Spring 2020 Sire Evaluation Report Forward

by American Angus Association staff

From a total of **280,359** sires with progeny records in the American Angus Association database Dec. 13, 2019, the *Spring 2020 Sire Evaluation Report* lists **2,304** sires with the following qualifications.

1. The sire must have at least 35 yearling progeny weights in proper contemporary groups on Angus Herd Improvement Records (AHIR®).
2. The sire must have a yearling accuracy value of at least 0.40.
3. The sire must have had at least five calves recorded in the American Angus Association Herd Book since Jan. 1, 2018.

The Young Sire Supplement lists **2,094** bulls born after **Jan. 1, 2016**, that have at least 10 progeny weaning weights on AHIR and have a weaning accuracy of at least 0.30.

The American Angus Association takes reasonable research and editing measures to ensure the quality of the genetic prediction analysis and other information made available in this report. However, the American Angus Association does not guarantee or assume responsibility for the accuracy, timeliness, correctness, or completeness of information available in this report. The information presented here should not be considered or represented to be a measure of the actual value of the animal or its progeny or a guarantee of performance. Any conclusions that users draw from the information presented here are their own and are not to be attributed to the American Angus Association.

The American Angus Association has available upon request additional booklets explaining expected progeny differences (EPDs) and national cattle evaluation (NCE) procedures.

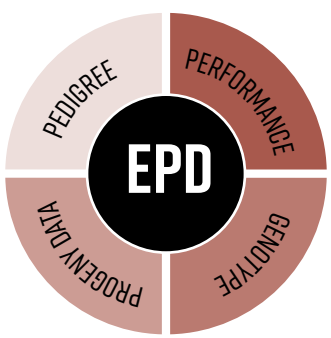
To view the latest Sire Evaluation Report online, *visit www.angus.org/nce.*

A new model for National Cattle Evaluation

The Angus National Cattle Evaluation (NCE) combines information from multiple sources to create the best estimate of the animal's genetic value as a breeding candidate presented as expected progeny differences (EPDs). All sources of information used, including genomic information, are described in Fig. 1.

The genotypes used in the NCE include a common set of about 40,000 single-nucleotide polymorphisms (SNPs). The EPDs are calculated using a single-step genomic BLUP (Best Linear Unbiased Predictor) model (SSGBLUP, or single step). The single-step model and underlying software was developed by Drs. Misztal, Legarra, Lourenco and colleagues at the University of Georgia and is peer-reviewed[1].

Fig. 1: ***EPDs combine multiple sources of information simultaneously***



Source: Angus Genetics Inc.

Due to the large number of genotyped individuals in the Angus dataset, the APY (Algorithm for Proven and Young) is implemented in the single-step approach. The Angus NCE includes a number of trait complexes that are combined into individual multiple-trait genetic evaluations that are used to calculate the reported EPD. The single-step approach allows for genotyped and non-genotyped animals to be combined into the same genetic evaluation analysis.

The traditional genetic analysis (animal model) to calculate EPDs is reliant on a pedigree relationship between all animals. Examples of these relationships include the parent offspring (0.5+), full siblings (0.5) and half siblings (0.25). Such expected relationships are based on pedigree. The analysis considers the interrelationships between all animals in the pedigree.

The high-density genotypes used in the Angus single-step approach allow a more accurate relationship to be determined between individuals than is possible with pedigree alone. When genetic relationships are based on pedigree, the average relationship is modeled. A progeny

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always inherits half its genetics from each parent, but the sample that parent passes from each of its parents (progeny grandparents) is different. The relationships determined from the genotypes (genomic relationships) reflect the "true" relationship between individuals and represent the different sampling from grandparents passed to grandprogeny.

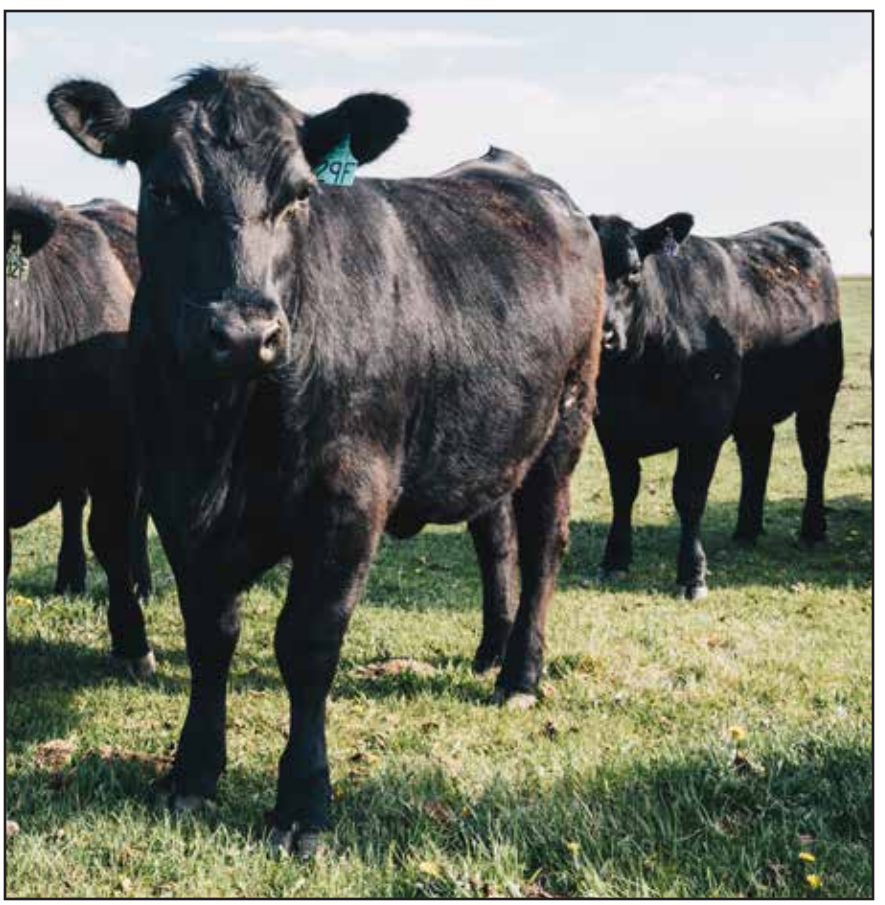
The single-step model uses these true genetic relationships based on genomics to calculate more accurate EPD values. With genomics included, different individual EPDs, can be provided to full-sib flushmates, for example, instead of the expected average EPD possible with pedigree alone.

The genetic relationship matrix used includes both genotyped and non-genotyped animals in the same analysis, making all animals in the Angus genetic evaluation influenced by genomics. Even if they are not genotyped, with other animals in the analyses genotyped, and all animals related, all EPD from the Angus genetic evaluation should be considered influenced by genomic information.

The degree that an individual's EPD is influenced by genomic information will depend on the relationship of that animal's inherited DNA to similar segments of DNA tied to phenotypes elsewhere in the pedigree. The individuals more influenced by genomics will be those that are genotyped. Among genotyped individuals, those most closely connected to genotyped individuals tied to phenotypes will have the highest EPD accuracy.

The EPDs presented are dependent on the phenotypic recording by Angus breeders. The Angus genetic evaluation offers the opportunity to more accurately evaluate young animals with genotypes for all traits. The genomic-enhanced predictions are only possible due to the phenotypic recording tied to genotypes in the database. Through recording (phenotyping) and genotyping, breeders provide the information contributing to the most accurate genomic predictions on their young animals.

Each bull listed in this report is comparable to every other bull in the database. The analysis takes



1Legarra, A., I. Aguilar and I. Misztal. 2009. A relationship matrix including full pedigree and genomic information. J. Dairy. Sci. 92:4656-4663.

Misztal, I., A. Legarra and I. Aguilar. 2014. Using recursion to compute the inverse of the genomic relationship matrix. J. Dairy. Sci. 97:3943-3952.

Lourenco, D.A., S. Tsuruta, B.O. Fragomeni, Y. Masuda, I. Aguilar, A. Legarra, J.K. Bertrand, T.S. Amen, L. Wang, D.W. Moser and I. Misztal. 2015. Genetic evaluation using single-step genomic best linear unbiased predictor in American Angus. J. Anim. Sci. 93:2653-2662.

+These relationships will be slightly higher in the Angus pedigree due to common ancestors (inbreeding).

Genomic-enhanced expected progeny differences (GE-EPDs) contained in this report are calculated using the American Angus Association database along with results from the Angus GS®, Zoetis HD 50K and i50K for Angus, and the GeneSeek GGP-HD and GGP-LD for Angus. Published EPDs include genomic results.

EPDs and associated $Values in this report were as of Dec. 13, 2019. For the most up-to-date information on an individual animal, go to *www.angus.org* and input the animal's registration number in the search function.

How to Read the Report

into account only the differences expressed in each herd in which the bulls were used. For example, bull A has a weaning EPD of +60 pounds (lb.) and bull B has a weaning EPD of +50 lb. If you randomly mate these bulls in your herd, you could expect bull A's calves to weigh, on average, 10 lb. more at weaning than bull B's progeny (60 – 50 = 10).

Accuracy (ACC) is the reliability that can be placed on the EPD. An accuracy of close to 1.0 indicates higher reliability. Accuracy is impacted by the number of progeny and ancestral records included in the analysis.

Expected progeny difference (EPD) is the prediction of how future progeny of each animal are expected to perform relative to the progeny of other animals listed in the database. EPDs are expressed in units of measure for the trait, plus or minus. Interim EPDs may appear for young animals when their performance is yet to be incorporated into the American Angus Association National Cattle Evaluation (NCE) procedures. This EPD will be preceded by an "I," and may or may not include the animal's own performance record for a particular trait, depending on its availability, appropriate contemporary grouping, or data edits needed for NCE.

Production Traits

Calving ease direct (CED) is expressed as a difference in percentage of unassisted births, with a higher value indicating greater calving ease in first-calf heifers. It predicts the average difference in ease with which a sire's calves will be born when he is bred to first-calf heifers.

Birth weight (BW), expressed in pounds, is a predictor of a sire's ability to transmit birth weight to his progeny compared to that of other sires.

Weaning weight (WW), expressed in pounds, is a predictor of a sire's ability to transmit weaning growth to his progeny compared to that of other sires.

Yearling weight (YW), expressed in pounds, is a predictor of a sire's ability to transmit yearling growth to his progeny compared to that of other sires.

Residual average daily gain (RADG), expressed in pounds per day, is a predictor of a sire's genetic ability for postweaning gain in future progeny compared to that of other sires, given a constant amount of feed consumed.

Dry-matter intake (DMI), expressed in pounds per day, is a predictor of a sire's ability to transmit feed intake during the postweaning phase to his progeny compared to that of other sires.

Yearling height (YH), expressed in inches, is a predictor of a sire's ability to transmit yearling height compared to that of other sires.

Scrotal circumference (SC), expressed in centimeters, is a predictor of a sire's ability to transmit scrotal size compared to that of other sires.

Docility (Doc) is expressed as a difference in yearling cattle temperament, with a higher value indicating more favorable docility. It predicts the average difference of progeny from a sire in comparison with another sire's calves. In herds where temperament problems are not an issue, this expected difference would not be realized.

