

Forages and Pastures: Animal Responses

T250 Application of a rising plate meter to estimate forage yield on dairy farms in Pennsylvania. A. N. Hafila*, K. J. Soder, M. Rubano, and R. Stout, *USDA-Agricultural Research Service-Pasture Systems and Watershed Management Research Unit, University Park, PA.*

Accurately assessing pasture forage yield is necessary to budget feed expenses. The rising plate meter (RPM) is a rapid method of estimating dry matter (DM) forage yield but calibrations and equations provided by manufacturers may be unreliable. The objective of this study was to evaluate the ability of a RPM to accurately estimate pasture forage yield on dairy farms with multiple plant species and determine the best calibration equation. The 3 PA farms in this study used rotational grazing with lactating dairy cows. Forage mass was estimated in each pasture, a day before grazing, using 45 measurements from a FILIPS RPM (n = 180–225 per farm). To measure forage DM yield, 15 clippings (n = 60–75 per farm) of 1 m × 10 cm were taken alongside RPM measurements. Visual estimates of botanical composition were made to assess species diversity. Equations for estimating pasture forage mass were determined by regressing measured DM yield on the corresponding RPM value. Four calibration equations based on measurements were evaluated: (1) pooled from all farms (2) by farm (3) by season (summer or fall) and (4) by farm and season. Two equations provided by the RPM manufacturer were also evaluated: a default and seasonal equation. Equations were evaluated by regression procedures (PROC REG, SAS) and estimated standard error of prediction (SEP). Measured DM forage yield was 1209, 896, and 2,246 kg/ha for farms 1, 2 and 3, respectively. Grasses made up 23, 44, and 63% of pasture composition; legumes composed 48, 25, and 20%, for the 3 farms. Manufacturer equations had the greatest SEP (32 and 38% of measured forage yield, respectively) and low r^2 (0.58 and 0.51, respectively). Error levels for calibration equations 1, 2 and 4 were greater than the 10% level considered acceptable by previous studies (12 to 21%). The equation considering season had the lowest SEP (9%) and a high r^2 (0.76). Our results indicate that manufacturer equations are unreliable for estimating forage yield on farms in PA in pastures with multiple species. Calibration equations should be developed and adjusted for each season to ensure the greatest accuracy.

Key Words: forage yield, grazing, rising plate meter

T251 Case study: Dairies utilizing ultra-high stock density grazing in the Northeast. K. J. Soder*¹, M. Hautau², A. N. Hafila¹, M. D. Rubano¹, B. Moyer², and R. Stout¹, ¹USDA-ARS, University Park, PA, ²The Pennsylvania State University, University Park.

Ultra-high stock density (UHSD) grazing has recently gained interest in the dairy industry. However, little research exists to support anecdotal claims that forage and soil improvement occur through trampling high proportions (75+%) of mature forage into the soil by grazing dense groups of cattle on small paddocks (550,000+ kg per 0.4 ha) with long (60–90+ days) rest periods. Furthermore, UHSD may not be appropriate for northeastern dairies. A case study was conducted to evaluate grazing management of dairies that are early adopters of self-defined UHSD grazing. Data, collected on 4 dairy farms in PA and NY during the 2012 grazing season, included: forage and soil nutrient analyses, stock density, botanical composition and pasture stratification. Data were analyzed using the MIXED procedure of SAS. Least squares means are presented. Pasture area ranged from 80 to

250 ha with 60 to 270 lactating cows. Milk yield ranged from 9 to 18 kg/cow. Stock density ranged from 37,800 to 180,444 kg/ha with an average 39 (± 7) day rest cycle. Forage consumed ranged from 50 to 70% of total forage available. Cows averaged 75% (± 18) consumption above 20 cm of growth with lower layers averaging 53% (± 11) consumption. Soil mineral content and pH were within recommended levels. Forage crude protein averaged 20% (± 3.5 ; DM basis) in June and 29% (± 3.7) in Oct. Neutral detergent fiber decreased from 52% to 34% (DM basis) from June until Oct. Forage net energy for lactation increased from 1.34 to 1.61 Mcal/kg DM between the 2 grazings, resulting from grazing at a less mature state in the autumn. Dairies in the Northeast took a modified approach to current UHSD definitions by grazing forages slightly more mature than that recommended in rotational grazing systems, and slowing the rotation to allow plants to mature (but not nearly as mature as what has been anecdotally reported in other UHSD situations) to increase forage DM available as well as improve nutrient balance (e.g., protein and fiber) in forage to better meet nutritional needs. Data from this case study will help identify needed areas to compare this grazing strategy with more traditional methods.

Key Words: dairy, grazing, ultra-high stock density

T252 Feed efficiency by dairy cows in China: A farm survey result. C. Wang*^{1,2}, J. X. Liu², N. B. Wei¹, Q. M. Xu¹, and H. P. S. Makkar³, ¹Zhejiang Agriculture and Forestry University, Hangzhou-Lin'an, China, ²Institute of Dairy Science, Zhejiang University, Hangzhou, China, ³Animal Production and Health Division, FAO of the United Nations, Rome, Italy.

This work was conducted to evaluate feed efficiency and economic profits under different dairy systems in China. Twenty-three farms across China were selected for survey on the basis of differences in management systems and animal numbers. Three dairy systems were defined: (i) Smallholder subsistence farms (SH): < 10 cows per farm and farm is owned by one person or one family; (ii) Peri-urban farms (PR): > 100 cows herd per farm, with good management practices; and (iii) Cooperative farms (CO): usually >100 cows per farms but the cows in the farm are owned by several different person and kept collectively in a farm. Data were statistically analyzed by using GLM procedure of SAS. Though statistical significance was not observed, numerically more concentrates were used in PR than other 2 systems (Table 1). Human edible grain was the most used feedstuff in all the systems with higher percentage in SH than in the other 2 systems where farmers used more cottonseed, extruded soybeans, and by-products. Milk production per cow ranked across groups as PR > CO > SH ($P < 0.01$). Average feed efficiency for lactating cows was significantly higher in PR than that in CO or SH system ($P < 0.01$), with highest value (1.51 kg milk/kg DMI) in PR and lowest value (0.93 kg milk/kg DMI) in SH system recorded for single farm. Nitrogen utilization efficiency was higher in PR than in CO or SH system, with little difference between CO and SH systems. Overall, although the milk produced per USD (\$) worth of feed was similar in different systems, the economic profitability and ecological benefit were higher in PR system because of the higher sales price, high nitrogen conversion, and less use of human edible grains.

Table 1. Production and economic profits for different systems of dairy farms

Item	PR	CO	SH	SEM	P-value
Concentrate, % DM	53.9	49.4	44.4	3.04	0.28
Grains, % DM	27.1	29.2	35.1	2.32	0.10
Milk yield, kg/d/cow	27.0 ^a	22.3 ^b	17.2 ^c	1.00	<0.01
Feed efficiency, kg milk/kg DMI	1.36 ^a	1.17 ^b	1.06 ^b	0.028	<0.01
Nitrogen conversion ¹	0.273 ^a	0.244 ^b	0.229 ^b	0.004	<0.01
Milk yield, kg/\$	2.63	2.47	2.68	0.060	0.20

^{ab}Means within same row with different superscripts differ ($P < 0.05$).

