



December 2023

Quarterly

Agricultural Research Service Small Farm Research Agri-news

Dale Bumpers Small Farms

Research Center

Booneville, Arkansas

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The mission of the Dale Bumpers Small Farms Research Center is to develop scientific principles and technologies to enhance the profitability and sustainability of small-scale farms.

Greetings from the Research Leader, Dr. Phillip Owens



Dr. Phillip Owens

I look forward to each Newsletter where we can keep you posted on new events and activities at the Dale Bumpers Small Farms Research Center. I want to thank Ms. Karen Chapman for serving as editor for the newsletter and gathering up the numerous activities from our employees to put into one document for our community. It is a reminder how each employee contributes to success of our Center in so many different ways. As the year 2023 comes to an end, it makes me reflect and be grateful for our employees and their resolve to help the small farm agricultural community.

Our center has the mission to find economic solutions for small holder farmers and we take that mission seriously. We think about the whole farm systems and how to find multiple uses for land. Our team has made a renewed effort to focus on agroforestry and silvopasture studies. These farming techniques incorporate trees into the operation for specific use. In the past we have looked at planting pines in field with a wide spacing so that animals can graze or farmers can bale the forage between the rows. Each year the pines are growing, they are adding value so that they can provide a payoff at some point while providing shade and forage nutrition between rows annually. We are continuing that work on that system, but we are also thinking more about tree products that can provide annual income. Working with the USDA ARS unit in Fayetteville and the Center for Agroforestry at the University of Missouri, we will be planting pecans, chestnuts and hazelnuts as an agroforestry system. Systems with nut crops may provide an annual product for additional annual income while still using the land for animal production. Our scientists are currently making research plans and organizing the projects. By mid-February, you should see the trees planted on the east end of the farm. This type of agricultural system involves all scientists at our Center to focus on soil health, carbon storage, water relationships, water quality, agronomics, forage production, animal production and animal health and welfare. Evaluating these systems is necessary to provide options for farmers to diversify their farms.



As I say in each newsletter, I am honored to serve as Research Leader at the Dale Bumpers Small Farms Research Center in Booneville Arkansas. Leading a great group of people who are serving a noble mission is a privilege. We will keep you informed of research findings and applications that we hope will help our community.

Dr. Phillip Owens's Tribal Soils Research Spotlight and Award

Innovation Award

Drs. Amanda Ashworth (USDA ARS Fayetteville, AR) and Phillip Owens (USDA ARS Booneville, AR) received the **USDA Office of Tribal Relations 2023 Tribal Innovation Award On Extraordinary Tribal Engagement** for the project of **Plant-Soil-Water-Nexus: Agricultural Systems Research on Tribal Lands Initiative**.

This project developed the first ever spatially precise (5 m resolution) continuous soil property, crop suitability, and soil health maps for the Quapaw Nation in Oklahoma. This project also created the 'Tribal Soil Explorer' webtool to host this information for Native American farmers. These maps are being used to match crops and soils and precisely manage soil resources at the Tribal Nation level. This led to further work focused on managing soils to manage water with the Colorado River Indian Tribes and the San Carlos Apache Tribes in Arizona to combat severe drought. These projects highlight the use of technology combined with traditional ecological knowledge to create sustainable water saving practices and tools that are being adopted by First Nations.

Results from the combined work led to grant funding of over 1 million dollars and the creation of the first ARS Tribal Soils web product. We had several invited talks (one included the USDA-wide webinar for the "National Native American Heritage Month"). This project trained over 100 Native American students and Tribal government officials on digital, climate-smart agricultural tools.



