

Production, Management and the Environment: Beef

W300 Embryo quality characteristics from superovulated cows receiving a blend of bioactive peptides and oligosaccharides to support immune function (Grade One). G. H. L. Marquezini¹, V. R. G. Mercadante¹, M. M. Ward^{*2}, A. R. Spell³, J. A. Carter³, N. D. Paton⁴, and G. C. Lamb¹, ¹University of Florida, Marianna, FL, ²Provimi North America, Inc., Brookville, OH, ³Advanced Reproductive Associates, Daphne, AL, ⁴Provimi Holding, BV, Rotterdam, Netherlands.

We determined whether supplementation of a blend of bioactive peptides and oligosaccharides to support immune function (Nutrition Horizons Grade One; Brookville, OH; US Patent no. 6,962,718) would alter quality, stage, and fertilization rate of embryos recovered after superovulation. Angus and Brangus cows were superovulated using follicle stimulating hormone as NIH-FSH-P1 and were stratified by breed before random assignment to treatment: 1) donors received 6 Grade One capsules (13 g/capsule) containing a blend of bioactive peptides and oligosaccharides (NHG1; n = 35); or 2) donors received 6 placebo capsules (13 g/capsule; Control; n = 37). Superovulation was initiated with a CIDR on d 0, 8 injections of FSH at 12 h intervals initiated on d 4, plus two injections of PGF 12 h apart on d 7. At 0 and 12 h after detected estrus cows received an AI. Boluses were inserted into the esophagus utilizing a balling gun. Cows received two boluses at CIDR insertion (d 0), at the first (d 4), and third (d 5) injection of FSH. Embryos were collected 7 d after first detected estrus and were recovered by nonsurgical embryo collection procedure and embryos were classified by stage and quality. Data was analyzed with PROC MIXED using flush as the experimental unit. Total ova (14.1 ± 1.8) and transferable embryos (5.2 ± 1.1) per flush for NHG1 and Control, did not differ. Mean number of grade 1 (2.5 ± 0.8) and 2 (2.7 ± 0.5) and no differences existed between treatments for degenerate (1.9 ± 0.4) or unfertilized ova (7.0 ± 1.4). However, the percentage of grade 1 embryos collected compared to recovered transferable embryos was greater ($P = 0.062$) for NHG1 (39.4%) than Control (23.4%). In addition, the percentage of grade 2 embryos collected compared to recovered transferable embryos was greater ($P < 0.05$) for Control (76.6%) than NHG1 (59.9%). We conclude that the number of transferable embryos collected per flush did not differ between treatments; however, the quality of transferable embryos was improved after embryo donor cows received NHG1 prior to embryo collection.

Key Words: embryo transfer, superovulation, immune function

W301 Evaluation of a distinct white Angus crossbred phenotype in southern Florida. P. G. M. A. Martins^{*1}, R. Cassiolato¹, F. Frigoni¹, M. M. Salin¹, D. B. Araujo¹, M. Meneghetti¹, G. C. Lamb¹, D. G. Riley², B. H. Carter², T. H. Friend², and J. D. Arthington¹, ¹University of Florida, Range Cattle Research and Education Center, Ona, ²Texas A&M University, Department of Animal Science, College Station.

A distinct beef phenotype has emerged from offspring of Angus × Brahman × Charolais cows being mated to Simbrah bulls. A proportion of these female offspring, when mated to black Angus bulls, produced offspring with white hair coats. This phenotype persists in a majority of these heifers through a second cross with black Angus bulls resulting in white Angus crossbred calves with 75% black Angus genetics. The white hair coat of these offspring is thought to be derived from the dilution gene effects from the Charolais and Simmental breeds. The objectives of these initial studies were to compare body temperature and grazing behavior among these white and black phenotypes. In the first study, vaginal temperatures were assessed over 2 consecutive yr (n = 5 black

and white phenotypes/yr). Temperatures were recorded over 5 consecutive summer days using an automated temperature logger (5.9×16.3 mm) placed in an intravaginal device. During the assessment period, heifers grazed a single pasture with no access to shade. In the second experiment, voluntary forage DMI was assessed in a fully shaded facility using weaned, yearling heifers (n = 9 black and 6 white) over a 42-d evaluation period. Heifers were provided free choice access to ground hay with grain supplement provided at 0.5% BW. Grazing behavior was evaluated in a subset of these heifers (n = 5 black and 5 white) by observing time spent in and out of shade and standing or lying over 10 individual 12-h observation periods (twice weekly; 5 wk). Average peak vaginal temperatures were 1.1 °C greater ($P < 0.001$) in black vs. white heifers (40.5 and 39.4 °C). There were no differences ($P = 0.15$) in voluntary forage intake when heifers were evaluated under full shade (1.49 vs. 1.27% BW for black and white heifers, respectively; SEM = 0.115); however, pasture observations during the summer daylight hours revealed that black heifers spent 7.4% more ($P < 0.01$) time in the shade compared to white heifers. These results suggest that Angus (50 to 75% black Angus) crossbred heifers with a white hair coat have a reduced non-shaded peak body temperature compared to black Angus cohorts. This reduction in body temperature may result in greater grazing times during the summer months in southern Florida.

