

Agricultural Research Service Small Farm Research Agri-news

**Dale Bumpers Small Farms
Research Center Newsletter
Booneville, Arkansas**

Greetings from the Research Leader, Dr. Phillip Owens



Dr. Phillip Owens

I am glad to be back as the Research Leader in Booneville! As mentioned in the last Newsletter, I served as the Acting Associate Area Director for the USDA ARS Southeast Area in Stoneville Mississippi. The Southeast Area is the largest management unit within the USDA ARS with 66 research units, approximately 500 scientists and around 1,700 employees. The research covers diverse topics from citrus and sugarcane in Florida, honeybees in Louisiana, pecans and peanuts in Georgia, blueberries in southern Mississippi, cotton and catfish in central

Mississippi and poultry production in Arkansas and Georgia. The SEA covers unique research programs like pickle production in North Carolina, vegetable crops in South Carolina and tropical fruit production in Puerto Rico. Each day on the job was different because all of the research units have a special focus addressing local agricultural needs. Serving as Associate Area Director for these different research units in multiple states gave me an opportunity to see different ways research centers are operated which helped me learn how to improve operations at the Dale Bumpers Small Farms Research Center. Because of the hard work and dedication of our employees, our Center is recognized nationally as one of the top performing research facilities and is one of the reasons I was chosen to serve in this role.

I want to thank Dr. Joan Burke for continuing forward progress in my absence and now that I am back, we will continue to make strides for advancement. Some coming events will feature stakeholder meetings. We want you to see our research facility and be able share ideas collectively. We want our research projects to serve the needs of the community so we need input on research that helps answer your questions. Please be on the lookout for more information on stakeholder meetings.



Arial photo of headquarters

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Dr. Christine Nieman's Cattle Research Spotlight



Dr. Christine Nieman

The 2022 field season has arrived. We are starting a large 5-year organic cropping systems study with Winrock International and the Natural Soybean and Grain Alliance. The project is a grant funded by the Organic Agriculture Research and Extension Initiative (OREI), and was awarded to Winrock International in fall 2021. The purpose of this study is to evaluate 4 different organic cropping systems and determine best management practices for organic farmers in the mid-South. In addition to our site in Booneville, this collaborative project includes demonstration plots and researchers from the Southwest Research Center at the University of Missouri and Agri-center International near Memphis, Tennessee. The

cropping treatments fall into three categories: System 1: Conservation Management, System 2: Integrated Enterprise, and System 3: Profit Driven. All management systems contain the same cropping rotation, a fall planted cereal crop/forage followed by a spring planted summer cash crop. However, the goals, and subsequently the management, of each system differ. Most of these differences surround the events of cereal crop/forage termination. Depending on the system, the cereal crop may serve as a fall planted cover crop either terminated via grazing, roller crimping, or harvest of the cereal grain. The systems also differ by the use or absence of tillage. **(Figure 1. below shows the differences in treatments)**

The conservation management system will use late summer/fall-planted cover crops that will be roller-cripped (no-tillage) the following spring/early summer. The cover crop will aid with reducing weed pressure on the cash crop while also building soil quality. In this experiment, the conservation management approach (no-tillage treatment) will (continued on page 3)

Figure 1. Experimental 3-year crop rotation with detailed management and tillage approaches. NT=no till, CT=conventional tillage

Tillage*	Yr 1	Yr 2			Yr 3			Yr 4		
System 1: Conservation management										
	Fall	Spring: CC termination	Summer: Primary crop	Fall	Spring: CC termination	Summer: Primary crop	Fall	Spring: CC termination	Summer: Primary crop	Fall
NT	Cereal rye/legume	Roller crimp	Soybean (commodity)	Cover crop mix	Roller crimp	Corn (commodity)	Cereal rye/legume	Roller crimp	Soybean (food grade)	
System 2: Integrated enterprise										
NT	Cereal rye/legume	Grazing	Soybean (commodity)	Grazing residue followed by cover crop mix	Grazing	Corn (commodity)	Grazing residue followed by cereal rye/legume	Grazing	Soybean (food grade)	Graze residue
CT	Cereal rye/legume	Grazing followed by tillage	Soybean (commodity)	Grazing residue followed by cover crop mix	Grazing followed by tillage	Corn (commodity)	Grazing residue followed by cereal rye/legume	Grazing followed by tillage	Soybean (food grade)	Graze residue
System 3: Profit driven										
CT	Cereal rye/legume	Rye grain harvest followed by tillage	Soybean (commodity)	Winter wheat	Wheat grain harvest followed by tillage	Corn (commodity)	Cereal rye/legume	Rye grain harvest followed by tillage	Soybean (food grade)	

