



Understanding EBVs & Indexes

TACE 

TransTasman Angus Cattle Evaluation



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What is TACE?

The TransTasman Angus Cattle Evaluation is the genetic evaluation program adopted by Angus Australia for Angus and Angus influenced beef cattle. The TransTasman Angus Cattle Evaluation uses Best Linear Unbiased Prediction (BLUP) technology to produce Estimated Breeding Values (EBVs) of recorded cattle for a range of important production traits (e.g. weight, carcase, fertility).

The TransTasman Angus Cattle Evaluation is an international genetic evaluation and includes pedigree, performance and genomic information from the Angus Australia and Angus New Zealand databases, along with selected information from the American and Canadian Angus Associations.

The TransTasman Angus Cattle Evaluation utilises a range of genetic evaluation software, including the internationally recognised BLUPF90 family of programs, and BREEDPLAN® beef genetic evaluation analytical software, as developed by the Animal Genetics and Breeding Unit (AGBU), a joint institute of NSW Agriculture and the University of New England, and Meat and Livestock Australia Limited (MLA).

What is an EBV?

An animal's breeding value can be defined as its genetic merit for each trait. While it is not possible to determine an animal's true breeding value, it is possible to estimate it. These estimates of an animal's true breeding value are called EBVs (Estimated Breeding Values).

TACE EBVs are expressed as the difference between an individual animal's genetics and a historical genetic level (i.e. group of animals) within the TACE genetic evaluation, and are reported in the units in which the measurements are taken.

EBVs are calculated for a range of traits within TACE, covering calving ease, growth, fertility, maternal performance, carcase merit, feed efficiency, temperament and structural soundness.

Using EBVs to Compare the Genetics of Two Animals

TACE EBVs can be used to estimate the expected difference in the genetics of two animals, with the expected difference equating to half the difference in the EBVs of the animals, all other things being equal (e.g. they are joined to the same animal/s).

For example, a bull with an IMF EBV of +3.0 would be expected to produce progeny with on average, 1% more intramuscular fat in a 400 kg carcase than a bull with a IMF EBV of +1.0 (i.e. 2% difference between the sire's EBVs, then halved as the sire only contributes half the genetics).

Importantly, TACE EBVs can only be used to estimate the difference in the genetics of two animals who both have TACE EBVs. TACE EBVs are not directly comparable with BREEDPLAN EBVs calculated in other genetic evaluations.

Using EBVs to Benchmark an Animal's Genetics with the Breed

TACE EBVs can also be used to benchmark an animal's genetics relative to the genetics of other Angus or Angus influenced animals in Australia and New Zealand.

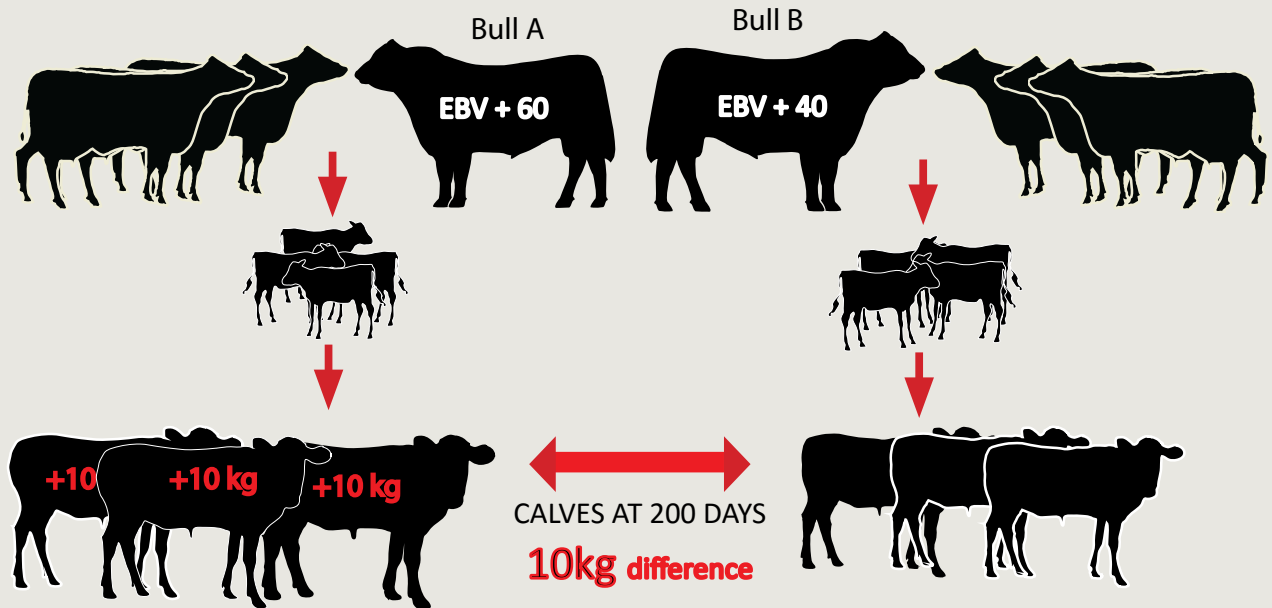
To benchmark an animal's genetics relative to other Angus animals, an animal's EBV can be compared to:

- the breed average EBV
- the percentile table

The current breed average and percentile table for each EBV can be found on the Angus Australia website, or they are normally listed in most TACE reports, sale and semen catalogues.


Example: Expected Difference in Progeny Performance


All other things being equal, a bull with a 200 Day Growth EBV of +60 would be expected to produce progeny that are, on average, 10 kg heavier at 200 days of age than a bull with a 200 Day Growth EBV of +40 kg (i.e. 20 kg difference between the sire's EBVs, then halved as the sire only contributes half the genetics).





