

# Better Bull Selection Decisions Using Selection Indexes

The major influence that beef producers have on the genetics of their herd is through the bulls that they select for use within their breeding program. Selecting bulls with the best genetic package for their operation represents a powerful opportunity to significantly improve the future profitability of their beef enterprise.

The bulls selected not only have a large influence on the performance of the calves produced by the enterprise in the following few years, but in self-replacing operations, their daughters influence the performance of the herd for many years to come. In effect, 87.5% of the genetic composition of the calves produced is determined by the sires used in the past 3 generations.

Importantly, beef producers have a range of information to assist them with bull selection and purchase decisions. One such piece of information are selection index values.

Selection indexes are utilised by livestock breeders around the world and across many species and aid in the selection of animals for use within a breeding program where there are multiple traits of economic or functional importance. Selection indexes provide an overall “score” of an animal’s genetic value for a specific purpose and are calculated based on weightings placed on individual traits that are deemed to be important for that purpose. Selection indexes assist beef producers in making “balanced” selection decisions, taking into account the relevant growth, carcass & fertility attributes of each bull to identify the animal that is most profitable for their particular commercial enterprise. Selection indexes reflect both the short-term profit generated by a bull through the sale of his progeny, and the longer-term profit generated by his daughters in a self-replacing cow herd.

In the Australian beef industry, selection indexes are now calculated for animals within all the major breeds and are designed to cater for the commercial market production systems of general relevance in each respective breed. The selection indexes that are calculated for Australian animals are generated using a software package called BreedObject which has been developed at the Animal Genetics and Breeding Unit (AGBU) in Armidale. BreedObject combines the BREEDPLAN EBVs for an animal with an economic weighting (based on costs of production and returns on outputs), to produce a single value of an animal’s overall genetic value. Different selection index values are calculated for the same animal for different production systems and market end points.

## Using Selection Indexes in Bull Selection

Incorporating selection index information into bull selection decisions should be an important consideration for all beef producers. One such strategy of utilising selection index information in selection decisions would be to complete the following steps:

- (i) Identify the selection index of most relevance
- (ii) Rank animals on the selection index
- (iii) Consider the individual EBVs of importance
- (iv) Consider other selection criteria of importance

### 1. Identify the Selection Index of Most Relevance

The first step when using selection indexes is to identify the index that is of most relevance to the particular production system in which the animal is going to be used. For seedstock producers, this may be the production system of their bull buying clients.

The following selection indexes are now calculated for animals in each respective breed:

BREED	NO.	SELECTION INDEXES
Angus	4	Long Fed/CAAB, Heavy Grass Fed Steer, Short Fed Domestic, Terminal
Hereford	4	Supermarket, Grass Fed Steer, Grain Fed Steer, EU
Shorthorn	3	Domestic Maternal, Export Maternal, Northern Maternal
Limousin	4	Domestic Terminal, Self Replacing, Heavy Steer Terminal, Vealer Terminal
Red Angus	3	Supermarket, Vealer, Northern Steer
Charolais	3	Domestic, Export, Northern Terminal
Murray Grey	3	Supermarket, Long Fed Export, Heavy Grass Fed
Simmental	4	Domestic Maternal, Export Maternal, Northern Terminal, Vealer Terminal
South Devon	3	Vealer, Supermarket, Export Maternal
Santa Gertrudis	2	Domestic Production, Export Production
Belmonts	2	Domestic Steer, Export Steer
Brahman	2	Jap Ox, Live Export
Brangus	2	Domestic Steer, Export Steer
Wagyu	1	Fullblood Feedlot

Further information regarding each of these indexes is available from the Tip Sheets page in the Technical area of the BREEDPLAN website (<http://breedplan.une.edu.au>). From the home page, click “Technical” then “BREEDPLAN Tip Sheets” and scroll down to the section titled “Interpreting Australian Selection Indexes”. Within this area, further details are provided such as the relative emphasis that is being placed on each EBV in the calculation of the different selection indexes, and the expected change in each individual trait if animals are selected based on the different selection indexes.

If the standard selection indexes are not relevant to their operation, beef producers also have the ability to develop a customised index using herd-specific production information and marketing goals. Further information regarding the development of customised indexes can be found on the BreedObject website ([www.breedobject.com](http://www.breedobject.com)).

Identifying the selection index of most relevance to the production system that the bulls will be used in is of utmost importance. Using the wrong selection index will potentially compromise any subsequent selection decisions that are made.

## 2. Rank Animals on Selection Index

Once the selection index of most relevance has been identified, the bulls available for selection should then be ranked on that particular selection index. An example of this is illustrated in Figure 1, where a group of sires within the Hereford breed have been ranked in descending order on the Supermarket index.