(continued from page 2) represent the most conservation-focused end of the spectrum. The integrated system will incorporate cattle with at least two grazing events within each phase of the crop rotation. This strategy may be beneficial to many small organic farmers that also raise livestock by providing additional grazing forage, and thereby, an additional source of income. Integrated systems may also promote a low-input and regenerative systems by recycling nutrients, building soil health, and managing weeds. Cover crops will be grazed in winter/early spring and crop residues will be grazed in the summer after harvest. In addition to livestock integration, two tillage treatments, representing opposite ends of the weed management and soil disturbance spectrum, will be explored. One treatment of the integrated system includes tillage after grazing, while the other remains a no-till system. The integrated systems are meant to utilize livestock as a tool to manage weeds and crop residue and recycle nutrients (**Figure 2 below shows grazed vs. ungrazed plots**). However, in some cases cattle may not be able to graze residue down far enough or cattle may select against some weeds, allowing for accumulation of heavy residue or weed pressure prior to planting. In this case, tillage after grazing may be beneficial in some years.

The profit driven system will emphasize maximum economic returns within each phase of the rotation and will not emphasize cover crop use. This rotation is dependent on tillage, which is common in organic cropping systems as a tool to reduce weed pressure. Two cash crops will be utilized in the profit driven system. The longer growing season and mild winters in the Mid-South can allow for more than one crop harvest per season. Harvesting a winter crop such as winter wheat as a value-added crop can significantly increase economic returns, especially with organic crop premiums. However, given the critical role cover crops play in organic agriculture, there may be tradeoffs associated with this approach. This treatment is meant to represent the extreme end of the spectrum and is focused more on short-term profitability and less on conservation.

The evaluation of these systems will include: crop and forage yield and nutritive value, occurrences of crop pests and disease, soil health (bulk density, soil organic carbon, electrical conductivity, pH, nutrients, and biological assessments), and an economic evaluation. For the economic evaluation, revenue and cost differences across the systems will be tracked and used to determine the most profitable system (continue on page 4).

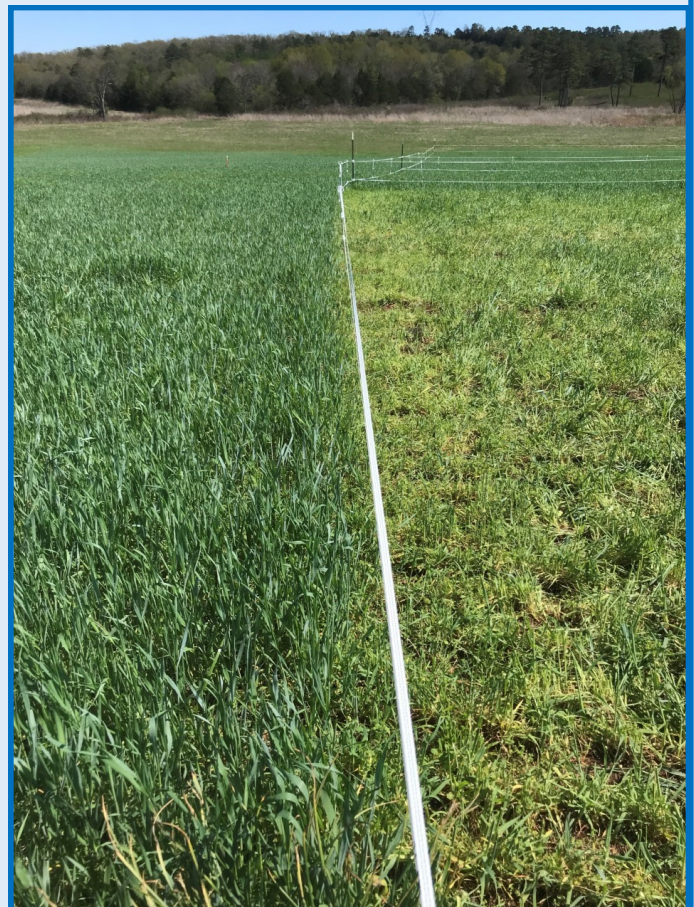


Figure 2. Grazed and un-grazed plots side by side in April 2022. All integrated treatments have been grazed at least once so far this spring. With two integrated treatments and 4 replicates for each treatment, eight 0.05 acre plots will be grazed in spring and again in fall.

