

SMALL RUMINANT

0724 Rumen microbial species associated with feed efficiency in sheep fed a forage-based diet.

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The rumen microbial ecosystem plays a dominant role in fermentation of consumed feeds in ruminant livestock and therefore influences the efficiency of feed utilization. Determination of rumen microbial species important to feed efficiency may ultimately lead to development of technologies to aid producers in selecting more efficient seedstock. Our objective was to identify rumen microbial species associated with variation in feed efficiency in lambs fed a forage-based diet. Briefly, growing wethers (initial BW = 51.5 ± 1.7 kg; $n = 38$) of Rambouillet, Suffolk, and Hampshire breed backgrounds were administered a forage-based pelleted diet and individual feed intake was collected using a GrowSafe system over a 7-wk period. Residual feed intake (RFI) was estimated for each lamb and subsequently used to rank lambs for feed efficiency. The most efficient (low-RFI; $n = 4$) and the least efficient (high-RFI; $n = 4$) lambs were selected for sequencing of DNA isolated from respective rumen fluid samples. Pair-end reads were filtered, quality trimmed and compared with a database of known 16S rDNA genes. Operational taxonomic units (OTU) were defined as sequence clusters with ≥ 97% identity. Abundance of 28 OTUs differed ($P < 0.05$) with feed efficiency status, with the majority ($n = 18$) of these being *Prevotella* species. Of particular interest were *Ruminococcus flavefaciens* and *Ruminococcus albus*, two predominant rumen fibrolytic bacterial species involved in cellulose digestion. Unexpectedly, these two bacteria were in greater ($P < 0.001$) abundance in high-RFI lambs (3.2-fold greater for *R. flavefaciens*; 1.5-fold greater for *R. albus*). This may be due to differences in diet quality and form (i.e., pelleted), as previous studies have indicated that changes in abundance of such fibrolytic species can be associated with diet differences. Data from this study suggest that rumen microbial populations differ with feed efficiency status; however, certain species may be prone to variations in diet quality and presentation.

Key Words: feed efficiency, microbes, rumen, sheep

0725 Rationing late gestation ewes using a net energy or metabolisable energy rationing system: Impacts on ewe and lamb performance.

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Ewe body reserves, colostrum, and milk production, lamb birth weight, lamb vigour and lamb survival are influenced by late gestation nutrition. Net energy (NE) rationing systems are purported to more accurately define the requirements of the animal relative to metabolisable energy (ME) systems. The objective of this study was to investigate the effect of rationing ewes to ME or NE during late gestation on ewe and lamb performance. Twenty-six twin-bearing ewes ($n = 13$) were rationed to either 100% of ME (MER) or 100% of NE requirements (NER) for the final 5 wk of gestation. Ewes were rationed on an individual basis and offered a grass silage diet supplemented with concentrate to 100% of requirements. Ewe live weight and body condition score (BCS) were recorded at Day 85 of gestation, parturition, 5 wk postpartum and weaning (14 wk postpartum). Colostrum production was measured at 1, 10, and 18 h postpartum along with lamb colostrum intake. Lamb live weights were collected at birth, weekly during the first 7 wk postpartum and fortnightly from 9 wk postpartum to slaughter. Lamb growth rate was calculated by regression of live weight on time. Carcass weight was obtained at slaughter and kill-out percentage calculated. Statistical analysis was performed using generalised least square means in SAS v9.4. Energy intake expressed as both NE and ME was lower for the MER ewes ($P < 0.01$). Live weight loss of MER ewes during the same period was higher ($P < 0.05$) reflecting their lower energy intake. No difference was observed in ewe live weight loss from parturition to weaning ($P > 0.05$). Ewe BCS did not differ between treatments throughout the study ($P > 0.05$). Total colostrum production to 18 h postpartum tended to be greater for NER ewes ($P < 0.1$). This difference was not mirrored in lamb colostrum intake to 18 h postpartum ($P > 0.05$) indicating both treatments produced sufficient colostrum to meet requirements. Lamb live weight, growth rate, carcass weight, and kill-out percentage did not differ between treatments ($P > 0.05$). This uniformity in postnatal performance appears to have resulted from increased body reserve mobilization by the MER ewes, thus countering potential negative effects of the reduced energy intake. For ewes in the correct BCS in late gestation, either the NE or ME rationing system used in this study are appropriate for dietary formulation.