Example: Using EBVs to Benchmark an Animal's Genetics


Relative to the two year old animals analysed in TACE, the example bull would be expected, all other things being equal, to:

 cause more calving difficulty than average when joined to heifers who calve down at 2 years of age (Calving Ease Direct EBV in the bottom 20% or 80th percentile)

 have calves that are heavier than average when weighed as yearlings (400 Day Weight EBV in the heaviest 10% or 10th percentile)

 produce daughters with lower fertility than average (Days to Calving EBVs in the bottom 20% or 80th percentile)

 produce progeny with heavier carcass weights than average (Carcass Weight EBV in the heaviest 10% or 10th percentile)

 produce progeny with higher marbling than average (IMF EBVs in the highest 40% or 40th percentile)

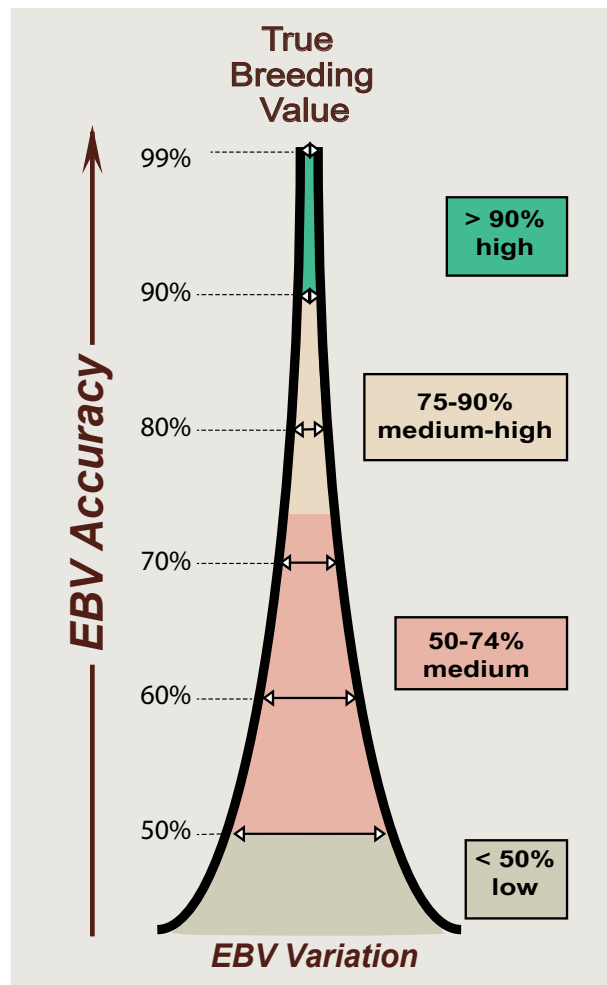
EXAMPLE BULL					
	Calving Ease Dir	400 Day Wt.	Days to Calving	Carcass Wt.	IMF
EBV	-2.4	+88	-2.1	+68	+1.8
Example Breed Av.	-0.1	+75	-3.6	+54	+1.5
EXAMPLE PERCENTILE TABLE					
	Calving Ease Dir	400 Day Wt.	Days to Calving	Carcass Wt.	IMF
1%	+5.1	+99	-7.6	+78	+3.7
10%	+3.3	+88	-5.8	+68	+2.8
20%	+2.3	+84	-5.2	+64	+2.4
30%	+1.5	+81	-4.7	+61	+2.1
40%	+0.8	+78	-4.3	+58	+1.8
50%	+0.1	+76	-3.8	+56	+1.5
60%	-0.6	+73	-3.4	+53	+1.3
70%	-1.4	+70	-2.9	+50	+1.0
80%	-2.4	+67	-2.1	+45	+0.7
90%	-3.9	+61	-0.9	+39	+0.3
99%	-8.1	+46	+2.7	+22	-0.3

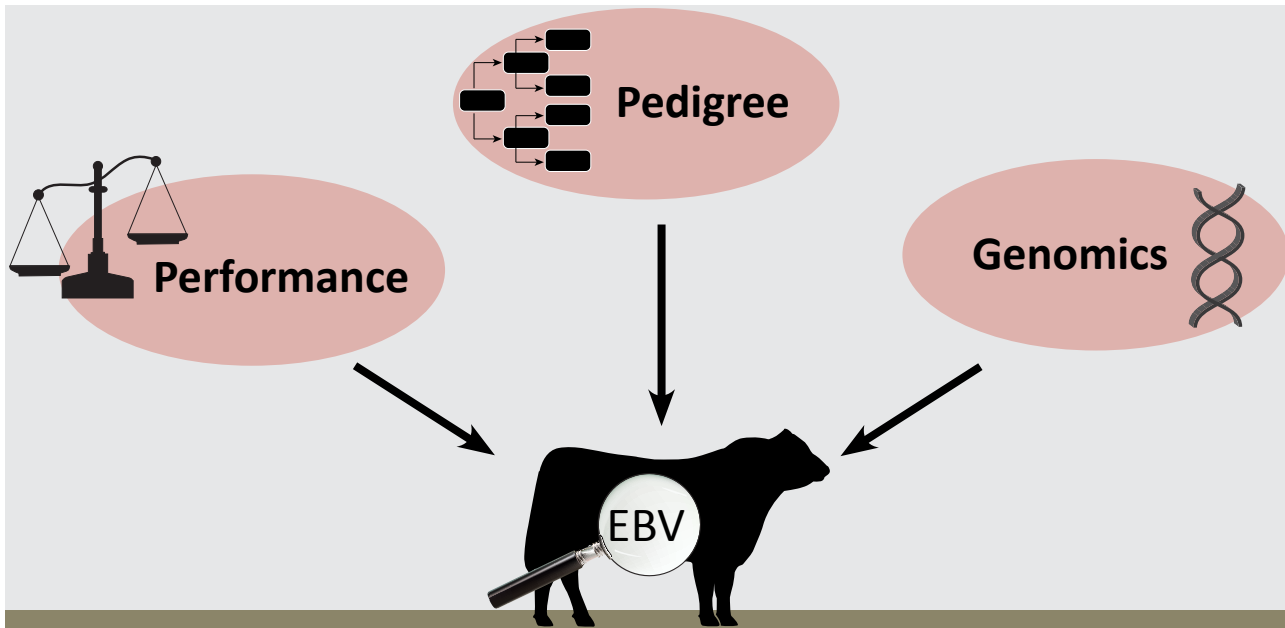
Considering Accuracy

An accuracy value is published in association with each EBV, which is usually displayed as a percentage value immediately below the EBV.

The accuracy value provides an indication of the reliability of the EBV in estimating the animal's genetics (or true breeding value), and is an indication of the amount of information that has been used in the calculation of the EBV.

TACE EBVs with accuracy values below 50% should be considered as preliminary or of low accuracy, 50-74% as of medium accuracy, 75-90% of medium to high accuracy, and 90% or greater as high accuracy.





