Relationship between body condition score, claw set, and foot angle in Angus and Red Angus beef cows grazing native annual-grass rangeland in northern California

M. R. Banwarth, K. L. DeAtley, S. P. Doyle
College of Agriculture, California State University, Chico

COLLEGE OF AGRICULTURE — CSU CHICO — EST. 1953

INTRODUCTION

Beef cattle production needs to continue to become more efficient in order to meet the population demands of the future (Tilman et al., 2001). Traits associated with longevity can lead to more efficient cattle. Specifically, prioritization of skeletal structure traits (e.g., structure of hooves and legs) in selection of breeding animals could reduce operational costs (Forabosco, et al., 2004). Focusing on improving longevity traits such as claw set, foot angle, and body condition scores (BCS) is one way that producers can increase their overall production.

Hoof trimming is commonly used in dairy production to help prevent lameness, increase motility and prevent certain forms of claw horn lesions (Mahendran & Bell, 2015). However, this practice is not feasible in range-based beef cattle operations. A recent study has investigated the relationship of beef cattle traits (i.e., pre-breeding body weight (BW) and body condition score (BCS), cow BW and BCS at weaning, pregnancy rate, 205-d adjusted weight, and weaning performance) in relation to foot scores. The results suggested that cows with desirable foot scores will likely have a more desirable BCS, as well as have calves that have a heavier weaning weight (McGuire, et al., 2019). Additionally, low and moderate estimates of heritability have been reported for associated traits like foot angle (0.34), claw set (0.21), spread (0.16), scissors (0.25), steep (0.22), and weak (0.37; Wang, et al., 2017).

Selection of traits associated with beef cattle structure may contribute to cow longevity and overall production profits on beef cattle operations. Previous research has investigated the relationship between cow and calf performance at breeding and weaning and the heritability of these traits, however, there is a lack of research investigating the relationship between BCS, foot angle and claw set in beef cows. *It was hypothesized that there would be a relationship between foot angle, claw set and body condition score in beef cattle.*

OBJECTIVE

To determine the relationship between BCS, claw set and foot angle in Angus and Red Angus beef cows grazing irrigated pasture and annual-grass rangeland in northern California.

Figure 1. Angus and Red Angus cows grazing irrigated pasture (A, C & D) and Angus cows grazing annual-grass rangeland in northern California (B).

MATERIALS & METHODS

Location, Animals and Management:
- Procedures were approved by CSU, Chico Animal Care and Use Committee
- Spring-calving Angus (n = 40) and Red Angus (n = 19) cows beef cows, 2 to 13 years of age
- Diet: Improved irrigated pasture (CP: 38%, and NDF: 49.2%, on a DM basis)

Data Collection:
- Data were collected in October 2019, 44 d post-weaning
- Traits: Body condition score (BCS; range = 1 (emaciated) to 9 (obese); (Vizcarra & Wettermann, 1996), year of age, claw set, foot angle (Figure 2)
- Each trait was estimated by two trained observers per cow and averaged

