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UNDERSTANDING TRAIT PREFERENCES AND VIEWS ON GENETIC TOOLS FOR THE NEW ZEALAND BEEF INDUSTRY

L. Kok[1], S. Harburg[1], B. Santos[1], P. Amer[1], J. Archer[2], A. Boyd[2] and G. Jenkins[2]

[1]AbacusBio Limited, PO Box 5585, Dunedin 9058, New Zealand
[2] Beef + Lamb New Zealand, PO Box 5501, Dunedin 9054, New Zealand

SUMMARY

Beef + Lamb New Zealand (B+LNZ) has implemented the Informing New Zealand Beef (INZB) programme, a 7-year Sustainable Food and Fibre Futures partnership with the Ministry for Primary Industries, which aims to boost the sector's profits by $460 million over the next 25 years. The programme includes the development of new traits for integration into future genetic evaluations. An online survey of beef producers was conducted. The survey consisted of a demographic section, asking questions about the respondent's production system and their views and attitudes on cattle selection and bull purchases. The survey also included a trait preference section for respondents to indicate their preferences and the relative importance of these traits to them. Overall, respondents had a preference for maternal traits, particularly cow fertility, cow functionality, and calving ease. In general, NZ beef producer survey respondents strongly support the use of estimated breeding values (EBVs) and indexes as tools to inform their selection and bull purchasing decisions. Almost 75% of respondents agree that NZ farm systems require specialized selection indexes. The survey also highlighted the importance of ongoing extension programs to improve adoption and understanding of genetic tools. There is strong priority for structural soundness and functionality traits, feed efficiency, and fertility traits, which are seen as important for new trait development.

INTRODUCTION

INZB is seeking to establish a beef genetic improvement system that can best support the needs and priorities of the NZ beef industry. One of the INZB projects aims to develop new traits for integration into industry phenotyping programs for future inclusion in industry genetic evaluations. An industry survey was undertaken between July and August 2022, to capture NZ beef industry perspectives on traits, trait priorities and selection index requirements to support genetic improvement within the NZ beef industry. Insights from the survey are being used to identify opportunities to develop new breeding traits, as well as to understand views and perceptions that might influence the scope and relevance of the genetic evaluation systems utilized by the NZ beef industry. Further, identification of beef farmer trait preferences (among current and future traits) and factors driving these preferences, will inform development of custom selection indexes that reflect the priorities of NZ beef industry stakeholders.

MATERIALS AND METHODS

A voluntary online survey was conducted from 1st of July to 12th of August 2022 and was distributed by B+LNZ to beef farmers and other industry stakeholders. The survey predominantly targeted beef farmer respondents (bull breeders, commercial breeders, and finishers), rural professionals, and other key stakeholders. Two distinct approaches were used to allow respondents to identify trait priorities, a direct ranking question (within the demographic component of the survey), and a Conjoint Analysis approach (Hensher *et al*. 2005) in the trait preference component. Firstly, the preference for traits was asked on a scale from 1 to 100 with the question displaying all traits jointly from which answers were converted to a relative weight of importance of each trait by dividing the score given to each trait by the sum of scores across all traits. Second, trait priorities were also captured through 1000minds (Hansen and Ombler 2009) which contrasts trade-off choices

between pairs of traits, assuming the level of the trade-off has broadly equivalent economic values. This pairwise comparison is practical and requires less effort from participants than other methods, making choice decisions simpler and nearer to respondents' "true" preferences.

The demographics component of the survey received 439 complete responses and 290 partial responses, whilst the 1000minds component received 311 complete responses and 169 partial responses. A broad sample of the NZ beef industry participants from a variety of beef business activities responded. There was strong engagement from commercial breeders (44.5% of respondents) and finishers (24.9% of respondents). Survey respondents also represented a broad cross-section of farming regions across the North and South Islands of New Zealand.

