# By the Numbers

by **Sally Northcutt,** *American Angus Association*

## Angus selection tools: genomic-enhanced EPDs

*Every week the American Angus Association releases a suite of selection tools for use by Angus breeders and their bull-buying clientele. The addition of genomic results to the expected progeny differences (EPDs) for economically important traits has revolutionized rapid selection tools for young breeding stock.*

### Starting point

Access to genomic information begins with DNA samples submitted by breeders that travel through a data flow process and ultimately return to the Association's system as genetic selection tools. Fig. 1 illustrates how samples, animal identification (ID), and genomic results move through channels to ultimately enter the Angus national cattle evaluation (NCE).

Only genomic results received through this data flow process will be incorporated into the EPDs.

To learn more about how to submit orders for genomic results, go to *www.angus.org/AGI/default.aspx* where DNA testing is streamlined through breeder AAA Login accounts.

### Genomic-enhanced EPDs for all

The new-age genomics go far beyond the first DNA marker tests that were introduced years ago, which only included a handful of markers. The modern genomic evaluations result from a panel of DNA markers, commonly referred to as a panel of SNPs (pronounced 'snips'; single-nucleotide polymorphisms).

Each SNP alone doesn't tell you much, but a panel of critically selected SNPs for multiple traits provides molecular breeding values that can be used in the calculation of EPDs. Already the EPD calculations use multiple sources of information. The genomic value becomes an additional piece of information.

Fig. 2 illustrates that animals receive an EPD from being included in the evaluation with varying amounts of information. In the classic example, an animal may have a weight and a pedigree, but no progeny. The individual still receives an EPD from the national cattle evaluation.

With the introduction of genomic results into the NCE model for a trait, the molecular breeding value (MBV) from the genomic company enters as an informative piece of data on an animal, which allows the calf to receive an EPD from the analysis even though no phenotypic measure has been submitted.

This also illustrates that genomic results can be captured and implemented into selection tools from any age animal. Breeders can use the electronic calving book found in AAA Login to expedite the process for preparing their animals' genomic data to enter NCE.

Fig. 3 outlines the combinations of information that will result in an EPD. Granted, the extensive pedigree of parents of animals in these cases also are part of the NCE and receive EPDs, in addition to animals with performance phenotypes and genomic data.

### Industry recommendation for genomic selection

The ideal way to utilize genomic results as a genetic selection tool is to use a genomic-

CONTINUED ON PAGE **96**

**Fig. 1: The big picture for data flow**

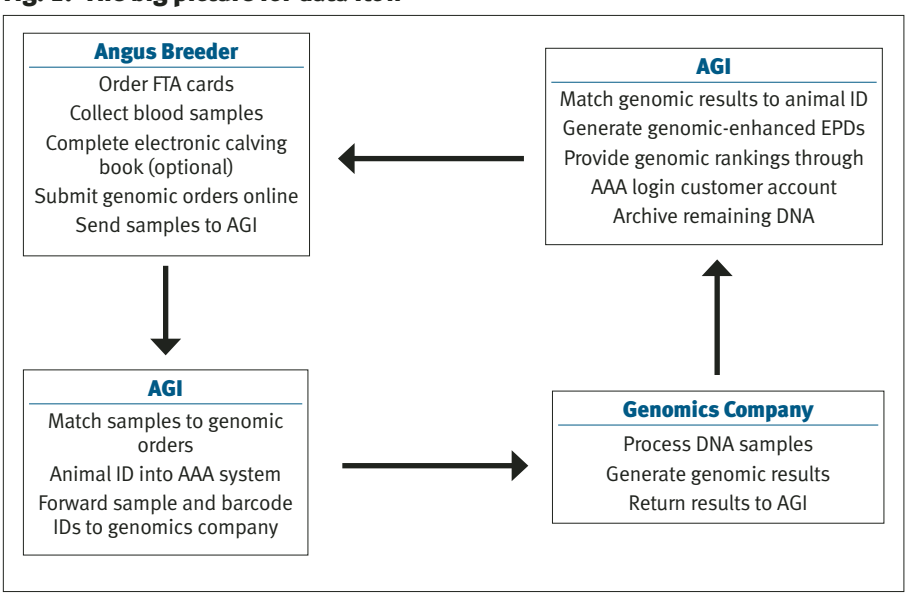



**Fig. 2: Information included in NCE EPD**

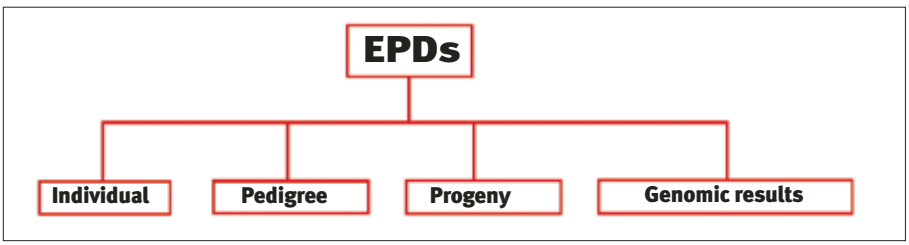



**Fig. 3: EPDs generated from genomic-enhanced NCE**

| Genomic result | Phenotypes | |
|---|---|---|
| | No | Yes |
| No | — | EPD |
| Yes | EPD | EPD |

## BY THE NUMBERS

CONTINUED FROM PAGE 92

enhanced EPD that incorporates the power of the DNA result. The Beef Improvement Federation (BIF) guidelines state that DNA test results should be reported to the beef industry in a consistent, understandable format. Further, the format should be in the form of an EPD, in the units of the trait, on a continuous scale, and with a corresponding BIF accuracy.

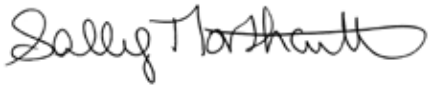
DNA tests have value in genetic selection when incorporated with all other available forms of performance information for economically important traits in national cattle evaluation, and when communicated in the form of an EPD with a corresponding BIF accuracy. If an EPD is available for the trait through the Association, then the EPDs should be considered the selection tool of choice. The EPD and accuracy account for all sources of information available on the animal of interest (e.g., pedigree, own record, weights/measures, genomic results).

How does this technology advancement affect you and your EPDs?

Genomic results are a way to enhance our current selection tools, to achieve more accuracy on predictions for younger animals, and to characterize genetics for traits where it's extremely difficult to measure the phenotype. Some of the traits from the genomic results do not even have EPDs in production as of yet for Angus breeders.

Choosing to purchase a genomic result for incorporation into an animal's genetic evaluation is up to the Angus breeder. Only through the pathway described in Fig. 1 will breeders have access to those results entering the American Angus Association EPDs.

Through the evolution of these technologies, we plan to keep breeders advised of progress we make in incorporating genomic results into the EPDs. These updates will be provided on *www.angus.org* as available. For the most up-to-date list of traits with genomic data contributing to results go to *www.angus.org/Nce/WeeklyEvalGenomicData.aspx*.



**E-MAIL:** snorthcutt@angus.org
***www.angus.org***

**Editor's Note:** *"By the Numbers" is a column by Association performance programs staff to share insights about data collection and interpretation, the NCE, genetic selection, and relevant technology and industry issues.*