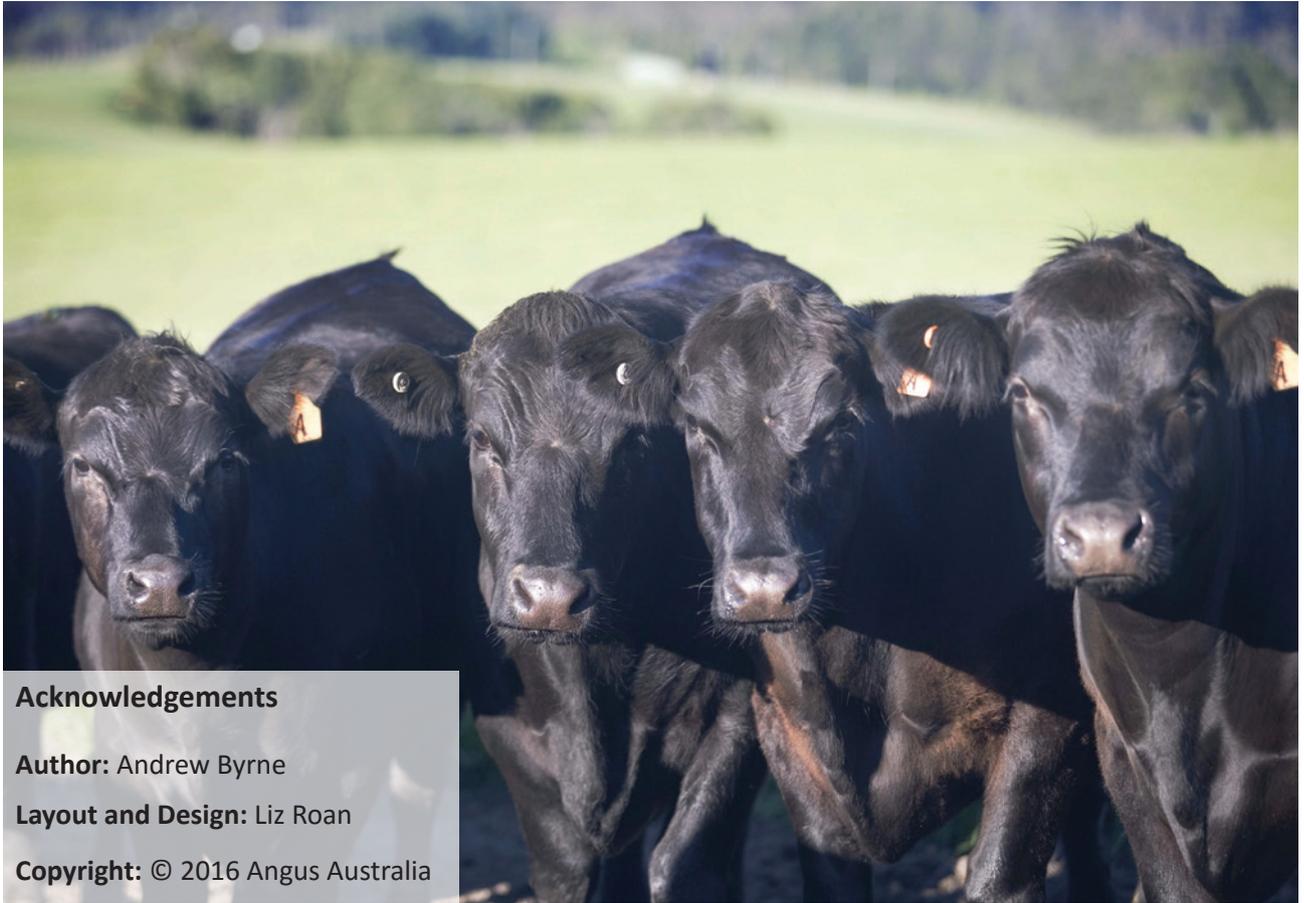


Angus BREEDPLAN

Understanding EBVs and Indexes





Acknowledgements

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What is Angus BREEDPLAN?

Angus BREEDPLAN is the genetic evaluation program adopted by Angus Australia for Angus and Angus influenced beef cattle. Angus BREEDPLAN 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).

Angus BREEDPLAN includes pedigree, performance and genomic information from the Angus Australia and New Zealand Angus Association databases to evaluate the genetics of animals across Australia and New Zealand.

Angus BREEDPLAN analyses are conducted by the Agricultural Business Research Institute (ABRI), using software developed by the Animal Genetics and Breeding Unit (AGBU), a joint institute of NSW Agriculture and the University of New England. Ongoing BREEDPLAN research and development is supported by Meat and Livestock Australia.

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).

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

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

Using EBVs to Compare the Genetics of Two Animals

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

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

Angus BREEDPLAN 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.

