

Beef Species I

736 Relationships between feed efficiency traits and indicators of energy expenditure in growing cattle. Phillip A. Lancaster*,¹, Gordon E. Carstens², Luis O. Tedeschi², Timothy P. Vining¹, Nicolas DiLorenzo³, and G. Cliff Lamb³, ¹Range Cattle Research and Education Center, University of Florida, Ona, FL, ²Department of Animal Science, Texas A&M University, College Station, TX, ³North Florida Research and Education Center, University of Florida, Marianna, FL.

Recent research indicates that residual feed intake (RFI) may not be related to efficiency of energy use, but few results have been published for other feed efficiency traits. The current objective was to determine the relationships of different measures of feed efficiency with indicators of energy expenditure at constant feed intake. Five performance trials were conducted to measure feed intake, growth and heart rate (HR) or heat production in growing cattle. Feed efficiency traits included those where a lesser value is more efficient [feed conversion ratio (FCR), RFI, RFI adjusted for fat composition (RFIc), RFI from model predicted feed intake (RFIm)] and those where a greater value is more efficient [partial efficiency of growth, residual gain efficiency (RGE), and residual intake and gain (RIG), which is combination of RFI and RGE]. Heart rate alone or heat production (heart rate \times oxygen pulse) was measured following the performance trial. Trials 1, 3, 4 and 5 included 39 Angus bulls and heifers, 119 Brangus heifers, 115 Brangus heifers, and 45 Angus heifers fed high-roughage diets with heart rate measured on 39 animals at fasting, 16 heifers at $1.1 \times$ expected maintenance requirement (MEm), 16 heifers restricted-fed at $120 \text{ g DM/kg}^{.75}$, and 16 heifers at $1 \times$ expected MEm, respectively. Trial 2 included 56 Angus bulls and heifers fed a high-concentrate diet with heart rate measured on 12 bulls and 12 heifers at $1.1 \times$ expected MEm. Phenotypic correlations of feed efficiency traits with DMI and ADG were similar to published studies. Phenotypic correlations of feed efficiency traits with fasting HR in Trial 1, maintenance HR in Trial 2 and 3, and restricted-intake HR in Trial 4 were not significant. In Trial 5, FCR (-0.62), RFI (-0.56), RGE (0.60), RFIc (-0.60), RFIm (-0.60), and RIG (0.65) had strong phenotypic correlations with maintenance heat production such that more efficient heifers had greater maintenance heat production. These data indicate that proposed traits to select for improved feed efficiency have no or an inverse relationship with energy expenditure when growing cattle are fed at constant feed intake.

Key Words: cattle, energy expenditure, feed efficiency

737 Effect of post-weaning heifer development on pregnancy rates and subsequent feed efficiency as a pregnant first calf heifer. Hazy R. Nielson*, T. L. Meyer, and Rick N. Funston, University of Nebraska, West Central Research and Extension Center; North Platte, NE.

To determine the effect of heifer development system on pregnancy rates and feed efficiency as a pregnant first calf heifer a 3-yr study was conducted. In Yr 1, weaned heifers either grazed corn residue (CR) or were fed in a drylot (DLHI). In Yr 2 and 3 heifers either grazed CR, upland range (RANGE), or were fed diets differing in energy, high (DLHI) or low (DLLO), in a drylot setting. Percent of mature BW before the breeding season was similar among treatments except DLHI which was significantly greater ($P = 0.04$) at 66.6% compared with 60.0, 61.0, and 61.7% for RANGE, CR, and DLLO treatments, respectively. Pregnancy

