Forages and Pastures: Improving Pasture Quality and Utilization and Animal Performance

T125 Herbage accumulation in *Brachiaria humidicola* subjected to different frequencies and intensities of defoliation. H. H. Vilela[1], D. Nascimento Junior*[1], A. L. Santos[1], D. L. R. Henriques[1], B. D. Faria[1], C. A. S. Freitas[1], and A. F. Sbrissia[2], *[1]Universidade Federal de Vicosa, Vicosa, MG, Brazil, [2]Universidade do Estado de Santa Catarina, Lages, SC, Brazil.*

The experiment was conducted to evaluate the herbage accumulation of *Brachiariahumidicola* cv. Humidicola Common, subjected to different frequencies and intensities of defoliation. Two defoliation intensities, stubble heights of 8 and 16 cm, and two defoliation frequencies [95 and 100% light interception (LI)] were evaluated. The experiment was a completely randomized block design with a 2 × 2 factorial treatment arrangement with 3 replicates. The light interception (LI) was measured using a canopy analyzer (LI-COR LAI 2000) at 4 points per experimental unit (314 m^2). Grazing was carried out by 200 kg Zebu mixed steers. At each point a reading above the sward and 5 readings on the soil surface were taken, resulting in 4 readings above the sward and 20 readings at ground level. Herbage mass was harvested pregrazing using a quadrat of 0.33 × 1.0 m at 3 points in each paddock. Forage was harvested to the stubble height of each residue treatment and weighed immediately after cutting. A sample was force-dried at 65°C for 72 h to determine dry matter (DM) content. After weighing, the herbage mass was calculated from the fresh weight multiplied by the harvested forage DM content. Presented data are from Dec. 2009 to Mar. 2010 and results were compared by the Student's t test, with a significance level of 10%. Herbage accumulation rate was influenced ($P < 0.10$) by the frequencies and intensities of defoliation. Greater herbage accumulation (4191 kg/ha) was observed at higher intensity of defoliation (8 cm). In relation to frequency of defoliation, the highest herbage accumulation (4173 kg/ha) was observed at lower frequency (100% LI). Lower frequency and greater intensity of defoliation presented the highest herbage accumulation rate.

Key words: DM production, light interception, sward target

T126 Sward bulk density in *Brachiaria humidicola* subjected to frequencies and intensities of defoliation. D. Nascimento Junior*[1], H. H. Vilela[1], A. L. Santos[1], B. D. Faria[1], B. M. L. Sousa[1], G. O. Rocha[1], and A. F. Sbrissia[2], *[1]Universidade Federal de Vicosa, Vicosa, MG, Brazil, [2]Universidade do Estado de Santa Catarina, Lages, SC, Brazil.*

The experiment was conducted to assess the forage bulk density of *Brachiariahumidicola* cv. Humidicola comum, subjected to different intensities and frequencies of defoliation. Two defoliation intensities were evaluated, represented by stubble heights of 8 and 16 cm, associated with defoliation frequencies represening 95 and 100% light interception by the sward. Treatments were assigned according to a completely randomized block design with a 2 x 2 factorial treatment arrangement with three replicates. The light interception was measured using a canopy analyzer (LI-COR LAI 2000) at four points per experimental unit. At each point, a reading was taken above the sward and five on the soil surface (within the sward), resulting in four readings above the sward and twenty readings at ground level. Herbage mass was harvested pre-grazing using a quadrat of 0.33 x 1.0 m, at three points in each paddock. The forage was harvested to the residue stubble height for each treatment and the harvested forage was weighed immediately after cutting. A sample was forced- dried at 65°C for 72 h to determine dry matter (DM). Calculated herbage mass was divided by corresponding sward height to determine forage bulk density for each sward. Presented data are for the period of December 2009 to March 2010, and results were compared by Student's t test with a significance level of 10%. The bulk density of forage was influenced by defoliation frequency ($P < 0.10$) and the highest values (161.3±15.2 kg/ha.cm of DM) were obtained at the highest frequency (95% of light interception, LI). Lower frequency of defoliation (100% of light interception, LI) resulted in lower forage bulk density (110.3±15.2 kg/ha.cm of DM).

Key words: sward target, light interception, rotational grazing

T127 Herbage accumulation dynamics in pastures of *Pennisetum purpureum* submitted to grazing severities. D. Nascimento Junior*[1], B. M. L. Sousa[1], H. C. F. Monteiro[1], H. H. Vilela[1], M. C. T. Silveira[1], A. F. Sbrissia[2], and S. C. Da Silva[3], *[1]Universidade Federal de Vicosa, Vicosa, MG, Brazil, [2]Universidade do Estado de Santa Catarina, Lages, SC, Brazil, [3]Escola Superior de Agicultura Luis de Queiroz, Piracicaba, SP, Brazil.*

The experiment was carried out from December 2009 to May 2010 to evaluate the herbage accumulation dynamics of *Pennisetum purpureum* 'Napiergrass' submitted to grazing severities. Three post-grazing heights were evaluated: 30, 50 and 70 cm. Grazing was initiated when the sward reached 95% of light interception during regrowth. A completely randomized block design with three replications was used. Monitoring of the light interception was done using the canopy analyzer (LI-COR LAI 2000). In the beginning of each regrowth period twelve tillers were marked in each experimental unit to evaluate the growth and development dynamics. Additionally, aerial tillers that appeared during the regrowth were monitored. In order to evaluate the herbage accumulation dynamics, on the last day of each evaluation period, all the tillers were cut, separated into stems and leaves, and placed in a forced air oven at 65°C for 72 h. After drying them, the material was weighted and the mass of each one was divided by its respective total length. A conversion factor was generated to transform the linear values (centimeters) of the leaf, stem and leaf senescence rates in weight values to area unit. The herbage accumulation rate was calculated by the difference between values of growth and senescence. The data was submitted to variance analysis using the Mixed Procedure of SAS (Statistical Analysis System) The herbage accumulation rate was influenced by the post-grazing height ($P = 0.0456$) and months of the year ($P < 0.0001$). The highest values were obtained in the post-grazing heights of 50 cm (110.1 kg/ha.day of DM) and 70 cm (119.7 kg/ha.day of DM). March and April in 2010 (105.0 and 112.1 kg/ha.day of DM, respectively) presented the highest values, followed by December in 2009 and January in 2010 (86.9 and 85.0 kg/ha.day of DM, respectively). February and March (66.3 and 70.7 kg/ha.day of DM, respectively) presented the lowest values. A:\\post-grazing height of 30 cm can drastically reduce the pasture accumulation rate.

Key words: post-grazing height, post-grazing height, light interception

T128 Pre-and post-grazing targets for mulato grass subjected to rotational stocking management. M. C. T. Silveira[1], D. Nascimento Junior*[1], S. C. Da Silva[2], K. S. Pena[1], C. S. Rodrigues[1], S. J. Souza[2], V. A. Limao[2], L. M. Barbero[2], and B. M. L. Sousa[1], *[1]Universidade Federal de Vicosa, Vicosa, MG, Brazil, [2]Escola Superior de Agricultura Luiz de Queiroz, Piracicaba, SP, Brazil.*

The objective of this experiment was to evaluate pre- and post-grazing condition targets on mulato grass subjected to rotational stocking management. The experiment was carried out at E.S.A. "Luiz de Queiroz" Universidade de Sao Paulo, from January 2008 to April 2009. Treatments corresponded to combinations between two pre- (95% and maximum canopy light interception - LI) and two post-grazing (15 and 20 cm residue) conditions, and were allocated to experimental units according to a 2 × 2 factorial arrangement in a randomized complete block design, with four replications. Canopy light interception was monitored using the LAI 2000 canopy analyser (LI- COR) at ten locations per experimental unit (1200 m^2 paddocks) and were followed by measurements of sward height at 100 points per paddock using a sward stick. Herbage mass and herbage morphological composition at pre- and post-grazing were estimated using three 0.90 x 0.37 m metallic frames per paddock. Data were analyzed as repeated measurements and means compared using t Student test at 5% significance. Post-grazing heights were consistently close to targets on swards managed at 95% LI, the same response did not occur on those managed at maximum LI (99%), particularly for the 15 cm target that became 20 cm after the first three grazing cycles. That was mainly due to increased accumulation of stem and dead material on swards managed at maximum relative to those managed at 95% LI. This was caused by intense competition for light when canopy light interception was allowed to increase beyond 95%, and caused difficulties to graze paddocks down to residue targets, deteriorating sward structure with potential negative effects on nutritive value and intake of the produced herbage. Pre-grazing height was larger on swards managed at maximum relative to those managed at 95% LI, regardless of post-grazing height for most of the experimental period, and values were relatively stable and around 30 and 40 cm. The results indicate that mulato grass should be grazed when paddocks reach 30 cm pre-grazing height (95% LI) using post-grazing heights of 15 to 20 cm.

