By the Numbers

► by *American Angus Association staff*

Mature cow size and finished steer weights

Mature cow size is a hot topic among seedstock and commercial cattlemen alike. Some producers favor large cows, while others prefer to populate their pastures with moderate-sized or even small cows. Varied opinions are commonplace on just how large the ideal beef cow should be. And, most cow-calf operators can back up their point of view with sound reasoning.

Cow cents

When the debate gets started, small-cow supporters are sure to mention cow-maintenance requirements and how important low cow-carrying costs are to keeping a rancher profitable. Cow feed costs represent 50%-60% of total operating costs, so you must start with an inexpensive cow, according to this line of logic.

Additionally, calves from smaller-framed cows wean at lighter weights, but they sell for a higher price per pound (lb.). Heavier calves may be worth more total dollars per head, but the incremental value of an additional 100 lb. of weaning weight is only about $70 in today's market (using a 10¢ price slide in the feeder calf market where a 500-lb. calf sells for $1.30 per lb. and is worth $650 per head, while a 600-lb. calf brings $1.20 per lb. or $720 per head). That amount is at or below the cost it took to get that extra calf weight in many herds.

Producers partial to larger cows quickly counter that more productive environments can easily support bigger bovines. In fact, larger females may be the only way to fully utilize the forage base in more productive environments. Nobody wants a bunch of little butterball cows and calves anyway, they say. Bigger calves with more growth potential aren't necessarily discounted in the marketplace. Buyers who understand the added performance potential in these calves will bid aggressively to get them, which means they often sell close to the price of lighter calves.

Table 1: How finish weight affects feeder steer value

	Steer A	Steer B
Purchase weight, lb.	700	700
Finish weight, lb.	1,400	1,200
Carcass weight, lb.	896	768
Average daily gain, lb.	3.25	3.25
Days on feed	215	154
Feedyard cost of gain, $ per cwt.	50	50
Total feedlot gain, lb.	700	500
Total feedlot cost of gain, $	350	250
Value of finished steer, $ per head*	1,232	1,056
Interest cost, $ per head	37	26
Net value as 700-lb. feeder steer, $ per cwt.**	120.78	111.41
Value advantage @ 700 lb., $ per head	65.56	–
Value advantage @ 700 lb., $ per cwt.	9.37	–

*Market price = $88 per cwt.

**Value of finished steer minus cost of gain in feedyard.

Sizing up two fed steers

Rarely included in this discussion is that steer finish weights should be evaluated and considered when determining the right size for a beef cow. As a rule, bigger cows produce offspring with heavier harvest weights. Conversely, smaller cows produce smaller fed steers and heifers. But which is more desirable? What about optimizing the needs of the cow-calf producer with economics of the feedlot and packing businesses?

To answer these questions, let's consider two hypothetical steers (see Table 1). Both enter the feedlot weighing 700 lb. Steer A has more frame size and growth potential, and reaches a Choice, Yield Grade (YG) 3 end point at a liveweight of 1,400 lb. after 215 days in the feedyard. Steer B, with smaller mature-size genetics, reaches the same carcass end point at 1,200 lb. and 154 days on feed. Both steers produce carcasses of acceptable size that fit within the boundaries of a grid pricing system.

But, there's one key difference: Assuming both steers sell out of the feedyard at $88 per hundredweight (cwt.), Steer A is worth $176 more the day he is sold, simply due to his heavier weight ($1,232 for Steer A vs. $1,056 for Steer B). Steer A does incur more total costs while on feed, including a $100 higher feed bill plus $11 more in interest charges. However, that still leaves $65 in extra value compared to Steer B ($176 – $111 = $65). So, the bigger steer clearly dollars up better in the feedlot.

