

# Beef Cattle Research Update

United States Department of Agriculture, University of Arkansas, and County Governments Cooperating

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## What's Inside

Page	Topic
2	• Effects of Injectable Trace Minerals at the Start of the Breeding Season on Attainment of Pregnancy in Commercial Beef Cows • The Effect of Good or Poor Residual Feed Intake Sires on Feedlot Heifer Performance and Carcass Characteristics
3	• Cost Analysis of Feeding Bermudagrass ( <i>Cynodon dactylon</i> ) or Ryegrass ( <i>Lolium multiflorum</i> ) Plus Rye ( <i>Secale cereale</i> ) Baleage Based on Nutrient Composition and Forage Refusal of Weaned Crossbred Beef Calves
4	• 300-Day Grazing Discovery Farm
5	• Hedonic Pricing Models for Angus Bulls Sold at Auction Following Performance Testing at Oklahoma Panhandle State University • Survey of Management Practices Used in the Implementation of Artificial Insemination and Estrous Synchronization Programs in the United States
6	• Reducing Winter Feeding Needs in Southern Arkansas Through the Use of Best Management Grazing Principles
7	• Bale Diameter and Feeder Design Effects on Hay Waste

## Response of Beef Cows Offered a Chlortetracycline-Fortified Mineral and Either Strip or Continuous Stocked to Stockpiled Fescue

(M. S. Gadberry et al., University of Arkansas)

Food and Drug Administration proposed changes to the United States feed law address judicious use of medically important antimicrobials. Cattle producers routinely feed mineral fortified with chlortetracycline. Available chlortetracycline-fortified minerals often contain 3.08 g/kg chlortetracycline (350 mg CTC/113.4 g mineral consumed). Fescue management may include fall stockpiling for deferred grazing with forage being allocated using either continuous or strip stocking. This project evaluated the effect of chlortetracycline delivered in a free choice mineral supplement with either strip stocking or continuous stocking on stockpiled fescue. The same mineral package was used for both the no chlortetracycline and chlor-tetracycline supplements. The chlor-tetracycline mineral contained 3.08 g/kg chlortetracycline. Ninety-six pregnant *Bos taurus* cows were randomly allocated to the 12 pastures. Grazing occurred from December 4 to January 29.

mineral intake (4.2 oz/day), differing only from continuous stocking; no chlortetracycline and strip stocking; chlortetracycline treatments.

- All other mineral intakes were similar (4.7 oz).
- Initial rising plate estimated forage allowance was 2,545 lb/acre.
- Forage utilization was not affected by either grazing method or chlortetracycline addition and averaged 47%. The numerical difference in forage utilization was 44% (continuous stocking) and 49% (strip stocking).
- Chlortetracycline resulted in a 49 lb greater body weight change from the initial to interim weigh date but not interim to final (15 lb less than no chlortetracycline).
- Final body weight and body condition score were not affected by grazing management or chlortetracycline.
- External body temperature and thermocirculatory

- The strip stocking; no chlortetracycline treatment had the least per cow

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index (based on rectal, skin and ambient temperature) at the rump and ear differed between strip stocking and continuous stocking but was not affected by chlortetracycline.

- Chlortetracycline had a greater skin temperature between the dewclaw at the interim but not final weigh date. Chlortetracycline had no effect on thermocirculatory index.

In conclusion, grazing method did not significantly affect forage utilization, body weight or body condition score but resulted in different skin temperature responses. Adding chlortetracycline to the mineral primarily resulted in an initial body weight gain response without affecting final body weight and body condition score. Feeding chlortetracycline to cattle grazing stockpiled fescue did not result in a sustained benefit for performance or body temperature.

## Effects of Injectable Trace Minerals at the Start of the Breeding Season on Attainment of Pregnancy in Commercial Beef Cows

(J. D. Arthington et al., University of Florida)

Our objective was to evaluate the effects of a single application of injectable trace minerals (ITM; MultiMin 90, Multi-Min USA, Inc., Fort Collins, CO) on pregnancy attainment of lactating beef cows. Mature Brahman × British crossbred beef cows ( $n = 3,750$ ) were enrolled from 14 separate commercial cow/calf operations in central and southern Florida. Ranch breeding season ranged from 90 to 120 days with study enrollment < 30 days after the start of the breeding season. During enrollment, cows were administered 5 mL of ITM or sterile saline subcutaneously in alternating order. The injectable trace minerals contained 60, 10, 15 and 5 mg/mL of Zn, Mn, Cu and Se, respectively. At the time of treatment administration, cow body condition score was recorded and assigned a body condition score category group (1 = low; 2 = moderate; 3 = high). In addition, samples of pasture forage and trace mineral supplement were collected. To estimate ranch trace mineral status, liver biopsy samples were collected from 10% (maximum of 16) of the enrolled cows. Treatment assignment was identified by an individual number and color-coded ear tag. Tags were removed during pregnancy diagnosis.