Key Words: Angus, coat color, grazing

W302 The relationship of pulmonary arterial pressure with feed efficiency, performance, temperament, and feeding behavior in growing beef cattle. T. D. Maddock^{*}, G. H. L. Marquezini, V. R. G. Mercadante, and G. C. Lamb, University of Florida, Marianna.

We examined whether pulmonary arterial pressure (PAP) has a relationship with feed efficiency, performance, temperament, or feeding behavior in growing beef cattle. Calves (n = 213; bulls, n = 107; heifers, n = 106; Angus and Angus-cross, n = 118; Charolais, n = 38; Zebu and Zebu-cross, n = 57; initial BW = 317 (SD = 39) kg) were placed in a feed intake facility and after 21 d of adaptation, daily DMI was recorded for 70 d. Diets (NEm = 1.34 Mcal/kg; NEg = 0.77 Mcal/kg; CP = 117 g/kg) were offered ad libitum. Ultrasound 12th rib LM area and fat depth (BF) and PAP (mg Hg) were measured on d 0 and 70. Chute score and exit velocity were measured on d 0, 35, and 70. Residual feed intake (RFI) was calculated by regressing ADG and mid-metabolic BW on daily DMI. Animals were classified as high, average, or low PAP (> 0.5 SD, ± 0.05 SD, and < 0.5 SD from the mean, respectively; mean PAP = 37.0, 32.6, 28.2, respectively). Least squares procedures using PROC MIXED of SAS were used to examine the effect of PAP group on other variables. Pearson correlation coefficients among traits were determined using the CORR procedure of SAS. There was no association between PAP and RFI, DMI, ADG, or G:F, but PAP was positively correlated to initial BF ($r = 0.29$, $P < 0.001$) and final BF ($r = 0.19$, $P = 0.009$) and was negatively correlated with chute score ($r = -0.18$, $P = 0.01$). Cattle with high PAP had lower RFI than those with average ($P = 0.03$) and low ($P = 0.04$) PAP. Cattle with low PAP had lower DMI, ADG, and G:F than cattle with average ($P = 0.008$, $P = 0.005$, $P = 0.05$, respectively) and high PAP ($P = 0.005$, $P < 0.001$, $P = 0.005$, respectively). Cattle with high and average PAP had a greater number of daily feeding events (consumed > 100 g DM) than low PAP cattle ($P = 0.02$, $P = 0.002$, respectively). There was no effect of PAP group on other feeding behavior traits, including daily feeding duration or eating rate (g DM/min). There was not a strong association between

PAP and performance traits, but calves with low PAP had lower intake, performance and subsequently lower feed efficiency.

Key Words: beef cattle, feed efficiency, pulmonary arterial pressure

W303 Technical and economic performance of a beef cattle production system: A case study in Bahia State, Brazil. F. A. Barbosa*¹, D. S. Graça², V. J. Andrade², I. M. Cezar³, and R. C. Souza², ¹University of Brasília (UnB), Brasília, DF, Brazil, ²School of Veterinary Medicine, Federal University of Minas Gerais (UFMG), Belo Horizonte, MG, Brazil, ³Anhanguera-Uniderp University, Campo Grande, MS, Brazil.

A case study on the transition from beef cattle breeding, rearing and fattening system to a cow-calf production system was assessed in the State of Bahia, Brazil, including production and economic performance over a four year period (January 2000 to December 2004). Production and economic data were collected using control software (Congado) and analyzed by electronic spreadsheets (Microsoft Excel). The system was developed exclusively on a grazing system of 2,926 hectares with a base herd comprised of Zebu (Tabapuã breed) and crossbred *Bos taurus* × *Bos indicus* cattle. During the rainy season the herd was fed mineral supplement based on a specific formulation for each animal category. Introduction of technologies related to pasture, feeding supplementation, breeding program, animal health practices, associated with technical-administrative management improved the animal performance indexes. Mean stocking rates ranged from 0.9, 1.3, 1.5, 1.4 to 1.5 heads/ha in 2000, 2001, 2002, 2003 and 2004, respectively. Annual mean rates of pregnancy, birth and weaning were 88.8%, 85.1% and 82.6%, respectively. As result of introduction crossbreeding, the mean weights at weaning and at slaughtering of males achieved 228.87 and 485.16 kg, respectively, with mean age at slaughtering of 24.6 months. Total accumulated cost was US 1,799,623.57. The total income of US 1,734,569.69 was not enough to pay the opportunity cost, resulting in a negative return on invested capital (RIC). The activity yielded total operating profit of US 484,194.82 during the five years evaluated. Mean RICs were 10.78% and 1.29% on operating and total profit, respectively. Estate valuation changed the return on the invested capital accumulated from the business to 9.75%. The implantation of a series of technologies improved animal performance indexes in the semi-intensive complete cycle system. The economic results indicated that the activity paid all operating costs but could not totally pay the opportunity cost.

