Goat Newsletter

Cooperative Extension Program
Langston University

The Newsletter of the E (Kika) de la Garza American Institute for Goat Research *Summer 2018*

From the Director's Desk

Summer in Oklahoma is hot but that is not news for those of you who live here. The summer is also the time that our scientists share research findings at the annual meeting of the American Society of Animal Science. This year we traveled to Vancouver, BC to attend the meetings so we had a respite from the Oklahoma heat for a few days. Regardless of the heat, activities at the Institute for Goat Research go forward.

On the research front, Drs. **Luana Ribeiro**, **Ryszard Puchala**, and **Arthur Goetsch** are busy with an experiment entitled " Effects of restricted periods of diet access on feed intake, behavior, and performance of lactating Alpine goats consuming diets differing in forage and fiber levels." Previous studies at the Institute have shown that goats spend considerably more time eating than is necessary. Thus, there is potential to improve at least efficiency of production by restricting feeder and diet access to increase rate of intake and to lessen wasteful energy usage.

Recently, Dr. **Abdelhafid Keli** from the National Agricultural University of Morocco returned for a short sabbatical as a Fulbright Fellow on a project entitled "Utilization of saline drinking water and low-quality forage by small ruminants." In 2010, Dr. **Keli** was here for a short sabbatical and results of that stay can be found in a scientific paper entitled "Effects of pasture access regime on performance, grazing behavior, and energy utilization by Alpine goats in early and mid-lactation" published in Small Ruminant Research in 2017. We welcome back Dr. **Keli** and look forward to reporting on his newest research project.

On the extension front, Drs. **Terry Gipson** and **Roger Merkel** and Messrs. **Micah Anderson** and **Dwight Guy** have been busy with an extension project involving goats, hair sheep, and hoop houses. Mr. **Anderson** joined Langston University earlier this year coming to us from the Oklahoma Department of Agriculture, Food and Forestry, where he had many years of experience in community gardening, hoop houses, and plasticulture. Mr. **Guy** is our USDA Liaison and has worked with the Institute on several projects. You can read more about this project on page 3.

On the international front, Dr. **Terry Gipson** traveled to Egerton University in Kenya on a project to explore techniques to simplify artificial insemination in goats using fresh semen and vaginal deposit. You can read more about the Egerton project on page 4. Dr. **Gipson** also traveled to Namibia to work with the Cheetah Conservation Foundation (CCF), that is working with farmers to encourage conservation via diversified agriculture, e.g. goats. Dr. **Gipson** conducted training in artificial insemination in goats for CCF staff and local goat farmers.

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Good Goat Neighbors from the North, Aye ?

Mses. Rain Maki, Katie Normet, and Jackie Shaw from Ontario, Canada spent Monday, April 30 at the Institute. Ms. Maki is a student at the University of Waterloo School of Architecture, working on her Masters degree in Architecture. She is also a dairy goat farmer, currently milking about 450 goats. Her ambition is to combine her passions for architecture and agriculture, specifically dairy goats, for her thesis project. This ambition has led her to design a dairy goat research facility for Ontario. There are at present no such goat facilities in Ontario or Canada. Ms. Normet and her employee, Ms. Shaw, run "River's Edge Goat Dairy" near Arthur, Ontario. They produce and market many different types of dairy goat products, including milk, yogurt, artisan cheeses, handmade soap, and pasture meats.

Mses. Normet and Shaw attended the cheese workshop conducted by Dr. Steve Zeng on Friday, April 27 before the annual Goat Field Day. All three participated in the Goat Field Day on April 28. Sunday they visited a dairy farm near Wichita Falls, Texas. The three spent the whole day at the Institute on Monday. It started with introductions, then discussions of research and farm management procedures with various faculty and staff members, and ended with a tour of the research farm facilities. Follow-up descriptions and answers to many questions were given by farm and research personnel. During the concluding final discussion with Drs. Sahlu and Goetsch, Ms. Normet provided samples of some of their "Farmstead Artisan Cheeses, and there were invitations to visit Ontario and their farms in the future.