- Overall tag loss was low and equally distributed between treatments (96.3% and

95.5% tag recovery for injectable trace minerals and saline, respectively), resulting in a total of 3,597 collected tags for pregnancy analysis.

- There was no ranch × treatment interaction or overall treatment effect for pregnancy attainment (88.8% and 87.2% pregnant for injectable trace minerals and saline, respectively).
- Attainment of pregnancy increased with increasing body condition score category (83.9%, 86.7% and 91.0% for low, medium and high body condition score categories, respectively).
- Interestingly, although not statistically significant, the numeric difference between the percentage pregnancy attainment due to injectable trace minerals increased as cow body condition score decreased (3.1%, 1.8% and 0.1% for low, medium and high body condition score categories, respectively).

Provided at the start of the breeding season, injectable trace minerals injection did not significantly improve pregnancy outcome in the commercial cow/calf ranches enrolled in this study.

## The Effect of Good or Poor Residual Feed Intake Sires on Feedlot Heifer Performance and Carcass Characteristics

(K. M. Retallick et al., CalPoly, University of Arizona and University of Illinois)

Performance and intake data were collected for 90 days on Angus yearling bulls ( $n = 8$ ) to calculate residual feed intake on these potential sires. These bulls were then used as herd sires during the fall breeding

season. The Angus × Simmental heifer ( $n = 84$ ) progeny of these sires were randomly allotted to pens, managed similarly and fed a common diet. Heifers had intake data collected for 70 days and were weighed

every two weeks for calculation of residual feed intake during this period. Thirty-seven heifers were sired by poor residual feed intake sires (residual feed intake = 0.64 to 1.35), and 47 heifers were sired by good residual feed intake sires (residual feed intake = -0.08 to -0.86). The objective of this study was to observe performance and carcass characteristics of feedlot heifers sired by good or poor residual feed intake sires and to determine phenotypic feed efficiency correlations between sire and heifer progeny.

- Heifer performance did not differ for initial weight, final weight or average daily gain.
- Heifers sired by good (low value residual feed intake) sires had a 1.43 lb/day lower dry matter intake than heifers sired by poor (high value residual feed intake) sires.
- As a result, heifers by good residual feed intake sires had a 1.12 lb/day lower residual feed intake than heifers by poor residual feed intake sires.
- Heifers by good residual feed intake sires also had a desirable 4.4% increase in gain:feed.
- Hot carcass weight, rib eye area, backfat and yield grade did not differ.
- A 28-unit marbling advantage was given to poor residual feed intake sired heifers.
- Heifer residual feed intake was correlated to dry matter intake at 0.78.
- Heifer residual feed intake and heifer gain:feed were correlated at -0.27; however, sire residual feed intake was not significantly correlated to heifer gain:feed.
- Sire residual feed intake was correlated to heifer dry matter intake at 0.33.
- Sire residual feed intake was correlated at 0.47 to heifer residual feed intake.

The significant correlation of sire residual feed intake to heifer residual feed intake as well as desirable effects on performance and carcass traits assist in the quantification of the advantages of selecting for residual feed intake.

## **Cost Analysis of Feeding Bermudagrass (*Cynodon dactylon*) or Ryegrass (*Lolium multiflorum*) Plus Rye (*Secale cereale*) Baleage Based on Nutrient Composition and Forage Refusal of Weaned Crossbred Beef Calves**

(R. M. Martin et al., Louisiana State University)

In the Gulf Coast region, supplementation can be costly for weaned beef calves during the fall backgrounding period due to limited forage production and quality. A study was conducted evaluating performance of weaned Angus crossbred calves fed bermudagrass (*Cynodon dactylon*) or ryegrass (*Lolium multiflorum*) and rye (*Secale cereale*) baleage in hay rings during a 60-day fall backgrounding period. Four forage treatment comparisons included early boot stage bermudagrass harvested for hay, early boot stage bermudagrass harvested for baleage, early boot stage ryegrass and rye harvested for baleage and bloom stage ryegrass and rye harvested for baleage. Both early boot stage bermudagrass harvested for hay and early boot stage bermudagrass harvested for baleage were harvested from the same hay field at the same time.