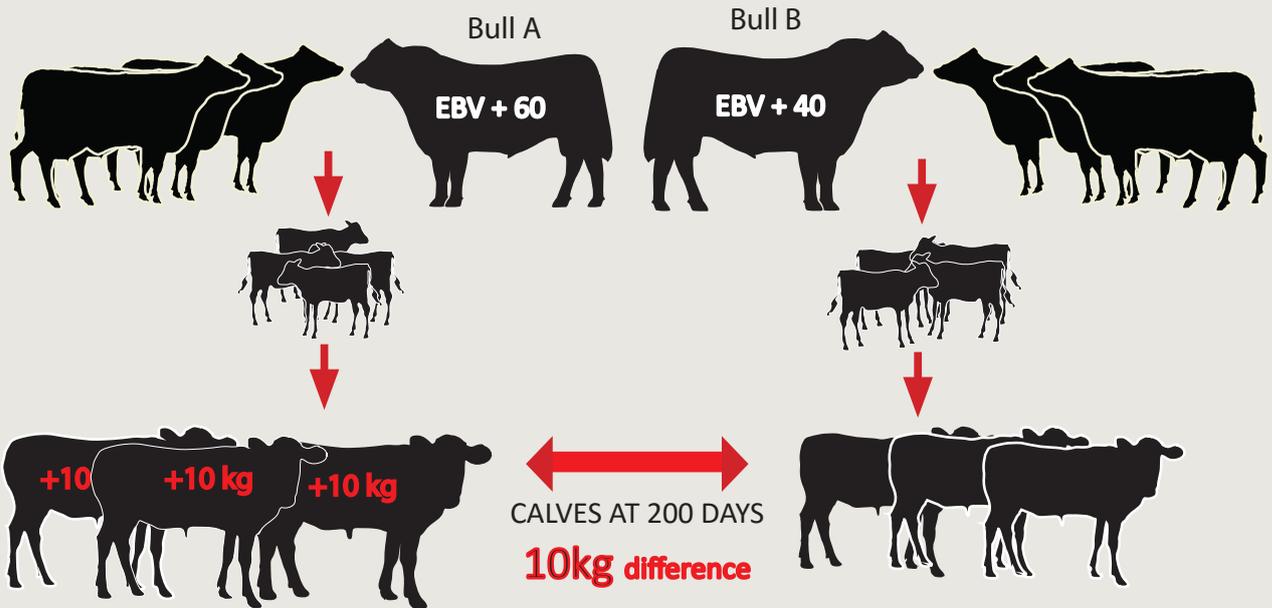
To benchmark an animal's genetics relative to other Angus animals, an animal's EBV can be compared to:

- 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 BREEDPLAN 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 Angus BREEDPLAN, 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)

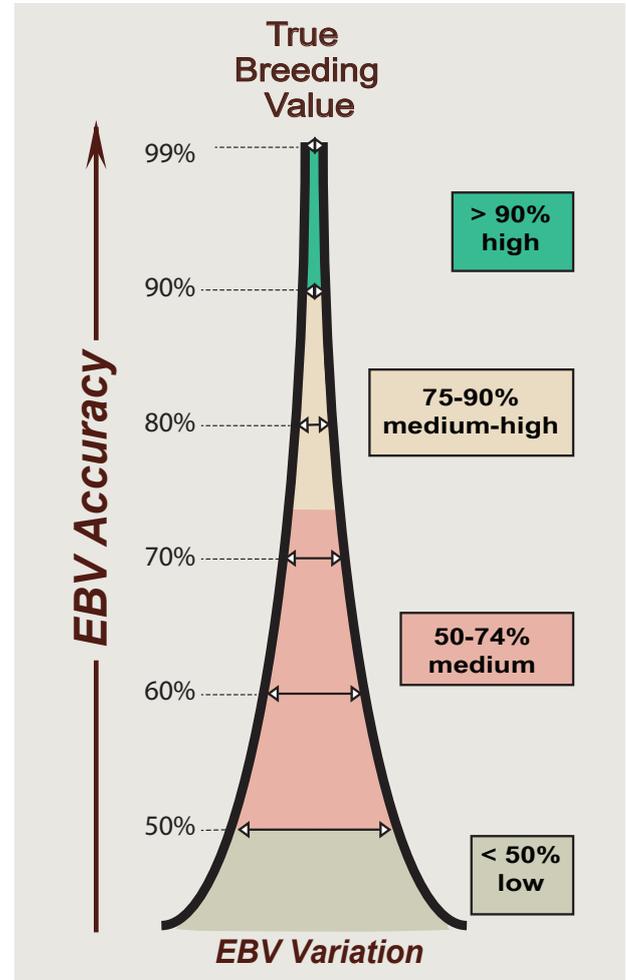
EXAMPLE BULL					
	Calving Ease Dir	400 Day Wt.	Days to Calving	Carcass Wt.	IMF
EBV	-2.4	+88	-2.1	+68	+1.8
Example Breed Av.	-0.1	+75	-3.6	+54	+1.5
EXAMPLE PERCENTILE TABLE					
	Calving Ease Dir	400 Day Wt.	Days to Calving	Carcass Wt.	IMF
1%	+5.1	+99	-7.6	+78	+3.7
10%	+3.3	+88	-5.8	+68	+2.8
20%	+2.3	+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

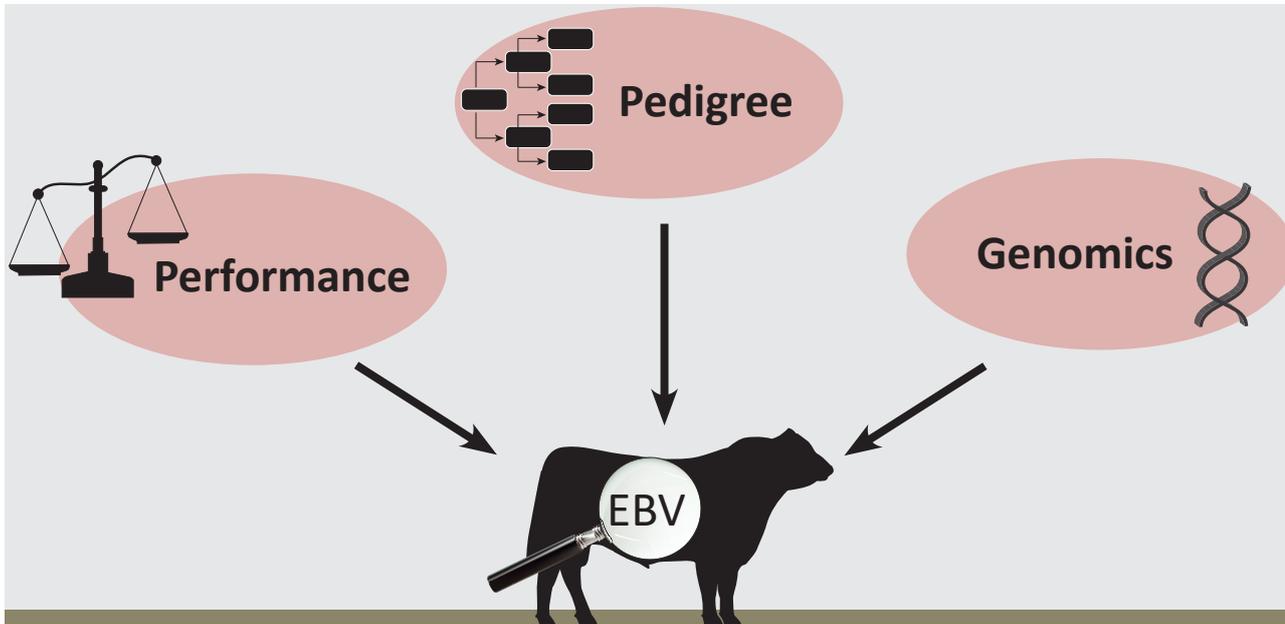
Considering Accuracy

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.