Key words: *Brachiaria* sp. 'Mulato', canopy light interception, sward target

T129 Balance between the emergence and mortality of tiller in *Brachiaria decumbens* pastures under continuous stocking. M. E. R. Santos[1], V. M. Gomes[2], D. M. Fonseca[2], D. Nascimento Junior*[2], and A. F. Sbrissia[3], *[1]Universidade Federal de Uberlandia, Uberlandia, MG, Brazil, [2]Universidade Federal de Vicosa, Vicosa, MG, Brazil, [3]Universidade do Estado de Santa Catarina, Lages, SC, Brazil.*

The experiment was conducted to evaluate 2 different strategies for managing *Brachiaria decumbens* under continuous stocking. From June 2008 to March 2009, the *B. decumbens* pastures were evaluated at the Departamento de Zootecnia of the Universidade Federal de Vicosa located in the State of Minas Gerais, Brazil. The experimental site was located at 651 m altitude, 20° 45′ S and 42°51′ W. Annual precipitation is around 1,340 mm. Maximum and minimum temperatures are 22.1°C and 15.0°C, respectively. The experimental area was made up of 8 plots (experimental units) of 0.3 ha. In one management strategy, *B. decumbens* pasture was maintained at height of 25 cm during the trial. In the other, the pasture was kept at an average of 15 cm high during the winter (July to September 2008), and at 25 cm from the beginning of winter until the summer (October 2008 to March 2009). The experiment was carried out using a randomized block design with 4 repetitions and subdivided plots. Both management strategies for the pasture correspond to the plots. The seasons of the year are the subplots. In each experimental unit, all tillers inside the frames with 0.0625 m^2 were counted and marked with colored plastic coated wire. Every 30 d, all tillers were recounted and new tillers were marked with a different wire color. The collected data was used to calculate the balance between the emergence and mortality of tiller (BAL). The BAL was lower ($P < 0.10$) in the winter (0.1%) and higher ($P < 0.10$) in the spring (22.3%) and summer (26.2%). These results characterize a high *B. decumbens* tiller turnover in the spring and the summer, resulting in more young tillers in the pasture. Lowering the pasture height to 15 cm in the winter increased ($P < 0.10$) the BAL (21.1%) if compared with the one kept at 25 cm (BAL equal to 11.3%). For lower canopies, the higher light incidence at the base of the plants stimulates tillering. Hence, to optimize the turnover of tillers, *B. decumbens* should be managed, under continuous stocking, to have 15 cm in height in the winter and 25 cm in the spring and summer.

Key words: grazing management, seasons of the year, sward height

T130 Forage utilization efficiency estimated in *Pennisetum purpureum* submitted to grazing severities. D. Nascimento Junior*[1], B. M. L. Sousa[1], H. C. F. Monteiro[1], F. C. Gomes[1], C. Z. Assis[1], H. H. Vilela[1], A. F. Sbrissia[2], A. L. Santos[1], and M. C. T. Silveira[1], *[1]Universidade Federal de Vicosa, Vicosa, MG, Brazil, [2]Universidade do Estado de Santa Catarina, Lages, SC, Brazil, [3]Escola Superior de Agicultura Luis de Queiroz, Piracicaba, SP, Brazil.*

The experiment was carried out from December 2009 to May 2010 in order to estimate the forage utilization efficiency of *Pennisetum purpureum* 'Napier' submitted to different grazing severities. Three post-grazing heights were evaluated: 30, 50 and 70 cm. The grazings were performed when the sward reached 95% of light interception during regrowth. A completely randomized block design with three replications was used. The monitoring of the light interception was done using the canopy analyzer (LI-COR LAI 2000). In the beginning of each regrowth period, twelve tillers were marked in each experimental unit to evaluate the growth and development dynamics. Aerial tillers that appeared during the regrowth were also monitored. In the last day of each evaluation period, all the tillers were cut, separated into stems and leaves, and dried in a forced air oven at 65°C for 72 h, then weighed and the mass of each compound was divided by its respective total length. A conversion factor was generated to transform the linear values (cm) of the leaf, stem and leaf senescence rates in weight values to area unit. The total growth rate (leaf growth + stem growth) and the pasture senescence rate were calculated. It was possible to estimate the forage efficiency utilization: {(1 â€“ senescence/total growth) x 100}. The data was submitted to variance analysis using the Mixed Procedure of SAS (Statistical Analysis System) and compared by the Student's t-test, with 5% of significance. The forage utilization efficiency estimate was affected by the post-grazing height ($P = 0.0284$) and months of the year ($P < 0.0001$). The post-grazing heights of 70 (82.2%) and 50 cm (86.0%) presented the highest ($P = 0.0284$) forage utilization efficiency estimates, and the residue of 30 cm (73.0%), the lowest. December 2009 presented forage utilization efficiency estimated at 4.5%. This value reduced in January (73.9%) and February (68.8%) in 2010, but increased in March 2010 (80.7%), and reaching

a higher value ($P < 0.001$) in April (87.7%) and May (86.9%) in 2010. The post-grazing height of 30 cm gave the lowest forage utilization efficiency of *Pennisetum purpureum* 'Napier'.

Key words: grazing management, light interception, post-grazing height

T131 Grazing losses and grazing efficiency on mulato grass subjected to strategies of rotational stocking management. M. C. T. Silveira[1], D. Nascimento Junior*[1], S. C. Da Silva[2], C. S. Rodrigues[1], V. A. Limao[2], L. M. Barbero[2], S. J. Sousa[2], K. S. Pena[1], and B. M. L. Sousa[1], *[1]Universidade Federal de Vicosa, Vicosa, MG, Brazil, [2]Escola Superior de Agricultura Luiz de Queiroz, Piracicaba, SP, Brazil.*

This experiment evaluated grazing losses and grazing efficiency on mulato grass subjected to strategies of rotational stocking management. The experiment was carried out at Piracicaba-SP, from January 2008 to April 2009. Treatments corresponded to combinations between 2 pre- (95 and 99% canopy light interception - LI) and 2 post-grazing (15 and 20 cm residue) conditions, and were allocated to experimental units (1200 m^2paddocks) according to a 2x2 factorial arrangement in a completely randomized block, with 4 replications. Litter losses to the soil pathway were considered as all material lying on the ground as well as broken stems and green leaves still attached and hanging onto plants in paddock areas (2 2.0 × 1.0 m sites) previously prepared for measurements before each grazing. Preparation consisted of removal of all surface litter (un-rooted live and dead plant material). Grazing losses were weighed and values calculated as kg/ha. These were also calculated as percentage of the total herbage removed during grazing (difference between pre- and post-grazing herbage masses), and the results used to calculate grazing efficiency as their complement to 100. Data were analyzed as repeated measurements and means compared using Student's *t*-test at 5% significance. Litter losses were smaller ($P < 0.0001$) on swards managed at 95% than on those managed at maximum LI (99%) (795 ± 32.3 and 1305 ± 36.6 kg/ha, respectively), with larger values ($P < 0.0001$) recorded in autumn-winter-early spring (1400 kg/ha ± 134.7 SEM) relative to those recorded in late spring (1265 kg/ha ± 84.6 EPM), summer 2008 (660 kg/ha ± 22.0 SEM) and summer 2009 (880 ± 37.7 SEM). In relation to post-grazing heights, litter losses were larger ($P = 0,0188$) on swards managed at 15 cm relative to those managed at 20 cm (1120 and 980 kg/ha ± 38.1 SEM). Grazing efficiency was 24% larger on swards managed at 95% relative to those managed at maximum LI (70.2 and 56.7% ± 1.4 SEM), suggesting the pre-grazing target of 95% LI as ideal since it was associated with reduced herbage losses due and enhanced grazing efficiency.