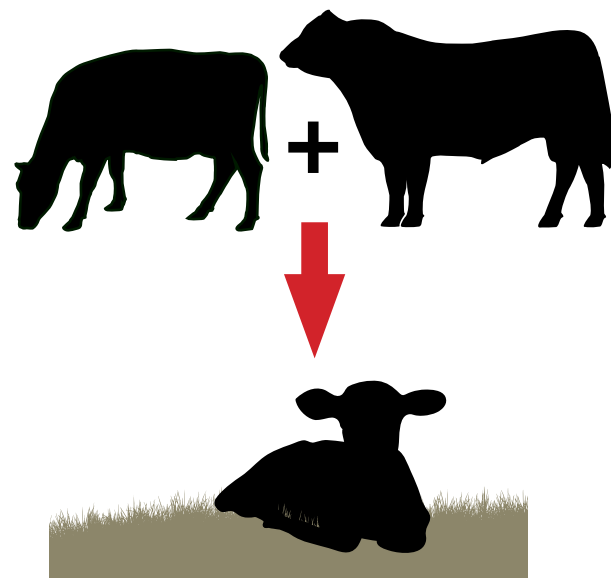
TACE analyses pedigree, performance and genomic information to calculate an estimate of an animal's true genetic merit.

Calving Ease Direct

Calving Ease Direct EBVs are estimates of genetic differences in the ability of a sire's calves to be born unassisted from 2 year old heifers.

Calving Ease Direct EBVs are calculated from calving difficulty scores, birth weights, gestation length records and/or genomic information, and are expressed as differences in the percentage of calves that will be born unassisted.

Higher Calving Ease Direct EBVs indicate an animal is expected to produce fewer calving difficulties in 2 year old heifers (i.e. greater calving ease).



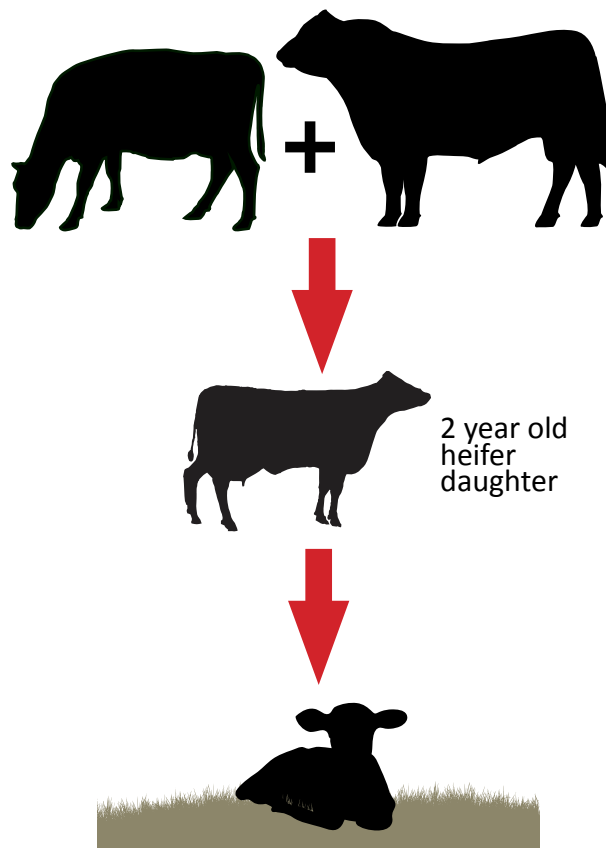
Easy birth for bull's progeny

Calving Ease Daughters

Calving Ease Daughters EBVs are estimates of genetic differences in the ability of a sire's daughters to calve unassisted at 2 years of age.

Calving Ease Daughters EBVs are calculated from calving difficulty scores, birth weights, gestation length records and/or genomic information, and are expressed as differences in the percentage of daughters that will calve unassisted.

Higher Calving Ease Daughters EBVs indicate an animal is expected to produce a higher percentage of daughters who will calve unassisted at 2 years of age.



Easy birth for daughters at 2 years



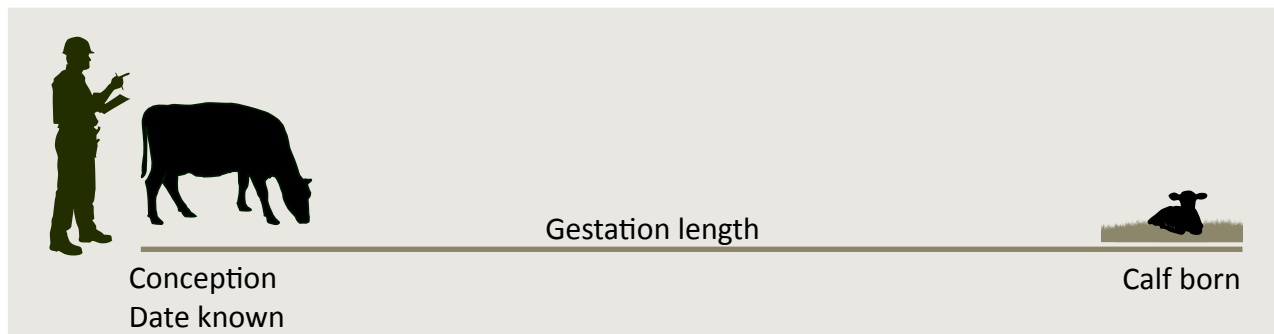


Gestation Length

Gestation Length EBVs are estimates of genetic differences between animals in the length of time from the date of conception to the birth of the calf.

Gestation Length EBVs are calculated from the joining date and date of birth records for calves conceived by either artificial insemination (AI) or hand mating, and/or genomic information, and are expressed in day units.

Lower Gestation Length EBVs indicate an animal is expected to produce calves that are born with a shorter gestation length.



Birth Weight

Birth Weight EBVs are estimates of genetic differences between animals in calf weight at birth.

Birth Weight EBVs are calculated from the weight of animals at birth and/or genomic information, and are expressed in kilogram units.

Lower Birth Weight EBVs indicate the animal is expected to produce progeny with lighter birth weight.



200 Day Growth

200 Day Growth EBVs are estimates of genetic differences between animals in live weight at 200 days of age due to genetics for growth.

200 Day Growth EBVs are calculated from the live weight performance of animals when they are between 80 and 300 days of age, and/or genomic information, and are expressed in kilogram units.

