IMPLICATIONS OF COW SIZE ON FORMULATING BEEF COW RATIONS

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INTRODUCTION

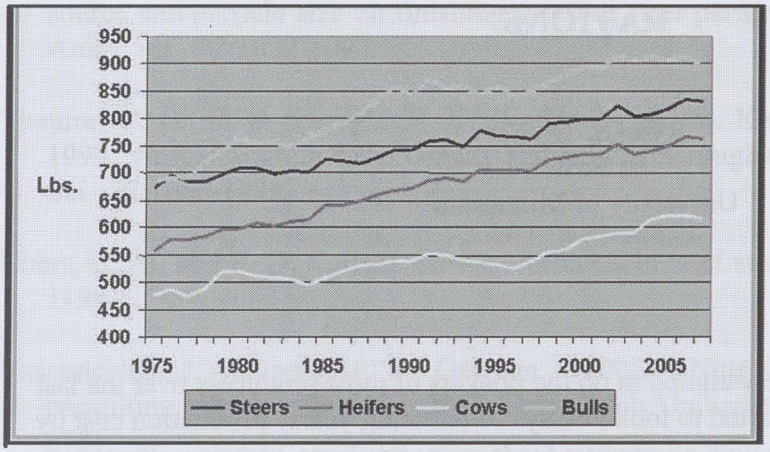
As the rise in production cost have weighed in on the pockets of most producers over the last couple of years, producers have started to look at ways of reducing yearly production cost by adjusting winter feeding strategies with alternative feeds or by-products, utilizing alternative feeding systems and extending the grazing season. Some of these practices can help to reduce overall production cost, but not all producers can realize these advantages depending on location. Proximity of some of these alternative feeds or by-products, change in market prices due to weather conditions or disease outbreaks, or weather conditions affecting forage production can all affect one's ability to utilize these alternative practices. Most production changes today focus on cutting the corners in those areas. The rest of this article will focus on evaluating a component of your beef operation that you have full control over that can impact your profit/loss margins.

The subject of "cow size" has received some attention over the past several years and recent data has shown that cow size will affect the efficient use of forages produced or feed purchased and its relationship to percent of body weight weaned. There is nothing complicated about the term cow size, but it has allowed us to think about cow efficiency in the herd. There are a number of factors that control efficiency of a cow in the herd, unlike feeding feeder calves in a feedlot, such as feed/forage composition, feed delivery or grazing method, feeding or grazing environment, breed, age, genetics, stage of reproduction, and weather. Controlling all of these factors is almost impossible; however, some of these factors are controllable in the cow herd and in fact are part of the reason why cow size has drawn some attention. Beef cow size, as we refer it, is a mature cow's body weight (five years of age or older) at a body condition score of five. Body condition score is a subjective measurement of a beef animal's nutritional status based on fat composition. Body condition scoring uses a numerical numbering system from 1 to 9 (1=emaciated and 9=obese). In this paper, we will look at how cow size has changed in the past 30 years, how it has affected production cost, and management strategies for optimizing cow production efficiency.

COW SIZE – A REVIEW

Over the last 30 years, U. S. cattle producers have seen a tremendous change in weaning and carcass weights. Thirty years ago, a cow that weaned a calf weighing 400 pounds going to market was considered a good calf. Today, a 400 pound calf going to market will not cover the annual production cost of that cow in most herds. In keeping up with inflation and the significant rise in feed, fuel, and fertilizer cost, it takes calves weighing nearer 600 pounds to generate a positive net return.

Figure 1: Carcass Weight of Bulls, Cows, Steers, & Heifers



National Agricultural Statistics Service – Federally Inspected Slaughter Report – 1975 to 2005 (*Adopted from Dr. Bryan McMurry, 2009).*

So what are the weights of the calves our producers are weaning today? If you look at the data from the National Agricultural Statistics Service "Federally Inspected Slaughter Report", carcass weights of bulls, cows, steers, and heifers increased some 223, 146, 144, and 194 lbs from 1975 to 2005 (Figure 1). With a 150 to 200 lb increase in steer and heifer carcass weights, weaning weights in our calves have also increased approximately 200 lbs.