- 9.2% CP, 57.4% TDN and 49.1% DM (early boot stage bermudagrass harvested for baleage)
- 12.8% CP, 64.5% TDN and 37.2% DM (early boot stage ryegrass and rye harvested for baleage)
- 9.2% CP, 62.7% TDN and 55.7% DM (bloom stage ryegrass and rye harvested for baleage).
- Nutrient composition of forage treatments included:
  - 8.2% CP, 59.9% TDN and 88.8% DM (early boot stage bermudagrass harvested for hay)
- Total costs of production were:
  - \$293.92/ton dry matter (early boot stage ryegrass and rye harvested for baleage)

Forage refusal on a dry matter basis was estimated as amount of and percent of bale weight fed based on forage remaining outside of the hay ring. Cost estimates for each treatment were performed based on nutrient composition and forage refusal and were derived using standard performance assumptions associated with the tractor and implements used during harvesting of the forage and were adjusted for the time needed to harvest forages for this study.

- \$209.18/ton dry matter (bloom stage ryegrass and rye harvested for baleage)
- \$128.33/ton dry matter (early boot stage bermudagrass harvested for baleage)
- \$117.87/ton dry matter (early boot stage bermudagrass harvested for hay)
- On a cost-per-nutrient basis:
  - Early boot stage ryegrass and rye harvested for baleage had the greatest cost/lb of CP and TDN (\$1.15 and \$0.23)
  - Bloom stage ryegrass and rye harvested for baleage (\$1.14 and \$0.17)
  - Early boot stage bermudagrass harvested for baleage (\$0.70 and \$0.11)
  - Early boot stage bermudagrass harvested for hay (\$0.72 and \$0.10)
- Forage refusal was greater for the early boot stage bermudagrass harvested for hay (254 lb and 10.0%) compared with early boot stage bermudagrass harvested for baleage (60 lb and 3.4%), early boot stage ryegrass and rye harvested for baleage (57 lb and 5.0%) and bloom stage ryegrass and rye harvested for baleage (64 lb and 3.7%) treatments.
- Value associated with hay refusal measured outside the hay ring was:
  - \$14.73/ton dry matter (early boot stage ryegrass and rye harvested for baleage)
  - \$7.66/ton dry matter (bloom stage ryegrass and rye harvested for baleage)
  - \$4.39/ton dry matter (early boot stage bermudagrass harvested for baleage)
  - \$11.74/ton dry matter (early boot stage bermudagrass harvested for hay)

Production costs were lower for bermudagrass harvested as dry hay or baleage. While hay refusal was less outside the hay ring for all baleage treatments, the high value of hay refusal and production cost of the early boot stage ryegrass and rye harvested for baleage treatment were greatly associated with the high moisture content of the bales.

### 300-Day Grazing Discovery Farm

(T. R. Troxel et al., University of Arkansas)

The objectives of the 300-day grazing discovery farm were to reduce hay feeding to 60 days or less, 90% net calf crop, average weaning weight of 550 lb and implement management practices common and available to cattle producers. The demonstration pastures consisted of 40 acres of common bermudagrass, two 22.5-acre pastures of toxic endophyte-infected Kentucky-31 tall fescue, 22.5 acres of Ark-Plus novel-endophyte tall fescue and 22.5 acres of Ark-Plus fescue/common crabgrass mix. Red and white clovers were interseeded into fescue pastures. Each pasture contained water sources and was subdivided with electric fence. In year 1, the cow herd was predominantly Balancer females (38 multiparous cows) bred to Balancer bulls with a fall calving season. Two-horned Hereford bulls were used in years 2 to 5. The breeding seasons were approximately November 21 to January 26. The grazing protocol for each year was fescue/clover in spring, bermudagrass for summer and early fall, fescue/clover for late fall and stockpiled fescue in winter.

- The primary management practices implemented were rotational grazing, strip grazing stockpiled forages during winter and a short defined breeding and calving season.

