

# SCANNING INTO THE FUTURE

with IOWA STATE UNIVERSITY



*Have you ever wondered how your cattle would fit into a grid marketing system?*

**Real-time ultrasound** uses high frequency sound waves to “see inside” while the animal is still alive. A sound-emitting probe held snugly on the animal’s back bounces sound waves off the boundaries between fat and muscle layers. A cross-sectional image created by the reflected sound appears instantly on the video screen.

*So what does that mean for you as a cattle producer?*

**Real-time ultrasound** enables you to get a fast and objective prediction on the carcass composition of your beef cattle. This tool can help you to meet specific market demands and production systems. In addition, carcass composition information could assist you in the genetic selection and breeding of your cow herd.

*OK, but what is the accuracy of real-time ultrasound – is it really worth it?*

**Ribeye area:** Certified technicians can measure ribeye area to within .6-.7 square inches of the actual ribeye area using real-time ultrasound.

**12-13<sup>th</sup> rib fat thickness and rump fat thickness:** Certified technicians can measure fat thickness to within .04-.05 inches of the actual fat thickness using real-time ultrasound.

**Percent intramuscular fat:** Certified technicians can measure PIMF to within .8-.9% of the actual amount of percent intramuscular fat. See Table 1 for the relationship between PIMF and degrees of marbling.

*“In the hands of properly trained technicians, ultrasound offers the beef seedstock industry with one of the most powerful tools for genetic improvement of carcass merit ever devised. Its time is now, not let’s wait and see,”* says Dr. Doyle Wilson, Iowa State University.

## **WHAT ARE THE BENEFITS OF USING REAL-TIME ULTRASOUND?**

- \*Objective prediction of carcass lean and fat in live beef animals.
- \*A trained evaluator can subjectively determine differences in fat cover and muscling on live cattle. However, it is impossible for a person to evaluate percent intramuscular fat (marbling) of the live animal. Ultrasound gives us the ability to objectively measure PIMF (marbling) of the live animal.
- \* Evaluation of percent intramuscular fat from the ribeye to determine USDA quality grading (marbling).
- \* Information on body composition eliminates the expense and time required by progeny testing for carcass merit.
- \* *The full potential of real-time ultrasound will be realized when the data collected can be used to calculate Expected Progeny Differences (EPD) on a national scale for every breed, working towards improved carcass merit.*

## **REAL-TIME ULTRASOUND GLOSSARY**

**Real-time ultrasound:** uses high frequency sound waves. A sound-emitting probe held snugly on the animal's back bounces sound waves off tissues of different densities, such as fat and muscle. An image is created by the reflected sound and appears on the video screen instantly.

**Ultrasound machine:** there are two major types of ultrasound machines being used for carcass evaluation of beef cattle: the Aloka 500 and the PIE Scanner 200. These machines have been designed to collect ultrasound images specifically for livestock.

**Transducer:** is the instrument attached to the ultrasound machine, in order to collect ultrasound images. The transducer both transmits and receives ultrasound waves.

**Standoff:** is made of a pliable "super flab" material. The transducer is placed in the standoff, which fits the natural curvature of the animal. This assists in the collection of the ribeye image.

**Marbling:** is measured as percent intramuscular fat. Beef carcasses are traded on the amount of intramuscular fat (marbling) they contain at the 12-13<sup>th</sup> ribs. Real-time ultrasound has the capability to predict the actual percent fat in the ribeye muscle which is what the USDA grader is primarily trying to visually evaluate. Heritability for marbling is in the moderate range, approximately 35%.

**Percent intramuscular fat:** an objective measurement of marbling in live cattle. Percent intramuscular fat is highly correlated with USDA grader's visual evaluation of marbling in a carcass.

