



## Researchers seek new ways to manage beef production in adverse environments.

by **Stephanie Veldman, Shauna Rose Hermel, Troy Smith & Angie Stump Denton**

**T**he Beef Improvement Federation (BIF) held its 35th Annual Research Symposium and Annual Meeting in Lexington, Ky., May 28-31. The theme was "Surviving Environmental Challenges."

The event began with a symposium sponsored by the National Association of Animal Breeders (NAAB) Wednesday evening, May 28. The speakers focused on the importance of reproductive performance and ways to improve reproduction in heifers and cows. The presentations are summarized in the first three sections of the following summary.

Thursday's program topics concentrated on management considerations of beef production in adverse environments, while looking at the potential use of genomics as a future selection tool in identifying cattle that will perform in harsh conditions.

The program on Friday looked at specific targets for the beef industry and how to meet them using available tools to make genetic change. In addition, BIF committees addressed emerging technologies; selection decisions; cow herd efficiency; producer applications; genetic predictions; and live animal, carcass and end-point measures. Synopses on all of the speakers and many of the committee meetings follow the NAAB summaries.

More information on the 2003 BIF Conference, audio files of the speeches and proceedings papers can be found in the newsroom at [www.BIFconference.com](http://www.BIFconference.com). This Web site, sponsored by Boehringer Ingelheim Vetmedica, Inc., provides Angus Productions Inc.'s (API's) online coverage of the event.

### Manage young cows to rebreed

The old rule of thumb that a heifer should reach 65% of her mature body weight by the start of breeding season still holds, says Tom Geary of the U.S. Department of Agriculture (USDA) Agricultural Research Service (ARS) Fort Keogh research center, Miles City, Mont. "The difference is that producers translate this into meaning 650 to 750 pounds (lb.), which was adequate when we were kids and mature cow weights were 1,000 to

1,100 pounds." Today, mature weights are often 1,250 lb. or more, meaning heifers should be at least 800 lb. at the onset of breeding.

To improve rebreeding performance of young beef cows, Geary suggests producers:

- ▶ develop heifers to 65% of their mature weight by breeding season;
- ▶ synchronize heifers to conceive early during a short breeding season;
- ▶ artificially inseminate (AI) heifers with semen from calving-ease sires;
- ▶ provide additional energy during the last 50 days of gestation so heifers calve at a minimum body condition score (BCS) of 5;
- ▶ provide early calving assistance when intervention is needed (Every 30-minute delay in providing calving assistance increases the postpartum interval by six days, Geary says.);
- ▶ provide young cows with the best feed resources available after calving;
- ▶ provide ionophores to cows after calving to improve utilization of feed;
- ▶ expose young cows to sterile bulls or androgenized cows during the last 30 days prior to the start of breeding;
- ▶ induce/synchronize estrous cycles in young cows, even if breeding with natural service; and
- ▶ consider early weaning during times of drought and when feed is an economical alternative.

### ECP vs. GnRH in controlled AI programs

Generally, more than 25% of cows are anestrus (not cycling) at the beginning of the breeding season. The use of estrogen to induce estrus has been an available tool for more than 50 years, but it has not been widely used. Jeff Stevenson, Kansas State University (K-State) animal scientist, says that his and others' research has shown that estrogen can be an alternative to gonadotropin-releasing hormone (GnRH) for follicle control up front, but it may not be as effective in anestrus cows.

Estradiol cypionate (ECP) is the only estrogen product approved for use in cattle. Its label indicates therapeutic usage to correct anestrus in the absence of follicular cysts.

To replace GnRH, Stevenson says estrogen must:

- ▶ induce follicle turnover in a synchronization program in cycling cows;
- ▶ induce ovulation in anestrus cows;
- ▶ induce ovulation after prostaglandin (PGF); and
- ▶ be easy to administer.

It must not produce hyper-estrous activity, which can lead to injury of cows due to excessive riding and standing behavior.

Research conducted at K-State showed that using ECP instead of GnRH reduces the need to remove calves for 48 hours prior to timed breeding. If using ECP with a CIDR® (controlled internal drug release) insert, Stevenson recommends removing the insert after nine days (rather than seven) because of the delayed follicle development caused by ECP use.

