



Genetic Improvement at Beef Improvement Center/One Bar Eleven Ranch

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HISTORY

In 1986, John E. Rouse, a long-time cattleman and oil company executive, donated his Angus ranch located in Saratoga, Wyoming to Colorado State University (CSU) Department of Animal Sciences to improve agricultural education and conduct beef cattle breeding research. In 2009, the Rouse family purchased the ranch back from CSU. An endowment fund was then established at CSU with the proceeds of the endowment to supplement ranch operations, fund continued research and establish the John E. Rouse faculty chair in the Department of Animal Sciences. Current research at One Bar Eleven has focused on 1) improving growth and carcass characteristics, stayability (cow longevity) and adaptability, and 2) incorporating genomic technology to study and select cattle tolerant to high elevations.

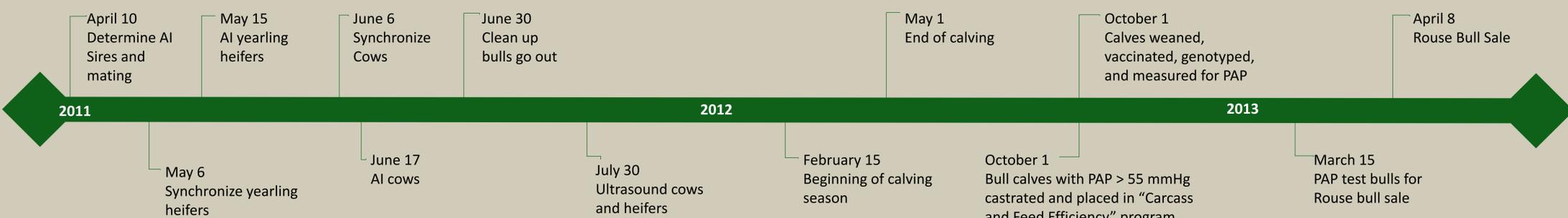
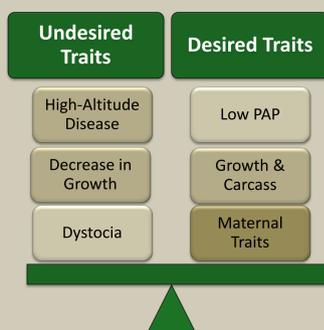
Introduction

The objective of this study was to determine the genetic progress of the One Bar Eleven Ranch over the past 60 years. Trends analyzed focused on growth characteristics, birth weight, weaning weight, yearling weight, and milk, (BW, WW, YW, and Milk, respectively), calving ease direct, calving ease total maternal, and stayability (CED, CETM, and STAY, respectively), and tolerance to high altitude as measured through pulmonary arterial pressure (PAP). Elevated PAP measurements have been selected against to reduce the incidence of animals developing High-Altitude Disease or Brisket Disease. Trends in relation to growth and stayability have been selected to enhance the progeny performance in feed efficiency and female longevity. Calving ease has focused on decreasing death losses associated with dystocia and delayed rebreeding of the cow.

Herd Management

Sire selection

- Traits desired
 - Growth (birth weight, weaning weight, yearling weight)
 - Calving ease (Direct and Maternal)
 - Maternal ability (Milk and Stayability)
 - Pulmonary arterial pressure (PAP):
 - Calves tested as yearlings
 - Sire selection typically < 40 mmHg and no bull with PAP > 55 mmHg sold
 - Average bulls in sale = PAP ± 46.3 mmHg
- ~60 bulls with desired traits (e.g., growth, stayability, and PAP) are placed on test
- Remaining bulls are castrated and sent to a "Carcass and Feed Efficiency" program at CSU's Agriculture, Research and Development Center (ADREC) located in Fort Collins, Co and ultimately finished at the CSU Eastern Colorado Research Center, Akron, CO
- > 85% of One Bar Eleven steers grade choice in the last 3 years with last year's steers grading > 90% choice



Glossary Terms and Abbreviations

- Birth Weight, Weaning Weight and Yearling Weight EPD:** Expressed in pounds, it is a predictor of difference in sires' progeny due to differences in breeding value for the trait of interest.
- Calving Ease EPD (CE):** Expressed as a probability of an unassisted birth, it is a predictor of a sire's ability to produce calves born unassisted. Higher values represent easier calving, **CE Total Maternal** represents the ability of a sire's daughters to calve easily.
- Milk EPD:** Expressed in pounds of calf weaned it is the difference in performance expected from daughters of the bull in question due to differences in genetics for milk production.
- PAP: (Pulmonary Arterial Pressure)** Obtained by a procedure called "right heart catheterization", this test is the best indicator to date for identifying animals predisposed to Brisket Disease. The test is not 100 percent accurate and should be used with that knowledge. Generally, cattle with PAP values greater than 50 are considered high risk and cattlemen should be cautious of using them at high elevations.
- Stayability EPD (STAY):** The probability that a sire's daughters will remain in the herd to age six assuming they produced their first calf at 2 years of age. This trait represents longevity of a sire's daughters. (Higher values result in a greater probability that a sire's daughters will remain in the herd to 6 years of age.)

