

# Lean and finish are targets of technology

*Soundings toward the future*

By Jim Cotton  
Editor

**T**urning the knobs and dials of the cattle industry in the 21st century will certainly include ultrasound. The terminology will become household, the techniques hold promise of becoming refined and predictable.

Adapted from medical applications, ultrasound is really no newcomer. It's been the subject of speculation and experimentation since the 1950s, and the fascination grows.

Two main forces are at work as research workers around the nation consider ultrasound's possibilities. One, the state of machine technology and reliability is rapidly improving. Two, demand by the feeding and packing industries for this or similar technology grows. Staying competitive with other sources of protein is at stake.

It's said cattle breeders and feeders have more than 70 breeds and combinations to choose from in the quest for a product all phases of the industry will find acceptable.

Keith Vander Velde, director of beef programs at American Breeders Service, is quoted in the October 20 issue of the *Drovers Journal*: "Cattlemen are realizing that they need to try harder to meet the caloric and cholesterol levels of other meats."

Vander Velde points out moves by industry giants such as Excel with its muscle scoring system and the IBP - Cactus Feeders cooperative venture raise farreaching, even ominous, questions for today's producers. The suspicion becomes: "When the industry moves in a certain direction, will it do so with more speed and finality than ever before? Will I be left out?" Vander Velde notes more willingness on the part of progressive producers to experiment, in moderation toward improving their management of resources and production.

Fred Knop, editor of the *Drovers Jour-*

nal, describes the movement toward Choice-grading lean carcasses as "a very powerful force." He continues chiding the sections of the industry for paying what he calls lip service to consumer specifications. He cites fat or finish still being used as a component of yield grading as one example. Perhaps ultrasound holds the potential of taking much of the guesswork out of the present grading system and challenging, then, the lip service.

**Workers are already** trying to incorporate ultrasound into their services or programs. Specialists at Oklahoma State University will now ultrasound yearling bulls or heifers. For an \$80 plus mileage, an OSU team will test a minimum of 20 head at the farm or ranch. Glen Dolezal of the team reports the effort is tied to the Beef Improvement Federation-sponsored program. BIF's primary objective is seeking uniform testing and interpretation of readings, one of the bogeymen of the process.

*"The system works well in animal tissue because the sound waves move through a more or less homogeneous solid (skin, fat, muscle, and bone.) In animal tissues, the variation in density between tissue types causes a change in the speed and the reflective attributes of ultrasound waves. The reflection of ultrasound waves back to the transducer is called an 'echo'. These echoes can be projected on a screen to give outlines of the different tissue layers." — Dr. Russell Cross and Lorna Pelton, Texas A & M.*

The American Hereford Assn. is currently offering an ultrasound measuring program to breeders at the cost of \$10 a head or \$500 minimum farm or ranch call. Texas A & M techs supply the machines and operating know-how. Through the fall of 1987 and the spring of 1988, over 3,500 animals from 54 Hereford ranches were measured, reports Greg Henderson of the *DJ*. Complete contemporary groups measured all at one time are preferred.

Cattle ages between 330 and 450 days of age will be entered into the breeds sire evaluation and EPD analysis.

These efforts toward incorporating ultrasound will likely be scrutinized with great interest. The industry's curiosity is amused. The experience of these two organizations will be added to the hopper of what's known so far concerning the accuracy and predictability of the technique.

Dr. Patsy Houghton, Northwest Kansas Extension Livestock Specialist at Colby, has been closely involved with applying the science of ultrasound to the feeding industry especially. Of the technique, she says:

**"It's not something that just anyone can do. Part of it is personality oriented. I think you have to be somewhat of a perfectionist. I'll argue with anyone who says it's an exact science!"**

And Dr. James Stouffer, animal science professor at Cornell University, Utica, N. Y. agrees. Stouffer is probably the *Numero Uno* of the beef industry ultrasound pioneers. He echoes the concern of beef associations who want ultrasound data to mean the same thing regardless who collects it. He states:

**"To assure this, it is very important that we go through enough group training to use the same anatomical reference points and the same method of interpretation."**

A workshop at Cornell last July was encouraging. Stressed was the very thin slice of an animals anatomy usable for ultrasound. "The orientation of the scan is very important to getting the right cross-section," notes Stouffer.

