Goat Newsletter

Cooperative Extension Program
Langston University

The Newsletter of the E (Kika) de la Garza American Institute for Goat Research *Summer/Fall 2019*

From the Director's Desk

This summer is mild in Oklahoma but bittersweet. Dr. **Steve Hart**, our premier Goat Extension Specialist, has retired. At the beginning of the academic year in mid-August, Dr. **Terry Gipson**, our Extension Leader, spoke about Dr. Hart's tenure at the Institute. I want to share Dr. Gipson's words with you.

Dr. Steve Hart was born in Texas City, Texas and raised on a small swine farm. He was very active in 4-H, having projects with chickens, fat barrows and a dairy heifer. While in junior high, he moved to northeast Texas and was active in FFA with crop and brood cow projects.

Dr. Hart received a B.S. from Texas A & M University in Dairy Science. While there, he was active in the Dairy Science Club, and student chapters of Agronomy Society and Soil Conservation Society. He was awarded the I.W. Rupel Scholarship for his Junior and Senior years. After graduation, he served two years in the Army. Dr. Hart went back to Texas A & M to work on his Master's degree studying sorghum silage for dairy cows. After graduation, he went to Virginia Tech to work on his Ph.D. in Dairy Science and was supported by a Pratt fellowship. He studied feed buffers for dairy calves and rate of passage of digesta.

After receiving his doctorate, Dr. Hart worked for the USDA Agricultural Research Service at El Reno, Oklahoma. He worked with silages and crop residues for beef and stocker cattle and grain-forage interactions in cattle. He also worked with turnips for sheep and conducted some grazing studies with sheep. While at USDA, he collaborated with Langston on several goat studies supported by USDA.

In 1991, Dr. Hart traded sheep for goats and moved to Langston University, first as a Research Scientist until 1994. He was Acting Director of the Goat Institute from 1995 until 1997. Since then he has been a Research Scientist and Extension Specialist.

Dr. Hart has been responsible for a considerable portion of the extension activities for more than the past 20 years. He conducts workshops annually on topics such as internal parasite control and gives many presentations at meetings and conferences on feeding and nutrition. He is well known not only in Oklahoma but all over the country. Dr. Hart was very involved in producer organizations, including serving as Director of the Oklahoma Meat Goat Association, and gave much of his personal time for activities such as the birthing centers at the State Fairs. He has had a number of research grant projects, such as ones dealing with grazing-based dairy production systems and vegetation management. His most recent research project concerned control of Eastern red cedar with goats compared with conventional methods of burning, mechanical, clipping, and use of herbicide. Dr. Hart was very active in professional societies, particularly the American Society of Animal Science nationally and in the Southern Section. He fielded many inquiries via phone and email messages, working closely with numerous farmers and farmer groups. A very important contribution to the University has been his service on and chairing of the Institutional Animal Care and

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Dr. Steve Hart with the Fencing Garden that he designed and constructed at the Institute.

Use Committee (IACUC).

I would like to share some personal recollection about Dr. Steve Hart. I had known Steve for several year prior to my coming to Langston University in 1998. I soon realized what a valuable asset Steve was to the American Institute for Goat Research. In 2001, I was named the Extension Leader and requested that all Extension staff participate in a team role exercise. This team-role exercise determined whether a person was a Creator, Evaluator, Finisher, Innovator, Leader, Manager, Moderator, or Organizer. Steve scored off the charts as an Innovator, way ahead of the rest of the Extension team. So from that time until now, if I need an innovative or creative idea, the first person that I go to is Steve and he will almost immediately provide me with a new outlook. That is how quick his mind works.

I have had the good opportunity to speak at several conferences with Steve over the years and one the major lessons that I have learned from Steve is servanthood. Steve is the Service in Cooperative Service. His motto is to serve everyone. There is no question so obscure or complex that Steve will say "I don't know" or "I give up". Steve's response may be that "I need to research that" and he will. Every question will be answered.