Key words: *Brachiaria* sp. 'Mulato', canopy light interception, harvest efficiency

T132 Relationship between canopy light interception and pre-grazing sward height in *Brachiaria humidicola* pastures subjected to frequencies and intensities of defoliation. H. H. Vilela[1], D. Nascimento Junior*[1], A. L. Santos[1], B. M. L. Sousa[1], G. O. Rocha[1], C. A. S. Feitas[1], and A. F. Sbrissia[2], *[1]Universidade Federal de Vicosa, Vicosa, MG, Brazil, [2]Universidade do Estado de Santa Catarina, Lages, SC, Brazil.*

The light interception by the sward is correlated with pre-grazing sward surface height, becoming a practical management tool for farmers. The aim of this work was to evaluate the light interception and pre-grazing sward height of *Brachiaria humidicola* 'Comum' pastures subjected to frequencies and intensities of defoliation. Two defoliation intensities were evaluated (8 and 16 cm), associated with defoliation frequencies represented by 95 and 100% of the intercepted light by the sward. The experiment was assigned according a complete randomized block design in a 2 × 2 factorial arrangement with 3 replicates. The light interception was measured using a canopy analyzer (LI-COR LAI 2000) at 4 points per experimental unit (paddock). A reading was taken above the sward and 5 on the soil surface (within the sward), resulting in 4 readings above the sward and 20 readings at ground level. The evaluation of the sward surface height was performed using a ruler, on the same day the paddocks had their light interception measured. Sward height was measured at 20 points per paddock. The data presented are for the period from December 2009 to March 2010 and means were compared by Student *t*-test, 10% significance. ANOVA was performed on light interception (control variable). The interception of light by pastures in the treatment with the highest frequency was 94.86% and the treatment of lower frequency, 98.05%. The sward height was influenced ($P < 0.10$) only by the frequency of defoliation, with an average of 30.27 cm for the highest frequency (95% LI) and 49.76 cm for lower frequency (100% LI). Pre-grazing stubble height is an important feature on plant and animal performance. In this study, sward height was consistently correlated positively with light interception.

Key words: light interception, rotational grazing, sward target

T133 Tiller population density in *Brachiaria humidicola* pastures subjected to frequencies and intensities of defoliation. H. H. Vilela[1], D. Nascimento Junior*[1], A. L. Santos[1], B. M. L. Sousa[1], G. O. Rocha[1], C. A. S. Feitas[1], and A. F. Sbrissia[2], *[1]Universidade Federal de Vicosa, Vicosa, MG, Brazil, [2]Universidade do Estado de Santa Catarina, Lages, SC, Brazil.*

The maintenance and stability of grasslands can be obtained through appropriate management practices. The use of rotational grazing systems, based on defoliation frequencies determined by canopy light interception can ensure pasture persistence, since this management practice is closely related to the sward ecophysiology. This study was conducted to evaluate basal and aerial tiller population density at post-grazing in *Brachiaria humidicola* 'Comum' pastures subjected to frequencies and intensities of defoliation. Two defoliation intensities were evaluated, represented by stubble height of 8 and 16 cm, associated with defoliation frequencies determined by 95 and 100% of light interception by the sward. A randomized complete block design was adopted with 3 replicates in a 2 × 2 factorial arrangement. The light interception was measured with the canopy analyzer equipment (LI-COR LAI 2000). The assessment of population density of basal and aerial tillers (alive) was held at 3 points in each paddock, by counting the total number of basal and aerial tillers in a quadrat of 0.25 × 0.25 m. The data presented are for the period of December 2009 to March 2010 and results were compared by Student *t*-test with a level of significance of 10%. The population density of basal tillers was influenced ($P < 0.10$) by the intensities and frequencies of defoliation. Highest population density of basal tillers (3205 tillers/m^2 was observed at lower intensity of defoliation (16 cm). Regarding the frequency of defoliation, higher population density of basal tillers (3170 tillers/m^2 was observed at higher frequency (95% light interception). The aerial tiller density was not influenced by treatment ($P > 0.10$). More frequent grazing (95% light interception) and the use of lower intensity defoliation (16 cm), seems to improve stability and persistence of *Brachiaria humidicola* 'Comum'.

Key words: light interception, tillering, sward target

T134 Forage production and leaf area index of tropical grass cultivars under irrigation in the cerrado region of Minas Gerais, Brazil. E. A. da Silva*[1,6], W. J. da Silva[1], J. R. M. Ruas[2,5], D. S. Queiroz[3], M. C. M. Viana[4,6], J. M. V. Paes[1,6], and L. C. da Silva Júnior[7,8], *[1]EPAMIG, Uberaba, Minas Gerais, Brazil, [2]EPAMIG, Janaúba, Minas Gerais, Brazil, [3]EPAMIG, Viçosa, Minas Gerais, Brazil, [4]EPAMIG, Prudente de Morais, Minas Gerais, Brazil, [5]CNPq, Brasília, Federal District, Brazil, [6]FAPEMIG, Belo Horizonte, Minas Gerais, Brasil, [7]FAZU, Uberaba, Minas Gerais, Brazil, [8]FAPEMIG, Belo Horizonte, Minas Gerais, Brazil.*

The Leaf Area Index (LAI) is one of the most important biophysical variables used for crop modeling, and it is directly related to evapotranspiration, yield and light interception. The objective of this work was to estimate LAI of tropical grass cultivars under irrigation on 10 cutting dates. The experiment was carried out from December 2008 to December 2009. The experimental design was a complete randomized block in a split plot with 4 replications. The herbage was considered the main plot and cutting date the subplot. The treatments were: *Brachiaria decumbens* 'Basilisk', *Brachiaria brizantha* 'Marandu', *Brachiaria brizantha* 'Xaraes', *Panicum maximum* 'Mombaça', *Panicum maximum* 'Tanzania' and *Cynodon* spp. 'Tifton 85' and 10 cutting dates. The dry matter percentage and LAI were evaluated. The LAI was calculated as the green leaf area per unit of ground area. The data were subjected to ANOVA and when significant effects for the factors evaluated became the Tukey Test at 5% probability using the statistical package SAS (2001). The dry mass production of forage showed strong relationship with LAI. The dry mass accumulation of cultivars Basilisk, Marandu, Tanzania and Mombaça were superior ($P < 0.05$) to cultivars Tifton 85 and Xaraes production. The LAI showed seasonal variations with lower values in the winter. The cultivars Mombaça and Tifton 85 presented higher and lower LAI ($P < 0.05$), respectively. The satisfactory performance presented by cultivars, associated with other important characteristics of adaptability, show the importance of these cultivars as an alternative pasture for different cattle systems as well as a contribution to their sustainability. The differentiated productive behavior between cultivars must be considered for an adequate management of these grasses. (Research supported by FAPEMIG/CNPq, Brazil)

Table 1. Dry matter (DM) production (t/ha) and leaf area index of different forages

Date	Basilisk	Marandu	Xaraes	Mombaça	Tanzania	Tifton 85
Dec	4^{Bb}	3^{Eb}	8^{Aa}	9^{ABa}	4^{Bb}	2^{Ab}
Jan	8^{Aa}	7^{ABCab}	5^{Aab}	7^{ABab}	7^{ABab}	4^{Ab}
Mar	5^{ABa}	5^{CDEab}	6^{Aa}	6^{BCa}	7^{ABa}	1^{Ab}
Apr	7^{ABa}	3^{Eb}	7^{Aa}	6^{BCab}	6^{ABab}	3^{Ab}
Jun	5^{ABa}	3^{Eab}	5^{Aa}	3^{Ca}	4^{Ba}	3^{Aa}
Set	6^{ABbc}	8^{Bab}	5^{Abc}	9^{Aa}	7^{ABabc}	4^{Ac}
Oct	8^{ABa}	8^{BCa}	5^{Aab}	7^{ABa}	9^{Aa}	3^{Ab}
Dec	9^{Aab}	9^{Aab}	6^{Abc}	10^{Aa}	9^{Aab}	3^{Ac}
DM	51^{a}	43^{ab}	33^{ab}	48^{ab}	43^{cd}	29^{d}

Means followed by different lowercase letters in the same row or capital letters in the same column are significantly different ($P < 0.05$).

