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Quarterly

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Small Farm Research Agri-news

Dale Bumpers Small Farms
Research Center
Booneville, Arkansas

Greetings from the Research Leader, Dr. Phillip Owens

Dr. Phillip Owens

We are enduring and managing our way through the summer heat and dry weather, just like all other farms in the area. Because the climate is unpredictable, the team at our Center are always testing and finding ways to get through difficult periods of the year. For example, Dr. Christine Nieman, in collaboration with the University of Tennessee and University of Missouri, is focusing on using native warm season grasses as part of a more climate resilient cattle grazing program. The strategy allows for summer grazing on native warm season species (switchgrass and big bluestem) and stockpiling of tall fescue for fall grazing. This year, cattle were rotated from tall fescue pastures to switchgrass pastures on May 16 and were just rotated back to the tall fescue pastures on Sept 6, allowing for one hay harvest on tall fescue in mid-June and stockpiling of tall fescue for fall grazing. The trial will continue through fall until tall fescue pastures have been exhausted. This year will complete the second year of this three year and three location grazing systems study. The study hopes to identify the ability of native warm season grasses to displace a proportion of tall fescue in the mid-south for overcoming the summer slump left by cool season forages and improve grazing options that are drought and heat resistant.

We had a wonderful field day where we hosted the USDA Research Education and Economics (REE) Deputy Under Secretary, Sanah Baig. We demonstrated some new technology, equipment and discussed our research efforts to find economic solutions for small-holder farmers (continued on page 2).

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(continued from page 1) The temperature was around 100 degrees so she got to fully experience Arkansas summer. I am very grateful to our staff who worked hard preparing for the event. I am grateful for our stakeholders for attending the event to show your support for our research center. I am also very grateful to the parents, 4H leaders and FFA leaders who brought kids to the event. We hosted a one-hour session so the Deputy Under Secretary could meet with the kids and talk about a future in the agriculture field. Agriculture is the economic driver for rural communities, and we need the next generation to see new technology and applications to help sustain our future.

I am honored to serve as Research Leader at the Dale Bumpers Small Farms Research Center in Booneville Arkansas. I am often asked “why did the USDA ARS put a research center in a rural area?” We are here because the stakeholders are here and we are surrounded by small scale farms. The challenges faced by small farms are very different than by large commodity-based farms. We are the only USDA-ARS small farms research center in the US. New and creative solutions are necessary and we are always solutions-focused. I am proud of our team because they work hard everyday and bring up topics that help with the application of research findings. Please feel free to reach out to us if you have questions or have issues you would like for us to explore. Until then, I hope your end of summer and fall transition goes well.

Dr. Burke Research Spotlight

Pedigree diversity and implications for genomic selection of U.S. Katahdin sheep.

Sheep producers using genetic/genomic selection through programs such as the National Sheep Improvement Program strive to improve traits such as parasite resistance and increased lamb growth. It is important to understand and maintain genetic diversity within a breed which can be compromised with intense selection. The objective of collaborators from University of Nebraska, USDA-ARS, and University of Idaho was to use pedigree records (up to 92,030) from 1984 to 2019 to estimate the quality and diversity of the pedigree in light of selection using genomic estimated breeding values introduced in 2021. It was determined that the effective population size is sufficient to maintain diversity while achieving progress with selection. Low rates of inbreeding and relatedness were uncovered suggesting that diverse genetic conservation is a low priority, and high levels of accuracy for genomic prediction can be achieved, but intense selection has the potential to cause loss of genetic diversity. These results are important to the U.S. sheep industry, the producers and consultants, geneticists and other scientists involved in improving sheep production.

Sheep grazing influences the diversity and community composition of wild bees and other insects in livestock pastures.

Pollinators contribute to the establishment of perennial native forages, but little is known about the effect of grazing practices on pollinator abundance and diversity in livestock pasture ecosystems. Collaborators from the USDA Agricultural Research Service, University of Arkansas, and Long Island University determined that a diverse array of bees (59 species) and other insects (at least 93 species) were found in the livestock-grazed pastures, but the abundance, diversity, and evenness of bee communities and other insects were greater in non-grazed plots. This enabled scientists to understand that reduction in bee and insect diversity in grazed areas highlight the importance of rotational grazing regimes to allow for sufficient floral resources for pollinators which is important to entomologists, food scientists, environmentalists and ecologists.

Small Ruminant Update

Katahdin Outreach

Erin Wood was invited to speak at the South Central Katahdin Association annual meeting and private treaty sale in Vicksburg, MS June 2nd and 3rd. Erin presented an information to the group on benefits and drawbacks of fall lambing and the mosquito transmitted Cache Valley Virus. The appeal of fall lambing is growing nationwide and at Dale Bumpers Small Farms Research Center, the small ruminant crew has been successfully fall lambing for several years (see Fall 2022 Newsletter for more information on our fall lambing system). Erin was also asked to sit on a producer panel and fielded questions on sheep parasites, disease, management and many more from the producers from Texas to Georgia and everywhere in between.

