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INDUSTRY CONSULTATION SURVEY FOR THE AMERICAN ANGUS $VALUE INDEXES REVIEW

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SUMMARY

An industry consultation which included an on-line survey distributed to breeders, commercial cattle producers and finishers was carried out as part of a larger revision of the American Angus Association's $Value indexes. A total of 3,174 responses were received. Survey outcomes were used to cluster respondents according to their farming systems and demographic profiles, understand their preferences for traits and to gain insight on whether there are different trait priorities within and between respondents. The survey provided a mandate from industry to review and propose changes to current $Value indexes. It also provided insight to modify bio-economic models that calculate trait economic values to accommodate non-economic factors that systematically influence preferences. The trait preference survey revealed that cow survival, docility, foot score, heifer pregnancy and weaning weight ranked higher on average than what we would have expected based on provisional bioeconomic model calculations. There are differences in trait preferences caused by intrinsic views and beliefs between groups of respondents across and within business activities. These differences reach beyond typical characteristics that can be readily described, such as production system or location. The survey has provided important information for development of indexes which are well aligned with requirements of stakeholders in Angus beef production.

INTRODUCTION

Selection indexes are often developed by bio-economic modelling of production systems. These models do not fully account for the large heterogeneity of trait preferences that is usually found within livestock industries (Paakala *et al*. 2018), for instance when beef cattle farmers choose bulls or select replacements for their herds. Experience has shown that indexes have greater uptake when they are aligned with farmer views and preferences. Industry consultation through survey methods provide a significant and valuable resource to analyse views of farmer trait preferences.

The American Angus Association (AAA) has recently reviewed its current multi-trait economic selection indexes, also known as Angus $Value Indexes. The aim was to update breeding objectives and economic selection indexes based on sound scientific methods, and in line with the preferences of American Angus breeders, cow-calf and feedlot producers and other industry stakeholders.

An on-line survey was designed to describe farming systems and demographic profiles. This stage is hereafter referred to as industry consultation and it aimed to understand drivers of selection decisions when breeders and ranchers choose bulls and replacement candidates. The industry consultation also sought to facilitate understanding of stakeholders' perceptions of the impact that breeding decisions have on their businesses, with a goal of understanding the factors that drive industry engagement.

The objective of this paper is to provide an overview of the industry consultation survey and its key findings. We also provide some perspective on how results of the survey were used to inform subsequent bioeconomic model calculations.

MATERIALS AND METHODS

The survey was conducted from July to early October 2018 and was distributed to all AAA members and made available widely to commercial cattle producers, retained owners and finishers.

The on-line survey was hosted at the American Angus Association; a link directed respondents to the demographics survey which then conducted respondents to the trait preference survey through a seamless process. Respondents had to complete the survey once it was initiated, with no option to pause and return later. The expected time to complete the survey was around 20 to 30 minutes per respondent with a target of 500 to 600 responses. Respondents had the option to either complete the process under total anonymity, or to provide their AAA membership number.

Demographics survey. This survey consisted of 53 questions on farmer and farm systems' to provide details of the farm operation, such as farm and herd size, location, feeding system, etc. Further questions were presented to farmers to determine their views on $Value index and EPDs, and to understand the importance placed on a range of selection criteria when buying or selecting bulls and heifers. The demographic survey asked 53 questions.

Demographic data were used to form a priori groups or, where appropriate, to define farmer typologies which are points of commonality and/or heterogeneity in trait preferences among respondents. Typologies might be associated with respondents' farming system, location, age or any other demographic factor.

Trait preference survey. We used the PAPRIKA pairwise comparison methodology which successively presented two options at a time for respondents to choose between. This approach is practical and requires less intellectual effort from participants when compared to other methods, such as choice experiments. The pairwise comparison makes choice decisions simpler and therefore may be nearer to "true" preferences of respondents. We used the on-line tool 1000Minds® (Hansen and Ombler, 2009) to prioritize choice alternatives. Fourteen traits of interest for farmers were included in the preference survey, and the list of traits and extent of trade-offs between them is presented in Table 1. Trait trade-offs were quantified based on industry data and market prices such that each trade-off produces a similar economic impact, assuming they make sense from a respondent point of view.

Table 1. Trait preference survey questions for the $Value indexes review

Trait Name	Unit of trade-off, comparison and clear trade-off
Weaning Weight	15 lbs more weaning weight because of growth potential
Milk	15 lbs more weaning weight because of cow milking ability
Heifer pregnancy	4 more heifers calve per 100 mated per year
Calving ease	3 less assisted calvings per 100 heifers
Cow survival	6 more cows per 100 live past 5 calvings
Cow mature weight	60 lbs less cow mature weight
Cow frame score	1 less unit (2 inches) of frame score
Body condition score	1 more unit of cow condition score under nutritional stress
Foot score	8 more heifers per 100 suitable as replacements because of good feet
Docility	8 more heifers per 100 suitable as replacements because of good temperament
Feedlot gain	14 less days to commercial endpoint due to feedlot growth performance
Feedlot efficiency	0.5 lb less feed per lb of live weight gain
Yield grade	5 less carcasses per 100 grading Yield Grade 4+
Marbling grade	30 more carcasses per 100 exceeding Mid-Choice grade or better for marbling

Farmers' preferences for traits are known to be heterogeneous, and accounting for this heterogeneity is an attempt to reflect the preferences of a large proportion of farmers. The objective of incorporating farmer's trait preferences is to account for intangible non-economic factors when formulating economic selection indexes.

