

## Do Breeding Programs Exist or Is It Simply Frame?

Burke Healey  
Davis, Oklahoma

"Yesterday's formula for success  
is tomorrow's recipe for failure."  
--Arnold Glasow

My topic was given to me by the esteemed planners of this seminar, and I'm supposed to discuss this subject for approximately thirty minutes. Not being from the academic world let me just say I can talk on this subject for as long as they-- or you--would like, but I can answer the question asked in the title of my topic in about one minute. On second thought, having admitted that, perhaps I do belong in academia.

Let me answer the question first, so we'll all understand from the outset just where I'm coming from and what my prejudices on this matter are. Then I'll attempt to justify my answer. The answer is--"Yes, breeding programs still do exist out there--or they better, and in my opinion no competent (or successful) breeder can long endure building a breeding program on just frame!" I'm supposing in this day and age that we're assuming "frame" means "bigger", but my answer would be the same whether it meant large, small or in between!

No innovation in animal breeding ever swept the beef industry as fast as the concept of linear measurements. Certainly none was ever abused so quickly. I guess it was inevitable it would be abused. For over a century purebred beef producers have operated under the principle that "more of a good thing is better." Once the so called experts point out what the "good thing" is we stampede in typical herd fashion towards the goal. The reception that our introduction of bovine growth curves and linear measurements received in the 1970's was no different...just a whole lot faster.

From the very start most of us who advocated and developed the use of frame scores in animal evaluation only considered it as just one tool in evaluating the growth traits... and please keep in mind there are many other important traits in this industry beside the growth traits such as fertility, milk, disposition and carcass characteristics, to name but a few.

When I think of growth traits in general I think of three traits at once...weaning weights, yearling weights, and frame size. In my mind they go together. In my books weaning weights tell 20% of the story and yearling weight and frame each tell 40%. That's just a wild estimate but that's about how, on my part, I evaluate their importance as tools to get you wherever you want to go in size and weight.

As I'm sure most of you are aware, weaning weights have been with us for about thirty-five years. Yearling weights came to the fore front about twenty-five years ago. It wasn't until the Madison Conference in 1969, however, that we began to see the correlation between frame and

weight. It's even more shocking when you consider that there were three conferences at Madison in 1969, '70 and '71--one sponsored by the Hereford Association, one by the Angus and one by the Charolais. At those three conferences the frame scores were described and agreed upon as a frame three being the average of the British breeds with frame five being the average of the Continental breeds! Amazing, isn't it? The British breeds are now exhibiting frame 10.0 cattle and some of the Continental breeds have surpassed even that!

Seven years after the first Madison Conference, when I gave my presentation on the bovine growth curve at the American Hereford Association's Judging Conference at Stillwater in 1976, I was attacked from all sides by amongst others, three past AHA presidents and one of the industry's most esteemed and venerable animal scientists. At first no one believed...then almost overnight everyone believed. By the time of our World Hereford Conference at Calgary that same summer of 1976, I had crowds of both Canadian and American Hereford breeders following me around taking notes when I measured herd bulls on the tours and at the show up there.

The news was traveling fast. Hereford breeders were not the only ones to take up this new tool. Skepticism as to the merits of linear measures was beginning to give way to debate and demands for academic discussion and research. Measuring devices were everywhere. Amazingly, the performance people split wide open. Some accepted the tool; others refused to consider it at all. In fact, some performance people were as close minded about this new tool as an aid in selection as the show ring people had been about weight measurements thirty years earlier.

By May 1979 the principle of the frame score had been pretty well developed. Skip and I at Flying L as well as Missouri University had both published frame score charts, calculated bovine rates of growth, and computed a set of adjustments. Several prominent academic researchers had developed a frame score system to enable feedlot operators to better feed their cattle to the proper finish weights. In May of 1979 I was asked to address the Beef Improvement Federation at their annual meeting on the subject of linear measurements. I remember it was a task I accepted with some trepidation.