Key Words: energy postpartum performance

0726 Determining growth performance implications on meat goat kids fed soybean hull or corn-based pelleted diets. A. C. Vesco*, C. K. Jones, L. C. Grimes, T. H. Fountain, B. R. Faris, and A. K. Sexten, *Kansas State University, Manhattan.*

The meat goat industry is rapidly expanding, yet there is limited knowledge on feeding kids to market weight, providing opportunities for research in this area. This study investigates the option of an alternative energy source to corn for a growing kid ration. Eighty-four Boer × Spanish kids (30 kg; 8 mo) were used in a randomized complete block design to determine the effects of a soybean hull based diet on growth performance and blood serum mineral composition. Kids were blocked by sex and randomly assigned to one of two treatments: 1) corn and soybean meal based pellet (Corn) or 2) soybean hull and soybean meal based pellet (Soyhull). Kids were allowed a 10-d pen and diet adaptation period. Feed was delivered once daily at 0600 with daily intake adjustments to maintain ad libitum intake of pellets and brome hay for 70 d. There were 7 pens per treatment with six head per pen; sex was divided equally between treatments. Weights for all kids were recorded every 2 wk. Pellet and hay grab samples were collected daily, composited by 2-wk period, oven-dried, and ground to be analyzed for DM, Ash, N, NDF, and ADF. Blood samples were taken on d 0, d 28, and d 70, and serum was analyzed for levels of Na, K, Cl, Ca, P, and Mg. Initial body weight was similar ($P = 0.24$) between treatments. Body weights remained similar ($P \geq 0.12$) between treatments for each weigh date for the entire 70-d feeding period. Overall gain and ADG were likewise not different ($P \geq 0.18$) between treatments. Kids consuming the Soyhull diet had greater ($P < 0.001$) DMI throughout the study compared to kids consuming the Corn diet. Overall DMI averaged $1.37 \text{ kg} \cdot \text{hd}^{-1} \cdot \text{d}^{-1}$ vs. $1.06 \text{ kg} \cdot \text{hd}^{-1} \cdot \text{d}^{-1}$ for the kids consuming the Soyhull and Corn diets, respectively. No differences ($P \geq 0.44$) were observed for blood serum mineral composition between treatments. Based on these results soybean hulls are a viable alternative feed source to corn for growing meat goats when protein requirements are met.

Key Words: meat goat, soybean hulls, mineral

0727 Early supplementation of alfalfa to starter diets improves the pre- and post-weaning performance of lambs. B. Yang*, B. He¹, S. S. Wang¹, J. X. Liu², and J. K. Wang¹, ¹*Institute of Dairy Science, Zhejiang University, Hangzhou, China,* ²*Zhejiang University, Hangzhou, China.*

The objective of this study was to determine the effects of alfalfa supplementation to starter diets of artificial reared lambs on pre- and post-weaning performance. Twelve Hu lambs at the age of 10 d, with an initial body weight of 3.87 ± 0.564 (SD) kg, were randomly divided into two equal groups and allocated

to two dietary treatments: cereal feeding (CF, milk replacer, and pelleted starter) and forage feeding (FF, milk replacer, pelleted starter, and alfalfa). All animals were fed the same milk replacer at 880 mL/d on d 1, and milk replacer was then reduced at a rate of 30 mL/d until d 24. The lambs were then fed at 180 mL milk replacer per day from d 24 to 28 (weaning). During this period, the pelleted starter (16.8% NDF) was offered to all animals, but alfalfa (38.6% NDF) was only to group FF ad libitum. After weaning, the animals were offered with 300 g/d cereal powder (21.5% NDF) and had free access to alfalfa. Feed offered and refused, and body weights were recorded for two consecutive days at 0800 every week during the 4-wk feeding trial after weaning. On d 57, blood samples were obtained to determine serum concentration of glucose and β -hydroxybutyrate. After slaughtered, rumen pH and weight of carcass and forestomachs were determined immediately. Average alfalfa intake was 118 g/d before weaning, and 345 and 289 g/d ($P = 0.365$) for FF and CF after weaning, respectively. Starter intake was not affected by early supplementation of alfalfa ($P = 0.195$), but intake of cereal powder tended to be higher in FF group than in CF (258 vs. 209 g/d, $P = 0.051$). Average daily gain was 69% ($P = 0.001$) and 12% ($P = 0.006$) higher in FF than that in CF before and after weaning, respectively. Forage feeding before weaning resulted in higher carcass weight compared to cereal feeding (5.76 vs. 4.57 kg, $P = 0.005$). No significant difference was observed in abomasum and reticulum weight between CF and FF ($P > 0.05$), but rumen weight tended to be higher in FF than in CF (292 vs. 247 g, $P = 0.059$), and omasum weight increased by 24% ($P < 0.05$) in FF than in CF. Differences in rumen pH and serum concentration of glucose and β -hydroxybutyrate were not observed between two treatments ($P > 0.05$). From the present study, it is inferred that supplementation of alfalfa in starter diets is beneficial to growth performance and forestomach development in weaned lambs.

