Embracing Technology

Speakers share how producers can add value to beef production through the use of technology.

by **KASEY BROWN,** *associate editor*; **KINDRA GORDON & TROY SMITH,** *field editors*

With projections for the world population to grow to more than 9 billion people by the year 2050, food production will also need to increase — by as much as 70% — to meet global demand. Use of technology in agriculture will be key to meeting that growth, emphasized Steve Paisley as he addressed the audience gathered for the second day of the Range Beef Cow Symposium being hosted Dec. 3-5 in Rapid City, S.D.

Paisley, an Extension beef cattle specialist with the University of Wyoming, noted that technology is already helping beef producers do more with less. He used the example that beef numbers nationwide have declined, while beef production has been able to increase. "That's testament to our industry that we are using technology to improve."

In addition to improving production, Paisley emphasized that technology is also helping the beef industry use environmental resources more efficiently.

In addition to improving production, technology is helping the beef industry use environmental resources more efficiently, said Steve Paisley, beef cattle specialist with the University of Wyoming.

Paisley credited producers for implementing many changes during the last 50 years, but he added, "We have to continue to change."

He concluded by sharing a list of technologies that producers have not maximized the use of yet that can continue to improve and add efficiency to the U.S. cow herd. These include better use of:

- Crossbreeding. Currently only about 44% of operations utilize this tool.
- Genetic information or EPDs. An example would be the use of feed efficiency information on bulls being purchased for the herd.
- Artificial insemination (AI). Paisley noted that costs of AI and labor needs are being reduced with the many synchronization programs that are available.
- Implants. Currently, 10% or fewer operations use implants, which can increase average daily gain by 0.10-0.13 pounds (lb.) per day.
- Recordkeeping. Only 12%-15% of operations use any type of computerized records. Paisley noted that individual animal identification as a part of a recordkeeping system can help provide information for continued performance improvement.
- Forage analysis and ration evaluation.
- Managing forage resources — from rotational grazing and water to use of crop aftermath and byproducts
- Managing risk.

The bottom line: "Opportunities remain for improvements," Paisley concluded.

— by Kindra Gordon

DNA tools for genetic prediction

There is a reason why for a day or two after Thanksgiving many U.S. consumers continue to eat turkey. Leftovers keep coming because today's commercially produced birds are big. According to geneticist Milt Thomas, larger turkeys are the result of tremendous genetic change that was accomplished through genetic selection.

A faculty member and researcher at Colorado State University, Thomas really is more interested in genetic improvement of beef cattle. The way genomics — a DNA-based technology — aids selection of breeding cattle was the subject of a presentation Thomas delivered during the Range Beef Cow Symposium.

Thomas told the audience of mostly commercial cow-calf producers that genomics means "all the DNA information." In practice, it is the application of all available DNA information to improve the accuracy of expected progeny difference (EPD) values that producers use in the selection of breeding stock.

PHOTOS BY TROY SMITH

The predictive power of an EPD becomes more accurate with the addition of a molecular breeding value, said Milt Thomas, faculty member and researcher at Colorado State University.

"Genomics is exploding in a way that's similar to the advancement of computer technology," said Thomas, predicting that advancements will keep coming, much like new apps for cell phones. "We'll all have to keep up, and figure out how we can use the new technology to best advantage."

Thomas reviewed the development of EPDs as a tool kit for comparing animals for genetic merit based on each individual's pedigree, its own performance and the performance of its progeny. Discovery of genes associated with specific characteristics or traits, and the ability to genotype individual animals (test an animal's DNA for those genes) has facilitated a process for estimation of an animal's molecular breeding value (MBV) relative to a particular trait. According to Thomas, the predictive power of the EPD becomes more accurate with the addition of an MBV.

Thomas said cattle breeders and breed associations will have to work hard to understand and utilize this technology as it rapidly evolves. Noting funding limitations for the National Beef Cattle Evaluation Consortium (NBCEC) and land-grant universities, Thomas said investment by breed associations and private industry is needed to maintain database management infrastructure necessary to keep pace.

