

# FREQUENTLY ASKED QUESTIONS

August 2016

## GENEMAX<sup>®</sup> ADVANTAGE<sup>™</sup>: THE SOLUTION FOR COMMERCIAL ANGUS HEIFER SELECTION



### GENEMAX ADVANTAGE

#### Q. What is GeneMax Advantage?

**A.** GeneMax Advantage is a DNA test for prospective commercial Angus replacement females that are 75% and greater Angus (black) breed composition. The test delivers genetic predictions in the form of three economic indexes, ten individual maternal, growth and carcass traits, customizable identification of outliers for three threshold traits, and Sire Match to HD 50K and i50K tested bull batteries. Created from a collaboration between AGI, CAB and Zoetis, GeneMax Advantage was built - and is periodically updated - based on what's learned from evaluation of the ever expanding population of tested, registered, genetically evaluated Angus seedstock. Test results help inform replacement female selection, lifecycle breeding (mating and bull buying) decisions, and may be integrated into various feeder cattle marketing programs for more informed price discovery.

#### Q. What bio-economic indexes are included in GeneMax Advantage?

**A.** GeneMax Advantage includes the following three economic index scores that are expressed on a normally distributed scale from 1 to 100, where scores of 50 equate to average genetic merit as benchmarked against the reference population of 37,519 tested females and higher scores represent genetics for greater net return:

- **Cow Advantage Scores** rank females for predicted net returns from combined genetic merit across maternal, growth and mature size traits, including: Calving Ease Maternal (CEM), Weaning Weight (WW), Heifer Pregnancy (HP), Milk and cow size - Mature Weight (MW) and height. The five primary maternal traits comprising Cow Advantage Scores are also reported individually, enabling more specific selection and breeding decisions.
- **Feeder Advantage Scores** rank females for predicted net returns from combined genetic merit transmitted to progeny for post-weaning growth, feed efficiency and carcass traits, including: Gain in the feedlot, Dry Matter Intake (DMI), Carcass Weight (CW), Marbling and Yield Grade traits (Fat and Ribeye Area - RE), as valued on CAB, marbling-oriented grids. Five of the primary traits included in Feeder Advantage Scores are also reported individually.
- **Total Advantage Scores** rank females for predicted differences in profitability across the entire beef supply chain, from combined genetic merit for all economically relevant traits captured in the Cow Advantage and Feeder Advantage Scores.

**Q. What are GeneMax Advantage Scores based on?**

**A.** GeneMax Advantage index scores are based on genomic breeding values for included economically important traits that span beef supply-chain segments, and weighted according to explained genetic variation and associated impact on costs and revenues generated from production. The genomic breeding values incorporate the maker effects derived from the latest HD 50K for Angus calibration – version 5 – that included HD 50K genotypes from 108,211 tested, registered Angus animals. The economic assumptions are generally the most recent three year rolling averages for production costs and sale prices (weaned calves and carcasses), and are consistent with those used for dollar indexes available for registered Angus seedstock computed by Angus Genetics, Inc. The reference population of commercial Angus females used for score formulation and benchmarking includes 37,519 tested animals.

**Q. How effective are GeneMax Advantage Scores?**

**A.** On average, approximately 37%, 47% and 42% of the additive genetic variation across contributing traits is accounted for by Cow Advantage, Feeder Advantage and Total Advantage Scores, respectively. If Angus breed composition is lower than 75%, these levels of explained variation are expected to be reduced. Net economic returns from more informed replacement heifer selection based on Total Advantage Index Scores have been estimated at nearly \$300 per selected female through the first six calf crops.<sup>8</sup> Other sources of value return include more informed breeding decisions to accentuate genetic strengths, correct weaknesses and manage inbreeding (mating, natural service bull buying and A.I. sire selection), as well as incorporation of results into feeder cattle marketing programs for enhanced price discovery of untested herd mates.