¹Milk protein yield/CP intake.

Key Words: feed efficiency, dairy system, economic benefit

T253 Silage management on high-producing dairy farms in Brazil. R. C. Amaral^{*1}, T. Gama¹, I. De Oliveira², and T. F. Bernardes², ¹DeLaval, Campinas, São Paulo, Brazil, ²University of Lavras, Lavras, Minas Gerais, Brazil,

Silage management on dairy farms is important to reduce the dry matter losses and maintain the quality of silage during the year. Most of the research on silages in Brazil has been performed in laboratory-scale silos, but limited research has been conducted on farm-produced silages. The objective was to assess the silage management practices in high producing dairy farms. A survey was carried out on 13 high producing dairy farms in 5 Brazilian States. All farms had Holstein cows, which average of 1,818 milking cows/farm. A questionnaire was applied to identify the silage management, regarding the harvest, silo type and feed-out management. The data were collected during a spring (August until November) in 2012. Silages samples were taken at 2 locations across the feed-out face (3 samples on the top and 3 samples on the center) to determine pH of the silages. The silage from top was measured to determine the spoilage silage and silage color. All data were tabulated in an Excel spreadsheet. The number of responses, mean, minimum value, maximum value, and standard deviation were calculated. The average milk production was 24,211.9 kg/d/farm and 31.4 kg/d/cow. For a silage harvest, 76.5% of the farms used contracted harvest and 23.5% used their own machines. One-hundred percent used self-propelled harvesters. Seventy one percent of the farms used a Penn State Particle Size Method to determine the distribution and the particle size of the forage, 6.0% used a ruler and 24.0% did not use any method. In these farms, 70.6% used inoculants in the ensiling process (75.0% homolactic and 25.0% heterolactic inoculant). The trench silo represented the major silo type (82.3%), followed by 11.3% of pile silo and 5.9% pressed bag. In the feed-out phase 58.8% of the farms used milling cutter and 41.2% wheel loader. Silage pH <4.0 was found in 64.7% of center silage samples and 47.1% on the top. Higher pH on top can explain the presence of spoiled silage of 4.4 cm average depth on top for 47.1% of the farms.

Key Words: corn silage, dairy nutrition, silage quality

T254 Modelling the effect of white clover protein degradability on milk solids production and nitrogen excretion. E. N. Khaembah^{*1}, P. Gregorini¹, P. C. Beukes¹, and G. P. Cosgrove², ¹DairyNZ, Hamilton, Waikato, New Zealand, ²AgResearch, Palmerston North, Manawatu, New Zealand.

There is a positive correlation between dietary white clover (WC) content and milk production; however, utilization of WC-rich diets may be

limited by increased urinary nitrogen (UN) excretion resulting from rapid ruminal degradation of WC proteins. Increasing the dietary fraction of rumen undegradable protein (RUP) has the potential to increase protein passage to the small intestine, thus improving protein utilization. Model simulation provides a tool to evaluate the effect of the RUP fraction in dietary WC on milk production and UN excretion. This study used the DairyNZ Whole Farm Model (with Molly cow model) to evaluate a Waikato dairy system with 2–7 year old Friesian cows (stocking rate = 3.0 cows/ha) for whole-farm productivity and N partitioning, over the 2004/2005 milking season. The control diet (standard perennial ryegrass (PR)/WC containing 15% WC) was compared with mixed PR (60%) and WC (40%) diets containing 0.3, 0.4 and 0.5 RUP fraction of WC (treatments 1, 2 and 3, respectively). Model adjustments were made to allow 22% extra dry matter intake (DMI) on WC of the treatment diets. Pasture silage was fed during feed deficits. Model outputs were DMI, milk solids (fat + protein) production, N intake and N in milk, urine and feces. There was greater DMI from treatment diets compared with the control (4.6 vs. 4.4 t DM/cow/lactation). Milk solids (kg/ha) production was 1179, 1260, 1264, 1269 for the control and treatments 1, 2 and 3, respectively. Dietary N intake was 14 kg/cow/lactation greater on treatment diets relative to the control. Nitrogen excretion (kg/cow/lactation) for the control and treatments 1, 2 and 3 were 26.9, 28.8, 28.9, and 29.1 in milk, 76.8, 87.5, 86.8, 86.2 in urine, and 33.6, 35.4, 35.9 and 36.3 in feces, respectively. Under this study's assumptions, increasing dietary WC content increased MS production, but also increased UN excretion. Increasing RUP of WC protein only slightly reduced UN excretion. This model-derived outcome indicates that breeding for decreased protein degradability would offer only limited prospects for reducing UN excretion from WC-rich diets.

Key Words: white clover, protein degradability, nitrogen partitioning

T255 Effect of cow genotype and level of supplementation at pasture on milk performance of animals under a simplified rotational grazing system. A. I. Roca-Fernandez^{*1,2}, L. Delaby², S. Leurant³, Y. Gallard³, and M. E. Lopez-Mosquera⁴, ¹Agrarian Research Centre of Mabegondo, La Coruña, Galicia, Spain, ²INRA Agro-Campus Ouest UMRPL, Saint Gilles-Rennes, Bretagne, France, ³INRA Experimental Farm Le Pin au Haras, Borculo-Exmes, Normandy, France, ⁴University of Santiago de Compostela, Lugo, Galicia, Spain.

Milk performance of 2 cow genotypes, Holstein-Friesian (F, n = 178) vs. Normande (N, n = 174), managed at 2 levels of concentrate supplementation at pasture, low (0 kg DM/cow/day, n = 174) vs. high (4 kg DM/cow/day, n = 178), was studied in 4 groups (F0, F4, N0 and N4) applying a 2 × 2 factorial design. A simplified rotational grazing system, with a mean residence time per cycle of 10 d, was examined at Pin au Haras farm (France) during 2001–2005. The objective of this work was to determinate the maximum milk yield (MY max.) and the milk yield drop (Dm) in each grazing cycle for both cow genotypes in both grazing feeding regimens. Data were analyzed using PROC MIXED in SAS. MY and peak of MY per lactation were higher ($P < 0.001$) in Holstein-Friesian (7,591 and 36.2 kg/cow, respectively) than in Normande cows (6,214 and 29.2 kg/cow, respectively), with lower ($P < 0.001$) body weight (BW) and body condition score (BCS) in Holstein-Friesian (659 kg and 2.18, respectively) than in Normande cows (695 kg and 2.83, respectively). Supplemented cows showed higher ($P < 0.001$) MY and peak of MY (7,567 and 35.0 kg/cow, respectively) than cows without supplementation (6,238 and 30.4 kg/cow, respectively), with higher ($P < 0.001$) BW and BCS in supplemented cows (702 kg and 2.85, respectively) than in cows without it (652 kg and 2.15, respectively). Supplemented cows had higher ($P < 0.001$) MY max. but lower ($P <$

0.001) Dm (24.9 and -5.3 kg/cow, respectively) than those cows without it (21.2 and -6.1 kg/cow, respectively). MY max. and Dm were higher ($P < 0.001$) in Holstein-Friesian (25.1 and -6.4 kg/cow, respectively) than in Normande cows (21.0 and -4.9 kg/cow, respectively). Milk protein and fat content were higher ($P < 0.001$) in Normande (34.5 and 40.6 g/kg DM, respectively) than in Holstein-Friesian cows (31.5 and 36.4 g/kg DM, respectively). To choose an appropriate cow genotype for an efficient milk performance at grazing is an important goal for adjusting food supply to animal demand by considering cow lactation stage and level of supplementation at pasture.