I realized only too well that many of the skeptics in the audience doubted that linear measurements had any value whatsoever. Nevertheless, I set out to convince them of the merit of this technique as a valid tool in selecting and fixing performance at certain desired levels in a herd. For those that weren't convinced I think that in many cases I at least planted a seed of curiosity.

I tried in my oral presentation that day at BIF to touch on some of the more important papers that had so influenced Skip and me in our endeavor. In the prior decade our industry had seen a flood of good scientific research in these and other areas. Research had been pouring in from such distant shores as Scotland, England, Australia, Rhodesia, and South Africa as well as from Canada and our own universities and other government research facilities here in the states. These facts

coming in a deluge as they did began to dovetail together amazingly. You'd be amazed at how many of those papers could aid us in answering the very questions we're asking here.

I presented a wealth of this research data that Skip and I had amassed to show that all animals of a species are quite alike in terms of skeletal composition, muscle placement and muscle proportion. In other words, anatomy is constant. The skeleton of one grown beef cow is very similar to that of another grown beef cow...except perhaps for overall size. No one denies today that two bones on one skeleton attach the same as they do on another skeleton. Similarly, the same muscles or muscle groups exist on each, and they attach to the same bones at the same points. A judge could no longer say with authority, for instance, that one bull's stifle carries down lower than another's.

Dr. Rex Butterfield's work in Australia, for instance, showed that the various muscle systems between animals of the same species are proportional. The USDA work at the Meat Animal Research Center at Clay City, Nebraska, had reinforced Butterfield's work dramatically.

I have heard researcher after researcher say that this project at MARC was one of the most beautifully designed and executed experiments in both statistical and genetic terms that's ever been conducted. Yet everyone appears to be ignoring this work now in our new quest for carcass data. Most of what we want to know was answered there and answered with numbers and statistical validity we'll have trouble ever again approaching.

The carcass studies on over 1,100 steers in that project at MARC involved many different breed crosses. Their data encompassed such extremes in sizes as Jersey sires crossed on both Hereford and Angus cows as well as Simmental and Charolais sires crossed on these same cow breeds. Straight Herefords and Angus as well as Hereford Angus crosses were also used. All of these steers were slaughtered at the same physiological age...that is when, as nearly as possible, each animal had a 5% chemical fat composition in the rib eye muscle (corresponding to the USDA choice grade).

Naturally, the various breed crosses had to be killed at different weights to obtain equal degrees of fat. When they were, however, we saw that the body composition of all the crosses were almost identical. (See Table 1.)

**Table 1: This Study Involves Data From 1121 Steers Published by  
USDA Animal Research Center (Progress Report No. 3 - April  
1976)**

	Live Weight	Carcass Weight	% Bone	% Lean	% Fat	Muscle Bone Ratio
Straight Hereford	970	609	12.7	67.5	19.8	5.4:1
Jersey x Hereford & Angus	886	550	12.9	66.9	20.3	5.2:1
South Devon x Hereford & Angus	992	632	12.6	68.1	19.2	5.4:1
Charolais x Hereford & Angus	1107	704	12.9	70.9	16.2	5.4:1
Simmental x Hereford & Angus	1109	699	13.1	69.7	17.2	5.3:1
Average	1008	638	12.8	68.8	18.4	5.4:1

All of these steers were killed at the same physiological age--when they had 5% chemical fat in the rib-eye (Choice Grade).

Dr. Bob Koch's work at the University of Nebraska again bore out this research from MARC and Butterfield. Koch's study involved breaking down one half of each of these same carcasses by their various retail cuts. The proportions of each cut (when trimmed) against total percent of lean meat was unbelievably uniform. (See Table 2.) Again this work was based on data from over 1,100 steers ranging over at least three different frame sizes.

**Table 2: Percent of Total Retail Product In Each Wholesale Cut**

	Round	Loin	Rib	Chuck	Roasts & Steaks
Hereford x Angus	25.8	14.8	9.3	30.3	51.6
Jersey x Hereford x Angus	24.7	15.1	9.7	30.7	52.0
South Devon x Hereford x Angus	25.7	15.1	9.5	29.9	51.2
Limousin x Hereford x Angus	26.6	15.1	9.3	29.8	51.1
Charolais x Hereford x Angus	26.5	15.1	9.4	29.8	51.2
Simmental x Hereford x Angus	26.4	15.0	9.2	30.1	51.2
Average	26.0	15.0	9.3	30.1	51.4

\*Retail Product is red meat with bone removed and fat trimmed to .3" outside fat.

