moisture retention. Meat quality traits and microbial analyses from inclusion of LM inhibitors alone and in combination in the formulation of turkey deli loaves and beef franks will be presented.

Key Words: Functional Ingredients in Further Processing, Listera Growth Inhibitors, Food Safety

248 Impact of marination and deboning time on poultry meat tenderness. C. M. Owens*, *University of Arkansas*, *Fayetteville*.

Marination is an increasing popular trend in the meat industry for meat quality enhancement. Sodium chloride or salt, an important component of the meat marinade solution, helps solubilize proteins to increase water-holding capacity, improves tenderness, and enhances flavor. However, there are concerns of increased sodium intake in consumer diets. Studies were conducted to determine the effectiveness of marination and level of salt concentration to improve tenderness and enhance juiciness and flavor of broiler breast fillets. In these studies, fillets were deboned at various times postmortem ranging from 0.25h to 24h postmortem and marinated with varying levels of salt (0 to 1.25%) salt (NaCl) and 0.45% phosphate in a 15% marinade solution. Cooked fillets were subjected to instrumental analyses including the MORS test for assessing tenderness as well as sensory analysis using hedonic and Just About Right scales to assess tenderness, juiciness, saltiness and flavor. All marinated treatments were significantly more tender than non-marinated controls. Using instrumental tenderness analysis, salt concentrations above 1.0% were more tender than other treatments; however, all marinated treatments were significantly more tender than non-marinated controls. Using the hedonic scale, there was no significant difference in marinated products (0.5% to 1.25% salt) for overall impression, flavor, and texture. However, fillets with the higher concentrations of salt (1% and 1.25%) resulted in high percentages of consumers who considered the product too salty. For juiciness and tenderness, a large percentage (>70%) of the consumers considered 0.5%, 0.75%, and 1% treatments to be just about right. The results indicate that marination of pre-rigor deboned meat is effective in producing product similar to marinated post-rigor deboned meat. While meat marinated with higher concentrations of salt may give more desirable levels of tenderness, there is a greater chance of a negative impact on flavor and saltiness in the end product. Furthermore, it is possible to marinate with lower concentrations of salt while still improving meat characteristics and keeping ingredient costs low.

Key Words: Marination, Salt, Tenderness

249 Characterizing the safety and quality of fresh beef cuts subjected to deep muscle marination. M. M. Brashears*, J. C. Brooks, and M. F. Miller, *Texas Tech University*, *Lubbock*.

In May 2005, USDA-FSIS published notice that establishments who produce non-intact beef products must reassess their HACCP plans because outbreaks indicate that *Escherichia coli* O157:H7 is a hazard reasonably likely to occur in these products. USDA-FSIS suggested that processors might also consider applying an allowed antimicrobial agent to the surface of the product prior to processing or tenderization. Research has shown that lactic acid bacteria (LAB) and acidified sodium chlorite (ASC) are effective at reducing pathogens in ground beef. Lactic acid spray (LAS) has also been shown to reduce pathogens when applied to beef trim. Information on the use of these interventions and their effect on the palatability of whole muscle beef products intended for enhancement is limited. Therefore, the objectives of this research were to validate the effectiveness of LAB, ASC, and LAS in reducing *Escherichia coli* O157:H7 and *Salmonella* spp in multi-needle injected and marinated beef strip loins, and to determine their effect on meat palatability. Boneless beef strip loins were transported to Texas Tech University and inoculated with a cocktail mixture of streptomycin-resistant *Escherichia coli* O157:H7. Loins were inoculated at a 10^4 level (high) to determine actual log reductions and a 10^1 level (low) to mimic potential industry levels. One-half of the low and high level inoculated samples were treated with lactic acid bacteria (1×10^9 cfu/g meat), acidified sodium chlorite (1000 ppm) or lactic acid (3%). Control and inoculated loins were vacuum packaged and stored at 2 to 4 °C in the dark for 14 and 21 d. Following the aging period, the remaining low and high level inoculated subprimals were treated with LAB, ASC or LAS. All subprimals were then injected with a brine solution formulated to provide 0.3% sodium chloride, 0.35% phosphate and 0.05% rosemary extract in the final product at a 10% injection level. Additional loins were transported to a separate facility and subjected to the same treatments, storage and enhancement prior to trained sensory panel assessment of flavor, flavor intensity, juiciness and tenderness.