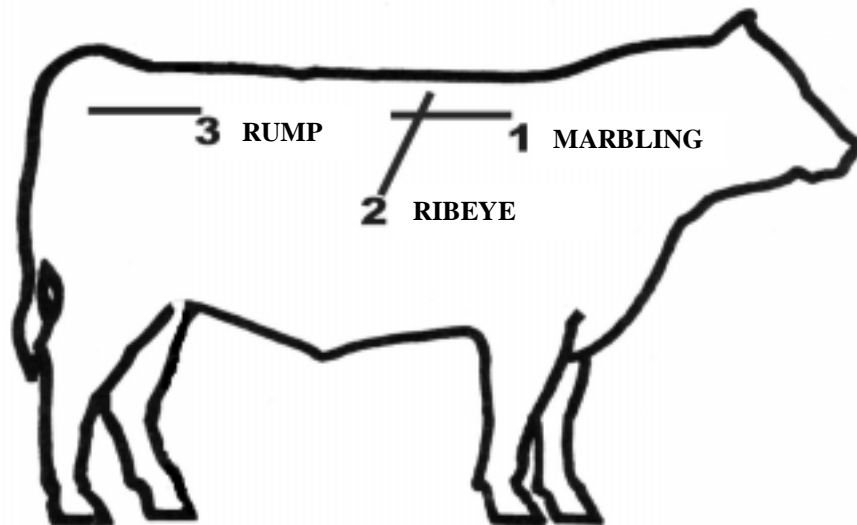
**USDA Quality grade:** is determined mainly by two factors – marbling and maturity (age) of the carcass.

**Ribeye area:** a measure of muscle in the carcass, which is measured in square inches. Ribeye area is highly correlated with retail product. This trait is moderately heritable at 35%, meaning that the trait should be passed on to its progeny.

**12<sup>th</sup>-13<sup>th</sup> Rib fat thickness:** a measure of external fat on the carcass, which is measured in inches. This measurement is taken at a point three-fourths of the length of the ribeye from the back bone end. Fat thickness is a good indicator of percent retail product. The higher the fat thickness, the lower the percent retail product. Fat thickness is slightly lower in heritability than ribeye area and marbling (20-25%).

**USDA Yield grade:** is the predicted yield of saleable meat from a beef carcass. Calculated as follows: Yield grade = 2.5 + 2.5 (fat thickness, inches) + 0.2 (percent kidney, pelvic, and heart fat) + 0.0038 (hot carcass weight, pounds) – 0.32 (ribeye area, square inches). The lower the yield grade, the higher the percent of retail product.

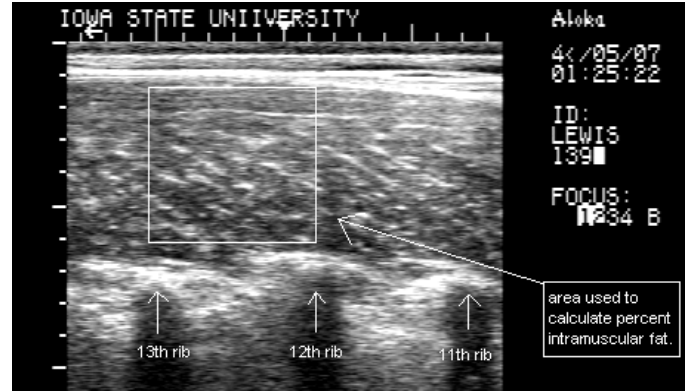
**Rump fat thickness:** a measure of external fat on the carcass, this is measured in inches. This measurement is taken across the rump of the animal. Rump fat is negatively related to percent retail product and is thought to be an additional indicator of carcass fat. Rump fat measures may be most useful for predicting percent retail product in leaner cattle which have less 12<sup>th</sup> rib fat.



The reference points (1,2 & 3) on this picture represent where ultrasound images are collected and later interpreted, as shown in the following images.



**Reference 1.** The technician is collecting the across image shown on the right for calculation of percent intramuscular fat (marbling).



Real-time ultrasound image collected the 11,12, & 13<sup>th</sup> ribs.



