257 Are there high and low *Salmonella* prevalence farms? M. H. Rostagno*[1], H. S. Hurd[2], and J. D. McKean[2], [1]*USDA, ARS, Livestock Behavior Research Unit*, *West Lafayette, IN*, [2]*Iowa State University*, *Ames*.

The objective of this study was to evaluate the stability of *Salmonella* prevalence in cohorts of finishing pig lots. Six finishing production sites were visited six times each. At each visit, 30 individual fecal samples were randomly collected directly from the rectum. At slaughter, 50 individual meat samples were randomly collected per lot. Fecal samples were selectively enriched, and analyzed for the presence of *Salmonella*. Meat samples were frozen, thawed, and the resulting liquid (meat juice) was analyzed for the presence of antibodies against *Salmonella*. All finishing production sites were positive for *Salmonella* in at least two fecal and four meat samplings. The overall *Salmonella* bacteriological prevalence was 12.9% (95% C.I. 8.0 to 17.8%), whereas the serological prevalence was 35.4% (95% C.I. 24.5 to 46.4%; $P < 0.05$). A wide variation in *Salmonella* prevalence (bacteriological and serological) of different finishing pig lots within individual production sites was found. The wide variation found did not allow the categorization of the sites (statistically) as high or low prevalence systems. Possible reasons for the variation found within production sites include: 1) occurrence of intermittent shedding and clusters, and 2) evolution and resolution of *Salmonella* infection epidemics. The results showed both, bacteriological and serological estimates of *Salmonella* prevalence in swine production systems to be inconsistent among cohorts over time. The results suggested that reporting high or low prevalence of *Salmonella* in swine farms is a matter of timing.

Key Words: Swine, *Salmonella*, Food safety

Forages and Pastures - Livestock and Poultry: Tropical Forages: Management and Environmental Issues Affecting Use Efficiency

258 Programming grazing, irrigation and fertilization cycles based on physiological and environmental data for tropical grasses. J. Rodriguez-Absi*[1] and E. Gutierrez-Ornelas[2], [1]*Raesa Mexico*, *Queretaro, Queretaro, Mexico*, [2]*Universidad Autonova de Nuevo Leon*, *Marin, Nuevo Leon, Mexico*.

An integrated system for intensive grazing management was developed using "Agroclimatic clocks" which are calculated from environmental data (mean, minimum and maximum monthly temperatures, and photoperiod) and physiological characteristics (upper and lower developmental temperature threshold for C-4 grasses). The system makes use of three types of "Clocks": a) Plant Development Clock (PDC) calculated from growing degree days b) Plant Growth Clock (PGC) calculated from optimum day and night temperatures for corn plant growth and c) Reference Evapotranspiration Clock (RETC). Actual field growing studies show that a specific corn variety required, depending on the planting date, from 55 to 120 calendar days to reach the kernel milk stage (silage making stage); however, when using the PDC the angular thermal time required for the plant to reach the same stage was 74°C regardless of planting date (angular thermal time is directly proportional to degree days). However PGC, is closely related with the quality of the daily heat received by the plant, (i.e. number of optimal growth days which occur during the plant cycle), that explains why yields are 1.3 to 1.4 times higher for the fall/winter than for the spring/summer growing seasons. Planting date for maximum yield can be established using PDC and PGC. Irrigation program requires also the RETC, FAO crop growth coefficients and soil textural analysis. Fertilization program requires soil fertility analysis and nutrient removal per unit yield. A year round rotational grazing system for perennial grasses can be set by gathering information of at least one growing and resting cycle, including data on stocking rate, forage yield and grass recovery period (50% forage removal). The system allows that grazing begins when the amount of nutrients in forage is maximum. An example of 11 grazing-fertigation cycles marked in the PDC clock for Bermuda grass in Culiacan is presented. Specific "Agroclimatic clocks" can be used for designing an efficient management plan for increase forage yield and quality improvements in harvesting or grazing systems.