Key Words: Marinate, Beef, Safety

Food Safety - Livestock and Poultry: Cattle and Swine

250 Beef traceability using a dual system based on electronic identification and molecular markers from farm to retailer. J. J. Ghirardi, G. Caja*, M. Hernández-Jover, N. Jiménez, and A. Sánchez, *Universitat Autònoma de Barcelona*, *Bellaterra, Spain*.

A total of 3,657 crossbreed calves on 14 farms in Barcelona and Lleida (Spain) were used to evaluate the efficiency of a dual traceability system based on electronic identification (e-ID), by radiofrequency boluses containing low-frequency (LF; 134.2 kHz) half-duplex 32 mm transponders (Rumitag, Barcelona, Spain), and genetic fingerprinting (DNA) by analyzing specific sets of bovine microsatellites (n = 12) from frozen biopsies. The e-ID of calves was done during the milk-feeding period using either B1 (75 g; 21 × 68 mm; n = 3,057) or B2 (73 g; 18 × 77 mm; n = 600) boluses. High-frequency (HF; 13.56 MHz) read-write inlay transponder (45 × 76 mm; Tiris, Almelo, Holland) were used for transferring e-ID to the carcasses. All animals had official ear tags (OE) made of polyurethane (2 flaps; 10.1 g; Azasa-Allflex, Madrid, Spain). Ear biopsies were taken using biopsying ear tags: E1 (n = 2,562; Biopsytec, Rheinbach, Germany) and E2 (n = 1,095; TypiFix, IDnostic, Switzerland). Calves were intensively fed and slaughtered before 1 yr of age. Blank read-write HF labels were attached to the calf shank before hide removal. Bolus LF code was transferred to the carcass by automatic reading of LF boluses and recording of HF shank labels. Carcass samples (n = 900) were taken using biopsy tubes (n = 357; Biopsytec) or plastic sticks (n = 543; Identigen, Dublin, Irland). Additionally, E2 sticks were used to sample 30 meat cuts randomly taken in nine butcheries. On-farm traceability

for B1 (99.8%) and B2 (100%) was greater than for all ear tags (OE, 96.4%; E1, 8.4%; and, E2, 99.1%). On-line readings failed in 37% of cases at the start of the experiment, suggesting the need for modifications of the equipment to adapt to the abattoir conditions. Automatic reading and label recording in the rest of the animals (n = 2,058) was 98.6% successful. When tracing back carcasses to calves in 176 random samples, five pairs (2.8%) did not match, showing 97.2% calf traceability. Retailer matching was 100%. In conclusion, the e-ID and DNA tracing system showed > 97% traceability efficiency. Improvement in label design and reading equipment is needed in practice.

Key Words: Traceability, Transponder, Microsatellites

251 Siderophore receptor/porin protein (SRP®) vaccine used as pre-harvest control of *E. coli* O157:H7 in feedlot cattle. A. B. Thornton*[1], D. U. Thomson[1], K. F. Lechtenberg[2], G. H. Loneragan[3], and T. G. Nagaraja[1], [1]*Kansas State University*, *Manhattan*, [2]*Midwest Veterinary Services*, *Oakland, Nebraska*, [3]*West Texas A&M University*, *Canyon*.