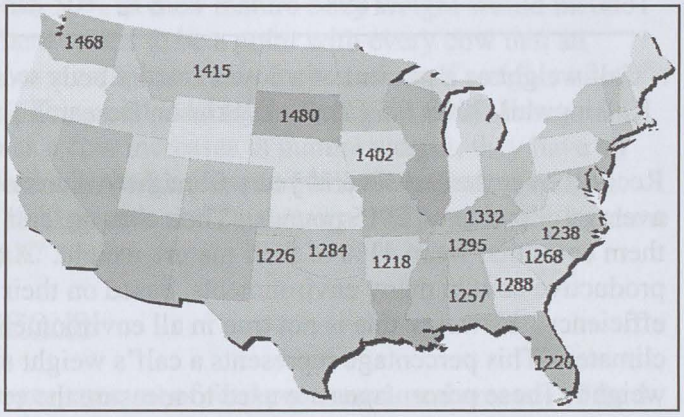
Over the last thirty years the cow/calf segment of our beef industry has improved weaning weights to near 600 pounds. This change in production has been accomplished by a response to market demands and incorporating a number of improvements in technology. In these 30 years, pressure from the feedlots forced producers to select more for growth and performance from calves going in and out of the feedlot. So producers started selecting for average daily gain and yearling weights, which had a significant impact on calf weaning weights over the years. Figure 1 also illustrates the increase in carcass weights of both slaughter bulls and cows. The increase in slaughter weights of bulls and cows may not be a surprise as the increase seen in calf carcass weights reflects on the heifers kept as replacements that would eventually become mature cows in the breeding herd. Because there is a strong positive genetic correlation between weaning weight and mature size and carcass weights and mature size (0.80 and 0.76; Bullock et al., 1993), the mature size of our cows increased as a direct response to the animal breeding technology used.

The influence of European breeds has had a substantial impact on increasing the weaning weights of our calves. Through the use of EPDs we selected breeding bulls to increase our weaning weights, without realizing the potential to increase mature cow size. Our geneticist warned us about selecting heavily for growth. Looking at average cow slaughter weights from packing plants at randomly selected states across the U.S. on February 9, 2009, there is a large variation in the average weight of cows from the states selected (Figure 2). Cow weights were larger in the northern states vs the southern states. Granted, a percentage of these slaughter weights in the northern states come from Holstein or Holstein crosses, cows are generally heavier in these colder northern climates. So how have our cow weights changed over the last 30 years? Using the Federally Inspected Slaughter Report, we can calculate approximate mature cow weights based on body condition scores that were recorded as they went to slaughter. Average mature cow weights in 1975 was calculated at 1047 pounds and in 2005, 1350 pounds. This is an increase of 303 pounds in cow weights over the last 30 years. If you take the average weights across the U.S. from Figure 2, the average weight is 1,314 lbs.

The U.S. Meat Animal Research Center (MARC) in Clay Center, Neb., recently reported an evaluation of current genetics of 6 major breeds to the genetics of these same breeds many years ago (Vanderwert, 2008). Looking at average mature weights from four-year old cows at the U.S. MARC from the six breeds evaluated showed Simmentals with the largest average cow herd size (1,353 lbs), followed by Hereford (1,348 lbs), Angus (1,342 lbs), Charolais (1,339 lbs), Limousin (1,330 lbs), and Gelbvieh (1,282 lbs). Today, we are seeing larger mature weights in many of our British breeds over some of the continental breeds that were traditionally known for their frame size and growth. While our Continental breeds allowed us to increase weaning weights of our calves, heavy selection of growth traits in our British breeds had an impact on mature cow size.

Other contributing factors to this increase in cow size and weaning weights, while somewhat minor, are improvement in our animal husbandry and health programs in terms of facilities management, animal handling, vaccinations, parasite control and antibiotics. The management of breeding systems and more controlled calving seasons has helped producers wean more uniform and heavier calves. Our nutrition programs in general have improved. Even though our native range country has declined in species diversity, overall quality and quantity, we have had success with improving forage varieties with legumes.

Figure 2: Cow Slaughter Weights Recorded on February 9, 2009 from Randomly Selected States Across the United States.



Adapted from Dr. Bryan McMurry, Cargill Animal Nutrition.

WHY IS COW SIZE IMPORTANT

With this motivation to wean as big a calf as possible through the use of genetic improvements, most of us did not pay attention to the fact that by increasing weaning weights we were increasing mature cow weights. Should it be the goal of every producer to produce a more moderate/efficient cow (1250 lbs) that weans a 650 lb calf? I think the more appropriate question is should we raise more moderate size cows with high reproductive rates and low input costs which produce high-value calves?

