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Dale Bumpers Small Farms Research Center Newsletter Booneville, Arkansas

Greetings from the Research Leader, Dr. Phillip Owens

Small farms make up 88% of the farms in the US and there is currently a gap in the use of technology for optimizing small farm operations. Increased efficiency leads to increased income and sustainability for small farms. Through ongoing research at Dale Bumpers Small Farms Research Center (DBSFRC), we have been using our GPS enabled autosteer tractors. We have seen an overall production gain of 20% by minimizing overlaps in the field which relates to reduced fuel, fertilizer, herbicides, and time inputs. With satellite-based soil mapping, we have seen a 30% gain in income for corn and soybeans by managing on soil based precise information. The DBSFRC has initiated research using machine learning and deep learning for optimizing farm operations. We have purchased a drone with a camera that detects visible and nonvisible light spectrums. It can tell the health of plants and identify weeds. The drone can use sensors such as ground penetrating radar and electromagnetic surveys to relate to forage production. We are using GPS collars to track cattle and sheep grazing preferences. We also equipped cattle with microphones to do acoustic analysis for optimized forage intake. We are even mowing our lawn with robots (photo to right) to evaluate the long-term potential cost savings. Those are a few of the technology-based projects that are showing a lot of promise for improved small farm efficiency. Technology is a booming industry in the US and jobs can be located anywhere with high-speed internet. As small farms begin using more technology, service industries will follow driving job growth throughout the rural farm-based communities. We feel that technology is the next frontier in farming and increased data will drive management to make more efficient operations. With sensors and equipment, we can collect a lot a data rapidly and use this data for creating efficiencies for increasing yield, farm income, increased precision for soil health and water quality issues. The team at DBSFRC have made great strides in identifying which technologies are appropriate for improving the economic viability of small farms through research. We are continuing to make progress by hiring Drs. Libohova and Rohila (see information on page 5 and page 6) to join the efforts in cutting edge research. I am looking forward to the day when we can have you out to see our progress!

In this issue:

Dr. Christine Neiman Research Spotlight

Dr. Christine Neiman

Root Growth in Thinned Hardwood Trees

We continue to be impressed by the forage growth in the thinned hardwood site (see May 2021 newsletter), but our research continues to evolve, and we have begun to ask questions beyond yield and forage quality. Our collaborators at the University of Arkansas (Dr. Dirk Philipp, Dr. Mary Savin, and graduate student Matt Janorschke) are studying root growth at the hardwood site. The goal is to assess the root growth over time under various forages and microtopography (small areas). To do this, we use ingrowth root cores. The core is a metal mesh (hardware cloth) cylinder of 12 inches in height and 3.5-inch diameter (Figure 1). An auger is used to create a hole of similar dimensions, the augured soil is packed in the core, and the filled core is placed snuggly in the hole. The core provides a known volume of space of root free soil, and the mesh allows fine roots to enter the core. Fine roots (<2mm) will grow into the mesh over 6 months after which the core will be removed and assessed for root biomass and general root structure with a root scanner. Figure 2 shows a test ingrowth root core that has been removed after 3 months in the soil.

Figure 1.

For this experiment, 42 ingrowth root cores were installed. The hardwoods site has been previously thinned to three basal areas, 30, 50, and 70 square feet per acre. The hardwood site is unique in that it also has variable microtopography with mounds and inter-mounds. Therefore, ingrowth root cores were installed in the different basal areas, either on a mound or inter-mound, in plots of tall fescue, orchard grass, or a control with no planted grass.

Figure 2.

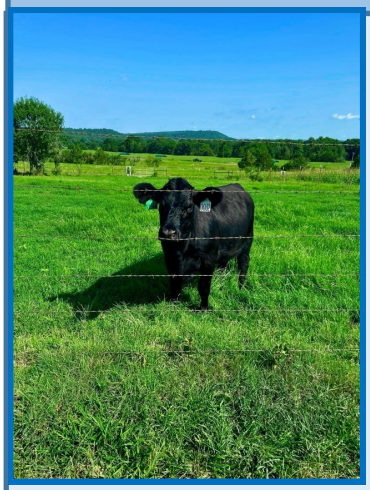
We hypothesize that fine root production will be greater in treatments with lower basal area because of greater light penetration and greater forage growth. Compared to the control, we hypothesize that fine root growth will be greater in tall fescue and orchardgrass. In terms of the microtopography, it is hypothesized that fine root production will be greater on the mounds because of lower soil moisture and better aeration.