Key Words: cow genotype, simplified rotational grazing system, supplementation

T256 Effect of forage proportion on milk fatty acids profile of Holstein-Friesian cows under Galician conditions (NW Spain). A. I. Roca-Fernández^{*1}, A. González-Rodríguez¹, O. P. Vázquez-Yáñez¹, and J. A. Fernández-Casado², ¹*Agrarian Research Centre of Mabegondo, La Coruña, Galicia, Spain*, ²*Agrarian and Fitopathologic Laboratory of Galicia, La Coruña, Galicia, Spain*.

The aim was to investigate the effect of forage proportions: S, 100% silage (50% grass + 50% maize); G/S, 50% grazing + 50% silage; and G, 100% grazing (80% perennial ryegrass + 20% white clover) on profiles of milk fatty acids (FA) from autumn calving Holstein-Friesian cows ($n = 60$) in NW Spain. From March to August, weekly milk samples were collected from individual cows for FA determination, measured by gas chromatography-mass spectrometry. There were differences in saturated FA, with higher levels in S ($P < 0.001$, 65.85 g/100 g) and G/S ($P < 0.001$, 65.34 g/100 g) than in G (61.95 g/100 g). Those differences were mainly due to C14:0, C16:0, C18:0 and to a minor extent to C6:0-C12:0. Lower content of short chain FA (C6:0-C10:0) was found in G ($P < 0.05$, 10.15 g/100 g) than in G/S (11.31 g/100 g). The lowest content of medium chain FA (C12:0-C16:0) was found in G (40.75 g/100 g) compared with S ($P < 0.001$, 44.68 g/100 g) or G/S ($P < 0.001$, 43.99 g/100 g). The highest content of long chain FA was found in G (38.50 g/100 g) compared with S ($P < 0.01$, 35.41 g/100 g) or G/S ($P < 0.001$, 34.78 g/100 g) due to C18:0, C18:1, C18:2 and C18:3. The highest level of unsaturated FA was found in G (27.45 g/100 g) compared with S ($P < 0.01$, 25.06 g/100 g) or G/S ($P < 0.001$, 24.75 g/100 g). The levels of oleic and linoleic acid were higher in G (23.70 and 3.13 g/100 g) than in S ($P < 0.001$, 21.81 g/100 g for oleic acid; $P < 0.001$, 2.86 g/100 g for linoleic acid) and in G/S ($P < 0.01$, 21.49 g/100 g of FA for oleic acid; $P < 0.001$, 2.76 g/100 g of FA for linoleic acid). Highest levels of mono- and polyunsaturated FA were found in G (23.70 and 0.75 g/100 g) compared with S ($P < 0.001$, 21.81 g/100 g for MUFA; $P < 0.001$, 0.26 g/100 g for PUFA) or to G/S ($P < 0.001$, 21.49 g/100 g for MUFA; $P < 0.001$, 0.25 g/100 g for PUFA) due to C18:1, C18:2 and C18:3. Linolenic and conjugated linoleic acid (g/100 g) differed ($P < 0.001$) between groups, with higher contents in G (0.62 and 1.14 g/100 g) than in S (0.40 and 0.49 g/100 g) or in G/S (0.50 and 0.82 g/100 g).

Key Words: dairy cow, forage proportion, milk fatty acids profile

T257 Effect of forage proportion on sward characteristics and milk performance of Holstein-Friesian cows under Galician conditions (NW Spain). A. I. Roca-Fernández^{*}, A. González-Rodríguez, and O. P. Vázquez-Yáñez, *Agrarian Research Centre of Mabegondo, La Coruña, Galicia, Spain*.

A trial was carried out to investigate the effect of forage proportions (S, 100% silage; G/S, 50% grazing + 50% silage; G, 100% grazing)

on sward characteristics and milk performance of autumn calving Holstein-Friesian cows ($n = 60$). On average, the G/S and G groups completed 4–5 rotations with 139 grazing days. The G group had less grazing days per rotation ($P < 0.001$, 27.9 d) than the G/S group (34.8 d). The G/S group was allocated to greater herbage mass (kg DM/ha) ($P < 0.05$, 3,347) than the G group (3,069). The G/S group had higher herbage allowance (kg DM/cow/day) ($P < 0.05$, 23.94) than the G group (19.34). Lower herbage utilization (%) was found in the G/S (40.1) than in the G group (89.2). The G group showed higher ($P < 0.01$) crude protein (G, 144 vs. G/S, 118 g/kg DM), carbohydrates (G, 182 vs. G/S, 148 g/kg DM) and digestibility (G, 785 vs. G/S, 756 g/kg DM) than the G/S group but lower acid (G, 271 vs. G/S, 289 g/kg DM) and neutral (G, 525 vs. G/S, 573 g/kg DM) detergent fiber. Pre- and post-grazing heights were lower in the G (16.4 and 4.7 cm) than in the G/S group (17.3 and 7.2 cm). Total intake (kg DM/cow/day) was lower in the S (21.2) than in the G/S ($P < 0.05$, 22.8) and G ($P < 0.01$, 23.6) groups. Pasture intake (kg DM/cow/day) was higher in the G (17.3) than in the G/S group ($P < 0.001$, 9.6). Silage intake (kg DM/cow/day) was higher in the S (14.9) than in the G/S group ($P < 0.001$, 6.9). Cows in the S group showed the highest ($P < 0.01$) body weight (631 kg) and body condition score (3.2) than those in the G/S (600 kg and 2.9) and G (580 kg and 2.7) groups. Milk yield was higher in the S (23.3 kg/cow/day) than in the G/S ($P < 0.001$, 21.5 kg/cow/day) and G ($P < 0.01$, 22.6 kg/cow/day) groups. The highest milk protein was found in the G (3.16 g/kg) compared with the S ($P < 0.001$, 3.03 g/kg) and G/S ($P < 0.01$, 3.06 g/kg) groups. Milk fat was higher ($P < 0.05$, 4.18 g/kg) in the S than in the G group (3.96 g/kg). Higher milk protein content was achieved in cows fed with higher proportion of forage in its diet due to higher crude protein levels in the swards.

Key Words: forage proportion, sward characteristics, milk performance

T258 Stocking strategies and stocking rate to enhance forage utilization, gain per animal, and gain per unit land area from rye-ryegrass pastures. F. Rouquette Jr.^{*}, J. Kerby, G. Nimr, and K. Norman, *Texas A&M AgriLife Research, Overton*.