Researchers at North Dakota State University have recently evaluated the cow herd size at the Dickinson Research Extension Center and reported that their larger cows are weaning less of a percentage of their body weight and producing smaller calf weights. Just breaking their herd of slightly over 100 head into two groups, lighter weight cows averaging 1272 pounds mature weight weaned 602 pounds resulting in 47% of mature body weight weaned. Heavier cows averaging 1571 pounds mature weight weaned 603 pounds resulting in 43% of mature body weight weaned. The researchers then broke the cow herd down into 100 pound increments (Table 1). Cows weighing over 1600 lbs weaned 33.7 percent of their body weight, 1501-1600

lb cows weaned 38.6 percent, 1401-1500 lb cows weaned 40.5 percent, 1301-1400 lb cows weaned 45 percent, and 1200 lb cows weaned 49.7 percent of their body weight. As mature cow weights increase for this herd, calf weaning weights actually decreased with a difference of 45 pounds from the lighter weight to the heavier weight cow groups. In order to be fair across all cows and weaning dates, calf weaning weights were adjusted to 205 day weights.

Table 1. Weaning weight performance for cows of varying weight groups

Weight Group	Average Weight	Weaning Weight	Percent[a]
1200	1242	617	49.7%
1300	1357	611	45.0%
1400	1456	589	40.5%
1500	1549	598	38.6%
1600	1698	572	33.7%

[a]Calf weight as a percent of a cow's mature body weight.
K. Ringwall, 2008 *Beef Talk.* Dickinson Research Extension Center, Dickenson, ND.

Records over the last several years from the Arkansas Cow Herd Performance Program reported average cow size of 1315 pounds. Their average calf weaning weight was 539 pounds, giving them cows that wean 41% of their mature weight. A thirteen hundred pound cow can be a productive cow in many environments, based on their genetic composition and biological efficiency. However this is not true in all environments, particularly in the hotter southern climates. This percentage represents a calf's weight as a percentage of a cow's mature body weight. These percentages are used to measure the economic efficiency of a cow in terms of pounds of calf weaned, feed efficiency, and biological efficiency. These percentages are a great tool for understanding how much weight a cow is pulling in the herd. It is obvious that producers don't get paid based on percentages; however, knowing these averages allow you to focus on the distribution around that average, more specifically the heavier cows. If you take the average of the mature weights of all your cows, you have created a normal distribution around the average. As a producer, your problem lies in the cows that weigh over 1350 pounds, or above your herd's average. We are seeing this in many herds in the Upper Midwest Region, and I call these the forgotten cows. There are not many of them in these herds, but they are there and most producers will look at her and just say, she is one of my bigger cows. The thought very seldom crosses their minds as to what she actually weighs, and how big a calf is she weaning in relation to her body size.

Let's say a herd has a distribution of cows that weigh from 900 to 1900 pounds, and again the average is 1350 pounds, attention needs to be given to those cows weighing one and two standard deviations from the mean. Those cows weighing 1550-1750 lbs represent one standard deviation and those cows weighing 1750-1900 lbs represent two standard deviations from the mean. Obviously those heavier cows that fall two standard deviations from the mean need to justify their place in the herd. It is estimated that approximately 16% of all U.S. beef cows weigh in excess of 1500 pounds (McMurry, B; 2009). That equates to over 5,000,000 head. Of

these 5,000,000 beef cows, are there any that can wean a 700 lbs calf, let alone a 750 lb calf? There are likely some, but it would be a small percentage.

Unfortunately, one size does not fit all operations, particular in the colder climate regions of the Upper Midwest. Minnesota has seen an increase in its cow size and I would suspect that most of the cow herds in MN and neighboring northern states average 1350 pounds or more. Even variation in individual cow weights within a herd can be as large as 1,000 pounds. North Dakota State University Beef Cow/Calf Specialist (Kris Ringwall, 2008) recently reported in *Beef Talk* that the mature weight of 102 beef cows within two herds at the Dickinson Research Extension Center ranged from 856 to 1935 pounds. I would suspect that this variation is typical for most operations in the northern climates.

Increasing cow size has a point of diminishing returns. It is not uncommon to find herds in the northern climates with cows weighing in excess of 1800 pounds. When we consider cow production efficiency, for those cows to wean 50% of their mature body weight would mean weaning a calf that weighs 900 pounds. There seems to be a point with every cow that an increase in mature weight no longer produces a complementary increase in calf weights to offset the additional feed cost of the heavier cow. This point is likely to be highly variable between herds, and between cows within herds. So as a cow increases in mature weight, they have an increasingly difficult time weaning a calf that will weigh close to 50% of her mature weight. How many cows do you know that weigh 1800 pounds and can wean a 900 pound calf, let alone a 1500 pound cow weaning a 750 pound calf?

