Arkansas beef cattle industry: 2017 self-assessment
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A previous cattle industry assessment for Arkansas indicated increasing production cost, animal disease, consumer confidence, product demand, and opportunity to purchase additional land were common challenges among small commercial cow-calf, large commercial cow-calf, purebred, stocker operators, and the allied support industry. The survey also revealed newsletters, extension print publications, on-farm demonstrations, and one-on-one consultation were the most preferred methods for receiving information. Objectives of this study were 2-fold. The first objective was to gain new insight into the strengths, weaknesses (limitations), opportunities, and threats (SWOT) for 6 segments of Arkansas’s beef industry including small commercial cow-calf (<50 cows), large commercial cow-calf, purebred, stocker, allied industry, and education support. The second objective was to evaluate educational preferences including methods for receiving information and group meeting participation.

• During phase I of the assessment, leaders from each segment participated in listening sessions and generated a list of SWOT comments. During phase II, up to 100 industry representatives from each segment were randomly selected to complete a survey.

• Results: The SWOT assessment revealed eight universal grand challenge areas including markets and marketing, land availability and cost, technology adoption, cattle genetic merit and health, government regulation, animal activism, labor, and next generation of producers. Printed extension publications was a preferred method for receiving information among producers and industry. Group meetings and workshops were only moderately preferred among producers and industry. Based on meeting day preference response rate, stocker operators were least likely to attend meetings.

• Implications: Industry assessments establish awareness of the challenges producers and supporters face and reveal opportunities in programming to advance industry sustainability.
The effect of precipitation received during gestation on progeny performance in *Bos indicus* influenced beef cattle

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Cattle producers are dependent on adequate precipitation for sustaining herds. Nutrient composition of range pastures fluctuates with time of year and annual precipitation. Variability in precipitation can cause negative effects on forage growth and quality. Forages undergo a translocation process under normal precipitation circumstances, which pulls nutrients from the root network into the stem and leaf system dictating mineral and nutrient quality. During times of prolonged drought stress, this process is hindered and such compounds cannot be properly allocated through the plant creating a dormant physiological status preventing plant growth. This relationship is especially critical in desert areas where precipitation values are generally low or seasonal. Therefore, drought can represent a major economic burden to cattle producers, with animal performance being altered due to low nutrient availability. Stresses experienced in utero affect fetal growth and development through a process referred to as fetal programming. Investigators have well documented that maternal nutrient intake during gestation can alter progeny calf health and performance. Decreased dam nutrient intake can also influence female offspring puberty attainment and pregnancy rates. The objective of this study was to determine the effect of precipitation level during specific time points during gestation on subsequent progeny growth and lifetime performance of female progeny.

- Precipitation data and cattle performance data on 2,429 Brangus cows were collected from 1969 through 2015 at the New Mexico State University Chihuahuan Desert Rangeland Research Center (CDRRC; Las Cruces, NM).
  - Precipitation data were gathered and compiled from 25 standard rain gauges located in subdivided pastures. Precipitation averages were calculated for each month and parameters set to analyze a time frame for the first trimester of gestation, which coincides with early gestation (July–September), late gestation (December–February), and total duration, which would account for a production year from breeding to calving (April–March).
  - **Results:** Calves experiencing high precipitation throughout gestation had heavier body weight (BW) at birth, weaning, and adjusted 205-day BW than those experiencing low precipitation. Female progeny gestated during low precipitation throughout gestation were more likely to remain in the herd and calve after the age of 8 years when compared to heifers experiencing high precipitation levels in utero (38% vs. 16% ± 5%, respectively).

- **Results:** A greater percentage of heifers experiencing low precipitation levels during the early gestation period produced a calf within the herd after 8 years of age. Similarly, calves experiencing low precipitation during those same time points also had a greater number of calves while in production when compared to the average and high precipitation groups.

- **Implications:** Results indicate that selection of heifers exposed to lower than average precipitation levels in utero may result in increased herd retention and productivity.
Microbiome of the upper nasal cavity of beef calves prior to weaning
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There is growing recognition that microbial populations (microbiome) associated with animals have profound effects on their physiology, phenotype, and disease incidence. More specifically, bacterial pathogens appear to play an integral role in the overall incidence of bovine respiratory disease (BRD). Bovine respiratory disease is a multifactor disease that commonly occurs in the feedlot when stress levels increase in the animals due to weaning, subsequent transport to the feedlot, and commingling. As a result, BRD is the most expensive animal disease afflicting herds in U.S. beef cattle industry, costing the industry over US$1 billion annually, so an understanding of the interaction of the respiratory tract microbiome with potential pathogens at time points prior to development of BRD is crucial. This study aims to characterize the microbiome of animals from 3 herds born in different locations at U.S. Meat Animal Research Center (USMARC) and sampled at multiple time points prior to entry into the feedlot.

- For each year, 3 research herds (approximately 800 animals total) were evaluated that originated and were managed in separate locations (locations 1, 2, and 3) at USMARC. Each location is separated by at least 3 miles and does not intersect with the other locations. Calves were raised under similar management, receiving standardized vaccinations and diets. Calves at any one location never had direct contact with calves at other locations until weaning. Calves were evaluated at the same 3 locations at USMARC in 2015 and 2016.

