Using Genomics as a Decision-Making Tool for Commercial Replacement Heifers

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Situation

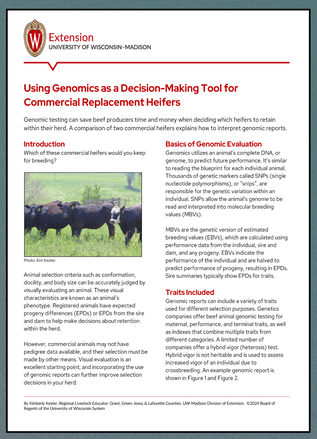
Making sound breeding decisions plays a critical role in improving the beef herd's profitability and sustainability, regardless of experience level or operation size. Maternal traits and terminal traits are influenced by genetics. However, not all cattlemen currently use genetic technologies as a means to improve the overall herd, or may lack good foundational education on the subject. Genomic testing looks at the animal's whole genome to predict future performance, and is one tool in the toolbox that can be utilized by producers to achieve herd goals.

DNA structure

Blood samples for genomic testing

One of the tested heifers from UW beef herd

Presenting at a face-to-face workshop



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Genomic testing can save beef producers time and money when deciding which heifers to retain within their herd. A comparison of two commercial heifers explains how to interpret genomic reports.

Introduction

Which of these commercial heifers would you keep for breeding?

Photo: Kim Kester

Animal selection criteria such as conformation, docility, and body size can be accurately judged by visually evaluating an animal. These visual characteristics are known as an animal's phenotype. Registered animals have expected progeny differences (EPDs) or EPDs from the sire and dam to help make decisions about retention within the herd.

However, commercial animals may not have pedigree data available, and their selection must be made by other means. Visual evaluation is an excellent starting point, and incorporating the use of genomic reports can further improve selection decisions in your herd.

Basics of Genomic Evaluation

Genomics utilizes an animal's complete DNA, or genome, to predict future performance. It's similar to reading the blueprint for each individual animal. Thousands of genetic markers called SNPs (single nucleotide polymorphisms), or "snips", are responsible for the genetic variation within an individual. SNPs allow the animal's genome to be read and interpreted into molecular breeding values (MBVs).

MBVs are the genetic version of estimated breeding values (EBVs), which are calculated using performance data from the individual, sire and dam, and any progeny. EBVs indicate the performance of the individual and are halved to predict performance of progeny, resulting in EPDs. Sire summaries typically show EPDs for traits.

Traits Included

Genomic reports can include a variety of traits used for different selection purposes. Genetics companies offer beef animal genomic testing for maternal, performance, and terminal traits, as well as indexes that combine multiple traits from different categories. A limited number of companies offer a hybrid vigor (heterosis) test. Hybrid vigor is not heritable and is used to assess increased vigor of an individual due to crossbreeding. An example genomic report is shown in Figure 1 and Figure 2.

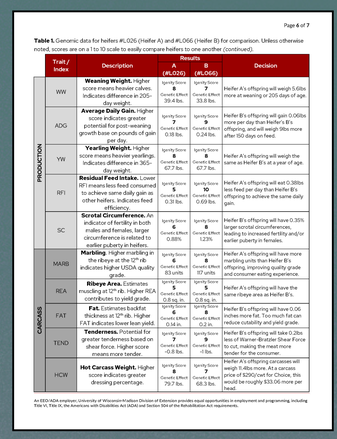

Table 1. Genomic data for heifers #L 026 (Heifer A) and #L066 (Heifer B) for comparison. Unless otherwise noted, scores are on a 1 to 10 scale to easily compare heifers to one another (continued).

