The 2016 and the 2036 cowherd, what we do and what we need to do better.

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Introduction

Tools and benchmarking data are readily available to monitor changes over time in post-weaning performance, finishing phase profitability and carcass characteristics. For example, in most breeds the genetic trend for yearling weight and marbling EPD continues to steadily increase over time (Kuhn and Thallman, 2015). Finished cattle weights and carcass weights are increasing at the rate of about 9.4 and 5.7 lb per year since 2007 (LMIC, 2016). Likewise, percent of federally inspected cattle grading USDA Choice and above has increased from 48% in 1995 to 78% for the 2015 calendar year (LMIC, 2016).

In contrast, documenting production and financial performance of the commercial cow/calf sector continues to be a challenge. Programs designed to simultaneously evaluate economic and animal performance are necessary because production outcomes are influenced by the production environment and management. In other words, one can increase production by accelerating input costs resulting in a higher per unit cost of production. Consequently, cost per unit of land or per unit of production ($/cwt of calf produced, for example) are better indicators of ranch efficiency…at least through the weaning phase. Obviously, this picture is complicated further if calves are retained through a post-weaning phase and especially considering dramatic differences in carcass value. Benchmarking data in the commercial cow/calf industry is scarce. Numerous commercially available programs are available to record and evaluate cow/calf enterprise production records (Lalman et al., 2015), although few of these provide the capability to benchmark against other similar enterprises. Fewer programs with the capability to simultaneously evaluate economic and performance outcomes are available. For the purpose of evaluating the current "state" of the commercial cow/calf sector and identifying areas of low hanging fruit through the next 20 years, we reviewed production and economic performance of commercial cow/calf enterprises over time. This data was provided by the Kansas Farm Management Association (Herbel, 2016), Southwest Cow-Calf SPA (Bevers, 2016), Cow Herd Appraisal Performance (CHAPS) program (Ringwall, 2016), and FINBIN, Center for Farm Financial Management (University of Minnesota, 2016).

Cost of Production

Figures 1 and 2 show the annual cost per cow in the SPA and KFMA data sets, respectively. Using simple linear regression to evaluate the trend over time, the cost to maintain beef cows has increased at the rate of $22.45 per year in the southern Great Plains (Texas, Oklahoma and New Mexico) as determined using the SPA methodology. In the KFMA system, annual cow cost escalation has averaged $34.35 per year since 1994. Methodology may differ between these

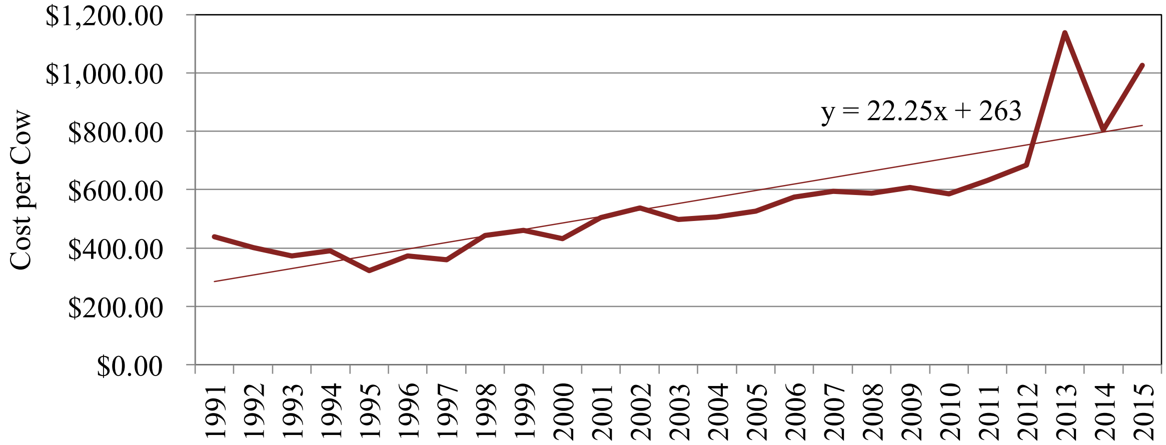

Figure 1. SPA (Texas, Oklahoma and New Mexico) total cost per cow.

programs, therefore, the costs should not be compared directly, but both clearly document increasing annual cost of production.