**Q. What are the underlying economic advantages of selecting commercial Angus heifers based on Cow, Feeder and Total Advantage Scores?**

**A.** GeneMax Advantage Scores range from 1 to 100, and represent underlying predicted differences in dollars of net returns due to combined genetic merit for traits included in each index. Higher scores are more desirable, and for each unit of Cow, Feeder and Total Advantage Score, there's predicted net return differences of \$1.09, \$.78 and \$1.65 respectively, per calf. For example, a 50-unit difference in Total Advantage score equates to just over \$82 (50 X \$1.65) per calf predicted advantage in net return, or \$492 (50 X \$1.65 X 6) difference through the first six calves.

**Q. How do I interpret scores for individual traits?**

**A.** Similar to the indexes, scores for individual traits range from 1 to 100, are normally distributed, with average genetic merit equal to scores of 50 as benchmarked against the reference population. Scores represent underlying Molecular Value Predictions (MVP) - or breeding values - and for most traits higher scores mean more favorable genetic merit. Exceptions include scores for Fat Thickness, where higher scores indicate less fat contributing to more desirable USDA Yield Grade, and scores for Mature Weight (MW) and Milk, where higher scores indicate breeding values for more milk and heavier mature weight, and higher associated feed requirements. It follows that for cow size and milk, more moderate score values will often represent more optimum genetic merit that's better matched to available feed resources. Beyond individual trait predictions for cow size and milk, these traits are included in the Cow and Total Advantage Scores, and the customizable Smart Outlier feature identifies genetic merit that may be out-of-bounds for Cow Cost.

**Q. How often will index assumptions and trait predictions be updated?**

**A.** The economic assumptions behind GeneMax Advantage are based on the most recent three-year rolling averages for cattle sale prices and costs of production.<sup>1-7</sup> The intent is to update these assumptions, as well as economic weighting factors and genomic predictions, on an annual basis to maximize their predictive value and economic relevance for historic and new animals tested.

**Q. What changed in 2016 as part of the annual GeneMax Advantage refreshment?**

**A.** Several upgrades and additions have been made to GeneMax Advantage:

- **Updated marker effects** from the latest HD 50K for Angus version 5 calibration are now incorporated into genetic prediction features
- **Updated economic assumptions** – synergized with those used for \$Value Indexes computed for Angus seedstock – are now incorporated into Cow, Feeder and Total Advantage Scores
- **Genomic prediction scores** are now reported for 10 individual traits, five of which contribute to Cow Advantage Scores and five of which contribute to Feeder Advantage Scores
- **Expanded reference population** for benchmarking tested animals now includes 37,519 commercial Angus females
- **For customer convenience**, the sire's name is now reported when a Sire Match is found, in addition to the previously reported Tag and Registration Numbers
- **Since scores** are now directly reported for Marbling, it is no longer included as a Smart Outlier trait

**Q. Will any of the changes affect previously tested animals?**

**A.** Updated and expanded results will be reported for historically tested animals. Due to the increased percentage of explained genetic variation with the new calibration (especially for heifer pregnancy), updated economic assumptions and the expanded reference population for benchmarking, the look of results and rank may change for previously tested animals.

**Q. What is customizable Smart Outlier reporting?**

**A.** GeneMax Advantage includes Smart Outlier Reporting for quick identification of animals that likely possess relatively extreme and less desirable genetics for the following threshold-oriented traits:

- **Cow Cost:** Identifies females with more expensive predicted genetic merit for feed costs due to combinations of larger mature size and higher milk production. The flagging of higher cow cost females may be customized from the default, most expensive 5%, in various increments up to the most costly 35% as evaluated against the reference population of tested animals (currently 37,519 head)
- **Docility:** Identifies outlier females with genetic potential for undesirable temperament, customizable from the bottom 5%, in various increments up to the bottom 35%
- **Tenderness:** Identifies outlier females with genetic potential for unfavorable end-product tenderness (shear force), customizable from the bottom 5% in various increments up to the bottom 35%

**Q. How can producers utilize Smart Outlier reporting in decision making?**

**A.** Females flagged for outlier genetic merit associated with higher feed costs, potentially difficult-to-manage behavior and less palatable eating experiences are candidates for either culling or corrective mating to Angus sires with favorable genetic merit. The customization feature is intended to easily and efficiently enable cow-calf producers to identify prospective replacement candidates that possess particular genetic merit that likely should impact mating and/or keep-cull decisions for their specific situations.