rates to AI were similar ($P = 0.62$) among treatments (58.6, 66.3, 59.9, $52.6 \pm 9.7\%$; RANGE, CR, DLHI, DLLO). A subset of AI-pregnant heifers from each development treatment were placed in a Calan gate system; they were allowed a 20 d acclimation and training period before beginning the 90 d ad libitum hay treatment period on approximately gestational d 170. Offerings were recorded daily andorts collected weekly. Initial BW was not different ($P = 0.62$) among treatments (458, 468, 473, $464 \pm 9 \text{ kg}$; RANGE, CR, DLHI, DLLO). Body weight at the end of the treatment period was also not different ($[P = 0.55]$ 485, 497, 503, $491 \pm 17 \text{ kg}$; RANGE, CR, DLHI, DLLO). Intake did not differ among treatments, either as DMI ($[P = 0.59]$ 9.2, 9.4, 9.5, $9.4 \pm 0.7 \text{ kg}$; RANGE, CR, DLHI, DLLO) or as a percentage of BW ($[P = 0.98]$ 1.96, 1.95, 1.95, $1.96 \pm 0.15\%$; RANGE, CR, DLHI, DLLO). There was no difference ($P = 0.61$) in ADG (0.28, 0.33, 0.32, 0.28 ± 0.17 ; RANGE, CR, DLHI, DLLO) or residual feed intake ($P = 0.41$) (-0.095 , -0.096 , 0.144, 0.113 ± 0.156 ; RANGE, CR, DLHI, DLLO) among treatments. Although there was no difference ($P = 0.41$) in the 3-mo-development cost among treatments (\$166.06, 141.66, 160.63, 171.80 ± 12.52 ; RANGE, CR, DLHI, DLLO), there was a \$30.14 numerical difference between the most expensive treatment, DLHI, and the least costly treatment, CR. Post-weaning heifer development system did not affect heifer pregnancy rate or feed conversion as pregnant first calf heifers.

Key Words: beef heifer, feed conversion, heifer development

738 Effects of prepartum supplement level on growth performance, feed efficiency, and reproductive performance of female progeny. Lindsay M. Shoup*, Thomas B. Wilson, Dianelys González-Peña, Frank A. Ireland, Sandra Rodriguez-Zas, Tara L. Felix, and Daniel W. Shike, University of Illinois, Urbana, IL.

Objectives were to determine the effect of prepartum dam supplement level on growth performance, feed efficiency, and reproductive performance of female progeny (127 heifers in yr 1, $n = 9$ dam pastures; 138 heifers in yr 2, $n = 9$ dam pastures). Mature, multiparous, Angus \times Simmental cows (BW = $623 \pm 70 \text{ kg}$; BCS = 5.7 ± 0.7) were offered 1 of 3 supplement levels (supplement contained 70% dried distiller's grains plus solubles and 30% soybean hulls; fed $103 \pm 11 \text{ d}$ prepartum to $2 \pm 11 \text{ d}$ postpartum): no supplement (NS), $2.16 \text{ kg/d}\cdot\text{hd}^{-1}$ (LS), or $8.61 \text{ kg/d}\cdot\text{hd}^{-1}$ (HS) while grazing tall fescue pastures. Heifer progeny were weaned at $187 \pm 11 \text{ d}$ of age and retained as replacements in a fall-calving system. Experimental unit was pasture (9 per year), and data were analyzed using PROC MIXED in SAS. Dam prepartum supplementation did not affect ($P = 0.99$) heifer progeny BW at weaning. During a 70-d intake and feed efficiency evaluation, starting at $305 \pm 31 \text{ d}$ of age, DMI, ADG, and RFI were similar ($P \geq 0.14$) among heifer progeny, regardless of dam supplement level. Heifer body weight and BCS, at start of 1st breeding season, also did not differ ($P \geq 0.60$). Body weight at pregnancy verification, percentage of heifers that conceived to AI in 1st breeding season, and overall pregnancy percentage in 1st breeding season were not different ($P \geq 0.51$) among heifer progeny, regardless of dam supplement level. At first calving, calf birth BW and percentage of unassisted births were similar ($P \geq 0.32$) among heifer progeny, regardless of dam supplement level. Milk production also did not differ ($P = 0.48$) among heifer progeny, regardless of dam supplement level. In conclusion, these data suggest that within a fall-calving fescue-based production system, supplementing dams with 2.16 or $8.61 \text{ kg/d}\cdot\text{hd}^{-1}$ of

a DDGS-based supplement does not affect growth performance, feed efficiency, and reproductive performance of subsequent female progeny.