Data Analysis:
- Data were analyzed as a factorial design using ANOVA (SPSS ver. 25, 2017)
- Foot angle and claw set were classified as either desirable (score = 4, 5, 6) or undesirable (score = 1, 2, 3, 7, 8, 9)
- Dependent variable: BCS
- Fixed effects: Breed, foot angle classification, claw set classification and up to 3-way interactions
- Pearson correlation was used to investigate relationships between BCS, foot angle, and claw set (SPSS ver. 25, 2017)
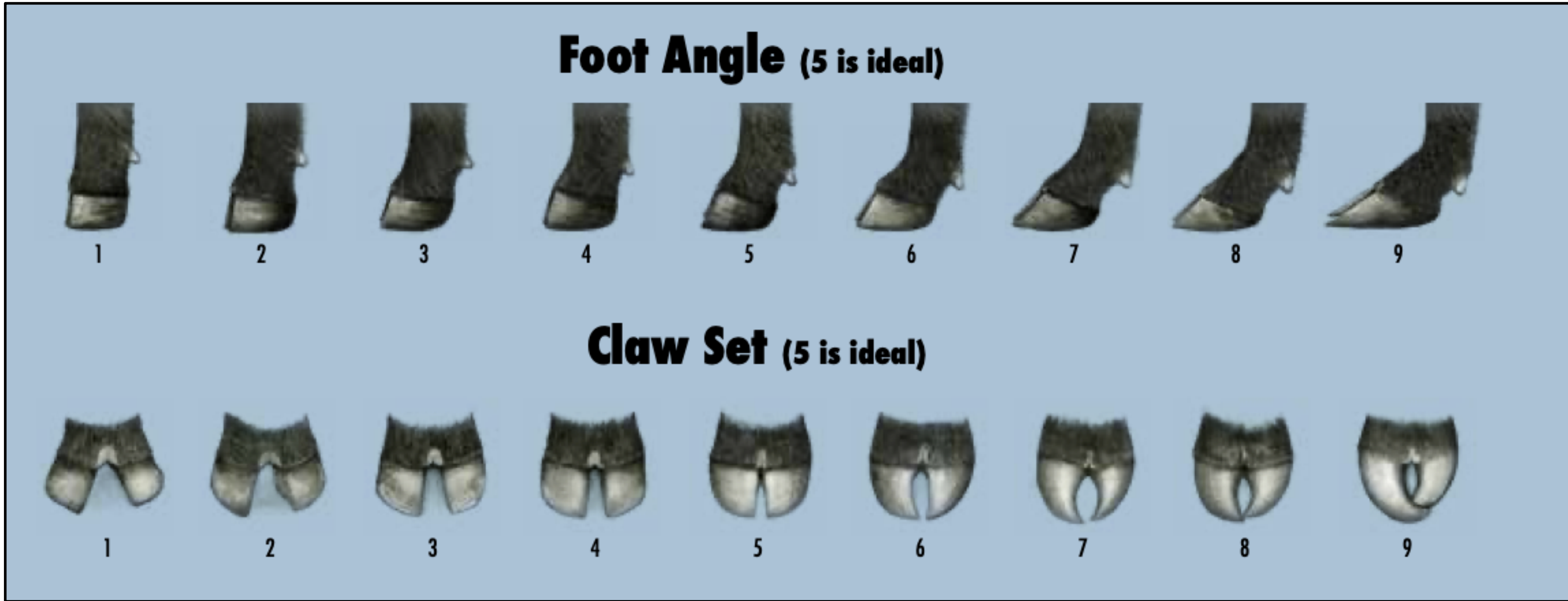

Figure 2. American Angus Association's foot score guidelines (American Angus Association, 2019).

RESULTS & DISCUSSION

Table 1. Correlation between BCS, foot angle and claw set in Angus (n = 40) and Red Angus (n = 19) grazing irrigated pasture.

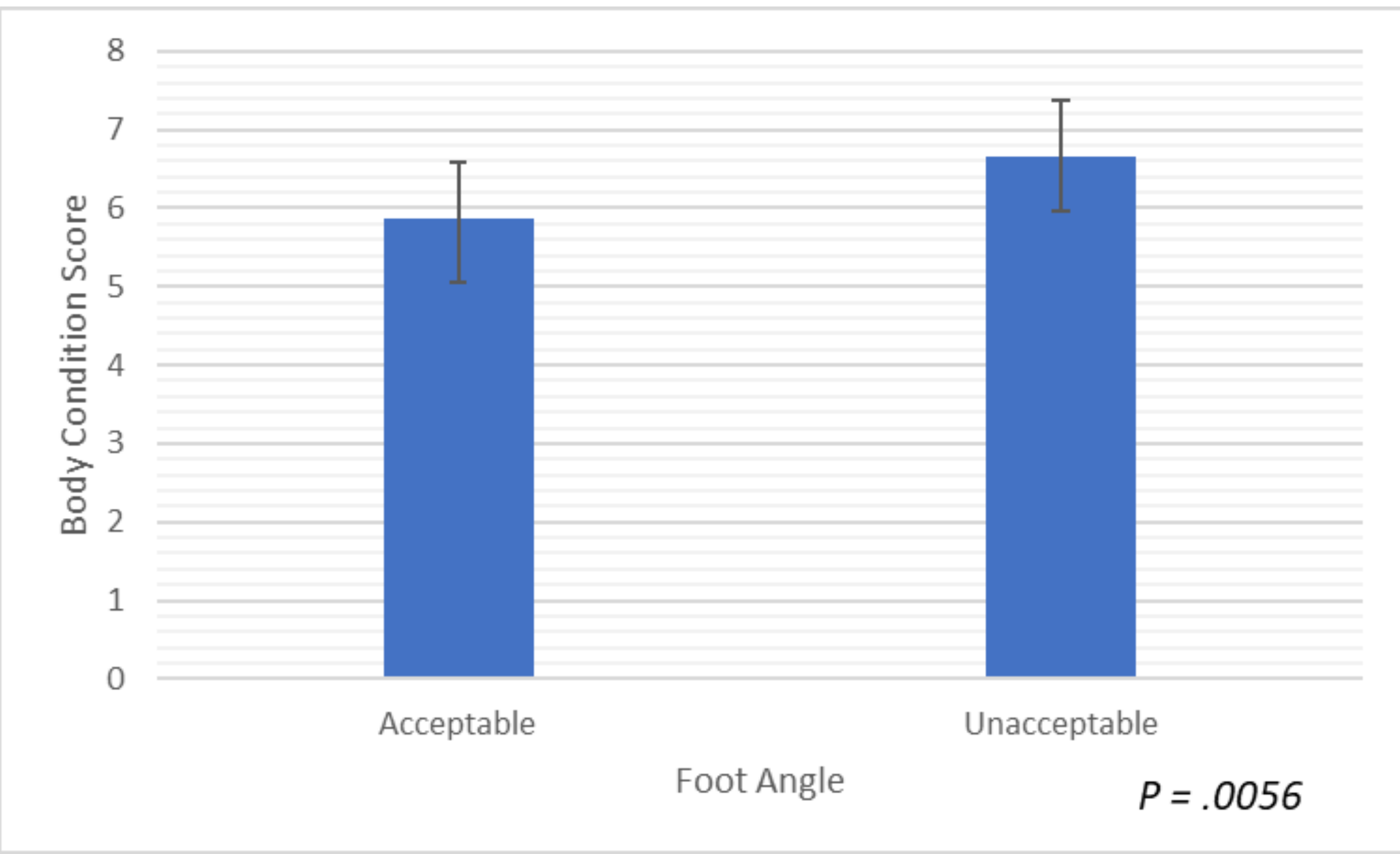|	BCS	Foot Angle	Claw Set
BCS			
r	1.0000		
p-value	0.0000		
Foot Angle			
r	0.3754	1.0000	
p-value	0.0034	0.0000	
Claw Set			
r	0.1949	0.3030	1.0000
p-value	0.1391	0.0197	0.0000

