ARKANSAS SOYBEAN PROMOTION BOARD MEETING—DAY 1
Zoom Option

Minutes

March 7, 2024
8:30 a.m.

Members Present in Person:	Josh Cureton, Brad Doyle, Rusty Smith, Douglas Hartz, John Freeman, Donald Morton, Shannon Davis & West Higginbothom
Members Present via Zoom:	None
Members Absent:	Joe Thrash

Chairman John Freeman commenced the first day of the AR Soybean Promotion Board meeting at 8:42 a.m. and welcomed all members and guests.

Administrator Scott Bray gave brief comments for a successful meeting, and introductions of board members and department staff were made. Administrator Bray recapped both previous meeting minutes, reading a summary of both minutes to the board.

Administrator Bray also gave a quick update on the procurement process between the board and the Communications Group contract.

Chairman Freeman then asked for a motion to approve the minutes from both previous meetings.

Moved by West Higginbothom. Seconded by Josh Cureton.

Motion carried.

Some further discussion ensued regarding the procurement process and the three-person panel the board must nominate to do the evaluating of the bidder offers.

Chairman Freeman then introduced the AR Department of Agriculture's Chief Financial Officer, Inoussa Zaki, to present the board's financial reports. **ATTACHMENT 1**

Zaki gave the rundown of the board's financial assessment for the current period, July 1, 2023 – February 29, 2024, mentioning that the board started this financial period with $9,347,445.

Zaki also mentioned that the board generated approximately $4,100,110 in total revenue during this same reporting period. He also mentioned that the total expenditure during this period was $1,882,311.

Zaki then told the board that they have $10,039,591 in available funding for future research and promotion projects. Zaki also gave a rundown of the board's collection values so far for this reporting period, which was valued at $646,901.

Zaki then gave a quick rundown of historical data from USDA-NASS compared to Arkansas numbers. Zaki also told the board that he projects between now and the end of the fiscal year, the board will collect close to 4% of the mass gross collections, which would put the board around $4 Million in total net for the fiscal year.

Zaki then concluded his financial report. Members asked a few questions of clarification from Zaki on the department's financial report.

Chairman Freeman then asked if there were any further questions and there were none.

Chairman Freeman then introduced the Communications Group to give their special contract report and review presentation, which was presented before the board. **ATTACHMENT 2**

Member Doyle asked the presenters about their interactions with other soybean producing states, and the presenters answered that they hold monthly calls with other states to collaborate and discuss challenges together.

Chairman Freeman then asked there were any questions and there were none.

Chairman Freeman then introduced the next agenda item, the University of Arkansas (UofA) research proposal reports.

Chairman Freeman then introduced the first ***new*** research project proposal before the board, reminding presenters that they have five (5) minutes to give their presentations.

The first new research project proposal entitled, "Development of a Turn Row Soybean Vegetative Health Analysis Using UAS Imagery for Production Decision Support" was then presented before the board, requesting funding for $19,989.00. **ATTACHMENT 3 PAGE 1**

Member Hartz then asked if they would be able to use a tablet type of hardware to use with their technology. Dr. Davis then said that for now, they are only able to use PC technology.

Members asked several questions about the drone technology and discussion about the project ensued.

UofA then introduced the next new research project proposal entitled, "Development of Data Driven Recommendations for Variable Soybean Seeding Rate in Arkansas," which was presented before the board, requesting funding for $81,876.00. **ATTACHMENT 3 PAGE 5**

Members asked a few questions about the presentation, and some discussion ensued.

UofA then introduced the next new research project proposal entitled, "Site-Specific Assessment of Soybean Response to In Field Variability Using Remote Sensing," which was presented before the board, requesting funding for $75,000. **ATTACHMENT 3 PAGE 9**

Members asked a few questions about the presentation, and some discussion ensued.

UofA then introduced the next new research project proposal entitled, "Phenotypic Assisted by Seed-Level Near-Infrared Information," which was presented before the board, requesting funding for $51,117.00. **ATTACHMENT 3 PAGE 13**

Member Doyle then asked a few questions from the presenter about the project, and some discussion ensued.

UofA then introduced the next new research project proposal entitled, "Enhancing Soybean Resistance to Charcoal Rot: A Collaborative Approach Involving Plant Pathology and the Soybean Breeding Program," which was presented before the board, requesting funding for $64,292.00. **ATTACHMENT 3 PAGE 17**

Chairman Freeman asked if there were any questions and there were none.

