By the Numbers

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

Efficiency phenotypes matter

Feed consumption has long been recognized as one of the most important factors in determining profitability of beef cattle production. Selection tools have been limited for efficiency traits, although breeders continue to request expected progeny difference (EPD) values to make genetic progress in this area. More than ever before, phenotypic measures are important to better characterize efficiency and generate breeding-value predictors.

Feed intake database

The American Angus Association provides residual average daily gain (RADG) EPDs on a weekly basis as a genetic selection tool to better characterize postweaning efficiency. As popularity increases and questions come in regarding this selection value, it's important to know the drivers in providing these results.

Currently the Association has more than 12,000 individual intake records for genetic evaluation purposes. Fig. 1 depicts the growth in these records since data collection was formalized. Fig. 2 illustrates the number of animals with RADG values available as a selection tool today.

The feed-intake data used as part of the national cattle evaluation (NCE) includes feed-intake results from cooperating breeders and their feeding systems, bull-test intake facilities, and multi-year research projects funded by the American Angus Association and the Angus Foundation. The evaluation procedures for conducting a genetic evaluation of feed intake were developed using these data in conjunction with other traits already analyzed in the Angus evaluation system, such as growth and ultrasound components. The end result is RADG provided as a regular part of the American Angus Association's suite of EPDs.

Phenotypes really matter for feed intake. The individual feed-intake measures are primary in driving the accuracy for an individual and sires. Animals with their own intake measure captured from a feeding facility will have the higher nonparent accuracies, and sires with phenotypic intake progeny will have accuracies that continue to drive upward. With so much talk regarding genomics in recent years, it's important not to forget that phenotypic intake data rules in terms of making this economically relevant efficiency measure, RADG, possible.

Genetic evaluation of feed intake

With a grasp of the value of the individual intake measures, along with the commitment by breeders to capture and submit data with cooperating intake facilities, a better understanding of RADG is helpful.

The initial steps to generate the components needed to calculate RADG include a comprehensive genetic evaluation of multiple phenotypic traits, with the additional inclusion of genomic results. Phenotypic traits include individual calf dry-matter intake (DMI), weaning weight, postweaning gain, ultrasound subcutaneous fat thickness, and DMI genomic values. The weight, gain, fat and genomic pieces function as indicator traits to predict genetic feed-intake values.

The genomic results are for the trait of DMI, and these values are integrated into the genetic evaluation as a correlated trait to standardized phenotypic DMI from the Association's intake database. Inclusion of genomic results allows calves to be included in the evaluation and ultimately have an RADG EPD prediction as a result of the incorporation of DNA technology. A similar scenario occurs with indicator traits of ultrasound and genomic values in the carcass EPD model.

From this multi-trait animal model evaluation, the resulting feed intake EPD is used to calculate residual gain. In this step, the genetic feed intake EPD and the genetic ultrasound fat EPD (a small composition adjustment) are used to adjust the postweaning gain EPD — thus, RADG is created. Weighting factors, or regression coefficients, representing genetic trait relationships are used to adjust the intake and fat EPDs in the math.

RADG is presented in pounds (lb.) per day, or average daily gain, with a higher value being more favorable. The genetic RADG is reflective of the postweaning period. It is not a cow-efficiency tool. RADG is reported with other production growth traits but more specifically characterizes genetic differences in gain given a constant amount of feed. In simple terms, it helps to identify animals that gain more while consuming the same amount of feed.

At first glance one might think that RADG is all growth and gain. However, the efficiency components are relevant and impactful on animal rankings. In the Association database, the sire rank correlation between yearling weight (YW) EPD and RADG EPD is only 0.52. With a correlation of 1 being perfect, one can see that sire rankings change depending on whether RADG EPD is the tool of interest or straight postweaning growth through the YW EPD is the point of interest. Genetic differences in feed efficiency are reflected in the RADG EPD and will help identify animals that would be more profit-oriented in a feedlot scenario.

