

Making the Grade

By using instrument carcass grading technology, USDA graders can work more accurately and efficiently.

By Christy Couch Lee

It's a tough job, but they're up to the challenge. Each day, U.S. Department of Agriculture (USDA) meat graders have roughly 6 seconds to evaluate a beef carcass as it passes on the line, determining yield grade, quality grade, fat thickness, marbling and ribeye area, among a host of other criteria.

For decades, they've relied on a well-trained eye to make these evaluations. But, with the USDA Agricultural Marketing Service (AMS), the USDA Meat Animal Research Center and experts within universities across the country, they have help.

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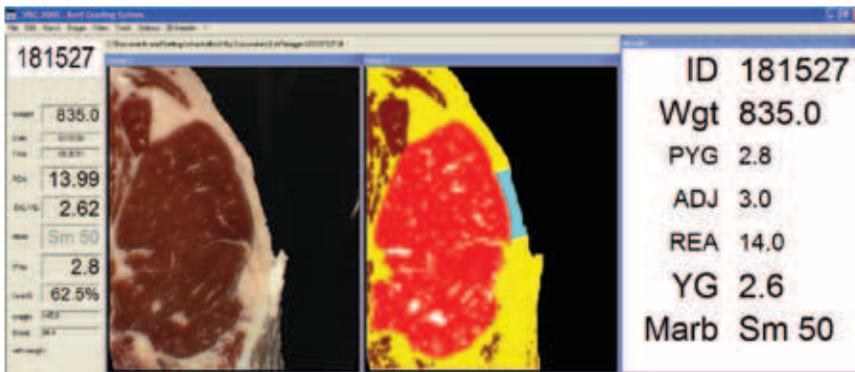
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“... human expert
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USDA meat graders have roughly 6 seconds to evaluate a beef carcass as it passes on the line. Thanks to a high-resolution digital camera and computer technology, instrument meat grading equipment can provide verification for meat graders when they place the grade on thousands of carcasses daily. Photo courtesy of Martin O'Connor.



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By developing technology and implementing standards, beef grading accuracy and uniformity can improve from plant to plant and from month to month. And, this could someday lead to increased revenue for cattle producers. Photo courtesy of Dr. Dan Hale.

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Together, Hale, O'Connor, and other USDA and university researchers have worked to develop the technology and standards for instrument carcass grading.

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There is a need

Hale says the need for instrument grading stems from increased production speeds.

"Many systems were developed in the 1950s and '60s, when beef production was at a slower scale," he says. "The production speeds have increased to 4,000 to 5,000 carcasses per day, and graders are assessing grades at a rate of 1 every 6 to 10 seconds."

In those few seconds, Hale says, a grader must assess carcass maturity, marbling score, ribeye area, fat thickness, the amount of fat in the kidney, pelvic and heart regions, and yield and quality grades.

The human eye, at that rate, is able to determine yield grades only in whole numbers — from 1 through 5. Using sight alone, graders are about 85

percent accurate on yield grade, and 94 percent accurate on quality grade, Hale says.

"Considering the constraints, these graders are doing a good job," he says. "But instead of whole grades, with the instrument technology we can determine incremental grades — for example, 1.2 or 1.7 — and producers could be paid for the differences, better discovering the true value of cattle."

By realizing this true value, Hale says, buying programs featuring grid marketing systems could be developed, paying to the nearest third, or possibly tenth of a yield grade.

In addition, by using standardized technology, grades can be more consistently assessed from plant to plant, Hale says.

"Everything is done from a human standpoint to make sure the technology is accurate," Hale says. "The machines ensure consistency from plant to plant and from year to year. It takes the pressure off the grader to make all of the assessments and arrive at a grade. It's really a more accurate and data-driven system, using actual data, rather than an estimate of the data itself."

How it began

O'Connor says it all began in 1978, when the General Accounting Office reported to U.S. Congress on the need for increased USDA research efforts to develop instruments to measure beef carcass characteristics.