Angus BREEDPLAN 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.





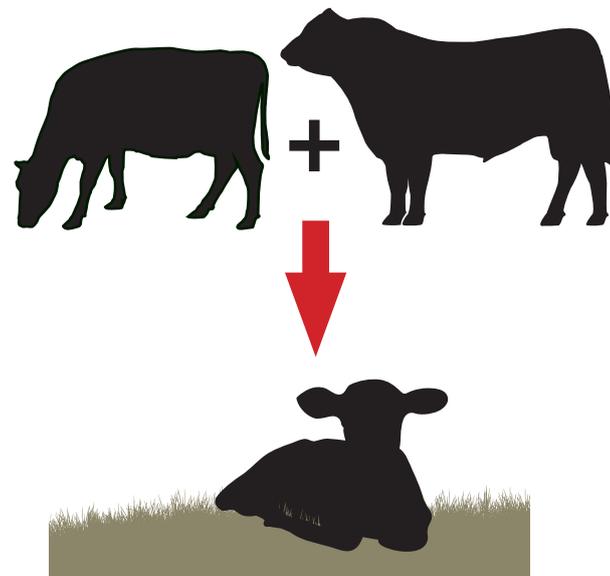
Angus BREEDPLAN analyses pedigree, performance and genomic information to calculate an estimate of an animal's true genetic merit.

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).



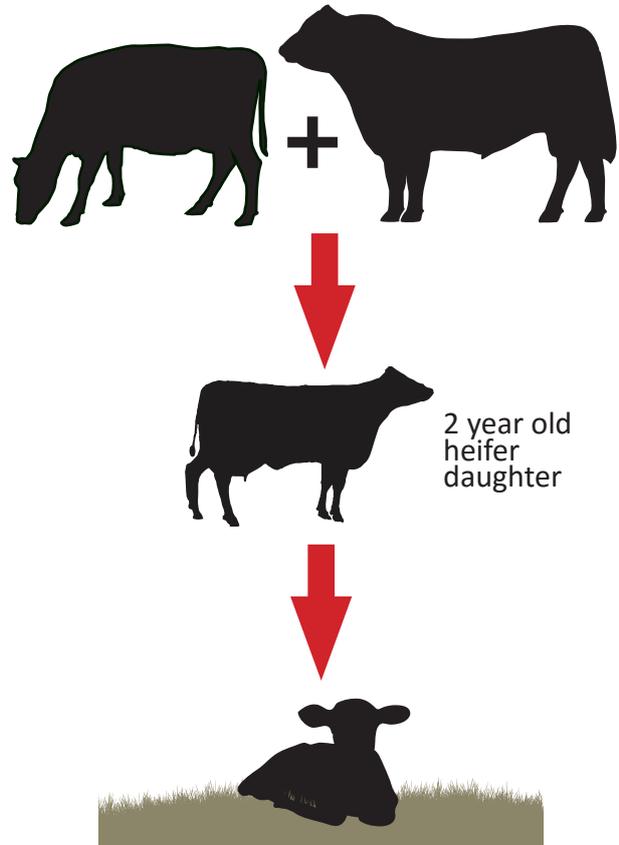
Easy birth for bull's progeny

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.



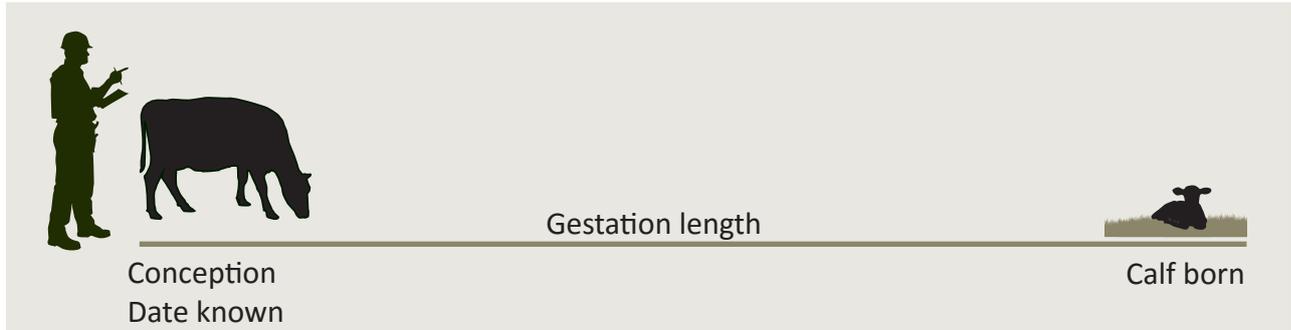


Gestation Length

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.