Example sires and RADG

In Fig. 3, assume two Angus sires have RADG EPDs of 0.22 and -0.09, respectively. On the average, calves sired by Bull A are expected to have a 0.31 lb.-per-day advantage

Fig. 1: American Angus Association individual feed intake records, growth in number of records by year

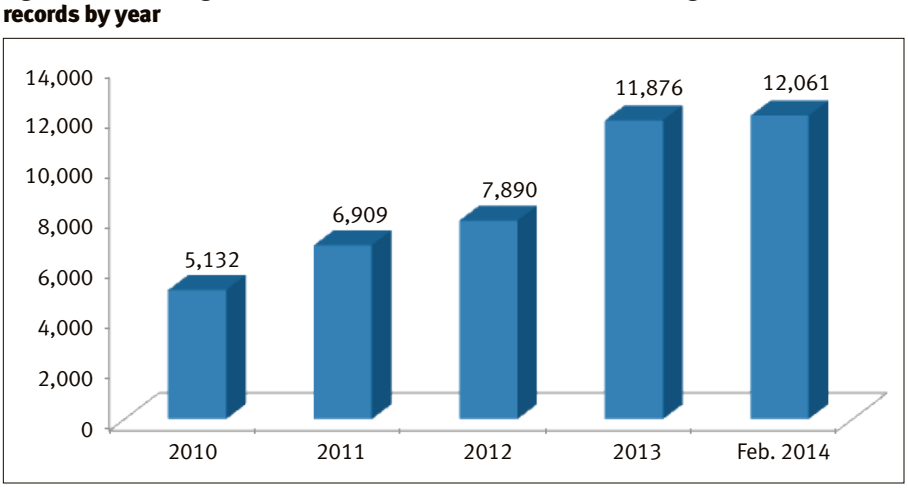
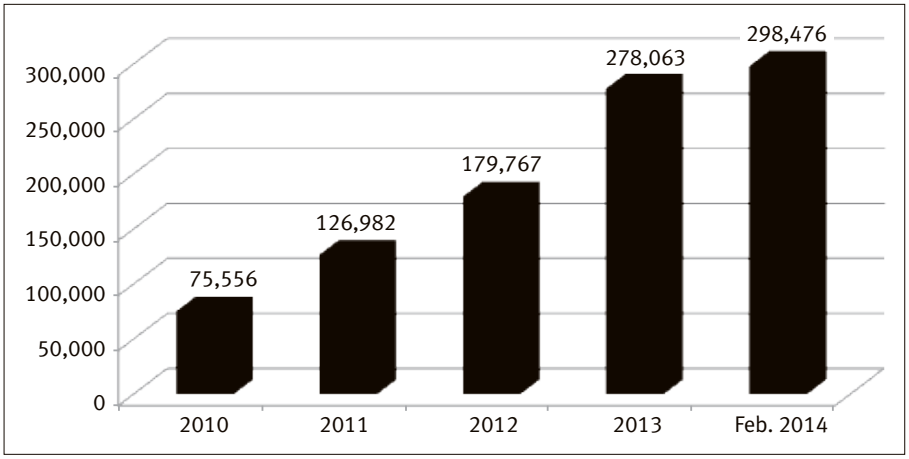


Fig. 2: American Angus Association RADG EPD values, growth in number of EPD values by year



in average daily gain over calves sired by Bull B when fed the same amount of feed during the postweaning phase of production.

This difference results in a large economic benefit in the feedlot. During a typical 160-day feeding period, Bull A's progeny will gain almost 50 lb. more (0.31 lb. per day × 160 days on feed = 49.6 lb.) as compared to the progeny of Bull B, with no additional feed cost. If fed cattle are selling for $140 per hundredweight (cwt.) live, Bull A's progeny generate a net economic advantage of $69.44 per head. Feedlot operators would consider this a sizable benefit, and will bid more aggressively when buying feeder cattle that perform like those sired by Bull A.

Use of the RADG EPD allows producers to characterize Angus genetics that will perform more efficiently in a postweaning feeding environment. It provides a balanced approach to identify cattle that, with a given quantity of feed, will still perform at industry-acceptable levels. Individual feed-intake data captured at efficiency collection facilities has the most sizable impact on improving the accuracy of the EPD.

Fig. 3: Sire comparison for RADG

Bull A	Bull B
RADG Acc	RADG Acc
+0.22 .75	-0.09 .75

On the average, calves sired by Bull A will have a 0.31 lb.-per-day advantage in average daily gain than calves sired by Bull B when fed the same amount of feed during the postweaning phase.

Leveraging the individual phenotypic intake data and associated indicator trait information in a weekly genetic evaluation will give Angus producers nearly "real time" selection of more feed-efficient genetics.

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Editor's Note: *"By The Numbers" is a column by Association performance programs staff to share insights about data collection and interpretation, National Cattle Evaluation (NCE), genetic selection and relevant technology and industry issues. Sally Northcutt is director of genetic research for the American Angus Association. If you have questions or would like to suggest a topic for a future column, contact the Association at 816-383-5100.*