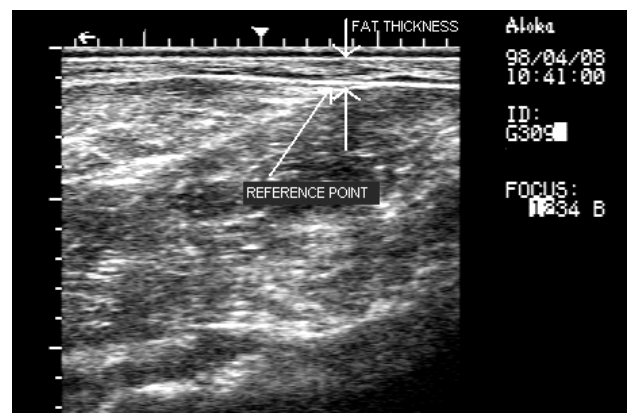
**Reference 2.** The technician is collecting the image shown on the right for measurement of ribeye area and the 12-13<sup>th</sup> rib fat thickness.



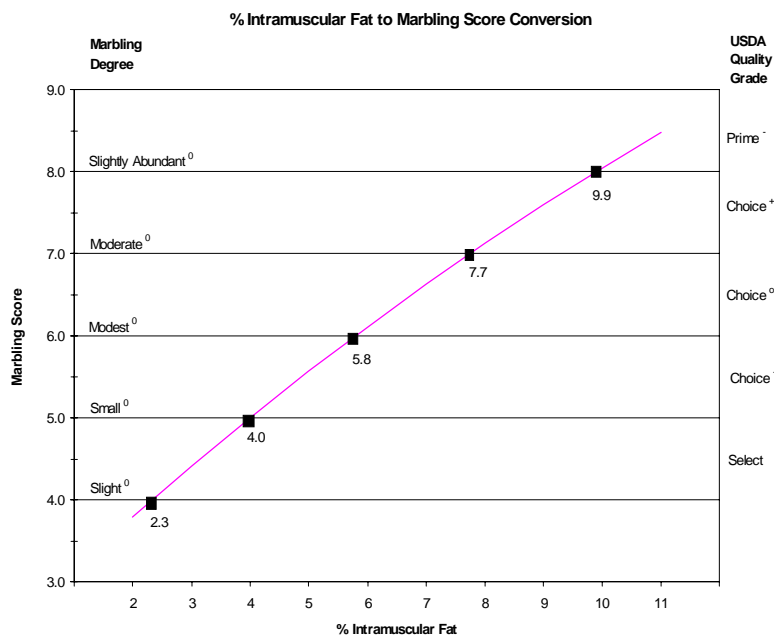
Real-time ultrasound image collected between the 12-13<sup>th</sup> rib.



**Reference 3.** The technician is collecting the image shown on the right for calculation of rump fat thickness.



Real-time ultrasound image collected across the rump.



Marbling is measured as percent fat. Beef carcasses are traded on the amount of intramuscular fat (marbling) they contain between the 12-13<sup>th</sup> ribs. However, marbling is a very subjective score. Real-time ultrasound has the capability to objectively predict the actual percent intramuscular fat in the ribeye, which is what the grader is trying to visually evaluate.

This graph relates percent intramuscular fat to amounts of marbling in the USDA Quality Grading system.

**Table 1. % Intramuscular Fat to Marbling Score Conversion**

Percent Intramuscular Fat	Quality Grade	Marbling Degree	Marbling Score
2.3 - 3.0	Select -	Slight 0 - 40	4.0 - 4.4
3.1 - 3.9	Select +	Slight 50 - 90	4.5 - 4.9
4.0 - 5.7	Choice -	Small 0 - 90	5.0 - 5.9
5.8 - 7.6	Choice o	Modest 0 - 90	6.0 - 6.9
7.7 - 9.7	Choice +	Moderate 0 - 90	7.0 - 7.9
9.9 - 12.1	Prime -	Slightly Ab 0 - 90	8.0 - 8.9
12.3 -	Prime o	Moderately Ab 0 -	9.0 -

Prepared by Doyle E. Wilson, Gene H. Rouse, Craig L. Hays, J. R. Tait, and Jodi Kruser, Iowa State University, Department of Animal Science, Ames, Iowa.

**...and justice for all**

The Iowa Cooperative Extension Service's programs and policies are consistent with pertinent federal and state laws and regulations on nondiscrimination. Many materials can be made available in alternative formats for ADA clients.

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Stanley R. Johnson, director, Cooperative Extension Service, Iowa State University of Science and Technology, Ames, Iowa.