Key words: dry matter, tropical forage, season

T135 Morphogenic characteristics of tropical grass cultivars under irrigation in the cerrado region of Minas Gerais, Brazil. E. A. da Silva*[1,5], W. J. da Silva[1], J. R. M. Ruas[2,6], M. C. M. Viana[3,5], D. S. Queiroz[4], J. M. V. Paes[1,5], and L. C. da Silva Júnior[7,8], *[1]EPAMIG, Uberaba, Minas Gerais, Brazil, [2]EPAMIG, Janaúba, Minas Gerais, Brazil, [3]EPAMIG, Prudente de Morais, Minas Gerais, Brazil, [4]EPAMIG, Viçosa, Minas Gerais, Brazil, [5]FAPEMIG, Belo Horizonte, Minas Gerais, Brazil, [6]CNPq, Brasília, Federal District, Brazil, [7]FAZU, Uberaba, Minas Gerais, Brazil, [8]FAPEMIG, Belo Horizonte, Minas Gerais, Brazil.*

The objective of this work was to estimate leaf area index of tropical grass cultivars under irrigation at 10 cutting dates. The experiment was carried out from January to December 2009. The experimental design was a complete randomized block in a split plot with 4 replications. The herbage was considered the main plot and cutting date the subplot. The treatments were: *Brachiaria decumbens* 'Basilisk', *Brachiaria brizantha* 'Marandu', *Brachiaria brizantha* 'Xaraes', *Panicum maximum* 'Mombaça', *Panicum maximum* 'Tanzania' and *Cynodon* spp. 'Tifton 85' and 10 cutting dates. To evaluate the morphogenic characteristics, 3 tillers were marked in each plot. Data were analyzed by ANOVA and means were compared by Tukey test ($P < 0.05$). The number of tillers per area of Tanzania did not ($P > 0.05$) vary with seasons and was 301/m^2. The number of tillers per area was 880, 526, 522, 292, 301 and 1147/m^2 for cultivars Basilisk, Marandu, Xaraes, Mombaça, Tanzania and Tifton 85, respectively. These values are consistent with those reported in the literature. The number of tillers in the sward was a function of grass cultivar and time of the year. The difference in number of tillers was statistically significant at the 5% probability level with the Tukey test. Highest values ($P < 0.05$) of tillers were recorded for Tifton 85 cultivar and the lowest ($P < 0.05$) for the 2 Panicum cultivars, whereas, *Brachiaria brizantha* cultivars ranked intermediate. Tiller population density varied with season of the year and cultivars, with lowest values being consistently recorded during winter. (Research supported by FAPEMIG/CNPq, Brazil)

Table 1. Tillers (m^2) per tropical forages

Date	Basilisk	Marandu	Xaraes	Mombaça	Tanzania	Tifton
Jan	$1{,}053^{ABCa}$	603^{ABab}	264^{Bb}	172^{ABb}	271^{Ab}	624^{Eab}
Mar	528^{Da}	525^{ABa}	370^{Ba}	165^{Ba}	286^{Aa}	595^{Ea}
Apr	765^{BCDab}	270^{Bc}	403^{Bbc}	172^{ABc}	258^{Ac}	928^{CDEa}
Jun	769^{BCDb}	373^{ABbc}	317^{Bbc}	130^{Bc}	176^{Ac}	$1{,}414^{ABCa}$
Set	684^{CDb}	754^{ABb}	465^{ABb}	491^{ABb}	314^{Ab}	$1{,}499^{ABa}$
Oct	$1{,}260^{ABa}$	$4{,}744^{ABc}$	942^{Aab}	676^{Abc}	399^{Ac}	$1{,}159^{BCDa}$
Dec	$1{,}419^{Aa}$	807^{Ab}	524^{ABbc}	524^{ABbc}	356^{Ac}	$1{,}717^{Aa}$

Means followed by different lowercase letter in the same row or capital letters in the same column are significantly different.

Key words: tillering, tropical forage, season

T136 Effect of patch-burning mixed-grass prairie rangeland on cattle performance. S. A. Gunter*[1], T. L. Springer[1], E. T. Thacker[1], and R. L. Gillen[2], *[1]USDA-ARS, Southern Plains Range Research Station, Woodward, OK, [2]Western Kansas Agricultural Research Centers, Kansas State University, Hays.*

Patch burning, a range management tool, has gained favor in recent years to renovate degraded rangelands. By burning a portion of a pasture, it is hypothesized that cattle will concentrate grazing on burned sites and the increased disturbance will encourage forb establishment and lessen grazing in the unburned portion. To evaluate the effect of patch burning on the performance by stocker cattle grazing mixed-grass prairie in northwest Oklahoma, 3 pastures ranging in size from

24 to 13 ha were selected; 2 pastures had been reseeded to native grass <8 yr before the start of the experiment and the third site was go-back land with no record of reseeding since 1939. Each pasture was divided in half and all were burnt in March of 2005 before the start of the 4-yr experiment in 2006; the patch-burnt pastures had 25% burnt each March starting in 2006 through 2009. Each pasture was stocked with steer calves (248 ± 7.6 kg) at a rate of 5l.1 animal-unit-d/ha from mid-January to late-July. From January until mid-April, calves were fed 0.68 to 0.91 kg/steer of a 41% CP cottonseed meal-based supplement; cattle had access to water and plain salt during the entire grazing period. Cattle were weighed in January, mid-April, and late-July after an overnight-shrink without feed or water. Data were analyzed using GLIMMIX in SAS with treatment as the fixed effect and pasture and year as random effects. The ADG of calves on the patch-burned rangeland (0.83 kg) did not differ (P = 0.73) for cattle grazing unburned pastures (0.82 kg). Because BW did not differ (P = 0.77) in January and ADG did not differ, BW at the end of the grazing period in July did not differ (P = 0.88; average BW = 382 ± 12.6 kg). Body weight gain/ha by calves on the patch-burned rangeland (68 kg) did not differ (P = 0.48) for cattle grazing unburned pastures (69 kg). Using the patch-burning tool on mixed-grass prairie in northwest Oklahoma did not have a detrimental effect on cattle performance. If this technique proves to augment the ecological services rangelands provide, it may become widely used by land managers.

Key words: grazing, rangelands, cattle

T137 Estimating pasture growth rates using local weather data. E. B. Rayburn and W. L. Shockey*, *West Virginia University, Morgantown.*

Climatic conditions in the Appalachian region of the US are generally conducive to forage production for use as ruminant livestock feed. Forage growth variations contribute to uncertainty about the number of ruminant livestock that can be supported at any given location in any given year or season of the year. A forage growth model was developed that predicts plant growth rates based on local weather data and Penman-type evapotranspiration. Based on field testing of the forage growth model with in-field weather and clipped forage production over 16 site years the model predicted yield compared with clipped yield with an R^2 of 0.81 and a residual SD of 965 kg/ha. The model was refined to use historical weather data to make a stochastic model that could evaluate yield variability based on historical weather variation. Thirty years of data were collected from 5 weather stations that are representative of a variety of elevations and mean monthly temperatures in northern WV. Data collected were latitude and daily maximum, minimum, and average temperatures, and rainfall. The stochastic model uses the local probability of rainfall frequency and amount to calculate random predictions of weather used in the calculation of the Plant Growth Rate (PGR) for each day of the modeled year for a location. A new model year for PGR is generated with each calculation of the spreadsheet model. By comparing the stochastically modeled PGR estimates which use the variability in the 30-year weather data, one might plan with some confidence, in light of the risk incurred due to variability in pasture growth across years and within the year, the number of animal units that can be supported on a farm that is located in the region supported by its weather station. Because the model estimates PGR for each the day of the year, livestock producers may more accurately plan the timing for changes in stocking rates, mechanical harvest of excess forage, or purchase of supplemental feed relative to the historical risk associated with a given weather station. With appropriate analysis of historical data from additional weather stations this stochastic model could be extended to other areas of the country.

Key words: pasture, weather, plant growth

T138 Impact of feeding strategies on milk production and income over feed cost: A case study of organic, grazing and conventional Wisconsin dairy farms. M. Dutreuil*, M. Wattiaux, R. Gildersleeve, B. L. Barham, and V. E. Cabrera, *University of Wisconsin, Madison.*

A survey was developed to understand feeding practices on Wisconsin dairy farms and their consequences on milk production and milk income over feed cost (IOFC). Farms were randomly selected across 3 management systems: conventional (CON), grazing (GRA) and organic (ORG). Preliminary results from 2 CON, 3 GRA and 3 ORG are presented. No statistical analysis is reported because of these small numbers of farms. Grains were used in similar amounts across the year 2010 on GRA and ORG, whereas CON used less than half grain in summer than in winter. Grains were partially replaced in CON by a protein mix that was used more than double in summer than in winter. Hay was the main component in the winter for all the farm systems, which was partially replaced by grazing during summer. Corn silage, haylage, and baleage were used in similar amounts throughout the year by CON and ORG, whereas GRA used an additional 3.9 kg DM/cow/d in summer. In total, DMI in winter (kg/cow/d) was higher for CON and GRA (24.6 and 23.8, respectively) than for ORG (15.0), which led to differences in milk production (kg/cow/d) and cost of feed, ($/cow/d) for CON (27.3 and 2.6), GRA (20.0 and 1.5), and ORG (10.4 and 1.5). Milk price for ORG ($60/100 kg milk) was about twice as much as CON and GRA. Calculated milk IOFC ($/cow/d) was higher for CON (6.8) in winter and for ORG (7.5) in summer. The use of grazing by ORG during summer improved milk production (+4.6 kg/cow/day) and decreased feed cost (−0.2 $/cow/day), which determined the highest milk IOFC. Our preliminary results indicate that, given 2010 prices, ORG could be as much profitable as CON or GRA systems when including the USDA's National Organic Program grazing standards.