(continued from page 3) Although the Center has some recent history of cash crop research (corn, soybean, and edamame), this project will be the first large scale cropping systems study at the Center. The project will be challenging, but we are excited to learn more about managing these cropping systems with tools such as grazing and the roller crimper that promote conservation and regenerative systems. We are thankful to Winrock International and the Natural Soybean and Grain Alliance that continue to work with us and support the research. We are looking forward to a busy growing season in 2022.

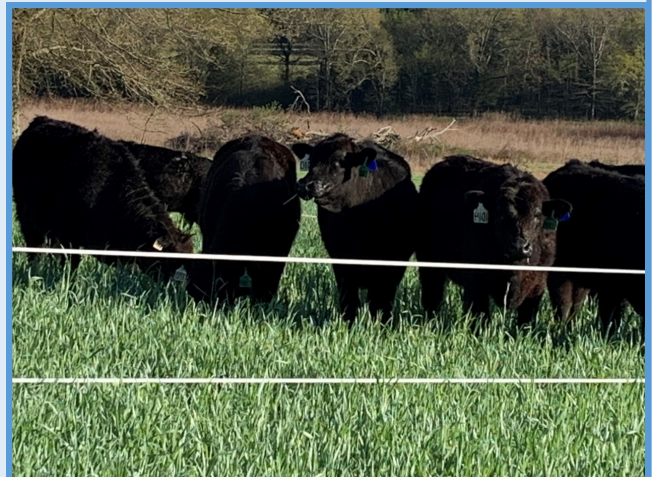
Cattle Program Update

Spring is here and with it comes an abundance of new tasks for the Cattle Crew at Dale Bumpers Small Farms Research Center. Some of these tasks include calving, Spring vaccinations, breeding soundness exams, Beef Quality Assurance (BQA) certifications as well as the onset of new and continuing research projects. Spring showers also keep the crew moving with the frequent run-off samples to collect and download from the ongoing Small Plot Run-off Study. While Spring is one of the busiest seasons for the Cattle Crew, it is also one of the most rewarding.

Calving is a large focus for the crew during the early Spring months. Each calf is tagged, weighed, and banded if it's a bull calf. At 60 days in, the DBS-FRC cows were 94% calved out with 63 heifer calves and 66 steer calves with only 7 cows left to calve on the farm.

Spring vaccinations have also begun. All the mature cattle on the farm will receive a fly tag, de-wormer, as well as an IBR vaccine, BVD vaccine, PI3 vaccine, BRSV vaccine, and a Mannheimia Haemolytica Toxoid. These vaccines will protect the cattle during the spring and summer months and ensure the calves receive passive immunity against many serious illnesses. Along with vaccines, the bulls undergo breeding soundness exams in the early Spring. These exams confirm the bull's physical capabilities and will let the crew know if they are sound and ready to go to pasture soon.

The cattle crew has also been involved in a few research projects this year. One of them is the OREI project also known as the cropping system study. This study involves 27 of the station's replacement heifers used to test grazing as one of the few crop termination methods (continued on page 5).



(continued from page 4) The study consists of 16-half acre plots with 8 of those being grazed. Another study the crew has been working on is the NIFA project. The cattle crew is working with other crews to complete the fencing on the 140-acre study that will utilize the station's cattle to explore grazing options with different forages.



Beef Quality Assurance (BQA) Certification

An exciting accomplishment for the Cattle Crew and the DBSFRS is the inclusion of the Beef Quality Assurance (BQA) certification. The farm is now nationally accredited after passing the final inspection and the cattle are now recognized as BQA certified beef. The crew has been working toward this achievement for the past several months knowing the result would be healthier, more valuable beef and further recognition for the high-quality cattle the farm produces.