Key Words: animal performance indexes, cost, profitability

W304 Economic efficiency and productivity of life-cycle beef cattle production systems in Bahia State, Brazil. F. A. Barbosa*¹, D. S. Graça², V. J. Andrade², I. M. Cezar³, and R. C. Souza², ¹University of Brasília (UnB), Brasília, DF, Brazil, ²School of Veterinary Medicine, Federal University of Minas Gerais (UFMG), Belo Horizonte, MG, Brazil, ³Anhanguera-Uniderp University, Campo Grande, MS, Brazil.

Economic efficiency and productivity of three life-cycle cattle production systems were simulated using four different calving rates (CR): SCC - 87%; -4CR- 83%; -2CR - 85%; +2CR - 89%. This evaluation used case study data and simulated the effect of variation in calving rates on economic returns. Production and economic data were collected using control software (Congado) and analyzed by electronic spreadsheets (Microsoft Excel). The base system (SCC) was developed on grazing system of 2,926 hectares composed of Zebu cattle (Tabapuã breed) and crossbred *Bos taurus* × *Bos indicus* cattle (n=3453). Data were collected from this herd from January of 2000 to December of 2002.

During the rainy season the herd was fed mineral supplement based on a specific formulation for each animal category. Systems -4 CR, -2CR and +2CR were simulated based on adjusted calving rates fluctuations according to energy requirement and herd composition during a three year periods. Liveweight sold were 149, 146, 144 and 141 kg/ha/year for -4CR, -2CR, SCC and +2CR, respectively. Accumulated profit were US 329,490.77; 311,271.28; 306,842.04 and 297,082.63 for -4CR, -2CR, SCC and +2CR, respectively. Returns over accumulated invested capital were 7.8, 7.4, 7.3 and 7.0% for -4CR, -2CR, SCC and +2CR, respectively. Calving rate fluctuation modified the economic efficiency and productivity of simulated production systems. Economic efficiency and productivity results decreased as calving rate increased.

Key Words: calving rate, cost, profitability

W305 Economic viability of breed Nelore and crossbreed F1 Nelore × Brahman produced in feedlot. R. A. Mandarino*, F. A. Barbosa, I. S. Silva, J. M. S. Diogo, and L. A. Chaves, University of Brasília (UnB), Brasília, DF, Brazil.

The experiment evaluates the costs of production and economic viability of the feedlot, divided into two genetic groups and subjected to three diets. The experiment was conducted from August to November 2009, lasting 96 days. We used 42 bulls with an average age of 23 months, and 21 breed Nelore (NEL) and 21 crossbreed NelloreBrahman (NBR). Each genetic group was divided into three diets, with 7 animals each: SIL - corn silage and concentrate (corn grain, soybean meal, soybean hulls, urea and mineral supplement) at a ratio of 25:75 (in dry matter), PEL - exclusive diet of pellets; GRN - diet with whole grain corn and pellets. The experiment was conducted in a completely randomized in a 2 × 3 factorial, divided as follows: NELSIL, NELPEL, NELGRN, NBRASIL, NBRPEL and NBRGRN. The feeding costs were calculated using the daily offered quantity for each treatment and divided by the respective number of bulls. The labor costs and depreciation were divided by the bulls. The total operating cost (TOC) was calculated by summing the costs for food, labor costs (US 10.20 / beef) and depreciation (US 3.80/beef). The net margin per kg of carcass was obtained by difference between total revenue/kg and TOC/kg. The average initial body weights (IP) were: 350.7, 350.6, 355.8, 379.2, 375.7 and 376.1 kg for NELSIL, NELPEL, NELGRN, NBRASIL, NBRPEL and NBRGRN respectively. Mean weight (PF) were: 500, 464.4, 479.6, 510.7, 571.8 and 501.5 kg for NELSIL, NELPEL, NELGRN, NBRASIL, NBRPEL and NBRGRN respectively. TOC for Nelore in the period were US 215.0, 182.1, 195.4, 165.2, 180.3 and 222.6 to NBRASIL, NBRPEL, NBRGRN, NELGRN, NELPEL and NELSIL, respectively. The total operating cost per kg carcass were US 2.20, 2.06, 1.96, 1.64, 1.86 and 1.90 to NBRASIL, NBRPEL, NBRGRN, NELGRN, NELPEL and NELSIL, respectively. The net margin per kg of carcass were US 0.52, 0.65, 0.76, 1.08, 0.86 and 0.82 for NBRASIL, NBRPEL, NBRGRN, NELGRN, NELPEL and NELSIL, respectively. All treatments were economically viable, and the NEL with numerically higher net margin than the NBR, and diet GRN exceeding PEL and SIL.

