**2023-2024 FUNDED RESEARCH/EXTENSION PROJECTS**

**MISSISSIPPI SOYBEAN PROMOTION BOARD**

**TITLE:** Management of Insect Pest in Mississippi Soybeans, 01-2023, $16,811.

**PI:** Don Cook, dcook@drec.msstate.edu MSU-ES/Delta Research & Extension Center

**Objective(s):** To provide up to date information on insect management strategies/tools for soybean insect pests. This information will be used to keep recommendations delivered to growers current, by means of the Insect Control Guide for Agronomic Crops, presentations at grower meetings, blog posts, podcasts, and direct communication with growers and consultants. Also, studies on insect damage potential and threshold verification for new and/or uncommon insect pests will be conducted should the opportunity arise.

**Duration:** Year 2 of 3

**End Results:** Identify and disseminate up-to-date information for producers and consultants to use to make the most informed decisions for managing/controlling soybean insect pests.

**TITLE:** Fertility and Agronomic Resource Management Extension and Research for soybean (FAMERs) Program, 02-2023, $148,278.

**PI:** Corey Bryant, cjb777@msstate.edu, MSU-MAFES/Delta Research and Extension Center

**Objective(s):** 1) validate and document fertility best management practices effectiveness at the field scale; 2) establishing the optimum tissue sampling location within a plant canopy for early detection of plant-mobile nutrients; 3) establish optimum boron fertilizer application rates and timings for soybean grown on soils ranging from clay to sandy loam; 4) determine the effect of foliar N applications on soybean subjected to flooding during the late vegetative to early reproductive stages; 5) determine proper potassium fertilizer application timing to reduce late-season K deficiency incidence; 6) Provide first-hand learning opportunities for existing and new soil fertility programs.

**Duration:** Year 2 of 3

**End Results:** Results from these objectives have the potential to impact all 2,200,000 acres of soybean planted in Mississippi. At an average cost of $8/acre identification of products not suitable for application would save Mississippi soybean producers approximately $17.6 million dollars. Conversely, identification of products that do provide a 5-10 bushel yield increase would increase net returns $42 to $93 per acre, using the five year average price of $10.10/bushel.

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**TITLE:** Impacts of Cover Cropping System on Soybean Grain Yield, Soil Health, Forage Production, and Animal Performance, 06-2023, $68,733.

**PI:** Brett Rushing**,** brett.rushing@msstate.edu, MSU-MAFES/Coastal Plain Exp. Station

**Objective(s):** Determine the impact of integrated livestock cover crop systems on soybean growth and grain yield and monitor the change in soil physical, chemical, and biological properties during each phase of production while assessing the economic productivity throughout each phase of production.

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**Duration:** Year 3 of 3

**End Results:** From a row-crop perspective, small grains are excellent choices for use as cover crops in protecting soil from erosion, nutrient scavenging, increasing organic matter, and enhancing soil structure in no-till settings. However, costs associated with planting cover crops often out-weighs potential benefits. Utilizing livestock may help account for these costs, and aid in nutrient cycling by returning undigested nutrients back into the soil profile through urine and manure. Partnering row crop and beef cattle enterprises has the potential to increase soybean acreage across the state, while simultaneously providing additional revenue outlets for soybean and cattle producers.

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**TITLE:** Evaluation of Commercially Available Biological and Biostimulant Products for Mississippi Soybean Production, 03-2023, $96,947.

**PI:** Corey Bryant, cjb777@msstate.edu, MSU-MAFES/Delta Research and Extension Center

**Objective(s):** 1) Identification of biological and biostimulant products that do and do not provide benefit to producers is crucial to aid Mississippi soybean producers in making the best use of already strained operating budgets; 2) field evaluation of commercially available biological and biostimulant products for disease prevention benefits.

**Duration:** Year 1 of 3

**End Results:** Results from these objectives have the potential to impact all 2,200,000 acres of soybean planted in Mississippi. At an average cost of $8/acre identification of products not suitable for application would save Mississippi soybean producers approximately $17.6 million dollars. Conversely, identification of products that do provide a 5-10 bushel yield increase would increase net returns $42 to $93 per acre, using the five year average price of $10.10/bushel.