Key Words: Growing Degree Days, Bermudagrass, Rotational Grazing

259 Agroforestry livestock feeding systems in tropical America. T. Clavero*[1] and J. Iglesias[2], [1]*Facultad de Agronomia, Universidad del Zulia*, *Maracaibo, Zulia, Venezuela*, [2]*Estacion Experimental Indio Hatuey*, *Matanzas, Cuba*.

Livestock production has been questioned for a long time because its association with deforestation, subsequent environmental degradation and a decline in productivity. Distinct patterns of deforestation are found within and between countries but most of these forests are converted to unsustainable pastures. Recently, agroforestry systems for sustainable animal production have been developed. Trees and shrubs have long been considered as important sources of nutrition for grazing animals for both the quantity and quality of pastures. Among the diverse types of agroforestry systems under study, protein banks and multiple association of tree/grass systems have contributed much to the development of sustainable dairy and meat production and could be considered as systems that can be extended to farmers. There is a diverse literature on the effects of fodder trees on the productivity of cattle, sheep and goats. The main results obtained are: average daily LW gain of 20-26% higher with browsing fodder trees than animals on only grass systems in young bulls for fattering, daily milk production of 7-10 kg/cow without supplementation with 60-65% more milk/cow, milk productivity (l/ha/year) for the associated tree/grass system 75% more than the traditional grass system, daily live weight gains between 400-525 g in growing replacement heifers which allows a live weight for reproduction of 290-300 kg, growing goats with daily live weight gain of 56% more than grass systems and daily LW gain between 85-100 g in sheep with minimal use of external inputs to the systems. The renovation and introduction of appropriate pastures, adapted to local edaphoclimatic conditions, together with the strategic incorporation of tree plants and shrubs in the grazing areas, seems to be a technological alternative that would contribute to improved livestock production diminish the impact of the ecosystems where they are developed. This could constitute an economically viable solution that does not produce environmental damages and is socially accepted and whose short term benefits would be observed in a sustained increment of the animal production.

Key Words: Agroforestry, Animal Production

260 Use of limpograss (*Hemarthria altissima*) in cow-calf grazing systems in southern Florida. J. D. Arthington*, *University of Florida-IFAS, Range Cattle Research and Education Center*, *Ona*.

Over 70% of Florida's 1 million beef cows reside in the state's peninsular region. Forages capable of providing adequate DM yield in the winter are a limitation to beef production systems in this region. Limpograss (*Hemarthria altissima*) possesses superior winter yield compared to other warm season perennial grasses. First extensively evaluated in 1974, 'Floralta' limpograss is the most widely utilized of the available limpograss varieties in southern Florida. This tropical grass originates from the Limpopo River in the Republic of South Africa. Floralta is a stoloniferous perennial tropical grass that was specifically selected for persistence under grazing conditions. In southern Florida, Floralta limpograss can be expected to produce as much as 40% of its annual growth in the winter months compared to only 10% for bahiagrass (Paspalum notatum), the predominate pasture forage specie in Florida. Another distinct characteristic of Floralta is the ability to maintain appreciable digestibility at later stages of maturity, suggesting potential as a stockpiled forage crop. In one 3-yr study, fall-calving cows assigned to a bahiagrass/limpograss rotational grazing system produced calves of equal weaning weight compared to cows grazing winter bahiagrass. In that study, 0.30 ha of stockpiled limpograss was equivalent to approximately 635 kg of supplemental winter. No differences in cow pregnancy rate were observed among grazing systems. Another distinct characteristic of limpograss is its relatively low crude protein content. Research investigating the performance of growing cattle grazing limpograss suggests that growth is not enhanced by protein supplementation until after the first frost of the season. After this time, protein-supplemented heifers realize a significant improvement in BW gain compared to heifers receiving no supplemental protein. Current research in southern Florida suggests that grazing strategies incorporating stockpiled limpograss could be an effective alternative to winter hay feeding. In addition, growing cattle grazing limpograss pastures may benefit from the provision of supplemental protein, especially after a killing frost.