When ranking bulls on a selection index, producers should note:

- Selection indexes cannot be used to rank animals across breeds. As with EBVs, the selection indexes for animals of different breeds are calculated in different evaluations and consequently, selection indexes can only be used to compare bulls with other animals of the same breed.
- Producers can use selection indexes to see where a bull ranks compared to other animals of the same breed by comparing its selection index value to the current breed average value and to the percentile table. For example in the below comparison, the breed average value listed at the bottom of the table of +65 indicates that all sires are expected to have genetics that are more profitable than

Name/ID	Calv. Ease Direct (%)	Calv. Ease Dtrs (%)	Gest. Len. (days)	Birth Wt. (kg)	200 Day Wt. (kg)	400 Day Wt. (kg)	600 Day Wt. (kg)	Mat. Cow Wt. (kg)	Milk (kg)	Scrotal Size (cm)	Days to Calv.	Carcass Wt. (kg)	Eye Muscle Area (sq.cm)	Rib Fat (mm)	Rump Fat (mm)	Retail Beef Yield (%)	IMF %	Supermarket Index (\$)
ARQO HUSTLER 4110 (IMP) (P)	+3.4	+2.2	-1.2	+3.6	+36	+66	+97	+95	+10	+3.4	-5.2	+74	+5.1	+0.4	+0.5	+1.5	+0.4	+\$ 121
INJEMIRA ADVANCE Y203 (H)	+2.6	+2.2	-0.6	+3.3	+33	+63	+94	+80	+30	+3.3	-3.8	+66	+3.6	+0.9	+1.1	+0.9	+1.0	+\$ 120
MOUNT DIFFICULT CADBURY (AI) (P)	+8.1	+7.3	-2.8	+1.2	+30	+58	+82	+72	+13	+2.2	-3.5	+68	+4.9	+1.0	+1.9	+1.3	+0.2	+\$ 117
REMITALL ONLINE 122L (IMP) (P)	+5.9	+4.8	-1.7	+4.0	+44	+74	+90	+75	+19	+3.0	-3.4	+71	+5.5	-0.6	-0.2	+1.3	-0.1	+\$ 115
SOUTH BUKALONG SHANNON 40 (P)	+2.1	+5.0	-0.8	+2.1	+36	+73	+94	+84	+19	+3.6	-3.7	+71	+2.3	+1.2	+2.2	-0.7	+0.8	+\$ 114
GH NEON 17N (IMP) (H)	+3.5	-0.8	-0.4	+3.6	+38	+67	+94	+87	+7	+1.9	-2.9	+71	+7.1	+0.9	+1.4	+1.4	+0.5	+\$ 114
KOANUI ROCKET 0219 (IMP) (P)	+11.9	+12.3	+0.1	-0.8	+29	+55	+72	+70	+22	+3.6	-5.6	+63	+3.1	+1.2	+2.3	+0.3	-0.4	+\$ 113
KOANUI BUSTLER 0132 (IMP) (P)	+3.5	+2.8	+1.1	+4.3	+39	+70	+98	+93	+16	+1.7	-	+68	+3.3	-0.3	-0.2	+1.2	+0.1	+\$ 112
MERRINA 219 ALTITUDE C41 (AI) (P)	+5.9	+7.1	+0.7	+1.9	+31	+62	+84	+80	+15	+2.3	-4.1	+59	+1.9	+2.2	+3.8	-1.0	+0.3	+\$ 111
SCHULLAR SN OF 9L 3008 (IMP) (P)	+0.9	+6.7	+0.5	+3.1	+42	+75	+97	+90	+16	+4.1	-3.7	+69	+2.8	-0.9	-1.9	+0.9	+0.6	+\$ 111
SOUTH BUKALONG WALLACE 2 (P)	+12.5	+4.5	-4.4	-0.5	+28	+49	+68	+34	+21	+3.1	-4.3	+56	+3.2	+0.8	+1.0	+0.4	+1.6	+\$ 110
ELITE 0219 D297 (AI) (P)	+3.7	+8.4	+1.7	+2.9	+33	+62	+83	+84	+15	+2.6	-3.9	+63	+3.9	+0.8	+1.5	+0.8	+0.1	+\$ 109
OKAWA COMMODORE 020076 (IMP) (P)	+1.6	-0.8	+1.0	+3.9	+39	+76	+105	+99	+21	+3.2	-4.7	+68	+1.4	-0.7	-0.6	+1.4	-1.6	+\$ 108
WIRRUNA DAFFY D1 (P)	+5.8	-0.8	0.0	+2.5	+29	+52	+67	+48	+5	+5.1	-4.6	+56	+7.3	+1.4	+2.1	+2.0	+1.2	+\$ 108
INJEMIRA ADVANCE V093 (H)	+4.6	+0.9	-3.4	+3.4	+29	+55	+89	+86	+21	+2.4	-2.9	+62	+2.7	+1.1	+1.5	+0.2	+0.7	+\$ 108
<b>Breed Avg. EBVs for 2010 Born Calves</b>	<b>-0.3</b>	<b>+0.9</b>	<b>-0.1</b>	<b>+4.3</b>	<b>+27</b>	<b>+43</b>	<b>+62</b>	<b>+60</b>	<b>+12</b>	<b>+1.5</b>	<b>-1.7</b>	<b>+38</b>	<b>+2.5</b>	<b>0.0</b>	<b>+0.2</b>	<b>+0.7</b>	<b>0.0</b>	<b>+\$65</b>