Yearling steers and heifers (n = 1,252) were used to examine effects of Siderophore receptor/porin protein (SRP) *E. coli* O157:H7 vaccine on fecal prevalence of *E. coli* O157:H7 and feedlot performance. Cattle were randomly assigned to one of two treatments: 1) SRP *E. coli* O157:H7 vaccination or 2) placebo control. Randomization was conducted by alternately assigning five cattle to a treatment until cattle within purchase group were assigned (two treatments; 10 replications; 20 pens). Cattle were fed a typical High Plains diet (74.5% DM; 58 % corn, 30 % corn gluten feed, 6.5% alfalfa hay, and supplement). Cattle were vaccinated with the assigned treatment on d-0 and d-21. Rectal fecal samples were collected on d-0. Pen floor samples were collected on d-21, d-35, and d-70. Simulated slaughter was performed on d-85 to evaluate prevalence of *E. coli* O157:H7 in rectal fecal samples, rectoanal mucosal swab samples, and hide swab samples. All samples were transported to the laboratory for *E. coli* O157:H7 isolation. Cattle were individually weighed on d-0, d-21, and d-85. Pen feed delivery was recorded daily and orts were removed and weighed. No vaccine by day interaction was observed. Cattle vaccinated with SRP had a reduced (P = .04) fecal shedding of *E. coli* O157 by 54% relative to those receiving placebo. Cattle vaccinated with SRP had a lower prevalence of *E. coli* O157:H7 in their feces (P = .01) and on their hides (P = .06) than those vaccinated with placebo at simulated slaughter. Vaccinating cattle with SRP *E. coli* O157:H7 had no effect (P > .05) on ADG or DMI. The *E. coli* O157:H7 SRP vaccine reduced prevalence of *E. coli* O157:H7 in feedlot cattle and could be used as a possible strategy to reduce the risk of foodborne illness associated with beef.

Key Words: Vaccine, *E. coli* O157:H7, Feedlot Cattle

252 Effects of distiller's grain on fecal prevalence and in vitro growth of *E. coli* O157. M. E. Jacob*, J. T. Fox, J. S. Drouillard, and T. G. Nagaraja, *Kansas State University*, *Manhattan*.

The objective was to determine effects of feeding distiller's grains (DG) on prevalence of *E. coli* O157 in feedlot cattle. Cattle (n = 379) were allocated to one of three treatments: steam-flaked corn (SFC) with 5% corn silage and 25% dried DG (DDG), SFC with 15% corn silage and 25% DDG, or SFC with 15% corn silage and no DDG. Cattle were fed in pens containing 14 to 16 animals, with 8 pens (replications) per treatment. From each pen, 10 pen-floor fecal samples were collected weekly for 12 wk and were cultured for *E. coli* O157. Cattle fed DDG with 5 or 15% corn silage had a higher (P < 0.05) prevalence of *E. coli* O157 than those fed no DDG. No differences (P > 0.05) in prevalence were observed between cattle fed DDG and either 5 or 15% corn silage. A second study was conducted to assess effects of DDG on growth of *E. coli* O157 in vitro (i.e., fermentations with ruminal or fecal microbial inoculum). Rumen fluid and feces were collected from two ruminally-cannulated steers fed high-grain diets containing 0 or 25% DDG. Fermentations (in duplicates) with 0, 0.5, 1, or 2 g of DDG (substrate) were repeated on 2 d. Each fermentation was inoculated with naladixic acid resistant (*Nal*^{R}) *E. coli* O157 and samples were removed at 0, 6, 12, and 24 h to determine concentrations of *Nal*^{R} *E. coli* O157. At 24 h, fecal fermentations with 2 g DDG had higher (P < 0.05) concentrations of *Nal*^{R} *E. coli* O157 than 0 , 0.5, or 1 g DDG. In fermentations with ruminal inoculum, the 24 h incubations with 0.5 g DDG had a higher (P < 0.05) concentration of *Nal*^{R} *E. coli* O157 than 0 , 1, or 2 g DDG. Fermentations with 0 g DDG had higher (P < 0.05) *Nal*^{R} *E. coli* O157 concentrations than 1 or 2 g DDG. The source of ruminal or fecal microbial inoculum (DDG or no DDG) had no effect on concentrations of *E. coli* O157. The results suggested inclusion of DDG in high-grain diets to have the potential to increase fecal shedding of *E. coli* O157.

Key Words: *E. coli* O157, Distiller's Grains, Cattle

253 Growth response of *Salmonella enterica* Typhimurium in co-culture with ruminal bacterium *Streptococcus bovis* is affected by time of inoculation and carbohydrate substrate. P. Herrera* and S. Ricke, *Center for Food Safety and Microbiology, IFSE, University of Arkansas*, *Fayetteville, AR*.

