493 ASAS Centennial Presentation: Impacts of animal science research on U.S. sheep production and predictions for the future. C. J. Lupton*, *Texas AgriLife Research*, *San Angelo, TX.*

A 100 yr ago, there were over 48 million sheep in the U.S. In 1910, they were valued at $4/hd with 43% of income from sale of sheep, lambs, and meat and 57% from wool. Great fluctuations in this ratio over the years have challenged breeder and researcher alike. By 2007, sheep numbers had declined to 6.2 million with the average sheep shearing 3.4 kg of wool (< 10% of income), 0.2 kg more than in 1909 but 0.5 kg less than fleeces in the mid 1950s. Sheep operations have declined by more than 170,000 in the past 40 yr. A cursory examination of this information might lead one to conclude that animal science research has made little impact on sheep production in the U.S. On the contrary, lamb crops in the new millennium (range = 109 to 115%) are greater than those recorded in the 1920s (85 to 89%) and dressed lamb weights increased from 18 to 32 kg from 1940 to present. In the past century, researchers conducted thousands of investigations with progress reported in new, existing and cross breed evaluations, quantitative and molecular genetics, selection, nutrition, fiber, meat, hides, milk, growth, physiology, reproduction, endocrinology, management, behavior, the environment, disease, pharmacology, toxicology, and range, pasture, and forage utilization such that a vast amount of new information was accrued. Our understanding of sheep has benefited also from research conducted on other species, and vice versa. Many factors that have contributed to decline in the sheep industry are not easily influenced by academic research (e.g., low per capita consumption of lamb meat, predation, reluctance to adopt new technology, cost and availability of labor with sheep-related skills, and fewer young people pursuing careers in agriculture). The size of the U.S. sheep industry is expected to remain stable with possible slow growth in the foreseeable future. To remain profitable, producers will take advantage of new (or previously unused) technology, the public's desire for things natural, domestic niche and international fiber markets, and the sheep's ability to control noxious weeds and thrive in sub-optimal ecosystems.

Key Words: Impact, Research, Sheep

494 Impact of grazing systems on management of gastrointestinal nematodes in weaned lambs in Arkansas. J. M. Burke*[1], J. E. Miller[2], and T. H. Terrill[3], [1]*USDA, ARS*, *Booneville, AR*, [2]*Louisiana State University*, *Baton Rouge*, [3]*Fort Valley State University*, *Fort Valley, GA*.

Gastrointestinal nematode (GIN) control for 'natural' or organic lamb production is needed, especially where *Haemonchus contortus* is prevalent. Objective was to determine the impact of grazing systems on GIN infection of weaned lambs. Naturally infected Katahdin lambs (120 d of age) were randomly assigned to graze 1) continuous bermudagrass (CB; n = 14), 2) rotationally grazed bermudagrass, moved every 3.5 d and returned to original plot 35 d later (RB; n = 14), 3) continuous tall fescue (TF; n = 7), or 4) continuous sericea lespedeza (SL; n = 19). In late summer, all lambs were supplemented with 500 g corn/SBM because of declining body condition. Fecal egg counts (FEC) and packed cell volume (PCV) were determined weekly and BW monthly. Individuals were dewormed with 0.5 g copper oxide wire particles when FAMACHA score increased to ≥ 3. FEC peaked on first d of grazing (D 0) and was lowest in SL lambs by D 28 (grazing system × day, $P < 0.001$). TF lambs became the most anemic by D 21 (grazing system × day, $P < 0.001$). Between 0 and 3 dewormings/lamb were necessary and there tended to be fewer SL lambs and more TF and CB lambs dewormed by D 105 (CB, 1.69; RB, 1.27; TF, 1.66; SL, 0.85 ± 0.26; $P < 0.10$). Worm free tracer lambs were introduced to CB (n = 6) and RB (n = 8) plots following the last rotation to determine worm burdens after 20 d grazing. Abomasal worm burden was greater in RB than CB tracer lambs ($P < 0.05$), but intestinal worm numbers were similar. Greater number of abomasal worms may occur because RB lambs required less deworming than CB lambs leading to more eggs on the RB plots. TF lambs gained no BW while grazing TF and BW never reached that of other lambs (grazing system × day, $P < 0.001$). BW of SL lambs was lower on D 28 than CB and RB lambs. In summary, the TF grazing system was unacceptable for GIN control or weight gain. The SL grazing system was best for GIN control, but did not persist during drought. Weight gains were similar between CB and RB groups of lambs, but CB lambs required more deworming. This research was funded by CSREES, IOP Grant #2005-51300-02392.