Dr. Zamir Libohova's Soil Modeling Research Spotlight



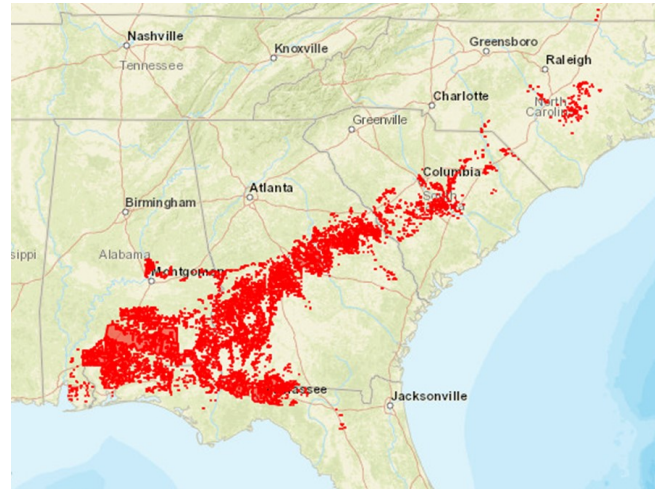
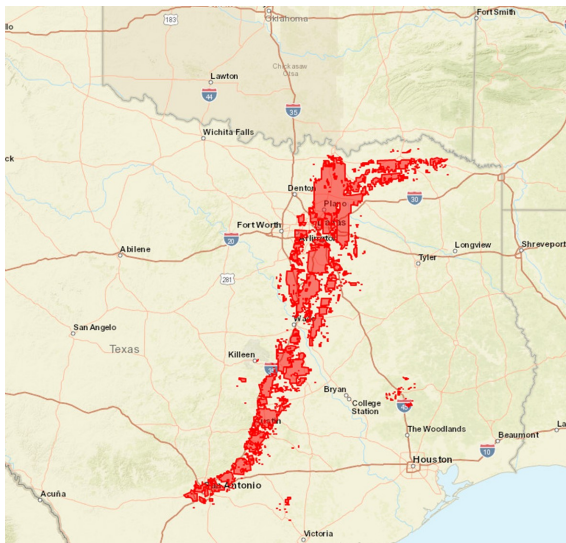
Dr. Zamir Libohova

Soil mineralogy control on SOC stability in soils

Soil Organic Carbon (SOC) pools and stability are influenced by interactions between climate, management, and soil properties. Numerous studies have determined the size and stability of SOC pools by incubation and other analytical methods. Few studies have linked the stability of SOC pools to soil clay mineralogy at molecular and structural configurations. Understanding the stability of SOC interactions at such scales offers not only a fundamental understanding of factors controlling SOC stability but means to upscale the stability of SOC pools to field, regional and continental scales by utilizing the spatial distribution of major soil minerals (smectite, kaolinite and mixed mineralogy) and

climate gradient.

Funded by the Department of Energy– Pacific Northwest Laboratory (DOI-PNNL) and in cooperation with the Environmental Molecular Science Laboratory (EMSL) at PNNL, USDA-NRCS Soil Survey Program and USDA-ARS Center in Temple, Texas, the team from Arkansas (Dr. Joshua Blackstock (ARS-Postdoc); Marcelo Mancini (visiting scholar from the Federal University in Lavras, Brazil) are collecting samples in Blackland Prairie soils in Arkansas, Texas and Alabama.



Distribution of Black Prairie soils in Arkansas, Texas and southeast US. Sampling in Arkansas with Dr. Joshua Blackstock (left) and Texas with visiting scholar Marcelo Mancini (right).

Dr. Joan Burke's Small Ruminant Research Spotlight



Dr. Joan Burke

Lambing Update

Fall lambing is complete at the Dale Bumpers Small Farms Research Center, and the ewes gave us over 100 healthy bouncing lambs. With new lambs comes a busy research season, the small ruminant

crew participates in collaborative research to evaluate new trait complexes and further the development of genetic tools for stakeholders to use in the selection of more profitable and healthy sheep. The research requires staff to collect over 20 different data observations from ewes within the first 8 days of lambing. Data include traits on udder health, coat scores, hoof health, body weight and condition, and parasite infection to determine robustness and how long the ewe is productive in the flock. Flocks in ARS at Clay Center, NE and Dubois, ID are collecting a similar set of data in their Katahdin flocks. It will be exciting to analyze the data next year to determine whether any of the traits are heritable and can be used for selection to increase economic viability of the farm.