Dr. Art Goetsch, Ms. Rain Maki, Ms. Katie Normet, Ms. Jackie Shaw, and Dr. Tilahun Sahlu (l to r).

Goats, Sheep, and Hoop Houses

What do goats, hair sheep, and hoop houses have in common? They are part of a Langston University project entitled "Empowering Community-Based Organizations in Rural Oklahoma to Increase Knowledge Base, Enterprise Productivity, and Economic Sustainability" and funded by the 1890 Universities Foundation.

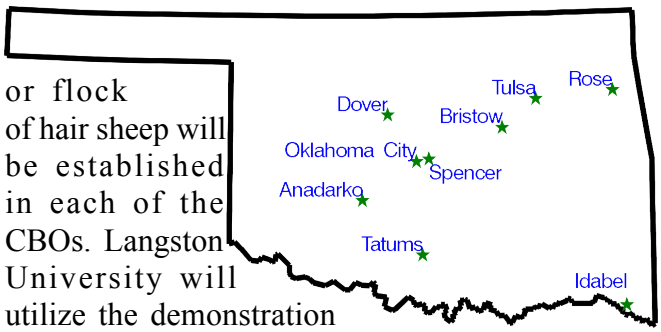
Hoop house. photo: Noble Research Institute

For many years, Langston University implemented an Outreach and Assistance for Socially Disadvantaged Farmers and Ranchers and Veteran Farmers and Ranchers Program (also known as the 2501 Program). Under the 2501 program, Langston University employed seven Outreach Specialists, thereby establishing a presence in nearly half of Oklahoma's 77 counties. However, funding for the 2501 program ceased in 2013 and, unfortunately, the local presence ceased as well. Although not nearly the scale of the previous 2501 program, this new project will reestablish a Langston University presence in some of the previously served communities.

The objectives of this project are to 1) reestablish and build new partnerships with Community-Based Organizations (CBOs) serving limited resource, veteran and beginning farmers and to establish baseline CBO data for small ruminant and/or vegetable production; 2) provide technical assistance to support production and management of sustainable small ruminant enterprises as well as for intensive vegetable production systems for CBOs serving limited resource producers; and 3) provide a series of training workshops to inform CBOs of USDA Rural Development (RD) and other programs that will help to enhance enterprise profitability and sustainability.

Under objective 1, relationships have been established with nine CBOs located in the map below.

Under objective 2, a small hoop house for community garden growth or a small herd of meat goats or flock of hair sheep will be established in each of the CBOs. Langston University will utilize the demonstration hoop house or herds/flocks as teaching tools. On a bimonthly basis, specialists from Langston University will visit each CBO and offer hands-on training. This will be a long-term relationship between Langston University and the CBOs.



Under objective 3, Langston University and USDA RD will hold two meetings this summer at each CBO. These meetings will highlight USDA RD programs, record keeping, and other related topics.

One of the meetings was highlighted by an Oklahoma City television station (http://m.news9.com/story.aspx?story=38440997&catId=112032).

Boer meat goats.

Young hair sheep rams.

Simplified AI

The goal of goat producers worldwide is to raise healthy, more productive animals. Improving productivity can be accomplished via selection, that is, the animals with the best "set" of genes are the progenitors of future generations. In many parts of the world, artificial insemination (AI) is the technology used to disseminate elite sires with these best sets of genes. The current state-of-the-AI-industry utilizes frozen semen, which requires extensive animal handling facilities, state-of-the-art laboratories, highly skilled technicians, specialized equipment, and an unforgiving cold-chain requiring freezing media (e.g., liquid nitrogen). Laparoscopic or transcervical insemination is the standard AI procedure, which also requires skilled technicians. However, simplified AI techniques such as fresh semen and vaginal deposit have received attention lately.