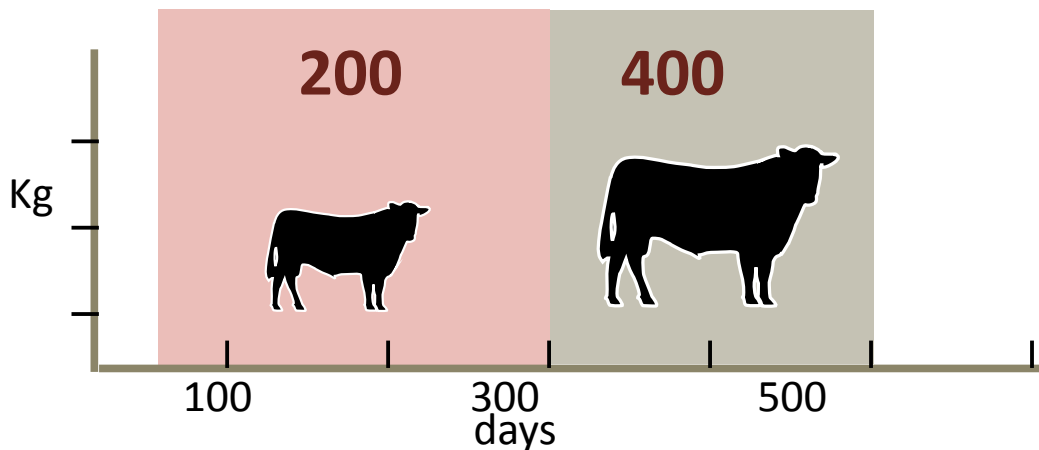
Higher 200 Day Growth EBVs indicate the animal is expected to produce progeny with heavier live weights at 200 days of age.

400 Day Weight

400 Day Weight EBVs are estimates of genetic differences between animals in live weight at 400 days of age.

400 Day Weight EBVs are calculated from the live weight performance of animals when they are between 301 and 500 days of age, and/or genomic information, and are expressed in kilogram units.

Higher 400 Day Weight EBVs indicate the animal is expected to produce progeny with heavier live weights at 400 days of age.

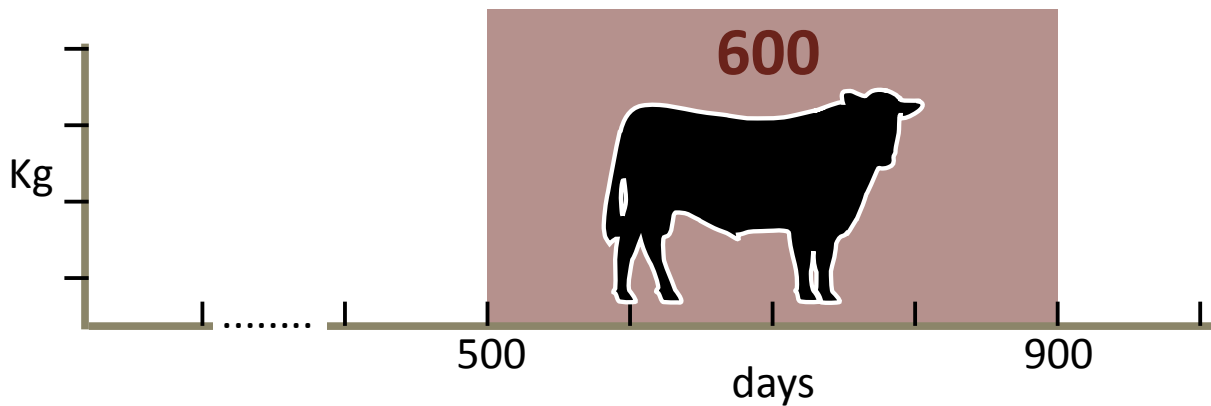


600 Day Weight

600 Day Weight EBVs are estimates of genetic differences between animals in live weight at 600 days of age.

600 Day Weight EBVs are calculated from the live weight performance of animals when they are between 501 and 900 days of age, and/or genomic information, and are expressed in kilogram units.

Higher 600 Day Weight EBVs indicate the animal is expected to produce progeny with heavier live weights at 600 days of age.



Growth

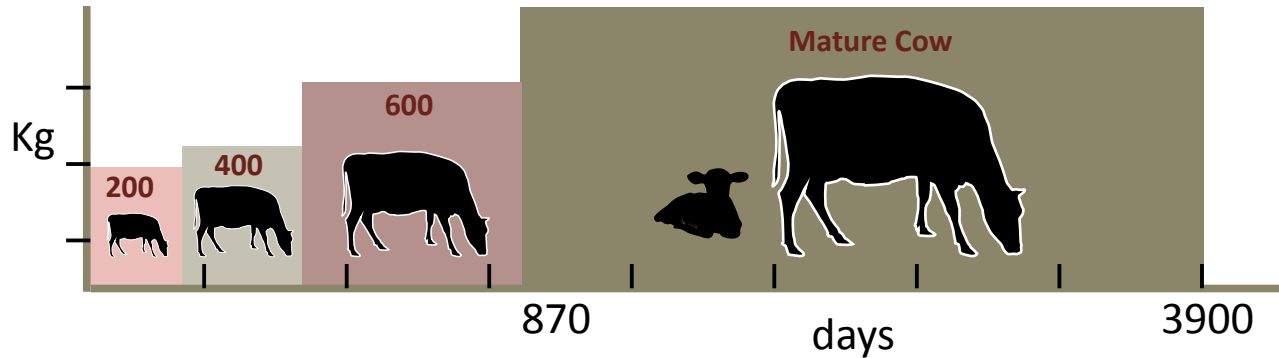


Mature Cow Weight

Mature Cow Weight EBVs are estimates of genetic differences between animals in live weight of cows at 5 years of age.

Mature Cow Weight EBVs are calculated from the live weights of cows when their calves are 200 days of age (i.e. at or around weaning), and/or genomic information, and are expressed in kilogram units.

Higher Mature Cow Weight EBVs indicate the animal is expected to produce daughters with heavier mature weights. Heavier mature weights are associated with higher feed and maintenance costs, but conversely higher returns for cull cows.

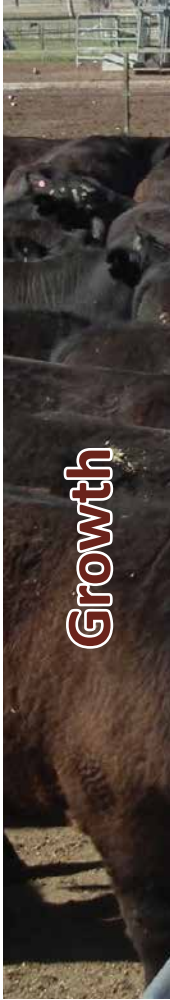


Milk

Milk EBVs are estimates of genetic differences between animals in live weight at 200 days of age due to the maternal contribution of its dam.