Key Words: Gastrointestinal Nematodes, Grazing Systems, Lambs

495 Nutrient digestibility of straw-based diets by sheep. C. Anderson Alexander-Huerta, A. S. Juárez-Reyes*, M. Murillo-Ortíz, R. Montoya-Escalante, G. Nevárez-Carrasco, and M. A. Cerrillo-Soto, *Universidad Juárez del Estado de Durango*, *Durango, Dgo. México*.

A study was conducted to estimate the effect of oat and bean straw-based diets on nutrient digestibility in sheep. Five criollo sheep (45 ± 4.5 kg BW) fitted with ruminal and duodenal cannulae were fed the experimental diets consisting of 70% oat straw (T1); 40% oat straw (T2), 70% bean straw (T3); 40% bean straw (T4); and a control with 20% oat straw and 20% bean straw (T5). Other ingredients were alfalfa hay, ground corn and cotton seed meal. Diets were isonitrogenous (11% CP). Each period of the trial consisted of a 14-day adjustment and a 5-day collection phases. Mordanted fiber was used as internal marker, it was dosed through the rumen cannula, whereas purines were utilized for estimation of microbial efficiency. Data were analyzed using PROC GLM for a 5 x 5 Latin Square experimental design. Intakes of OM were similar (P>0.05) accros diets. However, sheep fed T3 consumed higher amounts (P<0.05) of NDF and ADF. Apparent OM ruminal digestion was different across diets (P<0.05). Sheep fed T2 registered higher OM rumen digestibilities. Feeding T3 and T5 to sheep, however, resulted in lower OM digestibilities. No differences (P>0.05) in apparent ruminal NDF and ADF digestibilities were registered. Total tract digestibilities of OM, NDF or ADF were not affected by diets. Similarly, no effect was observed in N intakes. Nonetheless, differences were registered in microbial efficiency. Sheep fed T5 registered the highest efficiencies. Data evidenced the potential of diets based on bean and oat straw when other sources of food are scarce.

Table 1.

Item	T1	T2	T3	T4	T5	Mean	SEM	P
Intake, g/d								
OM	894	982	1029	1032	1000	987	105	0.28
NDF	468	450	563	498	481	492	52	0.04
ADF	288	244	385	308	301	305	33	0.001
Apparent ruminal digestion,								
OM	54	60	49	56	49	54	5.9	0.05
NDF	53	57	44	49	45	50	8.2	0.15
ADF	44	42	28	31	30	35	10.1	0.09
Apparent total tract digestion, %								
OM	73	77	70	76	73	74	4.7	0.22
NDF	62	62	56	63	58	60	6.4	0.38
ADF	51	45	50	50	46	48	7.7	0.74
N Intake, g/d	14	16	16	17	17	16	1.7	0.16
Microbial efficiency*	14	12	16	17	19	15	3.0	0.03

* g bacterial-N/kg OM trully digested in the rumen

Key Words: Digestibility, Straw, Sheep

496 WITHDRAWN

497 Ability of ewes to rebreed while lactating in spring. K. M. Jordan*, J. W. Knight, and D. R. Notter, *Virginia Polytechnic Institute and State University*, *Blacksburg*.

These studies were conducted to investigate the ability of a sheep population genetically selected since 1988 to lamb in fall and containing 50% Dorset, 25% Rambouillet, and 25% Finnsheep breeding to breed while lactating during anestrus. Raddled rams were introduced to lactating ewes, and percentages of ewes marked, diagnosed pregnant by ultrasonography, and lambing were recorded. In April 2006, January-lambing ewes of the selected line were compared to St. Croix ewes, a hair sheep breed often considered to be lowly seasonal. Rams were introduced at an average of 61 d (range 46-79 d) postpartum. By 21 and 42 d after ram introduction, more ewes in the selected population than St. Croix ewes were marked by rams (42 vs 0% and 71 vs 35%, respectively, P<0.05). However, the overall percentage of ewes exposed to rams for 42 d that subsequently lambed (41%) did not differ between breeds even though ewes in the selected line had been marked earlier and in greater numbers than St. Croix ewes. Thus, significant fetal loss appears to have occurred in ewes in the selected line. A second study in May 2007 used ewes that lambed in March and averaged 43 d (range 33-52 d) postpartum to study fetal loss in 35 ewes in the selected line that were bred while lactating during what is generally believed to be the deepest part of anestrus. Of the 18 ewes that were marked, 13 were diagnosed pregnant 120 d after ram introduction. Ten ewes maintained their pregnancy through September but only seven produced lambs of normal birth weight while three produced underweight, premature lambs that did not survive. Therefore, even though more than 51% of ewes were marked, only 20% of ewes gave birth to viable lambs. These studies indicate that ewes in the selected line are able to become pregnant while lactating during anestrus, but are often unable to carry the lambs to term. Although the selected ewes appear to be well suited to accelerated lambing systems involving 7 to 8-mo lambing intervals, reduction of lambing intervals to 6 to 7-mo appears to have detrimental effects on fetal survival.