Claw Set (Claw) is expressed in units of claw-set score, with a lower EPD being more favorable indicating a sire will produce progeny with more ideal claw set. The ideal claw set is toes that are symmetrical, even and appropriately spaced.

Foot Angle (Angle) is expressed in units of foot-angle score, with a lower EPD being more favorable indicating a sire will produce progeny with more ideal foot angle. The ideal is a 45-degree angle at the pastern joint with appropriate toe length and heel depth.

Maternal Traits

Heifer pregnancy (HP) is a selection tool to increase the probability or chance of a sire's daughters becoming pregnant as heifers during a normal breeding season. A higher EPD value is more favorable, and the EPD is reported in percentage units.

Calving ease maternal (CEM) is expressed as a difference in percentage of unassisted births with a higher value indicating greater calving ease in first-calf daughters. It predicts the average ease with which a sire's daughters will calve as first-calf heifers when compared to daughters of other sires.

Maternal milk (Milk), expressed in pounds of calf weaned, is a predictor of a sire's genetic merit for milk and mothering ability as expressed in his daughters compared to daughters of other sires. In other words, it is that part of a calf's weaning weight attributed to milk and mothering ability.

MkH indicates the number of herds from which daughters are reported as having progeny weaning

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weight records included in the analysis.

MkD indicates the number of daughters that have progeny weaning weight records included in the analysis.

Mature weight (MW), expressed in pounds, is a predictor of the difference in mature weight of daughters of a sire compared to the daughters of other sires.

Mature height (MH), expressed in inches, is a predictor of the difference in mature height of a sire's daughters compared to daughters of other sires.

Cow energy value ($EN), expressed in dollar savings per cow per year, assesses differences in cow energy requirements as an expected dollar savings difference in daughters of sires. A larger value is more favorable when comparing two animals (more dollars saved on feed energy expenses). Components for computing the cow $EN savings difference include lactation energy requirements and energy costs associated with differences in mature cow size.

Carcass Traits

Carcass weight (CW), expressed in pounds, is a predictor of the difference in hot carcass weight of a sire's progeny compared to progeny of other sires.

Marbling (Marb), expressed as a fraction of USDA marbling score, is a predictor of the difference in marbling of a sire's progeny compared to progeny of other sires.

Ribeye area (RE), expressed in square inches, is a predictor of the difference in ribeye area of a sire's progeny compared to progeny of other sires.

Fat thickness (Fat), expressed in inches, is a predictor of the difference in external fat thickness at the 12th rib (as measured between the 12th and 13th ribs) of a sire's progeny compared to progeny of other sires.

Group/progeny (CGrp/CProg and UGrp/UProg) reflects the number of contemporary groups and the number of carcass and ultrasound progeny included in the analysis.

$Value indexes

$Value indexes, an economic selection index allows multiple change in several different traits at once pertaining to a specific breeding objective. The $Value is an estimate of how future progeny of each sire are expected to perform, on average, compared to progeny of other sires if the sires were randomly mated to cows and if calves were exposed to the same environment.

$Maternal Weaned Calf Value ($M), an index, expressed in dollars per head, predicts profitability differences from conception to weaning with the underlying breeding objective assuming that individuals retain their own replacement females within herd and sell the rest of the cull female and all male progeny as feeder calves.

$Weaned Calf Value ($W), an index, expressed in dollars per head, to predict profitability differences in progeny due to genetics from birth to weaning.

$Feedlot Value ($F), an index, expressed in dollars per head, to predict profitability differences in progeny due to genetics for postweaning feedlot merit compared to the progeny of other sires.

$Grid Value ($G), an index, expressed in dollars per carcass, to predict profitability differences in progeny due to genetics for carcass grid merit compared to progeny of other sires.

$Beef Value ($B), a terminal index, expressed in dollars per carcass, to predict profitability differences in progeny due to genetics for postweaning and carcass traits.

EXPECTED PROGENY DIFFERENCES AND $VALUES

SIRE STATISTICS	PRODUCTION												MATERNAL							CARCASS						$VALUES		
	CED ACC	BW ACC	WW ACC	YW ACC	RADG ACC	DMI ACC	YH ACC	SC ACC	Doc ACC	Claw ACC	Angle ACC	HP ACC	CEM ACC	Milk ACC	MkH MkD	MW ACC	MH ACC	$EN	CW ACC	Marb ACC	RE ACC	Fat ACC	CGrp CProg	UGrp UProg	$M $W	$F $G	$B
A & B FINAL DESIGN 2135 17385077 [DOF] 02-12-12	+7 .60	+.5 .78	+55 .73	+106 .65	+.27 .39	+.87 .39	-.1 .66	+1.46 .58	+30 .34	+.48 .26	+.56 .26	+7.1 .30	+8 .46	+21 .46	8 24	+39 .44	+.1 .47	-6	+30 .57	+.54 .52	+.14 .49	+.028 .49	3 11	13 25	+53 +53	+78 +40	+118

Trait Descriptions

Calving ease

Calving ease. Heifer calving ease expected progeny differences (EPDs) were calculated using a multi-trait animal model including birth weight and calving score data. The result is a heifer calving ease direct and a heifer calving ease maternal EPD, as defined below.

Calving ease direct (CED): Calving ease direct EPD is expressed as a difference in percentage of unassisted births, with a higher value indicating greater calving ease in first-calf heifers. It predicts the average difference in ease with which a sire's calves will be born when the sire is bred to first-calf heifers.

Calving ease maternal (CEM): Calving ease maternal EPD is expressed as a difference in percentage unassisted births with a higher value indicating greater calving ease in first-calf daughters. It predicts the average ease with which a sire's daughters will calve as first-calf heifers when compared to daughters of other sires.

Growth

Birth weight/weaning weight/yearling weight/maternal milk. Growth traits were evaluated together in a multi-trait model. As it is recommended for the evaluation of maternally influenced traits, a direct genetic effect, a maternal genetic effect and a maternal permanent environmental effect were fitted for birth and weaning weights. Postweaning gain was not considered to be maternally influenced; therefore, the direct genetic effect was the only random effect fitted. Yearling weight EPDs were calculated from the EPDs for weaning weight direct and postweaning gain. The evaluation includes individual weights on embryo transfer calves out of registered Angus recipient females, provided any other national cattle evaluation (NCE) requirements for edited data are met.

Residual average daily gain and dry-matter intake. The steps to generate the components needed to calculate the residual average daily gain (RADG) EPD include a comprehensive genetic evaluation of multiple phenotypic traits, including the phenotypic feed intake data collected on individual animals through research and tests. Also, the dry-matter intake (DMI) genomic predictions are used as an indicator trait in the intake evaluation process. The resulting feed intake genetic component from the multi-trait animal model analysis is used to calculate RADG. The genetic RADG EPD reflects composition-constant genetic potential for growth given a constant amount of feed. It characterizes postweaning gain among animals given the same amount of feed consumed. RADG is presented in pounds per day, with a higher value being more favorable. DMI, expressed in pounds per day, is a predictor of difference in transmitting ability for feed intake during the postweaning phase, compared to that of other sires.

Yearling height and scrotal evaluations. Yearling height and scrotal circumference traits are analyzed separately using a multi-trait animal model in the genetic evaluation. Both the height and scrotal evaluations include genetically correlated measures for yearling weight and any available genomic results. Yearling height EPDs are reported in inches and are reported on bulls and heifers at or near a year of age. Scrotal circumference EPDs, generated from scrotal data collected on yearling Angus bulls, are presented in centimeters.

Foot score evaluations

Two scores for claw set and foot angle are recorded on a 1-to-9 scale with 5 being ideal. Both foot score traits are moderately heritable. Even though the performance database is assembled using all scores (1-9) submitted, only scores falling into the 5 through 9 categories are used in the genetic evaluation for claw set and foot angle. Therefore, a lower or more negative EPD indicates a sire that is better able to produce progeny with more ideal feet. Claw Set and Foot Angle EPDs are represented in units of foot score. Producers can submit foot scores into the database on cattle as early as yearling age and are encouraged to submit scores on mature females as more variation in the traits is prevalent at older ages.

Docility

Yearling temperament scores were used to calculate an EPD for docility. Four categories were used, for scores 1, 2, 3 and the combined category of scores 4, 5 and 6. The docility EPD is presented as a percentage, where a higher value is considered more favorable in terms of docile temperament. Since this is a threshold trait, herds that exhibit no problems in temperament will realize no improvement in selecting for favorable docility EPDs.

Heifer pregnancy

The heifer pregnancy (HP) EPD is designed to characterize differences among sires in the Angus breed for daughters' heifer pregnancy.

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When comparing two sires based on their heifer pregnancy EPDs (reported in units of percentage), a higher-EPD sire would be expected to have daughters with a greater probability or chance of becoming pregnant than a sire with the lower EPD. A performance database is assembled using available breeding information on first-calf heifers. A heifer's breeding record is coded as a success or failure of being pregnant based on any pregnancy check data or calving information recorded and submitted by the breeder. The heifer contemporary group is defined as breeding herd, breeding year, season and synchronization code. Edited data on heifers are analyzed in a threshold analysis.

Mature cow size

Mature weight (MW) and height (MH) are highly heritable traits, indicating selection for these traits can be effective. The mature size genetic evaluation is a multi-trait animal model using repeated measures on cows from yearling age throughout their lifetime.

A body condition score (BCS) must be included with the cow weight in order for data to be utilized to calculate mature size EPDs in the NCE. Any cow weights submitted without a body condition score are not used. For more information on body condition score, go to *www.cowbcs.info*.

As a reminder for weaning time, cow weights with a body condition score need to be taken ± 45 days of the calf's weaning measure date. Cow hip heights may be captured at this time, also. It is important to collect this information after the cow has weaned her first calf, and then again in subsequent years.

EPDs are generated for mature weight and mature height based on these varying amounts of performance information and pedigree relationships. The resulting EPDs are representative of the genetics for Angus cow size at a projected 6 years of age.

Carcass

Carcass EPDs are calculated from an integrated analysis of the Beef Improvement Records carcass, ultrasound, growth (weaning weight) and genomic profile databases. The weekly genetic evaluations result in a single EPD, respectively, for carcass weight, marbling score, ribeye area and fat thickness. The units of measure for EPDs are in carcass trait format — marbling score, carcass weight in pounds, carcass ribeye in square inches, and carcass fat thickness in inches. Growth (weaning weight), carcass, genomic and pedigree databases are simultaneously combined into one set of genomic-enhanced carcass EPDs for Angus breeding programs.

The carcass and ultrasound data contributing to the evaluation are described in Table 1 and Table 2 with average adjusted measurements.

Ultrasound images incorporated into the carcass EPDs were collected by field technicians certified by the Ultrasound Guidelines Council (UGC). The images were interpreted through one of the American Angus Association's authorized ultrasound processing labs by UGC-certified lab technicians.