I think that my feeling about Steve can be summarized in a recent conversation. Dr. Ann Wells, one of our past Goat and Hair Sheep Field Day speakers, and I were talking and she stated, "Steve will be difficult to replace" and my response was that "No, Steve will be impossible to replace". Hopefully, we will have another goat Extension Specialist in the near future but that person will not be a replacement for Steve, Steve is irreplaceable. We shall miss Steve and the American Institute for Goat Research will be a little poorer in the future but we have been blessed by his involvement and dedication. We wish Steve and his wife, Donna, enjoyment in his retirement but we know that we will see him often even in retirement.

Thank you, Steve.

Indeed, I echo Dr. Gipson's sentiments about Dr. Hart. It has been a pleasure and an honor to work with Dr. Hart.

Inaugural Kiko Buck Test - Pasture

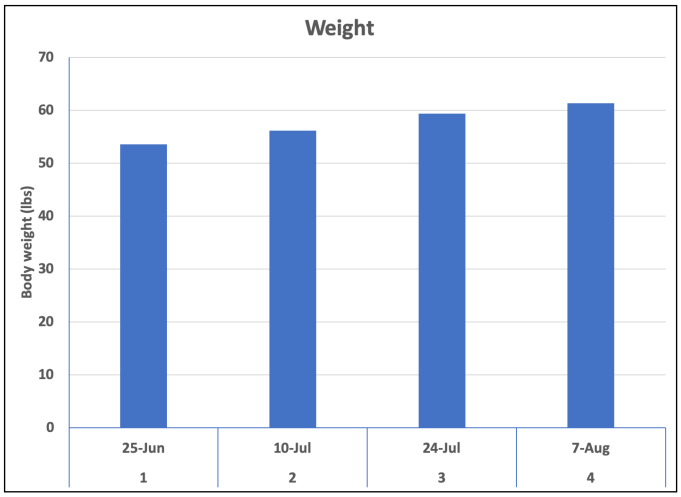
Several of the factors affecting the profitability of meat goat production include parasite resistance, growth rate, and feed efficiency. For breeders to make selection decisions to improve these traits, objective performance records are needed. However, comparing individuals from different farms/ranches clouds the decision process. A central performance test is a tool that permits the comparison of individuals objectively because all the animals make their record in the same environment. The Agricultural Research and Extension Program at Langston University and the American Kiko Goat Association partnered to establish a buck performance test open to all meat goat breeders. This performance test was different from previous performance test in that it incorporates both pasture and feedlot environments.

The Kiko Buck Test began on June 13 and 14 (entry) with 171 bucks from the following states.

State	*Bucks*	*State*	*Bucks*
AL	7	NC	5
AR	7	OH	12
GA	16	OK	23
IL	11	OR	2
KS	5	TN	8
KY	31	TX	14
MO	6	WA	2
MS	18	WV	4

The performance test was conducted in two phases, 6 weeks on pasture followed by 9 weeks in confinement. The pasture phase was conducted on a 57-acre pasture with native grasses and forbs in Logan county. On pasture, bucks were supplemented at 0.5% body weight daily to facilitate visual inspection of animals.

The average body weight at the beginning of the pasture phase (June 25) was 57 lbs and was 62 lbs at the end (August 8) as shown in the graph on the left. On average the bucks gained 0.19 lbs/day with



Location of the pasture phase of the Kiko Buck Performance Test (N 35.82348847, W 97.36668517).

a range from -0.17 to 0.44 lbs/day. At the end of the pasture phase, ten bucks had a negative growth rate on pasture.

Packed cell volume (PCV), which is the percent of blood that is red blood cells, is an indirect indicator of parasite load and of general health. PCV increased and followed the trend of body weight gain except for the final sampling period on pasture as can be seen in the PCV graph, above left. The trend in fecal egg counts (FEC) was the inverse of the PVC trend as shown in the FEC graph, above right. This trend in FEC was because 72 (42%) bucks were dewormed on either June 25 or July 10 based upon FAMACHA eye score. Bucks with a score of 4 or greater were dewormed immediately. This management practice was suspended on the July 24 sampling period so that parasite resistance variability could increase to better differentiate bucks.