Small grain pastures (PAS) in the Southeastern United States have a bimodal DM production trait with a minor peak in the fall, and a major DM peak during mid-February to mid-May. Climatic conditions create erratic monthly DM that challenges management of stocking strategies (STRG) for stocker cattle. During a 3-year season (2008–2009, 2009–2010, 2011–2012), bermudagrass [*Cynodon dactylon* (L.) Pers] was overseeded with 112 kg/ha ‘Maton’ rye (*Secale cereale* L.) plus 34 kg/ha ‘TAM 90’ annual ryegrass (*Lolium multiflorum* Lam.). Two replicate PAS of all STRG included stocking initiation at a normal or early (RLY) date of late December and a delayed (DLA) date of late January. The RLY PAS consisted of 2 fixed (FIX) stocking rates (STK) of low (LO) and medium (ME) and 2 variable (VAR) STK. For the RLY FIX PAS, the STK were 3.7 hd/ha for LO and 6.2 hd/ha for ME. Forage allowance (kg forage DM/kg BW) was 1.6 to 2.1 on LO and 1.2 to 0.7 on ME. The 2 RLY VAR STRG included an initial LO STK until mid-late March, then increased to ME and high (HI). The DLA PAS had FIX STK of ME and HI. Six 1/2 Simmental stockers (3 steers and 3 heifers) at 250 kg were used on each replicate PAS each year (total = 202 hd). The ADG and gain/ha were assessed via PROC MIXED with STRG and Year as Fixed, and rep as random effects. Year affected STRG for ADG. The RLY FIX LO with respective gains of 1.53, 1.60, and 1.22 kg/hd for the 3 years had highest ($P < 0.01$) ADG. In contrast, the DLA FIX HI STK had the lowest ($P < 0.01$) ADG for the 3 years at 0.69, 1.15, and 0.94 kg/hd. The greatest ($P < 0.01$) gains/ha were from RLY FIX ME with 1162, 1504, and 1329 kg/ha, respectively, for years 1–3

using STK of 5.9, 8.2, and 8.4 hd/ha. Lowest gain/ha ($P < 0.01$) resulted from DLA FIX HI with gains of 663, 975, and 627 kg/ha for years 1–3. The STRG of increasing STK to maximize forage utilization on PAS during the last 60 d of stocking lowered ADG which also reduced gain/ha. The actual, season-long STK was not as important a STRG as was the timing of stocking intensity.

Key Words: small grain, stocking rate, stocking strategy

T259 Effects of supplement or fertilizer on forage quality, and performance of stocker cattle grazing warm-season pastures in South Mississippi. J. D. Rivera*¹ and R. W. Lemus², ¹South MS Branch Experiment Station, Mississippi Agriculture and Forestry Experiment Station, Poplarville, ²Department of Plant and Soil Sciences, Mississippi State University, Starkville.

Crossbred (*Bos taurus* × *Bos indicus*) beef steers (BW = 224 kg; n = 54) were used over 2-yr to examine the efficacy of nitrogen fertilizer compared with feed supplementation on forage quality, animal production, and nitrogen cycling. Steers were weighed, and assigned to graze six 4-ha paddocks of mixed warm-season perennials (bermuda and bahiagrass) for an average of 126 d. Paddocks were randomly assigned to 1 of 3 treatments: no fertilizer and no supplement; 1.1 kg of dried distillers grains per steer/d and no fertilizer; or fertilizer (68 kg N per ha) and no supplement. Cattle were individually weighed every 28 d, and an individual fecal sample was collected. Pasture clippings were taken weekly and pooled for nutrient analysis for each 28 d period. Data were analyzed as a randomized complete block with year and block as random effects and pasture as the experimental unit. Supplement increased BW ($P < 0.04$) at d 56, 84, 112 and for the overall grazing period. No differences ($P > 0.10$) were noted regarding BW in steers that grazed fertilized pastures or non-fertilized pastures at any point in the study. Supplement also increased ($P < 0.05$) ADG d 56, 84, 112, and for the overall study compared with grazing alone (regardless of fertilizer). Moreover, ADF in forage samples was reduced ($P < 0.07$) in pastures that were fed a supplement or fertilized at d 56, 84 and for the overall study. In addition, forage CP was increased ($P < 0.06$) by supplementing or fertilizing at d 56, 112 and for the overall study, and pasture TDN at d 56, 84 and overall was increased ($P < 0.07$) by supplementing or fertilizing. In year 1, fecal N increased at d 28 ($P < 0.05$) for supplemented cattle compared with their counterparts, increased at d 56 ($P < 0.09$) for both supplement and fertilizer groups, and increased at d 84 for the fertilizer group. Overall fecal N was increased ($P < 0.08$) using either supplement or fertilizer application. Results suggest that supplementing cattle grazing warm-season pastures will improve performance compared with fertilization with no negative consequence to pasture quality.

Key Words: beef cattle, warm-season pasture, supplement

T260 Nutritional assessment and productive response in tropical sheep fed with conserved agricultural byproducts in Ecuador. A. Sánchez-Laiño*^{1,2}, J. Avellaneda-Cevallos^{1,2}, D. Zambrano-Gracia¹, E. Torres-Navarrete^{1,2}, L. Montenegro-Vivas¹, and I. Espinoza-Guerra¹, ¹Facultad de Ciencias Pecuarias, Quevedo, Los Ríos, Ecuador, ²Dirección de Investigación Científica y Tecnológica, Quevedo, Los Ríos, Ecuador.

The nutritional value of corn, rice, and soybean stover (CS, RS and SS) stored dry (12–14% moisture), after ammonification (3% urea), or stored as silage (10.12% molasses+1.0% urea) was determined using 18 tropical sheep. A factorial arrangement 3 (agricultural byproducts) × 3 (conservation methods) within a completely randomized design

was applied. The ensiled CS, when compared with RS and SS stored dry and after ammonification, registered the highest ($P < 0.01$) in vivo digestibility coefficient (IVDC) for dry matter (DM: 59.8%); organic matter (OM: 64.9%); ether extract (EE: 60.2%); crude protein (CP: 43.3%); crude fiber (CF: 71.9%); nitrogen free extract (NFE: 50.8%); neutral detergent fiber (NDF: 69.7%); acid detergent fiber (ADF: 62.0%); total digestible nutrients (TDN: 49.8%) and metabolizable energy (ME: 1768 kcal/kg DM). Forty tropical sheep (3 months of age) were used for fattening. A factorial arrangement (3 × 3) + 1 control diet based on *Panicum maximum* Jacq was used within a completely randomized block design. Feed consumption (FC), weight gain (WG), feed conversion ratio (FCR) and carcass yield (CY) were assessed. Profitability was determined by the cost-benefit ratio. With ensiled CS, higher WG (184.3 g/animal/d), FCR (6.08), and CY (49.3%) were obtained. The highest profitability was obtained when ensiled CS (60.8%) and ammoniated SS (60.04%) was provided. The conserved agricultural byproducts enhanced performance compared to the grazing control ($P < 0.01$). According to these results, it is concluded that preservation methods increase the digestibility of the agricultural byproducts and the productive response in tropical sheep documents their value as a staple food for ruminants during the dry season.

Key Words: ruminant, digestibility, byproduct

T261 Effect of Next Enhance with or without Rumensin on performance of growing steers grazing cool-season annual pasture. P. Beck*¹, H. Gray¹, B. Stewart¹, and T. Wistuba², ¹University of Arkansas Division of Agriculture, Hope, ²Novus International Inc., St. Charles, MO.