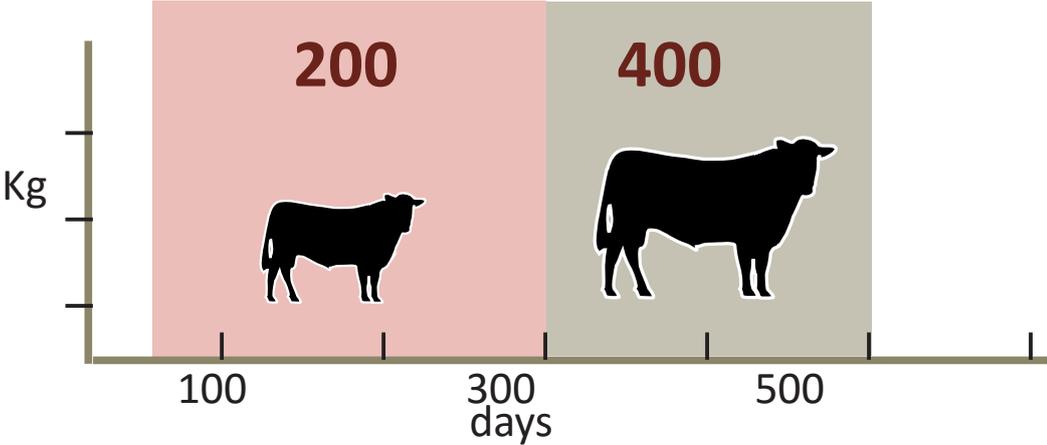
Higher 200 Day Growth EBVs indicate the animal is expected to produce progeny with heavier live weights at 200 days of age.

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.

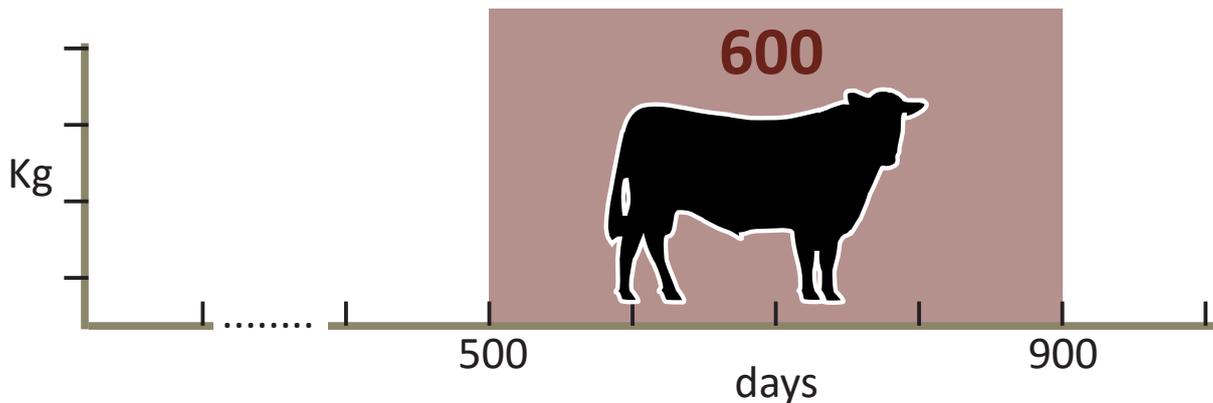


600 Day Weight

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



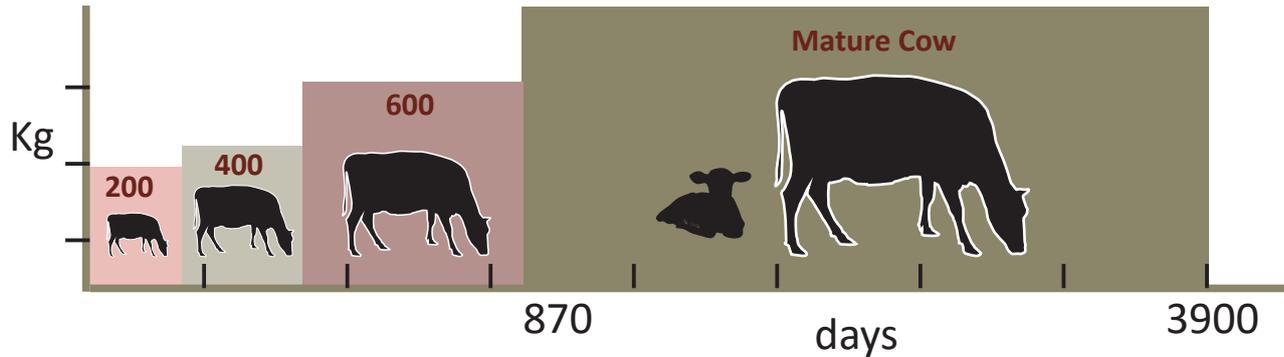
Growth

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.

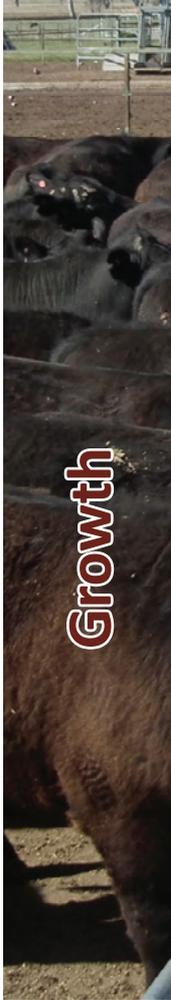


Milk

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).



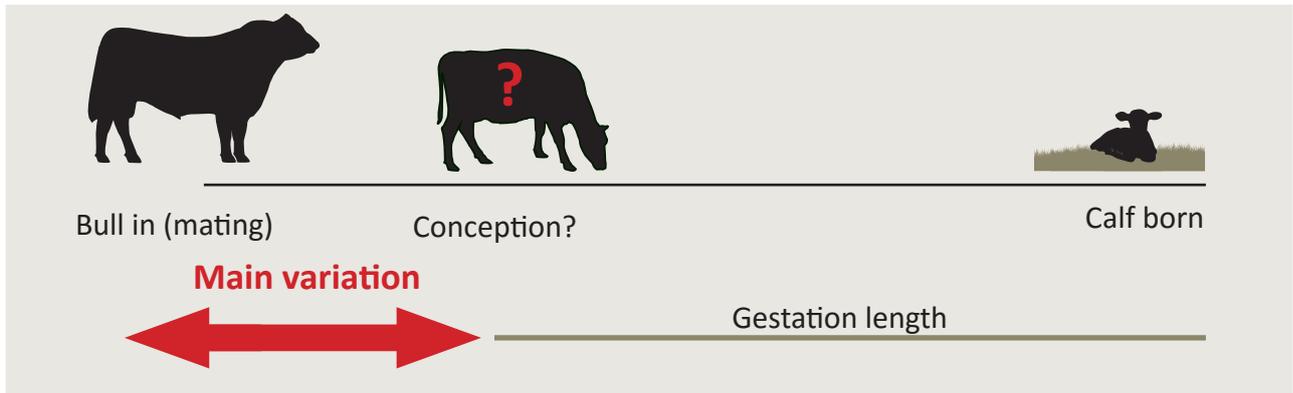


Days to Calving

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 carcase.