Table 1: ***Angus phenotypic averages of steer and heifer carcasses***

Age at harvest, days	*330< Age < 480*		*481 < Age < 799*	
Heifers:	**Avg.**	**SD[1]**	**Avg.**	**SD**
Avg. age at harvest, days	436	30	556	59
Adj. [2] carcass wt., lb.	713	86	720	101
Adj. fat thickness, in.	0.61	0.19	0.55	0.19
Adj. ribeye area, sq. in.	12.11	1.38	12.23	1.58
Adj. marbling score	6.83	1.33	6.45	1.41
No. of heifers	6,198		7,739	
Steers:				
Avg. age at harvest, days	437	26	525	44
Adj. carcass wt., lb.	801	86	785	102
Adj. fat thickness, in.	0.57	0.18	0.55	0.19
Adj. ribeye area, sq. in.	12.68	1.37	12.73	1.48
Adj. marbling score	6.26	1.10	5.94	1.28
No. of steers	80,433		30,169	

[1]SD = standard deviation.
[2]Carcasses adjusted to 480 days of age at harvest.

Table 2: ***Yearling Angus live-animal and ultrasound measures***

	Bulls		**Heifers**		**Steers**	
Trait	**Avg.**	**SD[1]**	**Avg.**	**SD**	**Avg.**	**SD**
Age, days	371	26	389	30	403	38
Gain, lb./day	2.92	0.69	1.51	0.52	2.83	0.73
Adj. scan wt., lb.	1,119	140	866	113	1,105	167
Adj. %IMF, %	3.84	1.09	4.82	1.38	4.95	1.42
Adj. ribeye area, sq. in.	12.61	1.89	9.77	1.74	12.36	2.27
Adj. 12th-rib fat thickness, in.	0.28	0.10	0.26	0.11	0.40	0.15
Adj. rump fat thickness, in.	0.30	0.11	0.30	0.12	0.41	0.15
Total animals	1,200,558		801,481		13,568	

[1]SD = standard deviation

As a review, the scoring system for marbling and its relationship to the USDA Quality Grading System is defined in Table 3. For a carcass to meet *Certified Angus Beef*® (CAB®) standards, it must have a Modest (average Choice) or higher marbling degree, be of "A" maturity (the most youthful classification for beef), have a 10- to 16-square-inch ribeye, less than 1 inch fat thickness, less than 1,050-pound hot carcass weight and a fine to medium marbling texture. For more details, go to www.cabcattle.com.

Table 3: ***USDA quality grading system and marbling score***

Quality Grade	Amount of Marbling	Numerical Score
Prime+	Abundant	10.0-10.9
Prime	Moderately abundant	9.0-9.9
Prime-	Slightly abundant	8.0-8.9
Choice+	Moderate	7.0-7.9
Choice	Modest	6.0-6.9
Choice-	Small	5.0-5.9
Select	Slight	4.0-4.9
Standard	Traces	3.0-3.9
Standard	Practically devoid	2.0-2.9
Utility	Devoid	1.0-1.9

Angus $Values

Dollar value indexes, or $Values, are a tool used to select for several traits at once based a specific breeding objective. An economic index approach takes into account genetic and economic values, as well as the relationships between traits to select for profit. An index is challenging to develop, but the end result is easy to use, adding the simplicity and convenience of a multi-trait approach.

$Values provide the opportunity for commercial producers to select for profitability given a specific breeding objective. Maternal weaned calf value ($M) and weaned calf value ($W) are expressed in dollars per head predicting preweaning profitability differences among different sire groups. Cow energy value ($EN) provides an opportunity to fine-tune the cow herd for costs associated with maternal milk and cow size. In addition, feedlot value ($F), grid value ($G) and beef value ($B) are economic index values to assist commercial beef producers in selecting individuals profitable for terminal traits, including feedlot gain and carcass merit.

$Values encompass the revenue generated from genetically derived outputs and associated costs (expenses) from required inputs. $Values only have meaning when used in comparing the relative merit or the ranking of two individuals. Each sire listed in this report is comparable to every other sire. The $Values are sensitive to the assumptions for the industry-relevant components used in calculating the indexes. Angus Genetics Inc., the American Angus Association and Certified Angus Beef LLC, alongside industry-leader CattleFax, work together to annually update these economic assumptions, which are derived from the previous 7-year market trend rolling average. As with expected progeny differences (EPDs), variation in $Values between animals indicates expected differences in the relative value of progeny if random mating is assumed. Thus, a $Value has meaning only when used in comparison to the $Value of another animal.

$Values ($Maternal Weaned Calf Value, $Weaned Calf, and Cow $Energy)

Maternal weaned calf value ($M)

Maternal weaned calf value ($M) is the most maternally focused selection index currently available to Angus members and commercial users of Angus genetics. $M, expressed in dollars per head, aims to predict profitability differences in progeny due to genetics from conception to weaning. $M is built off of a self-replacing herd model where commercial cattlemen replace 25% of their breeding females in the first generation and 20% in subsequent generations. Remaining cull females and all male progeny are sold as feeder calves.

$M places greater emphasis on the cost side of commercial cow-calf production than $W. Increased selection pressure on $M aims to decrease overall mature cow size while maintaining weaning weights consistent with today's production. Under $M selection, less emphasis is placed on maternal milk, while heifer pregnancy and docility have an increased emphasis, and foot traits start to improve. The index finds cattle that are most profitable when producers receive no economic benefit for traits affecting postweaning performance.

For example if Bull A has a $M of +75 and Bull B has a $M of +55 and both are mated to a comparable set of females, one would expect, on average, for Bull A's progeny to be $20 more profitable per head for the cow-calf producer.

EPDs directly influencing the index include: calving ease direct, calving ease maternal, weaning weight, maternal milk, heifer pregnancy, docility and mature weight, as well as foot angle and claw set.

Weaned calf value ($W)

Weaned calf value ($W) provides the expected dollar-per-head difference in future progeny preweaning performance from birth to weaning. $W assumes that producers retain 20% of their female progeny for replacements and sell the rest of their cull female and male progeny as feeder calves. Over time, increased selection pressure on $W will increase weaning and yearling weight traits while also continuing to increase mature cow size. As with any $Value, $W only has meaning

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when used in comparing the relative merit or ranking of two individuals.

EPDs directly influencing $W include: birth weight, weaning weight, maternal milk and mature cow size.

Weaned steer calf	$187 per cwt.
Weaned heifer calf	$174 per cwt.
Hay price (alfalfa)	$177 per ton
Hay price (other)	$130 per ton
Cow/heifer herd mix	80/20

Cow energy value

A cow energy value ($EN) is available to assess differences in cow energy requirements, expressed in dollars per cow per year, as an expected dollar savings difference in future daughters of sires. A larger value is more favorable when comparing two animals (more dollars saved on feed energy expenses). Components for computing the cow $EN savings difference include lactation energy requirements and energy costs associated with differences in mature cow size.

Cow Energy ($EN) Savings, $/cow/year	+16

Cow Energy ($EN) Savings, $/cow/year	+5

In the above example, the expected difference in cow energy savings per cow per year for future daughters of the two animals is +11 (16 - 5 = +11).

Feedlot value, grid value and beef value

Feedlot Value ($F), Grid Value ($G) and Beef Value ($B) are postweaning bioeconomic $Values, expressed in dollars per head, to assist commercial beef producers by adding simplicity to genetic selection decisions. The $Values were developed primarily to serve as selection tools for commercial bull buyers.

$Values are reported in $/head with a higher value indicating greater profitability:

	$F	$G	$B
Example	+36	+28	+83

Although feedlot and carcass merit are important components of the beef production chain, it should be stressed to producers that $F, $G or $B are not to be used as a single selection criterion, since the indexes only encompass postweaning and carcass performance.

$Feedlot, $Grid and $Beef Values incorporate available gain, feed intake, and carcass EPDs, converted into economic terms, incorporating industry-relevant components for feedlot performance and carcass merit. The base components used to calculate $Values for any registered animal are:

Feedlot assumptions:	
Calf-fed/Yearling-fed	75/25
Time on feed (steer), calf-fed/yearling-fed	231/161 days
Yearling steer	$158 per cwt.
Yearling heifer	$151 per cwt.
Fed steer, dressed delivered carcass	$204 per cwt.
Ration cost	$213 per ton
Grid assumptions:	
Quality components:	
Prime premium (above Choice)	$21.03 per cwt.
CAB premium (above Choice)	$5.10 per cwt.
Choice-Select spread	$-11.90 per cwt.
Standard discount	$-35.37 per cwt.
Yield components:	
YG 1 premium	$5.77 per cwt.
YG 2-2.5 premium	$2.93 per cwt.
YG 2.5-3 premium	$2.56 per cwt.
YG 4 discount	$-13.17 per cwt.
YG 5 discount	$-18.80 per cwt.
Industry avg. steer carcass weight	876 lb. per cwt.
Heavyweight discount (900-1,000 lb.)	$-9.32 per cwt.
Heavyweight discount (1,000-1,050 lb.)	$-15.72 per cwt.
Heavyweight discount (1,050+ lb.)	$-36.55 per cwt.

Beef value ($B)

Beef value ($B) facilitates simultaneous multi-trait genetic selection for feedlot and carcass merit. $B is a terminal index representing the expected average dollar-per-carcass difference in the progeny postweaning performance and carcass value compared to progeny of other sires. This index assumes commercial producers wean all male and female progeny, retain ownership of these animals through the feedlot phase and market these animals on a quality-based carcass grid. EPDs directly influencing $B include: weaning and yearling weight, dry-matter intake, carcass weight, marbling, ribeye area and fat.

$B only has meaning when two animals are compared against one another. For instance, if Bull A has a $B of +90 and Bull B has a $B of +120, one would expect, on average, the progeny of Bull B to be $30 ($120 - $90 = $30) more profitable per carcass due to feedlot gain and carcass merit, assuming both bulls were randomly mated to comparable females.

The resulting $B value is not designed to be driven by one factor, such as quality, red meat yield or weight. Instead, it is a dynamic result of the application of commercial market values to Angus genetics for both feedlot and carcass merit.

Feedlot value ($F)

Feedlot value ($F), an index value expressed in dollars per head, is the expected average difference in future progeny performance for postweaning merit compared to progeny of other sires. $F incorporates yearling weight (gain) and carcass weight along with feed efficiency traits, genomic information and trait interrelationships. The underlying objective assumes commercial producers will retain ownership of cattle through the feedlot phase and sell fed cattle on a carcass weight basis with no consideration of premiums or discounts for quality and yield grade.

Grid value ($G)

Grid value ($G), an index value expressed in dollars per carcass, is the expected average difference in future progeny performance for carcass grid merit compared to progeny of

other sires. The $G combines quality grade and yield grade attributes, and is calculated for animals with carcass EPDs. A seven-year rolling average is used to establish typical industry economic values for quality grade and yield grade schedules. Quality grade premiums are specified for Prime, CAB and Choice carcasses, as well as Select and Standard discounts. Yield grade premiums are incorporated for Yield Grade (YG) 1 and YG 2 (high-yielding carcasses), with discounts for YG 4 and YG 5 (low red meat yields).

The summation of $F and $G equates to $B.

Availability of $Values

$Value Search

$Values on individual animals may be viewed at *www.angus.org*. Members and affiliates can also access $Values through AAA Login.

Accuracy and Associated Possible Change

The following table lists the possible change values associated with each EPD trait at the various accuracy levels. Possible change is expressed as "+" or "-" units of EPD and can be described as a measure of expected change or potential deviation between the EPD and the "true" progeny difference. This confidence range depends on the standard error of prediction for an EPD. For a given accuracy, about two-thirds of the time an animal should have a "true" progeny difference within the range of the EPD plus or minus the possible change value.