**TITLE:** Developing Future Agronomy Leaders Through Day Camp and Individualized Learning Projects, 07-2023, $5,965.

**PI:** Bill Burdine bill.burdine@msstate.edu, MSU-ES/NMREC

**Objective(s):** Develop an agronomy day camp emphasizing hands-on training for young people through projects and contests

**Duration:** Year 5 of 5

**End Results:** Day Camp at NMREC, handouts and presentations by participants to provide results from hands-on activities. Project will attract future agronomic leaders and keep Mississippi at the forefront of agriculture research, Extension and consulting.

**TITLE:** Benefits of Precision Management for Iron Deficiency Chlorosis (IDC) Costs and Benefits of Precision Management for Iron Deficiency Chlorosis (IDC) in a Production Setting, 12-2023, $61,127.

**PI:** Mary Love Tagert, mltagert@abe.msstate.edu, MSU-ES/ABE

**Objective(s):** Determine effect of selected cropping systems on yield of IDC tolerant and intolerant soybean varieties, and evaluate soil moisture sensor data relationship to IDC symptoms in these cropping systems.

**Duration:** Year 1 of 3

**End Results: C**ombining promising research results from previous studies this project will evaluate the yield benefits along with the economic costs and benefits of site-specific management for IDC in production soybean fields. It is expected that results from this project will improve whole-field yields for all soybean fields affected by IDC.

**TITLE:** Row-Crop Irrigation Science Extension and Research (RISER) Program, 13-2023, $137,121.

**PI:** Drew M. Gholson, drew.gholson@msstate.edu, MSUES-ES/DREC

**Objective(s):** Identify, evaluate, and demonstrate new irrigation automation technologies in furrow irrigation; 2) Conduct hands-on training and learning opportunities with producers that have yet to adopt proven irrigation water management practices, and continue to offer assistance for producers who already utilize irrigation water management (IWM) practices.

**Duration:** Year 3 of 3

**End Results:** Identify, evaluate, and demonstrate new irrigation automation technologies in furrow irrigation; Conduct hands-on training and learning opportunities with producers that have yet to adopt proven irrigation water management practices, and continue to offer assistance for producers who already utilize IWM practices.

**TITLE:** Low-Cost Precision Agriculture Solutions for Advancing Irrigation Efficiency, 10-2023, $80,828.

**PI:** Mary Love Tagert, mltagert@abe.msstate.edu, MSU-ES/ABE

**Objective(s):** This experiment will create and apply a sector control VRI prescription on a production soybean field and measure the water savings realized while evaluating whether production fields would benefit from sector control VRI. Also evaluate the economic benefit from VRI adoption and perform a geospatial inventory of surface water storage systems used for irrigation in Northeast Mississippi, to assess the potential for VRI adoption. Information will be shared with producers and other stakeholders, especially those in Northeast Mississippi.

**Duration:** Year 3 of 4

**End Results:** By informing Northeast Mississippi farmers whether and how to adopt sector control VRI, project results are expected to enhance the economic and environmental sustainability of Mississippi soybean production.

**TITLE:** Evaluation of Soybean Varieties for Resistance to Cercospora Blight, Frogeye Leaf Spot, Stem Canker, and Seed Quality, 19-2023, $47,897.

**PI:** Tom Allen, tallen@drec.msstate.edu, MSU-ES/DREC

**Objective(s):** Evaluate Miss. OVT entries for resistance to Cercospora blight, frogeye leaf spot (natural infestations), stem canker (inoculated trials); collect and maintain stem canker isolates from infestations (when they occur) throughout Mississippi; and evaluate OVT entries for differences in mature seed quality when/if conditions promoting poor seed quality occur.

**Duration:** Continuation

**End Results:** Data that will provide producers information about the level of varieties’ disease resistance and/or susceptibility so that tolerant/resistant varieties can be selected to avoid yield losses associated with the above pathogens, and identification of varietal differences in mature seed quality.

**TITLE:** Understanding Spatial Response to Phosphorus/Potassium Fertilizer Application, 18-2023, $63,619.

**PI:** Vaughn Reed, vr401@msstate.edu, MSU MAFES/PSS

**Objective(s):** The objective is to determine soil physical and chemical properties that cause yield response differences to immobile nutrient applications within fields. If we can better understand what causes spatial variability of nutrient responses to occur, we can make our fertilizer recommendations more accurate, and increase our nutrient use efficiency.

