

Forages and Pastures: Pastures and Grazing

T82 Structure of Tanzania grass managed under different residual light area index at rotational stocking by goats. A. C. Ruggieri^{*1,2}, N. Lima Santos^{1,2}, I. A. M. Teixeira¹, V. C. e Silva¹, B. R. Vieira¹, and E. B. Malheiros¹, ¹São Paulo State University, Jaboticabal, São Paulo, Brazil, ²Fundação de Amparo a Pesquisa do Estado de São Paulo, São Paulo, São Paulo, Brazil.

The effect of residual leaf area index (LAI) on the structure of Tanzania grass pasture under rotational stocking with goats was evaluated. It was studied 3 treatments, with 3 residual LAI (0.8-1.6-2.4) as a randomized blocks design with 6 replications. The rest period was adopted according to the criterion of 95% of light interception (LI). The paddocks were grazed by goats until residual LAI. There were made measurements of IAF and of IL with accupar® LAI meter. The spatial distribution of the plants components were done with the “inclined point quadrat” by considering the components leaf, stem and dead material. The values of total, leaf and stem herbage mass in the pre grazing were similar ($P > 0.05$) between 1.6 and 2.4 residual LAI and larger ($P < 0.05$) than 0.8 residual LAI. The lower residual LAI had a drastic effect to the recovered of the plants, consequently the paddocks subjected to this treatment presented lower herbage mass. The dead material mass were similar ($P > 0.05$) among the tree different residual LAI. In the 0.8 residual LAI it was verified a great leaves concentration and an effective participation of stems in the sward layer of 17-24cm with 14.2% of leaves and 1.5% of stem. In the 1.6 residual LAI it was denoted a great concentration of leaves and a small participation of stems among the sward layer 25-32cm, corresponding at 14.8% of leaves and 0.9% of stem. Similar situation occurred at 2.4 residual LAI. However the largest concentration of leaves and short participation of stem occurred among the 33-40 cm, corresponding at 13.4% of leaves and 0.4% of stem. Thus, the adopted management was efficient in controlling stem growth, which is an structural trait that affects the ingestive behavior once that the herbage height post grazing were 25, 32 and 41cm for 0.8, 1.6 and 2.4 residual LAI respectively. The residual LAI measure is an effective tool to control and to define the grazing strategies. The spatial distributions of the morphologic components reflect the sward structure by grazing at different residual LAI.

Key Words: inclined point quadrat, spatial distribution, herbage mass

T83 Effects of stocking rate and supplementation on pasture quality, production, and utilization in pasture-based dairy systems in Eastern North Carolina. R. E. Vibart^{*1}, S. P. Washburn², G. A. Benson², and J. T. Green², ¹AgResearch Limited, Palmerston North, New Zealand, ²North Carolina State University, Raleigh.

Pasture-based systems with appropriate stocking rates (SR) and grazing management can achieve efficient levels of milk production per cow while maintaining high levels of pasture quality and utilization. A seasonal, fall-calving, pasture-based system was established on a research farm to address the effects of SR on pasture quality, production, and utilization for three years. Groups of 40 cows (approximately 1/3 Holsteins, 1/3 Jerseys, and 1/3 crosses of those breeds) were assigned to either a low stocking (LSR; 2.2 cows per ha) or a high stocking rate group (HSR; 3.3 cows per ha). Relative proportions of a corn-based concentrate mix were kept at 1.0:1.5 for LSR vs. HSR, respectively. Pasture/forage crop rotations included annual ryegrass and sorghum-Sudan (50%), annual ryegrass overseeded on bermudagrass (20%), and

an improved tall fescue (MaxQ) - white clover pasture (30%). Pre- and post-grazing herbage mass values did not differ among SR; means (\pm SE) were $3,342 \pm 255.8$ and $1,884 \pm 160.6$ kg DM/ha. Grazing area offered daily (m²/cow) was greatest ($P = 0.001$) for cows on LSR, whereas grazing intervals did not differ between SR ($P > 0.30$; 23.6 d). The nutritive value of fresh and conserved forages was similar among SR, except for freshly-grazed bermudagrass ADF ($P = 0.006$; 29.6 vs. 26.3% of DM for LSR and HSR, respectively). Cows on HSR spent more ($P = 0.04$) time on an extra feeding lot (85 vs. 61 days/year) as opposed to grazing (204 vs. 228 days/year), whereas the amount of conserved forage produced from the LSR area was 86% greater (1011 vs. 544 kg DM/cow) than that produced from the HSR. With the greater stocking rate, additional supplemental concentrate, forage, and time off of grazing paddocks were needed for supplemental feeding in times when pasture was limited.

Key Words: pasture-based dairy, stocking rate, grazing

T84 Predicting dry matter intake of grazing Brahman bulls selected for high and low feed efficiency. A. D. Aguiar^{*1}, L. O. Tedeschi¹, F. M. Rouquette, Jr.², T. D. A. Forbes³, C. M. Hensarling³, and R..D. Randel², ¹Texas A&M University, College Station, ²Texas AgriLife Research, Overton, TX, ³Texas AgriLife Research, Uvalde, TX.