Key Words: beef heifer development, fetal programming, maternal nutrition

739 Stocking rate and feeder design affects hay waste. Dexter J. Tomczak*, Nick E. Mertz, Dylan L. Hamlin, and William J. Sexten, *University of Missouri-Columbia, Columbia, MO.*

Ninety-six mid-gestation spring-calving cows were stratified by BW (562.9 ± 72.6), BCS (4.9 ± 0.7), and age (4.5 ± 2.0) into 2 replicate groups of 8, 16, and 24 cows to evaluate stocking rate and feeder design effects on hay waste. Cone feeders were equipped with cradle-chains (cone), sheeting on upper (50 cm) and lower (60 cm) portion, and 16 feeding stations (45.2 cm wide) separated by vertical bars (230 cm diameter, 170 cm height). Open feeders (ring) had no sheeting and 17 feeding stations (44.4 cm wide) separated by angled bars (240 cm diameter, 120 cm height). Feeder type and stocking rate were arranged in a 2×3 factorial, and randomly assigned to a 6×6 Latin square. Tall fescue round hay bales (87.3% DM, 6.33% CP, 66% NDF, 152 cm width x 170 cm diameter) were offered on circular end and replaced every third d (8), every other d (16), or daily (24) to ensure ad libitum hay access. A single bale was offered to 8 and 16 each period, while 24 were offered 3 bales. Bale number was not significant, so bale measures were averaged within period. Waste was collected daily, and residual forage (ORTs) was collected before new bale offering. Estimated DMI was hypothesized to not differ, while waste was expected to decrease with increasing stocking rate in ring, but not differ in cone. Estimated DMI did not differ ($P > 0.10$) as percent of BW ($2.0 \pm 0.1\%$) or $\text{kg} \cdot \text{hd}^{-1} \cdot \text{d}^{-1}$ ($11.8 \pm 0.3 \text{ kg} \cdot \text{hd}^{-1} \cdot \text{d}^{-1}$). A stocking rate by feeder interaction was observed due to changes in magnitude of difference when waste was expressed as $\text{kg} \cdot \text{hd}^{-1} \cdot \text{d}^{-1}$ ($P = 0.05$), percent of disappearance (%disp) ($P = 0.07$), and percent of intake (%intake) ($P = 0.09$). Waste was greater in ring ($P < 0.05$) than cone for 8 (2.9 vs. $2.0 \text{ kg} \cdot \text{hd}^{-1} \cdot \text{d}^{-1}$, 18.8 vs. 14.0%disp, 23.4 vs. 16.4%intake) and 24 (3.3 vs. $1.7 \text{ kg} \cdot \text{hd}^{-1} \cdot \text{d}^{-1}$, 22.4 vs. 12.5%disp, 29.2 vs. 14.7%intake), for 16 waste was increased ($P = 0.09$) (2.7 vs. 2.1 $\text{kg} \cdot \text{hd}^{-1} \cdot \text{d}^{-1}$, 18.8 vs. 15.4%disp, 23.6 vs. 18.3%intake). Increasing stocking rate to greater than 1 cow per individual feeding space did not reduce estimated DMI. Stocking hay feeders greater than 1 cow per individual feeding space or having no defined feeding space within feeder increased hay waste.

Key Words: hay waste, stocking rate, feeder design

740 Effects of feeding stockpiled tall fescue versus tall fescue hay to late gestation beef cows on circulating blood urea nitrogen and glucose concentrations. Jill M. Larson*, Katlyn N. Niederecker, and Allison M. Meyer, *Division of Animal Sciences, University of Missouri, Columbia, MO.*

We hypothesized that cows grazing stockpiled tall fescue (STF) during late gestation would have increased nutrient intake compared with cows fed summer-baled hay, which would result in increased nutrient availability for fetal growth and development. Forty-eight multiparous, spring-calving crossbred beef cows were allocated by BW (683 ± 16 [SE] kg), BCS (5.8 ± 0.1), age (5.6 ± 0.4 yr), and expected calving date (average = February 18) to 1 of 2 forage systems beginning on d 188 ± 2 of gestation. Forage systems were: 1) strip-grazed endophyte-infected STF (59.7% NDF, 12.3% CP; DM basis; 80.4% utilization) in 4.05-ha pastures ($n = 4$), or 2) ad libitum endophyte-infected tall fescue hay (64.9% NDF, 6.2% CP; DM basis) fed in uncovered drylots (18 m ×