Key Words: alfalfa, lamb, starter

0728 Performance and reproductive measurements of Katahdin ewes and fall-calving Angus cows grazing stockpiled toxic tall fescue under a mixed or sequential grazing scheme: 2-yr summary.

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Multi-species grazing has several potential advantages and ultimately may improve performance for one or both species. With renewed interest in multi-species grazing, there is value in evaluating mixed versus sequential grazing schemes. However, there has been little research evaluating hair sheep and cattle grazing stockpiled toxic tall fescue (E+) either mixed or sequentially. Our objectives were to determine performance and reproductive measurements of Katahdin ewes and fall-

calving Angus cows grazing stockpiled E+ under a mixed or sequential grazing scheme. Katahdin ewes ($n = 81$; 27 ± 3.6 kg initial BW; 3 ± 0.07 initial BCS) and fall-calving Angus cows ($n = 40$; 471 ± 23.5 kg initial BW; 6 ± 0.6 initial BCS) were stratified by BW and age within species and were allocated randomly to one of four groups representing two treatments: 1) mixed grazing (four replications) or 2) sequential grazing (four replications). In the sequential grazing treatment, cows always followed ewes. Each group had access to a 0.68-ha paddock and were rotated based on available forage. A total of 8.16 ha were grazed over 40 d for all groups. Initial weight and BCS from ewes and cows did not differ ($P \geq 0.83$) across treatments. Average daily gain, total gain, end weight, and end BCS from ewes and cows did not differ ($P \geq 0.35$) across treatments. Cow pregnancy rate, calf birth date, and calf birth weight did not differ ($P \geq 0.56$) across treatments. Calf start weight, end weight, average daily gain, and total gain did not differ ($P \geq 0.26$) across treatments. Ewe pregnancy rate, lamb birth date, and lamb counts did not differ ($P \geq 0.11$) across treatments. A treatment \times sex interaction tendency ($P = 0.06$) was detected for lamb birth weight and a treatment \times sex interaction ($P = 0.01$) was detected for lamb weaning weight. Mixed grazing ram lambs tended to be heavier at birth compared with mixed grazing ewe lambs, and mixed grazing ram lambs were heavier compared with sequentially grazed ram lambs at weaning. Therefore, utilizing sequential grazing with Katahdin ewes and fall-calving Angus cows may not increase performance or reproductive measurements; thus, managing a multi-species, sequential grazing regime relative to mixed grazing may not be warranted.

Key Words: fescue, mixed grazing, sequential grazing

0729 Reducing dietary cation-anion difference increased gastrointestinal calcium binding proteins-D9k expression level of transition goats for plasma calcium absorption. W. X. Wu* and Y. Yang, *College of Animal Science, Guizhou University, Guiyang, China.*

The mechanism to explain why reducing dietary cation-anion difference (DCAD, mEq/kg DM) could prevent hypocalcemia in transition dairy cows remains unclear. Calcium binding protein-9 kDa (CaBP-D9k) was the main biological factor highly associated with Ca absorption in the gastrointestinal tract (GIT; rumen, reticulum, omasum, abomasum, jejunum, ileum, colon, cecum, and rectum). This study was conducted to clarify the mechanism by investigating the influence of varying DCAD level on CaBP-D9k expression level in GIT and plasma Ca concentration of transition goats, which had similar anatomy and metabolic process relative to dairy cows. Twenty-seven transition goats were randomly allocated to one of three treatments and were fed one of three diets with varying DCAD levels: +300 (HD), +150 (CON), and -50 (LD), respectively. Goats were bled on d 10 before lambing, d 0 for lambing, and