— by Troy Smith

Economically relevant traits and selection indexes

Time has proven EPD values to be effective for selection of genetically superior beef cattle. Based on the assumption that more information about more traits would help to better characterize the genetic merit of potential breeding animals, the number of traits for which EPDs are calculated continued to grow. However, the multitude of EPD values and the volume of performance and pedigree information provided can be confusing to seedstock buyers.

"There can be too much information, causing us to throw up our hands," said Colorado State University geneticist Mark Enns. Enns said the concept of economically relevant traits (ERTs) and selection indexes can help producers reduce the amount of information needed to make effective selection decisions.

According to Enns, an ERT is a trait directly associated with a production cost or income derived from production. Change for an ERT results in change in either cost or income. On the other hand, change for indicator traits may or may not affect profitability.

"The challenge for commercial producers is to choose the index that best fits their production and marketing system," said Mark Enns, Colorado State University geneticist.

Enns used two traits associated with dystocia, or calving difficulty, as examples. Calving ease is an ERT, due to its effect on calf survival, dam rebreeding rates, as well as time and expense associated with aiding difficult births. However, birth weight is only an indicator trait of calving ease. Other factors also contribute to whether a heifer or cow experiences a difficult delivery. Therefore, the EPD for calving ease is the better tool when selecting for reduced incidence of dystocia.

"The ERT concept narrows the list of traits to focus selection," stated Enns, adding that ERTs are not the same for all cattle operations.

Enns described the economic

(Continued on page 62)

Embracing Technology *(from page 60)*

selection index as an extremely attractive option for making genetic selection and purchase decisions. A selection index reflects a combination of ERTs, and the economic value of each, into a single numeric value — often expressed in dollars. An index is used just like an EPD, with the difference between two animals' respective index values representing the differences expected in the performance of their respective progeny.

"The challenge for commercial producers is to choose the index that best fits their production and marketing system. They have to use it appropriately, realizing that different traits will be emphasized in different indices," said Enns, "but index selection works."

If the most appropriate selection index still doesn't include an ERT on which a producer wishes to focus, the producer will have to consider the EPD for that trait, independently, in addition to the index. By understanding the ERT concept and taking advantage of an appropriate economic selection index, Enns said producers can avoid information overload and make effective selection decisions.

— by Troy Smith

Using sexed semen in commercial herds

Artificial insemination (AI) with gender-sorted or sexed semen is not new. The technology has been commercially available to the dairy industry for most of a decade. The availability of sexed semen from a limited number of beef sires is more recent, with most interest coming from seedstock breeders interested in predetermining the gender of calves resulting from AI matings.

University of Idaho Beef Specialist John Hall shared the potential and limitations to using sexed semen in commercial cow herds.

University of Idaho Beef Specialist John Hall told symposium attendees that there definitely is potential, but there are limitations, too. For one, sexed semen typically costs $10-$15 more per AI dose. Other considerations, he said, include:

- Pregnancy rates are decreased 10%-20%, compared to conventional semen.
- Despite early results suggesting poor results when used for lactating mature cows, cows and heifers can be expected to respond similarly.
- Sexed semen will work with fixed-time AI systems, but inseminating females that express estrus is best. Mass insemination of females typically is less successful.
- There is considerable variation, from sire to sire, when using sexed semen.

"The best use of sexed semen in commercial herds may be to develop maternal lines of females that can be bred to terminal sires," said Hall, explaining how the University of Idaho research station has used sexed semen on 20% of its commercial cows to generate Angus × Hereford-cross heifers.

"Using a sexed-semen maternal-line strategy to produce replacement females could reduce the proportion of a herd dedicated to generating replacements," added Hall. "Terminal sires can then be used on the remainder of the cows."

Another potential application is

the heifer-heifer system, where all replacement heifers are bred to produce the next generation of replacement females. This allows all maternal cows to be mated with terminal sires. A limitation associated with this system is the impact of reduced first-service conception rate when using sexed semen. Inseminating only heifers detected in estrus would maximize pregnancy rates to sexed semen, but additional heifers would have to be retained to compensate for the reduced pregnancy rate.

Hall said another application that might be used to enhance marketing would involve using sexed semen to alter the steer-to-heifer ratio in favor of more steers. This might be most useful to smaller operations that currently must market mixed loads of calves. By shifting the gender ratio, producers could then sell load lots of steers and likely increase return per cow.