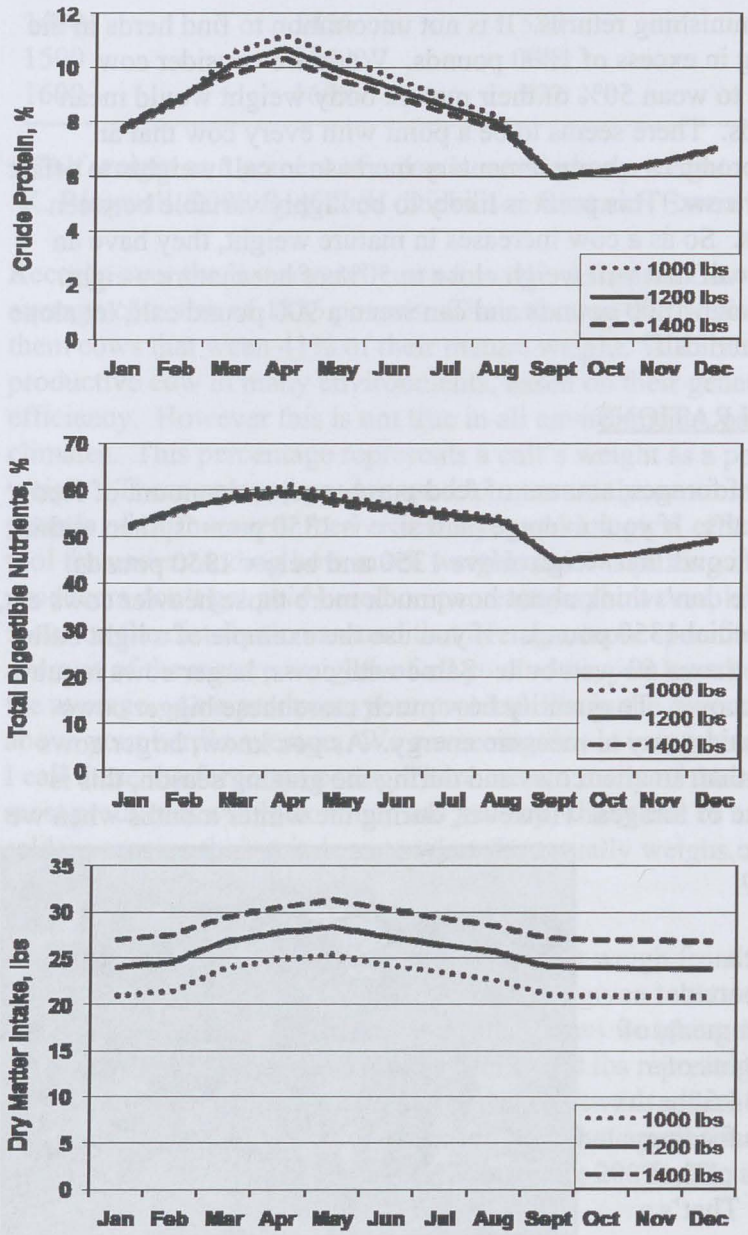
IMPLICATIONS OF COW SIZE ON RATIONS

Cow size can affect the efficient use of forages, amount of feed purchased, and amount of feed waste potential during the winter months. If your average herd size is 1350 pounds, then within your herd you will have a variation of cows that weigh above 1350 and below 1350 pounds. That has already been established. We don't think about how much more those heavier cows eat, because all your cows average that special 1350 pounds. If you use the example of a light bulb, a 100-watt bulb will use more energy than a 60-watt bulb. Same with cows, larger cows require more energy (in pounds) than smaller cows. To quantify how much more these bigger cows need, we will use DM intake as the easiest way to measure energy. As you know, larger cows require more energy for maintenance than smaller cows and during the grazing season, this is accomplished with a higher DM intake of forages. However, during the winter months when we dictate how much a cow needs, are we compensating for those heavier cows?

Researchers at the Dickenson Research Extension Center in North Dakota reported average daily dry-matter intake requirements of two groups of cows with average weights of 1216 and 1,571 lbs would be 28 and 34.5 lbs dry matter/cow/day. That breaks down to feeding those cows approximately 2.2 to 2.3% of their body weight in pounds of dry matter. That's a

difference of 2,372.5 lbs of dry matter/cow/year between those two herds. This equates to a little over a ton of hay/cow/year between the two weight groups. To break it down further, the difference in daily dry matter intake/cow is 6.5 lbs in these two herds. That equates to approximately 1.83 pounds per day additional dry matter intake for each 100 pounds increase in body weight. If you look at the dry matter intake graph in Figure 3 (NRC, 2000), DM intake increases three pounds/day for every 200 lb increase in mature body weight for a cow that produces 20 lbs of peak milk.

Figure 3: Nutrient Requirements of Crude Protein, Total Digestible Nutrients, and Dry Matter Intake for a 1,000 lb, 1,200 lb, and 1,400 lb beef cow.