Chad Lee, Abby O'bar and Erin Wood represented the DBSFRC at the Katahdin Hair Sheep International Expo & Sale in Van Wert, OH August 10-12th . On Thursday and Friday the crew attended seminars including "Combining data recording and genomics to maximize genetic process" by Dr. David Notter (who has collaborated with Dr. Burke on several grant projects and published scientific papers, and is a well known geneticist contributing to a partnership with the Australian SheepGenetics responsible for U.S. sheep genetic data analyses), producer panel discussions, and hair coat inspection training. They attended the annual KHSI meeting and experienced 2 pioneers (Dr. Notter and Mark Dennis who provided rams to the ARS flock approximately 20 years ago) of the Katahdin industry honored as lifetime members. The crew had the opportunity to discuss current and past research and genetics with producers from across the country and disseminate these genetics to producers for their breeding programs. On Saturday, a Katahdin sale was held featuring sheep from across the country from many different production systems. The USDA animals exhibited excellent genetics. There were at least 3 other farms with animals in the sale that were offspring of USDA animals. These producers purchased sheep from our location through our premier sale in recent years and brought their offspring with superior genetics to the Expo sale.

Kenya Small Ruminants Inbound Trade Mission

On 9/12/2023 a group of Kenya delegates visited the Research Center. The Kenyan delegates were really interested in the Center's research because Kenya alone has 10X times more sheep than all of the U.S. and much greater demand within and for exporting products. Like the U.S., the small ruminants in Kenya suffer from parasites, needing to improve efficiency of production, dwindling resources and climate change. The group members are very interested in research collaboration. Thanks to everyone who helped welcome the delegates and the team who sponsored them – Missouri Department of Ag and SMART Reproduction. SMART Reproduction is involved in disseminating small ruminant genetic resources within the U.S. and import/export to other countries. They are interested in sharing our Katahdin parasite resistance including potential future export to New Zealand. Exciting times!!

Dr. Nieman Research Spotlight

Warm-Season Grass Baleage Dr. Nieman recently published a manuscript on warm-season grass baleage. Baleage is an alternative to dry hay that may be particularly beneficial in the southeastern U.S. because frequent rain events and humidity may prevent optimal drying conditions for hay. Winter annual forages such as cereal rye, annual ryegrass, and wheat are generally used for baleage because they produce large amounts of forage mass of high nutritive value in the spring. However, longer drying times due to high summer humidity and the improved nutritive value of baleage compared to similar hay stored outdoors also provides potential advantages for warm-season grass baleage over dry hay (continued on page 6).

Figure 1.
Warm-season grass baleage.

(Continued from page 5) Another potential opportunity for improved efficiency for forage production is the use of subsurface applied poultry litter. Hay fields and pastures in the southeast are commonly fertilized by broadcasting poultry litter. This method of application can lead to nutrient losses from rainfall and nitrogen loss through ammonia volatilization. Injecting poultry litter below the soil surface, as can be completed with the "subsurfer" developed at DBSFRC, reduces nitrogen volatilization and runoff. Additionally, injection of poultry litter can increase forage yield and forage nitrogen concentrations.

The study aimed to test the effects of poultry litter application method (broadcast or subsurface) on baleage quality. However, an unforeseen rain event occurred and added a second treatment, delayed wrapping. Half of the bales from each replicate were baled and wrapped prior to the rain event, the remaining bales were baled, but not wrapped, and wrapping was delayed until the next morning (17 hours after baling). Delayed wrapping has been a treatment of interest in previous research because of the realistic potential for breakdowns or other incidents to occur prior to wrapping that prevent optimal wrapping times (wrapping within 4 hours of baling).

In general, previous research showed that delayed wrapping (0–3 days) resulted in greater final baleage pH, reduced volatile fatty acid concentrations, and reduced protein solubility, reducing the overall quality and fermentation stability of the ensiled forage. The results from our study showed that subsurface application of poultry litter had several positive effects on final bale nutritive composition compared to broadcast application (Table 1.), including increased crude protein (CP), reduced neutral detergent fiber (NDF), and increased lactic acid, acetic acid, and total acid concentration. Bales from plots that had broadcast litter had increased butyric acid, ethanol, and total alcohol concentrations indicating overall lower nutritive value and possibly increased activity of clostridial bacteria or other undesirable bacteria due to contamination from surface applied poultry litter. Rain and delayed wrapping of 17 hours caused slightly increased fiber components, but lactic acid and total acid concentration did not differ in the final bale nutritive composition. Overall, amendment of subsurface applied poultry litter improved final bale nutritive composition, while rain plus delayed wrapping had negligible effects on final bale nutritive composition of warm-season grass baleage.

The full final publication can be found here: https://www.mdpi.com/2073-4395/13/7/1896

Table 1. Post-ensiled ph, crude protein (CP), neutral detergent fiber (NDF), and selected fermentation parameters for wrapped silage bales following application with poultry litter by broadcast or subsurface methods.