61 m, $n = 4$). Cows remained on their respective treatments until calving. Jugular blood samples were obtained from cows on d 0 (baseline; d 188 of gestation), 35 (d 223 of gestation), and 77 (d 265 of gestation) for determination of serum blood urea nitrogen (BUN) and plasma glucose. Data were analyzed using a mixed model containing effects of treatment, sampling day, and their interaction, where sampling day was used as a repeated measure. Pasture or drylot was considered the experimental unit. During late gestation, there was a forage system × day interaction ($P < 0.001$) for serum BUN concentrations. Baseline serum BUN concentrations did not differ ($P = 0.95$) between forage systems. On d 35 and 77 of the study, cows grazing STF had greater ($P < 0.001$) serum BUN concentrations than cows fed hay only. There was no treatment × day interaction ($P = 0.57$) for plasma glucose, but cows grazing STF tended to have greater ($P = 0.11$) glucose concentrations than cows consuming hay. Additionally, as gestation progressed, plasma glucose increased ($P = 0.02$). We conclude that cows grazing stockpiled tall fescue had increased circulating BUN and glucose concentrations due to increased nutrient intake during late gestation, which may affect fetal development and subsequent calf performance.

Key Words: forage system, metabolite, pregnancy

741 Preweaning calf circulating blood urea nitrogen and glucose concentrations in a tall fescue forage system model of developmental programming. Katlyn N. Niederecker*¹, Jill M. Larson¹, Brian L. Vander Ley², and Allison M. Meyer¹, ¹*Division of Animal Sciences, University of Missouri, Columbia, MO*, ²*Department of Veterinary Medicine and Surgery, University of Missouri, Columbia, MO.*

We hypothesized that cows grazing stockpiled tall fescue (STF) during late gestation have greater nutrient intake than cows fed summer-baled hay, which would result in increased prenatal nutrient supply and ultimately improved fetal development and subsequent postnatal performance. Forty-eight multiparous, spring-calving crossbred beef cows (683 + 16 [SE] kg BW) were allocated by BW, BCS, age, and expected calving date to either strip-graze endophyte-infected STF (59.7% NDF, 12.3% CP; DM basis; $n = 4$ pastures) or consume ad libitum endophyte-infected tall fescue hay (HAY; 64.9% NDF, 6.2% CP; DM basis) in uncovered drylots ($n = 4$) beginning on d 188 ± 2 of gestation. Cows remained on their respective forage systems until calving, but STF cows were moved to drylots at 7.0 ± 1.0 d pre-calving and fed ryelage (58.6% NDF, 12.3% CP; DM basis). Within 1 wk postpartum, cow-calf pairs were moved to a single pasture for common pre-weaning management. At 52 ± 0.6 h and 83 ± 1 d postnatally, calf jugular blood samples were obtained for determination of serum blood urea nitrogen (BUN) and plasma glucose. Data were analyzed using a mixed model containing effects of forage system, sampling day, and their interaction, where sampling day was used as a repeated measure. Pasture or drylot was included as the experimental unit; calf date of birth and sex were included in the model when $P < 0.25$. We have previously reported that calves born to cows consuming STF tended to weigh more at birth and d 80. There was a tendency ($P = 0.07$) for a forage system × day interaction for serum BUN concentrations. At 52 h postnatally, calves born to cows consuming hay had decreased ($P = 0.02$) serum BUN compared with STF, but BUN did not differ ($P = 0.95$) between forage systems at 83 d of age. Treatment did not affect ($P \geq 0.20$) plasma glucose concentrations. Despite this, calves had greater ($P < 0.001$) glucose concentrations at 52 h then at 83 d. In conclusion, neonatal calves born to cows grazing

STF had increased circulating BUN, which may indicate increased perinatal nutrient supply.