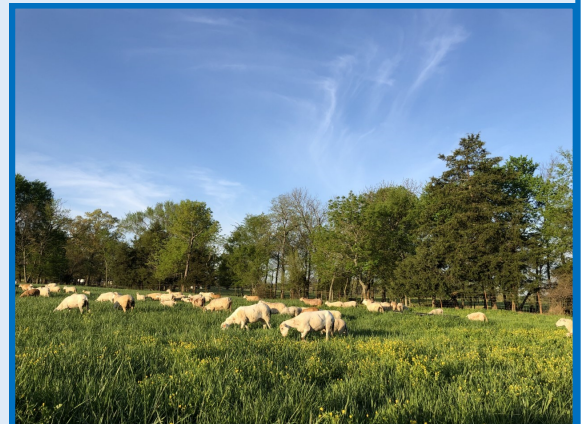
Dr. Joan Burke's Small Ruminant Research Spotlight



Dr. Joan Burke

Rollout of Genomic Enhanced Estimated Breeding Values in NSI

The small ruminant crew is gearing up for breeding season. Rams will be evaluated for semen quality, breeding soundness, and libido observations (interest, aggression, attempted mounting) and introduced to ewes in May. Multiple rams will be used for 1 of 2 breeding groups. For research purposes a group of 52 ewes will be exposed to parasite susceptible rams and a group of 83 ewes will be exposed to parasite resistant rams. Approximately 30 days after rams are removed, the crew will use ultrasound to determine pregnancy, number of offspring, and approximate date lambing will occur. Surprisingly, some rams hold back and let the other rams do the breeding, while more aggressive rams might claim as many as one-third of the offspring. The offspring's sire is determined by genotyping. We also obtain genotyping to add to the genomic-enhanced estimated breeding values in NSIP (see article in February 2022 newsletter). Interestingly, about one-quarter of the fall lambing ewes give birth to offspring from different sires. This data will contribute to the University of Nebraska's AFRI grant led by Dr. Ron Lewis, **"Improving robustness and climatic resilience in US sheep populations through genomics."** (see related article on page 8).



Grazing with the Fun Guy (Fungi) – Small Ruminant Worm Control

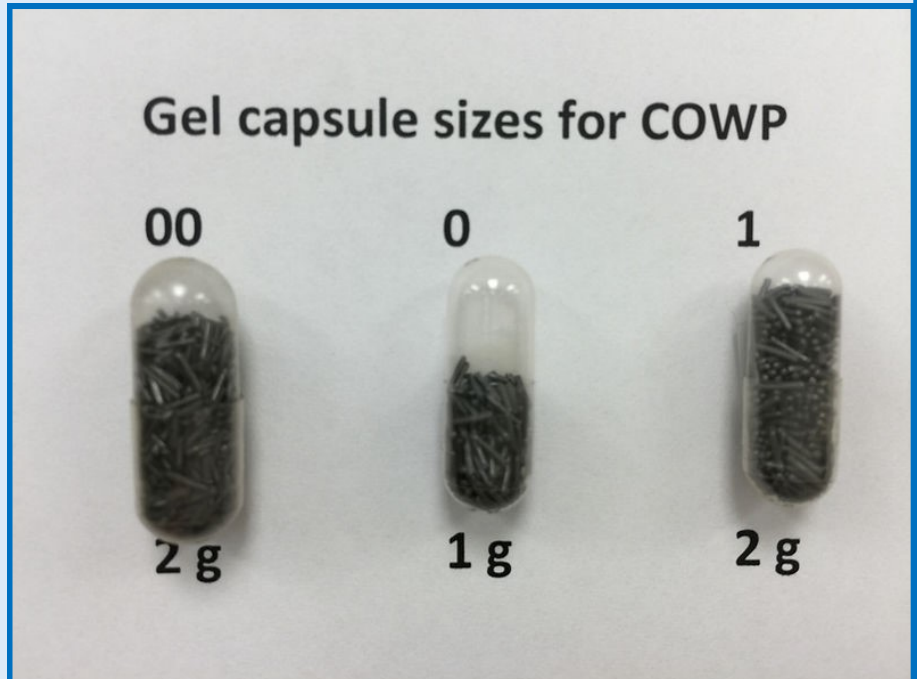
This new Research grant project uses a systems research approach to examine strategies to include *Duddingtonia flagrans* (Df), a nematode trapping fungus, to minimize the need for dewormer in sheep and goats in research and farmer's flocks/herds. Other worm control tools including genetics will be included. We aim to show it is possible to provide a strategy to offer the fungus, which controls gastrointestinal worms on pasture leading to improved animal health and productivity, and enhancing sustainability of livestock farms.