d 3 after lambing to determine plasma ions contents; and were slaughtered to detect the CaBP-D9k expression level, respectively. Dry matter intake was unaffected by DCAD treatments ($P > 0.05$). Urine pH was reduced with decreasing DCAD level ($P < 0.05$). The LD diet level induced higher plasma Cl^- and Ca^{2+} concentrations relative to CON and HD diets ($P < 0.05$). Greater CaBP-D9k mRNA expression level was observed in whole GIT of LD-fed goats except for ileum, cecum, and rectum compared with goats in two other groups ($P < 0.05$). Moreover, feeding LD diet moderated the decline of CaBP-D9k mRNA expression level in abomasum, jejunum, and colon after lambing ($P < 0.05$). In conclusion, reducing DCAD could up-regulate CaBP-D9k expression level in stomach, proximal intestine and colon, which was accompanied with higher plasma Ca concentration for transition goats. This result would be the possible mechanism of low DCAD enhancing blood Ca homeostasis during periparturient period to prevent hypocalcemia of transition dairy animals.

Key Words: dietary cation-anion difference, calcium binding protein-9 kDa, transition goats

0730 Hematological and serum chemical profiles in lambs fed sericea lespedeza. M. Acharya*¹,

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Sericea lespedeza (SL) is plant-grazed or fed to small ruminants for parasite control. Condensed tannins in SL may lead to unintended consequences such as changes in production. The objective was to determine the effect of SL with or without molybdenum supplementation on changes in BW, hematology, and serum chemistry in lambs. Thirty Katahdin or Katahdin \times Romanov lambs weaned in May (84 ± 1.5 d of age; 27 ± 1.1 kg) were blocked by BW, breed, and parasite resistance, and assigned randomly to be fed 900 g of 75% alfalfa pellets (CON; $n = 10$) or 75% SL pellets ($n = 20$) for 104 d. Supplements were isonitrogenous, isocaloric, and similar in trace mineral concentrations. Within the SL group, half of the lambs were administered ~ 70 mg/Lamb of sodium molybdate daily to ameliorate a reduction in serum molybdenum (SL+MO) observed previously. Lamb BW was obtained and blood collected every 14 d to determine hematological and serum chemical profiles. Data were analyzed using a mixed model with repeated measures. Mean packed cell volume, number of platelets, lymphocytes, monocytes, eosinophils, and hemoglobin were similar among diets ($P > 0.10$). White blood cell count ($P < 0.05$) and number of neutrophils ($P < 0.001$) were greater in CON than SL lambs.

Red blood cell count was greater in CON and SL+MO than SL lambs ($P < 0.03$). However, mean corpuscular volume ($P < 0.08$) and corpuscular hemoglobin ($P < 0.06$) tended to be greater in SL than CON lambs ($P < 0.08$). Serum concentrations of albumin ($P < 0.001$) and aspartate aminotransferase ($P < 0.003$) were lower in SL than CON lambs. Serum concentrations of creatinine were greater for CON and SL+MO than SL lambs ($P < 0.04$), and total protein was greater in CON and SL than SL+MO lambs ($P < 0.001$). Serum concentrations of uric acid were similar among diets ($P > 0.10$). There was a treatment \times time interaction for BUN in that values were greater in CON lambs between d 14 and 42 than SL fed lambs, and otherwise similar ($P < 0.001$). Lambs BW was similar among diets ($P = 0.11$). Since most hematological and serum chemical profiles were within a normal range, any changes in animal health or production associated with condensed tannins in SL observed in previous studies likely were not related to these variables examined.