The purpose of this study was to characterize growth of *Salmonella enterica* Typhimurium (ST) in the presence of the ruminal bacteria *Streptococcus bovis* (SB) under different incubation conditions. The growth of SB and ST plateaued after 9 h when incubated independently at 37°C. When SB and ST were co-cultured, 15.8 ± .02% growth inhibition was observed for ST. When inoculation of ST in the co-culture was delayed, ST growth was inhibited by 41.5 ± .02% for ST inoculation at 6 h and by 27.8 ± .06 % for ST inoculation at 12 h. A decrease in the pH of SB culture media from 7.1 to 6.2 was observed at 6 h of growth. To determine the effects of alternate carbon substrates, sugars were added to the media (1 mL of 180 mg/mL w/v solution to 9 mL media). Glucose produced a marked decrease in pH of SB culture media (7.0 vs 4.9 over 6 h) whereas fructooligosaccharide (FOS) did not (6.8 vs 6.0 after 6 h) when compared to SB cultures in an unmodified media. Addition of glucose to the culture media resulted in a 2.5 fold increase in SB when compared with SB cultures grown in an unmodified media or media amended with FOS. Supplementing the media with either sugar enhanced growth of ST. Cultures of ST supplemented with glucose reached the upper limit of detection of our assay within 4 h. When both bacteria were inoculated simultaneously in media containing either sugar, no ST growth inhibition was observed. No growth inhibition of ST in glucose-supplemented media was seen when a 6 h elapsed between the initial SB inoculation and subsequent inoculation with ST. However in similar trials with FOS amended media, a 68.1 ± 0.01% inhibition in ST growth occurred. These findings

suggest that carbon substrate and time of inoculation influence ST growth in the presence of actively growing SB.

Key Words: *Salmonella*, *Streptococcus bovis*, Bacterial Growth

254 Effects of acid marinades on *Listeria monocytogenes*, shelf life, meat quality, and consumer acceptability of beef frankfurters. J. W. J. Bowers* and S. R. McKee, *Auburn University*, *Auburn, AL*.

Listeria monocytogenes (LM) is estimated to cause over 2,500 cases of illness and 500 deaths in the U.S. annually. To control LM, acid marinades are being used in formulation of ready-to-eat meat products as *Listeria* inhibitors. Sodium diacetate, sodium/potassium lactate and sodium citrate are approved inhibitors that can be used alone or in combination to prevent growth of LM, but their effects on product quality need to be determined. The objective was to determine effects of marinade ingredients including: No inhibitors (NI), sodium lactate at 2% (SL); potassium lactate at 2% (PL); sodium citrate at 0.75% (SC); sodium lactate at 2% with sodium diacetate at 0.25% (SLSD) on growth of LM in beef frankfurters stored at 4°C and 15°C. Beef frankfurters (60 per treatment) were inoculated (10^6 cfu/mL) with a streptomycin-resistant (1,500 µg/mL) strain of LM and were sampled once per week for LM growth. Additional beef frankfurters prepared with inhibitors (60 per treatment) were used for shelf life determination (up to 12 wk; stored at 4°C and 15°C) and for meat quality measurements. Shelf life was evaluated each week using a consumer sensory panel combined with microbial analyses. Objective meat quality parameters measured included pH, total moisture, and springiness. At 15°C, all treatments except SLSD reached spoilage. All treatments stored at 4°C resisted spoilage until wk 3; however, the SLSD destroyed product quality. Microbial analyses of inoculated beef frankfurters suggested that all products containing inhibitors delayed growth of LM when compared with the control (NI) until wk 3. Inoculated treatments stored at 15°C were uncountable at wk 3 due to overgrowth of molds. Overall, LM growth was delayed with inclusion of inhibitors but this benefit was not observed with higher storage temperatures (15°C). Additionally, sodium diacetate at 0.25% may decrease protein functionality and consumer acceptability of beef frankfurters, but it restricts growth of spoilage bacteria.

