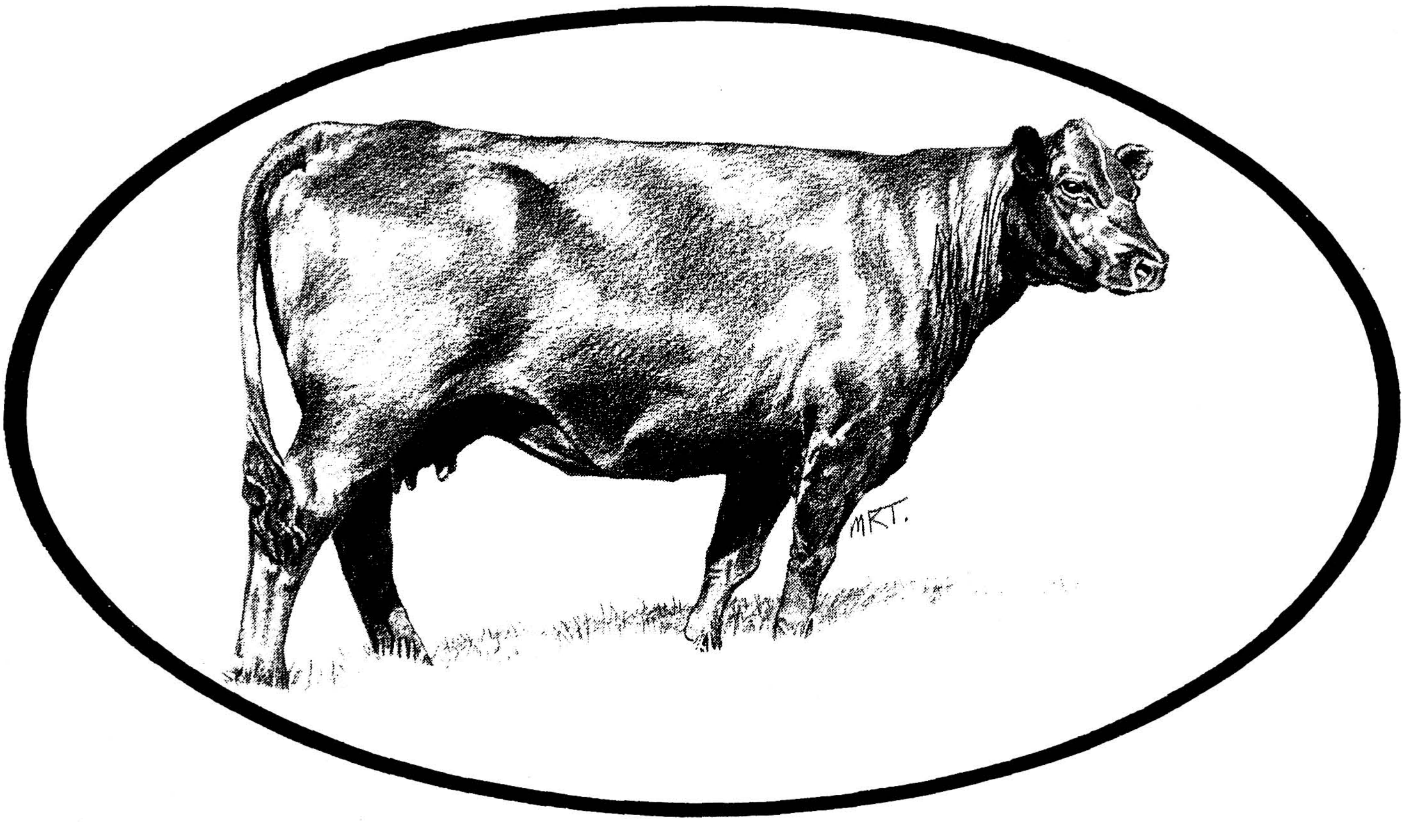

How Big Should a Beef Cow Be??????

by Dr. V.E. Jacobs, University of Missouri Extension Economist

Farm economist and Angus breeder Vic Jacobs examines optimal cow size with a refreshing emphasis on cost "behavior." The debate-worn angles of carcass size and energetic efficiency are reviewed only briefly before delving into examples of nonfeed costs and their relationship to cow size. Jacobs is a Missouri native who holds bachelor's and master's degrees from the University of Missouri—Columbia and University of Illinois, respectively, and a doctorate from Kansas State University. He spent seven years as a Kansas State farm management economist before joining the UMC staff in 1965.