**Q. How many markers are in the GeneMax Advantage test?**

**A.** The exact number of markers used for GeneMax Advantage Scores and trait predictions varies for each index and underlying trait. While the genotyping platform is proprietary to Zoetis and Angus Genetics Inc., customers should know GeneMax Advantage indexes and individual trait predictions are derived from thousands of marker genotypes from each animal tested and a process called imputation that effectively bridges to tens of thousands of marker genotypes that inform overall genetic merit.

**Q. What is Sire Match, and how do I use this information?**

**A.** GeneMax Advantage matches tested females to their most likely specific registered and transferred HD 50K and i50K tested Angus sire from multiple-sire breeding pastures (including A.I. sires). Sire Match - now reported as sire name, tag and registration number - enables management of inbreeding and sometimes negative effects on reproductive, fitness and survival traits through breeding females with known sires to unrelated service sires and/or groups of bulls. Angus bull buyers are encouraged to select bulls based on superior GE-EPDs powered by HD 50K and pedigrees that are relatively unrelated to the target females to which they are intended to be mated.

**Q. How can I receive Sire Match information if the bulls I used are not HD 50K or i50K tested?**

**A.** Angus sires must be Zoetis HD 50K or i50K tested for sire parentage to be assigned to GeneMax tested daughters. Commercial cow-calf producers should request Angus bull purchases be registered and transferred to their ownership to enable seamless sire parentage assignment. Sire candidates may be HD 50K or i50K tested either before or after potential daughters are tested – and for timely results should be designated on order forms submitted to AGI.

**Q. What are the advantages of GeneMax Advantage if I am using Zoetis HD 50K and i50K tested bulls?**

**A.** Bull selection based on superior American Angus Association® GE-EPDs powered by Zoetis HD 50K and i50K sets the stage for producing the best calf crop possible. GeneMax Advantage enables selection of heifers for higher net returns. An especially valuable attribute of a Zoetis HD 50K and/or i50K-tested bull battery is GeneMax-tested progeny are likely to have specifically assigned sires. This information can be used to make strategic breeding decisions to manage inbreeding.

**Q. Can I use GeneMax Advantage in males?**

**A.** GeneMax Advantage is designed for use in commercial Angus females that are 75% or greater Angus breed composition. It cannot be used in males.

**Q. Can GeneMax Advantage be used in heifers that are less than 75% Black Angus?**

**A.** GeneMax Advantage may be used in heifers that are slightly less than 75% Black Angus breed composition, but customers should understand that the level of explained additive genetic variation is anticipated to be compromised roughly proportional to the magnitude that breed composition other than Angus exceeds 25%.

**SAMPLE COLLECTION, SUBMISSION AND RESULTS**

**Q. What sample types are acceptable for GeneMax Advantage testing?**

**A.** Blood cards, Allflex® tissue samples, and hair may be used for GeneMax Advantage.

**Q. What is the turnaround time from submitting samples to receiving results?**

**A.** Customers are advised to allow up to 30 days from the time of sample arrival at AGI to the delivery of results through the secured customer portal of the AAA/AGI website.

**Q. How do I order tests and where do I send samples?**

**A.** More information and electronic ordering of Zoetis HD 50K, i50k, GeneMax Advantage and GeneMaxFocus can be found at [www.angus.org/agi](http://www.angus.org/agi) or [genemaxadvanage.com](http://genemaxadvanage.com) (download the Excel order form), and all samples/orders must be submitted to:



Email completed GeneMax Excel order form to: [gfuston@angus.org](mailto:gfuston@angus.org)

**Q. Can I send my samples directly to Zoetis?**

**A.** AGI/CAB are the exclusive distributors of HD 50K and i50k for Angus, GeneMax Focus and GeneMax Advantage, and all samples for these tests should always be sent directly to AGI.