Milk EBVs are calculated from the live weights of calves at 200 days of age (i.e. at or around weaning), and/or genomic information, and are expressed in kilogram units.

Higher Milk EBVs indicate the animal is expected to produce daughters that have heavier calves at 200 days of age due to superior maternal attributes (e.g. more milk).

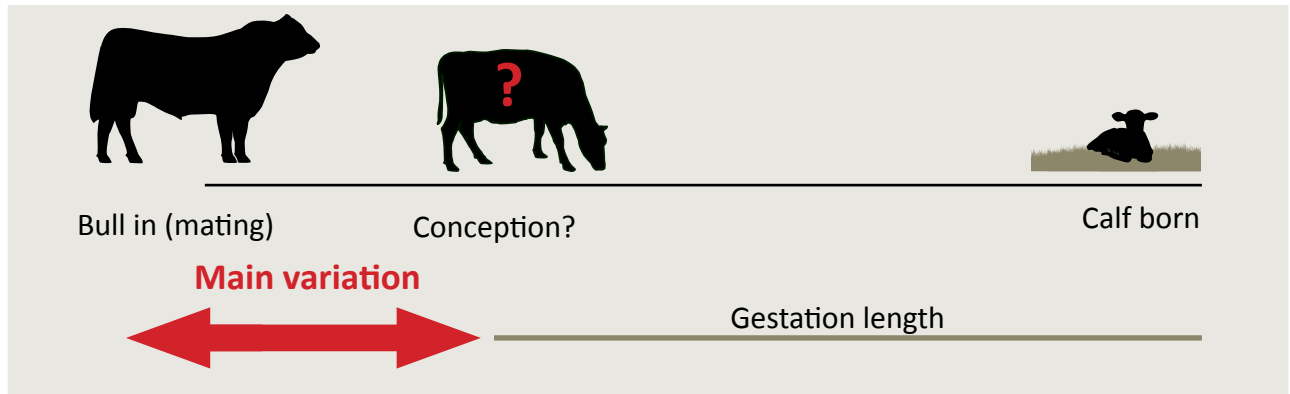


Days to Calving

Days to Calving EBVs are estimates of genetic differences between animals in the time from the start of the joining period (i.e. when the female is introduced to a bull) until subsequent calving.

Days to Calving EBVs are calculated from the joining records submitted for both heifers and cows who have been mated naturally in a paddock situation, and are expressed in day units.

Lower Days to Calving EBVs indicate an animal is expected to produce progeny that conceive earlier in the joining period. Females with lower Days to Calving EBVs also tend to show earlier puberty as heifers and earlier return to oestrous after calving.



Scrotal Size

Scrotal Size EBVs are estimates of genetic differences between animals in scrotal circumference at 400 days of age.

Scrotal Size EBVs are calculated from scrotal circumference measurements of bulls that are between 300 and 700 days of age, and/or genomic information, and are expressed in centimetre units.

Higher Scrotal Size EBVs indicate the animal is expected to produce sons with larger scrotal circumference as yearlings and daughters that reach puberty earlier.



Carcase Weight

Carcase Weight EBVs are estimates of genetic differences between animals in hot standard carcass weight at 750 days of age.

Carcass Weight EBVs are calculated from the hot standard carcass weight of animals between 300 and 1000 days of age, and/or genomic information, and are expressed in kilogram units.

Higher Carcass Weight EBVs indicate the animal is expected to produce progeny with heavier carcass weights.



Eye Muscle Area

Eye Muscle Area (EMA) EBVs are estimates of genetic differences between animals in eye muscle area at the 12/13th rib site in a 400 kg carcass.

EMA EBVs are calculated by measuring the area of the cross section of the longissimus dorsi muscle between the 12 and 13th rib via either live animal ultrasound scanning or direct measurement of carcasses in the abattoir, and/or genomic information. EMA EBVs are expressed in square centimetre units.

Higher EMA EBVs indicate the animal is expected to produce progeny with larger eye muscle area, relative to carcass weight.



Rib Fat

Rib Fat EBVs are estimates of genetic differences between animals in fat depth at the 12/13th rib site in a 400 kg carcasse.

Rib Fat EBVs are calculated by measuring the fat depth at the 12/13th rib site via either live animal ultrasound scanning or direct measurement of carcasses in the abattoir, and/or genomic information. Rib Fat EBVs are expressed in millimetre units.

Higher Rib Fat EBVs indicate the animal is expected to produce progeny with greater fat depth in a 400 kg carcasse.

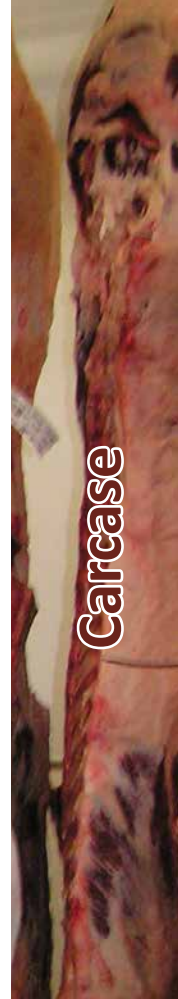


Rump Fat

Rump Fat EBVs are estimates of genetic differences between animals in fat depth at the P8 rump site in a 400 kg carcasse.

Rump Fat EBVs are calculated by measuring the fat depth at the P8 rump site (located at the intersection of the line from the high bone with a line from the inside of the pin bone) via either live animal ultrasound scanning or direct measurement of carcasses in the abattoir, and/or genomic information. Rump Fat EBVs are expressed in millimetre units.

Higher Rump Fat EBVs indicate the animal is expected to produce progeny with greater fat depth in a 400 kg carcasse.



Retail Beef Yield

Retail Beef Yield (RBY) EBVs are estimates of genetic differences between animals in boned out saleable meat from a 400 kg carcasse.

RBY EBVs are calculated by measuring the boned out saleable meat of carcasses in the abattoir, or from known relationships between saleable meat yield and other carcass measurements (e.g. fat depth). RBY EBVs are expressed in percentage units.

Higher RBY EBVs indicate the animal is expected to produce progeny that yield a higher percentage of saleable beef from a 400 kg carcass.