Ionophores have been proven to increase daily gains of growing steers on pasture. Essential oils (such as garlic oils and cinnamon extracts) have recently been found to have ruminal effects with potential to improve performance of growing beef steers. This research was conducted to determine the effects of Next Enhance (NE, 250 mg/d, Novus International Inc.) and Rumensin (R, 200 mg/d, Elanco Animal Health) supplementation on performance of growing steers grazing cool-season annual pasture. In the spring of 2012 (Exp. 1), 24 – 0.8 ha bermudagrass pastures that had been interseeded to either a mixture of cereal rye and annual ryegrass or oats and annual ryegrass the previous fall were stocked with 4 mixed breed beef steers per pasture (average BW 215 ± 4.8 kg) in early March for an 84 d grazing period. In the fall of 2012 (Exp. 2), 20 – 1.6 ha bermudagrass pastures that had been interseeded to cereal rye and annual ryegrass with 4 mixed breed beef steers per pasture (average BW 217 ± 6.7) in mid-November for an 84-d grazing period. Mineral premixes including the treatment materials were blended with soybean hulls and offered to steers in respective pastures 5-d/wk at a rate of 0.9 kg/steer each feeding. Steer BW were collected following a 16-h fast on 28-d intervals. Animal performance data for each year were analyzed as RCBD with a 2 × 2 factorial arrangement of treatments using the mixed procedure of SAS. There were no interactions between R and NE for steer BW or performance in either Experiment ($P \geq 0.17$). Over the 84-d spring grazing period in Exp. 1, NE increased ($P = 0.03$) steer BW by 10 kg, and steer ADG was increased ($P = 0.05$) by 0.06 kg/d, whereas there was no effect of R on steer BW or ADG ($P \geq 0.93$). In Exp. 2, NE had no effect on steer BW ($P = 0.83$) or ADG ($P = 0.77$), whereas R additions increased ($P = 0.05$) ADG by 0.09 kg/d. These results indicate that NE and R have potential to improve performance of steers grazing high quality pastures but additional research is needed to elucidate these effects.

Key Words: beef steer, cool-season annual pasture, Next Enhance

T262 Calf response to summer legumes as a creep grazing option in bermudagrass pastures. R. M. Martin^{*1}, R. S. Walker², G. Scaglia³, B. Buckley⁴, M. W. Alison⁵, K. J. Han⁶, G. Gentry⁷, and W. D. Pitman², ¹LSU AgCenter School of Animal Sciences, Baton Rouge, ²LSU AgCenter Hill Farm Research Station, Homer, ³LSU AgCenter Iberia Research Station, Jeanerette, ⁴LSU AgCenter Red River Research Station, Bossier City, ⁵LSU AgCenter Macon Ridge Research Station, Winnsboro, ⁶LSU AgCenter Southeast Research Station, Franklinton, ⁷LSU AgCenter Dean Lee Research Station, Alexandria.

Nutritive value of bermudagrass (*Cynodon dactylon*) pastures can limit growth of nursing calves. Summer legumes with high nutritive value have been evaluated for use by creep grazing in Florida and Georgia with contrasting results. Thus, calf responses to creep grazing and legume species were evaluated at 4 Louisiana locations from mid-summer to weaning. Each location included pastures with a creep-grazed summer annual legume treatment (CREEP) and a control with similar cattle, grass, and stocking rate but no legume. Legume creeps were planted on 10% of the pasture areas available. Legume species and grazing duration differed among locations with only alyceclover (*Alysicarpus vaginalis*) at the Iberia Research Station, *aeschynomene* (*Aeschynomene americana*) and cowpea (*Vigna unguiculata*) at the Dean Lee Research Station, cowpea and soybean (*Glycine max*) at the Red River Research Station, and all 4 of the legumes at the Hill Farm Research Station with 83, 96, 60, and 82 grazing d, respectively. Pasture size of 2.5 to 8 ha differed among locations with 2 replications per location except at Hill Farm, which had 3 replications. Initially, grazing was limited by novelty of the legumes and, at Dean Lee, accumulated legume growth (>1 m height and 15,000 kg/ha) despite 17% crude protein concentration of leaves of cowpea and *aeschynomene*, which was grazed very little. All legumes were heavily grazed at the Hill Farm and Red River with legume availability of approximately 3,000 kg/ha in mid season declining through August and likely limiting legume intake through September. At Iberia, alyceclover provided about 40% of creep swards dominated by bermudagrass, and grass dominance of the novel alyceclover may have limited intake and calf gains. CREEP calves gained more (76 vs. 71 kg per head, $P = 0.062$) at all locations except Iberia where legume accessibility was limited. Earlier grazing of legumes and increased legume availability in September should further increase calf weaning weights with creep grazing; however, creep grazing required substantially more intensive management than did the control treatment.

Key Words: cattle, creep grazing, summer legume

T263 Responses to creep feeding protein to calves for cow-calf pairs grazing limpograss pastures during summer in Florida. A. D. Aguiar^{*1}, J. M. B. Vendramini¹, J. D. Arthington¹, L. E. Solenberger², M. Hersom², J. D. Sanchez¹, and W. L. Ladeira¹, ¹Range Cattle Research Education Center, Ona, FL, ²University of Florida, Gainesville.

Limpograss (*Hermatrya altissima* [Poir] Stapf and C.E. Hubb) is a warm-season grass routinely used by cow-calf (*Bos* sp.) producers in South Florida; however, limpograss has low CP concentration, which may limit animal performance. The objective of this study was to test the effects of creep feeding protein supplements to calves on performance of cow-calf pairs grazing limpograss pastures during the summer. The experiment was conducted in Ona, FL from June to August 2012. Treatments were calves receiving 0, 200, or 400 g/d of soybean meal on creep feeding in randomized incomplete block design with 3 replicates for 0, and 200 g/d and 2 replicates for 400 g/d. Twenty-four cow-calf pairs (434 ± 49 and 182 ± 27 kg, respectively) were randomly distributed in 8 limpograss pastures (experimental units; 1.0 ha/pasture; 3 cow-calf pairs/pasture).

Cows and calves weights were recorded every 28 d. Herbage mass (HM) and nutritive value was measured every 14 d. The data were analyzed using PROC MIXED with treatment and months as fixed effects, and replicates and its interactions as random effects. There was no difference in HM (mean = 6,645 kg/ha, $P = 0.41$, SE = 686), herbage allowance (HA; mean = 3.4 kg DM/kg LW, $P = 0.67$, SE = 0.4), CP concentration (mean = 10.9%, $P = 0.29$; SE = 0.9), and IVDOM (mean = 50.3%, $P = 0.56$; SE = 3.4) between treatments. Herbage mass and HA decreased from June to July from 8,300 to 5,500 kg/ha and 4.5 to 2.9 kg DM/kg LW, respectively. Conversely, there was an increase in HM from July to August from 5,500 to 6,300 kg/ha. There was a linear ($P = 0.03$) effect of treatments in calf ADG (mean = 0.29, 0.48, and 0.60 kg/d for C, 200 and 400, respectively, SE = 0.07); however, there was no effect of the treatments ($P = 0.47$) on cows ADG (0.07, 0.38, 0.19 kg/d for C, 200, and 400, respectively, SE = 0.15). Both levels of soybean meal supplemented to calves in this study increased ADG of calves grazing limpograss pastures.