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 carcase 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 carcase.

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 carcase.

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 carcase.



© Mountview Butchery, Armadale

Net Feed Intake (Post Weaning)

Net Feed Intake (Post Weaning) 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 growing phase.

NFI-P 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 growing phase, and are expressed in kilogram per day units.

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

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.



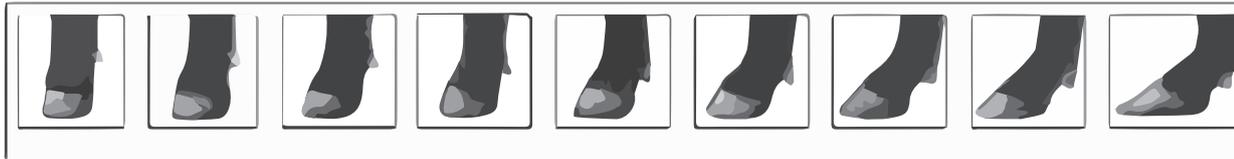
Front & Rear Feet Angle

Front Feet Angle (FA) and Rear Feet Angle (RA) EBVs are estimates of genetic differences between animals in desirable feet angle.

Front Feet and Rear Feet Angle EBVs are calculated from a subjective assessment of feet angle (strength of pastern, depth of heel) by an accredited assessor when animals are less than 750 days of age and are expressed in percentage units.

Higher Front Feet and Rear Feet Angle EBVs indicate an animal is expected to produce a higher percentage of progeny with desirable feet angle.

Low Front Feet and Rear Feet Angle EBVs are published with an additional flag of either "ST", indicating increased probability of progeny with steep feet angle, or "SH", indicating increased probability of progeny with shallow feet angle.



Pasterns too straight (ST)

Lower EBVs

Desirable Angle

Higher EBVs

Pasterns too sloping (SH)

Lower EBVs

Front Feet Claw Set

Front Feet Claw Set (FC) EBVs are estimates of genetic differences between animals in front feet claw set structure.

Front Feet Claw Set EBVs are calculated from a subjective assessment of front feet claw set (shape and evenness of claws) by an accredited assessor when animals are less than 750 days of age and are expressed in percentage units.

Higher Front Feet Claw Set EBVs indicate an animal is expected to produce a higher percentage of progeny with desirable front feet claw structure.

Low Front Feet Claw Set EBVs are published with an additional flag of either “OD”, indicating increased probability of progeny with open divergent claws, or “SC”, indicating increased probability of progeny with scissor claws.



**Divergent
Claws (OD)**

**Desirable
Claw Set**

**Scissor
Claws (SC)**

Lower EBVs



**Higher
EBVs**



Lower EBVs

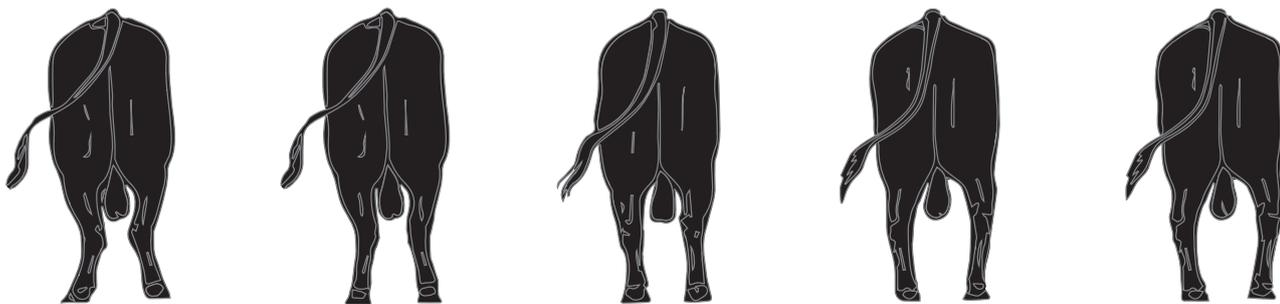
Rear Leg Hind View

Rear Leg Hind View (RH) EBVs are estimates of genetic differences between animals in rear leg structure when viewed from behind.

Rear Leg Hind View EBVs are calculated from a subjective assessment of rear leg structure when viewed from behind by an accredited assessor when animals are less than 750 days of age and are expressed in percentage units.

Higher Rear Leg Hind View EBVs indicate an animal is expected to produce a higher percentage of progeny with desirable rear leg structure.

Low Rear Leg Hind View EBVs are published with an additional flag of either “BL”, indicating increased probability of bow legged progeny, or “CH”, indicating increased probability of cow hocked progeny.



Cow hocked(CH)

Lower EBVs



Higher EBVs



Bow legged(BL)

Lower EBVs

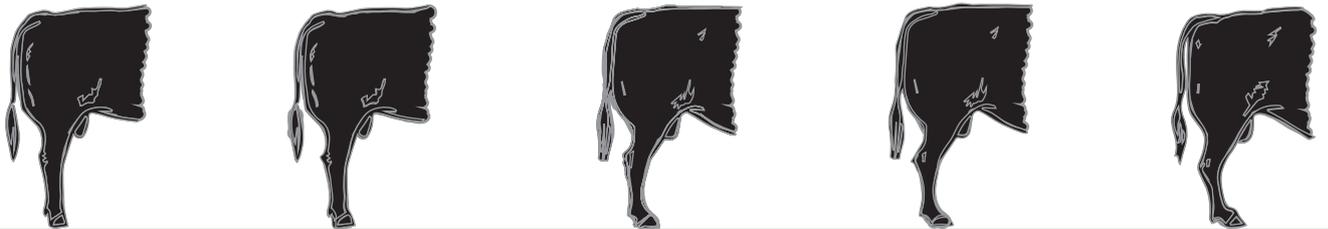
Rear Leg Side View

Rear Leg Side View (RS) EBVs are estimates of genetic differences between animals in rear leg structure when viewed from the side.