For example, a sire with an accuracy of 0.60 for a marbling EPD of +0.50 is expected to have his "true" progeny value falling within ±0.12 marbling score EPD (ranging between +0.38 and +0.62) about two-thirds of the time.

	Production									Maternal					Carcass			
Accuracy	CED	BW	WW	YW	RADG	DMI	YH	SC	Doc	HP	CEM	Milk	MW	MH	CW	Marb	RE	Fat
.05	9.7	2.55	14.9	24.3	.092	.730	.42	.76	16.7	7.7	10.4	9.5	38	.54	20	.29	.30	.041
.10	9.2	2.42	14.1	23.0	.087	.691	.40	.72	15.8	7.3	9.9	9.0	36	.51	19	.28	.28	.039
.15	8.7	2.28	13.3	21.7	.082	.653	.38	.68	14.9	6.9	9.3	8.5	34	.49	18	.26	.27	.037
.20	8.2	2.15	12.6	20.5	.077	.614	.35	.64	14.0	6.5	8.8	8.0	32	.46	17	.25	.25	.034
.25	7.7	2.02	11.8	19.2	.073	.577	.33	.60	13.2	6.1	8.2	7.5	30	.43	16	.23	.23	.032
.30	7.2	1.88	11.0	17.9	.068	.538	.31	.56	12.3	5.7	7.7	7.0	28	.40	15	.22	.22	.030
.35	6.7	1.75	10.2	16.6	.063	.500	.29	.52	11.4	5.3	7.1	6.5	26	.37	14	.20	.20	.028
.40	6.2	1.61	9.4	15.4	.058	.462	.26	.48	10.5	4.9	6.6	6.0	24	.34	13	.18	.19	.026
.45	5.6	1.48	8.6	14.1	.053	.423	.24	.44	9.7	4.5	6.0	5.5	22	.31	12	.17	.17	.024
.50	5.1	1.34	7.9	12.8	.048	.385	.22	.40	8.8	4.1	5.5	5.0	20	.29	11	.15	.16	.022
.55	4.6	1.21	7.1	11.5	.044	.346	.20	.36	7.9	3.7	4.9	4.5	18	.26	10	.14	.14	.019
.60	4.1	1.08	6.3	10.2	.039	.308	.18	.32	7.0	3.3	4.4	4.0	16	.23	9	.12	.12	.017
.65	3.6	.94	5.5	9.0	.034	.269	.15	.28	6.1	2.9	3.8	3.5	14	.20	7	.11	.11	.015
.70	3.1	.81	4.7	7.7	.029	.231	.13	.24	5.3	2.4	3.3	3.0	12	.17	6	.09	.09	.013
.75	2.6	.67	3.9	6.4	.024	.192	.11	.20	4.4	2.0	2.7	2.5	10	.14	5	.08	.08	.011
.80	2.1	.54	3.1	5.1	.019	.154	.09	.16	3.5	1.6	2.2	2.0	8	.11	4	.06	.06	.009
.85	1.5	.40	2.4	3.8	.015	.115	.07	.12	2.6	1.2	1.6	1.5	6	.09	3	.05	.05	.006
.90	1.0	.27	1.6	2.6	.010	.077	.04	.08	1.8	.8	1.1	1.0	4	.06	2	.03	.03	.004
.95	.5	.13	.8	1.3	.005	.038	.02	.04	.9	.4	.5	.5	2	.03	1	.02	.02	.002

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Across-Breed EPD Adjustment Factors

Researchers at the Roman L. Hruska U.S. Meat Animal Research Center (MARC) in Clay Center, Neb., develop breed adjustment factors annually so that expected progeny difference (EPD) values can be compared across breeds. This process allows the estimation of across-breed EPDs, sometimes referred to as AB-EPDs. The across-breed EPD concept was introduced in the late 1980s and continues to spark interest with commercial bull buyers using more than one breed of bull. This is mostly due to the fact that without adjustments, the within-breed EPDs cannot be used to directly compare animals of different breeds, since the values are typically computed separately for each breed.

Table 1 presents the most recent MARC adjustment factors that can be added to the EPDs of animals of different breeds, adjusting their EPD values to an Angus equivalent. The adjustment factors, given relative to an Angus equivalent of zero for each trait, take into account breed differences measured in the Germplasm Evaluation Project at MARC, as well as differences in breed average EPDs and base year. Animals of various breeds can be compared on the same EPD scale, after adding the specific adjustment factor to EPDs produced in the most recent genetic evaluations of the representative breeds. Use of these factors does not change differences in EPDs among bulls within a breed. However, it does affect differences among bulls of different breeds. The example below illustrates EPDs for Angus and Simmental bulls after across-breed adjustment factors have been applied to estimate AB-EPDs. The AB-EPDs for Simmental Bull #002 are on an Angus-equivalent scale and can be directly compared with values for Angus Bull #001.

It is important to remember that EPDs are not perfect when comparing bulls, even within a breed; therefore, AB-EPDs are somewhat less accurate when comparing animals of different breeds. AB-EPDs are most effective for selecting bulls of two or more breeds for use in systematic crossbreeding. When evaluating the potential application of AB-EPDs as a tool for a particular breeding program, commercial cow-calf producers must first examine the needs of their individual operations. Producers must diligently review their breed choices and crossbreeding systems in order to provide the best sire selection match to cow genetic type, environment, feed resources, and market targets.

Table 1: ***Adjustment factors to estimate across-breed EPDs***

Breed	BW	WW	YW	Milk	Marb[a]	RE	Fat	CW
Angus	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hereford	1.0	-16.1	-44.0	-10.4	-0.32	0.06	-0.075	-67.3
Red Angus	2.5	-19.5	-29.8	2.7	-0.13	0.24	-0.049	-14.4
Shorthorn	4.2	-32.5	-44.0	2.9	-0.05	0.55	-0.025	7.2
South Devon	2.3	-27.0	-68.1	4.4	-0.38	0.40	-0.181	-72.5
Beefmaster	4.0	21.3	-3.8	9.5				
Brahman	9.7	49.8	10.8	18.8		0.01	-0.164	-36.6
Brangus	2.7	14.2	0.5	15.8				
Santa Gertrudis	4.9	37.5	34.9	20.8	-0.46	0.14	-0.091	-10.8
Braunvieh	1.9	-19.4	-42.4	4.8	-0.65	1.05	-0.107	-51.7
Charolais	6.2	29.6	24.7	8.7	-0.31	0.82	-0.200	8.8
Chiangus	2.5	-21.0	-36.0	4.2	-0.47	0.57	-0.140	-17.8
Gelbvieh	3.3	-11.6	-19.6	12.4	-0.52	0.92	-0.102	-5.3
Limousin	2.2	-17.2	-48.6	-2.1	0.01	0.65	-0.021	-3.1
Maine-Anjou	1.6	-30.0	-63.1	-4.3	-0.46	1.02	-0.184	-32.9
Salers	0.6	-9.9	-41.8	7.1	0.09	1.16	-0.179	-43.0
Simmental	2.5	-13.0	-18.7	1.7	-0.08	0.48	-0.049	-5.4
Tarentaise	2.5	19.1	-15.8	22.4				

[a]Marbling score units: 4.00 = SI00; 5.00 = Sm00

Source: U.S. Meat Animal Research Center.

Table 2: ***Example of using across-breed adjustment factors to convert noncomparable within-breed EPDs to comparable across-breed EPDs***

		BW	WW	YW	Milk
Angus	AB adj. factors[1]:	0.0	0.0	0.0	0.0
Bull #001	EPD[2]:	2.8	56	83	20
	AB-EPD[3]:	2.8	56	83	20
Simmental	AB adj. factors[1]:	2.5	-13.0	-18.7	1.7
Bull #002	EPD[2]:	1.8	68	101	22
	AB-EPD[3]:	4.3	55	82	24

[1]AB adj. factors are the across-breed adjustment factors from Table 1.

[2]EPDs are the within-breed EPD values from the breed's genetic evaluation for the bull of interest.

[3]Across-breed EPDs after adjustment factors are applied to within-breed EPDs.

Table 3: *AHIR® Average Adjusted Weights and Measurements, By Year*

	BIRTH WT		WEANING WT		YEARLING WT		YEARLING HT	SCROTAL	
YEAR	Bulls	Heifers	Bulls	Heifers	Bulls	Heifers	Bulls	Heifers	Bulls
1972	69	65	477	425	847	621	44.0		
1973	68	65	476	425	857	638	44.0		
1974	69	65	478	427	855	630	44.1		
1975	69	65	475	427	866	642	44.7		
1976	70	65	493	440	884	661	44.1		
1977	72	67	500	446	881	657	45.8	42.5	
1978	73	68	499	445	882	663	46.1	43.5	
1979	73	68	508	453	901	674	47.1	44.7	
1980	74	69	518	463	922	693	47.7	45.1	
1981	75	70	530	474	926	692	48.0	45.7	36.4
1982	77	72	530	475	940	696	48.5	46.1	36.4
1983	78	73	534	480	938	703	48.6	46.5	35.8
1984	79	74	537	484	956	711	48.8	46.6	36.1
1985	80	75	554	498	978	730	49.3	47.2	36.4
1986	81	76	553	498	984	737	49.4	47.4	35.9
1987	81	76	572	516	1,010	762	50.0	48.1	36.1
1988	82	77	589	531	1,037	784	50.5	48.4	36.1
1989	83	78	599	542	1,059	797	50.3	48.6	36.0
1990	83	78	601	542	1,066	798	50.6	48.7	35.8
1991	83	78	599	539	1,067	796	50.6	48.5	35.7
1992	82	78	614	553	1,072	802	50.6	48.6	35.7
1993	82	78	611	551	1,077	802	50.4	48.6	35.6
1994	82	77	613	553	1,086	813	50.6	48.6	35.8
1995	82	77	610	551	1,081	798	50.4	48.4	35.7
1996	82	77	602	544	1,068	794	50.3	48.4	35.5
1997	82	77	612	554	1,087	809	50.3	48.3	35.7
1998	82	77	612	553	1,087	813	50.4	48.4	35.7
1999	82	77	623	564	1,115	832	50.5	48.6	35.9
2000	81	77	631	569	1,112	829	50.5	48.6	36.2
2001	82	77	628	567	1,120	840	50.6	48.8	36.1
2002	81	76	633	571	1,123	838	50.5	48.7	36.1
2003	81	76	639	578	1,132	848	50.5	48.8	36.2
2004	80	76	650	589	1,144	855	50.5	48.7	36.3
2005	80	75	649	587	1,147	860	50.5	48.7	36.3
2006	80	75	650	589	1,145	848	50.4	48.6	36.3
2007	80	75	643	584	1,136	844	50.3	48.3	36.4
2008	80	75	641	581	1,130	838	50.1	48.3	36.2
2009	79	75	646	584	1,129	839	50.0	48.2	36.2
2010	79	74	648	586	1,135	840	50.0	48.2	36.4
2011	79	74	646	583	1,140	845	49.9	48.2	36.3
2012	78	73	655	590	1,145	847	49.9	48.1	36.3
2013	78	74	652	588	1,147	845	50.0	48.1	36.4
2014	78	74	662	595	1,152	855	49.9	48.2	36.4
2015	78	73	661	594	1,153	855	50.0	48.3	36.4
2016	77	73	662	596	1,152	856	50.0	48.1	36.3
2017	78	73	665	598	1,167	861	49.9	48.2	36.3
2018	78	73	655	591	1,146	841	49.8	48.1	36.2
Averages	80	75	623	559	1,103	816	50.2	48.3	36.2