Key Words: cow-calf, creep-feeding, performance

T264 Heifer growth and reproductive performance following two levels of fall pasture allocation. B. L. Bailey¹, T. C. Griggs², and K. M. Krause^{*1}, ¹Division of Animal and Nutritional Sciences, West Virginia University, Morgantown, ²Division of Plant and Soil Science, West Virginia University, Morgantown.

The objective of this study was to compare heifer growth and reproductive performance following 2 patterns of gain during the fall grazing season. Three 5-ha fields were selected as blocks in a randomized complete block design for application of grazing treatments. All fields contained cool-season grass-legume mixtures. Spring-born heifers (yr 1, n = 72; yr 2 n = 64; yr 3 n = 67) of primarily Angus background and 246 kg mean BW were allocated to 2 grazing treatments during the fall period each replicated 3 times per year. The fall grazing treatment consisted of daily herbage dry matter (DM) allocation of 3.5 (LOW) or 7.0 (HIGH) % of BW. During the winter feeding period haylage (5.9 kg DM/hd/d, yr 1; 5.4 kg DM/hd/d, yr 2; 5.6 kg DM/hd/d, yr 3) and soybean hulls (1.7 kg DM/hd/d, yr 1; 1.5 kg DM/hd/d, yr 2; 1.8 kg DM/hd/d, yr3) was fed. Heifers were grazed continuously (as one group) throughout the spring and summer during all years. Heifers were synchronized and artificially inseminated (A.I) utilizing a single sire each year. A cleanup bull was used for 35 d. Mean ADG was greater for HIGH heifers (0.40 kg/d) than LOW heifers (0.12 kg/d) during the fall grazing period ($P < 0.0001$). During the winter feeding period, ADG were 0.30 kg/d and 0.39 kg/d ($P < 0.05$) for LOW vs. HIGH heifers. During the spring grazing period, ADG were 1.38 kg/d and 1.30 kg/d ($P = 0.17$) for LOW vs. HIGH heifers. Mean ADG was greater for LOW heifers (0.74 kg/d) than HIGH heifers (0.67 kg/d) during the summer grazing period ($P < 0.05$). Proportion of heifers that reached puberty at the onset of the breeding season did not differ (33% and 34%, $P = 0.82$ for LOW vs. HIGH), although LOW heifers had lower BW at the time of breeding (335 kg vs. 355 kg, $P < 0.05$ for LOW vs. HIGH). No treatment differences occurred for overall pregnancy rates by A.I., (34% vs. 44%, $P = 0.18$) bull (39% vs. 33%, $P = 0.43$), or overall (73% vs. 77%, $P = 0.55$) for LOW vs. HIGH heifers. We interpret these results to indicate that delaying the majority of weight gain until late in heifer development may decrease costs of winter feeding without detrimental effects on reproductive performance.

Key Words: heifer, grazing, reproductive performance

T265 Stocker steer performance on tall fescue or meadow fescue alone or in binary mixture with white clover. M. R. Schaefer*, K. A. Albrecht, and D. M. Schaefer, *University of Wisconsin-Madison, Madison.*

An evaluation of meadow fescue (*Festuca pratensis* L.) in pastures has not been reported in the USA since the early 1900s. This research was conducted to determine effects of either meadow fescue (MF) or tall fescue (TF, *Festuca arundinacea* L.) in binary mixture with white clover (*Trifolium repens* L.) or these species as N-fertilized monocultures on forage and animal performance in Upper Midwest pastures. Treatments were replicated 3 times, and data were collected over 3 grazing seasons. There was no attempt to reseed legume-containing swards. One hundred 80 crossbred beef steers (*Bos taurus*, 257 kg) were rotationally grazed across all pastures using a variable stocking rate to detect treatment differences. White clover persisted similarly ($P < 0.05$) in either grass pasture, and fraction of white clover in the sward decreased as the trial progressed (45, 24, and 14% for years 1, 2, and 3, respectively). The poor persistence of white clover may be attributed to below average rainfall and accentuates the need for a legume adapted to a variety of climatic conditions. Swards containing TF had greater available forage (3200 and 2800 kg/ha) and lower in vitro true digestibility (82.2 and 84.6%), neutral detergent fiber digestibility (66.5 and 70.6%), and steer ADG (0.84 and 0.98 kg/d) than meadow fescue ($P < 0.05$). Adding white clover to MF and TF swards increased all forage quality variables, steer ADG (0.98 and 0.84 kg/d), animal gain per hectare (780 and 680 kg/ha) ($P < 0.05$) and tended to lower available forage ($P < 0.10$) compared with monoculture pastures. Even though MF containing swards had greater steer ADG, TF had an increased stocking rate ($P < 0.05$) which resulted in similar gain per hectare (720 and 750 kg/ha for TF and MF respectively). Data collected suggests that both grass species are suitable for inclusion in Upper Midwest pastures. The addition of a legume to either grass species increased ADG and gain per hectare, both of which have positive economic implications.

Key Words: fescue, grazing, beef

T266 Bovine lateral saphenous veins exposed to ergopeptine alkaloids do not relax. J. L. Klotz¹, A. Pesqueira*², A. F. Branco³, and D. L. Harmon², ¹USDA-ARS, Forage-Animal Production Research Unit, Lexington, KY, ²Department of Animal and Food Sciences, University of Kentucky, Lexington, ³Universidade Estadual de Maringá, Brazil.

The ergot alkaloid, ergovaline has demonstrated a persistent binding and sustained contractile response in several vascular models. It was hypothesized that different alkaloids isolated from endophyte- (*Neotyphodium coenophialum*) infected tall fescue (*Lolium arundinaceum*) will contribute to this response differently. The objective was to compare contractile-response patterns of single additions of $1 \times 10^{-4} M$ lysergic acid (LSA), lysergol (LYS), ergonovine (ERN), ergotamine (ERT), ergocristine (ERS), ergocryptine (ERP), ergocornine (ERO) and $1 \times 10^{-6} M$ ergovaline (from a tall fescue seed extract; EXT). Lateral saphenous veins were collected from 6 Holstein steers (397 ± 28 kg) immediately after slaughter, sliced into cross-sections, and suspended in myograph chambers containing oxygenated Krebs-Henseleit buffer (95% O₂/5% CO₂; pH = 7.4; 37°C). Treatments were added at 0 min and buffer was replaced in 15-min intervals for a 120-min incubation. The maximum tension (g) and time interval to reach maximum tension were determined for each compound. Percent relaxation and rate of relaxation were determined following maximum tension for each treatment. Contractile response data were normalized to a reference addition of $1 \times 10^{-4} M$ norepinephrine and analyzed as a CRD with repeated measures using

mixed models of SAS. All compounds tested produced significant contractile responses ($P < 0.05$). Ergoline alkaloids, LSA, LYS, and ERN reached maximum tension in less time than the remaining compounds ($P < 0.05$) and began to relax immediately with LSA having the greatest percent relaxation ($P < 0.05$). The EXT and ergopeptine alkaloids, ERT, ERS, ERP, and ERO all had slower developing contractile responses with a longer interval until maximum tension was achieved. Maximal responses to these alkaloids, however, all persisted for the remainder of the 120-min experiment with negligible relaxation occurring. Persistence of contractile response caused by ergopeptine alkaloids is thought to be the primary contributing factor to vasoconstriction in animals demonstrating signs of fescue toxicosis.