Determining feed efficiency of beef cattle has become of increasing importance with the rising cost of feed and other inputs. Determination of feed efficiency on pasture might provide a more realistic methodology compared to conventional residual feed intake (RFI) tests; however, determination of intake under grazing conditions over extended periods has seldom been attempted. Our objectives were to determine if cattle previously phenotyped for feed efficiency maintained their rank on pasture, and to develop techniques that decreased the costs associated with intake determination. Purebred Brahman bulls, (438 ± 23 kg) previously phenotyped by conventional RFI procedures as either efficient ($n = 8$) or inefficient ($n = 8$), were grazed on replicated ($n = 4$) Coastal bermudagrass pastures at Overton, TX in July 2008. Animals were individually fed 400g of corn gluten labeled with 200 mg C32 n-alkane twice a day (07.00 and 19.00 h) using Calan gates. Feeding the labeled supplement continued for 10 d. Fecal samples were collect twice per d. (07.00 and 19.00) for the first 5 d. and then 4 times per d. for the remaining 5 d. (07.00, 11.00, 15.00 and 19.00 h). Forage samples selected from the grazed horizon, were collected daily beginning 2 d. prior to the start of dosing. All forage and fecal samples were dried at 60 C., and ground using a cyclone mill fitted with a 1 mm screen, prior to extraction and subsequent alkane determination by gas chromatography. No difference ($P > 0.1$) in forage DM intake was detected between efficient and inefficient bulls. Dry matter intake averaged 10.2 ± 0.48 kg. A highly significant effect ($P < 0.0001$) of time of fecal sampling on intake estimation was observed, with intake estimates being 9.8, 9.9, 10.4, and 11.1 ± 0.35 kg DM for collections made at 07.00, 11.00, 15.00 and 19.00 h, respectively. These data suggest that animals previously phenotyped under confinement feeding may not provide the same ranking under grazing, and that fecal collections need to be widely separated in time to provide the most reliable intake estimates.

Key Words: feed efficiency, intake, n-alkanes

T85 Summer forage species alters animal performance, carcass characteristics and fatty acid composition of grazing beef steers. J. R. Schmidt, J. G. Andrae, S. K. Duckett*, and M. Miller, *Clemson University, Clemson, SC*.

The objective of this study was to evaluate various summer forages and their effects on live animal performance, carcass quality, and fatty acid composition of finishing beef cattle. Angus-cross steers (n=60) were finished on alfalfa (AL), bermudagrass (BG), chicory (CH), cowpea (CO), and pearl millet (PM) during this two year grazing study. Ten 2-ha paddocks were blocked and assigned to forage species (2 reps per species). Each year, three tester steers were randomly assigned to paddocks. Grazing began when adequate forage growth for individual species was present. Put and take grazing techniques were utilized throughout the trial. Animal gains and herbage mass were monitored at 28 d intervals. Steers were slaughtered when sufficient forage mass for individual species was inadequate for supporting animal gains or when average steer weight exceeded 568 kg. Carcass data were collected at 24 h postmortem. Data were analyzed using PROC MIXED of SAS. Average daily gains were greater (P = 0.02) for AL than BG, CO, and PM, while CH produced higher ADG than BG and PM. Dressing percentages were greater (P = 0.01) for AL and CO than BG and PM, while CH was higher than BG. Cowpea carcasses had the highest (P < 0.05) quality grades and marbling scores. Postmortem aging decreased (P < 0.01) LM shear force measures. Shear force scores were lower (P = 0.05) for AL and CO than BG and CH with PM being intermediate. CLA cis-9, trans-11 concentration was greater (P = 0.02) in BG and PM than other treatments. Chicory and CO treatments had higher (P < 0.01) concentrations of linolenic acid than other treatments, while AL was higher (P < 0.01 than PM. Stearic acid concentration was higher (P = 0.02) in CO than CH, PM, and AL, while BG was higher than PM and AL, and CH was higher than AL.

Key Words: beef, forages, fatty acid

T86 Performance by spring and fall-calving cows grazing with full access, limited access, or no access to endophyte-infected tall fescue 2 year summary. J. Caldwell*¹, K. Coffey¹, D. Philipp¹, J. Jennings³, D. Hubbell III¹, T. Hess¹, D. Kreider¹, M. Looper², M. Popp¹, M. Savin¹, and C. Rosenkrans Jr.¹, ¹University of Arkansas, Fayetteville, ²USDA-ARS, Booneville, AR, ³Cooperative Extension Service, Little Rock, AR.

Replacing toxic *Neotyphodium coenophialum*-infected tall fescue (E+) with a non-toxic endophyte-infected fescue (NE+) has improved cow performance greatly, but producer acceptance of NE+ has been slow. Our objective was to compare performance by spring (S) and fall-calving (F) cows grazing either E+ or NE+ at different percentages of the total pasture area to determine to what extent having limited access to NE+ will enhance cow/calf performance. Gelbvieh Angus crossbred cows (n=178) were stratified by weight and age within calving season and allocated randomly to 1 of 14 groups representing 5 treatments: 1) F on 100% E+ (F100); 2) S on 100% E+ (S100); 3) F on 75% E+ and 25% NE+ (F75); 4) S on 75% E+ and 25% NE+ (S75); and 5) S on 100% NE+ (NE100; 2 replications). Cow BW at breeding, BW and BCS at the end of breeding, BW, BCS, and hair score at weaning, and calving rates were greater (P<0.05) for F compared with S. A calving season by NE+ % interaction tendency (P=0.07) was detected for cow BCS at weaning. Cow BCS at the end of breeding tended to be greater (P=0.08) for F100 and S100 compared with F75 and S75, but cow BW at weaning and calving rates were greater (P<0.05) for F75 and S75 compared with F100 and S100. Calf gain, actual weaning weight, ADG, and adjusted

weaning weight were greater (P<0.05) for F compared with S. Therefore, a fall-calving season may be more desirable for cows grazing E+, resulting in greater calving rates, BW and BCS at critical times, and heavier calves at weaning. Limited access to NE+ may not improve calf BW through weaning, but may improve calving rates and cow BCS at certain stages of production. This project was supported by the National Research Initiative of the Cooperative State Research, Education and Extension Service, USDA, grant # 2006-55618-17114.