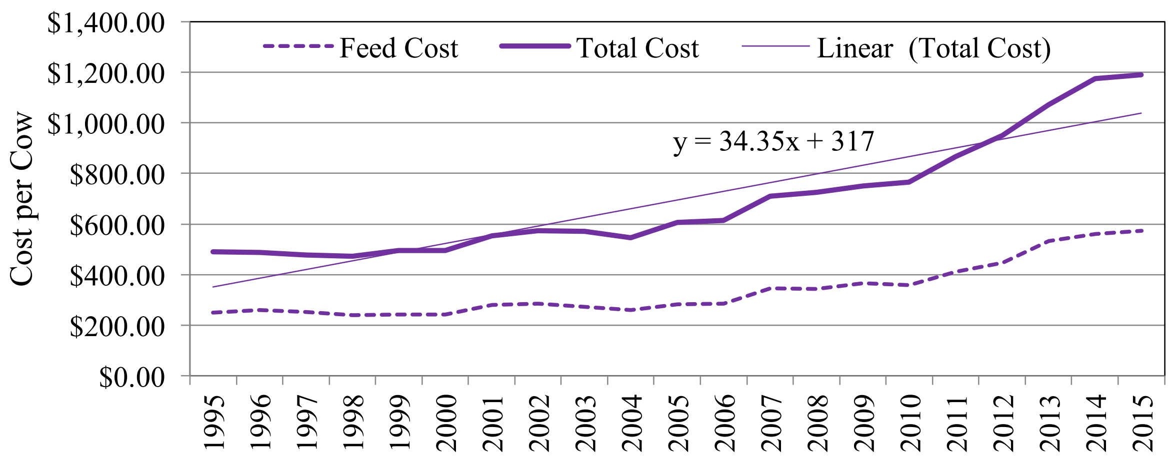

Figure 2. KFMA (Kansas) total cost and feed cost (pasture and non-pasture) per cow

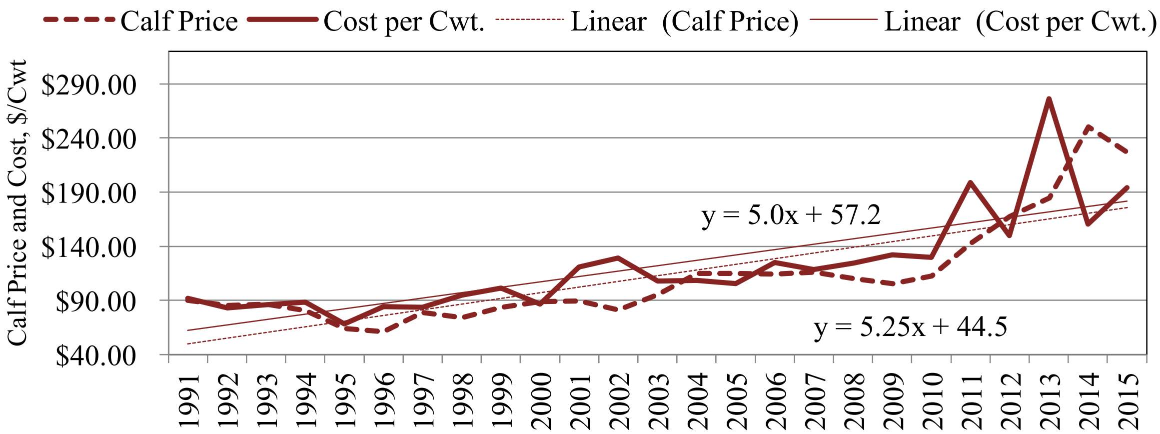

Figure 3. SPA (Texas, Oklahoma and New Mexico) calf price versus cost of production over time

Using the SPA data, cost per cwt of calf produced has accelerated at the rate of $5.00 per year. During the same time period, calf prices have accelerated at an average rate of $5.25 per cwt per year (Figure 3). These data suggest that the relationship between the cost of production and the value of weaned calves has not changed much when viewed from a general "trend over time" perspective.