Data presented by Dr. Robert M. Koch, Univ. of Neb. at the Range Beef Cow Symposium, Chadron, Nebraska 1977.

Dr. E. J. Warwick's work feeding identical twin calves at the USDA Animal Research Center at Beltsville, Maryland, under different types of rations proved once again this same fact...that every animal is a predisposed genetic package to grow to a certain size and carry so much finish at a certain weight regardless of when he gets there.

Dr. Judge's work with Holstein and Angus steers fed to the choice grade and Dr. Lidvall's work at Tennessee University feeding steers of various breeds and frame sizes to a constant grade all proved that there is really only one basic factor responsible for the difference in the growth or body composition of any two steers, bulls or heifers at a given age. That difference is the MATURE SIZE which the animals will attain if they are left alive to grow and develop.

Because of this amazing mass of background data, all of which dovetailed so well, my brother, Skip, and I had set out in 1970 to incorporate linear measurements in our records to help us fix performance. Please note--I said to help us "fix performance"--no more than that! The first fact we discovered about how cattle grew was hard to believe...yet it's the key to using linear measures. AT A GIVEN AGE BULLS OR HEIFERS GROW AT ALMOST THE SAME IDENTICAL RATE REGARDLESS OF FRAME SIZE. The work at Missouri University showed this also. The ration can vary the growth rate slightly, but it's so little as to be almost negligible unless the animals are so underfed that stunting occurs. To prove this point at BIF I calculated and showed them the daily growth rate from 205 days to 365 days on the tallest ten bulls and the shortest ten bulls in each of our last four calf crops. I then averaged the results for each group of bulls and the growth rates didn't vary 1/1000 of an inch!

I also ran the same figures on the shortest and tallest ten heifers over the same years. The average figures for growth per day were again identical to 1/1000 of an inch. Granted, in our herd in the early '70's those figures involved only a spread from frame size 3.5 to 5.5 animals. The work by the Extension Service of the University of Missouri, however, bore out this phenomenon over thousands of cattle ranging from frame size 1 to frame 7.

After some 20,000 measurements at our ranch taken at monthly intervals on the same animals, we were prepared to draw up growth charts for hip heights on bulls and heifers at all ages clear to maturity. Understand, the arbitrary decision that there would be a two inch spread between each frame size of bulls at a year of age was made by Missouri University. The rest of the industry had just followed along. These were the frame size charts for bulls and heifers that were generally accepted after I gave my paper at BIF.

I presented another fact often overlooked when I showed those frame charts at BIF. Our beef animals attain most of their skeletal growth at a relatively young age. Heifers, for instance, have 80% of their total growth at weaning. At a year they've attained 90%. At two years of age they are almost through growing. At somewhere between 2 1/2 and 3 years of age all skeletal growth is completed. This is true for both heifers

and bulls. Steers, of course, due to castration continue to grow throughout life.

As we mentioned before, maturity comes much quicker than most expect. The myth that big cattle are late maturing, achieving a lot of their growth at two, three or even five years of age was just that...a myth. There may be some little difference in when cattle mature, but it's relatively small.

At the conclusion of my speech at the BIF Meeting in 1979, I waved a big, red warning flag. In fact, I have never made a presentation on frame scores and growth curves since then to any group without making the same warning. For years, however, everyone was so captivated by the new concepts that few heard or remembered the warning. In recent years my warning portion of the speeches or slide presentations became more emphatic. I was actually showing pictures of real elephants in my slides by 1980!. Finally, I quit giving the speech anywhere. I had created a monster.