Key Words: *Listeria monocytogenes*, Acid Marinades, Beef Frankfurters

255 Implementation of a dual electronic identification and molecular markers system for tracing pigs. M. Hernández-Jover[1], G. Caja*[1], J. J. Ghirardi[1], J. Reixach[2], and A. Sánchez[1], [1]*Universitat Autònoma de Barcelona*, *Bellaterra, Spain*, [2]*Selección Batallé*, *Riudarenes, Girona, Spain*.

A total of 2,108 Duroc male piglets were used to validate a dual traceability system based on the use of electronic identification (e-ID) and on the use of DNA fingerprinting by analysis of a specific set of porcine microsatellites (n = 12). Piglets were identified (9 ± 3 d of age) using 32 mm half-duplex injectable transponders (Rumitag, Barcelona, Spain) injected intraperitoneally (IP). A single-shot injector with interchangeable needles (23 × 4.6 mm) was used. Needles were immersed in iodine solution before each injection, and injection area was disinfected by spraying an antibiotic. Piglets were also ear tagged and biopsied at the moment of IP injection, using two types of biopsying ear tags (E1 [n = 979; Biopsytec, Rheinbach, Germany] and E2 [n = 1,129; TypiFix, IDnostic, Switzerland]). Grow-fattening up to 120 kg BW (7 mo of age) was conducted under intensive conditions. Harvesting was done in a high throughput abattoir (500 pigs/h) and pig e-ID was automatically transferred to carcasses, using a high frequency inlay label (45 × 76 mm; Tiris, Almelo, Holland). Samples were taken from carcasses using biopsy tubes (Biopsytec) and stored frozen until DNA analysis. On-farm losses of IP transponders were 0.6%. Most of them (58.3%) occurred during wk 1 after injection. Ear tag losses were 0.7 and 0.4% for E1 and E2, respectively. On-farm traceability results were 99.3, 99.6, and 99.4% for E1, E2, and IP, respectively. Ear tag losses during harvesting (E1 [35.3%] and E2 [37.6%]) indicated their use for traceability is unsuitable. No losses of IP were reported during harvesting. Automatic transfer of e-ID to carcasses was 95.1% successful. Final pig traceability from birth to slaughter was 94.5% for IP transponders. A total of 100 pairs of samples (5%) were analyzed for DNA auditing. Results did not match in four pairs of samples, showing 96% traceability. In conclusion, the use of intraperitoneally injected transponders improved pig traceability. Nevertheless, automatic transfer of e-ID to carcasses needs to be improved in order to provide a more reliable technique for the swine industry.

Key Words: Traceability, Transponder, Fingerprinting

256 Split marketing: A risk factor for *Salmonella* in market pigs. 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*.

This study was designed to determine if split marketing affects *Salmonella* prevalence in market pigs. This was achieved by comparing *Salmonella* prevalence in the first group of pigs selected for slaughter (first pull) versus the last group of pigs selected for slaughter (close out) from typical commercial finishing barns containing approximately 1,000 animals. Nine paired observations were included in the study. Each paired sampling consisted in matched groups of pigs from the same barn as the first pull and the close out, with a 4-wk interval between groups. From each group, individual fecal (n = 45) and meat samples (n = 50) were collected, on-farm and at slaughter, respectively. In the laboratory, fecal samples were selectively enriched, and analyzed for the presence of *Salmonella* by a direct (antigen-capture) ELISA. Meat samples were kept frozen until processed, and then thawed, when the resulting liquid (meat juice) was collected and analyzed for the presence of antibodies against *Salmonella* by an indirect ELISA. All lots of finishing pigs studied were positive for *Salmonella*, based on sampling from both, first pull and close out. In seven of the nine lots studied (77.8%), an increase ($P < 0.05$) in *Salmonella* prevalence was observed based on both bacteriological and serological analysis. Overall, there was 9.3% increase ($P < 0.05$) in bacteriological prevalence and 25.1% increase ($P < 0.05$) in serological prevalence from first pull to close out market groups. The results showed that a significant increase of *Salmonella* prevalence to occur between the first and the last group of pigs from a finishing barn shipped to slaughter. Thus, split marketing affects prevalence of *Salmonella* in market pigs with close out market groups constituting a higher risk for *Salmonella* contamination of pork products.

Key Words: Swine, *Salmonella*, Food safety

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