Pendell et al. (2015) reported characteristics influencing profitability and cost in 79 Kansas cow/calf enterprises participating in the program between 2010 and 2014. Even though average cow/calf enterprise profitability has not changed much over the last 20 years, the variation in profitability from year to year remains lower than the variation in profitability among operations within any given year. In other words, in "bad" years, some cow/calf operations remain profitable and some continue to be unprofitable in "good" years. Cattle producers have little influence on macroeconomic factors driving year-to-year differences in industry-wide profitability. However, this data confirms older reports suggesting that management decisions and production systems, which are within the producers' influence or control, can have a dramatic impact on profitability.

In Pendell et al. (2015), the 79 operations were divided into high, medium and low profitability groups. The high profitability 1/3 ranches averaged $415.03 more net return per cow than the low 1/3 profitability group. When comparing the characteristics driving differences in profitability between the high 1/3 and the low 1/3 groups, they found that 67.8% of this difference was due to lower cost of production in the high profit group. The remaining 32.2% difference in profitability was due to differences in gross income per cow. As one would expect, higher profitability herds had slightly higher average weaning rate, weaning weight and calf sale price. However, controlling cost was substantially more important in driving profitability than was increasing pounds of cattle sold (calves and cull cows) or price for cattle sold.

In this same study, the Kansas group reported results from multiple regression analyses designed to explore factors explaining variation in profitability among these 79 operations. In the profit model, neither calf weight nor calf price were significant factors. However, in the cost ($/cow) model, increased calf sale weight (weaning weight) was highly significant. In fact, for every one-pound increase in calf weight, total cost per cow increased by $0.86. Considering the weaning rate during this time period in these operations averaged about 90%, the cost to increase one pound of weaning weight was about $0.96.

To quantify the value of additional weaning weight, we evaluated 234 weekly sales reports from the Oklahoma National Stockyards in Oklahoma City (Livestock Marketing Information Center) from 2010 through 2014. The mean value of added weight in the 550 lb to 650 lb weight range was $85.90 with a standard deviation of $33.20. On average, the cost associated with increasing weaning weight in the Kansas data was slightly greater than the value of increased weaning weight. The relative value of additional weaning weight is highly variable over time, and therefore, the profitability of managing to achieve greater weaning weight will be highly variable over time.

Clearly, in a "sell at weaning" enterprise context, there is more low hanging fruit in cutting or managing cost than there is in increasing production. Fortunately, selection indexes as well as relatively new EPD's more directly related to profitability, input costs and fertility are becoming available. Over the next 20 years, these tools should help curb the appetite for traits that result in increased cow costs such as increased mature cow weight, milk yield, and extremes in growth (Lalman, 2013).

Reproductive Efficiency

Genetic trend data (Kuehn and Thallman, 2015) indicates that tremendous changes have occurred in the seedstock sector over time in conjunction with continued proliferation and refinement of genetic selection tools. However, tools to assist in improving the genetics of fertility or reproductive efficiency, which are low in heritability, have been scarce and relatively recent in terms of implementation (heifer pregnancy EPD's for example). Perhaps it is no surprise that advancing such a difficult trait has been a challenge in the commercial cow/calf segment. Weaning percent, also described as weaning rate or percent calf crop weaned, is the calculation used to evaluate overall reproductive efficiency according to Beef Improvement Federation (BIF) guidelines (BIF, 2010). This calculation includes losses due to cows failing to become pregnant, pregnancy losses, calf death loss prior to weaning and cow death loss. Mean herd average weaning percent is shown for each of the last 24 years in figure 4 for commercial cow/calf operations contributing to KFMA (Kansas), SPA (Texas, Oklahoma and New Mexico), CHAPS (North Dakota) and FINBIN (upper Midwest) programs. The Kansas data represents percent of calves weaned from number of pregnant cows. Consequently, weaning rate in this data set would be a few percentage units lower than those reported in figure 4 (due to open cows and early embryonic losses not being included in the calculation).

