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Quarterly

Agricultural Research Service
Small Farm Research Agri-news

Dale Bumpers Small Farms
Research Center
Booneville, Arkansas

Greetings from the Research Leader, Dr. Phillip Owens

Dr. Phillip Owens

It is great to be back at the Dale Bumpers Small Farms Research Center! This year I served in a couple of different capacities within the USDA, ARS which increased my overall awareness of this great organization. Initially, I served as the Acting Associate Area Director for the Southeast Area office from January to April in Stoneville, Mississippi. This was followed in May to September, where I worked as the Acting Director of Operations for Partnerships for Data Innovations (PDI) in the Office of National Programs in Beltsville, Maryland. These experiences at the area and agency level provided opportunities for professional growth and gaining new perspectives to incorporate at our Center in Booneville. I am very grateful to our staff for continuing progress and Dr. Joan Burke, Dr. Christine Nieman and Dr. Zamir Libohova for serving as Acting Research Leaders in my absence.

During my most recent position as Acting Director of Operations, I helped launch a new enterprise within the agency called PDI which focused on building tools to help ARS scientists share data and build tools for farmers to more effectively utilize science in farming practices. An assignment I completed was a place to see all of the projects that PDI is engaged in. The PDI Spotlight (https://pdi-spotlight-usdaars.hub.arcgis.com/) was established; in which, you can see the breadth of activities ranging from tick eradication to helping stop citrus diseases. (continued on page 2)

In this issue:

(continued from page 1) At our Center in Booneville, we are focused on building useable tools that help farmers in the area be more successful and fulfill our center's mission of developing economic solutions for small holder farmers.

Since I have returned, we have had many unique activities that are described later in the Newsletter. We had staff from Senator John Boozman's office visit our Center on October 5 to see our innovative research activities and progress on solutions-based research.

On October 11, Congressman Westerman and his staff visited the Center. Rep. Westerman talked to our staff about the importance of work to support agriculture and the rural economy. We demonstrated our drone and how it's used to capture data and also toured our agroforestry research site. We are always happy to have groups visit our team and allow us to highlight the important work we are doing to address agricultural innovations.

Congressman Westerman and staff visited DBSFRC

I am looking forward to our changing season and transitioning into Fall activities. You will see our team working with sheep and cattle to continue our animal research. Our soils and agronomy teams are working on developing new tools and technology to understand the complex interactions that farmers deal with daily.

Innovations in Ag 2022 Field Day

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. One way to showcase the technology and management practices used at the research center is to have field days to meet the public.

On August 18th, we presented such a field day. The field day was a huge success! Farm Equipment with new technologies was showcased with a welcome and overview of the research center from Research Leader, Dr. Phillip Owens.(continued on page 3)

(continued from page 2) Topics covered by scientists included: Optimizing Farm Operations using Technology by Dr. Zamir Libohova; Utilizing Alternative Forages for More Productive Beef Systems by Dr. Christine Nieman; Producing More Efficient and Healthy Sheep by Dr. Joan Burke and an Overview of USDA NRCS Plant Materials Center was given by Steve Haller, Plant Center Manager. Breakout sessions were given after lunch for Soils and Crops, Beef Production and Sheep Production.

Remarks made by attendees were very positive and will help concentrate on the future research for our area. Comments on water usage, alternative practices, and continuing sheep, cattle and forages research were very helpful to keep us on the right track. Attendees were very interested on how new technology could be incorporated into their farms. Attendees were impressed to see equipment and research programs to help farmers incorporate better practices and improved technology. We can not wait to have another field day and share more of the great research being explored here at the research center.

Cattle Update

Fall is here and for the cattle crew at Dale Bumpers Small Farm Research Center, that means an end to the grazing studies for the year. The crew has been busy getting final weights from the cattle on the studies as well as starting the fall vaccinations of the station's cattle. The upcoming weeks will bring pregnancy checks for the cows and start weaning the calves. The calves will be tagged with their GoGreen tags.

Like everyone else in the area, the station's forage has suffered greatly from the lengthy drought, so the crew has begun supplementing the cattle with hay and additional feed. Although Fall time adds a few more chores for the cattle crew, it is extremely rewarding to see the weaning weights of the calves and the pregnancy confirmations on the cows.