Since our first SARE R&E grant in 2002 (Novel approaches for sustainable control of gastrointestinal nematodes in small ruminants in the southeastern US; LS02-143), we have strived to include nematode-trapping fungus in the toolbox for livestock producers to control gastrointestinal nematode (GIN) parasites. However, commercialization of the fungus (BioWorma®) took 17 years! GIN are the major health threat for ruminant livestock confounded by dewormer resistance. GIN infections can lead to anemia, poor weight gains and death. The goal of most sustainable farms is to eliminate chemical inputs and control GIN. The "Fun Guy" (Fungi) brings this closer to reality. The fungus can remove much of the GIN on farm. Approximately 90% of GIN are found on the pasture and 10% in the animal; Df can reduce up to 90% of larvae on pasture. A drawback is that the product is considered costly by most farmers (between \$0.20 to 0.60 per 100 -pound animal per day). (continued on page 7)

(continued from page 6) Thus, it is imperative to build a strategic program for farmers that considers effectiveness and economics. For example, can Df be fed every other day, or every other week or only in loose mineral supplements? These questions will be answered in research flocks/herds and on farm by examining changes in fecal egg counts, pasture larval counts and/or animal worm counts.

Genetics. Genetic selection for resistance and/or resilience to GIN represents the most promising means to minimize GIN infection, and with good pasture management and nutrition, can nearly eliminate the need for deworming. Parasite resistance is the ability of the animal to initiate and maintain an immune response to suppress establishment or eliminate GIN. Resilience is the ability to maintain production even when parasitized. The ARS flock and one of the farm flocks are enrolled in the National Sheep Improvement Program which upon receiving data on flock animals returns breeding values including for parasite resistance. Rams with exceptional parasite resistance will be compared with susceptible or unknown resistance on at least three of the cooperating farm flocks with similar breed type to evaluate FEC/resistance in offspring.

Another alternative that will be used for control of GIN with the fungus is copper oxide wire particles (COWP). COWP is administered as a bolus to sheep or goats in need, typically based on FAMACHA (scores of 1 or 2 do not need deworming, scores of 3 may, and scores of 4 and 5 indicate dire need for deworming). COWP targets barber pole worm, but not other GIN that could cause weight loss and diarrhea. COWP is commercially available and cost as little as 7¢/treatment for low doses (0.5 g) which minimize risk of copper toxicity. COWP is accepted by some organic certifiers as a dewormer, thus organic status can be maintained. Several cooperating farmers in this research project use COWP for worm control.



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The team of researchers includes Joan Burke (USDA, ARS, Dale Bumpers Small Farms Research Center, Booneville, AR), Tom Terrill and Niki Whitley (Fort Valley State University, GA), and Adriano Vatta (Louisiana State University). Outputs and farmer friendly publications will be found on the website of the American Consortium for Small Ruminant Parasite Control (www.wormx.info). You can also learn more about the researchers on the website. The on-farm research will include farmers from Arkansas, Georgia and Louisiana.

Improving robustness and climatic resilience in US sheep populations through genomics

The sheep industry contributes nearly \$6 billion annually to the US economy, with growing ethnic diversity strengthening demand. Sheep farms outnumber dairy cattle, pig, and broiler enterprises, with distinctive breed-types dispersed across climatically-diverse regions and management systems. Breeding robust animals that perform well under these conditions is paramount to the industry's sustainability. However, robustness and climatic resilience traits are largely absent in US sheep genetic evaluations.



Dr. Joan Burke is a co-principle investigator (PI) on a new 4-year USDA AFRI grant awarded to the University of Nebraska with Dr. Ron Lewis as the PI. The overarching goal of this project will be to develop the background knowledge and tools needed for successful implementation of genomic selection for robustness and climatic resilience in the major US sheep breed-types (hair, semi-prolific, fine-wool, terminal-sire). Furthermore, it will provide training to the next generation of scientists with interest in sheep breeding, which is greatly needed to ensure continued competitiveness

and advancements in this important agricultural sector. Other co-PIs are from USDA ARS Meat Animal Research Center in Clay Center, NE, USDA ARS United States Sheep Experiment Station in Dubois, ID, and Purdue University.