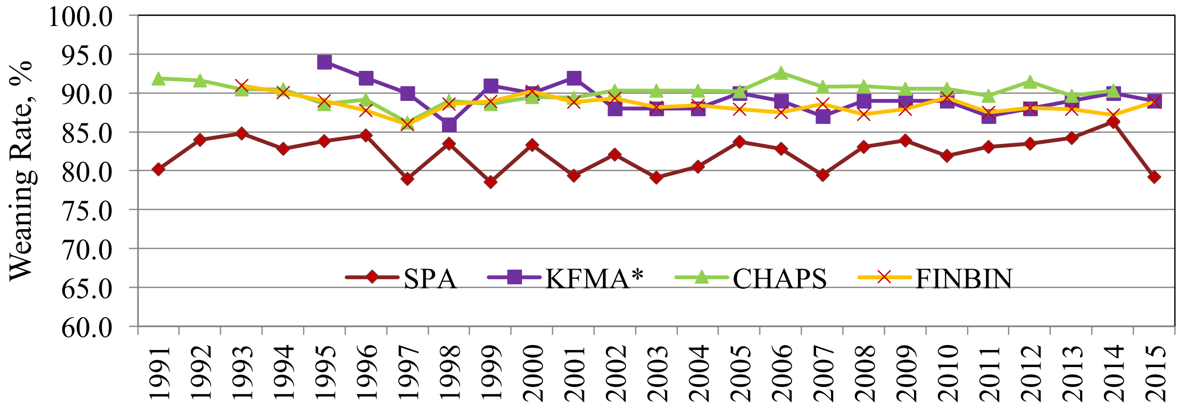

Figure 4. SPA, KFMA, CHAPS weaning rate over time
*KFMA data represents % calves weaned from pregnant cows

Overall reproductive efficiency has not changed significantly throughout this time period in these four datasets. For the ten-year period from 2005 through 2014, weaning rate has averaged 90.7, 88.7, 88.0 and 83.2 for North Dakota, Kansas, upper Midwest and the southern states of Oklahoma, Texas and New Mexico, respectively. True weaning rate in the Kansas data would be lower than 88.7, although how much lower is unknown. This data suggests a substantial reproductive efficiency gradient declining from the northern to the southern Great Plains region of the United States.

This discrepancy in fertility and (or) calf survival has been consistent over time. Many factors may contribute to reduced weaning rate in the South including heat stress, parasite burden, lower forage quality, an increase in proportion of non-adapted cattle (dark hide and hair color in particular), and reduced utilization of *Bos indicus* cattle in planned crossbreeding systems …to name a few. In general, it appears that room for economically beneficial improvement in overall fertility in the northern Great Plains is limited. On the other hand, there seems to be an opportunity for a major breakthrough in reproductive efficiency in the southern U.S. Obviously, the potential to improve fertility through maternal heterosis, planned crossbreeding systems, and use of composite populations have been known for a long time. In particular, it would seem that the southern cow/calf region as a whole should reconsider the rapid evolution away from use of planned crossbreeding systems or composite systems utilizing *Bos indicus* breeds and other regionally adapted cattle.

Consider a quote from Dr. Ron Randel, Texas A&M University in a recent conversation, "F1 females, out of Hereford bulls and Brahman cows, gives you North Dakota-like fertility in the Gulf-Coast region. You have a well-adapted, low-maintenance female that can take the heat, the parasites, and nutritional stress during tough drought years or in cases of marginal management. If you mate those females to an Angus bull with growth, feed efficiency, marbling and muscle, you have an animal that can compete in today's feeding industry and perform well in a grid marketing program." Obviously, there are challenges associated with creating and maintaining an F1 cow herd. These challenges along with market discounts for feeder cattle and carcasses have contributed a great deal to the decline in use of similar breeding systems. The same breed structure and crosses will not work in every region and each producer should choose a planned crossbreeding system that would work for their management and marketing goals. However, the use of planned crossbreeding or composite populations to create maternal heterosis and regional adaptability, paired with traditional selection on fertility-related EPDs, has the potential to dramatically increase reproductive performance in the southern U.S.

