CHAPTER 11: How to use breeding values to select beef cattle

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INTRODUCTION

If you have only started to breed beef cattle, you might have found breeding values overwhelming. Some breeds receive up to 18 breeding values. What do they mean, and are some more important than others? Selecting animals on breeding values are, in fact, quite easy, once you know how. The key is to do your homework before you select animals.

Some things you need to know about genetics

There is a saying, "good feeding can hide bad breeding", which is very true. You cannot eyeball an animal and decide what its genetics are. If he has been fed well, he will look good, but he can be genetically inferior. This implies that he – and his progeny – will need a lot of food and care to look good. It therefore makes more sense to buy an animal that is genetically superior, as it will be more profitable. Its superiority will also be transmitted to its progeny. The general idea is to rather breed animals that are suitable for your environment, not to continually change the environment to suit the animal, as this can be a very costly exercise. Using adapted animals is also the right thing to do from an animal welfare point of view.

The reason why we need to look at breeding values to know how the bull will breed, is because the effect of the environment, and feed, is so important. The only way to "get the environment out" is the scientific way, which entails performance measurements under controlled circumstances and complete pedigree recording. If you don't do performance measuring properly, your animals will not get usable breeding values. So if you buy stud animals, it should be from a breeder that does performance measurement on his animals, and knows and understands breeding values.

Another important factor is that genetic change is a long-term venture: the effect of the bulls that you buy today, will still be felt in the herd for years to come. If he is a good choice, his daughters will become your herd cows, and part of your profit, of the future. So, don't buy a lucky packet bull: one you don't know anything about, but you are hoping for the best. Even if the bull you buy, is not perfect, if you know about his shortcomings, you can manage it by using him on suitable cows.

Breeding Values

Breeding values are also expressed as indexes, which are very easy to interpret and use. The average breeding value index of live animals in the breed is set to 100. So, above 100 means the animal is better than breed average. A value of, for example, 120 for weaning weight, means a calf that has the genetic potential of 20% heavier than the average calf. Breeding value indexes indicate genetic potential, and how heavy the animal will actually be, is determined by the amount of feed it gets. However, it you have two calves, one with an index of 120 and another with an index of 80, kept together on the same farm, the 120 one will definitely be heavier. A lower birth weight is generally more desirable, as birth weight is the most important cause of difficult births. Thus an index for birth weight of above 100 indicates a lighter calf.

Note that, although above 100 indicates the more desirable direction, it does not imply that all breeding value indexes should be maximum. For some traits, for example birth weight and mature weight, average is, in fact, the most desirable.

Another fact that should be kept in mind, is that traits are connected to one another, meaning you should not select on one trait only. Selecting only for maximum weaning weight, for example, will increase both birth weight, which will cause difficult births, and mature weight, causing large-framed cows that can be inefficient under certain circumstances.

Table 1: Example of 6 Bonsmara bulls for sale in a sales catalogue.

Nr	DIRECT CALF TRAITS		DAUGHTER TRAITS			GROWTH		EFF.	REP	MEASUREMENTS		
	Progeny Birth Weight	Progeny Wean Weight	Ease of Calving	Milk prod.	Mature Weight	Post Wean Weight	Daily Gain	Feed Conv		Height & Length		
	Breeding Value Indexes											
	Birth Dir Acc	Wean Dir Acc	Birth Mat Acc	Wean Mat Acc	Mat Wgt Acc	Post Wean Acc	ADG Acc	FCR Acc	SC Acc	Hgt Acc	Lgt Acc	
	Wgt kg	Wgt kg / Ind	kg	kg	kg	365d Ind / 540d Ind	Ind	Ind	(mm)	(mm)	(mm)	
1	**94**	**105**	**99**	**84**	**85**	**103**	**88**	**87**	**101**	**86**	**92**	**A**
	1.24	12.8	0.08	-0.6	-10.0	17.8	29	-25	8.3	-7	4	**B**
	81	75	65	67	43	57	50	17	53	53	52	**C**
	37	224 / 100				112 / 107	-	-	-	-	-	**D**
2	**111**	**89**	**90**	**106**	**78**	**89**	**76**	**67**	**82**	**88**	**82**	
	-0.68	5.4	0.46	5.1	-17.0	8.0	-26	7	-2.5	-6	-6	
	80	73	62	63	23	47	33	8	36	37	36	
	31	181 / 91				98 / 97	-	-	-	-	-	
3	**86**	**109**	**94**	**111**	**110**	**110**	**110**	**104**	**107**	**106**	**117**	
	2.13	15.2	0.29	6.5	17.0	22.9	123	-51	11.7	6	27	
	81	74	54	65	38	58	45	17	49	50	46	
	40	229 / 108				98 / 97	-	-	-	-	-	
4	**97**	**110**	**91**	**110**	**104**	**113**	**116**	**111**	**107**	**123**	**112**	
	0.90	15.5	0.39	6.2	11.0	25.3	148	-63	11.9	18	23	
	80	70	62	61	38	50	45	23	40	40	48	
	36	238 / 108				108 / 109	-	-	-	-	-	
5	**97**	**100**	**106**	**107**	**105**	**100**	**107**	**104**	**108**	**110**	**109**	
	0.96	10.3	-0.22	5.3	12.0	15.9	110	-51	12.4	9	20	
	81	73	62	63	34	47	45	23	45	40	45	
	36	197 / 101				101 / 96	-	-	-	-	-	
6	**102**	**109**	**85**	**108**	**90**	**106**	**107**	**100**	**91**	**104**	**117**	
	0.34	14.8	0.64	5.8	-4.0	19.8	111	-46	2.3	5	28	
	81	74	55	65	43	55	45	17	43	48	47	
	35	258 / 108				91 / 106	-	-	-	-	-	