Intramuscular Fat

Intramuscular Fat (IMF) EBVs are estimates of genetic differences between animals in intramuscular fat (marbling) at the 12/13th rib site in a 400 kg carcass.

IMF EBVs are calculated by measuring intramuscular fat in the longissimus dorsi between the 12th and 13th rib via either live animal ultrasound scanning or direct measurement of carcasses in the abattoir, and/or genomic information. IMF EBVs are expressed in percentage units.

Higher IMF EBVs indicate the animal is expected to produce progeny with a higher percentage of intramuscular fat (marbling) in a 400 kg carcass.



© Mountview Butchery, Armadale

Net Feed Intake (Feedlot)

Net Feed Intake (Feedlot) EBVs are estimates of genetic differences between animals in feed intake at a standard weight and rate of weight gain when animals are in a feedlot finishing phase.

NFI-F EBVs are calculated from the differences in the amount of feed consumed by animals in feed efficiency trials where animals are placed in a feedlot while in a finishing phase, and are expressed in kilogram per day units.

Lower NFI-F EBVs indicate the animal is expected to produce progeny that eat less feed per day, relative to their weight and rate of weight gain.



Feed Efficiency

Docility

Docility EBVs are estimates of genetic differences between animals in temperament.

Docility EBVs are calculated from a subjective assessment of temperament when animals are between 60 to 400 days of age and are expressed in percentage units.

Higher Docility EBVs indicate an animal is expected to produce a higher percentage of progeny with acceptable temperament.



Claw Set

Claw Set EBVs (Claw) are estimates of genetic differences in claw set structure.

Claw Set EBVs are calculated from a subjective assessment of claw set on both the front and back feet (shape and evenness of claws), and are expressed in score units.

Lower Claw Set EBVs indicate an animal is expected to produce progeny with more desirable claw structure, being toes that are symmetrical, even and appropriately spaced.



**Desirable
Claw Set**

**Scissor
Claws (SC)**

Lower EBVs

Higher EBVs



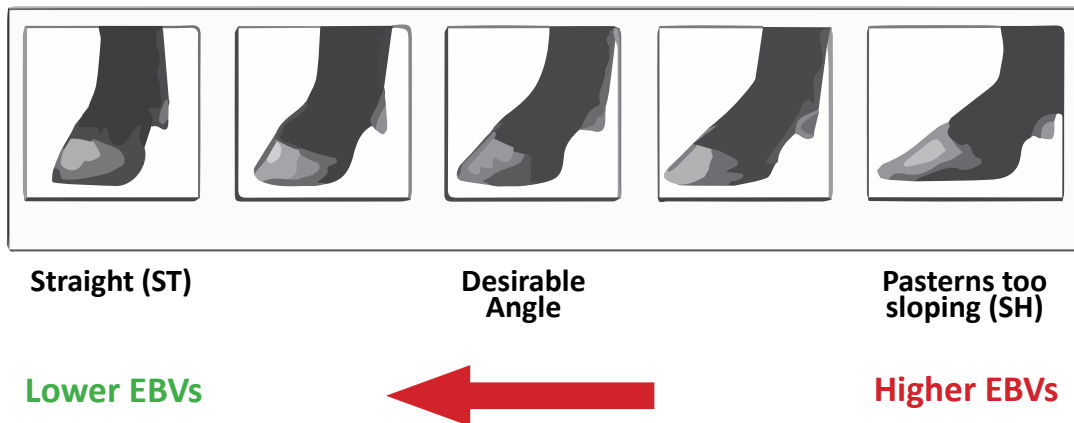
Structure

Foot Angle

Foot Angle EBVs (Angle) are estimates of genetic differences in foot angle.

Foot Angle EBVs are calculated from a subjective assessment of foot angle (strength of pastern, depth of heel), and are expressed in score units.

Lower Foot Angle EBVs indicate an animal is expected to produce progeny with more desirable foot angle, being a 45-degree angle at the pastern joint with appropriate toe length and heel depth.



Angus Selection Indexes

In addition to the EBVs that are published, ten selection indexes are also calculated for animals within the TACE analysis.

Index Name	Abbreviation
Angus Breeding Index	\$A
Domestic Index	\$D
Heavy Grain Index	\$GN
Heavy Grass Index	\$GS
Angus Breeding Low Feed Cost Index	\$A-L
Domestic Low Feed Cost Index	\$D-L
Heavy Grain Low Feed Cost Index	\$GN-L
Heavy Grass Low Feed Cost Index	\$GS-L
AngusPRO Index	\$PRO
Angus Terminal Sire Index	\$T

The selection indexes assist in making “balanced” selection decisions, taking into account the relevant growth, carcase & fertility attributes of each animal to identify animals that are most suitable for use within a particular commercial enterprise.

Selection indexes reflect both the short term profit generated by an animal through the sale of their progeny, and the longer term profit generated by their daughters in a self-replacing cow herd.

Calculation of Selection Indexes

All selection index values have been derived using BreedObject technology, as developed by the Animal Genetics & Breeding Unit (AGBU) in Armidale, NSW.

Selection index values are reported as an EBV, in units of net profit per cow joined (\$) for the given selection scenario.

Selection Index Descriptions

The Angus Breeding and Angus Breeding Low Feed Cost selection indexes are general purpose selection indexes that are suitable for use in the majority of commercial beef operations.

The Domestic, Domestic Low Feed Cost, Heavy Grain, Heavy Grain Low Feed Cost, Heavy Grass, Heavy Grass Low Feed Cost and AngusPRO selection indexes are specific to beef operations targeting a defined market endpoint with their steer progeny.

The Angus Terminal Sire Index is designed for use in situations where Angus bulls are being used as a terminal sire over mature breeding females.

Angus Breeding Index

The Angus Breeding Index estimates the genetic differences between animals in net profitability per cow joined in a typical commercial self replacing herd using Angus bulls.

This selection index is not specific to a particular production system or market end-point, but identifies animals that will improve overall profitability in the majority of commercial grass and grain finishing beef production systems.