- Nasal swabs were collected from the upper nasal cavity of all calves (820 in 2015 and 794 in 2016) using 6-inch nasal swabs at initial vaccination (approximately 40 days of age), preconditioning (approximately 130 days of age), and weaning (approximately 150 days of age).

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- DNA was extracted from nasal swabs and combined into 2 pools of 10 animals for each sampling time point, in each herd, for a total of 6 pools at each sampling time point and 18 pools for all sampling time points within each year.

- To evaluate and compare the microbiome of each pooled sample, hypervariable regions 1 through 3 along the 16S ribosomal RNA (rRNA) gene were amplified by PCR and sequenced using next-generation sequencing (Illumina MiSeq) for identification of the bacterial taxa present. Alpha and beta diversity were also measured.

- Results: With the microbial profile in the upper nasal cavity differing with sampling time and location, this indicates that calves from the same sampling time and location appear to have a unique microbiome signature as random pools of calves sampled without replacement at the same sampling time and location were more similar to one another than calves from a different sampling time or location.

- Results: Through this study, the microbiome of the upper nasal cavity in calves changed from early age through time periods prior to weaning and bacterial genera of the core microbiome for these sampling time points have also been reported in cattle diagnosed with BRD.

- Implications: Evaluation of these changes in the animal’s bacterial populations in the upper nasal cavity prior to weaning will improve our understanding of the impact of the microbiome on incidence of BRD in cattle.
To improve herd production, producers cull cows based on factors that include reproductive failure, structural issues, progeny performance, and disease. Udder conformation has been indicated as an important factor in cow–calf profitability due to management challenges and reduced calf performance. Udder conformation and milk yield can affect calf preweaning average daily gain. However, beef cows with poor udder conformation may produce lower calf weaning BW and increase labor costs, leading producers to cull productive cows with mammary problems. Data are, however, limited on the effect of udder score on the entire production system from birth to finishing. Thus, we hypothesized that cows classified with low udder scores (LUS) would perform similarly to high udder score (HUS) counterparts and produce calves with similar pre- and postweaning growth. The objective of this study was to evaluate the effect of beef cow udder conformation on cow performance, longevity, and pre- and postweaning progeny performance.

- In a 5-year study, crossbred cows at the Gudmundsen Sandhills Laboratory, Whitman, NE, were assigned an udder score each year at calving, from 1 to 5, using an udder and teat combination score. Cows were grouped by udder scores and classified as either LUS (udder score 1 or 2; n = 223) or HUS (udder score 3 or 4; n = 1,742). The udder score combines udder conformation and a teat scoring system.

- Low udder scores consisted of pendulous udders and large teats, whereas HUS consisted of tight udders and small, symmetrical teats.

- Cow body weight (BW) at prebreeding and weaning was greater in LUS cows compared with HUS counterparts. Pregnancy rate was not different between udder classification groups. Calf BW at birth, weaning, and adjusted 205-day BW were not different between udder groups.

- Results: This study suggested cows with less desirable udder structure may not have a negative impact on calf preweaning growth and performance; however, backfat thickness and HCW in the finishing phase were lower in steers from cows with a lower udder score.

- Implications: This study indicated culling cows for poor udder conformation may not be warranted, if calf suckling at birth is not an issue, due to similar postnatal calf performance.
An energy and monensin supplement reduces methane emission intensity of stocker cattle grazing winter wheat

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Enteric CH4 (methane) is a major contributor to the carbon footprint of the beef industry and has received considerable attention from researchers and the public. Methane is a natural by-product of ruminal fermentation and is a potent greenhouse gas, with a global warming potential 28 times that of CO2 over a 100-year time frame. Global greenhouse gas emissions from agriculture are estimated to be 7.1 Gt of CO2 equivalents, or 15% of total anthropogenic emissions. Of these, 2.8 Gt comes from enteric CH4 production, with cattle being responsible for 77%. Cattle grazing wheat pasture are commonly provided an energy supplement. This supplement consists primarily of ground corn or grain sorghum, typically contains monensin ranging from 83 to 258 mg/animal per day, and has been shown to typically increase animal gains and profitability. The objectives of this study were to quantify the effects of energy supplementation with monensin on ADG and enteric CH4 emissions in stocker cattle grazing wheat and to develop regression questions for use in future modeling efforts.

- Eight steers and 8 heifers were grazed in a 9-hectare winter wheat pasture, and CH4 emissions were recorded. Animals were randomly assigned within sex to receive from 0 to 1.07 kg of a supplement (as fed, primarily ground corn, wheat middlings, and 34 mg/kg monensin) per day. Animals were supplemented 3 days per week in individual stalls and orts were weighed. Forage intake was estimated with titanium dioxide as an external marker.

- Results: Animal performance increased, but at a decreasing rate, with increased total supplement intake and forage intake (R2 = 0.47). Supplement intake reduced forage intake (R2 = 0.77) with initial body weight (BW) and sex in the model. Methane emissions increased with increasing forage intake and initial BW, but heifers produced less CH4 than steers (R2 = 0.74). Increasing supplement intake reduced CH4 emission intensity (g of CH4/kg of BW gain) when baseline CH4 was included in the model.

- Implications: These results suggest that supplementation with energy and monensin likely reduces methane emission intensity, and provide equations useful for future modeling efforts.

Articles were edited for length and style.

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