Rear Leg Side View EBVs are calculated from a subjective assessment of rear leg structure when viewed from the side by an accredited assessor when animals are less than 750 days of age and are expressed in percentage units.

Higher Rear Leg Side View EBVs indicate an animal is expected to produce a higher percentage of progeny with desirable rear leg structure.

Low Rear Leg Side View EBVs are published with an additional flag of either “SR”, indicating increased probability of straight legged progeny, or “SI”, indicating increased probability of sickle hocked progeny.



**Straight
Legged (SR)**

**Correct
Leg Angle**

**Sickle
hocked (SI)**

Lower EBVs



**Higher
EBVs**



Lower EBVs

Angus Selection Indexes

In addition to the EBVs that are published, four selection indexes are also calculated for animals within the Angus BREEDPLAN analysis.

- Angus Breeding Index
- Domestic Index
- Heavy Grain Index
- Heavy Grass Index

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 Index is a general purpose selection index that is suitable for use in the majority of commercial beef operations, whereas the Domestic, Heavy Grain and Heavy Grass selection indexes are specific to beef operations targeting a defined production system and market endpoint.



Angus Breeding Index

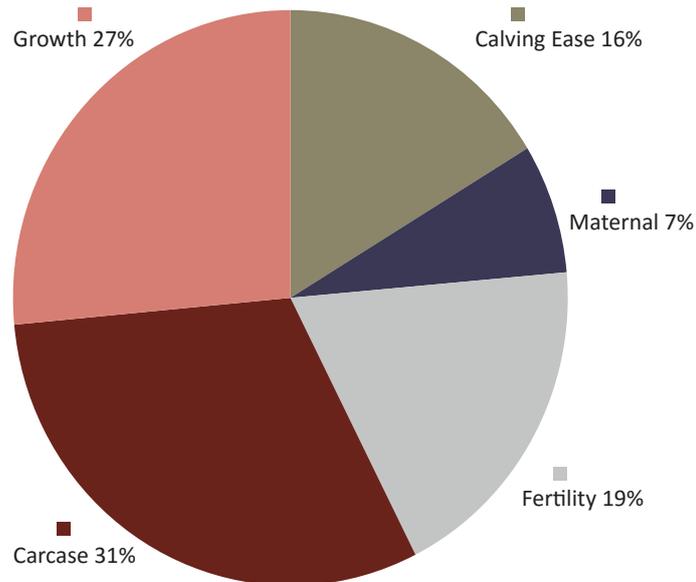
The Angus Breeding Index estimates the genetic differences between animals in net profitability per cow joined in a typical commercial self replacing herd using Angus bulls.

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.

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.



Indicative Response to Selection

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

Trait Group	Trait	Response
Calving	Calving Ease Direct	+0.9%
	Calving Ease Dtrs	+1.1%
Ease	Birth Weight	-0.2 kg
	Gestation Length	-0.8 days
Growth	200 Day Growth	+3 kg
	400 Day Weight	+6 kg
	600 Day Weight	+8 kg
Maternal	Mature Cow Weight	+5 kg
	200 Day Milk	+2 kg
Fertility	Scrotal Size	+0.4 cm
	Days to Calving	-1.0 days
Carcase	Carcase Weight	+3 kg
	Eye Muscle Area	+1.0 cm ²
	Rib Fat	+0.1 mm
	Rump Fat	+0.1 mm
	Retail Beef Yield	+0.1%
	Intramuscular Fat	+0.5%
TOTAL	Angus Breeding Index	\$19 / cow joined



The indicative response reflects the change if the Angus Published Sires (at the November 2014 Angus GROUP BREEDPLAN analysis) were ranked on this selection index and the Top 10% selected for use within a breeding program. The response will differ if a different group of animals was available for selection and/or a different selection intensity was applied.

Domestic Index

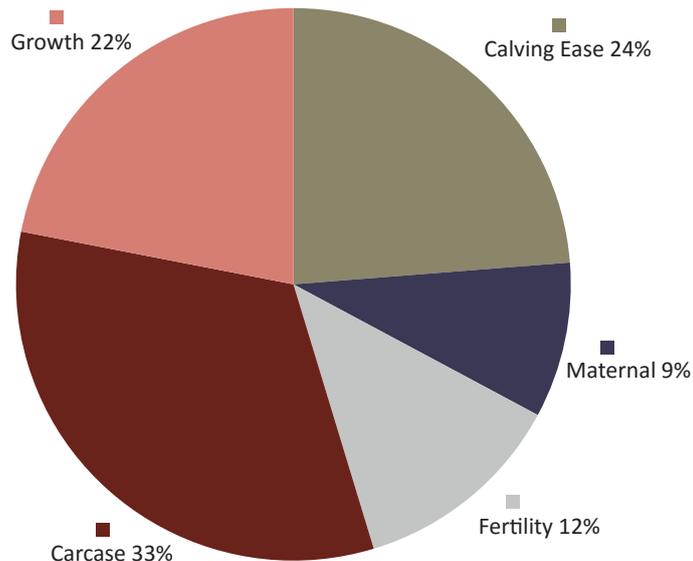
The Domestic Index estimates the genetic differences between animals in net profitability per cow joined in a commercial self replacing herd targeting the domestic supermarket trade.

Steers are assumed to be finished using either grass, grass supplemented by grain or grain (eg. 50 – 70 days) with steers slaughtered at 490 kg live weight (270 kg carcasse weight with 12 mm P8 fat depth) at 16 months of age.