Key Words: calf metabolite, developmental programming, pregnancy

742 Effect of supplementing heifers on pasture with bambermycin or monensin on growth and development. Paul Beck^{*1}, John Tucker², William Galyen³, Shane Gadberry⁴, Don Hubbell², Tom Hess², Doug Galloway³, Michael Sims¹, Beth Kegley³, and Matt Cravey⁵, ¹University of Arkansas SWREC, Hope, AR, ²University of Arkansas LFRS, Batesville, AR, ³University of Arkansas Department of Animal Science, Fayetteville, AR, ⁴University of Arkansas Cooperative Extension Service, Little Rock, AR, ⁵Huvepharma Inc., Amarillo, TX.

Spring calving (Block 1; n = 70 heifers; BW 208 ± 21.7 kg; age 231 ± 17.0 d) and fall calving (Block 2; n = 72 heifers; BW 225 ± 31.7 kg; age 276 ± 12.8 d) heifers were used to test the effects of feeding 20 mg of bambermycin (Gainpro; Huvepharma; Sofia, Bulgaria) or 150 mg of monensin (Rumensin; Elanco Animal Health, Greenfield, IN) in 0.91 kg/d corn gluten feed based supplements compared with non-medicated (Control) supplements on growth performance and development of grazing heifers. Heifers were allocated by breed, BW, and age to pasture groups (n = 5/group for Block 1 and n = 6/group for Block 2). Pasture groups were then randomly assigned to treatment (Control n = 4 pastures in Blocks 1 and 2; bambermycin and monensin n = 5 pastures in Block 1 and n = 4 pastures in Block 2). Block 1 began on 29 October 2013 and lasted 189-d, and Block 2 began on 24 June 2014 and lasted for 161-d. Heifers were weighed full on 2 consecutive days at beginning and end of each block. Reproductive tract scores (1 to 5 score) were assessed before breeding using ultrasound in Block 1 and rectal palpation in Block 2. In Block 1, heifers grazed non-toxic endophyte infected tall fescue pastures, while in Block 2 heifers grazed bermudagrass pastures until 14 October and then grazed non-toxic endophyte infected tall fescue pastures. Heifers were AI bred over 10-d, and natural service bulls were placed with heifers 14-d following final AI date. Data were analyzed as a randomized complete block design using the mixed procedure of SAS (SAS Inst. Inc., Cary, NC) least squares means were separated using contrasts: Control vs. Medicated and bambermycin vs. monensin. Ending BW and ADG of Control (323 ± 4.8 kg and 0.68 ± 0.0167 kg/d) was less ($P \leq 0.04$) than medicated, yet monensin (346 ± 4.6 kg and 0.73 ± 0.0163 kg/d) and bambermycin (344 ± 4.6 kg and 0.74 ± 0.0163 kg/d) did not differ ($P \geq 0.69$). Reproductive tract scores (3.5 ± 0.60), AI pregnancy rates (30 ± 12.3%) and total pregnancy rates (82 ± 11.5%, respectively) did not differ ($P \geq 0.36$) among treatments. This experiment indicates that both bambermycin and monensin effectively increase performance of growing heifers, but did not affect reproduction.

Key Words: bambermycin, heifer development, monensin

743 Effect of pre and postpartum herbage allowances of grasslands on metabolic and endocrine parameters of primiparous beef cows. Alberto Casal^{*1}, Martin Clatamunt², Ana L. Astessiano¹, Pablo Soca³, and Mariana Carriquiry¹, ¹Facultad de Agronomía, Universidad de la República, Montevideo, Uruguay, ²Facultad de Veterinaria, Universidad de la República, Paysandú, Uruguay, ³Facultad de Agronomía EEMAC, Universidad de la República, Paysandú, Uruguay.