**Duration:** Year 1 of 3

**End Results:** Understanding additional soil physical/chemical characteristics that lead to variable nutrient responses will allow researchers at Mississippi State University to provide better fertilizer recommendations for producers across the state. recommendations for producers across the state.

**TITLE:** Evaluating Fungicide Efficacy, Desiccant Applications, and Delayed Harvest for Soybean Grain Quality, 14-2023, $72,109.

**PI:** Tessie Wilkerson, twilkerson@drec.msstate.edu, MSU-MAFES/DREC

**Objective(s):** Evaluate the effect of early and mid-season fungicide application in combination with desiccation on seed quality, evaluate desiccation application rates in reducing seed quality in delayed harvest situations, determine the causal agents of reduced soybean seed quality in harvested soybean seed and determine efficacy of fungicide on reducing growth of pathogen causing seed rot in vitro

**Duration:** Year 2 of 3

**End Results:** Determination of the fungal complex responsible for and its association with seed rot in conducive environments; determination of specific environmental conditions and associated pathogens that promote seed rot in soybeans; development of strategies involving fungicide/insecticide applications and application timing to reduce the impact of seed rot on harvest seed quality of soybeans when conducive environmental conditions are anticipated; and identification of germplasm lines that can be used to develop varieties that are less susceptible to causes of seed damage.

**TITLE:** Enhancement of Mississippi Soybean Variety Trials Through Entry Standardization, 23-2023, $52,688.

**PI:** Brad Burgess, bburgess@pss.msstate.edu, MSU-MAFES/PSS

**Objective(s):** Conduct standardized soybean variety trials at multiple Mississippi locations to result in unbiased yield data with varied soybean cultivars.

**Duration:** Continuous

**End Results:** Soybean yield and trait results data, and seed quality data, that can be used by producers to select varieties for individual production environments throughout Mississippi, and that can be entered into the MSPB soybean variety selection tool on www.mssoy.org.

**TITLE:** Assessing Micronutrients Application for Efficient Soybean Production in the Mississippi Delta, 21-2023, $51,070.

**PI:** Ammar B. Bhandari, ammar.bhandari@usda.gov, USDA-ARS/Stoneville

**Objective(s):** Evaluate micronutrients application on nutrient uptake, partitioning, yield, and soybean quality under irrigated and non-irrigated conditions in the Mississippi Delta.

**Duration:** Year 1 of 2

**End Results:** Data will provide information on the effect of applying micro-nutrients on soybean yield and quality under irrigation and without irrigation field conditions. Soybean yield will be improved, and producers will be economically benefited by applying micro-nutrient fertilizers with high-yielding soybean hybrids in the MS Delta region.

**TITLE:** Weed Management Programs for Mississippi Soybean Production, 20-2023, $99,158.

**PI:** Jason Bond, jbond@drec.msstate.edu, MSU-ES & MAFES/DREC

**Objective(s):** Evaluate new and/or currently registered herbicides and herbicide-resistant (HR) technologies for use in Mississippi soybean weed management programs; identify production practices that optimize GR Palmer amaranth control when RR2 Xtend soybean varieties are used; and designing grass weed control strategies that mesh with current herbicide programs in Miss. soybean.

**Duration:** Year2 of 3

**End Results:** Identification/development/dissemination of cost effective control strategies for various weed control problems that occur in soybeans, to include control options for GR/HR weeds, management options to prevent or delay development of HR weeds, and assessment of new herbicide technologies and traits in consort with management practices that provide new weed management options.

**TITLE:** Development of an Automated System to Incorporate Holes in Lay-Flat Irrigation Tubing During Initial Development in Mississippi Soybean Production Systems, 27-2023. $72,460.

**PI:** Wes Lowe, wlowe@abe.msstate.edu, MSU-MAFES/ABE

**Objective(s):** Develop and assess methodologies for hole insertion into lay-flat irrigation tubing. Develop outlet formation methodologies for punched and slitted holes; assess hole performance (flow characteristics over time change in flow, hole integrity, etc.) for each tubing size and over working pressure range of typical irrigation systems in small-scale laboratory experimentation (single hole or equivalent in transverse cross-sectional area of tubing). Assess lay-flat irrigation tubing material and hole performance characteristics in large-scale experimentation (outdoor, multiple holes, timeline to mimic growing season use and conditions).