Evaluating how operator experience level affects efficiency gains for precision agricultural tools -Tulsi P. Kharel, Amanda J. Ashworth, and Phillip R. Owens

Tractor guidance (TG) improve environmental gains relative to non-precision technologies; however, studies evaluating how tractor operator experience for non-guidance comparisons impact gains are nonexistent. This study explores spatial relationships of overlaps and gaps with operator experience level (0-1; 2-3; 6+ years) during fertilizer and herbicide applications based on terrain attributes. Tractor paths recorded by global navigation satellite systems were used to create overlap polygons. Results illustrate operator experience level is critical for better efficiency gains estimation (for non-TG comparisons). Operators with 6+ years of experience reduced overlap by 7.7% and 20.6% compared to operators with 2-3 and 0-1 years of experience, respectively. New operators had consistently higher overlap across all slope (<0.5, 0.5-1, 1-2, 2-5, 5-9, and 9-15%) and roughness classes (<0.1, 0.1-0.2, 0.2-0.3, 0.3-0.5, 0.5-0.7, 0.7-1 and > 1). A low interpersonal reliability value of 0.02-0.03 indicates operator experience is crucial to estimate TG efficiency gains and consistent drivers experience levels are needed when evaluating economic and environmental gains from TG.

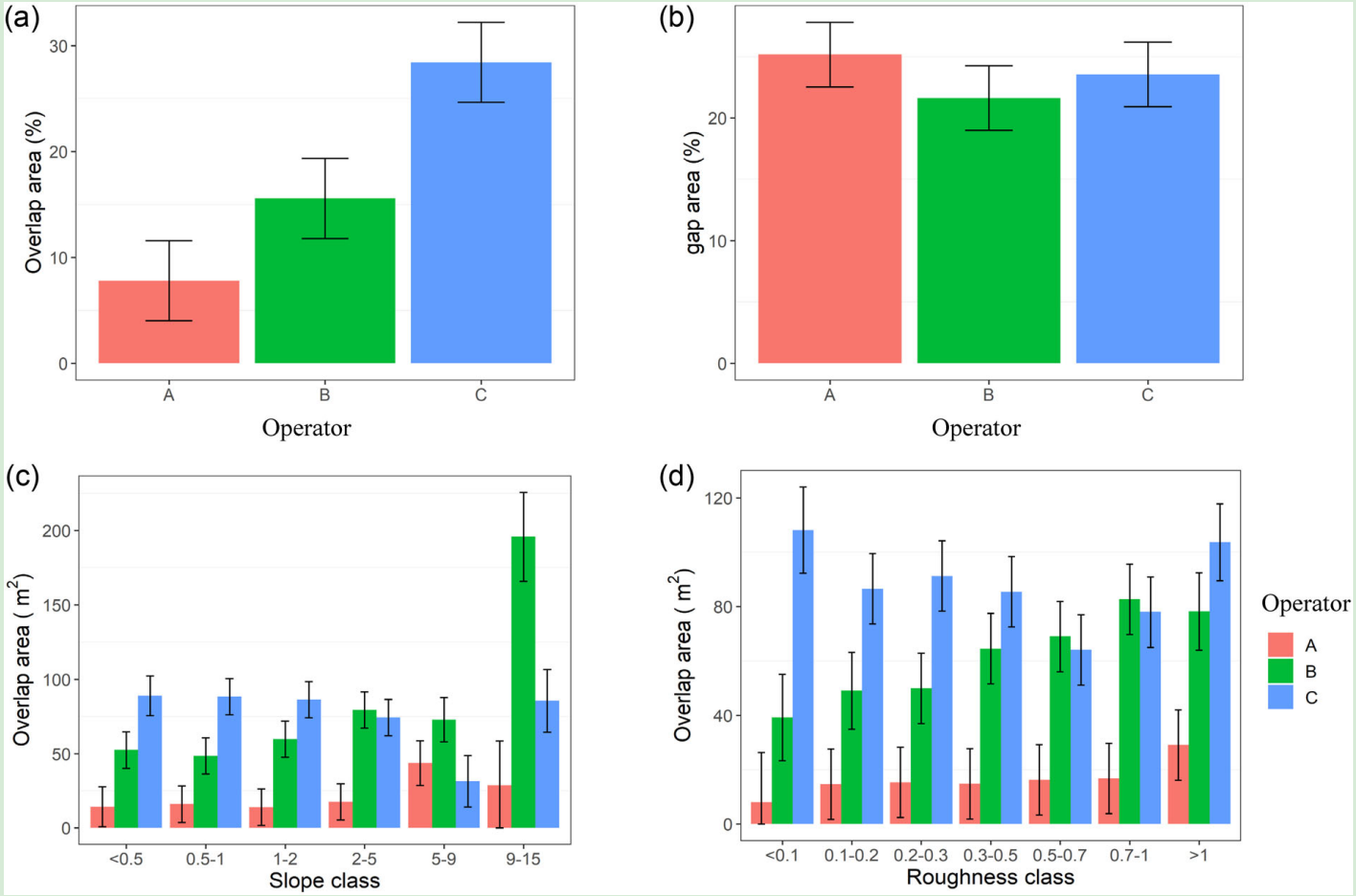


Figure 1. The graphs describe: (a) Overlap area (% to boundary area) by three operators, (b) gap area (% to boundary area) by three operators, (c) overlap area (m2/2500 m2 grid) by three operators for slope class, and (d) overlap area (m2/2500 m2 grid) by three operators for each roughness class. Operators' experience levels were 0–1, 2–3, and 6+ yr. Bars are standard error

Kharel, T.P., Ashworth, A.J., Owens, P.R. 2022. Evaluating how operator experience level affects efficiency gains for precision agricultural tools. Agricultural & Environmental Letters. https://doi.org/10.1002/ael2.20085

Dale Bumpers Small Farms Research Center hosts Arkansas Association of Professional Soil Classifiers Annual Meeting – October 13, 2022

The Dale Bumpers Small Farms Research Center (DBSFRC) hosted the **Annual Meeting of the Arkansas Association of Professional Soil Classifiers** (AAPSC) on October 13, 2022. About 25 soil scientists from different government agencies, universities as well as independent professional soil scientists participated in the meeting and various activities (**Figure 1**).

Figure 1. Members and participants of the Arkansas Association of Professional Soil Classifiers.

