DESIREBULL, A DECISION SUPPORT TOOL TO SIMPLIFY GENETIC INFORMATION FOR EFFECTIVE USE BY COMMERCIAL BEEF PRODUCERS

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SUMMARY

DeSireBull™ is a new decision support tool for commercial beef producers currently being developed by the NSW Department of Primary Industries, co-funded by Meat and Livestock Australia. It has been acknowledged that selecting a bull(s) can be a complex and overwhelming task for producers, when faced with large amounts of information on which to make their decision. Both producers and industry have developed ways to try and simplify the selection process, but this often results in sub-optimal decisions, negatively impacting the genetic progress of herds. DeSireBull™ aims to incorporate several strategies to simplify genetic information and aid producers in finding the right bull for their breeding objective.

INTRODUCTION

When faced with the task of purchasing bulls for use in the breeding herd, commercial beef producers can often be overwhelmed by the amount of information provided to them, be it genetic, or observable animal characteristics (Martin-Collado *et al.* 2018). In any given sale catalogue, there can be up to thousands of pieces of information, presented in numerical or graphical form. Given that bull purchases are an infrequent event, interpreting and digesting all of this information can be a somewhat complex, confusing and time consuming task.

Due to the complexity of the bull selection process, producers tend to limit the number of selection criteria and often do not realise the impact that this decision may have on other traits or the overall breeding objective. As a result, the genetic performance of herds is not progressing as fast and effectively as it could. This impacts the potential productivity and profitability of producers, the competitiveness of beef against other proteins, and the competitiveness of the Australian beef industry against its overseas competitors. This has been recognised by the NSW Department of Primary Industries, which is developing a decision support tool aimed at simplifying the use of genetic information to aid the bull selection process. This paper will revisit the complexity of the breeding selection process, discuss DeSireBull™ and its aims of simplifying the selection process for commercial beef cattle producers.

COMPLEXITY OF INFORMATION & THE CONSEQUENCES OF DECISION MAKING

The complexity of decision making when it comes to selecting a bull has been recognised as a somewhat cumbersome task for commercial beef cattle producers (Ipsos, 2016). The commercial producer has many factors to consider when running their beef enterprise of which, EBVs and genetic information often form a very small fraction (Figure 1). They must also select the right breeding animals to incorporate into the breeding program whilst considering the influence of other factors including current herd performance, costs, environmental constraints and commercial target market (Ispos 2016; BreedObject 2016).

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Figure 1. Considerations of the commercial farmer (Ipsos 2016)

Printed sale catalogues and online tools are the main information sources for producers when selecting bulls to buy. Martin-Collado *et al.* (2018) have identified some key sources of decision complexity and acknowledge that when making selection decisions, producers may be overwhelmed by one or in most cases, a combination of the following:

1. The number of animals available for sale,
2. The amount of information presented to them for each animal,
3. Trade-offs between traits of interest e.g. production and functional traits,
4. The existence of animals with unique features e.g. genetic conditions or polled animals,
5. The different trait units,
6. The format in which the information is presented.

The compounding effect is producers using their own simplifying strategies (heuristics), when selecting breeding animals, often results in sub-optimal decisions (Martin-Collado *et al.* 2018). When trying to avoid "negative" traits by using minimal selection criteria, producers often do not realise the implications this might have on other related traits. It is an optimal combination of all traits that contributes to the high genetic merit and suitability of an animal to a commercial production system and enables genetic progress. The over-simplified selection process used by many producers is impacting the potential productivity and profitability of their enterprise, as well as the beef industry in its entirety.

CURRENT TOOLS USED TO SIMPLIFY INFORMATION

There are a number of strategies currently used within the beef industry, both by farmers and industry leaders to try and reduce the complexity of information available to commercial producers to make selection decisions. Table 1 provides an indication of the ease of employing a range of selection strategies developed by industry, and the producers' use of heuristics, highlighting how effective they are in reducing decision complexity and whether or not they are based on genetic information (Martin-Collado *et al.* 2018). Whilst producers' own simplifying strategies are usually easy to implement and greatly simplify the selection process, it is worth noting that these methods are rarely based on genetic criteria alone, result in sub-optimal selection and hinder the long-term productivity and profitability of the enterprise.

Strategies used by industry leaders range in their difficulty to implement and their ease of interpretation. EBVs and selection indexes are most commonly used by industry leaders as they are based

on genetic information. Selection indexes have been available since the late 1980's to aid selection decisions by combining all EBVs with bio-economic modelling to create a single value (Barwick & Henzell, 2005). Whilst selection indexes take account of the complexity and uncertainty of both current and future production systems they are generally developed by breed societies and poorly understood by producers (Martin-Collado *et al.* 2018). Furthermore, selection indexes were designed to be used by producers as a first option in the selection process. However, more than one index is often presented alongside EBVs thereby increasing the complexity of decision making.