The aim of this study was to evaluate the effect of herbage allowance of grasslands during the prepartum and postpartum on metabolic and

endocrine parameters of beef cows. Forty Hereford heifers were used in a randomized block design and a factorial arrangement of prepartum (fall-winter; high vs. low, PREH vs. PREL) and postpartum (spring-summer, high vs. low, POSTH vs. POSTL) herbage allowance (4 vs. 2.5 kg of DM/kg of BW of annual mean for high vs. low). At the -90, -35, +80 and +160 ± 17 DPP (fall, winter, spring and summer, respectively), BW and BCS was recorded and blood samples were collected. Means from a repeated analysis using a mixed model were considered to differ when $P \leq 0.05$. During the prepartum (-90 to -35 DPP; fall and winter) all cows lost BW and BCS, increasing plasma urea, nonesterified fatty acids (NEFA) and β-hydroxybutyrate (BHB) while decreasing glucose, insulin and leptin concentrations. During this period, BCS and concentrations of urea were lower and NEFA tended ($P = 0.09$) to be greater in PREL than PREH cows (4.6vs. 5.0 ± 0.04 units, 7.3vs. 8.1 ± 0.1 mmol/L and 1.1 vs. 0.9 ± 0.03 mmol/L for BCS, urea and NEFA, respectively). During the postpartum (spring and summer), BCS and metabolic-endocrine profiles were affected by POST but did not differ due to PRE or the PRE by POST interaction. Cow BCS and plasma glucose and leptin were greater whereas urea and NEFA were less in POSTH than POSTL cows (3.9 vs. 3.6 ± 0.04 units, 2.9 vs. 2.7 ± 0.05 mmol/L; 5.7 vs. 3.8 ± 0.1 ng/mL; 5.2 vs. 5.7 ± 0.1 mmol/L and 0.63 vs. 0.66 ± 0.03 mmol/L for BCS, glucose, leptin, urea and NEFA, respectively) during the lactation period. Plasma urea and NEFA decreased during spring to increase again toward mid-summer when insulin and BHB concentrations also decreased. Metabolic and endocrine profiles of grazing primiparous beef heifers reflected negative energy balance as herbage mass and/or quality decreased during winter gestation or during summer in the late lactation. Improve PRE and POST herbage allowance reduced negative energy balance during the pre and postpartum, respectively.

Key Words: beef cattle, endocrinology, rangeland

744 The influence of tick loads of Senepol cows on calf tick loads and production traits in the tropics. Robert W. Godfrey*, Adam J. Weis, and Henry C. Nelthropp, Agricultural Experiment Station, University of the Virgin Islands, St Croix, VI.

This study was conducted to evaluate the relationship of tick load between multiparous Senepol cows (n = 127 observations) and their calves (n = 144 observations) born in fall 2010 and 2011 and spring 2011, 2012, 2013 and 2014. Cow tick load was evaluated using a visual score (clean, light, moderate or heavy) before monthly acaricide treatment at weaning. Calf BW and tick load were measured at weaning and yearling. Average daily gain (ADG) was calculated for birth to weaning and weaning to yearling. Data were analyzed using correlation and GLM procedures with calving season and cow tick load as the main effects and sire as a covariate due to unequal representation of sires across years. Calves born in the spring had greater 205-d adjusted weaning weights ($P < 0.002$) than calves born in the fall (319.4 ± 10.7 vs. 236.9 ± 23.2 kg, respectively) but there was no effect of cow tick loads ($P > 0.10$). There was no effect of calving season or cow tick load on 365-d adjusted weight of calves ($P > 0.10$). Spring-born calves had a higher ADG from birth to weaning ($P < 0.0001$) than fall-born calves (1.23 ± 0.04 vs. ± 0.93 ± 0.09 kg/d, respectively) but there was no effect of cow tick load ($P > 0.10$). Calves of cows with light tick loads had lower ADG from weaning to yearling ($P < 0.0001$) than calves of cows with clean, moderate or high tick loads (0.29 ± 0.02 vs. 0.49 ± 0.03 vs. 0.45 ± 0.03 vs. 0.44 ± 0.03 kg/d, respectively). Spring-born calves had greater tick loads at weaning ($P < 0.001$) than fall-born calves (2.3 ± 0.1 vs. 1.5 ± 0.2, respectively) but there was no difference ($P > 0.10$) as yearlings. Calves of cows with high tick loads at weaning had lower yearling tick loads ($P < 0.02$) than calves from cows with clean, light or

moderate tick loads (1.4 ± 0.3 vs. 2.1 ± 0.3 vs. 2.5 ± 0.2 vs. 2.1 ± 0.3 , respectively). Cow tick load at weaning had low correlations with calf tick load at weaning ($r = 0.24$, $P < 0.008$) and at yearling ($r = -0.23$, $P < 0.04$). Calf tick load at weaning was not correlated with tick load at yearling ($r = -0.01$, $P > 0.10$). Cow tick load does not affect calf tick load or pre-weaning growth. Because of the low correlation of tick load between cows and calves, and within calves, it may be difficult to select for this trait.