**Duration:** Year 3 of 4

**End Results:** Results from this project will impact 1,100,000 irrigated soybean acres in Mississippi. CHS can decrease pumping costs by 25% on average. With an average savings of $9/acre with the use of CHS alone, the development of an innovative automated hole punching system has the potential to save almost $10 million for Mississippi soybean growers.

**TITLE:** MSU Seed and Agricultural Technology Short Course Sponsorship, 24-2023, $500.00.

**PI:** Daniel Chesser, dchesser@abe.msstate.edu, MSU/MAFES/ABE

**Objective(s):** The MSU Seed and Agricultural Technology short course is an annual event (since 2015) held at MSU to impact and strengthen the Seed & Ag. Technology industry/value-chain. The short course promotes industry advancements, provides current trainings and resources, and provides a networking opportunity for industry professionals, stakeholders, and MSU personnel.

**Duration:** Year 1 of 1

**End Results:** Direct benefits to Mississippi’s soybean industry include stakeholder education; technical resources on current and emerging technologies; transfer of ideas/information and developed relationships via networking opportunities. Additionally, soybean industry stakeholders will benefit through Certified Crop Advisor CEU’s and MS commercial pesticide applicator recertification credits offered at the short course.

**TITLE:** Delta Agricultural Weather Center, 29-2023, $30,000.

**PI:** Mark Silva, ams158@msstate.edu, MSU-DREC

**Objective(s):** Continue data collection and dissemination of pertinent agricultural weather data and products required by Delta researchers and producers.

**Duration:** Continuous

**End Results:** Collection of weather data for Miss. Counties that will be assimilated into the DREC weather website archive to be available as a source for both current and historical weather data for researchers, producers, and consultants.

**TITLE:** Insect Management Strategies Using Insect Growth Regulators in Mississippi Soybeans, 28-2023, $45,462.

**PI:** Don Cook, dcook@drec.msstate.edu MSU-ES/Delta Research & Extension Center

**Objective(s):** To provide up to date information on insect management strategies/tools for soybean insect pests. This information will be used to keep recommendations delivered to growers current, by means of the Insect Control Guide for Agronomic Crops, presentations at grower meetings, blog posts, podcasts, and direct communication with growers and consultants. Also, studies on insect damage potential and threshold verification for new and/or uncommon insect pests will be conducted should the opportunity arise.

**Duration:** Year 2 of 3

**End Results:** Some producers already employ this management strategy. Results from these studies will help refine these strategies and provide more details on the yield and economic impacts of this management strategy.

**TITLE:** Impacts of Charcoal Rot (Macrophomina phaseolina) Epidemiology on Drought Resistant Soybean Cellular Metabolism and Accompanying Tissue Microbiome for Identifying Alternative Breeding Targets Under Increasing Environmental Stress, 31-2023, $74,503.

**PI:** Richard Baird, reb58@msstate.edu, MSU/MAFES, MBEPP.

**Objective(s):** We propose to use culture-independent metabarcoding and metabolomic analyses during year 1 (completed), 2 and 3, culture-dependent methods in year 2 to identify and isolate endophytes that specialized in disease tolerant plant varieties. Specific objectives of this project for year 2-3 are to conduct: (1) Microbial whole community analysis of fungal/bacterial endophytes in drought tolerant and susceptible varieties infected with M. phaseolina in two greenhouse trials (normal watering in Trial 3 and drought stressed in Trial 4). (2) Plant tissue subsamples collected from variety treatments in (1), an untargeted and targeted metabolomic analysis using NMR will be conducted emphasizing oxidative stress and energy producing metabolites. (3) Through strong statistical inference and experimentation, the holistic data will be analyzed to elucidate and three-party interactions among endophytic microbes, the fungal pathogen, and the host plant metabolism using greenhouse investigations (year 2) to inform yield improvements.

**Duration:** Year 2 of 3

**End Results:** Using a new approach to understand concurrent physiological, metabolic, and protective microbial changes in drought resistant and susceptible plants during the infection process by *M. phaseolina* has the potential to provide breeders with informed targets for the development of charcoal rot resistant soybean varieties or other protective agronomic approaches. To date much effort and expense has been invested in screening for resistance to *M. phaseolina* in soybeans without the release of commercially successful cultivars. Results from this proposed research can provide alternative approaches in targets for developing resistance varieties in the future, which will greatly increase yields.