Key Words: bovine, ergot alkaloid, vasoconstriction

T267 Effect of fescue toxicosis on ruminal kinetics, nitrogen and energy balance in Holstein steers. A. F. Koontz*¹, D. H. Kim¹, A. P. Foote¹, J. L. Klotz², K. R. McLeod¹, and D. L. Harmon¹, ¹Department of Animal and Food Sciences, University of Kentucky, Lexington, ²USDA-ARS, Forage-Animal Production Research Unit, Lexington, KY.

This study was designed to examine alteration of ruminal kinetics, as well as N and energy balance during fescue toxicosis. Six ruminally cannulated Holstein steers (BW = 217 ± 7 kg) were weight-matched into pairs and pair-fed throughout a crossover design experiment with a 2 × 2 factorial treatment structure. Factors were endophyte (infected, E+ vs. uninfected, E-) and feeding level (1.8 × NE_m, H vs. 1.1 × NE_m, L). During each period after 8 d of diet adaptation one steer per pair was ruminally dosed with ground endophyte-infected fescue seed (E+), the other with ground endophyte-free fescue seed for the remainder of the period. In situ degradation of ground alfalfa was determined on d 13–16. Total fecal and urinary collections were performed on d 17–21, with animals placed into indirect calorimetry head-boxes during d 20 and 21 for determination of heat production (HP) using the Brower equation. Liquid and particulate passage rates were evaluated using Cr:EDTA and iADF respectively on d 22 and 23. There was no difference ($P > 0.9$) in DMI/kg^{0.75} between endophyte treatments, and DMI/kg^{0.75} was different ($P < 0.01$) between H and L intake by design. Animals on H feeding had higher ($P < 0.01$) water, N, and energy intakes. Energy and N excretion, as well as retained N, DE, ME, RE, and HP were higher ($P < 0.03$) for H v L. There were no differences in retained N, DE, ME, or HP ($P > 0.15$) between endophyte treatments. Neither rate nor extent of in situ degradation was altered by intake level or endophyte treatment ($P > 0.3$). Dry matter percentage and DM weight of rumen contents were increased ($P < 0.01$) by E+ dosing. Particulate passage was decreased by both L feeding ($P < 0.01$) and endophyte ($P = 0.02$). Ruminal liquid passage rate increased ($P = 0.03$) with H feeding. Total VFA concentration increased with both H feeding ($P < 0.01$) and E+ dosing ($P < 0.01$). Despite these differences, the N and energy balance data indicate that reduced weight gain during fescue toxicosis is primarily a function of reduced intake which may be driven by a reduction in ruminal particulate passage rate.

Key Words: bovine, energy, fescue

T268 The fatty acid profile and retention time in the rumen in cattle grazing tropical grasses. D. F. A. Costa*¹, P. Isherwood¹, S. Quigley¹, S. R. McLennan², J. De Souza³, J. Gibbs⁴, X. Q. Sun⁵, and D. P. Poppi¹, ¹The University of Queensland, Gatton, Queensland, Australia, ²The University of Queensland, Brisbane, Queensland, Australia, ³University of Sao Paulo, Piracicaba, Sao Paulo, Brazil,

⁴Lincoln University, Lincoln, Canterbury, New Zealand, ⁵Northwest A&F University, Yangling, Shaanxi, China.

The objectives of this study were to examine the fatty acid (FA) profile in the rumen fluid (RF) and relate the extent of biohydrogenation (BH) to the retention time (RT) of fluid in the rumen. Four rumen cannulated steers (790 ± 17 kg BW) grazing pastures of C3 ryegrass *Lolium multiflorum* and C4 species, signal grass *Brachiaria decumbens*, stargrass *Cynodon dactylon* and speargrass *Heteropogon contortus*. Each pasture was grazed for 21d followed by 3d collection. On d 22 CrEDTA was used to estimate RT (182 mg Cr/100 kg BW injected via cannula) and RF samples collected at 0, 4, 8, 12, 16, 24, 28, 32 and 48 h after dosing for Cr analysis and at 0, 8 and 16h for FA profile by gas chromatography. One way model analysis was used for RT and repeated measures procedure for FA profile, both carried out using GLM procedure. Speargrass had a longer RT than ryegrass (8 vs. 11 h) while signal and stargrass grasses had intermediate values (10h) with the differences not expected to results in differences in extent of BH due to RT. Palmitic and stearic acids in RF were much higher than in forage plucked samples (PS) but all grasses had similar total saturated fatty acid (TSFA) with a greater degree of saturation for ryegrass. A higher CLAc9,t11 content in RF of steers grazing ryegrass resulted from the higher linolenic concentration in PS but linoleic concentration in RF was lower for those steers. Total unsaturated FA (TUFA) content of RF was reduced markedly compared with the TUFA of the forage with some small differences between forages.

Table 1. Fatty acid profile in PS and in RF samples

FA, %	Ryegrass		Signal		Stargrass		Speargrass	
	PS	RF	PS	RF	PS	RF	PS	RF
total FA								
C16:0	15.3	30.6 ^{ab}	19.6	34.2 ^c	21.2	34.0 ^c	21.0	29.1 ^a
C18:0	1.2	7.4 ^a	1.4	6.5 ^a	1.6	7.4 ^a	1.8	7.1 ^a
C18:2n-6	10.3	3.9 ^a	17.5	5.6 ^b	13.4	5.5 ^b	17.8	5.6 ^b
C18:3n-3	61.0	5.5 ^b	47.1	4.3 ^{ab}	50.8	4.9 ^b	35.1	3.5 ^a
CLAc9,								
t11	0.1	0.6 ^b	0.0	0.2 ^a	0.0	0.2 ^a	0.2	0.3 ^a
TSFA	18.7	58.5 ^a	25.1	64.2 ^b	25.8	64.8 ^b	30.2	57.1 ^a
TUFA	76.5	29.7 ^{bc}	69.6	28.6 ^{bc}	68.9	27.1 ^{ab}	59.7	23.8 ^a

Key Words: fatty acid, tropical forage

T269 Effects of forage type and season on rumen parameters of grazing cattle. D. F. A. Costa^{*1}, P. Isherwood¹, S. Quigley¹, S. R. McLennan², and J. De Souza³, ¹The University of Queensland, Gatton, Queensland, Australia, ²The University of Queensland, Brisbane, Queensland, Australia, ³University of Sao Paulo, Piracicaba, Sao Paulo, Brazil.

The objective of this study was to evaluate the effects of forage type and season on retention time (RT) and rumen function of grazing cattle. Four rumen cannulated steers (790 ± 17kg BW) grazing pastures (herbage mass 2600–6200 kg DM/ha) of C3 ryegrass *Lolium multiflorum* and C4 grasses kikuyu *Pennisetum clandestinum*, speargrass *Heteropogon contortus* in the wet season and the latter grass and a legume leucaena *Leucaena leucocephala* in consortium with *Panicum maximum* in the dry season. Each grazing run consisted of 21d followed by 3d collection period. On d 22 CrEDTA was used to estimate RT (182 mg Cr/100 kg BW via cannula) and rumen fluid (RF) samples collected at 0, 4, 8, 12, 16, 24, 28, 32 and 48h after dosing for Cr analysis. Diet crude protein (CP) and dry matter digestibility (DMD) were estimated by fecal NIRS. NH₃N concentration in RF was determined at 0, 8 and 16h. Volatile fatty

acids (VFA) concentration was from bulked RF from 0, 8 and 16h and determined by gas liquid chromatography. Speargrass treatment in dry season had the lowest CP and DMD, which was associated with less NH₃N and VFA concentration and a much longer RT. Despite the season of the year speargrass diet had the highest Acetic:Propionic (A:P). Total VFA was intermediate for grasses on wet season and highest for leucaena grass mix. Ryegrass had higher CP and DMD but a similar NH₃N to kikuyu and leucaena/grass mix. The RT of all wet season grasses, including the C3 ryegrass, was similar (even though some small quantitative significant differences) and similar to a leucaena/grass mix in the dry season. Only dry season speargrass had very long RT.