Key Words: cow, calves, tick load

745 Comparison of the growth of F₁ Senepol x Brahman and Brahman steers in an Indonesian feedlot. Tim J. Schatz*, Northern Territory Department of Primary Industry and Fisheries, Darwin, Northern Territory, Australia.

Most cattle in northern Australia have a high *Bos indicus* (usually Brahman) content as they perform better in the harsh conditions than *Bos taurus* cattle. However, Brahmans from northern Australia often suffer price discrimination when they are sent to Australian domestic markets as they are regarded as having less tender meat than *Bos taurus*. Crossbreeding with Senepol bulls has been found to be a way of producing offspring from northern Australian herds that have higher growth rates and more tender meat than Brahmans. However there is some resistance to adoption of crossbreeding as there are concerns that crossbreds are discriminated against in the Indonesian live export market (which is a major destination for young northern Australian cattle) due to the perception that they do not perform as well as high grade Brahmans in the tropical environment. Therefore a study was conducted to compare the growth of Brahman (BRAH) and F₁ Senepol × Brahman (F₁ SEN) steers in an Indonesian feedlot. F₁ SEN (n = 54) and BRAH (n = 32) steers were exported from Darwin (Northern Territory, Australia) to Indonesia through the normal live export process and fed for 121 d in a commercial feedlot near Lampung (Sumatra, Indonesia). The average weights of the genotypes at feedlot induction were 312.3 kg (F₁ SEN) and 308.5 kg (BRAH). All the steers were fed in the same pen and received the normal feedlot management and rations. Their growth was studied and the average daily gain over the feeding period was 0.17 kg/d higher ($P < 0.001$) in the F₁ SEN compared with BRAH (1.71 vs. 1.54 kg/d). As a result the F₁ SEN put on 21.6 kg more weight ($P = 0.002$) over the feeding period. There was no significant difference between the genotypes in average fat depth at the P8 site at the end of the feeding period (F₁ SEN = 10.5 mm, BRAH = 10.6 mm) despite the F₁ SEN being 25.4 kg heavier on average. This study found that that F₁ SEN steers performed better than BRAH in an Indonesian feedlot, and so the results should allow live export cattle buyers to purchase these types of animals (Brahman × tropically adapted *Bos taurus*) with confidence that Indonesian feedlotters will be happy with their performance.

Key Words: Senepol, Brahman, feedlot

746 Alternative weaning and finishing strategies affect finishing residual feed intake of beef steers. Jason K. Smith^{*1}, Deidre D. Harmon¹, Mark D. Hanigan², Samer W. El-Kadi¹, Sally E. Johnson¹, Scott P. Greiner¹, and Mark A. McCann¹, ¹Department of Animal and Poultry Sciences, Virginia Tech, Blacksburg, VA, ²Department of Dairy Science, Virginia Tech, Blacksburg, VA.

Recent evidence suggests that alternative early nutritional management strategies may metabolically imprint beef steers for reductions in finishing residual feed intake (RFI). To further evaluate this effect, as well as that of an alternative finishing nutritional management strategy, a 2×2