- The length of the grazing season for years 1, 2, 3, 4 and 5 was 337, 311, 330, 323 and 279 days, respectively, and averaged 316 days.
- The mean mature cow net calf crop for years 2, 3, 4 and 5 was 90%; 24% points improvement compared to year 1.
- The overall adjusted 205-day body weight increased from years 1 and 2 (419 and 459 lb, respectively) to years 3, 4 and 5 (496, 490 and 514 lb, respectively).
- All calves were weaned during the first two weeks of May. The weaning weight of year 1 was 470 lb.
- The weaning weight goal (550 lb) was achieved for years 2, 3 and 5 and was 562, 602 and 571 lb, respectively, and was 531 in year 4.
- The average calving season was 59 days for five years.

By incorporating rotational grazing, strip grazing stockpiled forage and a short breeding and calving season, a 300-day grazing with acceptable beef cattle performance can be achieved in Arkansas.

## Hedonic Pricing Models for Angus Bulls Sold at Auction Following Performance Testing at Oklahoma Panhandle State University

(D. L. Stephens et al., Oklahoma Panhandle State University)

Selection of a herd sire has always been of paramount importance, given the initial financial investment and the sire's contribution and effect on the genetic makeup of a beef herd. Data was collected from the nation's longest consecutively run bull test conducted at the University Farm of Oklahoma Panhandle State University. The Bull Test and Bull Sale data utilized were collected from 2008-2013. Performance data were collected over a 112-day test period, with data collection occurring at 28-day intervals. The top 70 bulls from each year's test were selected based on a performance index of 1/2 average daily gain and 1/2 weight per day of age, a semen quality and motility score of excellent and were sold at auction. Angus bulls were the focus of the study, as they represented the vast majority of individuals sold. Three hedonic pricing models were created. The initial hedonic model contained production data that included body weight, average daily gain, weight per day of age, Julian age, final test weight, ultrasound data and a dummy variable for sale year. The second model utilized production data and added genetic variables in the form of production EPDs (calving ease direct, body weight, weaning weight and yearling weight) and maternal EPDs (calving ease maternal and maternal milk). The third model included the variables

from the first and second model with the inclusion of carcass EPDs (marbling, ribeye area and fat).

- Year was significant in all three models; however, there was less of an effect on price as more variables were included.
- In model one, the production factors that were of significance were average daily gain, body weight and final test weight.
- In the second model, average daily gain, body weight and final test weight reached significance. The only production EPD that was significant was calving ease direct.
- In the third model, years, average daily gain and body weight were still significant. Final test weight and calving ease direct had substantial changes.

Producers who are placing bulls on test can utilize the given information to assist with their selection. It cannot go unsaid that while single trait selection can be very detrimental, average daily gain was significant across all models. The study indicates that performance and growth are of utmost importance to buyers, followed by birth weight consideration, because a live calf is the start of a potentially profitable calf crop.

## Survey of Management Practices Used in the Implementation of Artificial Insemination and Estrous Synchronization Programs in the United States

(S. K. Johnson and G. Dahlke, Kansas State and Iowa State University)

Artificial insemination and estrous synchronization remain underutilized tools by U.S. beef producers. Little information is available on actual management practices used by producers who use these technologies and the value they have within their operation. An online survey tool was developed concerning a variety of production practices, synchronization methods and available tools used with artificial insemination and estrous synchronization. A link to the survey was promoted through electronic extension publications, contact lists and cooperating news media. Producers who participated could enter a drawing for artificial insemination supplies at the completion of the survey. The survey was accessed by 546 individuals and 425 completed the survey.

- Responses came from 42 states.
- Average number of owned cows that were artificially inseminated was 67 cows (range 0 to 1,750) and 34 owned heifers (range 0 to 1,500).

- Respondents represented commercial herds (56%), seedstock herds (67%), having both commercial and seedstock (44%), commercial heifer development (14%), AI technicians (18%) and DVMs (18%).
- A majority of producers used artificial insemination for both cows and heifers (87%), with 8% use on heifers only and 5% on cows only.
- The proportion of respondents who always, usually, sometimes, rarely or never use estrous synchronization was 46%, 26%, 28%, 6% and 4%, respectively.
- The frequency of use of artificial insemination after observed estrus, estrus artificial insemination followed by clean-up timed artificial insemination and strict fixed-time artificial insemination was 42%, 25% and 34%, respectively, and was similar between cows and heifers.