Stevenson says producers may want to consider resynchronization of estrus after timed AI breeding. On Day 13, after timed AI, producers can administer ECP, then reinsert a CIDR for seven days, followed by a second ECP shot. This has no adverse effect on established pregnancies and synchronizes repeat estrus, he says. Research to date has shown the practice (using a 0.5-mg dose) reduces conception rates in heifers. In suckled beef cows, resynchronization produces





normal conception rates when ECP and CIDRs are used.

### Economics of estrus synchronization and AI

Fewer than 10% of the beef cows in the United States are bred by AI each year. There are several reasons why AI isn't used extensively, including the lack of adequate facilities and lack of knowledge concerning calculation of costs and profits. Many producers don't have adequate information to make decisions regarding return on investment and profitability when considering whether to use AI.

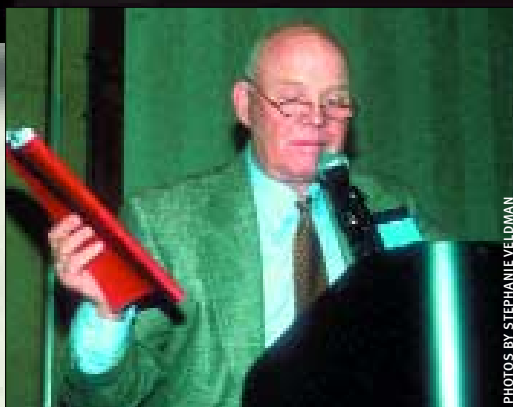
Les Anderson, a researcher at the University of Kentucky, compared the costs and benefits of using estrus synchronization and AI (ESAI) vs. natural service, for both short-term and long-term return on investments.

To discover the short-term return on investment using ESAI, researchers developed a trial to determine if the implementation of ESAI would be cost-efficient and if it would enhance the producer's net return. Cows were divided into two groups. Two-thirds of the cows were placed on an estrus synchronization program using a fixed-time insemination protocol called Co-Synch. The remaining cows were bred by natural service.

The results of the trial showed a greater percentage of cows calved in the Co-Synch program (90%) than in the natural-service group (81%); and a greater percentage of cows calved in the first 30 days of the calving season using Co-Synch (85%) compared to natural service (62%).

Revenue increased by \$99.62 per cow in the Co-Synch group, with an investment of \$29.88 per cow. Therefore, the total return on investment using ESAI was \$69.74.

Data collected from 1991-2003 served as the baseline for a trial to determine the long-term return on investment for using ESAI. During this time, 45 cows were exposed to a 60-day natural-service season using two bulls per year. The breeding system was then changed to determine the effects of ESAI. Researchers so far have found that the incorporation of ESAI increased the percentage of cows that calved, the percent of calf crop weaned and the average weaning weight of steer calves. This trial is ongoing, but Anderson says he expects the long-term



PHOTOS BY STEPHANIE VELDMAN

► Richard McClung, 2002 president of BIF and an Angus producer from New Market, Va., introduced the new *BIF Guidelines* publication, now in its eighth edition. S.R. Evans, an Angus producer from Greenwood, Miss., was elected the 2003 president of BIF.

benefits of ESAI to continue to show that increases in production efficiency lead to increases in profitability.

Anderson concluded that, based on the study, there is a dramatic difference between using ESAI and natural service — even in the first year. He found that ESAI is profitable in the short and long term, and that returns can be greatly increased if producers take advantage of programs that add value to their end product.

### Analyzing genetic evaluations by carcass end point

Most genetic evaluations for carcass traits adjust to an age-constant end point; however, cattlemen typically harvest their cattle according to a fat, carcass weight or quality grade end point, observed Janice Rumph, assistant professor in the department of animal and range sciences at Montana State University, Bozeman. But does that mean we're wrong?

During the Selection Decisions roundtable, Rumph presented research she is conducting for the American Simmental Association to answer that question.

Using the age-constant end point is not wrong, Rumph says, if either: (1) we harvest at an age-constant end point; or (2) it doesn't re-rank sires compared to how they would rank according to actual harvest end points.

Her research evaluated a database of more than 16,000 animals to compare correlations of using four different end points — age, carcass weight, marbling and fat thickness. Other traits evaluated included ribeye area and percent retail cuts.

Most correlations for fat thickness, carcass

weight, marbling and ribeye area — when adjusted to a carcass weight or a fat end point, compared to an age end point — fell within the 0.86 to 0.95 range.

While there were some bulls that were re-ranked for the traits, most of the ranks held constant.