Application Method	pH	CP	NDF	Lactic Acid	Butyric Acid	Total Acids	Total Alcohols
Broadcast	4.4	13.80%	61.9	4.02%	0.16%	5.80%	0.89%
Subsurface	4.5	12.90%	63.9	3.00%	0.59%	4.71%	1.03%
SEM[1]	0.04	0.2	0.386	0.221	0.180	0.346	0.050
p-value	0.16	<0.01	<0.01	<0.01	0.09	0.03	0.05
Wrapping Time	pH	CP	NDF	Lactic Acid	Butyric Acid	Total Acids	Total Alcohols
Within 2 hours	4.4	13.40%	61.90%	3.40%	0.22%	5.00%	1.01%
17-hour delay	4.4	13.30%	63.90%	3.63%	0.52%	5.52%	0.92%
SEM	0.04	0.19	3.7	0.221	0.178	0.333	0.048
p-value	0.89	0.77	<0.01	<0.01	0.21	0.27	0.18

[1] SEM=standard error of the mean

Keyser Trip

The native grasslands grazing project continues into summer 2023. The project is a research collaboration including three locations and is funded by a National Institute of Food and Agriculture (NIFA) grant. The goal of the project is to determine the benefits of grazing tall fescue in the spring and fall, and native warm season grasses (NWSG) in the summer. The three NWSG are eastern gamagrass, switchgrass, and big bluestem. The project is replicated at the University of Tennessee in Knoxville, TN and the University of Missouri in Linneus, MO. In June, project collaborators toured all sites including the research site at DBSFRC in Booneville. At the Booneville location there are 6 groups of cows with two replicates per system with systems of tall fescue only, tall fescue and switchgrass, and tall fescue and big bluestem. The TN location has 4 groups of cows and two replicates per system with two systems of tall fescue only and tall fescue and gamagrass, and the MO location has 4 groups of cows and two replicates per system with two systems of tall fescue only and tall fescue and big bluestem. This visit allowed all collaborators to view the multiple forage species, environments, and management at the different sites. Touring all the locations was amazing exposure for all collaborators and was helpful in expanding our understanding of management and the environment at each location. The tours also allowed for conversation and discussion among participates that strengthened our research collaboration. Attending from MO was Dr. Harley Naumann and Ellen Herring; from TN was PhD student Megan Berry and Dr. Pat Keyser; from the University of AR was Dr. Ken Coffey; from DBSFRC was Joie Bogart, Kolten Wright, and Cullen Pfeifer.

Figure 1. A picture of the group at the Forage Systems Research Center in Linneus, MO.

Cattle Update

Fall is approaching and with that comes Fall vaccines and weaning of the research center's calves. The cattle crew has administered the first round of vaccines to the calves and is gearing up for the second round for the calves as well vaccinating the cows and bulls. The crew has also been working on pasture management which includes bushhogging, cutting hay and spraying. Fall time keeps the cattle crew busy but the crew looks forward to the marketing of the calves and the cooler days!

Dr. Phillip Owens with the USDA ARS Dale Bumpers Small Farms Research Center and Dr. Amanda Ashworth with the USDA ARS Poultry Production and Products Safety Unit in Fayetteville led an effort for a precision agriculture display hosted at the National Botanical Garden in Washington, DC. Digital technology and data sharing can make farming more profitable and sustainable. Devices like satellites, drones, and specialized tractors provide real-time information to farmers in their fields. These tools can be used to increase efficiency of farm operations and reduce environmental impacts like nutrients in waterways from fertilizer runoff. While already common on large-scale farms, the use of precision agriculture is increasing on smaller farms.

To view archived newsletters or to find more publications, please visit our website at :

https://www.ars.usda.gov/southeast-area/booneville-ar/dale-bumpers-small-farms-research-center/

USDA, Natural Resources Conservation Service
Booneville, Arkansas Plant Materials Center

Conference Spotlight: 2023 Arkansas Water Resources Conference

Dr. Rajesh Chintala

Steve Haller and Rajesh Chintala from Booneville Plant Materials Center attended the 2023 Arkansas Water Resources Conference which was held on July 18-20 at Dyson Tyson Center for Agricultural Science in Fayetteville, Arkansas. The focus of the conference was on three themes i.e., water research and nonpoint source program, statewide water quality stewardship efforts, and local/small-scale watershed focus. The conference was formatted into talks, poster presentations, panel discussions and breakout group discussions.

There were 31 speakers from various entities including state, federal, non-profits, industry, academics etc. focused on topics such as nonpoint source pollution in Arkansas, review of ongoing stakeholder water quality projects, forestry & drinking water, source water protection, watershed level challenges, and Arkansas nutrient reduction strategy and gulf hypoxia program. The exhibit hall was displayed with products and services of various companies to help water stewardship efforts. This was an ideal conference for NRCS' Plant Materials program to learn the needs of stakeholders and citizens for protecting the quality of shared natural resources and help them in identifying plant science solutions through research, outreach, and inform cost-share conservation policy instruments.

The Plant Materials Center has published their Annual Progress Report of Activities. To read the full report please visit their website. PMC Information is available online at: http://www.plant-materials.nrcs.usda.gov/arpmc/