I had always pointed out to my audiences that if slaughtered at the right point in his individual growth curve any beef steer of any frame size can have just about ideal carcass characteristics. True, as those 1,000 steers killed each year had shown in the MARC work, the weight at which this occurs varies with each frame size (as we saw in Table 1), but most steers can be killed at some point in their life to have a yield grade 1 or 2 and choice marbling. When they do, they'll cut out about as well as any other steer. They'll also express as much muscling, as good a muscle-bone ratio, and nearly equal performance or efficiency of gain.

This is one of the main points to me of the work that Dr. Larry Cundiff and Dr. Bob Koch pioneered in that great MARC work. So many of the answers we and the packing industry are seeking right now are already proven in that project--and proven statistically in numbers too large to dispute and probably too large to ever again duplicate.

At what point then are we going to start drawing the line concerning what we'll call a "good yearling weight of measure"? So far, for instance, at the bull tests we are still saying the animal that wins the test is the best. You can bet he's usually also one of the biggest. Shouldn't we consider drawing a line somewhere? For several years now I've thought it was time we start classifying the performance of our cattle on test according to what frame size they achieved coming off test...without declaring a winner or passing judgment on what performance level is best. The present design of our bull tests is instead exerting ever upward pressure on frame size.

All our breed averages are steadily increasing...so our bases are moving. As our base moves up our need for further change upward in frame and the degree of change needed is diminishing. The target's changing and many of us are losing our perspective.

We all know bigger animals gain faster, mature larger and fatten less at equal weights with the smaller ones. Most will also admit the

big animal in a fertile breed is just as fertile as the smaller animal if it gets feed. It's usually improper maintenance that causes fertility problems. For three decades now bigger has been better. We've got to change our attitude of always shooting for the maximums in our selections. Always bigger can't continue to always be better.

Our colleagues who live and die by the show ring are just as bad. Since the pendulum swung it's been a continual stampede to bigger and bigger cattle at the shows. Since 1955 the cry at ringside has been, "Get 'em bigger!"...and with disastrous results!

This craze for tall cattle in the show ring has now fostered an economically ruinous Embryo Transplant program. No one can afford it, but it's almost impossible because of the growth hormone levels of the recipient cow for the natural calf out of his own dam to come within a frame size of his ET brothers. Consequently, no one's showing. There are no cattle in the ring!

The pressure for frame is so great in the ring that breeders will hardly even fit anything less than a frame 7. There aren't many of them. Probably every 60" horned Hereford bull in America eligible the last two years to show in Denver has been at Denver! It creates a false impression. Everyone runs around looking for a 60" bull thinking there are lots of them. They probably saw most of them at Denver if they were halfway structurally sound (and how many others have we all seen out there that weren't). This madness has to stop--in the show ring and at the bull tests.

We constantly hear it said "the box dictates" cattle size and performance in our industry. In reality what we mean is "the packer dictates." The packer in turn tells us what his customer and the economics of the business dictate. The truth is if the box dictates, the packer can always change the dimensions of the box in which he packs these cuts. We best never forget that.

If the specifications for the box as it is today dictate, then we should be breeding frame 4.5 to 5 plus cows to bulls of equal size! Did you get that? Frame 4.5 to 5 plus! That's what it takes to have yield grade 2 animals grading low choice that fit the packer's weight range.

As purebred breeders we can justify somewhat larger cattle in our herds because most herds are still considerably smaller than this and nature has an annoying habit of trying to regress all species to their average in every trait. In addition, three or more very credible research studies have shown that with today's economic conditions you can get the best overall return of investment in a program of breeding what once were larger size bulls (frame 5) to larger size cows (frame 5) if you keep the cattle all the way to slaughter.

We must start identifying the most efficient performers within each frame. The research and correlations I've seen seem to point out to us...Over 60% of the difference in cattle performance isn't due to frame size. That 60% is due to other factors. It's true, frame size gave us all a fast jump in performance. Now that we have significant numbers of



our cattle in the acceptable range of frame sizes to perform satisfactorily, we need to refine the process. We need to find the cattle within these ranges that perform the best and then stack their pedigrees. Keeping frame and performance constant and rolling generation after generation at those levels will give us genetically superior cattle with a high degree of repeatability.

