

Results of survey of stakeholders regarding knowledge of and attitudes towards feed intake, efficiency and genetic improvement concepts

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Introduction

Individual animal feed efficiency plays a key role in the profitability and sustainability of the US beef industry. During the growing and finishing phase of production, a 10% improvement in feed efficiency has a two-fold greater impact on profit than a 10% increase in rate of gain (Fox et al., 2001). The traits that beef producers routinely record are outputs which determine the value of product sold and not the inputs defining the cost of beef production. The inability to routinely measure feed intake and feed efficiency on large numbers of cattle has precluded the efficient application of selection despite moderate heritabilities ($h^2 = 0.16-0.46$; Archer et al., 1999). Feed costs in calf feeding and yearling finishing systems account for approximately 66% and 77% of costs, respectively (Anderson et al., 2005). Feed costs account for approximately 65% of total beef production costs. Of the metabolizable energy required from conception to consumption of a beef animal, 72% is utilized during the cow-calf segment of production while 28% of calories are utilized in the calf growing and finishing phases of production (Ferrell and Jenkins, 1982). Of the calories consumed in the cow-calf segment, more than half are used for maintenance which presents a large selection target.

A very large potential cost savings to the US beef cattle industry could be realized with selection for feed efficiency. Cattle selected for residual feed intake (RFI) with the same ADG eat less feed thus saving feedlot operators money. Assuming 27 million cattle are fed per year and that 34% of cattle in the feedlot are calves and 66% are yearlings, the beef industry could save over 1 billion dollars annually by reducing daily feed intake by just 0.91 kg. per animal (Weaber, 2012).

The emergence of individual feed intake monitoring systems has increased the availability of data for the genetic evaluation. The deployment of feed efficiency related genetic prediction tools may enable cattle producers to make better selection to improve profitability (Arthur et al., 2004; Hill et al., 2005). The cost and small number of records has slowed deployment of selection tools. At present, only the Am. Angus Assn. publishes a feed efficiency related EPD and only 8% of young sire candidates have the EPD (Am. Angus Assn., 2014). Little research has been conducted to understand the social aspects or barriers to adoption of feed efficiency technology by beef producers on a national scale. One such study (Wulfhorst et al., 2010) focused on the specific willingness of seedstock producers to begin collection of records for computation of RFI and willingness of commercial producers to select bulls based on RFI.

The objective of this study was to assess the awareness, attitudes and knowledge of US commercial cow-calf producers regarding a variety of feed efficiency and genetics concepts. This work was undertaken as a portion of the outreach component of the USDA funded integrated research project (USDA-NIFA-AFRI grant number: 2011-68004-30214) entitled the National Program for the Genetic Improvement of

Feed Efficiency in Beef Cattle. Results from the social survey will be used to refine the project's nationwide producer education program.

Data Collection and Analysis

Social Survey. The survey instrument, sampling frame and data entry were conducted under contract with the USDA National Agricultural Statistics Services (USDA-NASS). The sampling frame for the stratified random sample was derived from USDA-NASS lists and all beef, seed stock, cow/calf, stocker, and feedlot operations from the continental US. The total sample size was 7,500 and was stratified across seven US regions to proportionally represent the number of beef producers in those regions.

The 55 question survey was mailed September 18, 2013 and a second mailing occurred on October 23, 2013. Each mailing included an explanatory letter, the paper survey instrument and a return envelope. Data from returned surveys were entered into a database by USDA-NASS employees and a data set including strata, anonymous responses and weightings was delivered to researchers at Kansas State University.

Descriptive statistics including estimates of weighted frequencies and respective standard errors were generated using the SURVEYFREQ procedure and means were estimated via the SURVEYMEANS procedure (SAS Institute, Inc., Cary, NC). Respondents in each stratum (region) had unequal but known probabilities of inclusion in the sample due to the stratified sample design. Within stratum, each respondent had the same probability of inclusion. Unequal probabilities of inclusion in the sample were accounted for in the weighting of the frequencies. Results presented here are weighted frequencies or means.

Summary of Results and Discussion

A total of 868 (11.6%) respondents returned surveys. Of those, 401 (5.3%) were eliminated from further consideration as these were deemed ineligible for analysis because the respondents indicated that they were not at the time of survey an owner, manager or worker on a beef cattle operation. The remaining responses from 467 surveys were used in this analysis. Response to any given question varied among these 467 due to item nonresponse.