This work is important because it has soil health implications and will help us understand below ground plant growth. Fine roots constitute a large portion of the carbon pool within the soil and rapid turnover of finer roots is influential on a multitude of nutrient cycles within the soil. This work will also be useful to indicate how above-ground management variables influence below ground productivity.

Dr. Nieman Receives Award

At the virtual North American Agroforestry Conference, a conference organized in part by the Association of Temperate Agroforestry (AFTA), a professional organization for scientists, industry, and practitioners involved with agroforestry, Dr. Nieman was awarded the “Significant Contributions to AFTA” award. Dr. Nieman was chosen for this award by the AFTA board for her contributions to the AFTA newsletter – writing, reviewing, and organizing articles and general communications for the AFTA organization.

Cattle Program Update

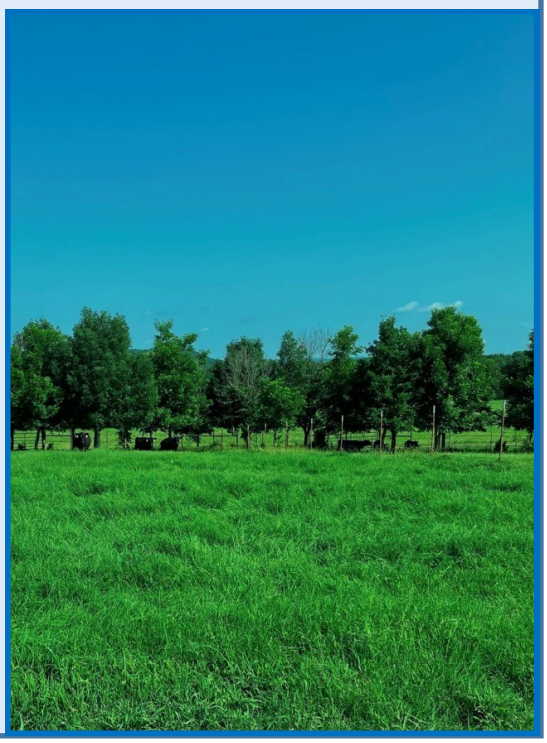


Grazing Projects Going Strong

The Dale Bumper Small Farm Research Center’s cattle crew has been busy this summer assisting with research projects. The cattle crew has been monitoring and managing forage types by reducing weed population and maximizing forage growth. The crew has been monitoring the quality and quantity in grazing pastures and in study plots.

The crew assisted in the initial phase of a grazing study that consists of 6 Sorghum Sudan plots, 6 Sorghum Sudan/Cow Pea plots, and 6 Bermuda grass plots. They are assisting in the 28 day rotation of the calves on the study plots.

The cattle crew has been working on maximizing forage on the ongoing Watershed study plots as well. This study consists of 18 plots: 3 overgrazed, 9 rotational grazed, and 6 hay plots. The cattle on the study has been able to remain on the rotation plots for an extended time period due to the amount of forage now available in those plots.



The cattle crew is working on bush hogging all the grazing pastures at the station. This cuts down on the weeds and old grasses and gives the summer grasses a chance to take off providing extended vegetation for the cattle.

The Summer is always an eventful time for the DBSFRC Cattle Crew!

Small Ruminant Research Spotlight

Dr. Joan Burke

APHIS Inspection

APHIS Animal Care Inspector conducted an unannounced inspection of our facilities, pastures and documentation the last week of June. The inspector was very thorough and drove through or walked into almost every pasture. The inspector was very complimentary about our location and praised the welfare of the animals, attention to detail, and upkeep of the facilities and pasture. We received no citations and were told to keep up with the good work and animal care. Our Animal Welfare Approved by a Greener World inspection occurred in late July and is always helpful with ways to improve animal welfare from experienced inspectors. The sheep flock has been AWA certified since 2012.