RESULTS & DISCUSSION CONTINUED

Figure 3. Effect of foot angle classification on BCS in Angus (n = 40) and Red Angus (n = 19) cows grazing irrigated pasture.

- Strong, moderate correlations between BCS and foot angle, as well as, foot angle and claw set were detected in this study.
- Cows with acceptable foot angle scores had 12.79% lower body condition compared to unacceptable cows (P = 0.0056).
- Cows with overall acceptable foot scores have shown to maintain a more beneficial BCS (McGuire, et al., 2019).

CONCLUSION & IMPLICATIONS

Longevity of a cow is dependent of multiple factors and traits, with BCS, foot angle and claw set scores being imperative. Undesirable foot angle and claw set scores, combined with an undesirable BCS can have a negative effect on longevity, which reduces overall profitability. This study determined the relationship between BCS, claw set and foot angle in Angus (n = 40) and Red Angus (n = 19) beef cows grazing irrigated pasture and annual-grass rangeland in northern California. There was no relationship between BCS and claw set scores, while foot angle scores were related to both BCS and claw set scores. Additionally, cows that had a lower BCS had an acceptable foot angle score when compared to cows with an unacceptable foot angle score. This would suggest that cows with a higher BCS tend to have an unacceptable foot angle score, while cows with an acceptable foot angle score tend to have a lower BCS. Further research needs to be done to investigate the differences of foot angle scores when affected by BSC.

REFERENCES

American Angus Association. (n.d.). Foot score guidelines. http://www.angus.org/performance/footscore/footscorebrochure.pdf

Forabosco, F., Groen, A. F., Bozzi, R., Van Arendonk, J. A. M., Filippini, F., Boettcher, P., & Bijma, P. (2004). Phenotypic relationships between longevity, type traits, and production in Chianina beef cattle. *Journal of Animal Science, 82*(6), 1572-1580.

Mahendran, S., & Bell, N. (2015). Lameness in cattle 2. managing claw health through appropriate trimming techniques. *In Practice, 37*(5), 231.

McGuire, C. L., Powell, J. G., Caube, R., Kutz, B., Anschutz, K., Lester, T. D., & Gragg, W. (2019). Foot scoring effects on cow and calf performance at breeding and weaning. (Report) (Author abstract). *Journal of Animal Science, 97*(Supplement_1), 50.

Tilman, D., Fargione, J., Wolff, B., D'Antonio, C., Dobson, A., Howarth, R., Schindler, D., Schlesinger, W. H., Simberloff, D., & Swackhamer, D. (2001). Forecasting agriculturally driven global environmental change. *Science, 292*(5515), 281-4.

Wang, L., Miller, S. P., Retallick, K. J., & Moser, W. (2017). Genetic parameter estimation for foot structure in American Angus cattle. (Report) (Author abstract). *Journal of Animal Science, 95*(8), 100.

Vizcarra, J. A. & Wettemen, R. P. (1996). Reproducibility, repeatability, and degree of expertise required to assess body condition to assess body condition score in beef cattle. *The Professional Animal Scientist, 12*(1), 28-31.