In 2017, Langston University was awarded a USDA Foreign Agriculture Service (FAS) Scientific Cooperation Research Program grant to investigate simplified AI techniques in goats using fresh semen and vaginal insemination. This project builds upon the successful partnership between Langston University and Egerton University established by the U.S./Africa/India Tri-Lateral University Partnership project (2012-2014) and on past USDA FAS Borlaug Fellowships.

Dr. Malanda instructs trainees in the use of an artificial vagina.

In June of 2018, Dr. Terry Gipson travelled to Egerton University to implement the objectives of the project. Dr. Joab Malanda of Egerton University and Dr. Gipson worked together to establish a small semen evaluation laboratory consisting of a digital microscope and a spectrophotometer. The gold standard for determining sperm concentration is using a hemocytometer and a microscope but it is a time-consuming and tedious task. The spectrophotometer uses light traveling through a solution and measures the amount of absorption by the solution. Using both instruments, Drs. Malanda and Gipson were able to establish standard curves that will render a quick and easy determination of sperm concentration. This is important for one of the objectives of the project, which is to determine the effect of total number of sperm on non-return to estrus (NRE) and pregnancy rate (PR). Typically, a dose (straw) contains 200 to 250 million motile sperm. This project will utilize two total number of sperm in a single dose: 300 million sperm or 500 million sperm. Using the spectrophotometer, the standard curve, and the total volume of the ejaculate, Egerton technicians will be able to divide the ejaculate into the appropriate number of dose containing the desired number of sperm.

Under the watchful eye of Dr. Malanda, trainees learn proper dilution for determining sperm concentration.

A second objective of the project is to

investigate the effect of management (breed, age, parity, body condition, etc.) on success rate (NRE and PR). This project will utilize the goat herd at Egerton University and will recruit goat producers in the community surrounding Egerton University as collaborators. From previous studies, factors that have affected success rate for insemination in goats are age of female, body condition score, month of AI, and buck.

Trainees learn to determine sperm concentration.

The final objective of the project is to investigate the effect of volume on success rate (NRE and PR).Typically a dose is ½ cc in the United States and ¼ cc in Europe; however, both sizes of straws generally contain 200 to 250 million sperm. Therefore, the concentration is different for the two straws. The effect of the total volume is unknown in goats; however, volume has affected semen quality in swine and in dogs. An ejaculate will be extended to total number of sperm, as defined in the first objective, per ½ cc or 1 cc of skim milk extender and stored in a labeled collection tube in a refrigerator. A summary of treatments are presented in Table 1. Extended, fresh semen can remain viable for 24 hours, if refrigerated. Therefore, a schedule will be established to collect various bucks to ensure that fresh semen is always available. A buck will be collected no more than three times per week and most buck will be collected only twice per week.

Table 1. Treatments to be used for testing simplified AI.

Treatment	Total number of spermatozoa (million)	Total volume
A	300	½ cc
B	300	1 cc
C	500	½ cc
D	500	1 cc

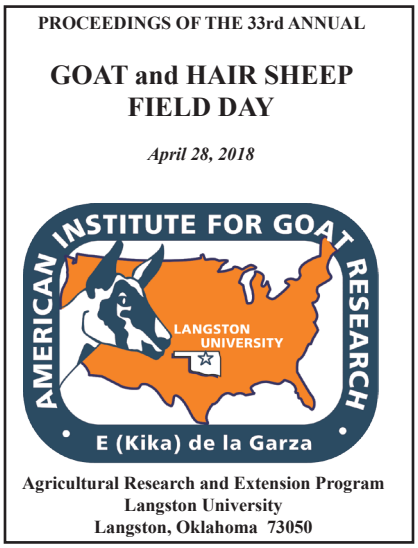
At Egerton University, farm staff will check heat daily, once early in the morning and once in late afternoon. If females are determined to be in estrus, then the appropriate insemination treatment will be deposited vaginally. The procedure will be that if a female comes into estrus in the morning, she will be inseminated that afternoon. If she comes into estrus in the afternoon, she will be inseminated the next morning. In the community surrounding Egerton University, local farmers will receive basic training on estrus detection. The simplified artificial insemination tool consists of a 3 cc syringe and an AI sheath cut to 7 inches and is used to deposit the extended semen vaginally. Langston University hopes this simplified AI technique will allow Egerton University to disseminate valuable genetics to surrounding farmers all the while maintaining vital biosecurity.