Key Words: calves, cows, novel endophyte fescue

T87 Characteristics of Tanzania (*Panicum maximum*) and Xaraés (*Brachiaria brizantha*) pastures under dairy cows grazing with two supplementation levels. C. A. M. Gomide*, D. S. C. Paciullo, D. Vilela, and J. H. Bruschi, *Embrapa Dairy Cattle Research Center, Juiz de Fora, MG, Brasil*.

In spite of the importance of comprehension of the plant-animal relationships to grazing management, there are few works that evaluate the influences of supplementation strategies under the pasture characteristics. This work aimed to evaluate the effect of two levels of supplementation on the characteristics of Tanzania grass and Xaraés grass pastures along the dry and rain seasons. The study was carried out with lactating dairy cows, under rotational grazing. The levels of supplementation were 3 and 6 kg of concentrate ration/cow/d. A 2 × 2 × 2 factorial blocks design with two replications was used. The total forage mass (TFM) did not vary with the studied factors, the average value was 6,894 kg/ha. Probably the high percentage of dead vegetation in the dry season (48.3%) caused the TFM to be overestimated in this period. A higher canopy was observed in the summer as well as higher values of leaf-stem ratio and percentage of leaf in the pre grazing forage. These two last attributes also were favorable regarding Tanzania grass, showing values of 2.03 and 43.2%, respectively. In Marandu grass pasture these values were 1.05 and 36.5%, respectively. The levels of supplementation influenced only the pasture height after grazing, when it was observed a residue of 58.1 cm with the 6 kg of concentrate supplementation against a residual height of 50.8 cm for the treatment of 3 kg of concentrate. Leaf-stem ratio and the percentage of leaves after grazing varied with the grass × season interaction. The percentage of residual leaves was higher in Tanzania grass during the dry season, while in the rainy season that percentages were 29.2 and 36.3%, respectively for Tanzania and Xaraés. The factor season was the more effective affecting the characteristics of the pasture, showing a bigger loss during the dry season. *Support by FAPEMIG/CNPq.*

Key Words: rotational stocking, sward structure, tropical pasture

T88 Characteristics of forages utilized by the Przewalski horse (*Equus ferus przewalskii*) in Hustai National Park, Mongolia. B. N. Petrukovich*, J. P. Stevens, and D. A. Christensen, *University of Saskatchewan, Saskatoon, Saskatchewan, Canada*.

Przewalski horses were reintroduced to the Hustai National Park in Mongolia in 1990. Their reintroduction has been carefully monitored, but information on supply and quality of forage is limited. Therefore, the goal of this research was to collect representative samples of the forage available to three harems in the Park and to measure the composition, amount, digestibility and adequacy of pasture forages to meet horse nutrient requirements and for use in providing guidelines for other species. Within each three home ranges forage was clipped from seven

areas defined by dominant plant species in 1.0 m² quadrants. Collection occurred at the end of the rainy season in August and the forage collected was used to represent the amount of forage available to the horses until the next growing season. A natural mineral sample available to the horses was collected and four fecal samples were collected from each of the three harems to estimate digestibility using lignin as an internal marker. Nutrient analyses of the samples included DM, ash, crude protein, EE, ADF, NDF, ADICP, NDICP, lignin and macro and micro minerals. Digestible energy (DE) was estimated according to NRC Horse 2007. Estimated DE averaged 2.25 Mcal/kg for the three home ranges with no significant differences ($P > 0.05$). Harem forage DM/ha averaged 1086 kg (SD 543), CP 10.4%, ADF 38.2%, and NDF 59.1%. Apparent digestibility of forage dry matter averaged 58.8%. Energy requirements were met from the available forage for 300 kg horses at maintenance from less than 2% of BW/day (4.45 kg DM/day) and for mares in late gestation (5.71 kg DM/day). Early lactating mares would need to consume 2.8% of BW per day (8.47 kg DM/day) to meet energy requirements. Results of this study suggest a marginal capacity of the available forage meeting all the requirements of Przewalski horses while lactating mares are at increased risk of losing condition and supporting foals.

Key Words: Przewalski horse, pasture forages, digestible energy

T89 Timing of herbage allocation in a strip grazing organic system: Effects on performance and milk composition of lactating dairy cows. L. Baldoceca^{*1,2}, G. Raggio³, R. Bergeron³, D. Pellerin¹, and R. Berthiaume², ¹Université Laval, Québec, Canada, ²Dairy and Swine Research & Development Centre, Agriculture and Agri-Food Canada, Lennoxville, Québec, Canada, ³Campus Alfred Université de Guelph, Alfred, Ontario Canada.