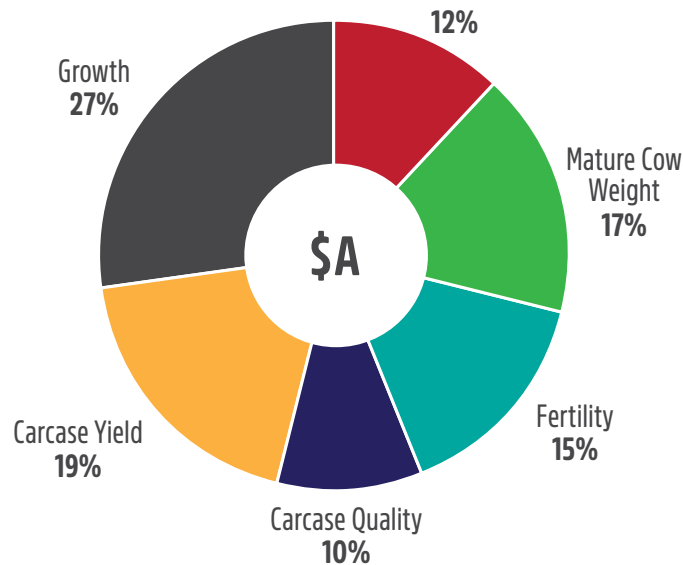
Daughters are retained for breeding and therefore female traits are of importance.

The Angus Breeding index caters for production systems where pasture is fully utilised for the majority of the year and aims to maintain mature cow weight.

The Angus Breeding Index is particularly suited to commercial producers who sell progeny into different markets, or to seedstock producers supplying bulls to commercial clients who produce for a range of different production systems and market end points.

Trait Emphasis

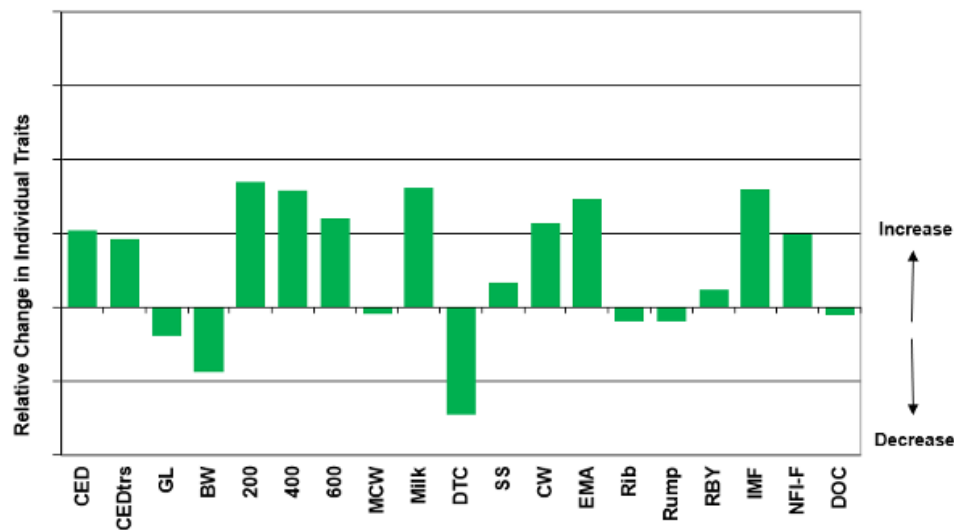
The graph below shows the emphasis that has been placed on each trait group in the Angus Breeding Index.



Selection Advantage

The following shows the indicative change in traits after one generation if producers select animals using the Angus Breeding Index.

Selection Advantage for the Angus Breeding Index



CED	+3.9	%
CEDtrs	+2.9	%
GL	-0.5	days
BW	-0.9	kg
WW	+8	kg
YW	+13	kg
FW	+14	kg
MCW	-1	kg
Milk	+5	kg
DTC	-1.9	days
SS	+0.2	cm
CW	+9	kg
EMA	+2.3	cm ²
Rib	-0.2	mm
Rump	-0.2	mm
RBY	+0.1	%
IMF	+1.0	%
NFI-F	+0.21	kg/day
DOC	-1	%

Angus Breeding Low Feed Cost Index

The Angus Breeding Low Feed Cost Index estimates the genetic differences between animals in net profitability per cow joined in a typical commercial self replacing herd using Angus bulls.

This selection index is not specific to a particular production system or market end-point, but identifies animals that will improve overall profitability in the majority of commercial grass and grain finishing beef production systems.

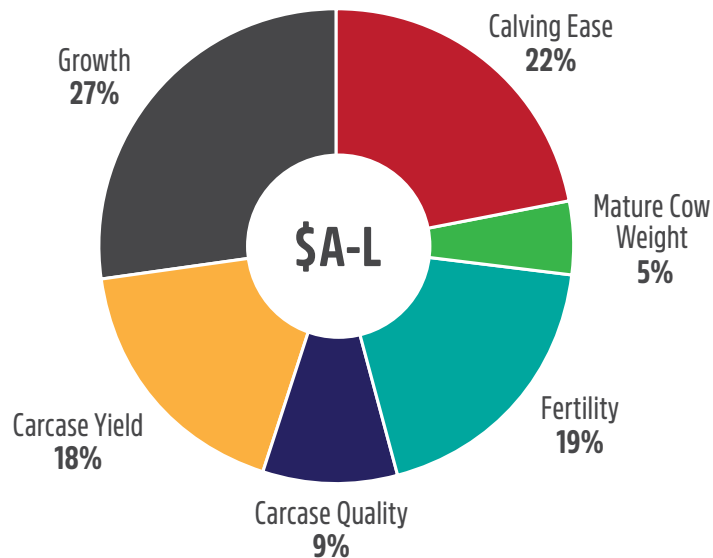
Daughters are retained for breeding and therefore female traits are of importance.

The Angus Breeding Low Feed Cost Index caters for systems where feed is surplus to requirements for the majority of the year, or the cost of supplying additional feed when animal feed requirements increase, via increased pasture production and/or supplementary feeding, is low. The Angus Breeding Low Feed Cost Index does not aim to limit an increase in mature cow weight.

The Angus Breeding Low Feed Cost Index is particularly suited to commercial producers who sell progeny into different markets, or to seedstock producers supplying bulls to commercial clients who produce for a range of different production systems and market end points.

