

# A Systems Approach

*Beef improvement efforts need to be looked at within the context of the system to ensure consequences of change are indeed improvements.*

Story & photo by  
**TROY SMITH**

Maybe it's time to consider a different approach to beef improvement. That was the suggestion offered by Barry Dunn, dean of the South Dakota State University (SDSU) College of Animal and Biological Sciences, during the opening session of the 2010 Beef Improvement Federation (BIF) Research Symposium.

"We can't invest our way to

profitability," Dunn stated. "And past approaches to beef improvement have taken us down that path."

According to Dunn, the most popular strategies have focused on manipulating gene frequency for economically relevant traits, then diffusing desirable genes into herds as rapidly as possible. Admittedly, those strategies have created change.

"Today, with the same number of cows that we had in 1958, [the U.S. beef industry] produces 1½ times more beef. But we have lost well over a third of the

number of producers that we had then," Dunn said. "If that continues, can the industry survive?"

Dunn likened beef improvement efforts to the assembly of a puzzle whose pieces have included ratios, breeding values, expected progeny differences (EPDs), gene markers and, now, genomic EPDs. He said he wonders if breeders have become dependent on a constant flow of new techniques and technologies for genetic selection targeting increased production.

Increased production has come, but not without tradeoffs and unintended consequences, such as the increased mature cow size that has accompanied selection for heavier weaning and yearling weights. Despite advancements in technology and increased production, profitability for beef producers remains relatively low.

Dunn challenged researchers and producers in the audience to look at beef improvement, not as a puzzle, but as a mystery to be unraveled. He recommended a systems approach emphasizing optimum production rather than maximum production, with consideration for controlling costs as well as increasing revenue. Dunn said each beef operation is a complex system where all the parts are tightly coupled and "everything affects everything else."

According to Dunn, interactions between management and genetics are huge. He cited, for example, fetal programming studies that have shown how the nutritional status of pregnant cows can impact the carcass characteristics of their progeny and the fertility of daughters saved as herd replacements. Creep-feeding calves can improve marbling, but also may decrease the long-term productivity of heifer calves retained. And growth-promoting implants can boost weight gain, but they also can have negative effects on carcass merit.

Rather than waiting for the next new selection tool for maximizing gene



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frequency, Dunn challenged his audience to consider whether it is more cost-effective to find optimum levels of gene frequency and learn how to turn genes on and off with management. He urged them to consider a creative systems approach.

Themed "Gateway to Profit," the 2010 BIF Annual Research Symposium and Annual Meeting was hosted by BIF June 28-July 1 in Columbia, Mo.



**Editor's Note:** Angus Productions Inc. provides online event coverage of BIF's annual symposium through the sponsorship of Biozyme Inc. Visit [www.bifconference.com](http://www.bifconference.com) for additional coverage of past meetings. The site will soon be updated with information for the 2011 symposium in Montana June 1-4 (see page 118).

## Fig. 1: Five fundamental characteristics of a complex system

1. They are tightly coupled; everything influences everything else.
2. They are dynamic; change occurs on many scales.
3. They are policy-resistant; obvious solutions to problems fail or actually make things worse.
4. They are counterintuitive; cause and effect are distant in time and space.
5. They exhibit tradeoffs; advantageous short-term behavior is often different, or even antagonistic, to advantageous long-term behavior.

**Source:** John Sterman, MIT professor, per 2010 BIF Proceedings, available online in the newsroom at [www.bifconference.com](http://www.bifconference.com).

## Fig. 2: Principles of complex systems

- The nature of feedback tends to mislead people into taking ineffective and even counterproductive action.
- People do not understand the complex interactions in a system and cannot correctly predict the outcome of their actions.
- Most difficulties are internally caused, even though there is an overwhelming tendency to blame outside forces.
- The actions people take, usually with the belief that the actions they take are a solution, are often the cause of the problem.

**Source:** Jay Forrester, MIT professor, per 2010 BIF Proceedings, available online in the newsroom at [www.bifconference.com](http://www.bifconference.com).