**TITLE:** Development of Molecular Diagnostic Method for the Diamide Resistance in Soybean Looper, 32-2023, $57,991.

**PI:** Seung-Joon Ahn, seungioon.ahn@msstate.edu, MSU-MAFES/ BMB-EPP

**Objective(s):** Establish and maintain a resistant strain of soybean looper from Puerto Rico and make comparisons between susceptible and resistant strains of the diamide resistance genes. Also conduct standard diamide bioassays for soybean looper populations collected in Mississippi. Develop a molecular diagnostic marker to detect resistant soybean looper larvaeand monitor resistance in field populations with a molecular diagnosis kit.

**Duration:** Year 3 of 3

**End Results:** Develop a rapid and accurate diagnostic method based on DNA sequences to screen populations of soybean looper for resistance to diamide insecticides.

**TITLE:** Harnessing the Potential of Biostimulants for Promoting Growth and Stress Tolerance in Soybeans, 43-2023, $99,347.

**PI:** Raju Bheemanahalli, rajubr@pss.msstate.edu, MSU-MAFES/PSS

**Objective(s): R**esearch aims to identify effective routes to improve stress resilience to sustain yield and quality under different growing conditions (Fig. 1). *Goal:* The properties and influence of biostimulants differ greatly from product to product. Identify a biostimulant that improves seed germination, seedling vigor, health, and crop yield.

**Duration:** Year 1 of 3

**End Results:** identifying products with greater synergistic impact on germination, shoot and root vigor, plant health, and yield under stress will assist in selecting suitable biostimulants for the US Mid-South climatic conditions. Improved understanding of biostimulants and stress tolerance will offer growers to enhance their revenue by at least 5%. Identified individual synergistic effect biostimulants can be used to create combinations of two or three formulations; such combinations may have additive effects in stress tolerance and increasing productivity.

**TITLE:** Video Support for Mississippi Soybean Producers, 41-2022, $16,585.

**PI:** Elizabeth North, elizabeth.north@msstate.edu, MSU- MSU-OAC

**Objective(s):** Identify important soybean production topics and produce video segments that will provide producers with current, timely information needed to address issues related to those topics; video presentations of results from MSPB-funded research projects that will be posted on the MSSOY YouTube channel.

**Duration:** Continuous

**End Results:** Video segments featuring projects and presentations of results from MSPB-funded projects posted on the MSPB website.

**TITLE:** Soybean Management by Application of Research and Technology (SMART), 36-2023, $218,124.

**PI:** Trent Irby, tirby@pss.msstate.edu, MSU-ES/PSS

**Objective(s):** Identify and apply key management practices that increase soybean production profitability, provide a hands-on educational opportunity to assess profitable best management practices (BMP’s) for soybean producers, collect long-term data for determining specific BMP’s that consistently increase yields and profits, and promote BMP’s that are proven to sustain profitable Mississippi soybean production.

**Duration:** Continuous

**End Results:** Demonstrating and showcasing BMP’s that are proven to consistently and sustainably improve soybean production in all Mississippi regions, and disseminating this information to producers, extension personnel, and consultants.

**TITLE:** Improving Agronomic Efficiency for Mississippi Soybean Producers, 44-2023, $143,630.

**PI:** Mike Mulvaney, mjm1166@msstate.edu, MSU- MAFES/PSS

**Objective(s):** To quantify soybean response to precision planting technologies. To increase fertilizer use efficiency. Develop strategies to improve cover crop performance and management in soybean systems.

**Duration:** Year 1 of 3

**End Results:** If the technology works, a considerable benefit is the reduced time required to plant, such that more acres can be planted on time, with a concomitant yield increase due to timely planting. Additional savings may be achieved using lower seeding rates.

**TITLE:** Sampling Soybean Insects using DINSS (Drone Insect Net Sampling System), 49-2023, $46,361.

**PI:** Fred Musser, fm61@msstate.edu, MSU-BCH-EPP

**Objective(s):** Test modifications of the current DINSS to increase insect counts per sample. This should decrease the number of samples required to make a management decision, making DINSS more efficient. Validate DINSS with multiple drones and drone pilots in a wide variety of field situations. This will provide the validation needed to recommend thresholds based on DINSS so they can be used by consultants and growers. Compare cost and time required to make management decisions using drone-collected defoliation images plus DINSS data versus manual estimates of defoliation plus conventional sweep net data. This will enable consultants and growers to estimate the value of DINSS to their situation.