Key Words: beef cattle, costs, genetic group

W306 Monitoring diet quality and body condition in beef cows grazing Arizona rangeland. D. R. Tolleson* and D. W. Schafer, The University of Arizona, Tucson.

Nutrition is the highest input cost in beef production. Monitoring the nutritional status of range cows is difficult. Near infrared spectroscopy (NIRS) of feces has been used to predict diet quality in cattle. When fecal NIRS is coupled with decision support software such as the Nutritional

Balance Analyzer (NutbalPro); nutritional status and animal performance can be monitored. Few reports on the applicability of these two methods exist for the southwestern US. Approximately 120 Hereford and 90 CGC composite (50% Red Angus, 25% Tarentaise, 25% Charolais) cows grazing in a single herd were used in a study to determine the ability of fecal NIRS/NutbalPro to project body condition score (BCS, 1 = thin, 9 = fat) under commercial scale rangeland conditions in central Arizona. Cattle were rotated across the 31,000 ha allotment at 10 to 20 day intervals. Fecal samples were collected in the pasture ~ monthly at the midpoint of each grazing period. A sample consisted of ~100g feces each from 5 to 10 animals of each breed. Samples were frozen and later analyzed by NIRS for prediction of diet crude protein (CP) and digestible organic matter (DOM). Fecal sampling occurred from November 2007 to October 2009. Cattle BCS was recorded for 10 to 30 individuals from each breed type at the time of fecal sampling beginning in November 2008. Along with fecal NIRS predicted diet quality, animal breed type and reproductive status characteristics, and environmental conditions were input to the NutbalPro software for each fecal sampling/BCS date (November 2008 to October 2009). Diet quality varied from a minimum of 5.24% CP and 56.89% DOM in January 2009 to a maximum of 14.61% CP and 62.87% DOM in August of 2008. Diet quality was related to observed seasonal changes and precipitation events. Projected BCS averaged 0.2 ± 0.06 score different than observed BCS ($R^2 = 0.75$, $SE = 0.19$, $P < 0.01$). The greatest difference in projected versus observed BCS occurred during periods of lowest diet quality. Body condition was predicted accurately enough to be useful in monitoring the nutrition of range beef cows under the conditions of this study.

Key Words: beef cattle, rangeland, near infrared spectroscopy

W307 Influence of residual feed intake, breed of sire and dam on the performance and carcass characteristics of early weaned steers during the feedlot phase. C. O. Trejo*, D. B. Faulkner, J. M. Dahlquist, and T. G. Nash, *University of Illinois, Urbana*.

Improving feed efficiency through management practices has become of more importance to the beef industry. The objectives were: (1) evaluate the effect of breed of sire and dam on the performance and carcass characteristics of early weaned steers (EW) during the feedlot phase; and (2) evaluate the effect of residual feed intake (RFI), breed of sire and dam on meat tenderness of EW. One hundred and fifty eight Angus (A), Simmental (S), Angus-Simmental, and Simmental-Angus steers were used across two different years. Animals were early weaned at 56 d of age. Animals were allotted to pens by weight and fed a common diet. Forty five steers classified in the high (H) RFI group and 113 steers in the low (L) RFI group. No differences were detected for initial weight (IW), adjusted final weight (AFW), and average daily gain (ADG). Steers in the H RFI group were 12% less efficient ($P < 0.0001$) than steers in the L RFI group. RFI differed ($P < 0.0001$) between H and L RFI groups. High RFI steers ate 1.5 kg more of expected feed intake. For carcass characteristics, only kidney, pelvic, and heart fat % (KPH) differed ($P = 0.0051$) between RFI groups. Meat tenderness did not differ between the RFI groups. Breed of sire had no effect on the performance characteristics. Breed of dam differed for IW ($P < 0.0001$), AFW ($P = 0.0014$), and RFI ($P = 0.0433$). For RFI, steers from S dams ate 0.5 kg/d less of expected feed intake. Steers from A sires had 0.33 cm ($P < 0.0001$) more of carcass back fat (BF) than steers from S sires. Progeny of A sires reported higher ($P = 0.0002$) marbling score (MS) than the progeny of S sires. Breed of dam had an effect in carcass characteristics. Steers from S dams had heavier HCW ($P = 0.0014$). Similar to breed of sire effects, BF ($P = 0.0003$) and MS ($P < 0.0001$) was higher in carcasses of steers from A dams. Breed of sire and dam interaction was significant only for MS. Pure bred A steers had the highest MS (P

< 0.05). Identifying steers with L RFI potential and understanding the contribution of cross breeding can help improve feed efficiency without negative affecting carcass traits.