Let's look at nutrient composition of crude protein (CP) and total digestible nutrients (TDN). Because maintenance requirements are higher for larger cows, are protein and energy requirements (as a percent) higher? If we look at the NRC requirements for CP and TDN of a 1,000 lb, 1,200 lb, and 1,400 lb beef cow with 20 lb peak milk, the requirements are similar (as a percentage of the diet) across all weight groups (Table 2). In fact, the bigger the cow, the lower the numerical value (as a percent of the diet) of CP and TDN that is required in the diet. As you can see in Figure 3, there is no difference in the percentage of CP and TDN in the diet for heavier cows. However, because DM intake is much higher for heavier cows, the amount (in lbs) of CP and TDN will increase for larger cows. In fact as cow size increases from 1000 to 1400 lbs at 20 lbs peak milk, intake, protein, and energy requirements (in pounds) increase 19%, 12%, and 17%, respectively for cows 90 days post-calving. So for purposes of formulating rations, beef cow groups that produce the same volume of milk at peak lactation (ex: 20 lbs peak milk), yet differ in weight require more dry matter intake, by a factor of 1.5 lbs/hd/day for every 100 pound increment in weight.

Table 2: Diet Nutrient Density Requirements of Beef Cows weighing 1,000 lbs, 1,200 lbs, and 1,400 lbs at 20 lb peak milk[a].

	Months Since Calving											
	1	2	3	4	5	6	7	8	9	10	11	12
1,000 lb Mature Weight, 20 lb Peak Milk												
TDN, % DM	**59.6**	**60.9**	**58.6**	**57.0**	**55.4**	**54.0**	**44.9**	**45.7**	**47.0**	**49.1**	**52.0**	**55.7**
ME, mcal/lb	1.00	1.02	0.98	0.95	0.92	0.90	0.75	0.76	0.79	0.82	0.87	0.93
NEM, mcal/lb	**0.60**	**0.62**	**0.59**	**0.56**	**0.54**	**0.52**	**0.37**	**0.38**	**0.40**	**0.44**	**0.49**	**0.54**
DM, lb	**24.0**	**25.0**	**25.4**	**24.4**	**23.5**	**22.7**	**21.1**	**21.0**	**20.9**	**20.8**	**21.0**	**21.4**
Milk, lb/day	16.7	20.0	18.0	14.4	10.8	7.8	0.0	0.0	0.0	0.0	0.0	0.0
CP % DM	**10.54**	**11.18**	**10.38**	**9.65**	**8.86**	**8.17**	**5.98**	**6.16**	**6.47**	**6.95**	**7.66**	**8.67**
Ca % DM	0.30	0.32	0.30	0.27	0.24	0.22	0.15	0.15	0.15	0.24	0.24	0.24
P % DM	0.20	0.21	0.19	0.18	0.17	0.15	0.11	0.11	0.11	0.15	0.15	0.15
1,200 lb Mature Weight, 20 lb Peak Milk												
TDN, % DM	**58.7**	**59.9**	**57.6**	**56.2**	**54.7**	**53.4**	**44.9**	**45.8**	**47.1**	**49.3**	**52.3**	**56.2**
ME, mcal/lb	0.98	1.00	0.96	0.94	0.91	0.89	0.75	0.76	0.79	0.82	0.87	0.94
NEM, mcal/lb	**0.59**	**0.61**	**0.57**	**0.55**	**0.53**	**0.51**	**0.37**	**0.38**	**0.41**	**0.44**	**0.49**	**0.55**
DM, lb	**26.8**	**27.8**	**28.4**	**27.4**	**26.5**	**25.7**	**24.2**	**24.1**	**24.0**	**23.9**	**24.1**	**24.6**
Milk, lb/day	16.7	20.0	18.0	14.4	10.8	7.8	0.0	0.0	0.0	0.0	0.0	0.0
CP % DM	**10.10**	**10.69**	**9.92**	**9.25**	**8.54**	**7.92**	**5.99**	**6.18**	**6.50**	**7.00**	**7.73**	**8.78**
Ca % DM	0.29	0.31	0.29	0.26	0.24	0.22	0.15	0.15	0.15	0.26	0.25	0.25
P % DM	0.19	0.21	0.19	0.18	0.17	0.15	0.12	0.12	0.12	0.16	0.16	0.16
1,400 lb Mature Weight, 20 lb Peak Milk												
TDN, % DM	**58.0**	**59.1**	**56.8**	**55.5**	**54.1**	**53.0**	**45.0**	**45.8**	**47.3**	**49.5**	**52.6**	**56.6**
ME, mcal/lb	0.97	0.99	0.95	0.93	0.90	0.89	0.75	0.77	0.79	0.83	0.88	0.95
NEM, mcal/lb	**0.58**	**0.60**	**0.56**	**0.54**	**0.52**	**0.50**	**0.37**	**0.39**	**0.41**	**0.44**	**0.49**	**0.56**
DM, lb	**29.5**	**30.5**	**31.3**	**30.3**	**29.4**	**28.6**	**27.2**	**27.0**	**26.9**	**26.8**	**27.0**	**27.6**
Milk, lb/day	16.7	20.0	18.0	14.4	10.8	7.8	0.0	0.0	0.0	0.0	0.0	0.0
CP % DM	**9.76**	**10.31**	**9.56**	**8.94**	**8.29**	**7.73**	**6.00**	**6.20**	**6.53**	**7.04**	**7.80**	**8.88**
Ca % DM	0.28	0.30	0.28	0.26	0.24	0.22	0.16	0.16	0.16	0.27	0.26	0.26
P % DM	0.19	0.20	0.19	0.18	0.17	0.16	0.12	0.12	0.12	0.17	0.17	0.16