Key Words: Limpograss, Grazing, Cow

261 Managing tropical forages: production, environmental benefits and risks. B. C. Pengelly* and J. G. McIvor, *Agricultural Landscapes, CSIRO Sustainable Ecosystems*, *St Lucia, Qld, Australia*.

Tropical forages have been used in farming systems of the developed and developing world for several decades. Grasses such as *Panicum* spp. and *Pennisetum* spp. have been cultivated for over a century but in the past 50 years there has been a greater focus on legumes such as *Stylosanthes* and *Vigna* spp. In all, over 150 tropical grass and legume species have been identified as being of value in the wide range of tropical and subtropical farming systems. The aims of much of the tropical forage research and cultivar development has been to increase animal production by identifying higher yielding species with better forage quality. The benefits of these species have been improved nutrition of animals and subsequently greater production of meat, milk and wool as well as better reproduction. The production downsides of this pasture use have been high costs, low reliability and poor persistence in some situations. The last 20 years has seen more attention given to environmental aspects of the use of these species. Environmental benefits from such use include nitrogen fixation and raised availability of nitrogen to other species, improved soil carbon levels, greater water use, and biodiversity benefits when compared to cropping systems. However the use of tropical forages has also been associated with a range of environmental disadvantages such as loss of native biodiversity, weed potential, enhanced nitrogen causing changes in species composition, and soil acidification. Overall, there have been large production benefits and some environmental gains from the development and adoption of tropical forages but these have come at a cost. The continuing challenge is in balancing the benefits and costs of their use through the better selection of appropriate species and application of appropriate management. Science has a role in both aspects.

Horse Species: Recent Advances in Understanding Metabolic Disorders in Horses

262 The impact of variability in pasture forages on horse metabolism. B. McIntosh*[1,2], D. Kronfeld[1], R. Geor[1], W. Staniar[1], P. Harris[3], and D. Ward[4], [1]*Virginia Polytechnic Institute and State University*, *Blacksburg*, [2]*Blue Seal Feeds Inc.*, *Londonderry, NH*, [3]*WALTHAM Centre for Pet Nutrition*, *Melton Mowbray, United Kingdom*, [4]*Rutgers University*, *Bridgeton, NJ*.

Nonstructural carbohydrates (NSC), which includes sugars, starches and fructans in pasture forages undergo circadian and seasonal variation which have direct effects on metabolism in grazing horses. Increased intake of NSC is implicated in the development of digestive and metabolic disorders, such as laminitis. A series of 36 h studies in Virginia examined circadian and seasonal variability in forage NSC content and circulating plasma glucose and insulin in grazing horses (n=10) compared to control horses fed timothy/alfalfa hay (n=4). The unequal group size was accounted for in the statistical analyses which included two-way repeated measures ANOVA with post tests, linear regression, and correlations. We found that circadian and seasonal patterns in forage NSC content in a 5-ha mixed grass/legume pasture were associated with environmental conditions, and NSC was in turn associated with plasma insulin and glucose in the grazing horses. Forage NSC content was highest in April (20.3±0.4 %DM) ($P < 0.001$) and was attributed mostly to sugars (18.9±0.4 %DM), including glucose, sucrose and fructose. Circadian patterns in forage NSC were evident in April, May, and August, with the most distinct pattern found in April with peaks in the afternoon (22.2±0.3 %DM) and nadirs in the morning (17.1±0.3 %DM). Plasma insulin was higher in grazing horses than control horses in April (54.6±9.9μIU/mL) and May (20.8±3.4μIU/mL) ($P < 0.05$). In grazing horses, plasma insulin was significantly correlated with forage NSC and sugar in April, May, and January. In grazing horses, plasma glucose was higher in April than all months except for May, and plasma glucose was higher in grazing horses compared to controls in April. These studies identified a potential link between forage NSC content and alterations in glucose and insulin characteristics that may increase risk of laminitis via exacerbation of insulin resistance. Management strategies to decrease intakes of pasture NSC by horses at risk of developing metabolic disorders are needed.

Key Words: Horse, Forage, Metabolism