Key Words: residual feed intake, breed of dam, breed of sire

W308 Supplemental corn dry distillers grains plus soluble on performance of steers grazing native range. M. F. Martínez-Pérez, D. Calderón-Mendoza, F. Loya-Holguin, A. Soto-Gaspar de Alba, C. Murdock, A. M. Encinias, and S. A. Soto-Navarro*, *New Mexico State University, Las Cruces*.

Medium- to high-quality rangeland forage is low in available energy in relation to its rumen degradable protein content. To complement forage quality, energy and phosphorus are usually supplemented to cattle grazing medium to high-quality forage. Supplementation with feedstuffs rich in digestible fiber (energy) and phosphorus, such as corn distiller grains plus solubles (DDGS), could alleviate the deficiencies of growing forage. We hypothesized that supplementation of DDGS to cattle grazing native range during the summer season will alleviate nutritional deficiencies, and will improve cattle grazing performance. To evaluate effects of DDGS supplementation level on performance of steers grazing native range during the forage growing season, 72 (206 ± 23.6 kg; 2008) and 60 (230 ± 11.3 kg; 2009) English crossbred steer calves were used in a grazing experiment. The grazing period lasted 56 and 58 d and started on August 11 and 20 for 2008 and 2009, respectively. Steers were blocked by BW into light, medium, and heavy. Each block was divided into 4 grazing groups. Each grazing group (6 steers in 2008 and 5 in 2009) was assigned to 1 of 4 DDGS supplementation levels: 1) 0% supplementation (no supplement), 2) 0.2%, 3) 0.4% and 4) 0.6% of BW. Total amount of supplementation per paddock for 7 d was calculated and divided by 3 to determine amount of DDGS to be fed as it was offered 3 times weekly. Supplement intake ($0, 0.42, 0.82$, and 1.25 ± 0.03 kg/d, for 0, 0.2, 0.4, and 0.6% of BW, respectively), and ADG ($0.64, 0.75, 0.80, 0.86 \pm 0.03$ kg/d for 0, 0.2, 0.4, and 0.6% BW, respectively) increased linearly ($P < 0.01$) with increasing DDGS supplementation level. Levels of DDGS supplementation did not affect ($P = 0.43$) supplement conversion ($4.18, 6.72$, and 6.03 ± 1.26 kg as-fed supplement/kg of increased BW gain for 0.2, 0.4, and 0.6% BW, respectively). Supplemental DDGS improved performance of steers grazing native range during summer in the Southern Plains.

Key Words: DDGS, grazing native range, steers

W309 Predicted mineral intake utilizing both water and forage analysis varies by source and location of livestock water in Eastern Montana. J. T. Mulliniks*¹, J. Muscha², S. I. Lodge-Ivey¹, and M. K. Petersen², ¹*New Mexico State University, Las Cruces*, ²*USDA-ARS, Fort Keogh Livestock and Range Research Laboratory, Miles City, MT*.

Livestock water can play an important role in contributing to mineral intake of cows grazing rangelands. Mineral analysis of both forage and water is needed to accurately assess mineral intake compared to animal requirements. Therefore, 93 pasture and water source combinations were sampled in May 2009 with the objective to predict total mineral intake (forage intake and water consumption) on a DM basis at the 22,257 ha USDA-ARS Fort Keogh Livestock and Range Research Laboratory in Miles City, MT. Mineral intake was predicted of a lactating beef cow with an estimated water and forage intake of 43.15 L/d (25.4 kg/d) and 2.4% of BW, respectively. Mineral content from hand plucked forage samples were analyzed from 43 pastures representing 3 geographical locations: north (N), southeast (SE), and southwest (SW). All drinking water locations from each pasture were sampled for mineral analysis

(Midwest Labs Inc.) from four sources: springs, pumped ground water, reservoirs, and flowing surface water. Location, source and the location by source interactions were evaluated and analyzed as a 3 × 4 factorial arrangement of treatments. Predicted intake of chloride, copper, dietary anion-cation difference (DACD), phosphorus, and potassium was affected ($P < 0.05$) by geographical location. Differences ($P < 0.05$) in mineral consumption due to water source were found in 5 analyzed minerals (Ca, Cl, DACD, Fe, and Mg). Location by source interactions ($P < 0.05$) were found for fluoride, sodium, and sulfur. Predicted fluoride and sulfur intake concentrations were at or above the maximum tolerable concentrations in the ground water sources in most pasture locations. Copper and zinc were below requirements for a lactating beef cow; whereas, most minerals were found at safe intake concentrations and met a lactating cow requirements. These results suggest that developing a mineral supplement to meet grazing livestock's requirement should take into account both forage and water mineral content.

Key Words: beef cow, mineral intake, water analysis

W310 The environmental impact of corn-fed vs. grass-fed beef finishing systems. J. L. Capper*¹ and R. A. Cady², ¹Department of Animal Sciences, Washington State University, Pullman, ²Elanco Animal Health, Greenfield, IN.