Ewes in our Winter 2024 lambing group have been checked for pregnancy by ultrasound. Fifty-one ewes were determined bred, many with multiple lambs. Winter lambing brings challenges of cold weather and Cache Valley Virus, so the small ruminant crew are already planning and preparing for January. Through our partnership with the CDC, we hope to determine ewes that may have been affected by the virus so that we can watch those carefully. The virus is carried by mosquitos, and we are exploring if there is a window of infection or if it can occur anytime the mosquitos are present. More research will be developed to understand more about the virus, which ewes become infected with negative consequences compared with those who suffer no known effects.



Pasture Planting

The small ruminant crew prepped and planted the pastures with cold season forages to extend the grazing season this fall and in early Spring. The crew planted different variations of wheat, rye, vetch, and clover these pastures will reduce the amount of hay and grain required over the fall/winter months.



Cattle update

The cattle crew at Dale Bumpers Small Farms Research Center has been busy with fall weaning and selling of steers, vaccines and yearly pregnancy checks. The pastures have been sustainable thus far meaning the cattle have not needed to be supplemented with hay. The steers were sold at Oklahoma City Stockyards and brought premium prices due to their pre-vaccinations and uniform appearance. This premium highlights the hard work and dedication of the crew to the station's cattle herd.



Dr. Christine Nieman Cattle Research Spotlight



Dr. Christine Nieman

Red Clover Study

Livestock operations in the mid-south mostly rely on cool season grasses, primarily tall fescue, which is grown on over 34 million acres within a region commonly referred to as the Fescue Belt. Most of the tall fescue in this region is “infected”. A fungal endophyte within the tall fescue plant produces ergot alkaloids that cause “fescue toxicosis” in livestock that consume it. Fescue toxicosis reduces reproduction efficiency, performance, and induces heat stress resulting in losses to the beef industry estimated at \$2 billion annually. Specifically, the endophyte impairs the animal’s ability to control body temperature due to vasoconstriction of blood vessels (resulting in increased body temperature). Numerous methods to mitigate tall fescue toxicosis have been investigated for more than 60 years, but a practical solution has not been discovered to date.

The USDA-ARS location in Lexington, KY has been evaluating the use of red clover to alleviate these symptoms in cattle and sheep. Red clover contains isoflavones including biochanin A which causes vasodilation, reversing the effects of the endophyte in infected tall fescue. Research from USDA-ARS in Lexington, KY has shown that cattle require as little as 20 grams per day of dried, ground red clover leaves to alleviate symptoms of tall fescue toxicosis. Cattle grazing infected tall fescue that are supplemented with red clover have greater average daily gains. Additionally, unrelated to tall fescue toxicosis, the biochanin A in red clover is active in the rumen and has been shown to increase feed efficiency in sheep when red clover was included at 15% of the diet. However, cultivating red clover and the subsequent processing required for accurate supplemental intakes (drying and grinding of the red clover) is expensive and labor intensive. Therefore, there is great interest in evaluating the lowest levels of supplementation that still result in benefits. The Dale Bumpers Small Farms Research Center has started two projects with the University of Arkansas to determine the lowest red clover supplement doses for increased nitrogen utilization in sheep consuming non-toxic forages and the lowest doses to reverse vasoconstriction in sheep on toxic tall fescue diets. The results of these studies may be used to help improve feed efficiency, average daily gains, and animal welfare by reducing heat stress in lambs consuming toxic tall fescue.



Photo: Dried red clover for processing, whole plant and leaves. Red clover leaves have the greatest concentrations of biochanin A and are sometimes removed from the plant by shaking or sieving prior to grinding to ensure higher biochanin concentrations of the supplement for feeding. Red clover is ground for easier mixing into grain supplements which ensures accurate intakes and prevents sorting by small ruminants.

Employee Engagement, Diversity, Inclusion and Outreach

Step Challenge



Employees did a Step Challenge this spring and finally awarded the winners with USDA water bottles. Michelle Armstrong won individual, and Team Owens won Team.