Percent retail cuts, however, was a different story. The rank correlation was only 0.60 for the fat-adjusted scale vs. the age-constant scale. For example, the top 10 bulls for percent retail cuts when ranked on the age-adjusted scale were dramatically re-ranked when adjusted to a fat-constant end point (see table and Rumph's Power Point presentation on the Web site).

### Ranking of sires for percent retail cuts by end point used for genetic evaluation

Age Adj.	CWT adj. <sup>a</sup>	Marb adj. <sup>b</sup>	Fat adj. <sup>c</sup>
1	1	220	22
2	2	4	2
3	14	639	517
4	6	5	104
5	4	3	6
6	3	6	59
7	7	2	8
8	5	1	288
9	10	53	269
10	9	11	169

<sup>a</sup>0.96 correlation with age-constant end point.

<sup>b</sup>0.88 correlation with age-constant end point.

<sup>c</sup>0.60 correlation with age-constant end point.

In summary, Rumph says, changing the carcass end point does alter bull rankings. That leaves three options: (1) use different end points for different expected progeny differences (EPDs); (2) change all EPDs to a different end point; or (3) do nothing. The research is a work in progress, she says. More work needs to be done before deciding upon the best option.

### Cow herd efficiency

During the BIF roundtable discussion of cow herd efficiency, Lowell Gould, of the Red Angus Association of America, explained the need for screening performance data when calculating EPD values for animals registered by associations. He called it a part of the responsibility to ensure integrity of the database.

"The role of a breed association is to provide a herd book and assure breed purity, but the primary function is to manage data

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► Industry tours were offered Saturday, May 31. Participants were given the choice of visiting purebred farms or commercial operations. The group on the purebred tour stopped for a picture before the tour began.

and provide information to breeders and their customers,” Gould says. “But there are many opportunities for errors or bias in data that are submitted.”

He says screening of data does not amount to a witch hunt. It’s about looking for bad data, not people who are trying to cheat. Skepticism regarding outliers is healthy, since factors other than genetics may influence weights, measures, dates and grouping of contemporaries. Selective reporting, says Gould, creates a very real opportunity for biased data.

Keith Long, of New Mexico’s Bell Ranch, described a research project the operation is conducting in conjunction with Cornell University to measure cow efficiency in a production environment. Long says the objective is to explore the relationship between inputs, in terms of the feed a cow requires, and output, represented by the calf she produces.

Data collection will include cow, calf and sire identification: calf sex, birth weight and date; calf age and weight on date of weaning; cow weight and BCS when pregnancy-checked; as well as BCS at calving. Monthly climate data, forage type and quality, and stocking rates also will be logged. Long says the data will be used to evaluate the total digestible nutrients required per individual cow, compared to the weaning weight of her calf, to explore the potential correlation between cow size and cow efficiency.

Denny Crews, researcher with Agriculture and Agri-Food Canada Research Center,

discussed a model for developing a multiple-trait selection index for cow stayability. Preliminary work indicates that cow weight may be strongly correlated to early-life production. Large cows exhibiting higher milk production and fertility tended to have greater stayability. Crews says it may take five years of additional trials to prove the worth of this proposed selection tool.

### Mapping the bovine genome

The bovine genome sequence contains the markers for important genes that assist in improving genetic evaluation systems. Knowing the genome will enable researchers to measure feed efficiency, reproductive traits and animal health more easily.

According to Ronnie Green, national program leader for food animal production at USDA-ARS, researchers are working to develop road maps of each chromosome. Green made his comments at the Emerging Technologies roundtable discussion.

Researchers use these road maps to identify chromosomal areas called quantitative trait loci (QTL), Green explained. After a QTL is identified, the next step is to identify what trait it represents. Gene markers and animals are used to refine the location of the QTL. Gene markers have already been found for traits such as tenderness and marbling, but much of the genome is still being studied.

Green defined a few terms to help producers understand the genetic infrastructure:

- A gene is the functional and physical unit of heredity that is passed from parent to offspring.
- A genome is the DNA comprising the complete genetic complement of an organism.
- The word genomics was developed in 1986 and is a new scientific discipline of mapping gene sequencing and analyzing genomes. There are two basic categories of genomics. *Structural genomics* describes the physical structure of the genetic material. *Functional genomics* are used to improve genetics and performance in animals after the structure has been mapped.