A principal components analysis (PCA) and cluster analysis (CA) of trait preferences was performed to investigate groupings of respondents with similar preferences. Subsequent analysis was undertaken to characterise these clusters and understand whether differences in trait preferences reflected potential demographic differences or differences in breeding philosophy.

RESULTS AND DISCUSSION

Respondents were asked a series of questions about their breeding system to inform development of new maternal traits (e.g., cow body condition score). Approximately 82% of respondents mate their heifers targeting a first calving as a 2YO, with over half of the respondents first mating heifers between 300-350kg live weight. The overall frequency of calving difficulty averaged 3.71% (standard deviation of 8.12%) and is broadly consistent with published literature (e.g. Faucitano *et al.* 2012). Respondents estimated that the average weight of cows at weaning was 548kg (SD ± 94kg) versus an optimum weight of 555kg (SD ± 81kg). Generally, respondents agree that cow size and composition is important and that more descriptive traits (beyond cow weight) could be beneficial. This could provide a case for the development of additional traits for describing cow size and composition such as cow body condition score and cow height (as an indicator of frame size).

When asked a series of questions associated with general views on the use of genetic tools, most respondents believe that EBVs (64%) and economic selection indexes (54%) are useful tools for representing animal genetic merit and improving herd performance. Many respondents considered genetic tools to be important for bull purchase decisions, although a subset (30%) rated visual appraisal, structural soundness, and horn/poll status as being sufficient to predict performance and genetic merit. Similar levels of importance were placed on genetic tools and raw performance information (animal live weight, and other phenotypic measurements). This highlights the need for ongoing investment in extension activities to improve understanding and drive adoption of better genetics and tools across the industry.

Respondents generally supported a simplified portfolio of selection indexes covering maternal, terminal, and dairy-beef systems (69% somewhat agree/agree/totally agree). Almost 75% of respondents selected somewhat agree, agree, or totally agree that NZ farm systems require specialised selection indexes. There is support for development of sub-indexes to summarise animal merit (83%) and customisability to adapt indexes to specific requirements (70%). Respondents also believed (69% somewhat agree/agree/totally agree) that maternal selection indexes should include emphasis on carcass and eating quality traits alongside maternal traits. There is also very strong support for inclusion of functional traits (structure, docility, etc.) within selection indexes. These traits are currently omitted from most industry indexes.

Trait preferences. In the sociodemographic part of the survey, respondents placed greatest emphasis on maternal traits, particularly cow fertility, cow functionality (foot/leg structure, teat and udder scores, docility), and calving ease. This indicates an opportunity to improve understanding of existing trait EBVs and encourages greater effort on data collection for docility and calving ease.

Growth traits, carcass weight, and feed efficiency represent the next highest priority traits. Feed efficiency represents the only novel/new trait among the highest priority traits.

Trait preferences from the 1000minds part of the survey broadly were consistent with the answers on trait preferences based on relative rankings. The exception was cow fertility which ranked 5th highest (out of 11 traits). This could reflect either an overestimation by respondents of the relative importance of fertility, or the nominated trade-off for fertility within the 1000minds survey (3 less cows per 100 culled due to low fertility) did not adequately reflect an appropriate value for cow fertility relative to the other trait trade-offs.

Trait preferences tend to hold across all respondent demographic categories. There were some interesting insights in this demographic breakdown. For instance, the dairy farmer segment (3% of respondents) was the most clearly differentiated segment within the primary beef activity group, with a greater priority placed on methane emissions, marbling and weaning weight, and lower priority placed on docility, cow fertility and calving ease. Bull breeders and commercial breeders were generally very closely aligned, except for marbling (higher priority for bull breeders) and cow body condition score (higher priority for commercial breeders) as the key areas of divergence. The tendency for bull breeders to place higher priority on marbling is a likely reflection of sourcing genetics from overseas (particularly US and Australia) and the use of the combined TransTasman Angus Cattle Evaluation (TACE) with Angus Australia (Angus Australia, 2021).