The aim of this study was to assess the effect of grazing management, more specifically timing of pasture allocation, on performance of dairy cows in an organic system. Thirty multiparous Holstein cows were blocked based on parity and milk yield, and then randomly assigned to one of 2 treatments that consisted in grazing fresh daily strips offered either after AM milking 6.00 (AM) or after PM milking 17.30 (PM). Plucked samples of herbage were collected in the morning, at noon, and in the afternoon to assess diurnal variation in the chemical composition of pasture (DM, NSC, NDF, ADF and CP). Milk yield was recorded daily and sampled weekly. Cow body weights were recorded every 2 weeks. Herbage availability for each group was measured by hand-clipping herbage at a stubble height of 3 cm from 9-30x30 cm quadrats before grazing, and herbage refused was determined by clipping 12-30x 30 cm quadrats after grazing. Data were analyzed as a randomized complete block design experiment using the MIXED procedure of SAS. Time of day (AM vs. PM) had an effect on herbage NSC concentration (11.01 vs. 13.76 ± 2.25%). Milk yield (27.7 vs. 27.4 ± 1.18 Kg/d; $P > 0.05$), concentration of milk fat (3.85 vs. 3.93 ± 0.10%; $P > 0.05$) and milk protein (2.93 vs. 2.97 ± 0.03%; $P > 0.05$), and body weight gain (+12 vs. +5 kg) did not differ comparing AM vs. PM treatment. Mean of herbage availability was greater for the PM treatment (33.9 vs. 35.8 DM/d) as was the coefficient of herbage utilization (33 vs. 42%). These results suggest that a simple modification in the time of pasture allocation (PM vs. AM) can improve herbage utilization. This is likely associated to changes observed in the composition of pasture during the day. However, changes in herbage composition (i.e.:NSC) were smaller than anticipated and this may explain the lack of effect on milk yield and milk composition.

Key Words: strip grazing, dairy cow, organic

T90 Performance of stocker cattle fed hay and protein supplements during the winter and grazed on wheat pasture during the spring. W. A. Phillips^{*1}, C. A. Bandyk², and T. W. Geary³, ¹USDA-ARS, El Reno, OK, ²Quality Liquid Feeds Inc., Dodgeville, WI, ³USDA-ARS, Miles City, MT.

In the southern Great Plains region, perennial warm- and annual cool-season grasses are used to grow stocker cattle. The objective of this experiment was to evaluate supplementation strategies used to winter stocker cattle on dormant warm-season grasses and the impact of these strategies on subsequent body weight gains during the graze-out period on spring wheat. Spring born calves (n = 152, BW = 219 kg) weaned in the fall were randomly assigned one of eight 3.2-ha pastures of dormant warm-season grasses in a completely random design. Steers had ad libitum access to hay (8.8% CP, 70% NDF, and 40% ADF) in addition to dormant warm-season grass. Four pastures were limit fed a dry supplement (20% CP plant protein based, 132 mg of lasalocid/kg) and four pastures had ad libitum access to a liquid supplement (24% CP, 17% CP equivalents from NPN, 63% DM, 165 mg of lasalocid/kg) in lick-wheel tanks. Pasture was the experimental unit and data were analyzed using GLM procedures with supplement type as the only source of variation. Average daily gains for the 98-d wintering period were not different ($P = 0.96$) between supplement groups (0.44 ± 0.04 kg). Daily supplement intake (as fed) was similar ($P = 0.21$) between the dry and liquid supplements (mean = 1.45 kg/d), but steers fed dry supplement had 12% less ($P = 0.7$) CP intake (0.30 vs 0.34 kg/d) and 16% less ($P = 0.07$) lasalocid intake (200 vs 232 mg/d) than steers fed liquid supplement. During the subsequent 43-d graze-out period on winter wheat, ADG did not differ ($P = 0.30$) between the supplement groups, but were greater ($P = 0.01$) than for steers (n = 32) that had grazed winter wheat all winter (1.15 vs 1.02 kg). Feeding a dry or liquid supplement to calves during the winter resulted in similar performance and some compensatory gain during the spring as compared to calves winter on wheat. The cost of supplemental feed, labor, and the value of steers in the fall versus the spring would dictate the economic feasibility of purchasing calves in the fall and wintering them for use the following spring as opposed to purchasing animals as needed.

Key Words: stocker cattle, supplementation, compensatory gain

T91 Perennial forage kochia for increased production of winter grazed pastures. L. K. Greenhalgh¹, D. R. ZoBell^{*1}, B. L. Waldron², K. C. Olson³, A. R. Moulton¹, and B. W. Davenport⁴, ¹Utah State University, Logan, ²USDA-ARS, Logan, UT, ³South Dakota State University, Rapid City, ⁴USDA-NRCS, Tooele, UT.

Grazing forage kochia (*Kochia prostrata*) during fall/winter has improved livestock health and reduced winter feeding costs. The objectives of this study were to compare forage production/quality and livestock performance of traditional winter pastures versus pastures with forage kochia. Two kochia pastures were established in Tooele County, Utah in January 2005. Mature, pregnant, crossbred cows at both locations were body condition scored (BCS) and randomly divided into groups, then placed in either forage kochia/crested wheatgrass (*Agropyron desertorum*) or crested wheatgrass/cheatgrass (*Bromus tectorum*) pastures. Grazing lasted for 60 days in 2007 and 84 days in 2008. Cows were combined and condition scored. Data were analyzed using the mixed procedure of SAS considering pasture treatments (improved with forage kochia vs. control) as fixed and each location by year combination as random blocks. Forage production data showed control and study pastures with 441 kg • ha⁻¹ and 2586 kg • ha⁻¹ of forage respectively. The nutritional quality of forage kochia plants was compared to that of

grass plants (primarily crested wheatgrass). *In vitro* true digestibility was similar ($P > 0.50$) for crested wheatgrass and forage kochia (63.0% and 64.0%, respectively), but crude protein was significantly greater ($P < 0.001$) for forage kochia than for crested wheatgrass (11.7% and 3.1% respectively). Cattle on improved ranges with forage kochia had a greater ($P < 0.01$) increase (+ 0.65) in BCS than cattle on unimproved rangelands (+ 0.39) comprised mostly of crested wheatgrass. Overall, this study found that both pastures had adequate forage to increase body condition; however, the most noteworthy result is the nearly six-fold increase in production (which translates to increased carrying capacity) in the forage kochia pastures.