Key Words: Sheep, Fertility, Season

498 Lactational and reproductive effects of melatonin in lactating dairy ewes mated during spring. G. Caja*, A. A. K. Salama, S. Carné, E. Albanell, X. Such, and R. Casals, *Universitat Autònoma de Barcelona*, *Bellaterra, Barcelona, Spain*.

A total of 110 dairy ewes of 2 breeds differing in milk yield and milk composition (Manchega, n = 57; Lacaune, n = 53) were used to evaluate the lactational and reproductive effects of using s.c. implants of 18 mg melatonin (Melovine, Ceva Salud Animal, Barcelona, Spain) for improving fertility at ram mating during lactation in spring. Ewes were switched from a seasonal lambing system (December) to an out-of-season lambing system (September) to obtain greater lamb and milk market prices under Spanish conditions. Lambs were weaned from their mothers in January (35 d of age), and the ewes were machine milked thereafter (wk 5 to 30 of lactation). At spring (April 21) lactating ewes were assigned to 4 balanced groups according to breed to which the experimental treatments were randomly applied: Control (untreated; n = 55) and **MEL** (melatonin implanted 42 d before mating; n = 55). Intensive management and feeding (ad libitum forage and 0.4 to 0.8 kg concentrate according to requirements) was maintained throughout lactation and ewes improved BCS during matting. Rams of each breed were also treated with 3 implants of MEL at d 60 before mating and were joined to ewes (1 ram/12 to 15 ewes) for 90 d (June 2 to August 31). Milking was maintained throughout the matting period and ewes were dried off during July. Milk yield was recorded weekly and sampling for milk composition was done fortnightly. Results showed no effects of MEL on milk yield ($P > 0.05$) and milk fat and protein contents ($P > 0.05$) for both breeds. Both MEL and control ewes showed good ability for out-of-season breeding during milking, and lambing was concentrated in 21 and 25 d, respectively. On average, fertility ($P < 0.05$) and prolificacy ($P = 0.12$) increased as a result of the MEL treatment (Table 1). Lamb birth weight (3.72 kg BW, on average) and mortality rate (4.2%, on average) did not vary. In conclusion, use of melatonin in dairy ewes was effective to improve reproductive performance in out-of-season conditions, without effects on milk yield and milk composition.

Table 1. Performance of dairy ewes according to breed and treatment during lactation

	Manchega		Lacaune	
Item	Control	Melatonin	Control	Melatonin
Ewes, No	28	29	27	26
Fertility, %	85.7[c]	100[a]	92.6[b]	100[a]
Prolificacy, lamb/ewe	1.75	1.83	1.92	2.00
Milk yield, L[1]	117 ± 13	120 ± 12	237 ± 15	227 ± 13
Milk fat, %	8.67 ± 0.21	8.90 ± 0.19	7.01 ± 0.13	7.22 ± 0.11
Milk protein, %	5.61 ± 0.08	5.71± 0.07	5.08 ± 0.05	5.13 ± 0.06

[1]For 147 d of milking excluding lamb sucked milk; [a,b,c]$P < 0.05$

Key Words: Melatonin, Breeding, Dairy Sheep

499 Effect of protein degradability on milk production of dairy ewes. C. M. Mikolayunas*, L. E. Armentano, and D. L. Thomas, *University of Wisconsin*, *Madison*.