Currently, Green is soliciting funds for the bovine genome research. He says that approximately \$51 million is needed to map the genome. Half of the money is coming from the National Human Genome Research Institute (NHGRI) if the agriculture sector raises the other half. To raise the money, Green is currently in negotiations with several groups, including the state of Texas, several international countries, Genome Canada, the USDA-ARS and the National Cattlemen’s Beef Association (NCBA).

Green says there are several benefits to sequencing the cow genome. These include improving the comparative map, reducing time and costs to identify genes, collaborating with human health research and keeping the findings in the public domain.



## Traits to dollars — What will the target be?

On what target should beef producers set their sights in order to make more dollars from their beef production systems? The opinions of representatives from four different beef processing and marketing entities indicate that variation in consumer preferences will continue to provide multiple targets. The trend toward branded beef, with varying emphasis on marbling, leanness, diet/health issues and convenience, is expected to continue. The ongoing battle of the brands provides producers with opportunities, but specification ranges for branded programs are narrowing.

First and foremost, consumers want safe food, says Jim Norwood, of PM Beef Group LLC. PM markets 35,000 head of finished cattle per year through its “Ranch to Retail” program, serving Ukrop’s Supermarkets in the eastern United States. The company also harvests cattle for other programs, with nearly 75% of production being branded.

According to Norwood, quality ranks second on consumers’ list of important beef product attributes. They define quality in terms of appearance, flavor, leanness, tenderness and source verification. PM’s effort to meet consumer expectations for safety and quality will mean increased accountability for producers and careful aim at qualifications for branded programs.

Within two years Norwood expects boxed beef yield to become the basis for pricing the cattle that his company buys. His suggestions for hitting the PM target include:

- ▶ British/Continental crossbred cattle;
- ▶ 1,200- to 1,300-lb. finished weight;
- ▶ emphasis on heavy muscle, less external and seam fat, less bone;
- ▶ carcass weight of 700-900 lb.;
- ▶ USDA Quality Grade ranging from high-Select to low-Choice;
- ▶ less than 0.4 inches (in.) back fat; and
- ▶ ribeyes ranging from 12 square inches (sq. in.) to 16 sq. in.

Excel Corp.’s Glen Dolezal sees two primary paths for branding beyond the commodity market. The qualitative approach will emphasize marbling to ensure tenderness, juiciness and flavor, with proper aging, to serve upscale, premium markets. The other path takes a more quantitative



▶ Joe Bill Meng, director of genetics and supply development for Creekstone Farms, Campbellsburg, Ky., highlighted the breeding and production goals of Creekstone Farms, as well as the premium focus for its product using Angus genetics.

approach, involving postharvest enhancement technologies such as marination and processes similar to those used in pork processing to “pump” flavor and tenderness into the product. Dolezal says producers who optimize production efficiency and red-meat yield should have the flexibility to participate in either brand strategy.

Owning no processing facilities, Laura’s Lean Beef is a Kentucky-based marketing company whose products are sold through 4,000 retail stores in 39 states. According to the company’s chairman, John Tobe, Laura’s Lean Beef serves a niche market comprised of health-conscious consumers. The company’s desire for a safe, lean and tender product drives the emphasis on all-natural production practices involving no antibiotics or growth hormones. Tobe says the program calls for high-yielding cattle that are at least three-quarter Continental. The company pays bonuses to cow-calf producers whose cattle meet product specifications, and it is promoting development of gene markers as a selection tool for tenderness.

Illustrated by its “Premium Black Angus” label, Creekstone Farms has a specific breed preference and a premium quality focus. Creekstone Farms is the newest player in beef packing, following its acquisition of the former Future Beef Operations (FBO) facility in Arkansas City, Kan. According to Joe Bill Meng, director of genetics and supply development, the company seeks to form alliances with seedstock breeders,

commercial cow-calf producers and cattle feeders who are willing to adopt production protocols that emphasize genetics, animal welfare, biosecurity and food safety. Meng says company goals include genetic and source verification of products.

## Tools for making genetic change

Producers have many tools available to make genetic improvements. The trick is to know which tools are appropriate for their operations. To help make those choices, a producer must first identify goals for the operation.

“A reasonable goal for the beef industry is to produce low-cost, high-profit cattle that yield competitively priced, highly palatable, lean products while conserving and improving the resources utilized,” says Tom Field, Colorado State University (CSU).