Key Words: perennial forage kochia, body condition score, beef cattle

T92 Seasonal distribution of minerals in grazed and ungrazed cool-season tame grass pasture. C. L. Wright* and A. J. Smart, *South Dakota State University, Brookings.*

In each of 2 years, forage samples were collected from grazed and ungrazed cool-season tame grass pasture for analysis of mineral concentrations. In each year, 4 replicated 100 m² exclosures were randomly located within the pasture. Treatments were considered ungrazed (inside exclosure) and grazed (outside exclosure) forage. Forages contained in a single 0.25 m² quadrat was clipped near the soil surface within each treatment and replication. In year 2, the exclosures were placed in different locations so that the ungrazed treatment would not be confounded by the previous year's location. Samples were collected on 20 May, 3 Jun, 18 Jun, 22 Jul, 8 Aug, and 18 Aug in year 1, and 26 May, 8 Jun, 22 Jun, 4 Aug, and 17 Aug in year 2. Forage samples sorted into green and dead plant tissue. Green tissue from each treatment and replication was analyzed to determine Ca, Co, Cu, Fe, Mg, Mn, Mo, Na, P, K, S, and Zn concentrations. Concentrations of Co and Na were below detectable limits in nearly all samples. In year 1, concentrations of K, Mg, P, and S were affected ($P < 0.03$) and Mo tended ($P = 0.06$) to be affected by treatment \times date interactions. Concentrations of each mineral were greater later into the grazing season in grazed forages than in ungrazed forages. The main effect of treatment influenced ($P < 0.03$) concentrations of P and S and tended to influence ($P < 0.10$) concentrations of Fe and K. Concentrations of each mineral were greater in grazed than in ungrazed forage. The main effect of sampling date influenced Ca, Cu, Mn, Mo, P, K, S ($P < 0.01$) and Zn ($P < 0.05$). Concentrations of Ca, Cu, P, K, S, and Zn decreased and concentrations of Mo and Mn increased over time. In year 2, concentrations of Mg and Mn were greater ($P < 0.04$) in grazed than in ungrazed forage. Concentrations of Ca, Co, Cu, Fe, Na, P, K, S, and Zn decreased ($P < 0.01$) and concentrations of Mg, Mo, and Mn increased ($P < 0.01$) over time. The concentration of various minerals in forages may be dependent upon whether or not it has been grazed and the sampling time within the growing season.

Key Words: forage, mineral, season

T93 Nutritive value of standing mature Buffel grass (*Cenchrus ciliaris*) for dry season feeding of cattle in Northeastern Mexico. H. Bernal-Barragan*^{1,2}, R. W. Blake², D. J. R. Cherney², and M. E. Van Amburgh², ¹Facultad de Agronomía UANL, Escobedo, N.L., México, ²Cornell University, Ithaca, NY.

Extensive cow-calf systems in northeastern Mexico rely on stocks of senescent standing roughage during the dry season, about which there

is little nutritional information. This study was conducted to evaluate the chemical composition and *in vitro* digestibility of NDF (IVNDFd) of Buffel grass from an ungrazed plot in semiarid Nuevo Leon, Mexico. Samples were hand-harvested at an above-ground cutting height of 40 cm and immediately dried at 65°C in a forced-air oven. Cuttings resulting from below average rainfall (September 2007 to July 2008) were analyzed in replicates for contents of ash, CP, soluble protein (SP), NPN, NDF, ADF, ADL, and 24-h IVNDFd. Crude protein exceeded 6% in only two months and the proportion of SP was 20% to 30% as a percent of CP. NPN averaged about 60% of SP from November to June; and ~85% in July/September. Monthly differences were not detected in NDF and ADF (76% and 44%). ADL increased from 4% to 9% of DM. Digestibility of NDF averaged ~34% from September to January; otherwise ~26%. Ash content declined from 11% in September to 5% in June. ADL increased from 4% to 9% of DM. Average *in vitro* DM digestibility also was greater (~48%) September to January than from February to July (~40%); however digestibilities may be overestimated due to added N and S for incubations. The feeding value of standing mature Buffel grass is comparable to that of maize or sorghum stover with 3% to 6% CP and 45% to 55% IVDMD. Taking an average value of the chemical composition at 1 \times maintenance intake, the Cornell Net Carbohydrate and Protein System (CNCPS) predicted energy value for standing mature Buffel grass was 1.45 Mcal/kg ME. These results can be used to develop feed library values for programs like the CNCPS. Their application would allow users to develop dietary supplementation strategies for cattle grazing dormant Buffel grass during drought conditions.

Key Words: Buffel grass, nutritive value, CNCPS

T94 The effect of grazing and supplementing with corn byproducts on reproductive performance of Creole \times Zebu cows: A simulation model. J. M. Tapia-Gonzalez*¹, A. Tewolde-Medhin², W. E. Grant³, J. C. Martinez González², H. Diaz Solís⁴, A. Moreno Valdéz⁵, O. Z. Montañez Valdez¹, L. F. Galvan-Benavidez¹, and G. Rocha Chávez¹, ¹CUSUR, Univ de Guadalajara, Cd Guzman Jalisco Mexico, ²Univ Autonom de Tamaulipas, Cd Victoria Tamps. Mexico, ³Texas A&M University, College Station, ⁴UAAAN, Saltillo Coahuila Mexico, ⁵Inst Tec de Cd Victoria, Cd Victoria Tamps. Mexico.