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Table 4: *EPD And $Value Averages, Standard Deviations (Sd) And Minimum/Maximum*

Trait	No. records	No. EPD	Avg.	SD	Min.	Max.
Production:						
Calving ease direct, %	1,671,076	10,352,272	3	6	-39	23
Birth weight, lb.	8,784,874	11,353,205	1.0	2.3	-12.7	16.0
Weaning direct, lb.	9,351,680	11,353,205	26	23	-81	120
Yearling weight, lb.	4,565,076	11,353,205	45	42	-140	208
Residual average						
daily gain, lb./day	26,953	1,401,135	.21	.06	-.13	.46
Dry-matter intake, %	26,953	1,401,135	.39	.7	-3.72	3.31
Yearling height, in.	979,121	2,523,943	.4	.5	-2.3	2.5
Scrotal circumference, cm	985,518	2,749,232	.54	.54	-3.77	3.86
Docility, %	309,398	1,683,005	13	8	-47	45
Foot claw set, score	27,715	1,293,376	.50	.07	.09	1.00
Foot angle, score	25,351	1,293,376	.50	.06	.02	1.16
Maternal:						
Heifer pregnancy, %	107,696	1,356,271	10.5	2.8	-7.8	24.5
Calving ease maternal, %	1,671,076	10,352,272	6	5	-40	22
Maternal milk, lb.	9,351,680	11,353,205	18	8	-30	54
Mature weight, lb.	226,417	1,573,944	24	45	-203	196
Mature height, in.	116,264	1,573,944	.1	.5	-3.4	2.8
Carcass:						
Carcass weight, lb.	124,539	3,708,153	22	17	-76	113
Marbling score	124,539	3,698,470	.42	.26	-.79	2.20
Ribeye area, sq. in.	124,539	3,708,153	.32	.24	-.76	1.73
12th-rib fat thickness, in.	124,535	3,708,153	.008	.023	-.121	.199
Ultrasound intramuscular fat, %	2,059,403					
Ultrasound ribeye area, sq. in.	2,065,189					
Ultrasound fat thickness, in.	2,068,921					
Current sires[1]		**No. Indexes**				
Maternal Wean Calf Value ($M), $/head		27,986	52	14	-20	110
Wean Value ($W), $/head		28,210	54	18	-49	115
Feedlot Value ($F), $/head		25,465	82	22	-36	177
Grid Value ($G), $/head		25,509	44	16	-8	116
Beef Value ($B), $/head		25,464	126	32	-25	238
Cow Energy ($EN), savings, $/cow/year		28,056	-11	15	-70	39

1Current sires have at least one calf recorded in the American Angus Association Herd Book within the past two years.

Table 5: *Spring 2020 Breed Average EPD And $Values*

	Production										Maternal				Carcass				$Values				
	CED	BW	WW	YW	RADG	DMI	YH	SC	Doc	HP	CEM	Milk	MW	MH	$EN	CW	Marb	RE	Fat	$M	$W	$F	$G	$B
Current Sires[1]	+6	+1.2	+54	+96	+.23	+.73	+.5	+.76	+15	+10.7	+9	+25	+46	+.3	-11	+38	+.50	+.50	+.012	+52	+54	+82	+44	+126
Main Sires[2]	+7	+1.0	+55	+98	+.23	+.72	+.4	+.78	+16	+10.5	+8	+24	+44	+.2	-11	+37	+.49	+.49	+.015	+51	+56	+81	+44	+125
Supplemental Sires[3]	+7	+1.1	+61	+109	+.25	+.98	+.5	+.89	+18	+11.4	+9	+26	+61	+.4	-17	+46	+.51	+.58	+.012	+55	+63	+88	+46	+135
Current Dams[1]	+6	+1.4	+49	+87	+.22	+.56	+.5	+.69	+14	+10.8	+8	+25	+38	+.2	-7	+33	+.49	+.43	+.012	+53	+49	+78	+43	+121
Non-Parent Bulls[4]	+6	+1.3	+54	+96	+.24	+.81	+.5	+.76	+16	+11.1	+9	+25	+51	+.3	-11	+40	+.54	+.55	+.011	+56	+54	+83	+46	+129
Non-Parent Cows[4]	+6	+1.3	+53	+95	+.24	+.79	+.5	+.72	+16	+10.9	+9	+25	+51	+.3	-10	+40	+.58	+.56	+.009	+56	+53	+83	+47	+130

[1]Current Sires — At least one calf record in herd book within the past two years. [2]Main Sires — Sires that met the requirements of the most recent American Angus Association Sire Evaluation Report. [3]Supplemental Sires — Young sires meeting the requirements for the American Angus Association Sire Evaluation Report. [4]Non-Parents — Registered animals born in the last three years with no current progeny in the Angus National Cattle Evaluation.

Table 6: ***Angus Trait Heritabilities (on diagonal) and Genetic Correlations (on upper off diagonal)***

Trait	CED	BW	WW	PG	DMI	YH	SC	Doc	Claw	Angle	HP	CEM	Milk	MW	MH	YW	UFAT	UIMF	UREA	FAT	MARB	REA	CW
Calving ease direct (CED)	0.19[1]	-0.65[2]										-0.06											
Birth weight direct (BW)		0.46	0.29	0.29																			
Weaning direct (WW)			0.28	0.48	0.50									0.44	0.48	0.87	0.12		0.34	0.09		0.27	0.65
Postweaning gain (PG)				0.27	0.61	0.65	0.28																
Dry-matter intake (DMI)					0.33																		
Yearling height (YH)						0.49									0.41	0.68							
Scrotal circumference (SC)							0.48																
Docility (Doc)								0.44															
Foot Claw Set (Claw)									0.25														
Foot Claw Angle (Angle)										0.25													
Heifer pregnancy (HP)											0.15												
Calving ease maternal (CEM)												0.20											
Maternal milk (Milk)													0.12										
Mature weight (MW)														0.35	0.69								
Mature height (MH)															0.59								
Yearling weight (YW)																0.42	0.07		0.33	-0.07		0.35	0.75
Ultrasound fat (UFAT)																	0.46		0.00	0.65		-0.35	-0.10
Ultrasound % intramuscular fat (UIMF)																		0.41			0.71		
Ultrasound ribeye area (UREA)																			0.39	-0.10		0.65	0.28
Fat thickness (FAT)																				0.33		-0.34	0.10
Marbling (MARB)																					0.48		
Ribeye area (REA)																						0.32	0.46
Carcass weight (CW)																							0.44

[1]Heritability estimates are on the diagonal.
[2]Upper off-diagonals are genetic correlations among traits.

Note: Symbols are used with a registration number to denote important information about an animal. An "F" following the symbol for a genetic condition means the animal has tested free of the condition. A "C" following represents a carrier of the condition, an "A" represents an animal that is affected, and a "P" represents an animal that is a potential carrier by pedigree.

The status for a bull listed in this Spring 2020 Sire Evaluation Report represents the status of that animal as of Dec. 13, 2019.

Symbol	Meaning
#	Pathfinder cow or Pathfinder sire
+	Embryo transfer calf
^	Cell clone
%	Split-ET
@	Clone-ET
*	Parentage qualified to both parents and the mating
AM	Arthrogryposis multiplex
CA	Contractural arachnodactyly
D2	PRKG2 gene mutation for dwarfism
DD	Developmental duplication

Symbol	Meaning
DM	Double muscling
DW	Dwarfism
HG	Horn gene
HI	Heterochromia irides
M1	nt821 mutation for double muscling
NG	Not genomic tested
NH	Neuropathic hydrocephalus
OH	Oculocutaneous hypopigmentation
OS	Osteopetrosis
RD	Red gene

Symbol	Meaning
RTF	Produced 35 or more calves from daughters without a simple recessive genetic defect or genetic factor
SN	Syndactyly
WT	Wild type color gene
XA	Affected of more than one genetic condition
XC	Carrier of more than 1 genetic condition
XF	Free of more than 1 genetic condition

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Table 7: ***Angus Genetic Trend, EPD By Birth Year***