"The next year, the USDA, National Aeronautics and Space Administration (NASA) and Jet Propulsion Laboratory joined in an effort in developing an instrument to assess quality and yield grade factors," O'Connor says. "Quite a few scientific minds went together to establish this technology."

Through a collaborative effort and much time, he says, performance criteria were developed and evaluated, and the technology evolved to provide consistent, accurate and precise evaluation of carcass attributes.

"It has been an evolution of the process and research, as well as the ability for the technology to advance and keep up with line speed," O'Connor says. "For the past 20 years, the mission has certainly evolved, but the needs have remained the same:

accuracy, precision, repeatability and speed.”

The potential of video image analysis has been addressed through this research, he says. Using this technology, many grade factors can be objectively measured at industry chain speeds, assisting USDA graders in more accurately applying carcass grades.



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Consistency is key

For carcass grading technology to be effective, accuracy and repeatability must be ensured with each and every instrument, Hale says.

“We need accuracy and repeatability in every single plant,” he says. “There are many environmental differences — from the time the beef carcass is ribbed to the time it reaches grading. The temperature can be different, which could impact the lean and fat color. And, this, among other things, may have an effect on the technology.”

Through a process of evaluating the results of 1.5 million carcasses in multiple locations, ensuring the functionality of instrument grading, the USDA AMS developed protocols and standards for the technology, O’Connor says.

Within the last 10 years, performance standards were established by the USDA LS program for instrument prediction of ribeye size, fat thickness, yield grade and ribeye marbling, O’Connor says.

How it works

The present-day grading instruments consist of a digital camera and a computer, O’Connor says.

“In seconds, the camera will take an image of critical attributes that are predictors of carcass composition and quality,” he says. “The computer then calculates pertinent information such as ribeye area, fat thickness, yield grade

and marbling score. A USDA grader monitors the process and the technology output to ensure proper operation.”

Hale says the USDA grader is critical, to determine maturity or anomalies in the ribeye.



... a more accurate and data-driven system ...



“The USDA grader stands by the monitor with a keyboard, to evaluate whether the machine is evaluating correctly,” Hale says. “If he believes the grade is correct, it stands. But, the grader also has the ability to override the machine, placing an appropriate grade.”

Regardless of how the technology advances, a live, human expert will always be needed, O’Connor adds.

“The autopilot feature can fly and land a plane,” he says. “But, it requires the pilot to optimize the performance. You’ll always have a pilot in the plane.”

The packers approve

Fifteen major plants have been approved for instrument use, O’Connor says.

“Collectively, these plants have a daily capacity of 62,000 carcasses, which is more than 50 percent of the current fed steer and heifer slaughter,” he says.

Many more plants are in the approval process, or are working to develop the technology to work within the configuration of their individual plants, O’Connor adds. Should these plants receive approval and implement the technology, nearly 90 percent of the fed steer and heifer carcass population will be graded by the system.

For the USDA graders who currently use the technology, response has been positive, Hale says.

“They’ve seen this isn’t going to replace them, or put people out of work,” he says. “It really provides a more accurate system — the graders check to ensure the system is grading accurately.”

An industry executive once described the impact of the technology, saying, “This is likely the biggest change in meat grading and livestock marketing that we will experience in our careers.”

The future of the technology

Hale predicts more buying systems will be based on instrument grading technology data.

“Particularly on cutability or percent lean meat yield, rather than calculated yield grade, we may go to an actual product yield that may look more like the pork buying grid, using fat-free lean and weight to determine premiums or discounts,” Hale says.

He believes this could benefit cattle producers because they can use the information derived from the systems to improve genetics, with information being passed from the processor to the feedyard to the producer.

In addition, O’Connor says, the USDA and academia will soon focus on eating satisfaction predictors, including tenderness and flavor.

“Our immediate effort is directed towards tenderness,” he says. “This will be an exciting development that will provide consumers a metric that directly correlates with the eating experience.”

By using instrument grading technology, USDA meat graders gain extra security in their evaluations, beef producers may someday see even greater returns for their efforts, and consumers can enjoy an even greater dining experience. Yes, instrument grading technology truly is making the grade. ■