RESULTS

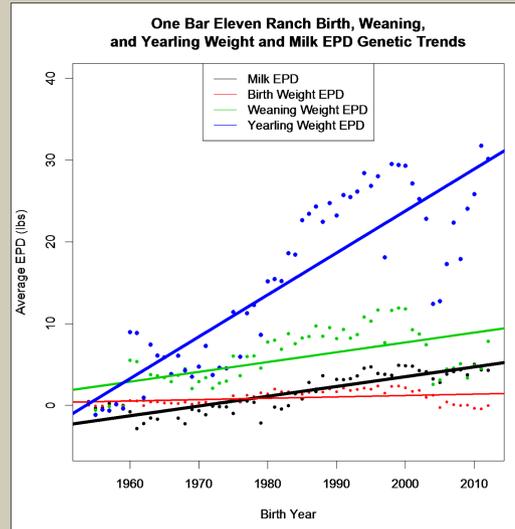


Figure 1: Milk, yearling weight (YW) and weaning weight (WW) have shown steady increases in genetic progress, while birth weight (BW) has remained low.

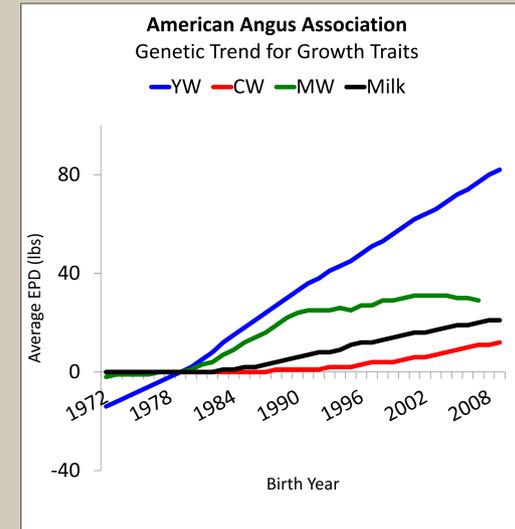


Figure 2: The American Angus Association have shown similar genetic trends as Rouse Angus in yearling weight (YW), carcass weight (CW), mature weight (MW) and Milk breeding values.

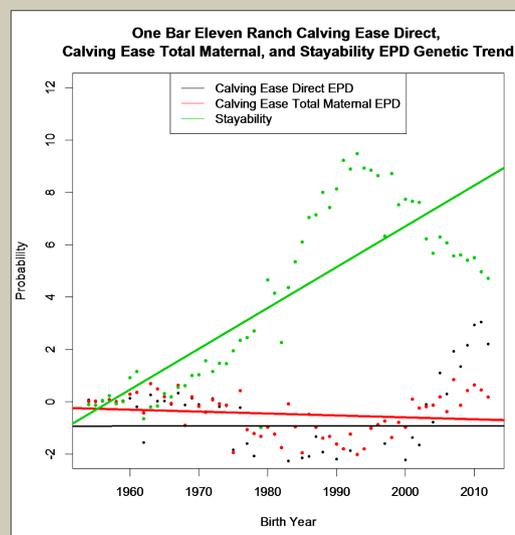


Figure 3: Stayability has increased while calving ease (CED and CETM) show a decline suggests cows are staying within the herd longer while needing less assistance when calving.

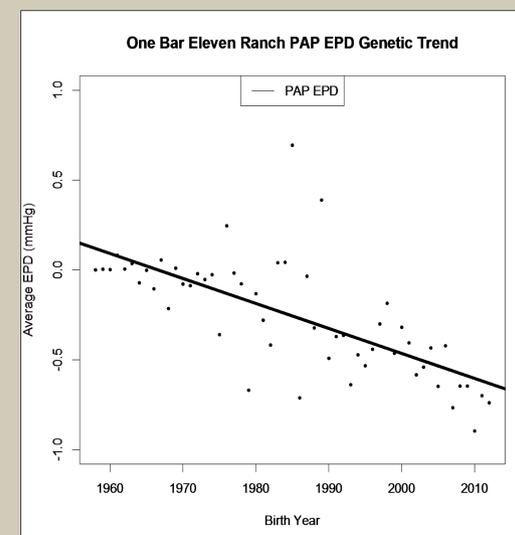


Figure 4: Pulmonary Arterial Pressure (PAP) continues to trend downward given cattle with PAP > 55 mmHg are selected against.

Conclusions and Future Research

Although genetic trends have suggested improvements in growth, maternal traits, and average PAP in the One Bar Eleven herd, there is still enormous room for genetic improvements. Introduction of the bovine genome sequence in 2004 has enhanced the industries base understanding of the relationship between environmental factors and gene interaction. The Breeding and Genetics team at Colorado State University are currently using whole-genome technology to identify the underlying mechanisms associated with complex traits like PAP. To date, ~1750 cattle in the One Bar Eleven herd have been genotyped. Additionally, this summer ~20 steers from the herd will have their whole genome sequenced to determine gene expression patterns. Collaborations with One Bar Eleven Ranch, CSU, and the University of Colorado Anschutz Medical School are using cutting edge technology to further understand difficult traits that will be used to improve the accuracy of selection. To translate these scientific findings, the long-term goal is to generate a genome (i.e., DNA)-enhanced EPD. Please follow our research briefs to stay updated.