After the opening and welcoming remarks from the President of the AAPSC, Larry Gray, participants attended presentations from members of the Association and invited speakers. Jessica Cox, from Quail Unlimited, presented the work that the organization is doing in Arkansas to establish and preserve Quail habitat. Dr. Christine Neiman is conducting research at the center in cooperation with Jessica Cox.

Richard Vaught, resource soil scientist with USDA-Natural Resources Conservation Service in the Conway office in Arkansas, discussed his experience conducting a Soil Survey in Sweetwater County in Wyoming during summer 2022. Dr. Phillip Owens, Research Leader at the DBSFRC provided an overview of the research at the center and shared with the participants the vision of the center for helping small farms improve their resource management through technology and research (**Figure 2**).

The participants visited the Experimental Watersheds established in 2011 by Dr. Phillip Moore (USDA-ARS Fayetteville) and Dr. Dan Pote (USDA-ARS Booneville, retired), to compare different treatments for reducing phosphorus runoff (**Figure 3**). Some of the practices that were evaluated include; (1) continuously grazed (CG); (2) rotationally grazed (R); (3) rotationally grazed with an unfertilized buffer strip (RB); (4) rotationally grazed with unfertilized fenced riparian buffer (RBR) and (5) hayed (H). All experimental plots receive surface poultry applications each year in April or May at 2.5 tons acre.

Figure 2. Dr. Phillip Owens, Research Leader providing a general overview of the research at the Dale Bumpers Small Farms Research Center.

Figure 3. The participants observed two pits located in key landscape positions representing major soils in the experimental watersheds.

Dr. Joan Burke's Small Ruminant Research Spotlight

Dr. Joan Burke

The value of using sires with high parasite resistance on offspring and the value of NSIP EBVs to sell breeding stock

Current problem with small ruminant parasite control

Infection with gastrointestinal parasites or worms threatens economic viability of sheep and goat production in warm, humid climates and is the major health concern due to dewormer resistance. Gastrointestinal worms can lead to reduced weight gains, anemia and death of infected animals. Alternatives to dewormers that aid in control of worms are extremely important such as the use of copper oxide wire particles, good nutrition, and perhaps, most importantly, genetic selection for parasite resistance in the animal.