Several factors must be taken into account to determine how to best reach the goals you set. Among these factors are trends in the consumer marketplace, structural challenges within the beef production system, the cost-effectiveness of the program and the availability of genetic tools. A brief summary of a few of the genetic tools follows. More in-depth information can be found in the proceedings paper, which is available from [www.BIFconference.com](http://www.BIFconference.com) by clicking the newsroom link.

Field says there are three primary genetic tools available to cow-calf producers — selection pressure, breed differences and mating systems. He says that any technologies developed should be cost-effective and user-friendly for producers.

Field says that crossbreeding is one tool that can maximize genetic benefits by exploiting breed differences and creating heterosis. He gives these reasons:

- ▶ No breed does all things well.
- ▶ Careful matching of breed strengths and weaknesses can yield optimal trait combinations.
- ▶ Hybrid vigor provides a buffer against environmental stress that allows crossbred animals to be more productive in some traits than the average of the parental breeds that originated the cross.
- ▶ The advantage of heterosis is greatest in reproductive performance.

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Field warns that implementing an effective crossbreeding system requires thoughtful planning, may increase management intensity and must account for the resource limitations of a particular ranch. If not designed properly, a crossbreeding system could yield less-than-desirable results. Field says the late Bob DeBaca provided four primary reasons a crossbreeding system might fail. They include:

- (1) overuse of independent cattle breeds that have too much in them (too much milk, birth weight, mature size, etc.);
- (2) using a system that is too complicated or not implemented in a systematic way;
- (3) seedstock producers' failing to develop the expertise and a service orientation to assist in developing a good crossing system; and
- (4) using poor-quality bulls.

**Residual feed intake: challenges and opportunities**

Canadian researchers are evaluating residual feed intake (RFI) and feed conversion ratios. RFI, or net feed efficiency, is the difference between the actual feed intake and that predicted by models accounting for growth and maintenance requirements.

Denny Crews of the Agri-Food Canada Research Center has been running small feeding trials on 285 Charolais-sired crossbred steers using a feedbunk system that measures feed efficiency in individual steers fed a ration of 75% barley silage.

At the end of the study, Crews says they separated out the data for the most efficient and least efficient steers. He found a 4-lb. difference in feed intake per day, but the steers' weights at the end of the study were very close to the same.

"The more efficient half of the steers gained the same amount of weight, produced carcasses with the same yield and quality grade and spent the same amount of time on feed," he says. "But the more efficient steers consumed 390 pounds less feed than the less efficient half."



► Speakers during Thursday morning's session focused on fescue toxicity. For more details, see page 74 of this issue or visit the newsroom at [www.BIFconference.com](http://www.BIFconference.com).

Crews says that most researchers agree that RFI is mildly heritable (0.25-0.40). Preliminary research reports show there is a highly positive genetic correlation with mature cow efficiency, and so far they have found no antagonism with reproductive efficiency.

**Individual animal ID**

Considering that an estimated 51% of U.S. cow-calf producers do not use ear tags or any form of individual animal identification (ID) for calves born on their operations, and 35% of producers do not identify their cows or calves, the BIF Producer Applications Committee hosted a discussion regarding the benefits of individual animal ID.

According to Matt Perrier, director of commercial programs for the American Angus Association, individual ID is a profitable practice when tied to a recordkeeping system. It allows for evaluation of individual animal performance, as well as reproductive performance of the breeding herd. Along with being an essential tool for in-herd comparisons and genetic selection, individual ID is essential

for source verification and genetic verification requirements of value-added beef marketing programs.

University of Kentucky Extension professor John Johns cited examples of programs, such as the Five-State Beef Initiative (FSBI), that are designed to help producers with small herds coordinate genetic selection and management practices to attain marketing options with greater profit potential. Johns says participating producers commingled their individually identified calves to have them finished and marketed collectively. Collection and return of detailed feedlot performance and individual carcass data allowed participants to evaluate their respective breeding programs and address weaknesses through genetic selection.

Paris, Ky., producer Nelson Curry explained how producers in his area adopted a common protocol for managing and marketing their weaned calves. All individually identified, the calves were commingled and then sorted into uniform packages for marketing. The combined volume of sized, preconditioned and source-verified feeder calves represented added value to buyers.

With regard the controversial concept of a mandatory national ID system, using technology such as electronic ID (EID) tags, Perrier suggested that a national system initiated by the beef industry might be more producer-friendly than a government mandated program.



**Editor's note:** For more information on these topics, visit the newsroom at [www.BIFconference.com](http://www.BIFconference.com).