[a]NRC, 2000

If you look at the NRC (2000) requirements for DM intake, CP, and TDN for 1,200 lb cows with a peak milk of 10, 20, or 30 lbs, requirements vary considerably (Table 3). While the weight of the cow is the same for all three categories, the amount of milk that cow is producing has a significant effect on the percentage or amount of nutrients required for maintenance of that animal. Research has shown that high-maintenance cows are characterized by high milk production and low-maintenance cows are likely to have low milk production. When you look at the values for each nutrient change from month-to-month, the biggest change is six to seven

months after calving; representing a cow that just weaned a calf. Energy consumption during the lactation portion of the production cycle represents 72% of energy utilized (Ferrell and Jenkins, 1988) which explains why nutrient densities (as a percent of the diet) for a 1,200 lb cow increases as peak milk production increases from 10 to 20 to 30 lbs.

Now, to make things more complicated, how will nutrient densities change for a 1,000 lb cow that produces 30 lbs peak milk versus a 1,400 lb cow that produces 30 lbs peak milk, or a 1,000 lb cow that produces 30 lbs peak milk versus a 1,400 lb cow that produces 10 lbs peak milk?

Table 3: Diet Nutrient Density Requirements of Beef Cows weighing 1,200 lbs at 10, 20, and 30 lb peak milk[a].

	Months Since Calving											
	1	2	3	4	5	6	7	8	9	10	11	12
1,200 lb Mature Weight, 10 lb Peak Milk												
TDN, % DM	**55.3**	**56.0**	**53.7**	**52.9**	**52.1**	**51.5**	**44.9**	**45.8**	**47.1**	**49.3**	**52.3**	**56.2**
ME, mcal/lb	0.92	0.94	0.90	0.88	0.87	0.86	0.75	0.76	0.79	0.82	0.87	0.94
NEM, mcal/lb	**0.54**	**0.55**	**0.51**	**0.50**	**0.49**	**0.48**	**0.37**	**0.38**	**0.41**	**0.44**	**0.49**	**0.55**
DM, lb	**24.4**	**24.9**	**26.0**	**25.6**	**25.1**	**24.8**	**24.2**	**24.1**	**24.0**	**23.9**	**24.1**	**24.6**
Milk, lb/day	8.3	10.0	9.0	7.2	5.4	3.9	0.0	0.0	0.0	0.0	0.0	0.0
CP % DM	**8.43**	**8.79**	**8.13**	**7.73**	**7.33**	**7.00**	**5.99**	**6.18**	**6.50**	**7.00**	**7.73**	**8.78**
Ca % DM	0.24	0.25	0.23	0.21	0.20	0.19	0.15	0.15	0.15	0.26	0.25	0.25
P % DM	0.17	0.17	0.16	0.15	0.14	0.14	0.12	0.12	0.12	0.16	0.16	0.16
1,200 lb Mature Weight, 20 lb Peak Milk												
TDN, % DM	**58.7**	**59.9**	**57.6**	**56.2**	**54.7**	**53.4**	**44.9**	**45.8**	**47.1**	**49.3**	**52.3**	**56.2**
ME, mcal/lb	0.98	1.00	0.96	0.94	0.91	0.89	0.75	0.76	0.79	0.82	0.87	0.94
NEM, mcal/lb	**0.59**	**0.61**	**0.57**	**0.55**	**0.53**	**0.51**	**0.37**	**0.38**	**0.41**	**0.44**	**0.49**	**0.55**
DM, lb	**26.8**	**27.8**	**28.4**	**27.4**	**26.5**	**25.7**	**24.2**	**24.1**	**24.0**	**23.9**	**24.1**	**24.6**
Milk, lb/day	16.7	20.0	18.0	14.4	10.8	7.8	0.0	0.0	0.0	0.0	0.0	0.0
CP % DM	**10.10**	**10.69**	**9.92**	**9.25**	**8.54**	**7.92**	**5.99**	**6.18**	**6.50**	**7.00**	**7.73**	**8.78**
Ca % DM	0.29	0.31	0.29	0.26	0.24	0.22	0.15	0.15	0.15	0.26	0.25	0.25
P % DM	0.19	0.21	0.19	0.18	0.17	0.15	0.12	0.12	0.12	0.16	0.16	0.16
1,200 lb Mature Weight, 30 lb Peak Milk												
TDN, % DM	**61.6**	**63.2**	**60.8**	**59.0**	**57.0**	**55.2**	**44.9**	**45.8**	**47.1**	**49.3**	**52.3**	**56.2**
ME, mcal/lb	1.03	1.06	1.02	0.99	0.95	0.92	0.75	0.76	0.79	0.82	0.87	0.94
NEM, mcal/lb	**0.64**	**0.66**	**0.62**	**0.59**	**0.56**	**0.54**	**0.37**	**0.38**	**0.41**	**0.44**	**0.49**	**0.55**
DM, lb	**29.2**	**30.6**	**30.8**	**29.4**	**27.9**	**26.7**	**24.2**	**24.1**	**24.0**	**23.9**	**24.1**	**24.6**
Milk, lb/day	25.0	30.0	27.0	21.6	16.2	11.7	0.0	0.0	0.0	0.0	0.0	0.0
CP % DM	**11.51**	**12.25**	**11.41**	**10.55**	**9.61**	**8.75**	**5.99**	**6.18**	**6.50**	**7.00**	**7.73**	**8.78**
Ca % DM	0.34	0.36	0.34	0.31	0.27	0.25	0.15	0.15	0.15	0.26	0.25	0.25
P % DM	0.22	0.23	0.22	0.20	0.18	0.17	0.12	0.12	0.12	0.16	0.16	0.16