**Duration:** Year 1 of 3

**End Results:** End products that are anticipated from this research are a recommended drone-powered sampling tool (potentially covered by a patent), insect action thresholds based on DINSS published in the Insect Control Guide.

**TITLE:** Safeguarding Mississippi SoybeanProduction from Interactive Heat and Drought Stress Induced Yield and Quality Losses, 48-2023, $41,810.

**PI:** Jessica Drewry, jdrewry@abe.msstate.edu, MSU- MAFES/ABS

**Objective(s):** Assess the accuracy of yield monitor data collected across the state and compare currently available yield data post-processing techniques

**Duration:** Year 1 of 2

**End Results:** The primary end-product of this project will be the development of an extension publication outlining best practices in collecting and processing yield monitor data to improve data quality.

**TITLE:** Characterize Root Microbial Communities with Anti-Fungal Activities in Soybean, 53-2023, $120,734.

**PI:** George Popescu, popescu@igbb.msstate.edu, MSU-BCH-EPP

**Objective(s):** Identify rhizobiome microorganisms with inhibitory activity on *Xylaria* growth. Characterize the growth-promoting and Xylaria-biocontrol activities of rhizobiome microorganisms in soybean and evaluate the impact of Xylaria infection on the composition of soybean rhizobiome. Evaluate the biocontrol activity of rhizobiome microorganisms against soybean taproot decline in the field.

**Duration:** Year 4 of 4

**End Results: C**haracterize the diversity of rhizobiome microorganisms that cause specific phenotypes in soybeans, test rhizobiome isolates for beneficial activities, and utilize this knowledge to establish methods for improved growth and biological control of soil pathogens. Anticipate having characterized a library of microorganisms for biocontrol and growth-enhancing effects. Results are expected to have an important positive impact on TRD management because they will provide evidence and proof-of-principle for the future development of synthetic rhizobiomes for targeted use against Xylaria sp., ultimately providing new opportunities to enhance soybean production in MS by reducing TRD incidence.

**TITLE:** Evaluation of Potential Cover Crops in Conjunction with Current Weed Control Programs in Soybeans, 56-2023, $37,970.

**PI:** Hunter Bowman, hdb207@msstate.edu, MSU- MAFES/PSS

**Objective(s):** Evaluate Herbicide carry-over from common season-long soybean herbicide programs and the tolerance of cover crops to fall-applied herbicides at the time of cover crop planting

**Duration:** Year 1 of 3

**End Results:** Italian ryegrass has been documented to reduce soybean yield by 37%. At an average state yield of 55 bushels per acre in a year like 2022, this equates to $293 per acre, with 2,280,000 acres of soybean in Mississippi, ryegrass as the potential to have a $668 million impact. Additionally, conservation programs have continued to increase funding for planting cover crops.

**TITLE:** Universal Detection and Identification of Soybean-Associated Viruses, 61-2023, $42,450.

**PI:** Sead Sabanadzovic, : ss501@msstate.edu, MSU-MAFES

**Objective(s):** To protect soybean industry in Mississippi (and broader) by executing surveillance activities aimed at early and unbiased discovery of all viruses.

**Duration:** Year 1 of 3

**End Results:** This research aims to protect soybean industry by establishing a surveillance activity aimed at discovery and identification of yet unknown viruses (and other potential pathogens) to anticipate possible future problems. In addition to the overall knowledge, one of results of this project will be availability of diagnostic tools and technical protocols for newly identified viruses.

**TITLE:** Increasing Soybean Field Drainage Systems to Allow Farming Operations Earlier in Wet Springs and Reduce Nutrients and Soil Losses, 62-2023, $35,593.