$\times 2$ factorial experiment was conducted that included Angus (ANG) and Simmental (SIM) sired steers randomly assigned to one of 2 weaning treatments (early weaned [EW; weaned at 111 ± 23 d of age; n = 14] or conventionally weaned [CW; weaned at 233 ± 21 d of age; n = 14]) and one of 2 finishing treatments (high corn [HC; 68.7% of DM from steam-flaked corn; n = 14] or low corn [LC; 50% of DM from steam-flaked corn isoenergetically replaced with dried corn gluten feed; n = 14]). EW steers were fed a concentrate-based ration ad libitum for 122 d following weaning. All steers were then commingled and backgrounded on pasture for 190 d, finished in a feedlot for 154 ± 64 d, and harvested in groups upon reaching a common 12th-rib fat thickness of 1 cm. Feed intake was measured daily following a 42 d finishing ration adaptation period using a Calan-Broadbent system. Observed ADFI expressed in Mcal of NE_g was regressed against average BW^{0.75}, ADG and duration of the measurement period ($R^2 = 0.73$; $P < 0.0001$) via the Fit Model procedure of JMP Pro, and RFI was calculated as the difference between observed and predicted ADFI. Analysis of variance was conducted to determine the fixed main and interaction effects of sire breed, weaning treatment and finishing treatment on ADFI, ADG and RFI. Although no effects were observed for ADFI ($P \geq 0.45$) or ADG ($P \geq 0.36$), RFI of ANG HC steers was lower than ANG LC (-0.91 vs. 0.49 Mcal NE_g; SEM = 0.22; $P < 0.001$), SIM LC (-0.91 vs. 0.20 Mcal NE_g; SEM = 0.22; $P < 0.01$) and SIM HC (-0.91 vs. 0.10 Mcal NE_g; SEM = 0.22; $P < 0.05$), and was lower for EW than CW steers (-0.27 vs. 0.21 Mcal NE_g; SEM = 0.15; $P < 0.05$). These results provide additional evidence of metabolic imprinting of EW steers for reductions in RFI, and independent effects of finishing energy source on RFI of ANG steers.

Key Words: early weaning, metabolic imprinting, residual feed intake

747 Alternative weaning and finishing strategies affect beef carcass marbling score. Jason K. Smith^{*1}, Hailey S. Cassell¹, Deidre D. Harmon¹, Mark D. Hanigan², Samer W. El-Kadi¹, Sally E. Johnson¹, Scott P. Greiner¹, and Mark A. McCann¹, ¹Department of Animal and Poultry Sciences, Virginia Tech, Blacksburg, VA, ²Department of Dairy Science, Virginia Tech, Blacksburg, VA.

Increased volatility in climate, grain prices and grid-based carcass premiums have led beef producers to search for alternative weaning and finishing management options. An experiment was conducted to evaluate the effects of an alternative weaning strategy and finishing diet on carcass marbling score (MS), quality grade (QG) and Certified Angus Beef LLC (CAB) retail brand acceptance. Angus (ANG) and Simmental (SIM) sired steers were randomly assigned to one of 2 weaning treatments (early weaned [EW; weaned at 111 ± 23 d of age; n = 14] or conventionally weaned [CW; weaned at 233 ± 21 d of age; n = 14]) and 1 of 2 finishing treatments (high corn [HC; 68.7% of DM from steam-flaked corn; n = 14] or low corn [LC; 50% of DM from steam-flaked corn isoenergetically replaced with dried corn gluten feed; n = 14]) in a $2 \times 2 \times 2$ factorial design. Following weaning, EW steers were fed a concentrate-based ration ad libitum for 122 d before commingling and pasture backgrounding with CW steers for 190 d. Steers were then finished for 154 ± 64 d and harvested in groups upon reaching a common ultrasound-estimated 12th-rib fat thickness of 1 cm. Chilled carcasses were evaluated to determine MS, QG and CAB acceptance, and ANOVA was conducted to determine the fixed main and interaction effects of sire breed, weaning treatment and finishing treatment using the Fit Model procedure of JMP Pro. All interaction effects were removed from the final ANOVA model due to lack of significance ($P \geq 0.54$). MS was greater for carcasses of EW than CW steers (741 ± 14 vs. 680 ± 15 ; $P < 0.01$), and HC than LC steers (775 ± 17 vs. 646 ± 15 ; $P < 0.0001$),

however no main effects were evident for QG or CAB acceptance ($\chi^2 \leq 2.32$; $P \geq 0.13$). Although weaning and finishing treatments affected MS, the effects were not detectable in QG and CAB acceptance within this experiment, and further research is warranted to increase sample size and statistical power. Nonetheless, the management practices utilized in

this experiment affected MS independently, indicating that both early and late nutritional management strategies affect marbling development.

Key Words: early weaning, carcass, marbling