Table 1. Feeding practices, milk production and income over feed cost (IOFC) on Wisconsin dairy farms

	Winter (January)			Summer (June)		
	CON	GRA	ORG	CON	GRA	ORG
Feed (kg DM/cow/d)						
Grain mix	6.3	4.0	4.3	3.0	4.0	4.3
Protein mix	3.6	0.5	0.0	7.7	0.3	0.0
Hay	8.6	13.1	8.0	3.8	3.6	1.3
Corn silage	4.3	3.0	1.3	4.3	3.0	1.3
Haylage/Baleage	1.8	3.0	1.3	1.8	6.9	1.5
Milk production (kg/cow/d)	27.3	20.0	10.4	28.2	22.0	15.0
Cost of feed ($/cow/d)	2.6	1.5	1.5	3.5	1.6	1.3
Milk price ($/100 kg)	34.5	35.8	62.1	32.4	32.3	58.2
Income over feed cost ($/cow/d)	6.8	5.7	5.0	5.7	5.5	7.5

T139 Performance of automatic milking during a whole herd transition to grazing. S. Utsumi*, M. Haan, R. Ashley, and J. Bronson, *Kellogg Biological Station, Michigan State University, Hickory Corners.*

The effect of the length of grazing sessions on the performance of automatic milking systems (AMS), and the milking behavior of a whole herd of Holstein cows transitioned for first time to pastures was evaluated. Two groups of cows (n = 49 ± 3, DIM = 213 ± 1 d, Age = 3.8 ± 01 yr, BW = 611 ± 6 kg) voluntarily milked with single-stall AMS at rates of 4 to 2 milkings/day (based on DIM and milk yield), were exposed to 1-wk adaptation periods of 0, 2, 4, 6, and 8 h of grazing followed by 6 1-wk periods of voluntary grazing for 12 h. Groups grazed at moderate levels (46 ± 8% utilization) on grass-legume strips located within 400 m from the barn. Exit to pasture was permitted via computer-operated gates if prescribed milking intervals (range: 6 to 12 h) were not exceeded. Fetching of cows with 12-h intervals since last milkings was conducted twice per day. Cows received once a day declining amounts of a forage-based TMR (5% orts) in addition to 1 kg of concentrate per 4 kg of milk. Contrast of linear and quadratic effects ($P < 0.05$) of the length of grazing periods on AMS performance and milking behavior of cows was conducted. Total milk, milking visits and the time AMS spent milking decreased linearly as grazing sessions extended. Performance of AMS was likely increasingly limited by lower milkings and milk yield of individual cows exposed to longer grazing sessions. Length of grazing sessions did not affect milk speed or duration of milking visits, but milking time and yield per milking dropped when the length of grazing session was intermediate. Optimization of AMS in pasture-based systems may require strategic planning of dynamic stocking rates to efficiently lessen declines in milking frequency and milk yield per cow.

Table 1. Automatic milking (AMS) performance and milk production of cows

	Grazing session, h						Contrast	
	0	2	4	6	8	12	L	Q
AMS								
Total Milk	1479	1394	1320	1239	1203	1189	**	
Milking visits	143	132	137	125	120	110	**	
Time milking, h/d	17	15	15	14	14	13	*	
Time free, h/d	5	7	7	8	8	9	*	
Time cleaning, h/d	2	2	2	2	2	2		
Cows								
Milk yield, kg/d	30.7	28.6	28.0	26.2	25.6	26.2	**	
Milkings	3.0	2.7	2.9	2.7	2.6	2.4	**	
Yield/milking, kg	10.3	10.5	9.6	9.8	10.0	10.8		**
Milking time, min	3.5	3.6	3.4	3.4	3.4	3.7		*
Milk speed, kg/min	2.5	2.5	2.4	2.4	2.4	2.4		
Fetch rate, %	7	7	7	8	10	12	*	

* = $P < 0.05$; **= $P < 0.01$.

Key words: automatic milking, grazing

T140 Corn and forage yield on degraded pasture recovered by integrated crop-livestock-forest system in the central region of Minas Gerais, Brazil. M. C. M. Viana*[1], M. H. T. Mascarenhas[1], W. M. Albernaz[2], F. M. Freire[1], R. C. Alvarenga[3], E. A. Silva[1], M. M. Gontijo Neto[3], and M. F. F. Teixeira[4,5], *[1]EPAMIG - Minas Gerais Agricultural Research Corporation, Belo Horizonte, Minas Gerais, Brazil, [2]EMATER MG - Minas Gerais Agricultural Assistance and Rural Extension, Belo Horizonte, Minas Gerais, Brazil, [3]Embrapa Maize and Sorghum, Sete Lagoas, Minas Gerais, Brazil, [4]FEAD, Belo Horizonte, Minas Gerais, Brazil, [5]FAPEMIG, Belo Horizonte, Minas Gerais, Brazil.*

The integrated crop-livestock-forest (iCLF) system has been used to recover degraded areas of crop and pastures in Brazil. To evaluate the influence of different eucalyptus arrangements and clones on the corn grain yield and pasture production in the first year of iCLF system a trial was carried out at Belo Horizonte, Brazil (19°28′ SE 45°15′W, 732 m) on *Brachiaria decumbens* degraded pasture. The experimental design was a randomized complete block in a split plot, with three replications. Eucalyptus arrangements: double rows (3 x 2) x 20 m; (2 × 2) × 9 m and single rows (9 × 2m) were distributed in the main plots, with 20 and 9 m between rows and 2 m between tree spacings. Eucalyptus clones: VM 58, GG100 and I144 were tested in the subplots. A corn (hybrid BRS3060) was intercropped with eucalyptus clones and cultivated as monoculture (control). Data were analyzed by ANOVA and means were compared by Tukey test ($P \leq 0.05$). Soil liming (2 t/ha), basal (300 kg/ha 08-28-16) and topdressed (350 kg/ha 20-00-20) corn fertilizations were accomplished. At the corn harvest, plant height, first ear height, number and weight of ears and grain yield were evaluated. Forty days after corn harvest dry matter (DM) production and chemical composition (CP, ADF, NDF and lignin contents) of *B. decumbens* regenerated from the soil seed bank were evaluated. There was no difference ($P \geq 0.05$) between corn in monoculture and corn intercropped with eucalyptus in all arrangements. The average corn grain yield in the iCLF system and as monoculture was 4.76 and 4.28 t/ha, respectively. Also there was no difference ($P \geq 0.05$) between the corn and forage growing under the eucalyptus clones. The DM yield and chemical composition of *B. decumbens* was not affected by the eucalyptus arrangements and clones. The soil liming and fertilizer applied to corn intercropped with eucalyptus contributed to the recovery of the pasture of *B. decumbens*. In the first year of iCLF establishment, the influence of eucalyptus shade is not a limitation to corn and pasture development. (Research supported by FAPEMIG/CNPq, Brazil)

Key words: agroforestry, forage, eucalyptus

T141 Supplement and stocking strategies for heavy-weight fall-born calves backgrounded on Tifton 85 bermudagrass. F. Rouquette*, J. Kerby, G. Nimr, and K. Norman, *Texas AgriLife Research, Overton.*