A significant proportion of the number of cows failing to wean a calf are due to failure to become pregnant and embryonic mortality (loss of pregnancy). Just recently, the American Hereford Association initiated the use of the Sustained Cow Fertility EPD (Northcutt and Bowman, 2015) designed to address these fertility components in genetic selection. Hopefully, whole-herd reporting will continue to expand across the seedstock sector allowing further development and implementation of similar tools directly related to reproductive efficiency.

Production at Weaning

Average weaning weights over time from the four benchmarking programs, along with Angus weaning weights for bull calves are shown in figure 5. Angus data is shown as an example of phenotypic changes over time in the seedstock sector. It should be recognized that the three commercial data sets represent actual weaning weights for both steers and heifers. Adjusted weights are not available in the SPA, KFMA or FINBIN programs. Logically, one primary factor that could lead to these results (no increase in actual weaning weight) would be a wide-spread evolution to earlier age at weaning in commercial operations. In other words, we are assuming that age at weaning has not changed substantially during this time period. The Angus data in the graph represents adjusted weights for bulls only. Consequently, the relative differences in weaning weights are not comparable. Rather, our objective is to observe change over time in large datasets that have used consistent guidelines in collecting and reporting weaning weight data.

Simple linear regression was applied to each dataset independently. The regression coefficient for the SPA ($P = 0.65$), CHAPS ($P = 0.80$) and FINBIN ($P = 0.74$) data did not differ from zero, indicating that, on average, there has been no change in weaning weight for herds participating in these programs during this time period. The regression coefficient for the KFMA data was positive and significantly different from zero ($P = 0.016$) suggesting that, on average, weaning weight in these herds have increased at the rate of about 1.1 lb per year since 1995. There is a highly significant ($P < 0.01$) positive linear coefficient in the Angus dataset, indicating that adjusted weaning weights have increased at a rate of about 2.6 lb per year. Although the Angus heifer data is not shown in Figure 5, a similar positive, linear coefficient ($P < 0.01$) was observed at the rate of 2.1 lb per year.

Based on the limited data available, we submit that commercial cow/calf and seedstock phenotypic changes in weaning weight may be uncoupled. Either the producers in these datasets are not selecting for increased weaning weight or lower nutrient availability and (or) less intense management restrict the expression of genetic potential for weaning weight growth in commercial operations. Genetic improvement would be expected to lag in the commercial segment by several years. Regardless of the reason, commercial operators should be asking the question, "Does continued aggressive selection for growth improve my bottom line?" Certainly, potential antagonisms of continued aggressive selection for growth should be considered (increased appetite and maintenance requirements in retained females, for example).

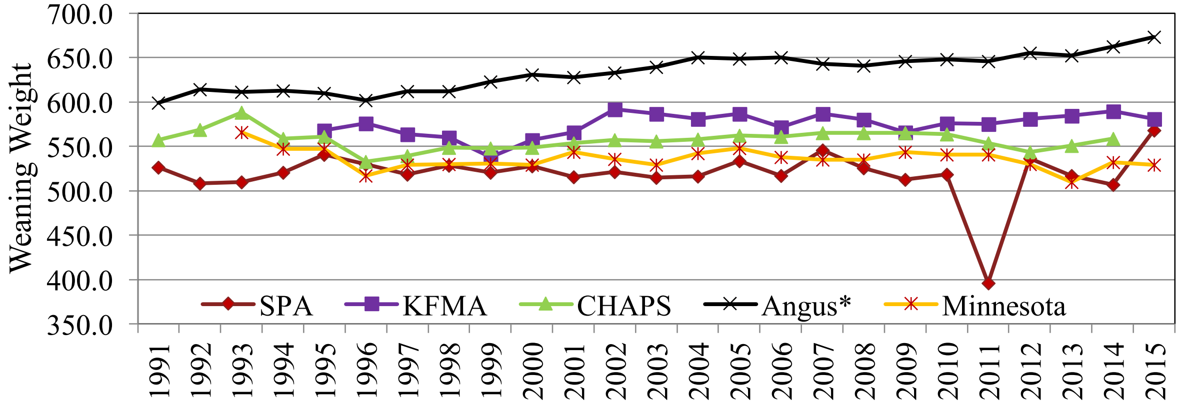

Figure 5. SPA, KFMA, CHAPS and Angus weaning weights over time.
*Angus values represent adjusted weaning weights for bulls