Trainees with Dr. Malanda on left and Dr. Gipson on right.

Goat and Hair Sheep Field Day: 2018

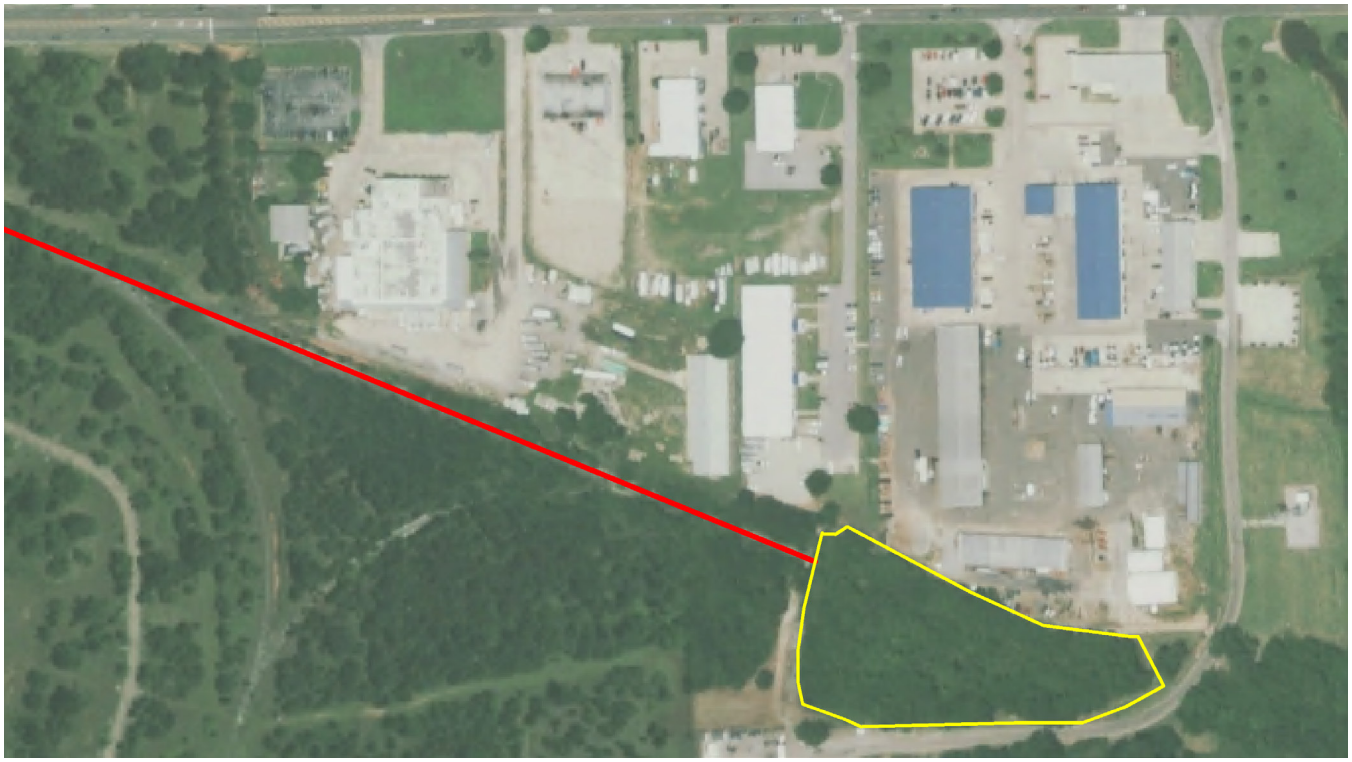
As mentioned earlier in this newsletter, the Goat and Hair Sheep Field Day was held in April. This year's theme was **Preventing Production Losses** and our featured speakers were Mr. Matthew Branan from the USDA National Animal Health Monitoring System, Dr. David Pugh from Auburn University, and Dr. Jim Keen from the University of Nebraska. Every Field Day, we publish a bound proceedings with papers from the invited speakers and several other topics.