Of the 467 respondents a majority (59.9%) were commercial cow-calf producers while 11.5% were seedstock, 12.0% were seedstock and commercial cow-calf producers, 13.3% were stocker operators and 3.2% were feedlot operators. The scope of the analysis reported here was limited exclusively to the 269 commercial cow-calf respondents of which 93.0% indicated they were owners, 5.1% were managers and 1.8% indicated other specific involvement in beef operation (managing partner, office manager, etc.). On average, the commercial producer respondents, planned to breed 83.1 ± 6.7 head of cows and heifers in 2013, on average used artificial insemination to breed 3.7 ± 1.1 percent of their herd, spent approximately US\$ $1,887 \pm 102$ to purchase each herd bull on inventory, and had a mean age of 57.4 ± 1.9 yr. with 33.2 ± 1.6 yr. of beef industry experience.

The highest level of education varied among commercial producer respondents with 38.3% 4 year college graduates or beyond, 23.3% with some college coursework, 27.3% high school graduates, 5.0% less than high school diploma and 6.3% not responding. Of the commercial producers responding, 47.1% indicated that 50% or more of their work-time was on a farm or ranch, while 43.3% spent a majority of their occupational work-time off farm. Commercial producers reported that on average 29.9 ± 2.2 % of their family's income was from their beef operation.

Unpaid consultants, such as neighbors or friends, were most frequently (38.9%) identified by respondents as valuable sources of breeding and genetics information followed by veterinarians (29.7%) extension professionals (29.5%), seedstock producers (27.7%), internet search (18.9%), farm supply or feed store staff (18.1%), breed association personnel (14.7%), AI stud personnel (11.7%), popular press sources (9.3%) and paid consultants (2.1%). These results suggest that it is important to educate not only traditional information providers (veterinarians and extension educators) but also commercial producer peers and their seedstock suppliers about genetic and breeding principles as these entities are often consulted.

When questioned about decision making processes used in the business, commercial producers indicated that profitability was the greatest concern (73.8%) and 24.2% identified themselves as an 'early adopter' of new technology. A large majority (77.0%) of producers responded that they tend to let new ideas prove themselves before adoption with 87% considering their current management and selection system to be sustainable. Producers obtain new knowledge by accessing a variety of media and programs/meetings (55.4%), relying on extension educators to teach them about new techniques (40.1%) and rely on seedstock producers and breed associations to provide new information on breeding and selection practices (39.8%).

Feed efficiency concepts. Commercial cow-calf producers struggled to correctly identify definitions of basic feed efficiency measures with 32.6% choosing the correct definition for feed-to-gain ratio and 36.2% correctly defining feed efficiency. Only 16.4% of producers had heard the terms residual or net feed intake (RFI or RFI) and only 14.3% of producers were familiar with residual average daily gain (RADG). A majority (54.8%) of producers identified the genetic improvement of rate of gain as the mechanism used in the beef industry to improve feed efficiency while improved diet formation was identified by 40.6%, feed additives such as ionophores or beta-agonists by 28.4%, growth promoting implants by 35.2% and 24.2% did not know if any of the options were used. Nearly one-half of producers did not know the consequence of selection for increased average daily gain on the cowherd (decreased body fat and increased mature weight), while 13.4% suggested no harmful effects and only 10.3% correctly answered the question.

Producers responded that they were not knowledgeable of methods to select for improved feed efficiency (41.2%) with 28.8% responding slightly knowledgeable, 20.2% somewhat knowledgeable, 7.0% very knowledgeable and 1.5% extremely knowledgeable.

When asked about the largest obstacle to genetic improvement of feed efficiency in beef cattle 11.9% identified a lack of available facilities and equipment to measure individual intakes, 9.7% identified a lack of uniform guidelines, 8.3% suggested there were no obstacles, 8.0% identified a lack of demand from bull buyers for feed efficiency tested bulls, and 7.1% said it was too expensive to collect individual feed intake records.

Most producers (81.8%) responding to the survey had no awareness of the research project that was undertaking the survey with 9.6% having awareness and 8.9% nonresponse.

Genetic concepts. Survey respondents were asked a range of questions to gauge their knowledge and understanding of some basic genetic concepts and attitudes towards new selection tools. Questions were posed to more fully understand producer's utilization of current selection technologies in their operations. Producers were also asked to identify current selection behaviors and the future directions that they may pursue.

Producers use a wide range of information for making selection decisions and plan to use different information for selection decisions in the future as reported in Table 1. Despite much work by industry and extension educators, commercial producers still use data sources that are not corrected for environmental effects.