System productivity fundamentally influences the environmental impact of animal agriculture. A partial life cycle assessment model was used to quantify the effect of finishing beef steers in a corn-fed (conventional) or grass-fed system on resource use and methane output. The model was based on nutrient requirements and metabolism of Angus × Hereford steers grown from 254 kg at weaning to 635 kg at slaughter. Corn or grass-based diets were formulated according to NRC with growth rates based on ad libitum intake at age-appropriate bodyweights. Inputs included feed composition and quantity, crop and pasture yields, energy and fertilizer use for cropping, and fossil fuel use for transport. Steers finished on pasture have an added energy requirement for grazing activity, thus increasing daily maintenance requirements (Table 1). Grass-based diets promote greater ruminal acetic acid production, increasing daily enteric methane production. The reduced growth rate of grass-fed steers increases finishing period length, each additional day increasing both total energy requirements and methane emissions. The differential in energy yield per acre between pasture and corn increases the land use for grass-fed beef. Energy use, methane emissions and land area per kg of beef are considerably increased in grass-fed vs. corn-fed beef production systems. The results demonstrate that the popular perception of grass-fed beef as being more sustainable than corn-fed beef does not align with true sustainability when producing an equivalent amount of food from each system.

Table 1. Comparison of energy inputs, methane output and cropland required to finish beef steers in corn-fed or grass-fed systems

	Corn-fed	Grass-fed
Start weight (kg)	254	254
Finished weight (kg)	635	635
Growth rate (kg/d)	1.61	0.87
Finishing period length (d)	237	438
Daily maintenance energy (MJ)	26	33
Daily growth energy (MJ)	30	15
Total energy use (MJ)	47,123	118,308
Total methane emissions (kg)	53	149
Energy MJ/kg beef	133	333
Methane kg/kg beef	0.15	0.42
Total land required (ha)	0.21	2.70

Key Words: beef production, environmental impact, methane

W311 Assessment of thermal signatures of nose-clip weaned calves using digital infrared thermography. H. T. Boland*^{1,2}, S. Bowers², and S. T. Willard^{2,3}, ¹Mississippi State University, Prairie Research Unit, Prairie, ²Mississippi State University, Department of Animal and Dairy Sciences, Mississippi State, ³Mississippi State University, Department of Biochemistry and Molecular Biology, Mississippi State.

Anti-suckling nose-clips (NC) are used for two-stage, low-stress weaning. Different NC types are available including adjustable size NC (ADJ) and “one-size fits all,” non-adjustable NC (ONE). A study was conducted in which beef calves (n=24, BW=242 ± 6 kg) were randomly assigned to be weaned with ADJ, ONE, or weaned conventionally by abrupt remote separation (CTRL). Digital infrared thermal imaging (DITI) is a non-invasive diagnostic tool for evaluating surface temperature gradients. The objective of this study was to investigate the use of DITI to determine whether temperature differences exist between calves weaned by different methods. Imaging was conducted using a FLIR P60 thermal camera and images were analyzed using ThermaCAM Researcher Pro (version 2.7). The lateral (LAT, inside the nostril) and anterior (ANT) surface temperature maximum of the nose, and eye temperature were recorded. The NC were placed on calves (d -5) and worn for 5 d prior to separation from dams (d 0). Images were taken at initial placement of NC and after removal on d 0. Blood was also collected on d -5 and 0, and serum analyzed for cortisol. Ambient temperature (AMB) ranged from 21.3 to 29.0°C at the time of imaging. Both LAT and ANT were positively correlated to one another ($r = 0.80$, $P < 0.01$) and to AMB ($r = 0.56$ and 0.55 , respectively; $P < 0.01$). Cortisol and ANT tended to be positively correlated ($r = 0.24$, $P = 0.10$). Eye temperature (indicative of core body temperature) did not differ ($P > 0.10$) between treatments or days. There were no differences ($P > 0.10$) between CTRL, ONE or ADJ treatments in mean LAT (35.6, 34.6, or 35.0°C, respectively) or ANT (34.4, 33.9, 34.1°C, respectively). From d -5 to 0, ANT increased ($P < 0.01$) within all treatments; however, AMB ($P < 0.01$) also increased which may have impacted surface temperature. In ADJ and ONE calves the LAT increased ($P < 0.01$) from d -5 to 0, but not in CTRL calves ($P > 0.10$) which may be explained by minor inflammation that developed within the nostril of calves wearing NC. This suggests that DITI may be useful in evaluating effects of NC on nasal tissue. Effect of breathing on nostril imaging needs further examination.

Key Words: thermography, nose-clips, weaning

W312 Selenium incorporation and depletion in beef heifers grazing pastures with very high selenium levels grown in saline soils. S. O. Juchem*^{1,2}, S. E. Benes², P. H. Robinson¹, P. Vasquez², M. Brito², G. Getachew¹, and P. Chilibruste³, ¹University of California, Davis, ²California State University, Fresno, ³Facultad de Agronomía, Paysandú, Uruguay.