Trait Emphasis

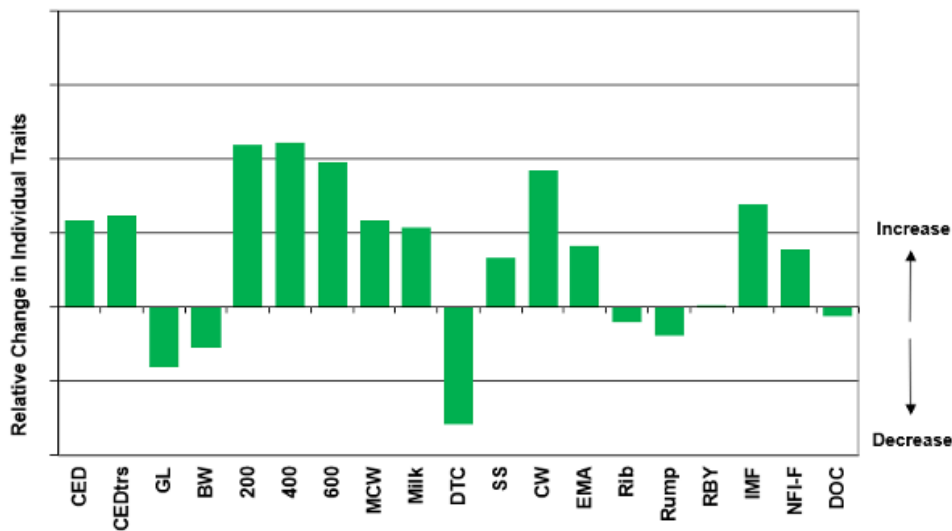
The graph below shows the emphasis that has been placed on each trait group in the Angus Breeding Low Feed Cost Index.



Selection Advantage

The following shows the indicative change in traits after one generation if producers select animals using the Angus Breeding Low Feed Cost Index.

Selection Advantage for the Angus Breeding Low Feed Cost Index



CED	+4.4	%
CEDtrs	+3.9	%
GL	-1.2	days
BW	-0.5	kg
WW	+10	kg
YW	+18	kg
FW	+22	kg
MCW	+16	kg
Milk	+3	kg
DTC	-2.1	days
SS	+0.4	cm
CW	+14	kg
EMA	+1.3	cm ²
Rib	-0.2	mm
Rump	-0.4	mm
RBY	+0.0	%
IMF	+0.9	%
NFI-F	+0.16	kg/day
DOC	-1	%

Selection Advantage

SUMMARY

BIRTH			
Calving Ease Direct	(%)	Genetic differences in the ability of a sire's calves to be born unassisted from 2 year old heifers.	Higher EBVs indicate fewer calving difficulties in 2 year old heifers.
Calving Ease Daughters	(%)	Genetic differences in the ability of a sire's daughters to calve unassisted at 2 years of age.	Higher EBVs indicate fewer calving difficulties in 2 year old heifers.
Gestation Length	days	Genetic differences between animals in the length of time from the date of conception to the birth of the calf.	Lower EBVs indicate shorter gestation length.
Birth Weight	kg	Genetic differences between animals in calf weight at birth.	Lower EBVs indicate lighter birth weight.
GROWTH			
200 Day Growth	kg	Genetic differences between animals in live weight at 200 days of age due to genetics for growth.	Higher EBVs indicate heavier live weight.
400 Day Weight	kg	Genetic differences between animals in live weight at 400 days of age.	Higher EBVs indicate heavier live weight.
600 Day Weight	kg	Genetic differences between animals in live weight at 600 days of age.	Higher EBVs indicate heavier live weight.
Mature Cow Weight	kg	Genetic differences between animals in live weight of cows at 5 years of age.	Higher EBVs indicate heavier mature weight.
Milk	kg	Genetic differences between animals in live weight at 200 days of age due to the maternal contribution of its dam.	Higher EBVs indicate heavier live weight.

FERTILITY

Days to Calving	days	Genetic differences between animals in the time from the start of the joining period (i.e. when the female is introduced to a bull) until subsequent calving.	Lower EBVs indicate shorter time to calving.
Scrotal Size	cm	Genetic differences between animals in scrotal circumference at 400 days of age.	Higher EBVs indicate larger scrotal circumference.

CARCASE

Carcase Weight	kg	Genetic differences between animals in hot standard carcase weight at 750 days of age.	Higher EBVs indicate heavier carcase weight.
Eye Muscle Area	cm ²	Genetic differences between animals in eye muscle area at the 12/13th rib site in a 400 kg carcase.	Higher EBVs indicate larger eye muscle area.
Rib Fat	mm	Genetic differences between animals in fat depth at the 12/13th rib site in a 400 kg carcase.	Higher EBVs indicate more fat.
Rump Fat	mm	Genetic differences between animals in fat depth at the P8 rump site in a 400 kg carcase.	Higher EBVs indicate more fat.
Retail Beef Yield	%	Genetic differences between animals in boned out saleable meat from a 400 kg carcase.	Higher EBVs indicate higher yield.
Intramuscular Fat	%	Genetic differences between animals in intramuscular fat (marbling) at the 12/13th rib site in a 400 kg carcase.	Higher EBVs indicate more intramuscular fat.

FEED EFFICIENCY			
Net Feed Intake (Feedlot)	kg/day	Genetic differences between animals in feed intake at a standard weight and rate of weight gain when animals are in a feedlot finishing phase.	Lower EBVs indicate more feed efficiency.
TEMPERAMENT			
Docility	%	Genetic differences between animals in temperament.	Higher EBVs indicate better temperament.
STRUCTURE			
Claw Set	score	Genetic differences between animals in claw set.	Lower EBVs indicate a more desirable structure.
Foot Angle	score	Genetic differences between animals in foot angle.	Lower EBVs indicate a more desirable structure.

SELECTION INDEXES

Angus Breeding Index (\$A)	\$	Genetic differences between animals in net profitability per cow joined in a typical commercial self replacing herd using Angus bulls. This selection index is not specific to a particular market end-point, but identifies animals that will improve overall net profitability in the majority of commercial, self replacing, grass and grain finishing beef production systems.	Higher selection index values indicate greater profitability.
Angus Breeding Low Feed Cost Index (\$A-L)	\$	<p>Genetic differences between animals in net profitability per cow joined in a typical commercial self replacing herd using Angus bulls. This selection index is not specific to a particular market end-point, but identifies animals that will improve overall net profitability in the majority of commercial, self replacing, grass and grain finishing beef production systems.</p> <p>The \$A-L index is similar to the \$A index but is modelled on a production system where feed is surplus to requirements for the majority of the year, or the cost of supplying additional feed when animal feed requirements increase is low.</p> <p>While the \$A aims to maintain mature cow weight, the \$A-L does not aim to limit the increase in mature cow weight as there is minimal cost incurred if the feed maintenance requirements of the female breeding herd increase as a result of selection decisions.</p>	Higher selection index values indicate greater profitability.