The Software STELLA® II Version 5 was used for comparing a simulated scenario with a real beef cattle production system. Type of feeding (grazing only or grazing + supplement) was compared using the conceptual mathematical model to determine the effect of several types of corn by-products on fertility of cows. We used real data to feed the software and predicted production performance under four different scenarios: Grazing only, grazing+ corn silage, grazing + nutritional blocks and grazing + tree leaves. Nutritional blocks are made of crushed corn straw plus molasses and minerals pressed together whereas tree leaves is referred as branches of specific trees that are cut for cattle feeding. A total of 20 repetitions during 48 months were represented in the model and predicted performance of the cow since she is a month old up to her first calving and lactation. Special emphasis was put on dry season when zebu-crossed cows start to lose weight. Studied parameters as well as predicted results are depicted in table 1. We found this model useful since predicted parameters were similar to those reported by several authors (Hernandez, 2001, Martínez *et al.*, 1999., Archondo, 1986., Manvielle y Hernandez 1962., Zaragoza y Castellon, 1999). It was again confirmed that simulation models are useful tools to predict future scenarios that otherwise are expensive to develop.

Table 1. Type of feeding and its effects on severa production parameters of beef cattle.

Type of feeding	Age (months)	Body weight (Kg)	Daily Gain (grams)	*BCS	Fertility rate	Age at onset of puberty (months)
Grazing only	43	198.8	150	4	30%	39.5
grazing+ corn silage	45.8	279	203	6.6	50%	29.5
grazing + nutritional blocks	45.8	289	240	6.8	60%	24.9
grazing + tree leaves	36.3	301	276	7.1	70%	21.5

*BCS = Body condition score (from 1- 10)

Key Words: simulation, supplements, cows

T95 Evaluation of cultivated summer pastures for meat goats in Tennessee. M. Lema*, K. Suleyman, and R. Opio, *Tennessee State University, Nashville.*

A grazing trial was conducted to evaluate Puna forage chicory (*Cichorium intybus* L.), Hybrid Penleaf pearl millet (*Pennisetum glaucum*) and Sahara bermudagrass (*Cynodon dactylon*) as summer pasture for meat goats. Puna chicory was 28.3 and 67.7% higher ($P < 0.05$) in crude protein (CP), 28.1 and 35.4% lower ($P < 0.05$) in acid-detergent fiber (ADF) and 40.0 and 46.0% lower ($P < 0.05$) in neutral detergent fiber (NDF) than Penleaf pearl millet and Sahara bermudagrass, respectively. Penleaf pearl millet was 37.7% higher ($P < 0.05$) in CP, 10.2 and 10.0% lower ($P < 0.05$) in ADF and NDF than Sahara bermudagrass, respectively. Relative Feed Value (RFV), Ca, P, Mg and K contents were significantly higher ($P < 0.01$) for Puna chicory than for Penleaf pearl millet and Sahara bermudagrass. Penleaf pearl millet was higher ($P < 0.01$) than Sahara bermudagrass in P, K and Mg content. Puna chicory and Pearl millet produced 73 and 70% higher ($P < 0.05$) forage CP per ha, respectively than Sahara bermudagrass. Average daily gain (ADG) and live weight gain per ha of does grazing Puna chicory were significantly higher ($P < 0.05$) than those does grazing Sahara bermudagrass does and Penleaf pearl millet.

Key Words: chicory, pearl millet, summer pasture

T96 Dry matter yield and nutritional value of Kikuyu Grass grazed under phenological concepts in commercial dairy farms in Costa Rica. J. M. Sánchez*^{1,2}, K. Peters^{1,3}, and A. Martínez^{1,2}, ¹Universidad de Costa Rica, San José, Costa Rica, ²Centro de Investigación en Nutrición Animal, San José, Costa Rica, ³Escuela de Zootecnia, San José, Costa Rica.

Because of its high dry matter yield and good nutritional quality, Kikuyu Grass (*Kikuyuocloa clandestina*) is the most important grass species on dairy farms located between 1300 and 2700 m in altitude in Costa Rica. Thus, the aim of this study was to analyze dry matter yield, botanical composition and nutritional value of kikuyu-based pastures grazed under the leaf stage concept, on commercial dairy farms located in the Central Mountains in Costa Rica. Samples and measurements were taken every other month for 1 year on four randomly selected farms. The farms were located between 1900 and 2400 m in altitude, where annual average precipitation is 1800 mm and annual mean temperature is 18°C (mini-

um of 13°C; maximum of 23°C). Average DM yield was 29t/ha/year (with a range of 24 to 33 t/ha/year), which is similar to literature values when this grass is intensively managed. Lowest average DM yield per rotation cycle (31 to 37d) was during July and August (1.7t/ha), which coincides with the months of the lowest irradiation (14 Mj/m²) and light hours (4 hours/d). Botanical composition analysis showed that 90.1% of the biomass was kikuyu grass, 1.9% other grasses, 1.6 clover, 1.6 weeds and 4% senescent material. On average, pasture dry matter contained 18.2% CP, 60.3% NDF, 32.1% ADF, 10.8% ash, 15.8 NFC, 3.2% lignin and 1.27 Mcal/ kg NE_L (3X). Cows grazed the kikuyu grass when it had an average number of 5.1 leaves, which is similar to the optimum value obtained by Australian researchers (4.5 leaves). Results showed that a grazing system based on the phenology of the plant is a good tool for managing kikuyu grass in the highlands of Costa Rica.