"We spent five hours actually scanning animals. Everyone's images were video taped and they had a chance to review them with someone looking over their shoulder."

One of the four steers was slaughtered and its actual measurements were compared with the ultrasounds.

"Right on," Stouffer said of the side-by-side test. Particularly satisfying to Stouffer was the marbling call. We figured it would be low to average Choice. It came. . . right in the Low Choice area."

Stouffer told participants a difference of one-half inch in selecting the target or anatomical point for the scanner can result in a one-half inch difference in rib eye area results.

"This correlates with work I did 25 years ago," he pointed out. "When we moved from the 12th rib to the 13th rib, we found a difference of 1.5 inches in rib eye area and 25 percent, in fat thickness.

During the Cornell workshop, participants also took measurements over the shoulder and rump. Stouffer considers this practice as highly important in dealing with variations between animals of different types and ages. Fat depots seem to occur and change independently, Stouffer cites from recent research. "In my experience, the fat over the rib and rump will vary from .2 inches to .8 inches. I don't have all the answers, but this could be a better way of coming up with measurements that are better indicators of the overall fat of a carcass."

All the data starting to accumulate and the volumes more available dramatize the need for guidelines. It's critical and fundamental to achieving industry acceptance. Steve Cornett, associate editor of the *Drovers Journal*, links carcass sawy with value-based marketing, the current industry buzzword. But before either can harmonize or even form a symbiotic partnership, uniformity must be assured.

**"(t) industry needs to decide on uniform rules for interpreting ultrasound data and a certification program that will assure cattlemen that the man (or lady) with the equipment not only knows what they're doing, but what their findings mean in relation to similar readings from other technicians and other cattle."**

Fortunately, workshops such as Cornell's and efforts of teams in Oklahoma and Texas illustrate results can come surprisingly close.

To help achieve uniformity, current procedures call for weighing cattle on the day of ultrasounding. Optional data include hip height and scrotal circumference. These two measurements might be useful in establishing correlations and of eventual importance in contributing to the data base.

Texas workers Dr. Russell Cross and Lorna Pelton make these recommendations. They work from the meats and muscle biology section of the department

of animal science, Texas A & M, at College Station.

They recommend this pair of basics should govern fat thickness and rib eye area measurements when using ultrasound:

1. The amount of external (subcutaneous) fat on a carcass is evaluated in terms of thickness of the fat over the rib eye muscle, *measured perpendicular to the outside surface at a point three-fourths of the length of the rib eye from the chine-bone end.*

2. The rib eye conversion factor is 1.1 square inches per 100 pounds live weight on steers between 550 and 1,100 pounds. It is 1.0 square inch per 100 pounds live weight on steers weighing between 1,100 pounds and 1,550 pounds.

Fat thickness relates to the Preliminary Yield Grade of USDA as indicated:

Fat over the rib eye	Preliminary YG
.2 inch	2.5
.4	3.0
.6	3.5
.8	4.0
1.0	4.5
1.2	5.0

And the "average" rib eye on the "average" steer should look something like this according to Cross and Pelton:

Live Wt.	Sq. Inches of rib eye (1.1)
550	6.1
600	6.6
650	7.1
700	7.7
750	8.2
800	8.8
850	9.3
900	9.9
950	10.4
1000	11.0

Live Wt.	Sq. Inches of rib eye (1.0)
1100	11.0
1150	11.5
1200	12.0
1250	12.5
1300	13.0
1350	13.5
1400	14.0
1450	14.5
1500	15.0
1550	15.5

*(It should be noted these are not the actual measurements used in the Yield Grade computation.)*

Rate of growth and growth curve influence the conversion rates used, say Cross and Pelton. Three tissues make up the growth curve: bone, fat., and muscle. "After an animal is born, bone (curves) increase and then level off. Muscle tissue increases at a rapid rate from birth to maturity, then only increases slightly until it

**"Real time ultrasonic transducers represent a major breakthrough because there are 64 linear crystal elements that generate and receive signals 15 times per second i.e., 'real time ultrasound'." – Dr. James R. Stouffer, Cornell University.**

levels off. However, fat increases-at a slow rate at first and more rapidly, later-until maturity is reached. After this point, fat deposition is controlled by diet management."