Survey result analysis. The demographic and trait preference surveys were analysed both separately and jointly to allow a better understanding of the heterogeneity of responses. Three analyses were undertaken; an a priori analysis based on demographic information; a principle component analysis (PCA) to reduce the dimensionality of the data; and a cluster analysis (CA) of the resultant principle components.

The PCA procedure explores the correlation and the variation in trait preferences from which the principal components of the preferences are calculated. For CA, the K-means clustering method was used to measure the distance between preference means for each variable (i.e. trait preference). K-means clustering aims to group *n* observations into *k* clusters in such a way that each observation belongs to the cluster with the nearest mean.

The combination of these analyses enables application of typologies, or drivers of preferences, into clustered groups of factors with statistically different patterns of trait preferences. These patterns can assist in designing selection indexes and tailoring extension efforts.

RESULTS AND DISCUSSION

A total of 3,174 responses were received, including 1,709 full completions of both demographic and trait preference survey sections. Results indicated a general positive perception about AAA's EPDs and $Value indexes. Over 70% of respondents use $Value indexes; there was 50-75% total agreement regarding the importance and usefulness of the $Value indexes; and over 80% of Breeders offer $Value figures to their clients. Of commercial cow-calf producers who responded to the survey, 68% ask for $Values when purchasing bulls.

Table 2. Mean preference ranks (lower ranks mean higher preference) for traits across business activities

Trait Name	Commercial cow-calf		Retained owner		Seedstock breeder		K.W. P value
	Mean	Sd	Mean	Sd	Mean	Sd	
Cow survival	3.9	2.9	5.3	3.5	4.6	3.1	0.642
Docility	5.4	3.3	5.4	3.0	5.1	3.1	0.176
Foot score	6.2	3.4	6.1	3.5	5.0	3.2	<0.001
Heifer pregnancy	5.8	3.1	6.5	3.4	5.4	3.1	0.046
Weaning weight	6.3	3.3	7.7	3.3	6.7	3.3	0.597
Calving ease	6.3	3.7	7.2	3.9	6.7	3.4	0.084
Body condition score	7.4	3.7	8.1	3.7	7.5	3.5	0.433
Marbling grade	8.1	4.0	5.4	3.5	7.7	3.9	0.308
Feedlot efficiency	8.0	3.4	6.8	3.4	7.8	3.3	0.877
Milk	7.6	4.0	9.5	3.9	7.9	3.8	0.531
Feedlot gain	9.4	3.4	7.9	3.6	9.1	3.3	0.049
Cow mature weight	9.1	3.5	9.7	3.6	10.1	3.4	<0.001
Cow frame score	10.2	3.3	10.6	3.4	10.8	3.2	0.203
Yield grade	11.1	2.8	8.8	3.6	10.7	3.0	0.396

There was also support to review and refine $Values, with 75% of respondents at least somewhat agreeing that there would be value in revised indexes that weight traits differently. Also, about 70% of respondents agreed there was need for a specific maternal index, which includes fertility and functional traits such as foot score and docility.

The trait preference survey revealed that the specified changes (Table 1) in cow survival, docility, foot score, heifer pregnancy and weaning weight ranked the highest on average (Table 2). There were differences in trait preferences between groups of respondents across and within business activities. These differences are caused by intrinsic views and beliefs and reach beyond typical characteristics that can be readily described, such as production system or location.

The PCA and CA analyses resulted in three distinct groups (or clusters) of respondents, named Maternal, Production and Cow Hard Environment, according to their pattern of trait preferences across regional or climatic attributes, and in all production or feeding systems (Table 3). These groups were distributed among cow-calf producers, seedstock breeders and retained owners. No difference was found between pattern of preference and business activity. The largest variation in preferences among respondents were on milk, MW, BCS, feedlot gain and marbling.

Table 3. Definition of preferences clusters with average trait rankings across clusters1

Group	WWT	Milk	HP	CE	Cow survival	MW	Cow frame	BCS	Foot	Docy	feedlot gain	Feedlot efficiency	Yield grade	Marb
Maternal	5.7	5.7	4.8	5.5	3.9	10.4	11.2	7.9	4.5	4.3	10.3	8.9	11.8	10.1
Production	6.2	7.2	6.5	8.1	5.6	11.3	11.8	8.5	6.3	5.9	7.1	6.7	9.4	4.4
Cow hard	8.5	11.9	5.6	6.6	3.8	7.1	8.4	5.7	5.8	5.6	9.8	7.4	10.6	8.2

The survey has provided important information for development of indexes which are well aligned with requirements of stakeholders in Angus beef production. Differing trait priorities related to cow feed requirements (e.g. mature weight, milk, condition score) were identified, but ultimately were not deemed enough to justify presentation of multiple indexes. Consequently, the current maternal sub-index was updated targeting the most common feeding systems, with downward pressure on cow maintenance requirements based on the cost of providing additional feed, and a non-linear emphasis on maternal weaning weight. The non-linear milk function (Quinton et al. 2019) was constructed to reward bulls with milk EPDs in the range desired by most breeders, while ensuring that bulls with very high milk do not rise to the top of the index without being exceptional for other traits. Modifications were also made to existing terminal sub-indexes (focused on growth, yield and marbling traits), and a new overall index combining maternal and terminal traits will be implemented based on the industry consultation survey results.

CONCLUSIONS

An on-line industry consultation survey was used to inform economic modelling, and selection index theory principles to propose revised options for $Value indexes. Different groups of farmers were identified according to their pattern of trait preferences. The resulting indexes and sub-indexes are therefore more closely aligned to the requirements of stakeholders in Angus beef production than those being replaced.

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