In Table 1, the information of 6 bulls in a sales catalogue is shown. The Breeding Value Indexes of the bulls (for example Row A) and the accuracy of the breeding value (Row C) are used in the selection of bulls. The accuracy indicates the amount of information available for breeding value estimation. If it is above 80%, the breeding value is based on a large amount of information, while, if it is below 30%, it is not very reliable, and may change a lot as new information is used for breeding value estimation. Row B can also be used, but it indicates breeding values, which are not as easy to interpret as the breeding value indexes. The information in Row D only indicates if the animal was measured for a specific trait. It cannot be used for any selection whatsoever, as it reflects mainly the environmental effect and not the genetic effect.

How to use breeding values

If, for example, you want to buy a breeding bull on breeding values, you need to follow a few simple steps. The first and most important is to know what you want. What you want is mainly determined by three factors: What do you want to do with the bull's calves? How much feed do you have? And what is the genetics of your cows?

What do you want to do with the calves? For example, you can sell some of the calves as weaners to a feedlot, or you can breed replacement cows for your older cows that are leaving the herd. If you intend to sell stud bulls, you should realise that it is a very specialised area, and you need to study performance measurement and breeding values in depth. Only the best bulls should become stud bulls. Having said that, as we shall see, not all bulls need to be the same to be best.

How much feed do you have? The amount of feed determines the frame size that will do best. If you have lots of good quality feed at a reasonable price, larger framed animals will probably be more profitable. If the animals are going to be kept extensively on the veld, medium framed animals will probably be better. If conditions are very harsh, smaller framed ones might be even better, but then rather choose a smaller framed breed, so that selected animals are well adapted, strong and small framed, and not small framed because they are poor quality.

What is the genetics of your cows? Are they perhaps the wrong frame size? Or don't they have enough milk (you can see that in their breeding values)? Or perhaps you are looking for a bull to use on your heifers. Are they pedigree animals or crossbred cows? If they are pedigree animals, they will have breeding values, and you will know with much more surety what their genetic abilities are.

Set up a breeding goal

Use the above to decide what type of bull will be best on your farm. Let us say, for example, that we need the following 3 bulls:

Bull 1: A bull with good growth to use on a group of crossbred cows that will be grazing the camp at the river with the good grass, as well as some crop rests. The calves will all be sold to a feedlot. A large framed bull with good growth will therefore be best. Important breeding value indexes are Weaning Weight, Average Daily Gain (ADG) and Feed Conversion Ratio (FCR), which should all be as high as possible. Post wean weight, Mature weight and Height and Length also give indications of the general frame size that the bull will breed. On the genetic evaluation report, the Growth Value will summarize all these values into a single value, which makes selection easier. From Table 1, Bull 4 will be best. Bull 3 is also suitable, but his Birth weight Breeding Value Index is too low. (A low birth weight index indicates a heavy calf at birth, which is undesirable). Bull 4's birth weight and weaning weight is much better than Bull 3's.

Bull 2: A bull to use on Bonsmara pedigree cows that do not have any particular problems. They will be on the veld all year. The heifer calves will be used as replacement cows in the herd, or sold as such, while the bull calves out of the superior cows will be sold as stud bulls. A bull with average or slightly above average growth will be ideal. Once again, the growth breeding values are important, but should not be as high as possible, but closer to 100. It is now important to also look at Birth Weight and Milk, as well as the reproduction breeding value indexes AFC (Age at first calving) and ICP (Intercalving period). The Cow Value, which combines all the important breeding values into one value, will give a quick indication of how suitable the animal is to breed cows. (AFC, ICP and the Cow Value are not on the sales catalogue, only in the genetic evaluation report that all stud breeders receive annually). From Table 1, both Bulls 5 and 6 will be suitable, although Bull 6 will be the better choice, since Birth Weight, Weaning Weight and Mature Weight are very favourable at 102, 109 and 90, indicating a curve bender, against Bull 5's 97, 100 and 105, indicating a little bit too heavy at birth in relation to average at weaning and above average at maturity.

Bull 3: A bull to use on heifers that are to be mated to calve at 2 years. The bull should therefore not have a high breeding value for birth weight, so as to ensure easy calving. The calves should, however, still be profitable, i.e. have enough growth in them to be either sold to the feedlot or to be used as replacement heifers. A bull with Breeding Value Indexes above 100 for both Birth Weight and Weaning Weight is ideal. In Table 1, for example, the best bull, when selecting only on the best value on Birth Weight, would be Bull 2, but he breeds small calves with little growth. Bull 6 will be a much better choice: although Birth weight index is above average (smaller), Weaning Weight is also above average (heavier), and these calves can be retained in the herd or sold.

CONCLUSION

As can be seen from the above, different types of bulls are suitable for different types of cows and circumstances. It is also possible to find a custom bull for your cows, with the aim to improve the calves. As inbreeding should also be kept at a minimum, it is usually easier to use a mating program to fit bulls to cows, based on breeding values.