Table 1. Some of the most common breeding industry and farmers' strategies and tools consciously used to deal with complexity of the selection decision

Actor	Strategy heuristic (H), tool (T)	Ease of implementation	Extent of complexity reduction	Based on genetic criteria
Farmers	(H) Truncated selection/ culling	Medium	Medium-High	Not only
	(H) Trait non-attendance			
	(H) Information non-attendance	Easy	Medium-High	Not only
	(H) Follow breeders, breeding company or other famers	Easy	Medium-High	Not only
	advice	Easy	High	Not only
BC/IO	(T) EBVs	Difficult	Low	Yes
/B&FO[#]	(T) Selection indexes and sub-indexes	Difficult	^Medium-High	Yes
	(T) Star systems	Easy	Medium	Yes
	(T) Charts	Easy	Medium	Yes
	(T) Animal of the month	Easy	High	Not only
	(T) Pre-selection of animals offered to farmers	Medium	Medium-High	Not only

Modified from "Complexity of animal breeding choice making", by Martin-Collado, D. *et al. (*2018)
[^] Depends if they are used just as another source of information to add to all the existing ones
[#] Breeding companies/Industry organisations/Breeder and farmer organisations

DESIREBULL™ – SIMPLIFYING GENETIC INFORMATION

The overall aim of DeSireBull™ is to aid the bull selection process, increasing the number of commercial producers effectively using genetic information and ultimately improving the productivity and profitability of herds. DeSireBull™ is intended to be a part of the BREEDPLAN toolkit, and provide an online platform for bull vendors to upload all relevant genetic information for their bulls, as well as additional, non-genetic information. DeSireBull™ will combine existing genetic tools, including BREEDPLAN data, in an innovative way so the genetic information is supplied in a more easily understood format. In addition to assisting bull purchasers, DeSireBull™ will be used by sellers and agents, and act as a channel for feedback to inform purchase decisions based on genetic information.

Combining simplifying strategies. The aim of DeSireBull™ is to combine a number of selection strategies in order to assist commercial producers in finding relevant animals and present all animal information in a format that is easy to process and understand. The three methods outlined in Table 1 of particular interest to this project are the use of selection indexes, trait subgroups (components of the index), and graphical representation e.g. star systems and charts, all of which are based on genetic criteria. Furthermore, producers will also be able to filter on a particular EBV subgroup of interest. Also under investigation is the use of an algorithm developed by Kinghorn (2013), which

will demonstrate the consequences selection on one EBV subgroup will have on other subgroups. By incorporating these strategies into one tool, DeSireBull™ aims to simplify the presentation of and increase the use of genetic information by commercial producers within the Australian beef industry.

Additional features and future uses. DeSireBull™ will use a condensed version of the Breed-Object questionnaire and bio-economic models to help producers define their breeding objective to develop their own selection index. Using a customised index as search criteria, producers will be able to find animals that best meet their breeding objectives. As well as providing feedback to seedstock breeders on customer requirements, additional information could also be harvested which would be extremely useful to industry as a way to examine buying behaviour and its potential consequences. This could be used to establish/review extension and education programs targeting commercial producers' buying behaviour. Such a tool could also be used as a channel to enable more direct feedback that is currently difficult to access, such as MSA carcass, processor and feedlot information, to inform current and future breeding decisions. Ideally, the successful development of DeSireBull™ will facilitate the streamlining of on-farm use of feedback for future breeding decisions based on current realised performance.

CONCLUSIONS

When it comes to selecting bulls to purchase, commercial beef producers are faced with the task of processing large amounts of information on each animal, all with different units of measurement and presented in many different formats. This amounts to a complex, cumbersome and time consuming task that has been shown to be quite overwhelming for producers. To cope with this information, producers often come up with their own ways to simplify the decision making process, resulting in sub-optimal decisions that hinder genetic progress, and impact their productivity and return. There are a number of tools currently available within industry that aim to simplify genetic information, however they are seemingly adding to the complexity of the decision process. DeSireBull™ is a tool that aims to incorporate these tools and further streamline genetic information so that it is easier to process, understand and compare. This project is well underway and so far has had positive feedback from a vast number of commercial beef producers who see value in a tool that can simplify genetic information, allow the comparison of all animals available for sale and provide feedback to both the buyer and seller.

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