How big should a beef cow be? Do you want 800, 1,200 or 1,600 lb. cows? Or, in the past decade's lexicon of frame scores—do you want 3 frame, 5 frame or 7 frame cows?

The feverish quest for larger-framed, later-maturing cattle of the past decade has predictably spawned a growing debate on just how big a beef cow should be.

Three factors appear to be important:

(1) Which size is most in-tune with market demands in terms of preferred carcass weight? Or, how does size affect selling price?

(2) Which size is energetically most efficient? Or, is feed efficiency substantially affected by genetic size?

(3) How are the "other" (or non-feed) costs affected by varying cow (or cattle) size?

While this discussion is primarily concerned with the third factor (other cost behavior)—its importance can only be appreciated by first reviewing the first two.

Preferred carcass size

Preferred carcass size in today's era of boxed beef is set primarily by the size of the box. It is this observer's understanding that preferred carcass weights are in the 600 to 800 lb. range. This implies a live weight in the 970 to 1,300 lb. range when the steer or heifer reaches optimal market finish. How large a beast does this require—and how big is too big?

If the calves are placed on feed at weaning and fed to market finish by 14 to 16 months of age, they would need to be at least a 3½ to 4 frame in size for the heifers to finish at least at the desired minimum of 970 lb. (or 600 lb. carcass). The upper limit would be around a 6 to 6½ frame to prevent the steers from exceeding the 1,300 lb. live (or 800 lb. carcass) weight on the upper side of the preferred range when finished.

If, as is more likely, feeder cattle are backgrounded and grown on hay and grass for 6 to 8 months after weaning prior to placement in a feedlot, then cattle of the same genetic size would finish at a 40 to 100 lb. heavier live weight—and both the lower and upper limits (in terms of optimal frame size) could be decreased by ½ to 1.0 frame score.

Combining both possibilities, to assure at least a 600 lb. carcass from a heifer fed on a "fast track" (placed on feed at weaning) but to also assure the steer finishing at or below an 800 lb. carcass, if backgrounded for a year or more, the most promising range of frame scores would appear to be in the 3½ to 5½ frame-score range. If herd bulls commonly have a 1 to 2 frame-score "reach" or size superiority over the cows on which they are used, then optimal cow size might be a half a frame-score less than is desired in the calf crop, suggesting an optimal frame score of 3 to 4½ on the cows. This might suggest a cow herd in the 950 to 1,150 lb. range as near optimal for meeting preferred slaughter weights in the offspring. Actual cow weights, however, are highly variable with fleshing condition and could vary 200 lb. or more from farm-to-farm even with the same genetic cow size on each farm.

Energetic efficiency and cow size

Many experiments have been conducted evaluating different sizes, breeds and crosses under quite varied conditions and objectives. While it is perhaps foolhardy to even attempt any brief summary of such a voluminous and varied literature, we will try:

(1) Efficiency generally is related to rates of performance when animals of the same weight and size gain at different rates; But—

(2) Larger animals gaining at faster rates may be no more efficient—even less efficient.

(3) When animals are fed to the same weight but different degrees of finish, genetically larger animals will be more efficient because they are still more immature, still growing and less fat (and perhaps underfinished) at the termination of the test; But,

(4) When animals are fed to the same market grade, same degree of finish, or to the same degree of maturity, genetically larger animals will perform at either the same or possibly even at a slightly poorer feed efficiency.

(5) In cow size experiments, larger cows will typically average about the same or slightly poorer efficiency. Slightly less energetic efficiency in calf production may be ecomomically compensated for by larger salvage value of cull cows.

While this discussion of the diverse results of these many experimemts relating genetic size and efficiency could go on almost interminably, it seems the safest conclusion would be that there is very little relationship (if any) between genetic size and feed efficiency, provided the cattle are handled, managed, and fed in ways appropriate to their own genetic size and maturity patterns. If a presumption exists for any slight difference in efficiency—it would probably favor moderate sizes over extremes.

NOW—if energetic (or feed) efficiency is essentially independent of genetic size, and market preferences (in terms of carcass weights) would argue for 3 to 4½ frame-score cows, then this would seem to settle the issue.