Commercial cow-calf producers currently lack a basic understanding of new genomic based selection tools and their anticipated benefit to beef cattle selection systems. A majority of producers (62%) responded that they did not know what class of traits should benefit the most from marker assisted selection. Only 13.1% responded correctly that this class includes traits which are difficult and/or expensive to measure and that have significant costs or returns associated with them. More than two-thirds of producers could not identify what was the primary benefit of adding molecular breeding value data to EPD calculations. Only 20.8% cited increase in EPD accuracy as the correct answer. Nearly 70% of cow-calf producers responded that they didn't know how much variation DNA markers explain in a trait.

When asked to summarize which traits were important in their selection objective over the past five years, a large majority (81.4%) of producers identified calving ease/birth weight, followed by reproduction (65.2%), growth traits (64.3%), temperament (63.3%), milk (51.5%), lifetime productivity (36.0%), maintenance efficiency (31.5%), and feed efficiency (30.3%). During the coming five years, producers identified calving ease/birth weight (69.3%), growth traits (66.1%), reproduction (65.8%), temperament (58.5%), milk (47.5%), lifetime productivity (42.4%), feed efficiency (36.7%), and maintenance efficiency (31.1%).

Average daily gain was most frequently identified (41.7%) by commercial producers as the selection criterion that they use to improve feed efficiency. Interestingly, mature weight and cow body condition score were the next most frequently indicated at approximately 27% of respondents. Less than 4% of respondents used maintenance energy EPD, residual average daily gain EPD, or selection indexes that use feed intake predictions.

Producers were asked how much more they would be willing to pay for a bull if a reliable method of evaluation were available to document its genetic merit for feed efficiency. Most frequently (23%) producers indicated that they would not pay any more for a bull with a reliable genetic prediction for feed efficiency, while 13.6% indicated they would increase their purchase price by more than US\$500, 11.8% indicated an increase of US\$201-\$300 and 10.5% would increase their bid by US\$101-\$200.

Conclusion

Although no direct price signal exists in the beef value chain for feeder cattle of different genetic potentials for feed efficiency, cow-calf and feedlot producers may obtain increased profits through reduced feed cost per unit output through selection for efficiency and growth rate. Results of this social survey suggest that commercial cow-calf beef producers in the US are not well versed in the basic concepts of feed efficiency or of the available methods to improve feed efficiency. Additional educational work must be done to aid producers in understanding the appropriate methods and tools for selection to improve feed efficiency.

Adapted from: Weaber, R.L. et al. Proceedings, 10th World Congress on Genetics Applied to Livestock Production

Literature Cited

- Am. Angus Assn. 2014 <http://www.angus.org/Nce/PercentBreakdown.aspx>.
- Anderson R.V., Rasby R.J., Klopfenstein T.J. et al. (2005) *J. of Anim. Sci.* 83:694-704.
- Archer, J.A., Richardson, E.C., Herd, R.M., et al. (1999) *Aust. J. of Exp. Agric.* 50:147-161.
- Arthur, P.F, Barwick, S.A., and Graser, H.U. (2004) *Aust. J. Exp. Agric.* 44:393-404.
- Ferrell, C.L., and Jenkins, T.G. (1982). *Germ Plasm Evaluation Report* 10:12.
- Fox, D., Tedeshi, L.O., and Guiroy, P.J. (2001). *Proc. of 33rd An. Beef Improvement Fed.* 80-98.
- Hill, R.A., Baker, S.D., Klein, T.A., et al. (2005) *Pacific Northwest Anim. Nutr. Conf.* 40:199-210.
- Weaber, R.L. (2012) *Proc. of Cornbelt Cow-Calf Conference, Ottumwa, IA, January 21, 2012.*
- Wulfhorst, J.D., Ahola, J.K., Kane, S.L., et al. (2010) *J. Anim. Sci.* 88:3749-3758.

Table 1. Frequency of use (SE) for various types of genetic prediction information used by beef producers during past five years and their anticipated future use.¹

Data type	Use past 5 years ²	Anticipated future use ²
Actual measurements	18.4 (3.0)	6.7 (1.8)
Ratios	21.6 (4.0)	13.8 (3.3)
Expected Progeny Differences	29.9 (4.4)	12.4 (3.4)
Genomically Enhanced EPD	5.6 (2.2)	12.6 (3.0)
Productivity of relatives	16.4 (3.5)	14.3 (3.7)
Comments by seller	17.6 (3.8)	11.4 (3.0)
DNA marker results	2.8 (1.5)	15.4 (3.1)
None of above	31.0 (4.9)	42.5 (5.1)

¹Respondents could select more than one type of information used; column totals will not sum to 100%.

²Percentage of respondents indicating use or anticipated use followed by standard error of measurement.