Salinization of soils in parts of the westside of the San Joaquin Valley (CA, USA) has led to cultivation of salt tolerant forages such as ‘Jose’ tall wheatgrass (TWG) (*Thinopyrum ponticum* var. ‘Jose’) and creeping wildrye (CWR) (*Leymus triticoides* var. ‘Rio’). Our objective was to measure tissue selenium (Se) concentrations and performance of beef heifers grazing TWG and CWR forages containing very high levels of Se (>3 mg/kg DM). Twenty 6 m old Angus heifers were allocated to two grazing areas, where each ~9 ha TWG or CWR area was divided into 2 subplots, with each subdivided into 4 paddocks that were rotationally grazed at 14 d intervals for 165 d. Blood was sampled at -25, 20, 45, 70, 91, 134 and 165 d of grazing, and muscle and liver biopsies were at -25, 91 and 165 d. Body weight (BW) was recorded before grazing and at 20, 45, 70, 91, 134 and 165 of grazing. At the end of grazing, heifers were moved to a feedlot and fed a ration that contained low levels of

Se (<0.25 ppm). Samples of liver, blood and recording of BW were at 23, 81, 136 and 208 d after grazing, whereas muscle was sampled at 81, 136 and 208 d. An additional blood sample was collected at 41 d. TWG had a higher level of metabolizable energy (6.7 vs. 6.0 MJ/kg DM) and Se (4.0 vs. 2.8 mg/kg DM), but lower CP level (7.9 vs. 9.0% DM) than CWR. BW gain was similar for TWG and CWR heifers (0.27 vs. 0.36 kg/d). Se accumulation in blood occurred quickly, increasing more than 3 fold by 20 d of grazing in TWG heifers (0.094 vs. 0.410 ppm Se), and CWR heifers had lower blood Se during the entire grazing period. Se accumulation in liver and muscle had similar patterns as in blood, but at slower rates. Se concentrations decreased after grazing ($P < 0.01$), but rates of Se mobilization from blood, liver and muscle differed. By 81 d post grazing, concentrations of Se were reduced by 77% in liver, 49% in blood but only 31% in muscle. Results suggest that TWG and CWR production using saline drain water can be a viable alternative for salinized soils. In addition, muscle Se depletion occurs slowly enough to allow slaughter of beef cattle with enriched levels of Se in beef.

Key Words: salinity, selenosis

W313 Influence of shading of feedlot pens on performance of growing bull-calves during winter in northwest Mexico. R. Barajas*¹, B. J. Cervantes^{1,2}, M. Verdugo¹, M. A. Espino^{1,3}, E. A. Velazquez¹, J. A. Romo¹, and L. R. Flores¹, ¹FMVZ-Universidad Autonoma de Sinaloa, Culiacan, Sinaloa, Mexico, ²Ganadera Los Migueles SA de CV, Culiacan, Sinaloa, Mexico, ³Tecnología de Máxima Producción, S.A. de C.V., Culiacan, Sinaloa, Mexico.

The objective of this study was to determine the influence of shading in feedlot pens on feedlot performance of growing bull-calves during winter in northwest Mexico. Sixty bull-calves (BW = 225 ± 1.2 kg) were used in a 105-d feedlot experiment. In accordance to a randomized complete block design, bull-calves were blocked by initial-BW (light and heavy), and in groups of five were assigned to receive one of two allotment schedules which consisted the treatments: a) Six 6 × 12 m pens with no shade (control), and b) Six 6 × 12 m pens provided with 6 × 4 m of metallic-sheets ceiling (shade). Experimental data were analyzed by ANOVA for a randomized complete block design. Final BW was improved ($P = 0.05$) for calves allowed shade compared with controls (399 vs. 380 kg). ADG was increased ($P = 0.04$) 12% in shaded animals (1.655 vs. 1.477 kg/d for shaded and control, respectively). Dry matter intake was not affected ($P > 0.80$) by treatment (8.319 vs. 8.322 kg/d). Feed to gain ratio was increased ($P < 0.01$) in 11% for shaded bull-calves (5.015 vs. 5.619 kg of DM/kg of BW gain, for shade and control, respectively). Retained net energy for maintenance from the diet, was 12% higher ($P = 0.07$) in shaded bull-calves (1.957 vs. 1.747 Mcal/kg of DM for shade and control, respectively). Animals in control no shade treatment expenses 8% more NEM ($P = 0.06$) that expected (observed/expected NEM ratio = 0.92). It is concluded that use of shading on feedlot pens improves performance of growing bull-calves in northwest Mexico during the winter season.

Key Words: bull-calves, feedlot performance, shade

W314 Preliminary evaluation of grandsire marbling potential and ultrasound use on backgrounding and finishing performance, and carcass merit. C. J. Mueller*^{1,2}, T. DelCurto^{1,2}, R. R. Mills¹, C. P. Sullivan^{1,2}, and G. L. Tschida^{1,2}, ¹Oregon State University, Corvallis, ²Eastern Oregon Agricultural Research Center, Union.