- A majority of respondents (97%) were familiar with the recommended protocols for synchronization of estrus and ovulation provided by the Beef Reproduction Task Force.
- Recommendations from these guidelines were generally used by 65% and sometimes or occasionally used by 20%.
- The estimated difference in value between AI-sired calves and natural service-sired calves was highly variable and averaged \$465 ± \$689 per head.
- The most common ways that artificial insemination contributed to profitability were through value of replacement heifers (60%), seedstock production (46%), reduced calving difficulty (42%) and premium of calves sold at weaning (35%).
- Sex-sorted semen had been used by 27% of respondents for use in heifers to make heifers (43%), cows to make heifers (47%) or cows to make bulls (8%).
- Pregnancy rates to sex-sorted semen were reported to be about as expected (61%), better than expected (12%) or worse than expected (27%).

Despite improvements in fixed-timed artificial insemination protocols, many producers still depend on artificial insemination after observed estrus.

## Reducing Winter Feeding Needs in Southern Arkansas Through the Use of Best Management Grazing Principles

(B. Stewart et al., University of Arkansas)

Research is being conducted at the University of Arkansas Southwest Research and Extension Center in Hope, Arkansas, to determine the impact of best management principles on production and winter feed requirements of spring calving cows (n = 72, body weight = 1,206 lb) grazing warm-season based pastures (n = 9, 10.6-acre pastures). The best management principles used include rotational grazing to improve pasture utilization, stockpiled bermudagrass to extend grazing into the fall and early winter and complementary cool-season annual grass plantings to provide high quality forage in the spring. This research compares low management (continuous grazing at a moderate stocking rate of 1.8 acre/cow) and intensive management at moderate (1.8/cow) and high stocking rates (0.88/cow). Stockpiling was managed by fertilization of 0.56 acre/cow of bermudagrass in early August with 164 lb ammonium nitrate/acre and deferring grazing until November.

- Stockpiled bermudagrass produced over 5,664 lb forage dry matter/acre, which was adequate to hold cows grazing these pastures until late February.
- During calving (from mid-February to mid-April), cows on intensive management at moderate stocking rate and intensive management at high stocking rate grazed cool-season annuals and stockpiled bermudagrass or fed hay on alternating days. Cows on low management pastures were fed hay an average of

74 days compared with 43 days for intensive management at high stocking rate and 0 days for intensive management at moderate stocking rate.

- Pregnancy rates at weaning were similar across treatments and averaged 85%.
- Growth performance of calves was reduced by both rotational grazing and increased stocking rate, with weaning weights of calves from low management (553 lb) being greater than intensive management at moderate stocking rate (490 lb), which was greater than intensive management at high stocking rate (467 lb).
- However, total weaning weight per acre was 68% and 90% greater for intensive management at high stocking rate compared with low management and intensive management at moderate stocking rate, respectively.
- With rotational stocking, there was the opportunity to harvest excess forage as hay in both the moderate (20,767 lb/pasture) and high (4,864 lb/pasture).

In this system, every year will be different and flexibility of management will be key. Using rotational grazing, stockpiled bermudagrass and complementary cool-season annual grasses can drastically reduce stored winter feed requirements and simultaneously increase carrying capacity and total net return.

## Bale Diameter and Feeder Design Effects on Hay Waste

(D. Tomczak et al., University of Missouri)

Forty-eight mid-gestation spring-calving cows were stratified by body weight (1,286 lb), body condition score (5.4) and age (5.6 years) into six pens to evaluate influence of bale diameter and feeder design on hay waste. Tall fescue round hay bales (85.5% DM, 8.22% CP, 66% NDF, 60 inches height) were classified as small (51 inches), medium (93 inches) or large (74 inches) diameter and placed in hay feeders equipped with a cradle chain or without in a 3 × 2 factorial design randomly assigned to a 6 × 6 Latin square. We hypothesized hay waste would increase as initial bale diameter increased without a cradle chain and not differ with a cradle chain. Bales were placed on the circular end in round bale feeders (91 inches diameter, 67 inches height) with 16 feeding stations and metal sheeting on top (20 inches) and bottom (24 inches). Small, medium and large bales were replaced every two, three and five days, respectively, to ensure *ad libitum* hay access. Waste was collected daily, and residual forage was collected prior to new bale feeding.

- Cradle chains (15.8%) reduced waste as a percent of initial bale weight compared to without chains (18.3%).
- Waste was increased for large (19.4%) compared to small (14.2%), while medium (17.6%) did not differ from large or small.
- Waste was not different due to increased access time to small bales in cradle chain feeders; however, waste was reduced as access time increased for small bales in feeders without chains.
- As access time increased to medium and large, waste was reduced.

In conclusion, cradle chains tended to decrease waste. Increasing access time due to increased bale diameter increased waste in all cases, except small bales in feeders with cradlee chains.



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