	Production											Maternal						Carcass				$Values				
YEAR	CED	BW	WW	YW	RADG	DMI	YH	SC	Doc	Claw	Angle	HP	CEM	Milk	MW	MH	$EN	CW	Marb	RE	Fat	$M	$W	$F	$G	$B
1972	+6	-3.3	-19	-36	+.05	-1.62	-.7	+.18	+12	+.50	+.50	+10.1	+0	+8	-97	-1.4	+31	-2	+.22	+.17	+.003	+0	-40	+16	+28	+44
1973	+5	-3.2	-18	-34	+.05	-1.53	-.7	+.17	+12	+.50	+.50	+10.0	+0	+8	-94	-1.3	+31	-2	+.22	+.16	+.003	+0	-39	+17	+28	+44
1974	+5	-3.0	-17	-32	+.05	-1.52	-.6	+.18	+12	+.50	+.50	+10.2	+0	+8	-91	-1.3	+30	-2	+.22	+.16	+.002	+1	-38	+18	+28	+46
1975	+4	-2.8	-15	-30	+.06	-1.50	-.6	+.17	+12	+.50	+.50	+10.1	+0	+8	-88	-1.2	+30	-3	+.22	+.16	+.003	+2	-35	+18	+28	+46
1976	+4	-2.6	-14	-27	+.06	-1.47	-.6	+.17	+12	+.50	+.50	+10.1	+0	+8	-85	-1.2	+30	-3	+.21	+.16	+.002	+3	-34	+21	+27	+48
1977	+3	-2.3	-13	-25	+.06	-1.41	-.5	+.16	+12	+.50	+.50	+10.0	+0	+7	-82	-1.1	+30	-3	+.21	+.16	+.002	+2	-35	+22	+27	+49
1978	+3	-2.1	-11	-22	+.07	-1.39	-.5	+.17	+12	+.50	+.50	+10.3	+0	+7	-80	-1.1	+30	-3	+.21	+.15	+.002	+4	-33	+23	+27	+50
1979	+2	-1.9	-10	-20	+.07	-1.38	-.4	+.18	+12	+.50	+.50	+10.1	+0	+7	-76	-1.0	+29	-3	+.21	+.14	+.002	+4	-32	+25	+27	+52
1980	+1	-1.6	-8	-17	+.08	-1.34	-.4	+.18	+12	+.50	+.50	+10.1	+0	+7	-72	-.9	+29	-4	+.21	+.13	+.002	+5	-30	+27	+27	+54
1981	+1	-1.3	-6	-13	+.08	-1.29	-.3	+.18	+12	+.50	+.50	+10.1	+0	+7	-67	-.9	+28	-3	+.20	+.13	+.003	+6	-29	+29	+26	+55
1982	+0	-.9	-4	-10	+.09	-1.24	-.2	+.19	+12	+.50	+.50	+10.1	+0	+7	-63	-.8	+28	-3	+.21	+.13	+.001	+7	-27	+31	+27	+58
1983	+0	-.4	-1	-6	+.09	-1.20	-.1	+.19	+12	+.50	+.50	+10.2	+0	+7	-56	-.6	+27	-3	+.21	+.13	+.001	+9	-24	+33	+27	+60
1984	-1	+.0	+0	-2	+.10	-1.16	+.0	+.20	+11	+.50	+.50	+10.2	+1	+8	-51	-.6	+26	-3	+.21	+.13	-.001	+10	-23	+36	+27	+63
1985	-2	+.4	+2	+1	+.10	-1.12	+.1	+.19	+12	+.50	+.50	+10.2	+1	+8	-46	-.5	+25	-2	+.21	+.13	-.002	+12	-21	+38	+27	+65
1986	-2	+.7	+4	+4	+.11	-1.07	+.2	+.20	+11	+.50	+.50	+10.3	+1	+9	-42	-.4	+24	-2	+.21	+.13	-.003	+14	-18	+39	+27	+66
1987	-3	+1.1	+6	+7	+.11	-1.01	+.2	+.20	+11	+.50	+.50	+10.3	+1	+9	-37	-.3	+23	-1	+.21	+.13	-.004	+15	-16	+40	+27	+68
1988	-3	+1.4	+8	+11	+.12	-.94	+.3	+.21	+11	+.50	+.50	+10.3	+2	+9	-33	-.3	+23	+0	+.21	+.14	-.004	+16	-15	+42	+27	+70
1989	-3	+1.6	+10	+14	+.12	-.88	+.3	+.22	+11	+.50	+.50	+10.4	+2	+10	-27	-.2	+22	+0	+.23	+.14	-.004	+19	-11	+43	+28	+71
1990	-3	+1.8	+11	+17	+.13	-.81	+.4	+.24	+10	+.50	+.50	+10.4	+2	+11	-23	-.1	+21	+1	+.23	+.13	-.003	+20	-10	+45	+28	+73
1991	-3	+1.9	+13	+21	+.13	-.75	+.4	+.25	+10	+.50	+.50	+10.3	+3	+12	-19	-.1	+20	+2	+.24	+.12	-.003	+23	-7	+47	+29	+75
1992	-2	+1.9	+14	+23	+.14	-.69	+.4	+.27	+10	+.50	+.50	+10.4	+3	+13	-17	-.1	+19	+2	+.24	+.12	-.003	+25	-4	+47	+29	+76
1993	-2	+1.9	+16	+26	+.14	-.62	+.4	+.27	+9	+.50	+.51	+10.3	+4	+13	-14	-.1	+18	+3	+.25	+.12	-.001	+26	-2	+48	+29	+77
1994	-1	+1.9	+17	+28	+.14	-.56	+.4	+.28	+9	+.50	+.51	+10.2	+4	+14	-11	+.0	+18	+4	+.25	+.12	+.000	+28	+0	+48	+29	+77
1995	-1	+1.8	+18	+31	+.15	-.49	+.4	+.29	+9	+.50	+.51	+10.3	+4	+15	-9	+.0	+17	+5	+.25	+.12	+.002	+30	+3	+50	+29	+79
1996	+0	+1.8	+20	+34	+.15	-.42	+.4	+.29	+9	+.50	+.51	+10.2	+5	+16	-5	+.0	+16	+7	+.26	+.13	+.003	+33	+7	+51	+29	+80
1997	+0	+1.8	+21	+37	+.16	-.35	+.4	+.32	+8	+.50	+.51	+10.2	+5	+17	-2	+.0	+15	+9	+.26	+.13	+.004	+34	+9	+53	+29	+82
1998	+0	+1.8	+23	+40	+.16	-.30	+.4	+.36	+8	+.50	+.51	+10.1	+6	+17	+0	+.0	+15	+9	+.27	+.13	+.004	+36	+11	+53	+29	+83
1999	+0	+1.9	+25	+43	+.16	-.25	+.5	+.40	+8	+.50	+.51	+10.1	+6	+18	+3	+.1	+13	+11	+.28	+.14	+.006	+37	+14	+55	+30	+85
2000	+0	+1.9	+26	+46	+.17	-.19	+.5	+.43	+8	+.50	+.51	+10.1	+6	+18	+6	+.1	+11	+12	+.30	+.16	+.005	+36	+15	+57	+31	+88
2001	+1	+1.9	+28	+49	+.18	-.15	+.5	+.44	+8	+.50	+.51	+10.0	+6	+19	+9	+.1	+9	+14	+.32	+.18	+.005	+38	+19	+59	+32	+91
2002	+1	+1.9	+29	+52	+.18	-.11	+.5	+.46	+9	+.50	+.51	+10.1	+6	+20	+12	+.1	+7	+15	+.34	+.20	+.005	+38	+21	+61	+34	+95
2003	+2	+1.9	+31	+55	+.18	-.06	+.5	+.47	+9	+.50	+.51	+10.1	+7	+20	+14	+.1	+6	+17	+.37	+.22	+.006	+40	+23	+63	+35	+99
2004	+2	+1.8	+32	+57	+.19	-.01	+.5	+.50	+9	+.50	+.51	+10.1	+7	+21	+16	+.1	+5	+18	+.38	+.24	+.006	+40	+26	+64	+36	+100
2005	+2	+1.8	+33	+60	+.19	+.05	+.5	+.52	+9	+.49	+.51	+10.2	+7	+21	+19	+.2	+3	+19	+.41	+.26	+.007	+40	+26	+66	+38	+104
2006	+3	+1.7	+35	+63	+.20	+.12	+.5	+.55	+9	+.50	+.51	+10.1	+7	+22	+21	+.2	+2	+21	+.42	+.28	+.008	+41	+30	+67	+38	+105
2007	+3	+1.7	+37	+66	+.20	+.19	+.5	+.59	+9	+.50	+.51	+10.0	+7	+22	+23	+.2	+1	+23	+.45	+.30	+.008	+42	+33	+67	+40	+107
2008	+4	+1.6	+39	+69	+.20	+.25	+.5	+.58	+10	+.50	+.51	+9.9	+7	+23	+26	+.2	-1	+24	+.47	+.31	+.010	+43	+37	+68	+41	+109
2009	+4	+1.6	+40	+72	+.20	+.30	+.4	+.60	+10	+.50	+.51	+10.0	+8	+23	+28	+.2	-2	+25	+.49	+.33	+.012	+43	+37	+70	+42	+112
2010	+4	+1.5	+41	+74	+.21	+.36	+.4	+.63	+11	+.50	+.51	+10.2	+8	+23	+30	+.2	-3	+27	+.47	+.35	+.012	+44	+39	+71	+41	+113
2011	+5	+1.5	+43	+76	+.21	+.41	+.4	+.65	+12	+.50	+.51	+10.3	+8	+23	+32	+.2	-4	+28	+.47	+.38	+.011	+46	+41	+72	+42	+114
2012	+5	+1.5	+44	+79	+.22	+.47	+.4	+.68	+13	+.50	+.50	+10.3	+8	+24	+34	+.2	-5	+30	+.48	+.40	+.012	+47	+43	+74	+42	+116
2013	+5	+1.4	+46	+82	+.22	+.54	+.4	+.69	+13	+.51	+.50	+10.3	+8	+24	+36	+.2	-6	+31	+.50	+.42	+.013	+47	+46	+74	+44	+117
2014	+5	+1.4	+48	+86	+.22	+.62	+.4	+.71	+14	+.51	+.50	+10.5	+8	+24	+39	+.2	-8	+33	+.53	+.45	+.013	+48	+48	+76	+46	+121
2015	+5	+1.3	+50	+89	+.23	+.68	+.5	+.73	+15	+.51	+.50	+10.7	+8	+24	+43	+.3	-10	+35	+.53	+.48	+.011	+49	+50	+76	+46	+123
2016	+6	+1.3	+52	+92	+.23	+.73	+.5	+.73	+15	+.51	+.50	+10.9	+8	+24	+46	+.3	-11	+38	+.54	+.52	+.010	+50	+52	+79	+47	+126
2017	+6	+1.3	+54	+96	+.24	+.82	+.5	+.75	+16	+.51	+.50	+11.1	+8	+25	+51	+.3	-14	+40	+.55	+.55	+.010	+50	+55	+80	+48	+128
2018	+6	+1.2	+56	+100	+.25	+.93	+.5	+.79	+17	+.51	+.50	+11.3	+8	+25	+56	+.4	-16	+43	+.58	+.58	+.010	+51	+57	+82	+50	+132