Key Words: hematology, lambs, molybdenum, sericea lespedeza

0731 Comparison of white blood cell phagocytic efficiency in two genotypes of Katahdin sheep.

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The production and deployment of phagocytic cells are central functions of the hematopoietic system. Neutrophils, the most abundant type of white blood cells in mammals, are an essential part of the innate immunity. The objective of this study is to compare the phagocytic efficiency of neutrophils in two genotypes of footrot resistant and susceptible Katahdin sheep. Fourteen Katahdin ewes, seven in each of high resistant footrot gene markers (HR) and low resistance (LR) were selected and blood sampled, weekly for 8 wk. Blood samples were collected in vacutainer tubes (2×10 mL) contained EDTA. Blood smears were made on glass slides to determine the percentage of neutrophils in whole blood. Neutrophils were isolated using a Percoll gradient technique, and stained with 0.8 mM Trypan Blue to determine the percentage of viable cells. Subsequently, 1 mL of freshly isolated neutrophils was inoculated with 1 mL of *Lactobacillus casei* (2×10^7 /mL) in PBS and incubated with rotation at 37°C for three time periods at 20 min, 40 min and 1 h. Control samples were incubated in PBS with neutrophils alone to account for bacterial growth during the assay. At specific intervals of 20, 40, and 60 min the number of surviving bacteria in the supernatant (extracellular) was determined by culture plate colony counting to estimate the phagocytic efficiency of the neutrophils. The data were analyzed by using mixed model procedures of SAS and $P < 0.05$ was considered as significant. The average viability of extracted neutrophils was 95% in each individual specimen at inoculation. The percentage of neutrophils in

whole blood was not significantly different ($P = 0.57$) in HR vs. LR genotypes. There were no significant differences ($P = 0.63$) among the numbers of bacterial colonies after addition of neutrophil and incubation periods in HR vs. LR genotypes. The number of bacterial colonies significantly decreased after 20, 40, and 60 min of incubation ($P < 0.001$). The interaction of time and gene marker groups was not significant ($P = 0.23$). No bacterial colony growth was observed in control samples. There is no difference in phagocytic efficiency of the white blood cells in footrot resistant and susceptible genotypes of Katahdin sheep.

Key Words: neutrophil, phagocytic efficiency, sheep

0732 Short-term effects of divergent selection for parasite resistance in F₁ Kiko \times Boer doe progeny.

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Future prospects of the goat industry appear optimistic as demand for goat meat has consistently overwhelmed domestic supply in recent years. However, parasitism is arguably the most serious economic restriction limiting goat production in the United States. One approach to combat internal parasites is utilizing the host animal's natural immunity in a selection program to increase the level of parasite resistance in a herd. The objective of this study was to evaluate the short-term effects of divergent selection for parasite resistance in F₁ Kiko \times Boer doe progeny. First generation Kiko \times Boer progeny ($n = 41$) from two lines of does selected for high resistance to internal parasites (HL; $n = 22$) or low resistance to internal parasites (LL; $n = 19$) were compared. Fecal egg counts (FEC), FAMACHA scores (FAM), and packed cell volumes (PCV) were measured at weaning, 28 d post-weaning, pre-breeding, during breeding, and at end of breeding. No differences ($P \geq 0.12$) were found between HL and LL for FEC, FAM, or PCV at all measurement times except for PCV at 28 d post-weaning, which tended ($P = 0.09$) to be higher for HL vs. LL. Consequently, number of times dewormed and survival rates were similar ($P \geq 0.19$) between lines. Reproductive rate, litter size, kidding date, and F₂ kid birth weight did not differ ($P \geq 0.23$) across lines. A sex effect ($P \leq 0.04$) was detected, with males weighing more vs. female kids. Correlations between FEC and FAM were significant ($P < 0.05$) and positive for LL ($R = 0.26$), but were insignificant ($P = 0.74$) for HL; correlations between FEC and PCV were significant ($P < 0.01$) and negative for LL ($R = -0.30$), but were insignificant ($P = 0.25$) for HL; correlations between FAM and PCV were significant ($P < 0.001$) and negative for LL ($R = -0.46$) and tended to be significant ($P = 0.10$) and negative for HL ($R = -0.16$). Short-term effects of divergent selection for parasite resistance re-

sulted in minimal differences in parasitism, survival rate, and reproductive performance. Associations between indicators of parasitism were moderate in some cases, but varied by doe line. This research is part of an ongoing long-term selection project for parasite resistance.