The project entails collecting genomic and phenotypic data (DNA and production data) from ARS locations and farms that have Katahdins, Polypay, Rambouillet, and Suffolk breeds who enter data into NSIP (the National Sheep Improvement Program; www.nsip.org). These flocks are called Innovation Flocks or Sheep GEMS (Genetics, Environment, Management and Society). They will record data on what are thought to be heritable traits (those traits passed down to the next generation) that measure robustness or ability to withstand adverse climate change. Traits include teat length in ewes that have lambed (if too long or large, lambs cannot nurse very well), hair shedding in Katahdins (sheep that completely shed will be less prone to heat stress), and body condition scores at key points throughout the year (those sheep that can maintain good body condition in adverse conditions will likely thrive and produce more lambs).



The plethora of data to be collected is very time-consuming but should contribute to identification of important traits to move the sheep industry forward in a changing climate.

Dale Bumpers Small Farms Research Center Spring Sheep Sale



The Dale Bumpers Small Farms Research Center held their Spring Katahdin online sale on Wednesday April 26th, 2022. The sale included mature and fall born rams and ewes. The animals selected for the sale were high quality breeding animals enrolled in National Sheep Improvement Program and included animals in the top of the breed for parasite resistance, growth, and maternal traits. There were 19 bidders from across the country with over 365 bids placed.

This online auction allows us to excess animals to keep our herd numbers balanced and enables us to share our premium genetics to repeat and new buyers in 9 different states (West Virginia, Texas, Missouri, Louisiana, Kentucky, South Carolina, Wisconsin, Maine, and Arkansas). Fall born ram and ewe lambs that were not kept as replacements or put in the Spring Katahdin sale were sold as market lambs at a local sheep sale on April 1st just in time for the Easter market and brought an average of \$2.30 a pound. If you missed these sales, there will be another on July 19th selling mostly January born lambs, a couple of rams, and a few mature ewes.

DBSFRC Earth Day Activities 2022



At the Dale Bumpers Small Farm Research Center (DBSFRC), our chosen project for Earth Day Celebration was planting a Cherry Tree in memory of retired employee Jackie Cherry. Everyone took part in the planting, speaking, and remembering Jackie and her dedication to Earth Day activities at the DBSFRC. Tyler Brewer and the Farm Crew dug the hole and oversaw the planting and care of the tree. Dr. Owens read Ms. Cherry's Obituary and a few people shared stories and memories. Earth Day was a special event for Jackie to conduct each year. She enjoyed coming up with fun activities .

As an additional Earth Day event, the employees at DBSFRC developed a Subsurfer demonstration at the University of Arkansas farm in Fayetteville AR. This activity was attended by approximately 30 people and the positive environmental implications of utilizing the Subsurfer was discussed. The Subsurfer is farm equipment developed by DBSFRC researchers that incorporates poultry litter below the surface of soil yielding decreased phosphorus runoff by over 90%. It also decreases the amount of greenhouse gases by greater than 90% and increases above ground biomass. These benefits of the research equipment demonstrate how creativity by USDA ARS employees can benefit the environment.

In Remembrance...



Jacquelyn "Jackie" Cherry (June 20, 1953– March 25, 2022)

Jacquelyn "Jackie" Cherry was 68 years old when she passed at home in Blue Mountain, Arkansas. Jackie was a long-time ARS employee (over 28 years) and retired from the DBSFRC on March 31, 2021. Jackie started working at the Center on June 28, 1992, as a Biological Technician for Dr. Mike Brown working with both cattle and sheep. In 1999, she transitioned to Dr. Joan Burke's research team on projects that included sheep and goats. Over the years Jackie served a vital role in regards to research support, purchases, property control, environmental management, and safety. She always excelled at the many roles that she was tasked with over the years. She organized and participated with many animal projects and facility events. Jackie was an intricate leader in outreach by organizing school tours, teacher programs, and representing the station at conferences and events. She was a former board member and organizer for Arkansas women in Agriculture. In Lieu of flowers, the employees took up a collection for the Booneville Animal shelter. We will miss having Jackie at the station but we planted a cherry tree in remembrance of all the fun and informative Earth Day activities she arranged for the station.

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/>



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

The [NRCS PMC 2021 Review of Activities](#) was published.

Other PMC Information is available online at: <http://www.plant-materials.nrcs.usda.gov/arpmc/>

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