EPD and $Value Percentile Breakdowns Sires - Current Sires

	Production									Maternal							Carcass				$Values				
TOP PCT	CED	BW	WW	YW	RADG	DMI	YH	SC	Doc	Claw	Angle	HP	CEM	Milk	MW	MH	$EN	CW	Marb	RE	Fat	$M	$W	$F	$G	$B
1%	+17	-3.2	+85	+148	+.34	-.85	+1.3	+2.17	+34	+.32	+.33	+18.2	+16	+40	+119	+1.2	+21	+73	+1.35	+1.15	-.053	+84	+91	+131	+88	+197
2%	+16	-2.6	+81	+142	+.33	-.53	+1.2	+1.97	+32	+.34	+.35	+17.2	+16	+38	+110	+1.1	+19	+69	+1.23	+1.06	-.045	+80	+87	+126	+82	+189
3%	+15	-2.3	+79	+139	+.32	-.36	+1.1	+1.86	+31	+.36	+.37	+16.6	+15	+36	+105	+1.1	+17	+67	+1.16	+1.01	-.041	+78	+84	+122	+79	+184
4%	+14	-2.0	+77	+136	+.32	-.25	+1.1	+1.79	+30	+.37	+.38	+16.2	+15	+35	+101	+1.0	+15	+65	+1.11	+.98	-.037	+76	+82	+119	+76	+180
5%	+14	-1.8	+76	+134	+.31	-.18	+1.1	+1.72	+29	+.38	+.39	+15.8	+14	+35	+97	+1.0	+14	+63	+1.07	+.94	-.034	+75	+81	+116	+74	+176
10%	+13	-1.1	+71	+126	+.29	+.04	+.9	+1.50	+26	+.40	+.41	+14.6	+13	+32	+86	+.8	+9	+58	+.92	+.84	-.023	+70	+75	+109	+67	+166
15%	+11	-.6	+68	+120	+.28	+.18	+.8	+1.35	+25	+.42	+.43	+13.8	+12	+31	+79	+.7	+5	+54	+.83	+.77	-.016	+67	+72	+104	+62	+158
20%	+11	-.2	+65	+116	+.27	+.29	+.8	+1.24	+23	+.44	+.44	+13.2	+12	+30	+73	+.6	+1	+51	+.75	+.72	-.011	+64	+69	+100	+58	+152
25%	+10	+.1	+63	+112	+.27	+.38	+.7	+1.14	+22	+.45	+.46	+12.7	+11	+29	+68	+.6	-1	+49	+.69	+.67	-.006	+62	+66	+96	+55	+147
30%	+9	+.3	+61	+109	+.26	+.46	+.7	+1.06	+20	+.46	+.47	+12.3	+11	+28	+64	+.5	-3	+47	+.64	+.63	-.002	+60	+64	+93	+52	+143
35%	+8	+.6	+60	+106	+.25	+.54	+.6	+.98	+19	+.47	+.47	+11.8	+10	+27	+59	+.5	-6	+44	+.59	+.59	+.002	+58	+62	+90	+50	+139
40%	+8	+.8	+58	+103	+.25	+.61	+.6	+.90	+18	+.48	+.48	+11.4	+10	+26	+55	+.4	-7	+42	+.55	+.56	+.005	+56	+60	+88	+47	+135
45%	+7	+1.0	+56	+100	+.24	+.67	+.5	+.83	+17	+.49	+.49	+11.1	+9	+26	+52	+.3	-9	+41	+.51	+.53	+.009	+55	+58	+85	+45	+131
50%	+7	+1.2	+55	+97	+.23	+.74	+.5	+.76	+16	+.50	+.50	+10.7	+9	+25	+48	+.3	-11	+39	+.47	+.50	+.012	+53	+55	+83	+43	+127
55%	+6	+1.4	+53	+94	+.23	+.80	+.4	+.69	+15	+.51	+.51	+10.3	+8	+24	+44	+.2	-13	+37	+.43	+.46	+.015	+51	+53	+80	+41	+123
60%	+5	+1.7	+51	+91	+.22	+.87	+.4	+.61	+14	+.52	+.52	+9.9	+8	+23	+40	+.2	-15	+35	+.40	+.43	+.019	+49	+51	+78	+39	+120
65%	+5	+1.9	+50	+88	+.22	+.94	+.3	+.54	+13	+.53	+.53	+9.5	+7	+23	+36	+.1	-17	+33	+.36	+.40	+.022	+47	+49	+75	+37	+116
70%	+4	+2.1	+48	+85	+.21	+1.02	+.3	+.45	+11	+.54	+.54	+9.1	+7	+22	+32	+.1	-19	+31	+.32	+.36	+.026	+45	+47	+72	+35	+112
75%	+3	+2.4	+46	+81	+.20	+1.09	+.2	+.37	+10	+.56	+.55	+8.6	+6	+21	+27	+.0	-21	+28	+.28	+.33	+.030	+43	+44	+69	+33	+107
80%	+2	+2.7	+43	+77	+.20	+1.19	+.2	+.28	+8	+.57	+.56	+8.1	+6	+20	+22	-.1	-23	+25	+.24	+.28	+.035	+41	+41	+65	+30	+102
85%	+1	+3.0	+40	+72	+.19	+1.29	+.1	+.16	+6	+.59	+.57	+7.5	+5	+19	+15	-.1	-26	+22	+.18	+.23	+.040	+38	+38	+60	+28	+95
90%	+0	+3.5	+36	+65	+.17	+1.43	+.0	+.02	+4	+.61	+.59	+6.7	+3	+17	+6	-.3	-29	+17	+.12	+.17	+.047	+34	+32	+54	+25	+86
95%	-2	+4.2	+29	+51	+.15	+1.63	-.2	-.20	+0	+.64	+.62	+5.5	+2	+15	-10	-.5	-35	+10	+.03	+.07	+.057	+28	+24	+43	+20	+72
Total Animals	28,147	28,210	28,210	28,210	20,448	20,448	21,581	22,644	21,416	20,409	20,409	20,315	28,147	28,210	20,502	20,502	28,056	23,428	23,428	23,428	23,428	27,986	28,210	25,465	25,509	25,464
Avg. EPD	+6	+1.2	+54	+96	+.23	+.73	+.5	+.76	+15	+.50	+.50	+10.7	+9	+25	+46	+.3	-11	+38	+.50	+.50	+.012	+52	+54	+82	+44	+126

EPD and $Value Percentile Breakdowns Sires - Current Dams

	Production									Maternal							Carcass				$Values				
TOP PCT	CED	BW	WW	YW	RADG	DMI	YH	SC	Doc	Claw	Angle	HP	CEM	Milk	MW	MH	$EN	CW	Marb	RE	Fat	$M	$W	$F	$G	$B
1%	+16	-2.6	+77	+135	+.32	-.57	+1.2	+1.96	+31	+.34	+.35	+17.6	+16	+39	+103	+1.1	+19	+65	+1.27	+1.03	-.046	+81	+84	+120	+83	+183
2%	+15	-2.1	+73	+129	+.31	-.43	+1.1	+1.79	+29	+.36	+.37	+16.7	+15	+37	+95	+1.0	+17	+61	+1.16	+.95	-.039	+78	+80	+115	+77	+175
3%	+14	-1.8	+71	+125	+.30	-.34	+1.1	+1.69	+28	+.37	+.38	+16.1	+15	+36	+90	+.9	+15	+59	+1.09	+.90	-.034	+76	+77	+111	+74	+171
4%	+13	-1.5	+70	+122	+.29	-.28	+1.0	+1.61	+27	+.38	+.39	+15.8	+14	+35	+86	+.9	+14	+57	+1.04	+.86	-.031	+75	+75	+109	+71	+167
5%	+13	-1.3	+68	+120	+.29	-.23	+1.0	+1.55	+27	+.39	+.40	+15.4	+14	+34	+83	+.8	+13	+55	+1.00	+.83	-.028	+74	+74	+107	+69	+164
10%	+11	-.7	+64	+113	+.27	-.06	+.9	+1.35	+24	+.41	+.42	+14.4	+13	+32	+73	+.7	+10	+50	+.86	+.74	-.019	+69	+69	+100	+62	+153
15%	+10	-.3	+61	+108	+.26	+.06	+.8	+1.22	+22	+.43	+.44	+13.7	+12	+31	+66	+.6	+7	+47	+.78	+.67	-.013	+66	+65	+96	+58	+147
20%	+9	+.1	+59	+104	+.25	+.15	+.8	+1.12	+21	+.44	+.45	+13.1	+11	+30	+61	+.5	+4	+44	+.71	+.62	-.008	+64	+62	+93	+54	+142
25%	+9	+.4	+57	+101	+.25	+.23	+.7	+1.04	+19	+.46	+.46	+12.7	+11	+29	+56	+.5	+2	+42	+.66	+.58	-.004	+62	+60	+90	+51	+137
30%	+8	+.6	+55	+98	+.24	+.30	+.7	+.96	+18	+.47	+.47	+12.2	+10	+28	+52	+.4	+0	+40	+.61	+.54	+0	+60	+58	+87	+49	+133
35%	+7	+.8	+54	+95	+.23	+.36	+.6	+.89	+17	+.47	+.48	+11.9	+10	+27	+48	+.4	-2	+38	+.57	+.51	+.003	+58	+56	+85	+47	+130
40%	+7	+1.0	+52	+92	+.23	+.42	+.6	+.82	+16	+.48	+.49	+11.5	+10	+26	+45	+.3	-4	+36	+.53	+.48	+.006	+57	+54	+83	+45	+127
45%	+6	+1.2	+51	+90	+.22	+.48	+.5	+.76	+15	+.49	+.50	+11.1	+9	+26	+41	+.3	-5	+34	+.50	+.45	+.009	+55	+52	+80	+43	+123
50%	+6	+1.4	+50	+87	+.22	+.54	+.5	+.69	+14	+.50	+.50	+10.8	+9	+25	+38	+.3	-7	+33	+.46	+.42	+.012	+53	+50	+78	+41	+120
55%	+5	+1.6	+48	+85	+.21	+.60	+.4	+.63	+13	+.51	+.51	+10.5	+8	+24	+35	+.2	-9	+31	+.43	+.39	+.015	+52	+48	+76	+39	+117
60%	+5	+1.8	+47	+82	+.21	+.67	+.4	+.56	+12	+.52	+.52	+10.1	+8	+24	+31	+.2	-10	+29	+.40	+.36	+.018	+50	+46	+74	+38	+114
65%	+4	+2.0	+45	+80	+.20	+.73	+.4	+.50	+11	+.53	+.53	+9.8	+7	+23	+28	+.1	-12	+28	+.37	+.34	+.021	+48	+44	+72	+36	+111
70%	+3	+2.3	+44	+77	+.20	+.80	+.3	+.43	+10	+.54	+.54	+9.4	+7	+22	+24	+.1	-14	+26	+.33	+.30	+.025	+47	+42	+69	+34	+108
75%	+3	+2.5	+42	+74	+.19	+.87	+.3	+.35	+9	+.55	+.54	+9.0	+6	+21	+20	+0	-16	+24	+.30	+.27	+.028	+45	+40	+66	+33	+104
80%	+2	+2.8	+40	+70	+.19	+.96	+.2	+.26	+7	+.56	+.55	+8.5	+5	+21	+15	-.1	-18	+22	+.26	+.24	+.032	+42	+37	+63	+31	+100
85%	+1	+3.1	+37	+66	+.18	+1.06	+.1	+.16	+5	+.57	+.57	+7.9	+5	+19	+10	-.1	-20	+19	+.22	+.20	+.037	+40	+34	+60	+29	+95
90%	+0	+3.5	+34	+60	+.17	+1.18	+.1	+.03	+3	+.59	+.58	+7.2	+4	+18	+3	-.2	-23	+16	+.17	+.14	+.042	+36	+30	+55	+26	+89
95%	-2	+4.1	+29	+51	+.15	+1.38	-.1	-.16	+0	+.62	+.61	+6.1	+2	+16	-8	-.4	-28	+11	+.09	+.07	+.051	+31	+23	+48	+23	+79
Total Animals	353,472	354,630	354,630	354,630	208,678	208,678	227,478	231,020	225,749	208,078	208,078	211,241	353,472	354,630	218,854	218,854	352,610	260,544	260,544	260,544	260,544	352,024	354,644	303,927	304,081	303,903
Avg. EPD	+6	+1.4	+49	+87	+.22	+.56	+.5	+.69	+14	+.50	+.50	+10.8	+8	+25	+38	+.2	-7	+33	+.49	+.43	+.012	+53	+49	+78	+43	+121

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Sire Evaluation Report *continued from page 155*