Table 1. Crude protein and DMD estimated by fecal NIR, rumen NH₃N and VFA concentration, A:P and RT of liquid phase in the rumen

Parameter	Ryegrass	Kikuyu	Speargrass		Leucaena	SEM
			(wet)	(dry)		
CP (g/kg)	200 ^c	176 ^d	99 ^b	39 ^a	135 ^c	0.56
DMD (g/kg)	68 ^d	62 ^c	59 ^b	49 ^a	58 ^b	0.84
NH ₃ N (mg/L)	113 ^{bc}	130 ^c	29 ^a	9 ^a	147 ^c	20.1
Total VFA (mmol/L)	95 ^b	93 ^b	96 ^b	70 ^a	114 ^c	7.4
A:P	3.3:1 ^b	2.5:1 ^a	6.8:1 ^d	6.9:1 ^d	5.3:1 ^c	2.1
RT (h)	8.3 ^a	10.1 ^{ab}	11.3 ^{ab}	19.8 ^c	13.4 ^b	1.9

^{a-d}Different superscripts across the rows indicate significant difference between treatments ($P < 0.05$).

Key Words: tropical grass, rumen parameter

T270 Interactions between grazing management and a low level of energy supplementation on ingestive behavior of beef cattle. L. R. D. Agostinho Neto^{*}, J. R. R. Dorea, V. N. Gouvea, D. F. A. Costa, A. V. Pires, M. G. M. F. Santos, and F. A. P. Santos, *University of Sao Paulo, Piracicaba, Sao Paulo, Brazil.*

The objective of this trial was to evaluate the effect of 2 pregrazing canopy heights and 2 levels of energy supplementation on ingestive behavior of Nelore steers grazing intensively managed tropical grass during the rainy season. Treatments were a control (mineral supplementation) and a low level of energy supplementation (0.3% BW of fine ground corn) combined with 2 pregrazing canopy heights (25 and 35 cm). Eight 48-mo-old rumen-cannulated steers (343 kg BW ± 5.97) were assigned to 2 4x4 Latin squares and allocated in 2 ha of *Brachiaria brizantha* pasture. Ingestive behavior was evaluated through a 24-h observation period in which grazing, rumination and resting activities were monitored every 5 min. Bite and ingestion rates were also evaluated. Grazing time decreased when 25 cm of canopy height and energy supplementation were used (78.3 and 39.7 min, respectively). The rumination time was not affected by energy supplementation and pre-grazing canopy height. However, resting time increased when the grazing management was 25 cm. Energy expenditure for maintenance could be reduced by this fact, resulting in an increased animal performance. The pregrazing canopy height of 25 cm increased ingestion rate what possibly is related to a higher harvest efficiency, but no further effects were observed for energy supplementation. A higher bite rate was also observed for the 25 cm grazing management also indicating a higher harvest efficiency and consequently more dry matter intake. The pregrazing canopy height of 25 cm was determinant to improve harvest efficiency, but there was little influence of low level of energy supplementation on ingestion behavior.

Table 1. Grazing, rumination and resting time, ingestion and bite rate

	Management, cm		Supplementation, % of BW		P-value			SEM
	25	35	0	0.3	M	S	M × S	
Grazing time, min/d	386	465	445	406	*	*	NS	20.29
Rumination time, min/d	385	384	379	389	NS	NS	NS	19.73
Resting time, min/d	608	530	554	584	*	NS	NS	18.33
Ingestion DM rate, g DM/min	16.72	9.21	13.34	12.59	*	NS	NS	1.85
Bite rate, bite/min	34.23	22.78	28.20	28.80	*	NS	NS	3.28

Key Words: ingestive behavior, tropical pasture

T271 Interactions between grazing management and a low level of energy supplementation in beef cattle. L. R. D. Agostinho Neto¹, J. R. R. Dorea*¹, V. N. Gouvea¹, D. F. A. Costa¹, A. V. Pires¹, L. G. R. Pereira², and F. A. P. Santos¹, ¹University of Sao Paulo, Piracicaba, Sao Paulo, Brazil, ²Empresa Brasileira de Pesquisa Agropecuaria, Juiz de Fora, Minas Gerais, Brazil.

The objective of this trial was to evaluate the effect of 2 pregrazing canopy heights and 2 levels of energy supplementation on voluntary intake and ruminal parameters of Nelore steers grazing intensively managed tropical grass. Treatments corresponded to control (mineral supplementation) and a low level of energy supplementation (0.3% of BW of fine ground corn) combined with 2 pregrazing canopy heights (25 and 35 cm), with a common stubble height of 15 cm for all treatments. Eight 48-mo-old rumen-cannulated steers (300 kg BW ± 5.97) were assigned to two 4 × 4 Latin squares and allocated in 2 ha of *Brachiaria*

brizantha pasture. Chromium oxide was used as an indigestible marker. Concentration of purine derivatives in the urine was used to estimate microbial synthesis. Forage intake decreased for 35 cm of canopy height and for use of energy supplementation (1.03 of substitution rate). The total and energy intake were not affected by energy supplementation. However, grazing management of 35 cm decreased both total and energy intake. Ruminal pH was affected only by grazing management, but remained above 6.0. Concentration of NH₃N decreased with grazing management and energy supplementation whereas microbial synthesis was not affected by either. The N retention decreased when the pre-grazing canopy height was 35 cm. Interactions between management and supplementation were not significant. Pre-grazing canopy of 35 cm affects intake and may result in lower animal performance; these effects were more significant on voluntary intake than responses to a low level of energy supplementation.

Table 1. Forage and total intake, ruminal parameters, microbial synthesis and nitrogen retention

Item	Management, cm		Supplement, % BW		P-value		
	25	35	0	0.3	M	S	SEM
Forage DMI, %BW	1.86	1.32	1.79	1.38	*	*	0.14
DMI, %BW	2.01	1.47	1.79	1.68	*	NS	0.14
Digestible DMI, %BW	1.34	0.93	1.13	1.15	*	NS	0.08
Substitution rate	0.00	0.00	0.00	1.03	NS	*	0.25
pH	6.39	6.52	6.46	6.44	*	NS	0.14
N-NH ₃ ,mg/dL	11.22	9.77	11.28	9.70	*	*	1.10
Microbial synthesis, g/d	457.07	411.25	425.01	443.32	NS	NS	62.35
N retention, %N intake	45.96	21.07	39.55	40.48	*	NS	5.04

* = significant, NS = not significant.

Key Words: tropical pasture, energy supplement