If you were not able to attend the 2018 Goat and Hair Sheep Field Day but would like a copy of the proceedings, please email Dr. Terry Gipson at terry.gipson@langston.edu with your mailing address and he will send you a free copy. Please hurry because copies are limited. Alternatively, you can access the complete proceedings at http://goats.langston.edu/Annual Goat Field Day.



I've been working on the railroad ...

In 2017, Langston University partnered with the Wastewater Treatment Plant (WTP) in Midwest City, OK to use goats to clear unwanted brush and vegetation that is a constant maintenance problem for the WTP. The goats have done such a wonderful job at the WTP that the city of Midwest City has requested more assistance. This summer, a second group of weed munchers will be employed to assist with vegetation control starting in a 3-acre parcel at the Public Works Administration building (yellow polygon in the photo below) and then working on the abandoned railroad right-of-way that runs between Midwest City and Oklahoma City (red line running to the northwest). This project is partially funded by the USDA Renewable Resources Extension Act.



Research Spotlight

Genomic Evidence for Parasite Resistance.

The objective of this study was to identify single nucleotide polymorphisms (SNPs) associated to internal parasite resistance in sheep and goats exposed to *Haemonchus contortus*, using a targeted sequencing approach. Three different breeds of sheep (St. Croix, Katahdin and Dorper) and goats (Spanish, Boer and Kiko) were used in this study. Dewormed male animals were infected with 10,000 L_3 *H. contortus* larvae. Average daily gain (ADG), fecal egg count (FEC) and packed cell volume (PCV) were measured in all animals. The level of IgA, IgM and IgG was measured from serum samples at 21 days post-infection. The targeted sequencing panel included 100 candidate genes for immune response against *H. contortus*. SNPs were discarded if call rate < 95% and minor allele frequency ≤0.01. A mixed model was used to analyze the response variables and included the identity by state matrix. Year and breed were included as fixed effects. Bonferroni correction was used to control for multiple testing. Thirty two SNPs on chromosomes 1, 2, 5, 11, 12, 16, 17, 19, 24 and X were significant for different traits. For ADG and IgM, significant SNPs were located within IL12RB2 and IL4R genes. For IgA and PCV, one common peak was significant to both traits in exon 2 of CD86 gene. For IgG and IgM, significant regions were observed on IL5RA. Significant regions for FEC and PCV were identified in the NFIL3 gene. These results suggest that chromosomal regions related to cytokine receptors and membrane proteins expressed by antigen presenting cells play an important role in the expression of resistant phenotypes. In conclusion, potential immune-like loci could be used as DNA markers for resistance in sheep and goats exposed to *H. contortus*.

Estrada Reyes, Z.M., Y. Tsukahara, A. Goetsch, T. Gipson, Z. Wang, T. Sahlu, R. Puchala, R.G. Mateescu. 2018. Targeted sequencing approach identifies immune loci associated to resistance to Haemonchus contortus in sheep and goats. Journal of Animal Science. 96(Suppl. 4):222.

Indicators of Parasite Levels.