Genetic selection for parasite resistance

The National Sheep Improvement Program (NSIP) provides predictable, economically important genetic evaluation information to the American sheep and goat industry by converting performance records into relevant decision-making tools (www.nsip.org). By using sheep or goats with predictable genetics or performance attributes, including growth, reproductive or maternal traits, and parasite resistance, an economically productive parasite resistant flock can be developed. Estimated breeding values (EBVs) are calculated for each individual enrolled in NSIP that gives genetic predictability for each trait, which are science-based, industry-tested measures of a predicted animal performance.

Significant progress has been made in identifying sheep that are superior for parasite resistance in the last few years. This greatly helps with raising pasture-based and organic sheep sustainably by reducing worm infection and need for deworming. Coupling genetic resistance with other important traits will lead to economic success.

Most of the data on parasite resistance EBVs came from the Katahdin breed, but any breed and goats can submit data to NSIP in the U.S. There can be a large variability within a group of animals in the marker for parasite infection, fecal egg counts or FEC. Within the Katahdin breed, FEC EBVs ranged from -100 to more than +500% (-100 is the best EBV for parasite resistance), indicating great potential for genetic selection. For more information on using FEC EBVs see fact sheets on Genetic Selection at (www.wormx.info). What is the value of selection for parasite resistance?

Impact of using sires with high FEC EBV

The weaning and post-weaning FEC EBVs of sires influence FEC and degree of anemia (barber pole worm is a blood sucking parasite that causes blood loss or anemia) of offspring. (continued on page 7)

The lower the FEC EBV (the more negative the number, the better the resistance) of the sire, the lower the FEC of offspring. This suggests the importance of selecting breeding sires with the highest resistant EBV or the closest to -100% to minimize worm infection in offspring. In the USDA ARS flock in Booneville, for every 1-unit reduction in the sires post-weaning FEC there was a reduction of up to 8 eggs/g in the offspring's FEC. Also, as sire's FEC EBV decreased (became more resistant), packed cell volume (a measure of anemia; a lower value approaches anemia) increased. In other words, lambs were less or not anemic when sire EBV was closer to -100. A way for farmers to estimate packed cell volume is through FAMACHA scores. The more resistant sires will give offspring with lower FAMACHA scores (1 = red or not anemic; 5 = white or severely anemic). Use of FAMACHA as a selection tool may be quite useful in flocks that have not begun selection for worm resistance and for those with predominantly barber pole worm as FAMACHA is not useful in detecting other kinds of worm infections (see ACSRPC | InfoSeries: the other worms (www.wormx.info)).

Influence of lamb EBV on value of the lamb

It may be an important consideration to producers wishing to sell animals with NSIP EBVs. Would sale price be impacted by FEC EBV? A study conducted by agricultural economists using sale data from ARS and three private farms determined that the Ewe Productivity Trait, also known as the Katahdin Index was an important consideration in the sale value of a lamb. Buyers offered a premium for animals with higher index values. Also, sale prices were influenced by sale venue with premium sales such as an NSIP or Katahdin Hair Sheep International Expo sales being higher than selling directly from the farm. Retention of breeding animals was also associated with a premium value to farmers who raised the animal. Thus, buyers appear to be interested in sheep with balanced EBVs (above average in two or more traits of interest) and high Index, which will lead to productive daughters. Other breeds and goats may benefit from having information such as this for marketing purposes.

Summary

An important tool in the management of worm parasites is genetic selection for resistance within a flock or herd. Even the use of a parasite resistant sire that may have been purchased from a flock with measured genetics can lead to more resistant lambs. Differences in farm management and pasture worm load are minimized across flocks when selecting genetics for parasite resistance from other sheep operations. The more parasite resistant a sire is, the lower the worm infection will be in his offspring. When it comes to selling lambs, even though parasite resistance is a desirable trait, it does not necessarily influence the sale price of breeding stock lambs but rather the overall genetic profile of the lamb. An individual buyer's desire to meet their flock goals through other or balanced traits may be more important than solely considering the parasite resistance status of the ram.

Other resources: Microsoft Word - *What is an EBV worth.docx* (www.nsip.org)

This study was supported by USDA Southern SARE Grant No. OS19-124 and USDA NIFA OREI Grant No 2016-51300-25723. Mention of trade names or commercial products in this manuscript is solely for the purpose of providing specific information and does not imply recommendation or endorsement by the U.S. Department of Agriculture.