[a]NRC, 2000

Let's start with the first comparison: a 1,000 lb cow producing 30 lbs peak milk versus a 1,400 lb cow producing 30 lbs peak milk (I will refer to requirements at peak milk). First, DM intake will be significantly higher for a 1,400 lb cow (33.3 lb) versus a 1,000 lb cow (27.8 lb). However, percent of CP and TDN in the diet will be slightly higher for the 1,000 lb cow (12.86 and 64.5) versus the 1,400 lb cow (11.77 and 62.2). In terms of actual amount of CP and TDN, intake is higher for the 1,400 lb cow (3.9 and 20.7 lbs) versus the 1,000 lb cow (3.6 and 17.9 lbs). Let's look at the second comparison: a 1,000 lb cow producing 30 lbs peak milk versus a 1,400 lb cow producing 10 lbs peak milk. Dry matter intake will be similar for the 1,400 lb cow (27.6 lb) versus the 1,000 lb cow (27.8). However, percent CP and TDN in the diet will be much higher for the 1,000 lb cow (12.86 and 64.5) versus the 1,400 lb cow (8.56 and 55.5), respectively. In terms of actual amount of CP and TDN, intake is higher for the 1,000 lb cow (3.6 and 17.9 lbs) versus the 1,400 lb cow (2.4 and 15.3 lbs). Based on these comparisons, a cow with higher maintenance requirements (lactation) has a higher priority for nutrient partitioning than size of an animal. Lactation requires more nutrients, as a percent of the diet, versus weight; however, total DM intake and intake of CP and TDN will generally be higher for cows that weigh more, if milk production is average to high.

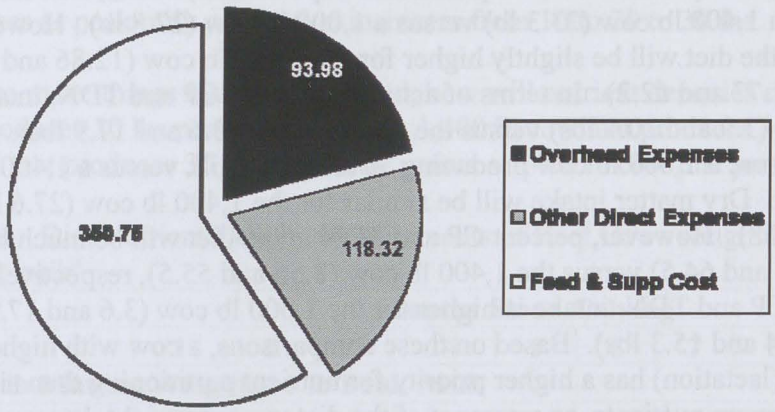
During the winter months when producers are providing feed to animals, we at times have been negligent on providing what the cow actually needs during the winter. Either we feed our cows more than they require in the winter because we do not want them to lose body condition, and rightfully so, or the heavier cows (or boss cows) consume more leaving lighter/smaller cows with inadequate amounts to eat. In turn, these cows get bigger because of the ample amount of feed they are exposed to. I believe it is a fact that most producers don't have a good understanding of how much their cows weigh. Knowing what the actual weight is will give you a better understanding of what your cows should be eating during all four stages of their production cycle so that you may sort cows in the winter based on weight and/or condition and feed accordingly.