Spring Katahdin Sheep Sale

The Small Ruminant crew conducted the Summer Online Katahdin sale on July 28th, 2021. The sale offered registered and commercial producers a chance to obtain some of the genetics that Dr. Burke has worked hard to build. The sale included mature, fall born, and winter born ram and ewe lambs. There were 94 lots and some lots included bred ewes. The animals selected for this sale were enrolled in the National Sheep Improvement Program and included animals that are in the top of the Katahdin breed with parasite resistance, growth traits and have a proven production record. The sale was open for bidding from 7am-7pm July 28th and utilized racehorse style bidding. Eighty-three animals were sold during our Summer Katahdin Sale (69 ewes & 14 rams). The animal's averaged $485/head from returning and new buyers. Our genetics are going out to small farms and university programs in 14 different states: Alabama, Arkansas, Oklahoma, Missouri, Tennessee, Texas, Iowa, Ohio, Minnesota, Kentucky, Indiana, Pennsylvania, South Carolina and Virginia. The center looks forward to sharing our genetics with sheep producers nationwide.

Staff Spotlight

Welcome new hire…

Dr. Zamir Libohova

Dr. Zamir Libohova received a Bachelor's degree in Agronomy and Doctor of Science in Soil Fertility and Plant Nutrition from the Agriculture University of Tirana, Albania. He worked for 2 years as a research scientist at the National Soil Institute conducting soil fertility trials and leading the North Research Station and the National Soil Laboratory. He received a Fulbright scholarship (named after William J. Fulbright, Senator from Arkansas who started the program) to study soil science at Oregon State University. He joined the World Bank Forestry Project in Albania as the interim director of Project Environmental Management Unit overseeing the implementation of the Environmental Impact Assessment program. Zamir graduated with a Master of Science degree from Colorado State University with focus on hydrology and watershed management.

While working as a soil scientist with USDA-NRCS in Alabama, he received an advanced certificate on GIS and remote sensing from the University of Alabama in Tuscaloosa. Dr. Libohova graduated with a Doctor of Philosophy (PhD) in soil science from Purdue University and joined the National Soil Survey Center (NSSC) in Lincoln, NE as a Research Soil Scientist. At the NSSC he conducted research on soil modelling using digital soil mapping and remote sensing approaches. During this time, he worked for the Global Soil Map project, an international initiative funded by the Bill & Melinda Gates' Foundation and supported by the International Union of Soil Scientists (IUSS).

During his tenure at NSSC, he worked on many projects in different countries like Albania, Brazil, China, El Salvador, Honduras, Nicaragua, Guatemala, Colombia, France, Mexico, Haiti, Kenya, Russia and Switzerland where he continues to collaborate. His research interests include understanding how technology can be applied to small farm operations to understand animal, plant and soil interactions for optimizing economic gains (continued on page 6).

April 2019. Field trip to collect soil and cacao samples in Sierra Nevada de Santa Marta, Colombia for the Cacao for Peace Project funded by USAID. At a local farm of natives who grow coca plants for medical purposes.

His research focus is on developing models and tools to better manage these systems add to the technology focus at the Dale Bumpers Small Farms Research Center. Dr. Libohova said "the position at the DBSFRC is a great opportunity and I am very honored and fortunate to join the team of researchers and the center staff to help and contribute to the mission. I look forward to building a research program that supports small farms and contributes to the profitability of rural communities. I am excited to participate in stakeholder meetings and learn more about the challenges of operating small-scale farms."

Welcome new hire...

Dr. Suman Rohila

Dr. Suman Rohila is a Biological Science Laboratory Technician for the Dale Bumpers Small Farm Research Center. She is serving as the laboratory manager at the DBSFRC and overseeing animal, plant, and soil sample analysis.

She earned a Ph.D. in plant nematology at Cornell University and conducted her research on reniform nematodes, and their control based on management practices on cotton. Following the completion of Ph.D., she worked as a Research Associate and led a study on the biological control of nematodes through bacterial antagonists. At Cornell University, she investigated the interactions of nematodes, microbes, and abiotic factors in soil environments. Dr. Rohila also has extensive experience in plant molecular biology, Agrobacterium-mediated plant transformation, and plant/soil nutrient analysis. At Pennsylvania State University, her research focus was on Drosophila (fly) genetics; specifically, she studied the cellular and molecular basis of learning, memory, and ovulation in Drosophila. Dr. Rohila also supported research at the South Dakota Animal Disease Research and Diagnostic Laboratory. Her research has been published in Peer-Reviewed Open Access Scientific Journal (PLOS One) and Proceedings of the South Dakota Academy of Science. Please join us in welcoming Dr. Rohila!

To view archived newsletters or to find Publications, please visit our website at https://www.ars.usda.gov/southeast-area/booneville-ar/dale-bumpers-small-farms-research-center/