One important concern is noted by Dr. Patsy Houghton-that of hanging carcasses. Do they potentially "measure differently" when compared to a live animal standing on all fours?

Citing some research from Kansas State University and the USMARC at Clay Center, Neb., Dr. Houghton pointed out a frequency distribution was developed to compare or contrast the two. This is important to know since, as Dr. Houghton put it, hanging carcasses represent the "real world".

Data indicated the technician in this study was still able to determine loin eye area within .25 inch 95 percent of the time and backfat within .1 inch 100 percent of the time. This accuracy despite the difference in configuration between standing animals and hanging carcasses.

There's hope, then, that ultrasound will eventually help sharpen the tools the feeder has at his command to survive. Some keys to ultrasound's future as offered by Houghton

**1. Validation of ultrasound measurements needs to be ongoing. A data base that's continually confirmed and updated for both backfat and rib eye area is essential.**

**2. Accuracy is highly correlated to operator technique. "Certified" technicians are a must.**

**3. Cost, durability, and practicality of the equipment needs to be considered.**

**4. A reliable data base needs to be developed that monitors muscle growth and fat deposition in various biological types of cattle under different management systems.**

**5. Adjustment factors for rib eye and backfat need to be developed allowing animals to be compared at a constant age and/or weight.**

Houghton foresees feedlot managers incorporating ultrasound into their man-

agement and marketing mix or routine to 1) improve the uniformity of pens through sorting toward biological type; 2) determine a compositional endpoint for slaughter as individuals or groups reach that point; 3) and identify breeding cattle with genetics to produce the weight, age, quality, and yield desired by this yard.

Students look for the mechanics and technology to come on line to produce such a scenario. Dr. J. R. Stouffer, writing "Beef Evaluation with Real Time Ultrasound" in the 1988 BIF Proceedings, states ultrasound can be a very important tool in selection. Fat thickness, rib eye area, and marbling are all highly heritable, he points out.

"We have been able to determine these characteristics on live cattle, on the farm or at a bull test station, at 25-30 head an hour. Others have demonstrated that it is practical to group and uniformly feed cattle in pens that have similar fat thickness and frame size and to then predict the number of days on feed required to market them as Choice, Yield Grade 3s.

"Preliminary studies have indicated that ultrasound can be used to identify cattle that would have a minimum of seam fat in ribs and chucks," he continues. "It has also been demonstrated we can measure fat thickness and rib eye area of hide-on carcasses at commercial chain speeds of 200-400 an hour. This suggests

that instrument grading may be just around the corner."

If that corner is to be turned, things will become really interesting for all involved in the beef chain. The breed associations might emerge as the hub, around which much of the activity and basic input will revolve. As chairman of the Live Animal Evaluation and Carcass Trait Committee (Beef Improvement Federation), the American Angus Association's John Crouch will be keenly aware of the potential and also the heightened demand for guidelines. He and his committee are working toward that end so ultrasound can be brought on line without hitch or misfire.

Its impact is too critical, too revolutionary, and of such consequence that the industry simply can't "back into it" or wait until everything is perfected and glistens with state-of-the-art.

Sire evaluation didn't happen that way. Those that believed in it, championed it, and brought it forward while accepting the imperfections and limitations.

That sire evaluation has enjoyed such success and acceptance over the years is proof enough. Its present shortcomings fall squarely in the domain of ultrasound, namely speeding the collection of progeny carcass data at much less labor and expense and time. Should ultrasound

emerge as the technique or approach filling the void sire evaluation couldn't, then it might be the component many in the beef industry have been waiting for.

## REFERENCES

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