Cluster analysis. Two distinct groups of respondents with similar preferences were identified. The 'production focus' cluster, which comprises 136 respondents, showed higher preference for both growth and carcass traits (i.e., feed efficiency, weaning weight and carcass weight) alongside calving ease. The 'maternal focus' cluster (comprising 168 respondents) had a stronger focus on maternal and functional traits (i.e., calving ease, cow fertility and docility). The average trait preferences (% weighting) of both clusters are presented in Figure 1. Interestingly, the PCA analysis indicated that a sub-cluster of novel, progressive traits, namely methane emissions, feed efficiency, and marbling could be formed from the 'production focus' group if clusters were to be further separated out. This reveals the existence of diversity of thought even within groups of similar preferences.

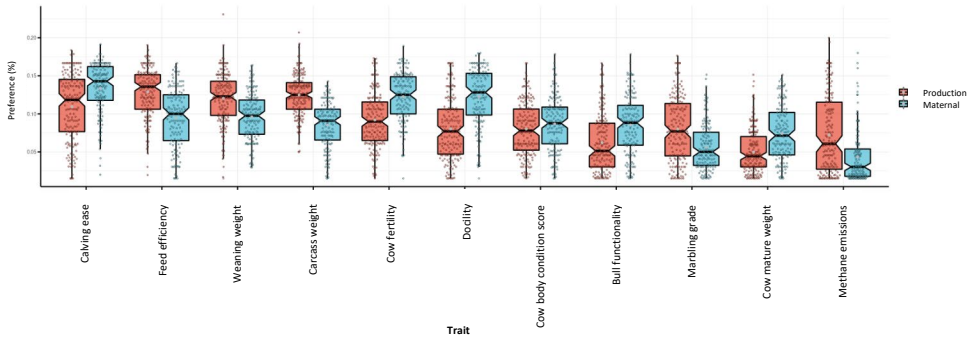

Figure 1. Cluster analysis of trait preferences from New Zealand beef industry stakeholders

Views and attitudes. Demographics only had a small influence on trait preferences. This is consistent with many similar studies, whereby breeding philosophy is intrinsic to the respondent, rather than reflecting their demographic situation or background. In addition to trait preferences, there are subtle differences in views and attitudes between the clusters. Respondents from the Production Cluster generally placed greater importance on genetic tools than those in the Maternal Cluster, however, overall patterns of response were quite similar between the two clusters (Figure

2). Whilst industry does consider genetic tools to be important for bull purchase decisions, their importance is lower than visual appraisal (structural soundness and overall appearance).

Figure 2. Respondent views represented by level of importance on bull purchase criteria

Indexes and index development. Survey results highlight several key opportunities to enhance the use and relevance of economic indexes to the NZ beef industry. The industry strongly supports the inclusion of functional traits (docility and structural traits) to indexes. This represents a key area of potential collaboration between B+LNZ and the breed societies to evaluate options to incorporate these traits within industry selection indexes. The implementation of a narrower range of selection indexes includes several key challenges to ensure these indexes are relevant to the trait preferences and breeding objectives of as many users as possible. These key challenges comprise 1) the relative importance of maternal versus production traits reflects a key area of divergence between key segments/clusters of the industry; 2) Whilst industry supports a simplified portfolio of indexes, there is strong interest in the ability to customise indexes to meet individual breeding objectives.

CONCLUSIONS

This industry survey underlines the importance of maternal and functional traits to most segments of the industry. It has identified key areas for B+LNZ and other key stakeholders to improve the scope and delivery of genetic tools. The importance of ongoing extension programs to improve adoption and understanding of these tools is critical for the success of the INZB programme. In addition to scoping the feasibility of collecting phenotypic data, B+LNZ should also engage with breed societies to assess the feasibility of implementing existing and developing new traits in a NZ genetic evaluation system. This engagement will secure collaboration and identify preferred approaches for implementation of future selection indexes for the New Zealand beef industry.

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