Table 1. Agronomic and nutritional data of kikuyu grass grazed under the leave stage concept in the highlands of Costa Rica¹

Farm N°	N° leaves at grazing	Regrowth period, d	DM yield kg/ ha/cut	CP DM%	NDF DM%	NE _L (3X) Mcal/kg DM
1	5.06 ^b	35	2068 ^b	18.6 ^a	61.4 ^a	1.31 ^a
2	5.27 ^a	37	3360 ^a	19.3 ^a	58.8 ^b	1.28 ^b
3	4.90 ^b	31	2041 ^b	17.3 ^b	61.2 ^a	1.22 ^c
4	5.24 ^a	33	3420 ^a	17.6 ^b	59.8 ^a	1.25 ^c
X	5.11	34	2722	18.2	60.3	1.27

^{a,b,c} Means in a column with different superscripts are different ($P < 0.05$). ¹Average of 6 samples or measurements

Key Words: Kikuyu grass, dry matter yield, nutritional value

T97 Nutritive value of the Tanzania grass managed under different residual LAI, at rotational stocking by goats. N. Lima Santos^{1,2}, A. C. Ruggieri^{*1,2}, I. A. M. Teixeira¹, V. C. e Silva¹, A. F. Campos¹, and E. B. Malheiros¹, ¹São Paulo State University, Jaboticabal, São Paulo, Brazil, ²Fundação de Amparo a Pesquisa do Estado de São Paulo, São Paulo, São Paulo, Brazil.

The herbage nutritive value was evaluated during the grazing by goats in different residual leaf area index (residual LAI) by handing plucking samples. It was studied 3 treatments, with 3 levels of residual LAI (0.8-1.6-2.4) as randomized blocks design with 6 replications. The rest period was adopted according to the criterion of 95% of light interception (LI). There were made measurements of IAF and of IL with accupar® LAI meter. Hand-plucked samples were collected during three grazing cycles. It was collected approximately 300g of herbage by cutting with scissors. The samples were dried at 55°C by 72h, and analyzed to ash, crude protein (PB), neutral detergent insoluble fiber (NDF) and acid detergent insoluble fiber (ADF). The NDF content in the first day of grazing was similar ($P > 0.10$) between 1.6 and 2.4 residual LAI, and larger ($P > 0.10$) than 0.8 residual LAI. In the third day of grazing the NDF content of the 2.4 residual LAI was similar ($P > 0.10$) to the others, and the 0.8 residual LAI were smaller than 1.6 ($P < 0.10$) with means approximately of 75%. The ADF content in the first day of grazing was different ($P < 0.10$) between 0.8 and 1.6 residual LAI and similar to the 2.4 residual LAI. In the third day of grazing the ADF content were similar among the treatments. The values of ash in the 2.4 residual LAI, were smaller than the other residues, as the first as third day of grazing, with means varying from 34 to 39.9% in the first and third grazing respectively. The CP content was not influenced by residual LAI with means of 13,3%. However, it was observed that CP percentage was lower in the third day of grazing, mainly due to the higher amount of old

leaves in that day. The hand plucking technique is an excellent tool in the determination of the forage quality intake by the animal during the

grazing. However, it is necessary a meticulous evaluation of the habit of grazing to the animal for sampling at a coherent way.

Key Words: light interception, hand-plucked, crude protein

Graduate Student Paper Competition-CSAS Poster Competition: CSAS Graduate Student Competition 2

T98 Effects of ruminally-degradable starch and ruminally-degradable protein levels on urea-nitrogen recycling, microbial protein synthesis, and nitrogen balance in beef heifers. K. Baker*¹, J. J. McKinnon¹, T. A. McAllister², and T. Mutsvangwa¹, ¹*University of Saskatchewan, Saskatoon, SK, Canada*, ²*Agriculture and Agri-Food Canada, Lethbridge Research Centre, Lethbridge, AB, Canada*.

The objective of this study was to determine the effects of dietary levels of ruminally-degradable starch (RDS) and ruminally-degradable protein (RDP) on urea-N recycling to the gastrointestinal tract (GIT), microbial protein synthesis and N balance of beef heifers. Four ruminally- and duodenally-cannulated beef heifers (723 ± 57 kg BW) were used in a 4 × 4 Latin square design with a factorial arrangement of dietary treatments and 23-d periods. Dietary treatments were 2 levels (DM basis) of RDS (30% vs. 70%) and 2 levels of RDP (36% vs. 52%). Levels of RDS were manipulated by feeding whole or steam-rolled corn. All diets contained 10% CP (DM basis). Jugular infusions of [¹⁵N¹⁵N]-urea (220 mg/d) were conducted for 4 d (d 18-22), with total collection of feces and urine to estimate urea-N kinetics. Both N intake and N balance were unaffected by diet ($P > 0.05$), however, ruminal NH₃-N concentrations were greater ($P = 0.01$) in heifers fed high RDP as compared to those fed low RDP (8.6 vs. 6.3 mg/dL). Endogenous production of urea-N (UER; 129.6 to 152.8 g/d) and urea-N transfer to the GIT (GER; 72.4 to 93.5 g/d) were similar across diets; however, there was a tendency for a RDS × RDP interaction for UER ($P = 0.11$) and UER ($P = 0.10$). The amount of urea-N returned to the ornithine cycle (ROC; 69.6 g/d vs. 61.9 g/d) tended ($P = 0.08$) to be greater in heifers fed high RDP compared to those fed low RDP. Feeding a high level of RDP increased ($P = 0.03$) microbial N supply to the duodenum compared to feeding low RDP. In summary, at a low dietary CP level (10%), feeding high RDP tended to increase the amount of urea-N returned to the ornithine cycle and increased microbial N supply to the duodenum compared to feeding low RDP.