Sheep Crew Activities

Jessie Tanner, Joie Bogart, Sarah Hayward and Erin Wood represented the DBSFRC at the Katahdin Hair Sheep International Expo. The crew took 3 rams and 4 ewes with superior genetics and they also delivered sheep sold in the USDA premier sale. The parasite resistant genetics that Dr. Burke has developed are highly sought after and the crew members take advantage of these opportunities to discuss the genetics and research accomplished at the center. The Expo sale is one way we disseminate these genetics to producers for their breeding programs. The 7 sheep sold at the Expo brought in $11,350 with the highest selling ram bringing $2,800. All proceeds will help to continue animal research at the center.

Sarah Hayward, Joie Bogart, Jessie Tanner, and Erin Wood

Fall Lambing

Fall lambing is underway at the center. There are 114 ewes to lamb throughout October into November with 40 lambs in the first 2 days. The flock will more than double with over 200 lambs expected. Lambing season also begins a very busy research season for the small ruminant crew. Up to 20 data observations and samples are collected on each ewe within 8 days of lambing. These data sets are part of a collaborative research project including ARS locations at Clay Center, NE and Dubois, ID, and University of Nebraska and Purdue University, as well as innovative producers to evaluate hard-to-measure indicator traits of robustness and climate resilience, including lamb survival, ewe longevity, gastrointestinal parasitism, and udder health to determine whether any traits are heritable and can be selected for (USDA AFRI funded research).

The small ruminant crew took charge of sheep pasture maintenance with brush hogging and planting fall forages. Sarah Hayward and Chad Lee planted wheat, rye, clover, and vetch in organic and conventional pastures to extend the grazing season for the sheep. There are plots at Small Ruminant Central that are considered experimental units. We will determine the parasite larvae infectivity from a nematode-trapping fungus that was fed to sheep and transferred to the pasture. (Southern SARE funded research)

Breeding for our Winter 2023 season concluded in September and ultrasound data shows 80% conception rate. This group of ewes are part of a research project investigating whether pyrethroid ear tags attached to a collar will reduce the incidence of Cache Valley Virus (CVV) in maiden ewes (first time exposed to rams). Cache Valley has become a common issue in the area with sheep bred in August/September. For more information on Cache Valley Virus see our February 2022 newsletter.

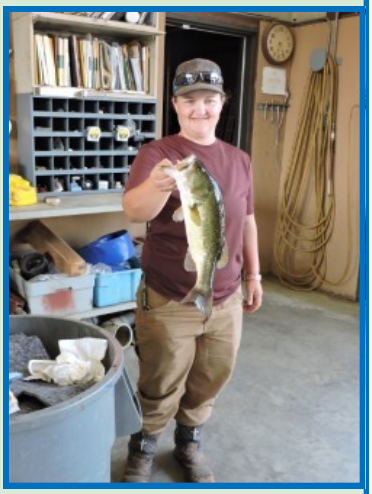
Organic inspection

Nature's Inspection Certification Services (NICS) conducted their annual organic inspection of the DBSFRC organic livestock and crops program in September. This year marked 10 years of certified organic sheep production at the research center. Our center is the only ARS research facility to have certified organic sheep. One of Dr. Burke's long-term research projects is understanding parasite resistance in organic livestock, using genetic selection to produce quality organic livestock that are resistant to parasites, foregoing the need for dewormers. The DBSFRC has approximately 164 acres of certified organic pasture, hay meadows and crop land, and a new barn is currently under construction to house organic hay.

Employees Activities

Fishing Derby

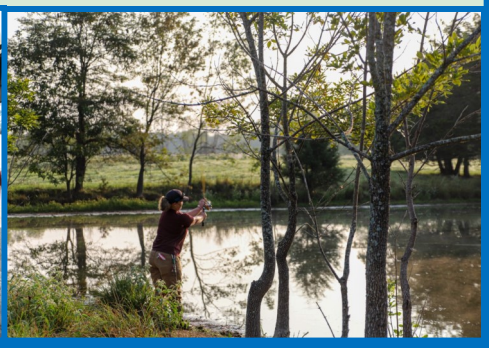
A few times every year employees get together and have some social time. Here are some of the pictures from the 2022 GoGo Fishing Derby. Employees got together and had a great time fishing and hanging out. Trophies were handed out for Biggest fish, smallest fish and Most fish caught. It was a great day for fishing!