Packed cell volume (PCV) and fecal egg count (FEC) have been used as indirect and direct indicators of haemonchosis, respectively. The relationship between PCV and FEC was evaluated with growing hair sheep and meat goats in 3 central sire performance tests. There were 52 Dorper (3.9±0.13 months old; initial BW 61±01.6 lbs), 96 Katahdin (3.8±0.05 mo; 68±2.5 lbs), 49 St. Croix (4.3±0.06 mo; 42±1.7 lbs), 48 Boer (3.9±0.08 mo; 43±1.7 lbs), 55 Kiko (3.6±0.06 mo; 42±1.0 lbs), and 57 Spanish (4.0±0.09 mo; 40±1.0 lbs) males used. A 50% concentrate pelleted diet was consumed ad libitum in confinement. Animals were dewormed then dosed with 10,000 infective *Haemonchus contortus* larvae, with PCV and FEC determined 21, 28, 35, 42, and 49 days later. The PCV and FEC were correlated. A mixed effects model for each species included fixed effects of breed, year, breed×year, day as a repeated measure, and log transformed FEC (lnFEC) and lnFEC×breed as covariates. Breed affected PCV in goats (24.9, 27.1, and 25.9% for Boer, Kiko, and Spanish, respectively) but not in sheep (30.2, 26.6, and 31.2% for Dorper, Katahdin, and St. Croix, respectively). There were effects of lnFEC×breed for Dorper, Katahdin, St. Croix, Boer, and Kiko (-0.0011, -0.0005, -0.0006, -0.0005, and -0.0009% per egg) but not Spanish (-0.0002% per egg). In conclusion, PCV does not appear highly reflective of FEC in Spanish goats infected with *H. contortus*, and the nature of the relationship varied among other breeds of sheep and goats. Based on the magnitude of the lnFEC×breed coefficient, Dorper sheep and Kiko goats incurred relatively greater reduction in PCV as FEC increased, and correlations indicate strongest relationships for Katahdin sheep and Boer goats.

Tsukahara, Y., T.A. Gipson, S. Hart, L. Dawson, R. Puchala, T. Sahlu, A.L. Goetsch. 2018. The varying relationship between packed cell volume and fecal egg count in different breeds of hair sheep and meat goats artificially infected with Haemonchus contortus. Journal of Animal Science. 96(Suppl. 4):333.

Editor's Note: The research for both of these abstracts was made possible from funding from a USDA/NIFA project #OKLXSAHLU12 entitled "Sustainable Small Ruminant Production through Selection for Resistance to Internal Parasites"

Noteworthy News

►In May, Dr. **Steve Hart** conducted a workshop on internal parasites and on browse/nutrition at the National Kiko Registry meeting in Cookeville, TN.

►In May, Dr. **Steve Hart** conducted an internal parasite workshop and FAMACHA training at Langston University.

►In June, Dr. **Arthur Goetsch** traveled to Beltsville, MD to attend a workshop entitled "Elevating Dairy Research and Extension Through Partnership" hosted by the National Dairy Council.

►In June, Dr. **Steve Hart** conducted a FAMACHA training for attendees at the American Kiko Goat Association Convention and Showcase Sale in Vinita, OK.

►In June, Dr. **Terry Gipson** traveled to Egerton University in Kenya to implement objectives of the USDA/FAS-funded project entitled "Sustainable Genetic Improvement via Simplified Artificial Insemination for Sheep and Goat Producers." You can see a report on page 4.

►In June, Dr. **Steve Hart** conducted a workshop on small ruminant parasites control at the Oklahoma Veterinary Medical Association meeting in Stillwater, OK.

►In July, Drs. **Arthur Goetsch, Steve Hart, Ryszard Puchala,** and Mr. **Ali Hussein** attended the national meetings of the American Society of Animal Science in Vancouver, BC to present research findings and attend scientific sessions. Two of the abstracts of research findings can be found on page 7.

►In July, Dr. **Terry Gipson** traveled to Washington, DC to present research findings at the Project Director Meeting for the 1890 Institution Teaching, Research and Extension Capacity Building Grants Program. Dr. Gipson also moderated the Plant and Animal Research Panel.

►In July, Dr. **Terry Gipson** traveled to the Cheetah Conservation Fund headquarters in Namibia to implement objectives of the Kirkpatrick Foundation-funded project entitled "Sustainable Conservation through Community Involvement and Agriculture."

►In July, Mr. **Dwight Guy** and Dr. **Roger Merkel** traveled to Anadarko, OK and Dr. **Roger Merkel** and Dr. **Joshua Ringer** traveled to Jay, OK to conduct workshops on small ruminant management for the 1890 Universities Foundation. More information on this project is on page 3.

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