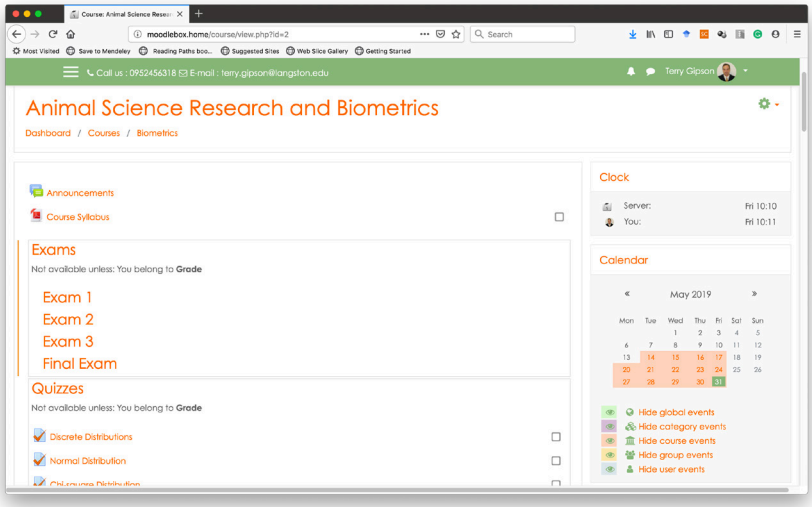
A total of 15 (9%) bucks died during the pasture phase with the majority of these bucks succumbing in the early part of the pasture phase due to shipping and related stressors.

In early August, the bucks were moved into confinement and that report will be in the next newsletter.

Collaboration with Haramaya University

Langston University has a long standing relationship with Haramaya University (previously Alemaya University) in Ethiopia. This relationship has been strengthened by the exchange of Visiting Scholars and by the long-term relationship formed through the Ethiopia Sheep and Goat Productivity Improvement Program (ESGPIP, www.esgpip.org), which was a USAID sponsored program from 2005 to 2011. Most recently, Langston University has partnered with Oklahoma State University in a project entitled "Italian Contribution to the Education Sector Development Programme - Post Graduate Program", in which the two universities provide faculty members to teach graduate level courses at Haramaya University. One of the objectives of this project is a three-week short course entitled "Animal Science Research and Biometrics", which Dr. Terry Gipson taught in May 2019. Four graduates students were enrolled in the course and three graduate students audited the course. Dr. Gipson used MoodleBox as the learning management system (LMS) for Animal Science Research and Biometrics. All class notes, exams, and quizzes were disseminated via the MoodleBox. In addition, take-home exams were submitted via MoodleBox; therefore, a fully electronic classroom. Course content included discrete and continuous distributions, correlation, simple linear, polynomial, and multiple regression using R, nonlinear regression using R, matrix algebra for models of less than full rank, analysis of variance (ANOVA) using R, analysis of covariance (ANCOVA) using R, matrix algebra for mixed models, and mixed models using R. R was chosen as the statistical analysis software environment because it is open-source and is freely downloaded from the R Project website (https://www.r-project.org/). It runs on Windows, MacOS, and a wide variety of UNIX platforms. The R community freely shares libraries for data manipulation and analysis.

Dr. Gipson teaching Animal Science Research and Biometrics.



Screenshot of the MoodleBox class site.

cont. on next page.

MoodleBox is built on a Raspberry Pi mini-computer and on the Moodle learning environment, the most used open source LMS in the world. This combination allows the MoodleBox to be a standalone, small, and cheap mobile device working without Internet. MoodleBox is used to enhance online learning and teaching where infrastructure is non-existent or inadequate. More information on MoodleBox is available at https://moodlebox.net/en/.