**PI:** Gary Feng, gary.feng@ars.usda.gov, USDA-ARS

**Objective(s):** Determine cost-effective drainage system design, and best management practices to increase existing drainage tiles efficiency, reduce runoff and loss of soil and nutrients, improve soil infiltration and water holding capacity, and surface water harvest. Apply hydrology and agroecosystem models, in conjunction with commercial farm field trials in Objective 1, to determine optimal drainage system/production/management options for consistent and high soybean yield across typical MS weather conditions and in dominant soil types based on 100-year daily weather records and on predicted daily weather in future 50 years. Conduct economic analysis using results of field trials (Objective 1) and simulation studies (Objective 2) to compare the cost and return of using drainage systems, soil organic amendments or/and cover crop in comparison with conventional management practices. The goal is to help soybean growers in different MS environments determine the long-term profit-maximizing management practices for given soil types, topography, precipitation patterns, and other climate conditions found on their farms.

**Duration:** Year 1 of 5

**End Results:** Recommendations of cost-effective drainage system and layout/design, and their soil-specific management options to improve drainage efficiency, nutrients and water productivity, and soil health, which enable optimal soybean yields with maximum economic returns for dominant soil types under wet, normal and dry years in MS.

**TITLE:** Improving Herbicide Efficacy and Residue Penetration of Herbicides Using Common Adjuvants for Weed Control in Soybean, 64-2023, $9,505.

**PI:** Darrin Dodds, dmd76@pss.msstate.edu, MSU–MAFES/PSS

**Objective(s):** Evaluate herbicide efficacy and weed control of several commonly available adjuvants for control of Amaranthus spp., prickly sida (teaweed), and barnyardgrass. Research the effectiveness of non-ionic surfactants and silicone-based herbicides at penetrating through cover-crop and crop residues to improve soil contact and herbicide efficacy for soil-applied herbicides.Develop an easy-to-use guide for soybean farmers to aid in making adjuvant purchases for specific herbicide programs in Mississippi.

**Duration:** Year 2 of 2

**End Results:** This project seeks to determine which adjuvants are most effective in aiding herbicide applications for control of Amaranthus spp., teaweed, and barnyardgrass. Improved herbicide efficacy through the adoption of effective adjuvants will ensure that herbicides work the first time, resulting in maintaining maximum yields for soybean growers. By improving control of weeds at initial application, the potential for herbicide resistance development will be mitigated, and ultimately the return on investment of herbicide programs will improve for Mississippi soybean farmers.

**TITLE:** Determining Duration of Residual Control of Soil-Applied Herbicides to Form Total Preemergence Herbicide Programs in Soybean, 63-2023, $9,505

**PI:** Darrin Dodds, dmd76@pss.msstate.edu, MSU–MAFES/PSS

**Objective(s):** Evaluate duration of control for labeled soil-applied herbicides in soybean production and determine the rainfall activation requirements for labeled soil-applied herbicides in soybean production. Overall goal is to take information from the two objectives and develop and evaluate total preemergence (PRE) herbicide program for soybean**.**

**Duration:** Year 2 of 2

**End Results:** The expected end products will be an experiment station bulletin – including a separate guide for rainfall activation of soil-applied herbicides and length of control for soil-applied herbicides, as well as one or more refereed publication(s) that describes the results.

**TITLE:** MSSOY Website Hosting and Management, 65-2023, $4,587.

**PI:** Steve Hankins, s.hankins@msstate.edu, MSU–MSUES

**Objective(s):** Provide for day-to-day management and maintenance of web site and content. Perform system backups and Purchase/maintain domain name(s) associate with website(s).

**Duration:** Continuous

**End Results:** The end product will be the mssoy.org website and its sub-domain websites will be hosted on a commercial hosting service and will be supported by MSU-ES CTO personnel that will work closely alongside MSPB members.

**TITLE:** Is Mississippi Irrigation Water Accumulating Salts in Soil and Potentially Limiting Soybean Growth, 66-2022, $17.855.

**PI:** Mike Mulvaney, mjm1166@msstate.edu, MSU–MSUES

**Objective(s):** Survey on-farm irrigation water quality to assess quantity and types of salts applied to soils in irrigation water and quantify salt concentrations in Mississippi soils

**Duration:** Year 1 of 1

**End Results:** It is unknown if salt accumulation in soils is yield-limiting under Mississippi conditions. If salt levels approach problematic concentrations, this preliminary research will determine if this is something Mississippi farmers should be concerned about, which would lead to further research. If salt levels in irrigation water and soils do not approach problematic concentrations, no further research is required and Mississippi soybean growers need not worry about amending irrigation water or soils to combat salt concerns.

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