Key Words: divergent selection, F_1 Kiko \times Boer, parasite resistance

0733 Milk production and characteristics of lactation curve in dairy sheep and their crosses in Mexico.

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The use of appropriate genotypes for milk production in dairy sheep herds allows maximizing the use of natural resources, obtain adequate milk yields and promotes their economic viability. The aim of this study was analyze the milk yield and the characteristics of the lactation curve of sheep of local breeds, dairy breeds and their crosses. Lactation records used were obtained from dairy herd located in Mexico. We used 863 weekly milk records of sheep of six genotypes: 12 East Friesian (EF), 12 Native (Nt), 6 EF1/2Native1/2 (EF50Nt50), 16 EF3/4Native1/4 (EF75Nt25), 15 Suffolk1/2Native1/2 (SF50Nt50), and 8 Corriedale sheep. Sheep were milked mechanically, and milk production was recording weekly from the fourth day after lambing; the first 60 d of lactation, sheep were milked once a day with a partial weaning, lambs were separated from sheep during the night and milked in the morning (0800). At d 60 post-lambing, full weaning was complete, and sheep began to be milked twice daily (0800 and 1800). For analysis of the lactation curve and their parameters, we used the Wood (WD) model: $Y_t = at^b e^{-ct}$. Where Y is the milk production at time t , and a , b , and c are the parameters describing the curve shape, these were estimated individually for each lactation using a nonlinear regression. Using WD model, we calculated total milk yield observed (TMY^{obs}) and adjusted to 180 d (TMY¹⁸⁰), peak yield (PY), peak time (PT), and persistence (Per). Genotype influenced significantly ($P < 0.05$) in the TMY^{obs} and TMY¹⁸⁰, where EF50Nt50 sheep had the best performance. With respect to parameters of WD model, differences between genotypes were observed only in the parameter b , being higher ($P < 0.05$) in SF50Nt50, EF50Nt50, and EF sheep. PY was higher ($P < 0.05$) in sheep EF50Nt50, also PY showing a positive correlation with TMY ($r = 0.582$) and negative with Per ($r = -0.176$). PT was positively correlated ($P < 0.01$) with TMY¹⁸⁰ and Per ($r = 0.479$ and 0.525 respectively). There was a positive effect on the TMY^{obs}, TMY¹⁸⁰ and shape of the lactation curve in EF50Nt50 sheep. EF and EF75Nt25 sheep

showed lower TMY compared with EF50Nt50, who show the best productive performance, which may be associated with better adaptation to the agroclimatic conditions and the lower adaptation to the environmental conditions of animals with a higher proportion of EF genes. The crossing EF50Nt50 is a viable option in dairy sheep herds with similar climatic conditions to those of the present study.

Key Words: dairy sheep, crossbreeding

0734 Goats of Arkansas and Missouri: A production survey.

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A survey of goat producers in Arkansas and Missouri was conducted to assess the current state of the goat industry. Production data from 206 producers (response rate of 21%) were examined to determine areas needed for education, future research, and outreach activities. An introductory email was sent to 1087 producers before the survey followed by reminder email sent after the survey was delivered. Undeliverable and inapplicable targets were removed from the original listing. Producer addresses and emails were obtained from registry organizations and extension personnel. The survey was conducted primarily as Web-based via email through Survey Monkey with a hard-copy option. Survey questions focused on farm characteristics, farm management protocols, product marketing, informational sources, and personal demographics. Of the 206 responding farms, 30.6% were from Arkansas and 69.4% from Missouri, with 24.7% raising both meat and dairy, 41.8% raising only dairy, and 33.5% only meat goats. An estimated 57% of producers were between the ages of 41 and 60. Respondents reported a source of income (58.9%) and personal consumption (54.3%) as major incentives to raise goats. Over 94.3% of respondents use anthelmintics as a part of their deworming program, whereas 38.3% use culling and animal selection. Years of experience influenced deworming strategies ($P \leq 0.05$). Educational attainment ($P \leq 0.05$) also influenced producer willingness to use services provided by extension and university personnel. Producers with less than 5 yr of experience use other goat producers ($P \leq 0.05$) for information; whereas, producers between 61 and 70 and 71 and 80 are more likely ($P \leq 0.05$) to use group meetings as an informational sources. Dairy goat producers are less likely to use farm visits ($P \leq 0.05$), farm field days ($P \leq 0.05$), group meetings ($P \leq 0.05$), and university/extension staff ($P \leq 0.05$) as informational sources than meat goat producers. Dairy producers are also more likely ($P \leq 0.05$) to use the internet as a source of information and consider food safety regulations a limiting factor in selling their products ($P \leq 0.05$). Based on our results, producers need to lower their reliance

on anthelmintics to reduce internal parasite resistance and rely more on more sustainable production practices. Understanding how age, education level, years involved, and farm type influence the type of resources used to gain further knowledge of new practices and informational sources could allow the development of education programs more suited for the pop-

ulation. Awareness of current production practices will assist educators, extension, and industry collaborators in conducting appropriate educational programming.

Key Words: goats, survey, production