Forty-one crossbred calves (285 ± 32 kg) were backgrounded and finished to determine the impact of grandsire marbling potential and ultrasound use on predicting carcass merit. Dams were sired by either a

high marbling EPD Angus bull (HIGH; Marbling EPD: +0.44, Acc: 0.23) or a low marbling EPD Angus bull (LOW; Marbling EPD: +0.02, Acc: 0.30) as evaluated by the American Angus Association, then bred to a common sire. Weaned calves were backgrounded on a barley-based diet in a common pen for 60 d. Calves were ultrasonographed for marbling (UMARB), muscle depth (UMD), and backfat (UBF) at the beginning (d0) and end of the backgrounding period (d60), and again at 72 d into the feedlot phase (d135). Gain and carcass data were evaluated as a 2 × 2 factorial design with grandsire and sex as main effects and calf age as a covariate. Correlations between ultrasound measurements and carcass data were used to determine the relevancy of ultrasound timing to carcass merit. Daily gain was similar ($P > 0.10$) between grandsire groups during both phases. Heavier carcass weights, increased backfat, and larger ribeye area (REA; $P < 0.05$) were evident in HIGH calves. No differences ($P > 0.10$) were detected for KPH, marbling score or yield grade between LOW and HIGH calves. A strong ($r > 0.50$) positive relationship between UBF, carcass backfat, and yield grade at d60 and d135 ($P < 0.05$) emerged across grandsires. Final marbling score had a weak positive relationship with UMARB at d0 and d60 ($P < 0.05$), but a strong positive relationship at d135 ($P < 0.05$). HIGH calves had stronger positive relationships between UMARB and final marbling score during both the backgrounding and finishing phases as compared to LOW calves. Though this data set is limited, it indicates that grandsire marbling potential may impact carcass merit through factors other than marbling, and use of ultrasound during the backgrounding phase to predict final carcass merit may be limited and dependent on marbling predisposition.

Key Words: marbling, ultrasound, beef cattle

W315 Growth and carcass merit of purebred Jersey steer calves finished on grain-based diets at two different energy levels. C. J. Mueller*^{1,2}, G. L. Tschida^{1,2}, and V. B. Cannon¹, ¹Oregon State University, Corvallis, ²Eastern Oregon Agricultural Research Center, Union.

Twenty purebred Jersey steers were used to evaluate lifetime growth and carcass development while finished on different caloric-dense diets. Steers were grouped by weight (GRP = LIGHT, HEAVY) then randomly assigned to either a 70% (F70) or an 85% (F85) concentrate finishing diet. Data were analyzed as a 2 × 2 factorial design with GRP and finishing diet as main effects. Daily rations were distributed by pen during the growing phase and individually during the finishing phase. Growth data from the growing phase (168 d) were analyzed as LIGHT (77 ± 8 kg) versus HEAVY (97 ± 8 kg) only, since finishing treatments were yet to be applied. Growing phase ADG was not different ($P > 0.10$) between LIGHT (0.89 kg/d) and HEAVY (0.97 kg/d), respectively. LIGHT calves tended ($P < 0.10$) to consumer less feed per day versus HEAVY calves. During the finishing phase ADG for F85 steers (0.91 kg/d) was greater ($P < 0.05$) than F70 steers (0.82 kg/d). Intake was not different ($P > 0.10$) between F70 (7.77 kg) and F85 steers (7.65 kg), whereas G:F was lower ($P < 0.05$) for F70 steers (0.11 kg/kg) compared to F85 steers (0.12 kg/kg). Ultrasonography was used to track carcass changes and showed no differences ($P > 0.10$) in backfat accretion (+4.22 mm vs. +4.20 mm), muscle depth (+13.03 mm vs. +14.57 mm) or marbling score (+166 units vs. +177 units) for F70 and F85 steers, respectively. Ultrasound indicated that changes in muscle depth plateaued around 14 mo of age, while fat deposition continued to increase. Actual carcass data showed no differences ($P > 0.10$) in backfat (0.61 cm vs. 0.58 cm) or KPH (2.48% vs. 2.58%) between F70 and F85 steers, respectively. Ribeye area for F85 steers (23.98 cm²) was greater ($P < 0.05$) than F70 steers (21.39 cm²), whereas marbling score tended to be greater ($P < 0.10$) for F85

steers (640, modest) versus F70 steers (590, small). Calculated yield grade (2.97 and 2.77) and retail yield (49.93% and 49.58%) were not different ($P > 0.10$) between F70 and F85 steers, respectively. Jersey

steers have the ability to produce highly marbled carcasses, but carcass quality must be valued against low growth efficiency.

Key Words: carcass, growth, Jersey steers