Key Words: fermentable carbohydrate, ruminally-degradable protein, urea-N recycling

T99 Effect of ruminal protozoa on urea-nitrogen recycling in growing lambs fed diets varying in ruminally-fermentable carbohydrate. D. Kiran* and T. Mutsvangwa, *University of Saskatchewan, Saskatoon, SK, Canada*.

We examined how interactions between ruminal protozoa and ruminally-fermentable carbohydrate (RFC) alter urea-N recycling to the gastrointestinal tract (GIT), microbial protein synthesis and N balance in growing lambs. Four Suffolk ram lambs (61.5 ± 4.0 kg BW) were used in a 4 × 4 Latin square design with 28-d periods and a 2 × 2 factorial arrangement of treatments. Treatments were: 1) partial defaunation vs. faunation; and 2) dry-rolled vs. pelleted barley as the principal sources of RFC. Linoleic acid-rich sunflower oil was fed (6% of DM) as an anti-protozoal agent. Nitrogen balance was measured from d 22 to d 26, with concurrent measurements of urea-N kinetics using continuous intra-jugular infusions of [¹⁵N¹⁵N]-urea. Only minor ruminal protozoa

× RFC interactions were detected. Feeding sunflower oil decreased ($P < 0.01$) total protozoa by 92%, thereby decreasing ($P < 0.01$) ruminal NH₃-N concentration. Intake of N was unaffected ($P \geq 0.12$) by diet; however, urinary N excretion was lower ($P < 0.01$) and retained N was higher ($P < 0.01$) in partially-defaunated compared to faunated lambs. Endogenous production of urea-N (UER) was similar across diets (22.6 to 24.6 g/d); however, urea-N transfer to the GIT (GER), when expressed in absolute amounts (16.4 vs. 13.1 g/d) or as a proportion of UER (0.69 vs. 0.57), and its anabolic use (9.0 vs. 6.0 g/d) were higher ($P < 0.01$) in partially-defaunated compared to faunated lambs. Partial defaunation increased ($P < 0.01$) microbial N supply. Source of RFC did not alter UER; however, urea-N loss in urine, when expressed in absolute amounts (9.5 vs. 7.5 g/d) or as a proportion of UER (0.40 vs. 0.34) were higher ($P < 0.01$), whereas GER as a proportion of UER was lower (0.60 vs. 0.66; $P < 0.01$) in lambs fed dry-rolled compared to those fed pelleted barley. Feeding pelleted barley tended ($P = 0.09$) to increase microbial N supply compared to feeding dry-rolled barley. In summary, partial defaunation or increasing RFC by feeding pelleted barley increased the proportion of UER that was recycled to the GIT, while also increasing microbial N supply.

Key Words: fermentable carbohydrate, ruminal protozoa, urea-N recycling

T100 Effect of feed borne *Fusarium* mycotoxins on the performance of grain fed veal calves. L. M. Martin*¹, K. M. Wood¹, P. L. McEwen^{2,1}, T. K. Smith¹, I. B. Mandell¹, A. Yiannikouris³, and K. C. Swanson¹, ¹*University of Guelph, Guelph, ON, Canada*, ²*Ridgetown Campus, University of Guelph, Ridgetown, ON, Canada*, ³*Alltech, Nicholasville, KY*.

Holstein bull calves (n=32; 177±6.7 kg body weight) were used in a randomized complete block design with a 2 × 2 factorial arrangement of treatments to determine the effects of corn naturally contaminated with *Fusarium* mycotoxins on grain fed veal production and to examine the efficacy of a polymeric glucomannan mycotoxin adsorbent (GMA). Calves were blocked according to room and fed in individual pens, one of four dietary treatments for at least 84 days: 1) control corn + pellet, 2) control corn + GMA pellet, 3) contaminated corn + pellet, and 4) contaminated corn + GMA pellet. Corn and GMA were fed at 75 and 1% of the diet respectively. Deoxynivalenol (DON) was the major mycotoxin contaminant present at 8.31 mg/kg of the total ration. Zearalenone (1.49 mg/kg) and 15-acetyl DON (1.01 mg/kg) were also present in the contaminated corn. Body weight, dry matter intake (DMI), acute phase proteins (haptoglobin, fibrinogen), immunoglobulin A (IgA), blood analytes [glucose (BG) and urea nitrogen (BUN)], organ weights and carcass traits (rib eye area, back fat (BF), marbling and colour value) were measured. Results were analyzed using Proc Mixed in SAS. There were no differences ($P > 0.05$) in total weight gain, DMI, acute phase proteins, IgA, or organ weights between treatments. Calves fed the contaminated corn had a tendency for greater ($P = 0.07$) average daily gain and decreased ($P = 0.003$) feed:gain than calves fed control corn. BG and BUN decreased ($P = 0.004$) and increased ($P = 0.001$), respectively,