To study the effect of protein degradability on milk yield and milk urea N (MUN) concentration in dairy ewes, three diets were formulated of similar energy density but varying dietary concentrations of rumen-degradable protein (RDP) and rumen-undegradable protein (RUP): 12% RDP and 6% RUP (12-6), 14% RDP and 4% RUP (14-4), 12% RDP and 4% RUP (12-4) (% of dry matter). Eighteen multiparous dairy ewes in mid-lactation were assigned to 2 blocks of 9 ewes each according to milk yield and randomly assigned within block to 6 pens of 3 ewes each. Dietary treatments sequences were balanced for carryover in two 3 × 3 Latin Squares and applied to pens for 2 wk. Milk yield was measured during the final 8 milkings (4 d) and milk composition (% fat, % protein and MUN) was determined on compiled samples (morning and evening milking) from the final 2 d of each period. Pen dry matter intake was measured on the final 4 d of each period. Pen data were analyzed using the PROC MIXED model of SAS. The model included square, treatment, period x square and treatment x square, and the random effect was pen (square). There was an interaction ($P < 0.01$) of block by diet for dry matter intake and milk, fat, and protein yield. Across both squares, milk yield was greater ($P < 0.01$) for the 12-6 treatment compared to the 14-4 and 12-4 treatments (2.02 vs. 1.79 and 1.79 kg/d, respectively). Milk fat yield was greater ($P < 0.05$) for the 12-6 treatment compared to the 14-4 and 12-4 treatments (122.1 vs. 110.7 and 108.0 g/d, respectively), and milk protein yield was greater ($P < 0.05$) for the 12-6 treatment compared to the 14-4 and 12-4 treatments (94.9 vs. 85.6 and 85.0 g/d, respectively). Milk urea N concentration was greater ($P < 0.05$) for the 12-6 and 14-4 treatments compared to the 12-4 treatment (26.33 and 27.39 vs. 23.43 mg/dL, respectively). There was no effect of dietary treatment on dry matter intake. The results indicate a positive effect of RUP on milk yield. Higher dietary crude protein concentration resulted in higher milk urea excretion, regardless of protein degradability.

Key Words: Dairy Sheep, Protein Degradability, Milk Urea Nitrogen

500 Implementing electronic identification for milk recording in dairy sheep. A. Ait-Saidi, A. A. K. Salama, S. Carné*, and G. Caja, *Universitat Autónoma de Barcelona*, *Bellaterra, Barcelona, Spain*.

Dairy ewes (n = 48) were used to compare manual (**M**) vs. semi-automated (**SA**) systems for identification (**ID**) and milk recording (MEC Project AGL-2007-64541). Ewes were grouped according to milking frequency (once daily, 0.98 ± 0.05 L/d; twice daily, 1.45 ± 0.06 L/d). The M system used visual ID, on-paper data recording, and manual data uploading to a computer. The SA system used e-ID (20 g ceramic boluses, containing 32 mm HDX transponders) by a hand-held reader and manual data recording by reader keyboard (milk yield and observations), and data was automatically uploaded to a computer by Blue-tooth connection. Data were collected for groups of 2 × 12 ewes for 10 test-days of each system and milking frequency over a period of 70 d. Time data was converted to a decimal scale. Dynamic reading efficiency measured at the milking parlor entrance (speed, 1 ewe/s) using a stationary transceiver with a frame antenna was 100%. Milk recording time varied according to milking frequency and milk recording system, being greater in M (0.49 to 0.56 min/ewe; $P < 0.001$) than in SA (0.40 to 0.47 min/ewe; $P < 0.001$), and correlated with ewe milk yield during the experiment (R^2=0.62). Average data transfer time per batch of 24 ewes was greater for M (0.13 ± 0.01 min/ewe) than SA (0.03 ± 0.01 min/ewe). Total milk recording time was greater in M (0.62 to 0.70 min/ewe; $P < 0.001$) than in SA (0.43 to 0.50 min/ewe; $P < 0.001$). Time for transferring data to the computer of groups of 24 ewes, was 3.27 ± 0.09 and 0.78 ± 0.03 min for M and SA, respectively. Increase for the next additional 24 ewes in SA was only 0.19 ± 0.01 min. Data errors were only found for the M system (3.6%). Differences in labor time between M and SA increased with number of ewes processed on the same test-day (4.6 to 218.6 min for 24 to 1,008 ewes, respectively) and reduction in milk recording cost ranged from $US 1.0 to 49.3 (0.8 to 36.5 Euros), being able to pay for the extra costs of e-ID. In conclusion, both labor cost and data errors showed the benefits of using electronic identification for milk recording in sheep, the benefit being greater with complete (am and pm) milk recording and in larger flocks.

Key Words: Transponder, Milk Recording, Dairy Sheep