Additionally, there has been considerable collaborative research activities with institutions in Ethiopia over the decades, as well as many Ethiopians conducting research at the Institute as Visiting Research Scholars. In this regard, Dr. Art Goetsch made a relatively short trip to Ethiopia in November 2019. The first day in the capital Addis Ababa, Dr. Goetsch met with Dr. Girma Abebe, previously of Hawassa University, ESGPIP and various livestock and human nutrition nongovernmental organizations and collaborating on multiple projects and activities since 1998, about future cooperation and assistance. However, the main activity of the visit was to participate in the Ph.D. dissertation defense at Haramaya University of Ms. Hirut Yirga, Visiting Research Scholar of the Institute from October, 2015 to April, 2016. One of the three studies that was a part of Hirut's dissertation was conducted at Langston University. Her research dealt with water sources high in total dissolved solids consumed by livestock. An article about that research was published in the journal Small Ruminant Research in 2018 (volume 164, pages 70-81). A journal article concerning one of the experiments conducted in Ethiopia has been submitted and another manuscript is being finalized at the present time. Moreover, potential future collaboration was discussed with faculty of Haramaya University such as Dr. Mengistu Urge as well as Dr. Tegene Negesse of Hawassa University who was the external examiner (both previous Visiting Research Scholars at Langston University). Thereafter, Dr. Goetsch traveled to Debre Berhan University, north of Addis Ababa, and met with Dr. Dereje Tadesse (previous Visiting Research Scholar with the Institute) and other faculty members of the University about potential future collaboration with Langston University including the current status of the Memorandum of Understanding (MOU). Moreover, Dr. Goetsch made a presentation on preparation of scientific manuscripts, their review, and revision as well as preparation of competitive grant proposals for faculty members and students of the Animal Science Department. In the last evening in Ethiopia before the departure flight, there was discussion with Mr. Asrat Dolebo, previous Visiting Research Scholar at Langston University, about potential future collaboration, inclusive of his current role as head of the country's artificial insemination program. Although the length of the visit was much too short, it was very important to strengthen current ties and foster new joint activities.

Ms. Hirut Yirga conducting research at Langston University.

Dr. Mengistu Urge (front row, right) and Dr. Art Goetsch take notes during Ms. Hirut Yirga's public defense of her dissertation.

Research Spotlight

Genes Involved in Parasite Resistance.

Gastrointestinal nematode infection (GNI) is the most important disease affecting the small ruminant industry in U.S. The environmental conditions in the southern United States are ideal for the survival of the most pathogenic gastrointestinal nematode, *Haemonchus contortus*. Host genetic variation for resistance to *H. contortus* allows selective breeding for increased resistance of animals. This selection process increases the prevalence of particular alleles in sheep and goats and creates unique genetic patterns in the genome of these species. The aim of this study was to identify loci with divergent allelic frequencies in a candidate gene panel of 100 genes using two different approaches (frequentist and Bayesian) to estimate F_{st} outliers in three different breeds of sheep and goats exposed to *H. contortus*. Our results for sheep populations showed SNPs under selection in C3AR1, CSF3, SOCS2, NOS2, STAT5B, TGFB2 and IL2RA genes using frequentist and Bayesian approaches. For goats, SNPs in CD1D, ITGA9, IL12A, IL13RA1, CD86 and TGFB2 genes were under selection. Common signatures of selection in both species were observed in NOS2, TGFB2 and TLR4 genes. Directional selection was present in all SNPs evaluated in the present study. A total of 13 SNPs within 7 genes of our candidate gene panel related to *H. contortus* exposure were identified under selection in sheep populations. For goats, 11 SNPs within 7 genes were identified under selection. Results from this study support the hypothesis that resistance to *H. contortus* is likely to be controlled by many loci. Shared signatures of selection related to mechanisms of immune protection against *H. contortus* infection in sheep and goats could be useful targets in breeding programs aimed to produce resistant animals with low FEC.

Estrada-Reyes, Z. M., Y. Tsukahara, R. R. Amadeu, A. L. Goetsch, T. A. Gipson, T. Sahlu, R. Puchala, Z. Wang, S. P. Hart, and R. G. Mateescu. 2019. Signatures of selection for resistance to Haemonchus contortus in sheep and goats. BMC Genomics. 20:1–14. doi:10.1186/s12864-019-6150-y.

Variation in Parasite Indicator Levels.