UNLESS—behaviors of other (or non-feed) costs somehow tip the economic balance in one direction or the other. So, what is the likely behavior of these "other" costs?

Other cost behavior

If most other costs are essentially tied to or fixed to the feed supply, then they will be size-neutral.

An example: On a 100-cow grassland unit, fence depreciation might amount to $1,000 per year. It is certainly a fixed cost by most criteria—and it can be expressed as a $10 fixed cost per cow. While it can be so expressed, it is really NOT fixed on a per cow basis. It is fixed to the total unit—not per cow. Thus, if the operator chooses to replace those 1,000 lb. cows with 30 percent larger ones (1,300 lb. cows), what "behavior" of this cost might be expected on a per cow basis? If those 30 percent larger cows consume 21 percent more feed and produce 21 percent larger calves (a biologically reasonable assumption), what are the consequences? That same feed supply will now handle only 82.6 percent as many cows—each producing 21 percent larger calves— and exactly the same total pounds of calves. Fence depreciation remains the same on a total ranch unit and, with the same total pounds of calves, the same cost per lb. of calf (but more per calf). On a per head basis, however, this fixed cost has increased from $10 per cow to ($1,000 ÷ 82.6) or to $12.11 per cow.

Such is the behavior of a fixed cost that is fixed not on a per head basis—but on a per ranch or total unit basis.

Another large group of costs are feed related and behave the same as general overhead. If, in the above example, machinery costs total $3,000 in putting up 150 tons of hay—these costs behave just like the fence depreciation in the above example. While they can be expressed as $30 per cow ($3,000 ÷ 100 cows) they will jump to $36 per cow if 17.4 percent fewer (but 30 percent larger) cows are employed to utilize that same 150 tons of winter feed. Again, all such feed-associated costs (whether called fixed or variable) are all fixed to a given feed supply, hence fixed for the ranch unit—but variable on a per cow basis as cow size is varied. Thus, they are size-neutral—and unaffected by whether a given feed supply is consumed by more and smaller—or by fewer and larger cows.

Some size-affected costs can be identified. Any cost incurred on a flat or constant price per cow favors larger cows. If a vaccine or other veterinary treatment is priced or paid for on a flat per head basis (i.e., $2/cow)—then fewer and larger cows result in a smaller total of this cost.

Some costs may increase on a per cow basis more than in proportion to the cow feed requirement. One of rather substantial proportions may be interest on the money tied up in the cows. If, for instance, a 30 percent larger cow consumes (produces) only 21 percent more feed (or calf weight), then total cow inventory (in cwt.) increases with larger cows. If the feed supply will then carry 82.6 percent as many cows weighing 130 percent as much per cow, then total cow inventory (in cwt.) must increase by 7 percent (or .826 × 1.3). And, if that 7 percent larger cow inventory cost as much per cwt. to produce (or purchase)—then cow investment (and interest cost on it) must be 7 percent larger in total.

Another cost which may increase on a per cow basis more than in proportion to cow feed requirement is veterinary costs arising from calving difficulty. There is at least some suspicion that larger, heavier-boned, heavier-muscled breeds and genotypes may experience some more calving difficulty even though they are as much larger as the bulls to which they are bred.

Table 1 attempts an evaluation of the behavior of the various non-feed costs reported by Missouri Mail-In Record (MIR) cow herd operators in 1981. The totals of each of these costs by categories is given on a per cow basis in the first column of Table 1. In the next three columns these non-feed costs are allocated by whether they are expected to be: (1) fixed or unchanged for the total unit—and thus size neutral; (2) essentially fixed on a per cow basis—thus reduced in total when fewer-larger cows are employed; or (3) increased in total because the per cow cost increases more than in proportion to the feed consumed per cow.

Table 1. Non-Feed Costs Per Beef Cow*
(for producers selling at less than 600 lb.)