Figure 1. A group of Hereford sires ranked in descending order on the Supermarket Index

Percentile Band	Calv. Ease Direct (%)	Calv. Ease Dtrs (%)	Gest. Len. (days)	Birth Wt. (kg)	200 Day Wt. (kg)	400 Day Wt. (kg)	600 Day Wt. (kg)	Mat. Cow Wt. (kg)	Milk (kg)	Scrotal Size (cm)	Days to Calv.	Carcass Wt. (kg)	Eye Muscle Area (sq.cm)	Rib Fat (mm)	Rump Fat (mm)	Retail Beef Yield (%)	IMF %	Supermarket Index (\$)
Top Value	+14.2	+10.5	-8.5	-4.5	+52	+84	+126	+123	+29	+4.8	-8.2	+76	+7.6	+3.7	+6.3	+3.3	+2.6	+\$130
Top 1%	+8.8	+6.9	-4.0	-0.6	+40	+64	+94	+94	+21	+3.3	-4.9	+60	+4.8	+1.3	+2.2	+2.0	+1.0	+\$101
Top 5%	+5.8	+4.7	-2.4	+1.2	+36	+58	+84	+84	+19	+2.6	-3.9	+53	+3.9	+0.9	+1.5	+1.6	+0.6	+\$90
Top 10%	+4.2	+3.7	-1.8	+2.0	+34	+55	+79	+79	+17	+2.3	-3.4	+50	+3.5	+0.7	+1.2	+1.3	+0.5	+\$84
Top 15%	+3.2	+3.0	-1.4	+2.6	+33	+53	+76	+75	+16	+2.1	-3.1	+47	+3.3	+0.5	+1.0	+1.2	+0.4	+\$80
Top 20%	+2.4	+2.5	-1.1	+3.0	+32	+51	+73	+73	+16	+2.0	-2.8	+46	+3.1	+0.4	+0.8	+1.1	+0.3	+\$77

Figure 2. Excerpt of Hereford Percentile Table

the current genetic level of the breed if used within this production scenario. Further comparison to the percentile table indicates that these sires all rank in the top 1% of the breed for this particular production scenario (see circled information in figure 2).

Current breed average and percentile table information for each selection index should be available from sale catalogues or can be accessed from the online database facilities offered via each Breed Society website.

### 3. Consider Individual EBVs of Importance

While Selection Indexes combine all the available EBV information to provide an indication of a bull's overall genetic merit, it is still very important to pay attention to the bull's individual EBVs for traits of particular importance.

For example, producers may pay attention to:

- Calving Ease EBVs if they are planning to use the bull over heifers
- Fat EBVs if they require more or less fat on their steers at slaughter
- EMA EBVs if they want to specifically improve the muscling in their herd

One simple way of considering a bull's individual EBVs, is to set acceptable ranges for the individual EBVs of particular importance. In this scenario, bulls would firstly be ranked on the selection index of relevance but then any animals whose individual EBVs fall outside of the acceptable range be excluded from selection.

It is also important to note that not all EBVs are currently included in the calculation of the selection index values. For example, Docility, Structural Soundness, Flight Time and Shear Force EBVs are currently excluded. In a similar vein to that outlined above, if these EBVs are of importance then bulls should firstly be ranked on the selection index of relevance but then any animals whose EBV falls outside of an acceptable range for these traits be excluded from selection.



### 4. Consider Other Selection Criteria of Importance

While selection indexes take into account all the available performance information on an animal, it is also important to recognise that they do not consider all the selection criteria of functional and economic importance. Consequently, when using selection indexes to assist with bull selection, it is important to also consider other information that may not be accounted for in the index. For example, this may include such things as assessment of a bull's temperament, structural soundness, phenotype, bull fertility information, carrier status for any relevant genetic disorders, and DNA results for qualitative traits like coat colour and polledness.

One strategy that can be used to incorporate selection for these other traits of economic and functional importance with the animal's EBV and selection index information is to firstly rank animals on the selection index of relevance, exclude any animals whose individual EBVs fall outside of an acceptable range and then assess the animals for other selection criteria of importance, excluding any animals from selection who are not acceptable in each area.

Using selection indexes in this manner will enable beef producers to make the most informed bull selection decisions and provides the best possibility of maximising the value of the genetics that are introduced into the beef operation.

For further advice regarding the use of selection indexes in bull selection, please contact staff at SBTS or TBTS.



## Tips for Using Selection Indexes in Bull Selection

1. Identify the Selection Index of Most Relevance
2. Rank Animals on Selection Index
3. Consider Individual EBVs of Importance
4. Consider Other Selection Criteria of Importance