Now in my opinion, that's what a breeding program is all about. There are always certain traits we've got to keep in our cattle. Things like fertility, optimum levels of milk, structural soundness, good disposition, the ability to survive in blizzards, droughts or other weather extremes--these seem to me to be the kinds of traits we have to keep in our cattle. They endure forever. The fat or lean levels we want, the size we want, yes even the muscle-bone ratios--these fads come and go. Most of our breeds are flexible. We can select and mold them up and down for slaughter weights and carcass content. These other traits, however, are with us forever, and some of them are not very heritable, which means either your breed's got them or it doesn't, because in the case of a lowly heritable trait, you can't live long enough in one lifetime to alter it very much by selection.

So I would suggest the good breeding programs start with strong cow families strong in these enduring traits. Selected properly, our cows can get us through a lot. Anyone who throws away these major qualities of such economic importance for fast improvement in these fads and fancies is doomed to failure.

We have to keep our perspective. Performance in general is no fad, but whether we are selecting right now for big or little, for this weaning weight or for that yearling weight--these things are fads in the sense that those kind of goals, up 'til now anyway, have always been temporary and subject to change, if you take the long view. We seldom stay on these trends for much over 15 to 20 years--then they change.

Skip and I were able to survive in this business for 38 years, which has been all of our adult lives, up to now at least by staying flexible where these temporary fads are concerned. We always tried, however, to maintain a cow herd of good milking, structurally sound cows that were fertile and that had good dispositions. Those things make it a whole lot easier and profitable to select for the other traits as they come along.

In summary, I'd say frame score is an important trait to help you fix many traits, but it's only that--certainly no more. Remember this also, as our fads change the desirability of one frame score over another can change, too. Tomorrow, frame scores may be employed to help us select for cattle of medium or small mature size. Never were frame scores intended--at least on our part--to be a "breeding program."

If I don't get as excited about each new tool of performance as being the ultimate and an end in itself, but only regard it as a tool and perhaps a means to whatever end I choose, please keep in mind that my views are coming from a perspective of almost 40 years in the business, and as Emerson said, "The years teach much that days never

know." I understand what Emerson meant a whole lot better now than I did in 1950 and 1960. He may just be right.

### Literature Cited

- Brown, C.J., and Butts, W.T., 1973. "The Relationships Between Immature Measures of Size, Shape and Feedlot Traits in Young Beef Bulls", The Journal of Animal Science, Vol. 36, No. 6, 1973.
- Butterfield, R. M., 1973. "What Are Meat Animals Made Of?", American Hereford Journal, November, 1973.
- Conner, Fred, 1974. "Beef Cattle Evaluation", NLTA Reporter, August, 1974.
- Judge, M.D., 1965. "Comparison of Dairy & Dual-Purpose Carcasses With Beef-Type Carcasses From Animals of Similar and Young Ages", Journal of Dairy Science 48:509.
- Koch, R.M., 1977. "Shaping Production to Meet Future Demands", Range Beef Cow Symposium V, Chadron, Neb., Dec., 1977.
- Lidvall, Ed, 1977. Presentation at Beef Selection Clinic, Fort Collins, Colorado, April, 1977.
- Smith, G.M., 1976. "Evaluation Germ Plasm for Beef Production", U.S. Meat Animal Research Center Progress Report No. 3, April, 1976.
- Taylor, St. C.S., and Fitzhugh, H.A., Jr., 1971. "Genetic Relationship Between Mature Weight and Time Taken to Mature Within A Breed." Journal of Animal Science, Vol. 33, No. 4, 1971.
- Topel, David, and Dewitt, Dennis L., 1973. "Influence of Energy Consumption During Growth on Carcass Composition of Feedlot Cattle." Iowa State University A. S. Leaflet R183, July, 1973.
- Topel, David, 1975. "Efficient Use of Feed Energy in the Beef Production Factory", Iowa Beef Improvement Assoc. Annual Meeting, January, 1975.
- Warwick, E.J., "Response of Monozygotic Bovine Twins to High and Low Concentrate Rations."