Non-Parent Bulls

	Production											Maternal							Carcass				$Values			
TOP PCT	CED	BW	WW	YW	RADG	DMI	YH	SC	Doc	Claw	Angle	HP	CEM	Milk	MW	MH	$EN	CW	Marb	RE	Fat	$M	$W	$F	$G	$B
1%	+16	-3.0	+82	+144	+.33	-.38	+1.3	+2.15	+33	+.32	+.33	+18.3	+16	+39	+118	+1.2	+18	+72	+1.37	+1.18	-.054	+84	+89	+125	+88	+191
2%	+15	-2.4	+79	+139	+.32	-.23	+1.2	+1.98	+32	+.34	+.35	+17.4	+15	+37	+110	+1.1	+15	+69	+1.26	+1.10	-.047	+81	+85	+120	+82	+184
3%	+15	-2.1	+77	+135	+.32	-.14	+1.1	+1.87	+31	+.35	+.36	+16.9	+15	+36	+105	+1.0	+14	+66	+1.19	+1.05	-.042	+79	+83	+116	+79	+179
4%	+14	-1.8	+75	+132	+.31	-.07	+1.1	+1.79	+30	+.36	+.37	+16.5	+14	+35	+101	+1.0	+12	+64	+1.14	+1.01	-.038	+78	+81	+114	+76	+176
5%	+14	-1.6	+74	+130	+.31	-.01	+1.0	+1.73	+29	+.37	+.38	+16.2	+14	+34	+98	+.9	+11	+63	+1.10	+.98	-.035	+77	+79	+112	+74	+173
10%	+12	-.9	+70	+122	+.29	+.17	+.9	+1.51	+27	+.40	+.41	+15.0	+13	+32	+88	+.8	+6	+58	+.96	+.88	-.025	+73	+74	+105	+67	+163
15%	+11	-.5	+67	+117	+.28	+.29	+.8	+1.36	+25	+.42	+.43	+14.3	+12	+30	+81	+.7	+3	+55	+.86	+.81	-.018	+70	+70	+101	+62	+156
20%	+10	-.2	+64	+113	+.27	+.39	+.8	+1.25	+23	+.44	+.44	+13.7	+12	+29	+75	+.6	+0	+52	+.79	+.76	-.012	+68	+67	+97	+59	+151
25%	+10	+.1	+62	+110	+.27	+.47	+.7	+1.15	+22	+.45	+.45	+13.2	+11	+28	+71	+.6	-2	+50	+.74	+.71	-.007	+66	+64	+94	+56	+146
30%	+9	+.4	+61	+107	+.26	+.55	+.7	+1.07	+21	+.46	+.46	+12.7	+11	+28	+66	+.5	-4	+48	+.68	+.67	-.003	+64	+62	+92	+53	+142
35%	+8	+.6	+59	+104	+.25	+.62	+.6	+.98	+20	+.47	+.47	+12.3	+10	+27	+62	+.5	-6	+46	+.64	+.64	+.001	+62	+60	+90	+51	+139
40%	+8	+.9	+57	+102	+.25	+.68	+.6	+.90	+19	+.48	+.48	+11.9	+10	+26	+58	+.4	-8	+44	+.60	+.60	+.004	+60	+58	+87	+49	+135
45%	+7	+1.1	+56	+99	+.24	+.75	+.5	+.83	+18	+.50	+.49	+11.5	+9	+26	+55	+.4	-9	+42	+.55	+.57	+.008	+59	+56	+85	+47	+132
50%	+6	+1.3	+55	+97	+.24	+.81	+.5	+.76	+17	+.51	+.50	+11.1	+9	+25	+51	+.3	-11	+40	+.51	+.54	+.011	+57	+54	+83	+45	+129
55%	+6	+1.5	+53	+94	+.23	+.87	+.4	+.69	+16	+.52	+.51	+10.8	+8	+24	+48	+.3	-12	+39	+.48	+.51	+.015	+55	+52	+81	+43	+126
60%	+5	+1.7	+52	+92	+.23	+.93	+.4	+.61	+15	+.53	+.52	+10.4	+8	+24	+44	+.2	-14	+37	+.44	+.48	+.018	+54	+51	+79	+41	+123
65%	+5	+1.9	+50	+89	+.22	+1.00	+.4	+.54	+13	+.54	+.53	+10.0	+8	+23	+40	+.2	-16	+35	+.40	+.45	+.022	+52	+49	+77	+39	+119
70%	+4	+2.2	+49	+86	+.21	+1.07	+.3	+.46	+12	+.55	+.54	+9.5	+7	+22	+36	+.1	-17	+33	+.36	+.41	+.025	+50	+47	+74	+37	+116
75%	+3	+2.4	+47	+83	+.21	+1.15	+.3	+.37	+11	+.56	+.55	+9.0	+6	+22	+32	+.1	-19	+31	+.32	+.38	+.029	+48	+45	+72	+35	+112
80%	+3	+2.7	+45	+80	+.20	+1.23	+.2	+.27	+9	+.58	+.56	+8.5	+6	+21	+27	+.0	-21	+29	+.27	+.34	+.034	+46	+42	+69	+33	+108
85%	+2	+3.0	+42	+76	+.19	+1.33	+.1	+.15	+7	+.59	+.58	+7.9	+5	+20	+21	-.1	-24	+26	+.22	+.29	+.039	+43	+39	+65	+31	+103
90%	+0	+3.4	+39	+70	+.18	+1.46	+.1	+.0	+5	+.62	+.59	+7.2	+4	+19	+13	-.2	-27	+23	+.16	+.23	+.046	+40	+35	+60	+28	+96
95%	-2	+4.1	+34	+60	+.17	+1.64	-.1	-.22	+1	+.65	+.62	+6.0	+2	+17	+2	-.3	-32	+17	+.07	+.14	+.056	+34	+29	+52	+24	+86
Total Animals	167,524	170,552	170,552	170,552	74,924	74,924	80,698	88,108	79,496	73,912	73,912	73,317	167,524	170,552	73,317	73,317	170,748	93,649	93,649	93,649	93,649	170,254	172,324	132,598	132,596	132,587
Avg. EPD	+6	+1.3	+54	+96	+.24	+.81	+.5	+.76	+16	+.51	+.50	+11.1	+9	+25	+51	+.3	-11	+40	+.54	+.55	+.011	+56	+54	+83	+46	+129

Non-Parent Cows

	Production											Maternal							Carcass			$Values				
TOP PCT	CED	BW	WW	YW	RADG	DMI	YH	SC	Doc	Claw	Angle	HP	CEM	Milk	MW	MH	$EN	CW	Marb	RE	Fat	$M	$W	$F	$G	$B
1%	+16	-2.9	+82	+143	+.34	-.43	+1.3	+2.10	+33	+.32	+.33	+17.8	+16	+38	+118	+1.2	+19	+73	+1.42	+1.20	-.056	+84	+88	+124	+88	+192
2%	+15	-2.3	+78	+137	+.32	-.27	+1.2	+1.94	+31	+.34	+.35	+17.1	+15	+36	+110	+1.1	+16	+69	+1.31	+1.13	-.048	+81	+84	+119	+83	+184
3%	+14	-2.0	+76	+133	+.32	-.18	+1.1	+1.84	+30	+.36	+.36	+16.6	+15	+35	+105	+1.0	+14	+67	+1.24	+1.08	-.043	+79	+81	+115	+79	+179
4%	+14	-1.8	+74	+130	+.31	-.11	+1.1	+1.76	+30	+.37	+.37	+16.2	+14	+34	+102	+1.0	+13	+65	+1.19	+1.04	-.040	+78	+79	+113	+77	+176
5%	+14	-1.6	+73	+128	+.31	-.05	+1.0	+1.70	+29	+.37	+.38	+15.9	+14	+33	+99	+1.0	+11	+63	+1.15	+1.01	-.036	+76	+77	+111	+75	+173
10%	+12	-.9	+68	+120	+.29	+.14	+.9	+1.49	+26	+.40	+.41	+14.8	+13	+31	+88	+.8	+6	+58	+1.00	+.90	-.026	+73	+71	+104	+67	+163
15%	+11	-.4	+65	+115	+.28	+.27	+.8	+1.35	+25	+.42	+.42	+14.1	+12	+30	+81	+.7	+3	+55	+.91	+.83	-.019	+70	+68	+100	+63	+156
20%	+10	-.1	+63	+111	+.27	+.36	+.8	+1.23	+23	+.44	+.44	+13.5	+11	+29	+75	+.6	+0	+52	+.84	+.77	-.013	+67	+65	+97	+59	+151
25%	+9	+.2	+61	+108	+.27	+.45	+.7	+1.13	+22	+.45	+.45	+13.0	+11	+28	+71	+.6	-2	+50	+.78	+.73	-.009	+65	+62	+94	+56	+147
30%	+9	+.5	+59	+105	+.26	+.52	+.7	+1.04	+21	+.47	+.46	+12.6	+10	+27	+66	+.5	-4	+48	+.73	+.69	-.005	+64	+60	+92	+54	+143
35%	+8	+.7	+58	+102	+.25	+.59	+.6	+.96	+20	+.48	+.47	+12.1	+10	+27	+62	+.5	-6	+46	+.69	+.65	-.001	+62	+58	+90	+51	+139
40%	+8	+.9	+56	+100	+.25	+.66	+.6	+.88	+19	+.49	+.48	+11.7	+10	+26	+59	+.4	-7	+44	+.64	+.62	+.003	+60	+56	+88	+49	+136
45%	+7	+1.1	+55	+98	+.24	+.73	+.5	+.80	+17	+.50	+.49	+11.3	+9	+25	+55	+.4	-9	+42	+.60	+.58	+.006	+59	+55	+86	+47	+133
50%	+6	+1.3	+54	+95	+.24	+.79	+.5	+.73	+16	+.51	+.50	+10.9	+9	+25	+51	+.3	-10	+40	+.56	+.55	+.010	+57	+53	+84	+45	+130
55%	+6	+1.5	+52	+93	+.23	+.86	+.5	+.65	+15	+.52	+.51	+10.6	+8	+24	+48	+.3	-12	+38	+.52	+.52	+.013	+55	+51	+82	+43	+127
60%	+5	+1.7	+51	+90	+.23	+.92	+.4	+.57	+14	+.53	+.52	+10.2	+8	+24	+44	+.2	-13	+37	+.48	+.49	+.017	+54	+49	+80	+42	+124
65%	+5	+1.9	+49	+88	+.22	+.99	+.4	+.50	+13	+.54	+.53	+9.8	+8	+23	+40	+.2	-15	+35	+.44	+.46	+.020	+52	+48	+78	+40	+121
70%	+4	+2.2	+48	+85	+.21	+1.06	+.3	+.41	+12	+.55	+.54	+9.3	+7	+22	+36	+.1	-17	+33	+.40	+.42	+.024	+50	+46	+75	+38	+117
75%	+3	+2.4	+46	+82	+.21	+1.14	+.3	+.32	+10	+.57	+.55	+8.8	+7	+22	+31	+.1	-18	+31	+.35	+.39	+.028	+48	+44	+73	+36	+114
80%	+3	+2.7	+44	+79	+.20	+1.22	+.2	+.22	+9	+.58	+.56	+8.3	+6	+21	+26	+.0	-20	+28	+.30	+.34	+.032	+46	+41	+70	+34	+110
85%	+2	+3.0	+42	+75	+.19	+1.32	+.1	+.10	+7	+.60	+.57	+7.7	+5	+20	+20	-.1	-23	+26	+.25	+.30	+.037	+43	+38	+66	+32	+105
90%	+0	+3.4	+39	+69	+.18	+1.45	+.1	-.05	+4	+.62	+.59	+6.9	+4	+19	+13	-.2	-26	+22	+.18	+.24	+.044	+40	+35	+62	+29	+99
95%	-1	+4.1	+33	+59	+.16	+1.65	-.1	-.27	+1	+.65	+.62	+5.8	+3	+17	+2	-.3	-31	+17	+.08	+.15	+.053	+35	+28	+54	+25	+89
Total Animals	127,555	130,252	130,252	130,252	44,122	44,122	48,347	43,598	47,153	43,815	43,815	44,673	127,555	130,252	43,641	43,641	128,408	53,623	53,623	53,623	53,623	127,932	131,071	92,359	92,356	92,351
Avg. EPD	+6	+1.3	+53	+95	+.24	+.79	+.5	+.72	+16	+.51	+.50	+10.9	+9	+25	+51	+.3	-10	+40	+.58	+.56	+.009	+56	+53	+83	+47	+130

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