Photo Contest

Employees also did a Photo Contest this fall to bring in new photos from around the facility. Rajesh Chintalla (NRCS) won the overall award (pine tree plantation) and received a snack box of honey buns. Jennifer Keatts won best equipment, Erin Wood won best crop and animal category and received a Little Debbie snack box. These were fun events that brought the fun competitive side of the employees to enhance the work environment.



Best Overall



Best Crop



Best Equipment



Best Animal



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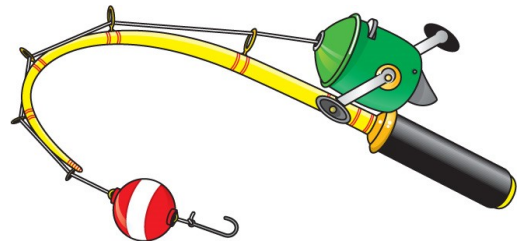


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The 2nd Annual “GoGo” Jones Fishing Derby was a success again this year.

The employees started this event last year. The Annual “GoGo” Fishing Derby is an event recognizing an employee who has been working at the Center for over 30 years. Darwin “GoGo” Jones loves fishing and hunting and has become well-known for it. He has been supplying fish for our fish fry gatherings for many years.

For the Derby, employees signed up to fish for a few hours on the morning of the 17th and report back to the weigh station. A friendly competition of Biggest Fish, Smallest Fish, and Most Fish were judged. Chad Lee won Biggest Fish with a 3.3 lb Bass (receiving a x-large Hershey bar), Ben Holleman won Smallest Fish (receiving Mini M&Ms), and Sarah Hayward won Most Fish with 42 (receiving a box of honey buns). Each were presented with a medallion. The fish that were caught were fileted and frozen for the Fish fry in 2024. Pizza and Cinnamon Rolls was delivered for lunch for all the employees.



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/>

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



Dr. Rajesh Chintala

Research Spotlight 1:

**Observational
Plantings of PMC-
Germplasm (Project
Duration:2022-2026)**

The objective of this five-year field study is to determine the potential area of adaptation of conservation plant releases and potential releases from other PMCs and compare performance to commercially available cultivars. Thirty germplasms (Big bluestem, little bluestem, switchgrass, Indiangrass, sunflower, gamagrass, and wildrye) were planted in 20 ft long rows during summer 2022.

Growth performance data for germplasms was collected three times i.e., fall, 2022, May 30, 2023 (late spring), and September 25, 2023. Based on the data, Big bluestem (Roundtree), E Gama (WV PMC, Highlander), Indiangrass (Excelso), and switchgrass (Expresso and Alamo) are performing well in terms of survivability and vigor. Wildrye (kinchafoone) plants have completely died.



Gama grass (May 2023)



Data Collection (September 2023)



Germplasm study plots (October 2023)

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:

www.plant-materials.nrcs.usda.gov/arpmc/

Research Spotlight 2: Evaluation of Side-oats grama grass germplasms in Arkansas Agro-Climatic Conditions

2023



Fig 1. Geo-origins of side-oats grama grass

Nation-wide PMCs provided 12 types of side-oats germplasms for evaluation study including: South Texas, Killdeer, Zone 1, Zone 2, Zone 3, Haskell, 907907z, Butte, Roundstone, Vaughn, Niner, and Pierre (Fig 1). In the greenhouse, seed were sown in trays and later the germinated seedlings were transferred to cones to allow better growth (Fig 2.). Seedlings of cones were used to transplant in the field on May 30-31, 2023 (Fig 3).



Fig 2. Side-oats seedlings

Among these cultivars, South Texas, Haskell, Vaughn, and Niner performed well in terms of survivability of seedlings, vigor, cold tolerance, drought tolerance with low pest incidence (Fig 4). The growth performance of Pierre, Killdeer, and Butte cultivars was relatively poor at Booneville's environmental conditions.



Fig 4. Performance data collection



Fig 3. Planting seedlings