Daughters are retained for breeding and therefore maternal traits are of importance. Emphasis has been placed on eating quality and tenderness to favour animals that are suited to MSA requirements.

Trait Emphasis

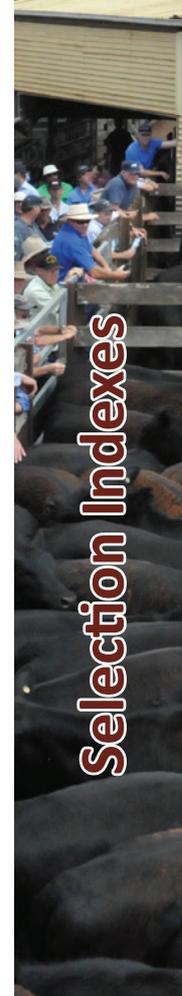
The graph below shows the emphasis that has been placed on each trait group in the Domestic Index.



Indicative Response to Selection

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

Trait Group	Trait	Response
Calving	Calving Ease Direct	+1.1%
	Calving Ease Dtrs	+1.3%
Ease	Birth Weight	-0.4 kg
	Gestation Length	-0.8 days
Growth	200 Day Growth	+3 kg
	400 Day Weight	+6 kg
	600 Day Weight	+6 kg
Maternal	Mature Cow Weight	+1 kg
	200 Day Milk	+2 kg
Fertility	Scrotal Size	+0.3 cm
	Days to Calving	-0.8 days
Carcase	Carcase Weight	+4 kg
	Eye Muscle Area	+1.4 cm ²
	Rib Fat	+0.1 mm
	Rump Fat	+0.1 mm
	Retail Beef Yield	+0.2%
	Intramuscular Fat	+0.4%
TOTAL	Domestic Index	\$12 / cow joined



The indicative response reflects the change if the Angus Published Sires (at the November 2014 Angus GROUP BREEDPLAN analysis) were ranked on this selection index and the Top 10% selected for use within a breeding program. The response will differ if a different group of animals was available for selection and/or a different selection intensity was applied.



Heavy Grain Index

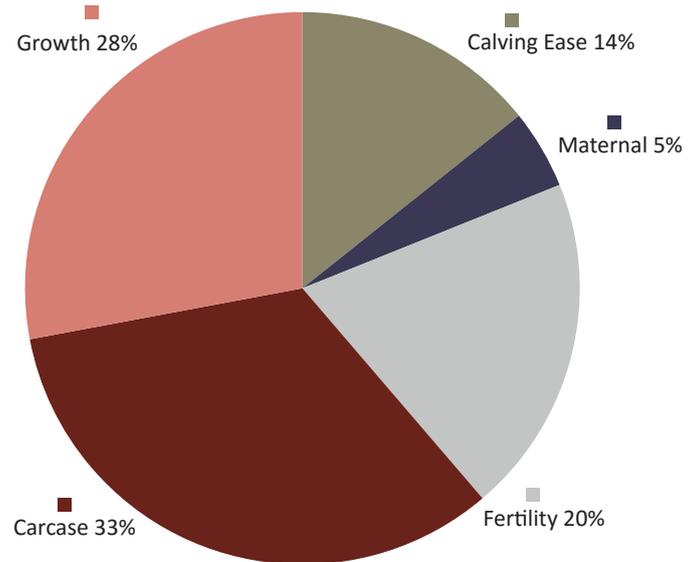
The Heavy Grain Index estimates the genetic differences between animals in net profitability per cow joined in a commercial self replacing herd targeting pasture grown steers with a 200 day feedlot finishing period for the grain fed high quality, highly marbled markets.

Steers are assumed to be slaughtered at 760 kg live weight (420 kg carcass weight with 30 mm P8 fat depth) at 24 months of age.

Daughters are retained for breeding and therefore maternal traits are of importance. There is a significant premium for steers that exhibit superior marbling.

Trait Emphasis

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



Indicative Response to Selection

The following table shows the indicative change in traits after one generation if producers select animals using the Heavy Grain Index.

Trait Group	Trait	Response
Calving Ease	Calving Ease Direct	+0.7%
	Calving Ease Dtrs	+0.9%
Ease	Birth Weight	-0.1 kg
	Gestation Length	-0.6 days
Growth	200 Day Growth	+2 kg
	400 Day Weight	+5 kg
	600 Day Weight	+6 kg
Maternal	Mature Cow Weight	+4 kg
	200 Day Milk	+2 kg
Fertility	Scrotal Size	+0.3 cm
	Days to Calving	-0.9 days
Carcase	Carcase Weight	+2 kg
	Eye Muscle Area	+1.0 cm ²
	Rib Fat	+0.1 mm
	Rump Fat	+0.0 mm
	Retail Beef Yield	+0.0%
	Intramuscular Fat	+0.7%
TOTAL	Heavy Grain Index	\$27 / cow joined



Selection Indexes

The indicative response reflects the change if the Angus Published Sires (at the November 2014 Angus GROUP BREEDPLAN analysis) were ranked on this selection index and the Top 10% selected for use within a breeding program. The response will differ if a different group of animals was available for selection and/or a different selection intensity was applied.



Heavy Grass Index

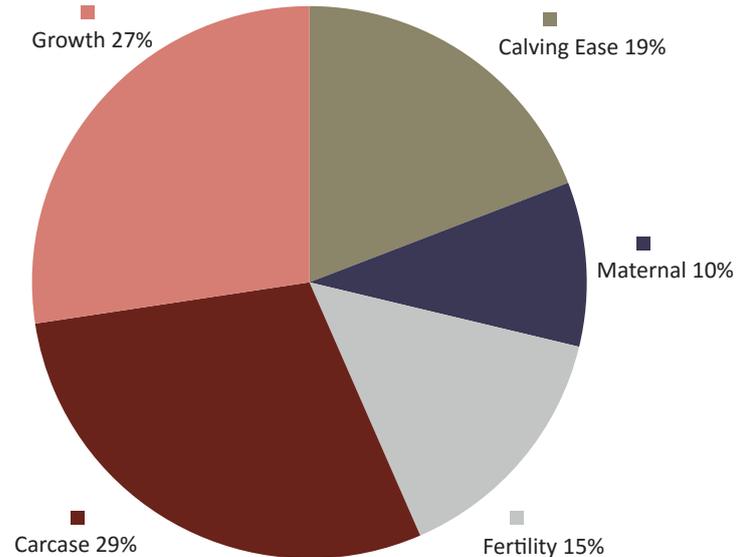
The Heavy Grass Index estimates the genetic differences between animals in net profitability per cow joined in a commercial self replacing herd targeting pasture finished steers.