		COSTS BY EXPECTED "BEHAVIOR"		
Non-Feed Cost Category	Average "Other" Costs Per Cow	Size—Neutral: Fixed for the Unit	Reduced by Fewer & Larger Cows	Increased by Fewer & Larger Cows
Variable Costs:				
Vet. & Medicine	$ 7.54	$ 2.51	$2.52	$ 2.51
L.S. Matls. & Services	4.01	4.01		
Labor (8.8 hrs. @ $4.38)	38.49	33.49	5.00	
Mach. & Equip. Exp.	13.24	13.24		?
Utilities	3.41	3.41		
Insurance	2.07	2.07		
Pers. Prop. Taxes	1.65		1.65	
R.E. Maintenance	4.58	4.58		?
Misc. Overhead	1.01	1.01		
Int. on Optg. Costs	18.72	18.72		
Fixed Costs:				
R.E. Taxes, Depr., Int.	13.46	13.46		
Int. & Depr. Mach. & Equip.	14.90	14.90		?
Int. on Breeding Herd	36.61			36.61
Totals	$159.69	$110.40	$9.17	$39.12
Percent	100.0%	69.8%	5.7%	24.5%

**Figures taken from 1981 Missouri Mail-In Record cow herd operators.*

Some cost categories are quite ambiguous in terms of expected behavior. Veterinary and treatment costs are a case in point. Some are probably incurred on a per head basis. Some may be on a per cwt. basis (antibiotics). Some may increase more than in proportion to the cow's feed requirement (calving dificulties). For lack of any systematic data, this cost category was simply split between the three behavioral columns.

Another cost with ambiguity is that of labor. It can be considered fixed for the ranch unit. Much of it is associated with feed and manure handling and keeping water available. Of even the checking and handling labor, much is size (and numbers) neutral, as travel time, getting the cows up, etc. is essentially invariant with whether there are 100 or only 86 cows. A Missouri study of beef cow labor requirements several years ago, however, showed 13 percent was expended in moving, sorting and handling of cattle. Thus 13 percent (or $5) was allocated to the column of costs that are reduced in total when fewer and larger cows are utilized.

Personal property taxes were assumed to be decreased with fewer and larger cows—as a uniform value per cow is generally used for assessment purposes—whether a 700 or 1,700 lb. cow.

Interest on breeding herd investment was allocated to the column expected to increase in total because total cwt. of cow inventory was expected to increase with fewer and larger cows. As noted above, feed requirement and productivity increase less than in proportion to cow weight— thus more total weight (and cost) in cows is expected when fewer but larger cows are matched to a given feed supply.

While not allocated to the last column, three cost categories possibly should be—and thus a (?) was placed in the third column. These are the costs associated with facilities and equipment. Handling 7-frame animals in 3-frame fences, corrals and equipment may result in either larger repair and maintenance costs—or a need for replacement with higher or stronger (hence more expensive) facilities.

As can be noted in the percent line at the bottom of Table 1, 69.8 percent of these other (or non-feed) costs were estimated to be size-neutral; 5.7 percent would favor larger and fewer cows, and 24.5 percent would perhaps increase with fewer and larger cows. Such allocations are, of course, judgmental, crude and a bit speculative. (The reader is encouraged to make his own allocations.)

Some costs, of course, cannot be predicted without reference to particular situations and methods of payment. The cost of producing pasture would, for example, be size-neutral so long as production rates of the cows were in direct proportion to their feed requirements—thus, making feed efficiency essentially independent of cow size. The same conclusions would apply if pasture was rented for a flat price per acre. If, however, pasture is rented on a flat price per cow per month, such a contract strongly favors larger cows. So long as price per cow month is not adjusted for larger cows, we could expect such renters to opt for large cows.

In conclusion, it would appear that most of the "other" costs behave about like feed costs—and essentially are size-neutral. A few (5 to 6 percent) might be incurred on a per cow basis—and hence favor fewer and larger cows. A larger percent, perhaps 25 percent, at least offer the potential of increasing more than in proportion to the cow's feed requirement—and thus increase for the total unit with fewer and larger cows. And, this estimate does not include the three question mark categories associated with equipment and facilities costs—which could also increase with larger animals to be confined, handled and subdued for treatment.

In general, it would appear that non-feed costs would be largely size- and numbers-neutral—with possibly some slight advantage for moderate as opposed to very large cow size. Such a conclusion would toss the cow size "football" back to be determined by carcass size preferences. In that case, it would seem that 3 to 4½ frame cows might well be about optimal. If so, how much further in their feverish quest for size unlimited should the seed stock industry go? What do you think? AJ