**GENOMIC TESTING OVERVIEW**

**Q. What other genomic tests are provided by the partnership of Angus Genetics Inc. (AGI), Certified Angus Beef (CAB) and Zoetis?**

**A.** The following tests deliver Angus breeders and commercial producers a comprehensive and powerful genetic game plan to advance productivity and net returns:

- **HD 50K and i50K for Angus Seedstock:** Genomic Enhanced Expected Progeny Differences (GE-EPDs) powered by Zoetis HD 50K deliver the equivalent of an initial progeny proof – the better part of a first calf-crop worth of information - to the accuracy of EPDs for 15 traits. This is especially valuable for both commercial bull buyers and seedstock sellers of young Angus sire prospects, as well as for selection and mating of Angus females. The USDA SNP parentage markers included on HD 50K and i50K are used to verifying parentage and inform Sire Match for GeneMax tested progeny produced from multi-sire breeding schemes.
- **GeneMax Focus** provides genomic predictions for weaning weight, feedlot gain, carcass weight, marbling score, an index for combined growth and grade genetic merit, as well as Sire Match to HD 50K and i50K tested bull batteries. As the name implies, GeneMax Focus targets key feedlot and carcass traits.
- **Genetic Conditions and Parentage Testing** are available through the secured, on-line member portal at [Angus.org](http://Angus.org).

**Q. When should I use GeneMax Advantage and when should I use GeneMax Focus?**

**A.** GeneMax Focus provides information about growth and quality grade – weaning weight, post-weaning gain, carcass weight and marbling score - and Sire Match information are desired to help inform feeder/fed cattle marketing programs and replacement heifer decisions. As the name implies, GeneMax Focus includes information for a targeted range of key growth and carcass traits, and does not include predictions for maternal, feed efficiency, docility, tenderness and carcass yield grade traits that are included in GeneMax Advantage.

GeneMax Advantage provides more comprehensive genetic information across the complete range of economically important maternal, feed efficiency, growth and carcass traits that span the beef

production chain. This test was developed for advanced replacement heifer decisions, including selection and mating, as well as to help inform feeder cattle marketing programs. As well, because of the more expansive genotyping platform used for GeneMax Advantage, greater levels of explained variation are also achieved.

**Q. Can GeneMax be used by seedstock producers on registered Angus animals?**

**A.** GeneMax Advantage and GeneMax Focus are only intended for unregistered, commercial Angus animals. As such, GeneMax predictions do not contribute to GE-EPDs. Zoetis HD 50K and i50K for Angus and resulting GE-EPDs, accuracy and index values, are exclusively for registered Angus animals.

**References**

- 1 American Angus Association website (\$Value Changes Due to Market Trends). [www.angus.org/Pub/Newsroom/Releases/dollar-value-page.aspx](http://www.angus.org/Pub/Newsroom/Releases/dollar-value-page.aspx). By August 24, 2016.
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- 5 Fox DG, Sniffen CJ, O’Connor JD. Adjusting Nutrient Requirements of Beef Cattle for Animal and Environmental Variations. *J Anim Sci* 1998;66:1475.
- 6 McCorkle D, Bevers S. Cow-Calf Enterprise Standardized Performance Analysis. 2009. Available at: <http://hdl.handle.net/1969.1/86917>. Accessed March 19, 2014.
- 7 NRC. 2000. Nutrient Requirements of Beef Cattle (7th Revised Edition: Update 2000). National Academy Press, Washington, D.C.
- 8 Short T. 2016. Using Genomic Tools in Commercial Beef Cattle: Taking Heifer Selection to the Next Level. Beef Improvement Federation Proceedings 2016:160-165.