If we apply that extra $65 back to the value of Steer A as a 700-lb. feeder steer, he'd be worth $9 per cwt. more than Steer B at the same weight, which is a large difference. As long as feedlot gain costs are significantly below the price of fed cattle (which historically occurs about nine years out of 10), there is a sizable economic advantage for steers that finish at heavier weights. That holds true up to 1,475 lb. or 1,500 lb. of liveweight, because most grids begin to discount for excess carcass size at 950 lb. to 1,000 lb. Beyond these limits, additional weight becomes detrimental.

In this example, a cattle feeder who purchases both steers A and B, weighing 700

Table 2: Combining cow-calf and feedlot economics

	Economic Advantage		
	Cow-Calf	Feedlot	Overall*
1,200-lb. cow & steer	Base	Base	Base
1,400-lb. cow & steer	–$27	+$65	+$38

*Combined annual advantage for cow and steer offspring.

lb., could afford to pay $9 per cwt. more for the higher-growth, heavier-finishing steer and still wind up with the same profit outcome on both animals. Real-world value differences would probably be even larger. Any steer that feeds to a 1,400-lb. finished weight is almost certain to gain faster and more efficiently than another steer that reaches a YG 3 end point at 1,200 lb. The math in Table 1 is actually conservative, because no daily gain rate or gain cost advantage was assumed for Steer A.

Relating cow size to steer size

Research by Stephen Hammack at Texas A&M University (TAMU) suggests that "the mature weight of cows in moderate body condition [body condition score (BCS) 5] averages the same as that of equivalent-frame-score steers with 0.5 inches of back fat." In other words, when a cow is mated to a bull of similar frame size, she will produce steers that reach a desirable fat end point near the dam's mature weight. Thus, a 1,400-lb. steer roughly matches up with a 1,400-lb. cow, while steers from a 1,200-lb. cow will tend to finish closer to 1,200 lb.

Other variables affect this relationship, of course. TAMU researchers noted that differences in muscularity could cause up to a 10% difference in cow weight within the same frame size. So, keep in mind that this "mature cow weight equals finished steer weight" relationship is more a rule of thumb than a perfect predictor.

The feedlot steer analysis in Table 1 demonstrates that heavier finish weights are typically more desirable and create greater total value. Feeder cattle capable of reaching heavier finish weights are therefore worth more than their lighter-finish-weight counterparts. Now, let's use the TAMU relationship to bring cow herd economics into the picture and link the cow-calf and feedlot sectors together.

As shown in Table 2, larger cows cost more to maintain, so they are disadvantaged relative to smaller cows on the farm or ranch. The 1,400-lb. cow in Table 2 requires 490 more megacalories (Mcal.) of feed energy annually vs. a 1,200-lb. cow, according to the Nutrition Research Council (NRC). That difference amounts to $27 per head more in yearly feed expense, assuming an industry-representative feed cost of 5.5¢ per Mcal.

Despite her higher feed costs, the larger cow still turns in an overall economic advantage when the feedlot value of her steer offspring is considered. Using value and cost assumptions that are typical in today's industry, the 1,400-lb. cow would generate $38 more per year for her owner compared to a 1,200-lb. cow.

Directly or indirectly, recognition of these economics may have contributed to increased cow size during the past 10-15 years. The average 5-year-old Angus cow now weighs about 1,300 lb., up 75-100 lb. since 1990.

Still, not every environment or operation can support larger-sized cows. Limited forage production and higher feed costs in some locations necessitate a cow of more moderate size. Commercial operations facing this situation could benefit from the use of higher-performance, terminal-type sires to increase the desirability of their calf crops.

But, regardless of feed resources, every cow-calf operation should at least consider what size steers their genetics are going to produce for the feedlot operator. In addition to evaluating farm- and ranch-level issues, mature cow size should partially be determined with the perspective of those further down the supply chain.

Editor's Note: *"By the Numbers" is a column by Association performance programs staff to share insights with Angus members about data collection and interpretation, the National Cattle Evaluation (NCE), genetic selection, and relevant technology and industry issues. If you have questions or would like to suggest a topic for a future column, contact Sally Northcutt, director of genetic research, or Bill Bowman, director of performance programs, at (816) 383-5100.*