Trait / Index		Description	Results A (#L026)	Results B (#L066)	Decision
PRODUCTION	WW	**Weaning Weight.** Higher score means heavier calves. Indicates difference in 205-day weight.	Sprtly Score 8 Cumntv Effect 39.4 lbs.	Sprtly Score 7 Cumntv Effect 33.8 lbs.	Heifer A's offspring will weigh 5.6lbs more at weaning or 205 days of age.
	ADG	**Average Daily Gain.** Higher score indicates greater potential for post-weaning growth base on pounds of gain per day.	Sprtly Score 7 Cumntv Effect 0.18 lbs.	Sprtly Score 9 Cumntv Effect 0.24 lbs.	Heifer B's offspring will gain 0.060lbs more per day than Heifer's B's offspring, and will weigh 18lbs more after 150 days on feed.
	YW	**Yearling Weight.** Higher score means heavier yearlings. Indicates difference in 365-day weight.	Sprtly Score 6 Cumntv Effect 67.7 lbs.	Sprtly Score 8 Cumntv Effect 67.7 lbs.	Heifer A's offspring will weigh the same as Heifer B's at a year of age.
	RFI	**Residual Feed Intake.** Lower RFI means less feed consumed to achieve same daily gain as other heifers. Indicates feed efficiency.	Sprtly Score 5 Cumntv Effect 0.31 lbs.	Sprtly Score 10 Cumntv Effect 0.69 lbs.	Heifer A's offspring will eat 0.38lbs less feed per day than Heifer B's offspring to achieve the same daily gain.
	SC	**Scrotal Circumference.** An indicator of fertility in both males and females, larger circumference is related to earlier puberty in heifers.	Sprtly Score 8 Cumntv Effect 0.88 lbs.	Sprtly Score 8 Cumntv Effect 1.23 lbs.	Heifer B's offspring will have 0.35% larger scrotal circumferences, leading to increased fertility and/or earlier puberty in females.
CARCASS	MARB	**Marbling.** Higher marbling in the ribeye at the 12th rib indicates higher USDA quality grade.	Sprtly Score 5 Cumntv Effect 83 units	Sprtly Score 7 Cumntv Effect 117 units	Heifer A's offspring will have more marbling units than Heifer B's offspring, improving quality grade and consumer eating experience.
	REA	**Ribeye Area.** Estimates muscling at 12th rib. Higher REA contributes to yield grade.	Sprtly Score 5 Cumntv Effect 0.8 sq. in.	Sprtly Score 5 Cumntv Effect 0.8 sq. in.	Heifer A's offspring will have the same ribeye area as Heifer B's.
	FAT	**Fat.** Estimates backfat thickness at 12th rib. Higher FAT indicates lower lean yield.	Sprtly Score 6 Cumntv Effect 0.14 in.	Sprtly Score 8 Cumntv Effect 0.2 in.	Heifer B's offspring will have 0.06 inches more fat. Too much fat can reduce cutability and yield grade.
	TEND	**Tenderness.** Potential for greater tenderness based on shear force. Higher score means more tender.	Sprtly Score 9 Cumntv Effect -0.8 lbs.	Sprtly Score 9 Cumntv Effect -1 lbs.	Heifer B's offspring will take 0.2lbs less of Warner-Bratzler Shear Force to cut, making the meat more tender for the consumer.
	HCW	**Hot Carcass Weight.** Higher score indicates greater dressing percentage.	Sprtly Score 8 Cumntv Effect 79.7 lbs.	Sprtly Score 7 Cumntv Effect 68.3 lbs.	Heifer A's offspring carcasses will weigh 11.4lbs more. At a carcass price of $2.90/cwt for Choice, this would be roughly $33.06 more per head.

Response

Blood samples were drawn and genomic reports were run for maternal, growth, and carcass traits on a group of replacement heifers in the University of Wisconsin beef herd. Heifers were photographed to assess overall conformation and phenotype for comparison to genetic information - i.e., "Do the pretty heifers also look good on paper?" Genomic reports were used to develop a decision-making fact sheet that compared two animals side-by-side to aid producers' understanding of each trait. The fact sheet and genomic reports were used as teaching tools in producer workshops.

Outcomes

The genomic data and fact sheets were presented to cattle producers through a variety of communication channels, including face-to-face workshops and meetings, webinars, one-on-one farm visits, websites, social media, popular press, and radio.

Face-to-Face Events:
- UW Beef Cow-Calf Field Day
- Wisconsin Schools of Grazing
- Farm visits with producers

Webinars:
- Beginning Beef Production

Media:
- Wisconsin Agriculturist magazine
- "Farm Talk" on 95.5 WEKZ

Impact & Next Steps

Workshops generated dialogue with producers about using genetics in their operations. Sharing the fact sheet and article online reached a broader audience. This dissemination will continue, with the goal of documenting decision making changes on-farm as a result of the information.

63 Producers at Workshops & Webinars

515,000+ Print & Radio Audience

People via Website & Social Media **478**

The goal: High quality animals to retain for breeding

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