. In addition, there were significant but hardly practical differences in fat thickness.

An important consideration in evaluating these differences is the proportion of the base breed (Hereford) relative to the introduced breed. Since the slaughter calves were sired by Longhorn bulls, the proportion of introduced blood (Angus, Simmental or Tarentaise) in the breed groups would be a mix of 1/8 and 5/16 for Angus and Simmental crosses and 1/8 for Tarentaise. This relatively low percentage of introduced blood does influence these production traits. These differences do not reflect differences due to sire or breed of sire, since these were minimized in the design in order to better study individual cow differences. In addition, postweaning cow efficiency would be important only to the cow-calf producer who feeds his own calves and not to the feeder who buys calves.

The use of pinpointer feeders permitted slaughter of the calves at the time each individual's gain and efficiency of gain started to decline. This is commonly termed a physiological or chemical end point, indicating a constant fat to lean composition. The lack of differences in quality grade and cutability and the factors affecting them indicate that this end point was achieved in this experiment. The indication of differences in retail cut yield and fat trim at this end point are partially responsible for the change in price paid by packer and feeder for slaughter and feeder cattle, respectively, in recent years. The other major factor involved has been those cattle fed past the chemical end point which resulted in higher proportions of number 4 yield grade. That is, the faster growing, leaner calves have produced more pounds of lean beef for the packer and provided more salable pounds for the feeder with less risk of number 4 yield grade discounts.

TABLE 1. COW EFFICIENCY BY BREED GROUP FOR EXPERIMENT 1

Breed of dam	Number of progeny	Efficiency[a]
Angus	103	11.03
Ang x Cha	73	11.17
Cha x Ang	89	10.94
Charolais	68	11.24

[a] Cow and calf TDN divided by weaning weight.

TABLE 2. COW EFFICIENCY BY BREED GROUP FOR EXPERIMENT 2

Breed of dam	Number of progeny	Efficiency[a]
Her	29	13.4[cd]
Sim x Her	73	13.1[c]
Ang x Her	71	13.6[d]
Tar x Her	26	12.1[b]

[a] Cow and calf TDN divided by weaning weight.
[b,c,d] Averages with one letter common are not different (P>.05).

TABLE 3. LEAST-SQUARES MEANS FOR PRESLAUGHTER POSTWEANING TRAITS

Item	No. of progeny	Days on feed	Slaughter wt, lb	Cow and calf TDN/slaughter wt, lb/lb	Postweaning gain, lb	Postweaning calf TDN/ postweaning gain, lb/lb
			Breed group			
Her	21	241	865[b]	9.79[ab]	477	5.64
Sim x Her	59	243	925[a]	9.82[b]	469	5.84
Ang x Her	63	241	882[b]	9.82[b]	469	5.72
Tar x Her	26	252	894[b]	9.47[a]	455	5.98
			Sex			
Steer	86	247	961[a]	9.21[a]	512[a]	5.69
Heifer	83	241	821[b]	10.24[b]	423[b]	5.90

[a,b] Averages with one letter common are not different (P>.05).

TABLE 4. LEAST-SQUARES MEANS FOR CARCASS TRAITS

Item	No. of progeny	Carcass wt, lb	Carcass wt/day of age, lb/day	Fat thickness, in.	Longissimus area, sq. in.	Quality grade[a], score	Cutability, %[b]	Retail cut yield, lb	Cow-calf TDN/retail cut yield, lb/lb	Fat trim, lb
					Breed Group					
Her	21	543[e]	1.27[cd]	.37[c]	9.9	18.8	50.77	325[d]	25.90[cd]	60[c]
SimxHer	59	582[c]	1.31[c]	.34[c]	10.5	18.9	50.66	348[c]	26.03[d]	65[d]
AngxHer	63	552[de]	1.23[d]	.39[d]	10.2	19.1	50.64	328[d]	26.40[d]	64[d]
TarxHer	26	563[d]	1.25[cd]	.32[c]	10.5	18.8	50.99	341[c]	24.74[c]	63[cd]
					Sex					
Steer	86	601[c]	1.35[c]	.35	10.5[c]	18.9	50.74	363[c]	24.36[c]	66[d]
Heifer	83	510[d]	1.17[d]	.36	10.1[d]	18.9	50.80	308[d]	27.18[d]	60[c]

[a] Score of 19 = low choice USDA grade.
[b] USDA yield grade formula.
[c,d,e] Averages with one letter common do not differ (P>.05).