Influence of Mature Cow Size on Feed and Energy Requirements

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One of the more frequent questions asked about production efficiency in the beef cattle business deals with the influence of cow size on feed requirements. The question concerning optimum cow size is complex, however, one bit of information of importance in arriving at an answer concerns the amount of additional feed, largely energy, to support increasing increments of cow weight.

This serves as a progress report on a two year study underway at this station to study the influence of cow size on energy requirements to support the cow unit. A more complete analysis will be published upon termination of the second trial which is presently being completed.

Procedure

Twenty mature, commercial Hereford cows were selected from a large Oklahoma ranch to serve as experimental animals. The cows selected were 6 to 7 years of age and ranged in weight from approximately 900 lbs. to 1500 lbs. Degree of fatness was estimated by measuring fat cover at the 12th rib with a thermister probe. Fat cover per 100 lbs. of shrunk live weight was similar for the group of medium size cows (averaging about 1000 lbs.) and the large cows (averaging about 1400 lbs.). The cows were confined in dry lot at the Ft. Reno station and fed individually during the experimental period which encompassed a calendar year from just ahead of calving until the next calf was dropped. The cows were weighed at weekly intervals and the feed adjusted periodically to foster a desirable individual weight change pattern throughout the lactation and dry periods. A mixed ration containing 60 percent TDN was fed during the lactation period and a similar ration containing 50 percent TDN was fed during the dry period. Numerous body measurements were collected and will be reported when the second trial is completed. During the lactation period the calves ran with the cows except during the feeding period each day. The calves were given individual access to a mixture of chopped alfalfa hay and 5 percent molasses.

Milk production was measured at 28 day intervals throughout the lactation period and milk samples were taken for fat analysis to permit the expression of energy requirement for the cow on a milk corrected basis.

Digestible energy content of the ration fed was determined by the chromic oxide reference technique. When the two year study is completed, final data will be presented on a digestible energy as well as

established commercial herd.

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TDN basis. In this report the energy requirements will be expressed on the basis of TDN values.

The weight change patterns during the lactation and dry periods were predetermined based on initial weight and were carefully controlled to restore the initial pre-calving weight just ahead of the next calving.

Results and Discussion

The data from this trial resulted in the following equation for predicting the annual energy requirement to support the cow exclusive of that required for milk production.

$$\text{Annual TDN Requirement (lbs.)} = 16.31 \text{ Weight}^{0.74}$$

The annual requirements predicted by the above equation for cows of different mature weights are shown in Table 1.

From the data in Table 1, the energy requirement to support the cow, exclusive of milk production, increases at a rate of 7 percent for each 100 lb. increment in cow weight.

In order to estimate the cow-calf unit efficiency the energy consumed by the calf in the form of milk and other feeds must be superimposed on the requirement to support the cow. For example a 1000 lb. cow would require about 2710 lbs. of TDN for her support plus another 810 lbs. to produce 15 lbs. of 3 percent milk daily during a 205 day lactation. For the calf to wean at 475 lbs., an additional 643 lbs. of TDN would be required above that supplied by the milk consumed. On this basis the annual TDN requirement for the cow-calf unit would be 4163 lbs. This would result in a TDN efficiency value of 876 lbs. of TDN per 100 lbs. of weaned weight. Had the calf weaned heavier, added TDN would have been required in production but efficiency would have improved.

Through calculations of this type it is possible to estimate the added calf weight needed to support the additional TDN required by the

Table 1. Influence of Cow Size on Annual TDN Requirements to Support the Cow Including a Desirable Weight Change Pattern

Cow Weight (Lbs.)	Annual TDN Required (Lbs.)	Requirement as % of 100 lb. Cow
900	2503	93
1000	2709	100
1100	2904	107
1200	3098	114
1300	3286	121
1400	3472	128
1500	3653	135
1600	3832	142

larger cow and the larger calf so that TDN efficiency is similar for cow-calf units involving cows of different weights. This involves the use of the prediction equation for the cow requirement and the TDN requirements of the calf for maintenance and production. On this basis the TDN efficiency of a 1000 lb. cow weaning a 475 lb. calf can be established as a base point for TDN efficiency. Then the efficiency of the larger cow can be calculated at different calf weaning weights. This can be plotted and the improving efficiency of heavier weaning weights will intersect the efficiency line of the base point cow-calf unit.

By calculations of this type it is estimated that the weaning weights shown in Table 2 would be required of cows of different weights in order to have equal TDN efficiency for the unit.

The following formula is proposed as a method of indexing cows of different size for production efficiency.

$$\text{Cow Efficiency Index} = \frac{\text{205 day adjusted calf wt.} \times 100}{\text{Mature cow weight}^{0.74}}$$

This formula involves calf weight and cow weight to the 0.74 power. Table 3 illustrates the use of the index.

All cows in this example index the same. If the 1200 lb. cow had weaned a calf at 500 lbs. then the resulting index would be 263 rather than 286. As a result this cow would have been less efficient in the production of calf weight than the 1000 pound cow weaning a 475 pound calf.

Table 2. Calf Weaning Weights Required of Cows of Different Weights to Result in Equal TDN Efficiency

Cow Weight (lbs.)	Necessary Weaning Wt. (lbs.)	Calf Weaning Weight as a % of Cow Wt.
1000	475	47.5
1200	543	45.3
1400	609	43.5
1600	672	42.0

Table 3. Efficiency Index for Cow Efficiency

Cow Weight lbs.	Cow Weight$^{0.74}$ lbs.	Calf Weight lbs.	Efficiency Index
1000	166.1	475	286
1200	190.0	543	286
1400	212.9	609	286
1600	235.0	672	286

It should be recognized that calf weight required to result in equal TDN efficiency may not be the same as the added calf weight required to support the cost of additional TDN. These relationships depend on the cost estimates on the TDN utilized, weaning weight value and percentage calf crop which influences the pounds of calf weaned per cow.

Table 4 provides values for cow weights to the 0.74 power for use in the equation for indexing cow efficiency.

Table 4. Cow Weights$^{0.74}$

Cow Wt (lbs.)	Cow Wt.$^{0.74}$ (lbs.)	Cow Wt (lbs.)	Cow Wt.$^{0.74}$ (lbs.)
900	153.5	1350	207.2
950	159.7	1400	212.9
1000	166.1	1450	218.6
1050	172.0	1500	224.0
1100	178.1	1550	229.5
1150	184.0	1600	235.0
1200	190.0	1650	240.4
1250	195.8	1700	245.8
1300	201.5		

Summary

Twenty commercial Hereford cows were used to study the relationship between cow size and energy requirements. An equation is presented for predicting the annual energy requirement of cows of different weights. A formula for indexing cow efficiency is proposed.

The Influence of Stilbestrol Implants on the Performance of Calves on Wheat Pasture or Sorghum Silage

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The influence of stilbestrol on the performance and efficiency of finishing cattle is well recognized. In addition, several tests have shown gain stimulation in stocker cattle grazing good improved pastures. Little information is available, however, as to the gain stimulation that might be expected in calves grazing wheat pasture. Since this type of forage program is of great importance to Oklahoma it was deemed desirable to test the influence of stilbestrol implants on calves grazing this type of pasture or consuming other roughages in a stocker program.