Fall-born calves weaned at 340 kg in early summer present management challenges for gain on bermudagrass (*Cynodon dactylon*) pastures (BG). Our objectives were to quantify gain/animal and gain/ha due to stocking rates (SR) and supplement (SUP) source and quantity. Simmental-sired calves with F-1 (Angus × Brahman) dams were allotted to SUP treatments in successive years (YR). In YR 1, a 2:1 soybean meal:cracked corn (SBM) 36% protein ration containing Rumensin 80, salt, and minerals was group-fed daily at 0.4% BW (4-SBM) to 3 steers and 2 heifers on each of 2 replicate pastures of Tifton 85 BG stocked at 12, 18.5, and 22 320-kg calves/ha. Calf average daily gain (ADG) from 28 June to 28 September increased ($P < 0.05$) with SUP (0.7 kg/d) compared with pasture only (PAS) at 0.31 kg/d. The ADG differed ($P < 0.01$) between each SR of low (LO) (0.75 kg/d), medium (ME) (0.52 kg/d), and high (HI) (0.32 kg/d). Resultant gain/ac for SUP was 980, 1300, and 1118 kg/ha, respectively, for LO, ME, and HI SR; and for PAS was 690, 470, and 241 kg/ha, respectively. The SUP:extra gain was 3.3:1 for calves on ME or HI SR and 6.2:1 for LO SR. In YR 2, the 4-SBM ration was compared with daily 0.4% BW and 0.8% BW each of 8% protein cracked corn (CRN) (4-CRN, 8-CRN) and pelleted 23% protein corn gluten (GLU) (4-GLU, 8-GLU). Two replicate pastures of the 6 treatments were stocked at LO to ME SR from 22 June to 14 October. With 13.5 320-kg calves/ha, ADG was similar for 8-CRN (0.97 kg/d) and 8-GLU (0.86 kg/d), and similar for 8-GLU, 4-CRN

(0.78 kg/d), and 4-SBM (0.75 kg/d). Calf ADG was similar for all SUP fed at 0.4% BW. The ADG from PAS was lower ($P < 0.01$) at 0.35 kg/d than all SUP. The SUP:extra gain for calves was 3.6:1 (4-CRN), 4.2:1 (4-SBM), 5:1 (8-CRN), 5.1:1 (4-GLU), and 6.1:1 (8-GLU). Gain/ha for 8-CRN was 1385 kg/ha, about 1065 kg/ha for 8-GLU, 4-CRN, and 4-SBM, 900 kg/ha for 4-GLU, and 450 kg/ha for PAS. Economic considerations of calf value, SUP costs, and SUP:extra gain favored ME SR and 0.4% BW SUP of energy (CRN) or protein with Rumensin (SBM) for backgrounding fall-born calves on Tifton 85 BG pastures.

Key words: supplement, bermudagrass, stocking rate

T142 Production of wheat and oats overseeded into Tifton-85 grass at different forage allowances. F. F. Simili*[1], A. C. Ruggieri[2], T. V. Bertolino[2], D. R. Casagrande[3], R. A. Reis[2], and R. Godoy[4], *[1]APTA, Ribeirao Preto, Sao Paulo, Brazil, [2]UNESP, Jaboticabal, Sao Paulo, Brazil, [3]UFAM, Parintins, Amazonas, Brazil, [4]EMBRAPA, Sao Carlos, Sao Paulo, Brazil.*

The overseeded technique has been used successfully for many years in southern Brazil and southern United States and it is considered an appropriate alternative to increase forage production during the winter when there is moisture available in the soil. The objective of the experiment was to evaluate forage mass of annual oat and wheat overseeded into perennial Tifton-85 grass (*Cynodon nlemfluensis* × *Cynodon dactylon*) grazed by sheep, which received three different forage allowances (FA). The experimental design was completely randomized with 3 x 3 factorial scheme and repeated measures (grazing periods), with three repetitions. The treatments were oat (*Avena bysantina*), var. UPF 86081, wheat (*Triticum aestivum* L.) 'BRS Figueira' and the combination of the two species wheat and oats. These grasses were grazed at three FA 4, 7 and 10% of body weight of animals. There was a significant interaction between FA and grazing cycle for all variables ($P < 0.05$). The dry mass production (DMP) by hectare (ha) of Tifton-85 grass was significantly higher ($P < 0.05$) in the third grazing cycle, with an average of 6,728 kg DMP/ha, but there were no differences among FA. The production of annual grass was lower ($P < 0.05$) in the first grazing cycle, with an average of 551.4 kg DMP/ha, but there were no differences among FA. The highest DMP of annual grasses was achieved with 10% of FA in the third grazing cycle, with an average of 2,488.8 kg DMP/ha. These results can be explained by occurrence of rain in October, at the same period of the third grazing cycle. The best ($P < 0.05$) percentage of annual grass plants was observed in the second grazing cycle with an average of 39.6%. However, Tifton- 85 grass presented the highest percentage of plants in all grazing cycles and FA. It was concluded that the overseeded technique to increase DMP for grazing animals was not successful in the environment that was studied.

Key words: *Cynodon*, grazing, winter forage

T143 Effects of lack of shade on Wye Angus brood cows. M. S. Updike* and R. M. Harrell, *University of Maryland, College Park.*

In the Chesapeake Bay watershed, increased environmental regulations will likely result in cattle producers having to fence cattle out of the streams. One side effect of such fencing is that most of the shade (from trees) is provided along the streams and will no longer be available to the cattle. In addition, cost share programs in the Mid Atlantic region for fencing the streams do not include any cost share for adding shade elsewhere on the farms. This study was conducted to determine the effects of lack of shade on mature Wye Angus brood cows that had been adapted to shade in previous years. Forty cow calf pairs (bull calves) were rotationally grazed as normal with access to shade and 40 cow calf pairs (bull calves) were rotationally grazed with no access to shade. To minimize location effects, individual fields were split into paddocks so that shade treatment group had access to trees for natural shade. The study began July 1st which was immediately after the clean up bulls were pulled from the herd. Blood was collected in June before the beginning of the treatments, in July and in August. Cows were checked for pregnancy in the middle of August. Previous research has shown that heat stress causes has a greater impact on early stages of pregnancy. Therefore it was not surprising that 40% of the cattle with no shade were pregnant while 85% of the cattle with shade were pregnant. Blood was analyzed for hematocrit and other blood chemistries. No significant differences were found ($P < 0.05$) and all results were within normal parameters. These results have implications not just for farmers who must contend with changing regulations, but also government agencies and NGOs that are working with farmers to decrease nutrient loss into the watershed.

Key words: cattle, shade, stress

T144 Effect of stocking rate on forage production, soil compaction and root numbers in a swine pasture system. B. Renner*[1], S. Pietrosemoli[1], J.-M. Luginbuhl[1], C. Raczkowski[2], J. T. Green[1], and J. Grossman[1], *[1]North Carolina State University, Raleigh, [2]North Carolina Agricultural and Technical State University, Greensboro.*

Grazing experiments were conducted at the Center for Environmental Farming Systems in Goldsboro, NC from July to August 2008 and 2009 to determine the effect of swine stocking rate on subsequent forage production, soil compaction and root numbers. Pigs (18.4 and 118.5 kg initial and final body weight, respectively) were randomly assigned to each of 12 paddocks sized to equal stocking rates (SR) of 37, 74, 111, and 148 head/ha in a randomized complete block design. Animals had ad libitum access to water and concentrate feed. A winter cereal rye/annual ryegrass (*Secale cereale*/*Lolium perenne*) mixture was sown following removal of the pigs in fall 2009 from a mature bermudagrass (*Cynodon dactylon*) pasture. Forage harvested at early boot stage to 5cm stubble length in spring 2010 was followed by a sorghum-sudangrass hybrid no-till seeded into the plots and harvested at early boot stage to 7cm stubble in August and again at stem elongation stage in October 2010. Soil samples were taken in spring and fall 2010 following the final harvest of each forage crop. Soil compaction and root numbers were determined at depths of 15, 30, 45, 60, 90 cm, and 15, 30, 60, 90 cm, respectively. A Delmi soil penetrometer was used to determine soil compaction and root numbers were determined by counting the roots in the cross-sections of harvested soil cores. In spring, forage yield ($P = 0.72$), soil compaction ($P = 0.4$) and root numbers ($P = 0.8$) did not change with SR, but soil compaction ($P = 0.0001$) and root numbers ($P = 0.0001$) were affected by soil depth. Summer ($P = 0.08$) and fall ($P = 0.7$) sorghum-sudangrass yields were not affected by SR. Fall root numbers were not affected by SR ($P = 0.2$) but strongly affected by soil depth ($P = 0.0001$). Under the conditions of this experiment, SR rate had no effect on subsequent forage yield. Conversely, soil compaction and root numbers were affected by soil depth, the latter being most prevalent in the top 15 cm.