The relationship between packed cell volume (PCV) and fecal egg count (FEC) in different breeds of meat goats and hair sheep infected with gastrointestinal nematodes, including *Haemonchus contortus*, was characterized. Growing males from eight commercial and two research farms (one Kiko, Spanish, Dorper, and St. Croix; three Boer; four Katahdin) in the southcentral United States were evaluated in a central performance test. There were 84 Boer, 55 Kiko, and 57 Spanish goats and 52 Dorper, 129 Katahdin, and 49 St. Croix sheep. During adaptation, animals were dewormed then dosed with 10,000 infective *H. contortus* larvae. PCV and FEC were determined at 21, 28, 35, 42, and 49 days after artificial infection. Breed affected PCV in goats (24.8, 27.2, and 26.0% for Boer, Kiko, and Spanish, respectively) and sheep (29.8, 26.7, and 31.0% for Dorper, Katahdin, and St. Croix, respectively). With all data, PCV and FEC with natural infection were highly correlated for Boer and Kiko goats and Dorper and Katahdin sheep ($r = -0.59, -0.67, -0.77$, and -0.84, respectively) but not for Spanish goats or St. Croix sheep. Correlation coefficients for artificial infection with *H. contortus* were significant except for Spanish goats, although values were lower ($-0.40, -0.21, -0.23, -0.47$, and -0.28 for Boer, Kiko, Dorper, Katahdin, and St. Croix, respectively) compared with natural infection. In conclusion, PCV was not related to FEC in Spanish goats infected either naturally or artificially, and the nature of the relationship varied among breeds of goats and sheep. Sheep incurred a relatively greater reduction in PCV as FEC increased, and correlation coefficients indicate stronger relationships with natural than artificial infection.

Tsukahara, Y., T. A. Gipson, S. P. Hart, L. J. Dawson, Z. Wang, R. Puchala, T. Sahlu, and A. L. Goetsch. 2019. Across and within breed differences in the relationship between packed cell volume and fecal egg count in growing meat goat and hair sheep males naturally and artificially infected with gastrointestinal nematodes. Vet. Parasitol. Reg. Stud. Reports. 17:100311. doi:https://doi.org/10.1016/j.vprsr.2019.100311.

Editor's Note: The research for both of these manuscripts 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. **Terry Gipson** taught a three-week short course on Animal Science Research and Biometrics at Haramaya University in Ethiopia.

►In July, Drs. **Arthur Goetsch**, **Raquel Lourencon**, **Luana Ribeiro**, **Ryszard Puchala**, and **Wei Wang** attended the national meetings of the American Society of Animal Science in Austin, TX to present research findings and attend scientific sessions.

►In October, Drs. **Terry Gipson** and **Arthur Goetsch** participated in the 1890 Universities Foundation Centers of Excellence conference in Atlanta, GA.

►In October, Drs. **Arthur Goetsch**, **Luana Ribeiro**, **Yoko Tsukahara**, **Wei Wang**, and Ms. **Farida Belkasmi** conducted farm visits.

►In October, Dr. **Arthur Goetsch** and Ms. **Farida Belkasmi** attended the World Food Prize Symposium in Des Moines, IA.

►In November, Dr. **Arthur Goetsch** traveled to Haramaya University in Ethiopia to participate in a doctoral defense for now Dr. **Hirut Yirga**, who conducted part of her doctoral research in 2015-2016 under the guidance of Dr. **Goetsch**. Dr. **Yirga**'s research project while at Langston University focused upon brackish and saline drinking water for small ruminants.

►In November, Drs. **Terry Gipson** and **Steve Hart** traveled to Cornell University and presented at the Small Ruminant Management & Fiber Conference hosted by the Cashmere Goat Association and Cornell University. Dr. **Gipson** presented on "Basic Genetics of Cashmere Production" and Dr. **Hart** presented on "Effect of Nutrition on Fiber and Follicle Development in Goats & Sheep."

►In December, Dr. **Terry Gipson** presented on multi-species grazing at a meeting hosted by Project A Association and the Cherokee Nation in Tahlequah, OK.

►In December, Dr. **Terry Gipson** travelled to Egerton University in Kenya to provide follow-up training on a USDA Foreign Agriculture Service grant entitled "Kenya Sheep and Goat Genetics," whose objective is to investigate simplified AI techniques in goats using fresh semen.

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