Summary

Long-term trends in cost of production appear to be keeping pace with increased calf prices while there has been no substantial change in productivity of the nation's commercial cow herd over the past 24 years when viewed from a "sell at weaning" enterprise context. In contrast, changes in post-weaning growth, carcass weight and marbling has been dramatic. This is both good and bad news. While overall cow/calf segment year-to-year profitability has not changed substantially, well-managed operations remain profitable even during financially difficult years. At the same time, some cow/calf enterprises continue to lose money in relatively "good" years. While increased calf prices, weaning weight and reproduction are features of profitable cow/calf enterprises, controlling or minimizing cost of production is more important. On average, minimal improvement in weaning weight and no improvement in reproductive efficiency has been achieved in the nation's commercial cow herd over the 24-year time period evaluated. This is surprising because genotypic and phenotypic trends indicate substantial positive change in breed association data. Although certainly not new or revolutionary, a shift towards more emphasis on minimizing production cost in the cow/calf enterprise is appropriate. This shift should not come at the expense of industry gains made in post-weaning characteristics over the past 20 years. The toolkit to convey the costs (antagonists) associated with increasing growth, milk yield and carcass weight genetics has expanded in recent years. This trend in development of genetic selection tools is vital to assist the commercial cow/calf sector in balancing genetic selection for controlling production cost versus increasing post-weaning phase performance, post-weaning phase profitability and carcass value.

Literature Cited

Bevers, S. Texas Rolling Plains Agricultural Economics Program. Ranch economics and analysis and beef cow-calf SPA information. http://agrisk.tamu.edu/beef-cow-calf-spa-ranch-economics-and-analysis/ranch-economics-and-analysis-and-beef-cow-calf-spa-information/ (Accessed 15 May 2016.)

Beef Improvement Federation. 2010. Guidelines for uniform beef improvement programs. 9th ed. J. Cassady, executive director, North Carolina State University, Raleigh, NC.

FINBIN Center for Farm Financial Management, University of Minnesota, www.finbin.umn.edu.

Herbel, K. 2016. Kansas Farm Management Association. http://www.agmanager.info/kfma/ (Accessed 15 May 2016.)

Kuehn, L. A. and Thallman, M. 2015. Mean EPDs reported by different breeds. Roman L Hruska U.S. Meat Animal Research Center, USDA-ARS, Clay Center, NE.

Lalman, D., Ladd, B., Doye, D. 2015. Cow-calf production record software. Oklahoma Cooperative Extension Service, Stillwater, OK.

Lalman, D., Rolf, M., Kropp, R., Brown, M., Sparks, D., Linnen, S. 2013. Addressing cowherd efficiency in a world of mixed messages for producers: matching production levels to environmental conditions. In: Beef Improvement Federation Proc. p 78-87.

Livestock Market Information Center, Lakewood, CO. (2016, June 10). Retrieved from Member Reports at http://www.lmic.info/

Northcutt, S., and B. Bowman. 2015. American Hereford Association. http://www.hereford.org/content/sustained-cow-fertility (Accessed 15 May 2016).

Pendell, D. L., Youngjune, K., Herbel, K. 2015. Differences between high-, medium-, and low-profit cow-calf producers: an analysis of 2010-2014 Kansas farm management association cow-calf enterprise. Kansas State University Department of Agricultural Economics, Manhattan, KS.

Ringwall, K. 2015. Cow Herd Appraisal Performance. The benchmarks. http://www.chaps2000.com/benchmarks.htm (Accessed 15 May 2016.)