Key words: outdoor pig production, stocking rate, root count

T145 Average annual weight prediction of cows kept four years in a tough regime using a model of simulation. J. M. Tapia[1],

J.C. Martinez[2], H. Diaz[3], A. Moreno[4], J. A. Martinez[1], O. D. Montañez*[1], J. A. Ochoa[1], and G. Rocha-Chavez[1], *[1]CUSUR, U de G, Cd. Guzman, Jalisco, Mexico, [2]Univ Autonom de Tamaulipas, Cd. Victoria, Tamps, Mexico, [3]Univ Auton Agr Antonio Narro, Saltillo, Cohahuila, Mexico, [4]Instituto Tecnologico de Cd Victoria, Cd. Victoria Tamps, Mexico.*

The objective of this study was to predict the average annual weight of cows living in a tough environment using a simulation model. Software STELLA 8, was used and data for the model was obtained from farm systems of the Tamaulipas region in northern Mexico characterized by semi arid climate and low quality pastures including cactus plants. Farmers are usually poor peasants having an average of 3 cows used mostly for subsistence of their families. Cows in the study were 4-year-old crosses (creole-zebu) and were grouped (21 cows per group) into 4 diet regimens: (1) grazing only (buffel and native grass), (2) grazing in a silvopastoral system (mostly bushes), (3) grazing with silage and (4) grazing with corn-molasses nutritional blocks. Silage for supplementing group 3 diets was made with chopped green corn plants that were compressed in a silo and allowed to ferment. The silvopastoral system included grazing over small plants of prosopis farcta and celtis spinosa. Regimen was assessed for 48 mo with 21 simulation cycles totalizing 84 years for each regimen. Analysis of variance was used to compare means and significance was set to $P < 0.05$. As it can be seen in Table 1, the best average weight was for the silvopastoral system whereas the lowest finding corresponds to the grazing only group. No significant differences were found among groups 2 and 3 ($P < 0.05$). Simulation models are useful to predict potential real life scenarios; however, there are several environmental aspects (such as unusual rain) that may influence their outcome.

Table 1. Average annual weight of cows with several types of diets

Diet type	Cycles[1]	Avg annual weight (kg, mean ± SE)
Grazing only	21	331.91±11.32 [a]
Grazing + corn silo	21	343.21±7.90 [b]
Grazing + nutritional block	21	338.33±21.05 [b]
Grazing silvopastoral	21	347.40±10.55 [c]

[1]All values evaluated for each treatment representing a cycle of 48 months totalizing 84 years of evaluation. Different letters in the same column differs significantly ($P < 0.05$).

Key words: weight, cows, prediction

T146 Effects of stocking rate and supplementation on carcass traits of beef cattle grazing winter annual forages. B. C. Williamson*[1], M. L. Looper[2], F. M. Rouquette[3], G. E. Aiken[4], S. F. Tabler[2], J. B. Wolley[2], and C. F. Rosenkrans[1], *[1]University of Arkansas, Fayetteville, [2]USDA/ARS, DBSFRC, Booneville, AR, [3]Texas AgriLife Research, Overton, [4]USDA/ARS, FAPRU, Lexington, KY.*

Environmental and managerial conditions are known to affect subsequent performance and carcass traits of beef cattle. The objective of this study was to document the effect of stocking rate (SR) and supplementation on carcass traits. Steers and heifers (n = 856; BW = 274 ± 46) were allowed to graze 'Maton' rye (*Secale cereale* L.) and 'TAM90' annual ryegrass (*Lolium multiflorum* L.) pastures from January to mid-May of 1999 to 2005. Cattle were allotted to stocking rates (SR) of high (6.7 animals/ha), medium (5.2 animals/ha), or low (3.7 animals/ha), and supplemented (0 vs. 3.0 kg/d corn/cottonseed meal; 16% protein), and finished in commercial feedlots. Body condition score (BCS); ultrasound measurements of intramuscular fat (UIMF), LM area, and rump fat at end of grazing; ADG during stocker (119 d ± 25) and feedlot (125 d ± 28) phases; hot carcass weight (HCW); carcass rib fat; carcass LM area (CLMA); and yield grade (YG) were measured. The ANOVA determined the effects of year, sex, SR, supplementation, and interactions on ADG, ultrasound measurements, and carcass traits . A supplement x SR interaction affected ($P < 0.05$) YG. Cattle tended ($P < 0.10$) to have lower YG when grazed at low SR (YG = 2.7 ± 0.08) compared with cattle grazed at high SR (YG = 3.1 ± 0.08) when supplemented. An SR × sex interaction ($P < 0.05$) affected CLMA. Steer CLMA was not affected ($P > 0.25$) by SR; however, heifers grazed at high SR had the smallest ($P < 0.10$) CLMA. Supplement x SR interaction ($P < 0.05$) affected HCW. Cattle supplemented while grazing had increased ($P < 0.05$) UIMF (1.13%) compared with nonsupplemented cattle (0.94%). High SR cattle had lower ($P < 0.05$) UIMF then medium and low SR (0.79%, 1.05%, and 1.26%, respectively). Cattle allotted to low SR gained more ($P < 0.05$) than cattle on medium or high SR while grazing (1.28, 1.14, 0.77 kg/d, respectively). In the feedlot, cattle at high SR gained more ($P < 0.05$) than cattle at medium or low SR (1.84, 1.67, 1.69 kg/d, respectively). Stocking rate and supplementation of cattle grazing winter annuals affected subsequent performance and carcass traits.

Key words: carcass traits, stocker cattle, ultrasound

T147 Matching hay composition to cow requirements during the winter. W. M. Backus[1], B. T. Campbell[1], A. M. Saxton[1], D. K. Joines[2], and J. C. Waller*[1], *[1]The University of Tennessee, Knoxville, [2]Soil, Plant, and Pest Center, Nashville, TN.*

The objective of this study was to compare the nutrient composition of hays produced in Tennessee and their ability to meet the nutrient requirements of beef cattle during the winter. Crude protein (CP) and estimated total digestible nutrients (TDN) values from 2,076 samples [bermudagrass (*Cynodon dactylon*) - 392; tall fescue (*Festuca arundinacea*) - 607; grass/clover - 200; mixed grass - 793; orchardgrass (*Dactylis glomerata*) - 84] submitted from Jan. 2007 - Dec. 2009 to the Tennessee Forage Testing Lab were used to evaluate available hay for winter feeding. CP levels ranged from 4 to 30% with a mean of 12.98 ± 0.21, TDN levels ranged from 34 to 88% with a mean of 60.77 ± 0.39. Nutrient requirements for 6 herds of 90 cows were established (NRC, 1996), with hay consumption based on published estimates for dry matter intake. Calving distributions from 8 years of spring and fall calving data from the Research and Education Center at Ames Plantation were used to develop the distribution for a 60 d calving season; comprised of 10 6 d periods. Spring and fall herds were grouped into 3 categories by mature size of cows; small cow size (453.6 ± 45.4 kg), medium cow size (544.3 ± 45.4 kg) and large cow size (635.0 ± 45.4 kg), each having an average milking ability of 9.1 kg ± 4.5 kg, with milk production ranging from 4.5 kg to 13.6 kg within each herd. Spring and fall calving seasons began Feb. 1 and Oct. 1 respectively. Hay feeding began Nov. 15 and ended Mar. 15. All hays were compared with individual cow requirements in each 10 d period. Tall fescue comparisons are presented because this is the predominant hay fed to beef cows in Tennessee. The results of matching tall fescue hay to the nutrient needs of the medium cow size spring calving herd indicate that 99% of samples met CP requirements and 93% of samples met TDN requirements of 80% of the herd in Nov., while 57% of samples met CP and 28% of samples met TDN requirements for 80% of the herd in Mar. In the medium cow size fall calving herd 65% of samples met CP requirements and 27% of samples met TDN require-

ments of 80% of the herd in Nov., while 89% of samples met CP and 74% of samples met TDN requirements for 80% of the herd in Mar.