All things considered, Hall does not recommend use of sexed semen by producers new to AI. If not now, sexed semen may become a useful tool for commercial producers who already implement successful AI breeding programs.

"Stay tuned," advised Hall. "We will probably see results improve [as] better semen-sorting technology and synchronization protocols are developed."

— by Troy Smith

Researchers have harvested cells from carcasses to create a clone bull calf named Alpha and three heifers named Gamma 1, 2 and 3, said Dean Hawkins, West Texas A&M reproductive physiologist.

Using DNA from exceptional carcasses to produce sires, cows

Cloning is not new. Most livestock people can remember hearing about "Dolly," the cloned sheep. That was back in 1996, and cattle, horses and other species have been cloned since then. According to West Texas A&M reproductive physiologist Dean Hawkins, researchers are still looking for ways that somatic-cell nuclear transfer, or cloning technology, can benefit livestock production.

"Genetically, a clone is a twin separated by time," said Hawkins, during his presentation at the RBCS. He talked about a different approach to the application of cloning technology.

"Typically, clones have been created by taking a tissue biopsy from an outstanding live animal," stated Hawkins, "but we started with the end product and worked backward."

Hawkins explained how, in 2010, researchers took muscle biopsies from a Prime, Yield Grade (YG) 1 carcass that had been harvested six days before. From a steer carcass sample, viable cells were grown and used to create a clone bull calf named Alpha. Cells grown from a heifer carcass yielded three heifer clones named Gamma 1, 2 and 3.

Semen from Alpha is currently being collected, and the cloned heifers will serve as embryo donors. Plans call for superovulation of the cloned heifers in March, and artificial insemination with semen from Alpha. Resulting embryos will be transferred to recipient cows. Progeny from this mating will be DNA-tested for gene markers associated with carcass merit and feed efficiency. Progeny will be fed at the university feedlot, and resulting carcasses will be evaluated for quality and yield grade.

(Continued on page 65)

Hawkins admitted that the project involves numerous unknowns, but the research team hopes to determine whether hitting the desirable "Prime One" target can be enhanced through cloning technology. Hawkins advised his audience to "stay tuned" for further developments.

— by Troy Smith

Economic value in managing genetics

We all know there is value in genetic management, but how do we effectively capture its value? Lisa Elliott, commodity marketing specialist from South Dakota State University, asked this question to the more than 500 RBCS attendees.

Strategic alliances help in market differentiation, said Lisa Elliott, commodity marketing specialist from South Dakota State University.

Organizational design and market differentiation help capture that value more fully. The organizational design of the beef industry is segmented, and she noted that there are benefits to vertical integration. It can reduce transaction and potential bureaucratic costs. While vertical integration is far from likely for the beef industry, more information and feedback between segments would help capture the value of genetic management.

"This information flow depends on records and performance information being shared through the supply chain, either through efficient, clear price signals, or from information and value-sharing in more integrated supply chains," Elliott said.

Strategic alliances help in market differentiation. She placed the benefits of these kinds of alliances between vertical integration and the spot market. For instance, alliances can get bulk input purchases; reduce transaction costs, like commission and trucking fees; increase information sharing like management, carcass and performance data; and get more value-based pricing for products, like grid pricing formulas. Most notably, the *Certified Angus Beef*® (CAB®) brand and U.S. Premium Beef (USPB) are examples of these alliances.

She noted there is potential for more of these types of alliances in the Northern Plains because of more feedlots moving north, higher technology adoption rates, higher cattle quality, larger operation size and more readily kept records.

Less region-specific, she gave her recommendations for capturing added value through genetic management.

- "Improve genetic protocols and provide transparency.
- "Be creative; there are many possibilities for strategic alliances, including proper feedback mechanisms.
- "Identify producers with whom to partner who have similar operation and genetic management techniques.
- "Market differentiation that is clear and transparent.
- "Identify new, efficient, organizational arrangements and market-differentiation mechanisms that are complementary to greater genetic management.
- "Identify genetic-management technologies that need to be developed to capture more value."

— by Kasey Brown