Steers are assumed to be slaughtered at 620 kg live weight (340 kg carcass weight with 12 mm P8 fat depth) at 22 months of age.

Daughters are retained for breeding and therefore maternal traits are of importance. Emphasis has been placed on eating quality and tenderness to favour animals that are suited to MSA requirements.

Trait Emphasis

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



Indicative Response to Selection

The following table shows the indicative change in traits after one generation if producers select animals using the Heavy Grass Index.

Trait Group	Trait	Response
Calving	Calving Ease Direct	+0.9%
	Calving Ease Dtrs	+1.2%
Ease	Birth Weight	-0.1 kg
	Gestation Length	-0.9 days
Growth	200 Day Growth	+4 kg
	400 Day Weight	+7 kg
	600 Day Weight	+9 kg
Maternal	Mature Cow Weight	+5 kg
	200 Day Milk	+2 kg
Fertility	Scrotal Size	+0.3 cm
	Days to Calving	-0.8 days
Carcase	Carcase Weight	+5 kg
	Eye Muscle Area	+1.1 cm ²
	Rib Fat	+0.2 mm
	Rump Fat	+0.2 mm
	Retail Beef Yield	+0.2%
	Intramuscular Fat	+0.3%
TOTAL	Heavy Grass Index	\$15 / cow joined



The indicative response reflects the change if the Angus Published Sires (at the November 2014 Angus GROUP BREEDPLAN analysis) were ranked on this selection index and the Top 10% selected for use within a breeding program. The response will differ if a different group of animals was available for selection and/or a different selection intensity was applied.

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	kg	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 carcass weight at 750 days of age.	Higher EBVs indicate heavier carcass weight.
Eye Muscle Area	cm ²	Genetic differences between animals in eye muscle area at the 12/13th rib site in a 400 kg carcass.	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 carcass.	Higher EBVs indicate more fat.
Rump Fat	mm	Genetic differences between animals in fat depth at the P8 rump site in a 400 kg carcass.	Higher EBVs indicate more fat.
Retail Beef Yield	%	Genetic differences between animals in boned out saleable meat from a 400 kg carcass.	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 carcass.	Higher EBVs indicate more intramuscular fat.

FEED EFFICIENCY

Net Feed Intake (Post Weaning)	kg/day	Genetic differences between animals in feed intake at a standard weight and rate of weight gain when animals are in a growing phase.	Lower EBVs indicate more 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.
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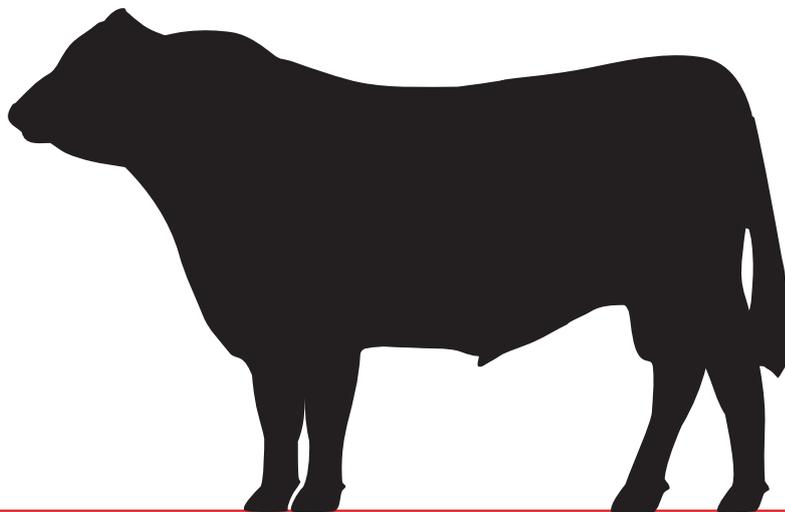
STRUCTURE

Front Feet Angle	%	Genetic differences between animals in desirable front feet angle (strength of pastern, depth of heel).	Higher EBVs indicate more desirable structure.
Front Feet Claw Set	%	Genetic differences between animals in desirable front feet claw set structure (shape and evenness of claw).	Higher EBVs indicate more desirable structure.
Rear Feet Angle	%	Genetic differences between animals in desirable rear feet angle (strength of pastern, depth of heel).	Higher EBVs indicate more desirable structure.
Rear Leg Hind View	%	Genetic differences between animals in desirable rear leg structure when viewed from behind.	Higher EBVs indicate more desirable structure.
Rear Leg Side View	%	Genetic differences between animals in desirable rear leg structure when viewed from the side.	Higher EBVs indicate more desirable structure.

SELECTION INDEXES

Angus Breeding Index	\$	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.	Higher selection index values indicate greater profitability.
Domestic Index	\$	Genetic differences between animals in net profitability per cow joined in a commercial self replacing herd targeting the domestic supermarket trade.	Higher selection index values indicate greater profitability.
Heavy Grain Index	\$	Genetic differences between animals in net profitability per cow joined in a commercial self replacing herd targeting pasture grown steers with a 200 day feedlot finishing period for the grain fed high quality, highly marbled markets.	Higher selection index values indicate greater profitability.
Heavy Grass Index	\$	Genetic differences between animals in net profitability per cow joined in a commercial self replacing herd targeting pasture finished steers.	Higher selection index values indicate greater profitability.





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