Biggest Fish: Sarah Hayward (pictured right with her 2.6 lb. bass)

Smallest Fish: Ben Holleman

Most Fish: Brent Woolley (33 fish)



ARS New Hire

Dr. Joshua Blackstock

Dr. Joshua Blackstock received a bachelor's degree in Geology and a Minor in Environmental Geology from the University of Arkansas-Little Rock, a Masters with First Class Honours from the University of Canterbury in Geological Sciences, and a PhD from the University of Arkansas-Fayetteville in Geosciences.

As an undergraduate, Dr. Blackstock studied land use and water quality changes within watersheds of the Buffalo National River. During his graduate work, his Masters involved the development and application of novel water identification techniques towards tracing moisture sources of surface water and groundwater that comprise water resources of the South Island, New Zealand. His PhD focused on determination of sources, transport, and fate of water solutes in low and high temperature surface waters both in the US and New Zealand. As part of this research, Dr. Blackstock also developed a direct measurement system for measuring dissolved carbon dioxide, the CO2-LAMP. Continuing from this research, several applications and further adaptions of the CO2-LAMP have been used at a range of localities worldwide. Additionally, Dr. Blackstock recently developed an in-situ, high-temperature dissolved gas measurement system for a NASA-funded project monitoring hot springs systems near small farms in central Costa Rica.

Prior to joining the Dale Bumpers Small Farms Research Center, he worked for the University of Arkansas Department of Geosciences investigating how groundwater affects surface water inundation and flood duration in agricultural areas of southeast Missouri. His research interests involve the use of water chemistry, physical monitoring of water features, and geographical information systems (GIS) to model the variability of water quality, with particular emphasis on the determining the sources of carbon, nutrients, and pollutants to both water and airways. Through his research Dr. Blackstock aims to increase the knowledge and efficiency of water quantity, water quality, and environmental management on small 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

New Hire At PMC

Dr. Rajesh Chintala

Rajesh Chintala is new to the Booneville Plant Materials Center (PMC). Since Aug 28th, he is the new study leader/ agronomist for the center. His duties are to identify plant science solutions to mitigate water quality concerns, to control soil erosion from croplands and critical areas, and to improve forage production and quality on pasture and rangelands that will also benefit wildlife habitat.

Dr. Chintala got his PhD in soil & plant sciences from West Virginia University. He comes from a small-holding farming family and is passionate about advancing sustainability in agriculture by promoting soil health practices. He hopes to benefit farmers economically through improved resource-use efficiency, productivity, and deliver several other ecosystem services.

Prior to coming to Booneville PMC, Chintala worked for Maryland Department of Agriculture as a part of agricultural resources conservation team. He provided technical assistance to Maryland state's TMDL (Total Maximum Daily Loads) implementation plan and other state's cost-share and regulatory programs, including Agricultural Certainty Program, Cover Crops Program, and Ecosystem Services Markets Program. He mapped and determined the regulatory compliance of best management practices (BMPs) installed in agricultural operations. He helped prevent soil erosion & nutrient run-off, enhance soil health, and protect several other shared natural resources of Chesapeake Bay watershed.

Booneville Plant Materials Center's Cover Crop Research Study Spotlight

Crimson clover crop stand adjacent to other cover crop species

Incorporating cover crops into a cropping system improves cash-crop performance by enhancing multiple soil health benefits which include, increased soil organic matter, improved soil structure, better water infiltration, weed suppression, and reduced pest incidence. The success of cover crops depends on selection, use of species, and cultivars adapted to the local climate and soils. Biomass production by cover crop is the key factor for achieving many of the cover crop benefits. The Booneville Plant Materials Center conducted an experimental field study to evaluate several varieties of cool season cover crops including, Austrian winter pea, berseem clover, cereal rye, crimson clover, daikon radish, hairy vetch, and red clover for biomass production and their adaptation to climatic conditions of southern Ozarks. In this field trail, crimson clover varieties were found to perform relatively better and produced the highest dry biomass yields followed by daikon radish and hairy vetch crops. More details about this field study are available at: "Yield of Cool Season Annual Grasses and Legumes in the Southern Ozarks" (ID#13934). https://www.nrcs.usda.gov/Internet/FSE_PLANTMATERIALS/publications/arpmcsr13934.pdf

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