Key words: hay, cow

T148 Total fat and fatty acid composition of steaks from steers finished on three different forage systems in the Gulf Coast Region. G. Scaglia*[1], J. Rodriguez[2], K. McMillin[2], G. Gentry[2], and H. Boland[3], *[1]LSU AgCenter Iberia Research Station, Jeanerette, LA, [2]LSU AgCenter School of Animal Sciences, Baton Rouge, LA, [3]Prairie Unit Mississippi State University, Prairie.*

The objective was to evaluate the effect of 3 forage systems (S1, S2, and S3) on meat characteristics of spring weaned beef steers (n = 54; 257 ± 2.5 kg; 3/8 Gelbvieh, 3/8 Red Angus, and 1/4 Brahman). Steers were divided into 9 groups based on initial body weight (d 0) and randomly assigned to 3 replicates paddocks (average area of 2 ha) within system. Steers in S1 grazed bermudagrass (*Cynodon dactylon*) during summer, ryegrass (*Lolium multiflorum*) and ryegrass sod-seeded into bermudagrass paddocks in winter. Steers in S2 grazed bermudagrass in summer, dallisgrass (*Paspalum dilatatum*)/red (*Trifolium pratense*), white (*Trifolium repens*) and berseem (*Trifolium alexandrium*) clovers (clover mix) during fall and spring, and rye (*Secale cereale*)/ryegrass/clover mix during winter while those in S3 had access to bermudagrass and sorghum-sudan hybrid (*Sorghum bicolor* x *S. bicolor* var. sudanense)/forage soybean (*Glycine max*) during summer, dallisgrass/clover mix during fall and spring, and rye/ryegrass/clover mix during winter. Systems differ in complexity, total forage mass produced and/or nutritive value parameters of forages. Pastures were rotationally stocked with a stocking rate for the systems of one steer per hectare through the grazing period (324 d). Eighteen steers (6 per system) where harvested and steaks obtained for analysis of total fat and fatty acids. Data were analyzed using PROC MIXED with means separation conducted using Tukey (α = 0.05). Total fat (5.4, 4.4, and 4.3%), percent saturated fatty acids (50.4, 51.6, and 54.3%), and percent conjugated linoleic acid in fat (1.3, 1.6, and 1.9%) were not different ($P > 0.05$) between systems (S1, S2, and S3, respectively), but saturated fatty acids were higher than expected. Concentration (as % of total fat) of monounsaturated fatty acids, polyunsaturated fatty acids, omega-6 and omega-3 fatty acids, and omega-6/omega-3 ratio were not different ($P > 0.05$) between systems. Preliminary data indicate that the 3 forage systems for finishing beef in this study did not result in differences in total fat and fatty acids in beef.

Key words: forage-fed beef, forage systems, steers

T149 Effect of molasses or cornmeal on milk production and nitrogen utilization of grazing organic dairy cows. S. Ross*[1], A. F. Brito[1], K. J. Soder[2], K. Greene[1], A. Green[1], and P. Y. Chouinard[3], *[1]University of New Hampshire, Durham, [2]USDA-Agricultural Research Service-Pasture Systems and Watershed Management Research Unit, University Park, PA, [3]Université Laval, Quebec City, Quebec, Canada.*

Pasture is rich in soluble N which is rapidly converted to ammonia in the rumen reducing N utilization in lactating dairy cows. Sucrose is more quickly degraded in the rumen than starch, suggesting that feeding molasses (MOL) to balance energy and RDP supply in the rumen can be strategically used to improve N utilization in grazing dairy cows. Twenty lactating organic Jersey cows (DIM 119 ± 73) were blocked by parity and milk production, and assigned randomly to one of 2 energy sources: 1) liquid MOL (12% diet DM) or 2) cornmeal (CM; 12% diet DM). MOL and CM averaged (% DM), respectively: 5.35 vs. 7.85% CP, 0.12 vs. 68.9% starch, and 50.1 vs. 1.53% sucrose. Cows grazed for approximately 18 h/day on mixed species pasture consisting mostly of orchardgrass, tall fescue, timothy, white clover, red clover and alfalfa from early June to mid-September for a total of approximately 110 d. The energy sources were top-dressed on baleage containing perennial ryegrass, timothy, reed canarygrass, white clover and red clover (18% diet DM) and fed individually twice daily using Calan doors. Cows were split into 2 grazing groups with pasture intake estimated by group using a calibrated rising plate meter to quantify pre- and post-grazing herbage biomass. Data was analyzed using the MIXED procedure of SAS for a completely randomized design with repeated measures over time. Intake of supplement (baleage plus MOL or CM) was significantly higher for cows fed MOL vs. CM possibly due to enhanced palatability of MOL. Pasture and total DMI were numerically higher for cows fed MOL than those fed CM. Despite enhanced total DMI, no significant differences were observed for milk yield comparing MOL and CM. Likewise, yields and contents of milk components did not differ between MOL and CM. However, cows fed MOL had reduced MUN ($P = 0.03$) and PUN ($P < 0.01$) compared with those fed CM, which may be partially explained by the higher CP of CM vs. MOL. Compared with CM, MOL had no detrimental effect on animal performance and improved N utilization in organic dairy cows. Liquid MOL may be an alternative energy source for CM if economically competitive.

Table 1. Performance and N utilization

	Treatments			
	MOL	CM	SED	$P > F$
Pasture DMI, kg/d	11.5	10.0	-	-
Supplement DMI, kg/d	4.27	3.67	0.13	<0.001
Total DMI, kg/d	15.77	13.67	-	-
Milk yield, kg/d	12.8	11.8	1.53	NS
Milk fat, %	4.82	4.81	0.22	NS
Milk fat, kg/d	0.61	0.56	0.06	NS
Milk protein, %	3.45	3.46	0.15	NS
Milk protein, kg/d	0.43	0.40	0.04	NS
Milk lactose, %	4.70	4.64	0.04	NS
Milk lactose, kg/d	0.60	0.55	0.07	NS
MUN, mg/dL	13.4	14.9	0.59	0.03
PUN, mg/dL	14.8	16.7	0.56	<0.01
BW change, kg/d	0.36	0.22	0.17	NS

SED = standard error of LSM difference; NS = not significant.

Key words: grazing, molasses, organic cows

T150 Sensory properties and abundance of selected volatile compounds in milk from cows fed timothy grass as hay, silage or pasture. M. P. Villeneuve*[1,2], Y. Lebeuf[1,2], R. Gervais[1], G. F. Tremblay[3], J. C. Vuillemard[2,4], and P. Y. Chouinard[1,2], *[1]Département des sciences animales, Université Laval, Québec, QC, Canada, [2]Institute of Nutraceuticals and Functional Foods (INAF), Québec, QC, Canada, [3]Agriculture and Agri-Food Canada, Québec, QC, Canada, [4]Département des sciences des aliments et de nutrition, Université Laval, Québec, QC, Canada.*

To evaluate the effects of feeding different types of forage on milk flavor and volatile compounds, 21 Holstein cows (1st lactation and higher, 209 ± 52 DIM) were blocked according to calving date and randomly assigned to one of three dietary treatments, which consisted of timothy grass (*Phleum pratense*) fed ad libitum as hay (H), silage

(S), or pasture (P) for 27 d. Each cow also received 7 kg/d of concentrates in two equal meals. Cows fed P were grazing on the same parcel where hay and silage were harvested simultaneously at the mid-heading stage, the previous summer. On the last 3 d of the period (d25, d26, and d27), bulk milk from two consecutive milkings was collected separately from each group of cows. The 9 batches of milk thus obtained were standardized to 3.25% fat, homogenized, and pasteurized at 75°C for 16 sec. Samples of each milk produced on d25 were collected and stored at 4°C to be used for sensory evaluation. Additional samples from each batch (d25, d26, d27) were frozen at −20°C for further analysis of volatile compounds using solid- phase microextraction (SPME) and gas chromatography-mass spectrometry. Milk samples from d25 were evaluated in a triangle test by a panel of 30 untrained assessors to compare H vs. P, and H vs. S. Among assessors, 40% were able to distinguish H from S ($P = 0.28$), while 67% perceived a difference between H and P ($P < 0.01$). Milk samples from d25 were also evaluated in a sensory ranking test by a similar panel. Assessors were asked to rank H, S and P milk samples for aroma intensity, as well as sweet and grassy flavors on a scale of 1 to 3 (from less to more intense). For H, S, and P, respectively, sums of rankings were 54, 52, and 74 for aroma intensity, 70, 59, and 51 for sweet flavor, and 53, 54, and 73 for grassy flavor ($P < 0.05$). Chromatographic analyses of free fatty acids, alcohols, aldehydes, ketones, and lactones revealed that all these volatile compound families were present in H, S, and P milk samples. Further investigation is needed to assess the contribution of specific volatile compounds to sensory properties of milk as affected by forage types.

Key words: volatile compounds, milk flavor, SPME