IMPLICATIONS OF COW SIZE ON PROFITABILITY

If the objective of our cow calf operations is to produce a calf that weighs between 550 and 650 pounds at 7 months of age of a quality and type to fit into our growing and finishing systems as economically as possible then how does mature weight of the cow impact that objective? One would logically expect that larger cows are more capable of producing larger calves rather than small cows, but at what cost?

First let's look at what it costs to run a cow and calf for one year. Data from Minnesota's Farm Business Management 2008 Annual Report on 119 farms indicate annual cost of production for a cow on average is $563.05 (Figure 4). If we broke the total cost down to determine total feed and supplement cost, it would be $350.75, which is over half of the total cost. Of that feed and supplement cost, summer feed and pasture cost make up approximately 15%, or $52.61. So a large portion of production cost comes from winter feed and supplement cost, approximately 53% of the annual cow cost. The more feed you have to provide to that cow during the winter months, the more cost of production goes up/head.

Figure 4: Average Annual Cost Per Cow from the Minnesota Farm Business Management 2008 Annual Report



Let's say we have two herds of 50 cows each in Minnesota consuming 2.3% of their body weight in dry matter and one herd averages 1250 lbs, while the other herd averages 1550 lbs. The difference in average body weight of the two MN herds is 300 pounds, so for every 100 pound increase in body weight that animal requires 2.3 lbs more/day. For every 100 lb increase in body weight, a cow would need to consume an additional 839.5 lbs/year. The difference in forage dry matter required annually is 125,925 pounds or 63 tons. Sixty three additional tons for those fifty larger cows is not economically sustainable. In fact, Dr. Bryan McMurry (2009) reported at today's prices for hay, supplement, and mineral it is estimated that for every 100 pound increase of mature weight an additional $15-$20 is required per year in costs for those three inputs alone.

The logical next question would be if you could make management and/or genetic changes in your herd, how would you utilize 63 additional tons of forage/hay? Would you increase your cow herd, or would you use that as a way to reduce your annual cow cost. That question completely relies on the market and your production goals. If calf market prices are good, you may want to increase your herd size. If your herd of 1250 lb cows is consuming 2.3% of their body weight daily, then during the year that cow will consume a total of 10,494 pounds of dry matter forage. That is just over five tons. With the extra forage that the larger herd is consuming on a yearly basis, you could support an additional 12 cows that weigh on average 1250 lbs. However your goal may be to reduce production cost in your herd. This simply would allow you to save in purchasing the additional 63 tons in forage or hay. With current hay prices at $75.00/ton of good quality grass or grass/legume hay, that would be a savings of $3,750 /year for 50 head or $75 per cow per year.

SUMMARY

The size of our cows has increased in the last 30 years and geographically, cow sizes in the northern states are bigger. With the high cost of production in today's economy, producers cannot afford to just feed cows. If our heavier cows are profitable and can wean a big calf, there is no reason to put her ear tag number on the cull list. In today's economic environment arguably the most valuable piece of equipment on a cow/calf operation is a good set of scales. Secondly, knowing what the nutrient densities are based on your cow weights, such as DM intake requirements, will allow you to keep good records on feed cost, feed inventory, and to feed accordingly. We learned that milk production can have a greater impact on DM intake, % of crude protein and total digestible nutrients than weight of an animal. We did not go into the

area of the genetic improvements in milk production and its impacts on calf performance, and rightfully so as this would have taken a second proceedings paper.

However there is a point of diminishing returns, based on the reports we have seen, when larger cows may actually produce smaller calves at weaning. When your cows reach a point where they are no longer generating a positive return, then your cull list should start to get longer. Because cattle markets have not been favorable over the last couple of years, getting rid of your inefficient (or larger) cows will drive your cost per cow lower in the operation and improve overall efficiency. Using what we know about the relationship between cow size and nutritional inputs we can make sound decisions regarding which cows are making a positive contribution to the bottom line and more importantly those that are not.

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