UofA then introduced the next new research project proposal entitled, "Designing Soybean Ideotypes for Adaptation to Weather Variability," which was presented before the board, requesting funding for $66,122.00. **ATTACHMENT 3 PAGE 21**

Member Higginbothom asked the presenter how they selected the varieties that they would use in their research. The presenter answered that they wanted to work with breeding lines that had contrasting yields to determine specific traits that could help explain yield differences. Chairman Freeman then asked if there were any further questions and there were none.

UofA then introduced the next new research project proposal entitled, "Overcoming Soybean Yield Plateau by Leveraging Physiology-Efficient and Yield-Formation Traits," which was presented before the board, requesting funding for $83,620.00. **ATTACHMENT 3 PAGE 25**

Members asked a few questions from the presenter and some discussion ensued.

UofA then introduced the next new research project proposal entitled, "Economics of Soil Health Practices for Soybeans in Arkansas," which was presented before the board, requesting funding for $57,838.00. **ATTACHMENT 3 PAGE 29**

Members asked several questions from the presenter and some discussion ensued.

UofA then introduced the next new research project proposal entitled, "Engineering Synthetic Microbiome Communities to Enhance Soybean Disease Resistance," which was presented before the board, requesting funding for $39,500.00. **ATTACHMENT 3 PAGE 37**

Members asked a few questions from the presenter and some discussion ensued.

Chairman Freeman then called for a break at 10:30am. Meeting recessed.

Meeting resumed at 10:43am.

UofA then introduced the next new research project proposal entitled, "Predicting the impacts of herbivory across a salinity gradient in AR Soybeans," which was presented before the board, requesting funding for $45,924.00. **ATTACHMENT 3 PAGE 33**

Chairman Freeman asked if there were any questions and there were none.

UofA then introduced the next new research project proposal entitled, "Screening Arkansas Soybean Cultivars for Protein Quality as A Novel Food Preservative," which was presented before the board, requesting funding for $50,049.00. **ATTACHMENT 3 PAGE 41**

Members asked a few questions from the presenter and some discussion ensued.

UofA then introduced the next new research project proposal entitled, "Innovating Arkansas Soybean Utilization for Soymilk and Tofu Production," which was presented before the board, requesting funding for $63,986.00. **ATTACHMENT 3 PAGE 45**

Member Doyle then asked the presenter if it was possible for tofu to be made in their laboratory, and the presenter answered that it was not difficult to make tofu from soymilk using a coagulant. Some discussion ensued.

The last ***new*** proposal presentation was then introduced by UofA to the board. The next new research project proposal entitled, "Quantification of Crop Coverage and Weed Pressure for Instantaneous Variable Spraying with UAV Computer Vision," was presented before the board, requesting funding for $83,598.00. **ATTACHMENT 3 PAGE 49**

Member Higginbothom asked if this technology could eventually be tailored to target a specific weed. The presenter answered that it does not work on any weed, and that the calibration would be based on just soybean coverage.

The next series of presentations were considered ***renewal*** or ***continuation*** research project proposals before the board.

UofA then introduced the first ***fertility***-related continuation research project proposal entitled, "Fertilization of Soybean," which was presented before the board, requesting a proposed funding amount of $80,641.00. **ATTACHMENT 3 PAGE 125**

Members asked several questions from the presenter and some discussion ensued.

UofA then introduced the next fertility-related continuation research project proposal entitled, "Influence of Cover Crops and Soil Health on Soybean," which was presented before the board, requesting a proposed funding amount of $60,786.00. **ATTACHMENT 3 PAGE 129**

The presenter asked if there were any questions and there were none.

UofA then introduced the next fertility-related continuation research project proposal entitled, "Field-Based Determination of Chloride Tolerance in Soybean," which was presented before the board, requesting a proposed funding amount of $50,605.00. **ATTACHMENT 3 PAGE 133**

Members asked several questions about this project and some discussion ensued.

UofA then introduced the next fertility-related continuation research project proposal entitled, "Monitoring the Extent of Potassium Deficiency and Chloride Toxicity in Arkansas Soybean Fields," which was presented before the board, requesting a proposed funding amount of $36,870.00. **ATTACHMENT 3 PAGE 137**

Members asked several questions about this project and some discussion ensued.

The first ***promotion*** continuation project proposal entitled, "UADA Feed Kit," was then presented before the board, requesting a proposed funding amount of $2,500.00. **ATTACHMENT 3 PAGE 203.** Presenter Allison Harman passed around two (2) example feed kits for the board members to see as part of their presentation.

Members asked several questions from the presenter and some discussion ensued.

UofA then introduced the first ***post harvest***-related continuation research project proposal entitled, "The Effects of the inclusion of soybean oil in beef heifer diets on heifer development, reproductive function, and calf growth performance," which was presented before the board, requesting a proposed funding amount of $48,940.00. **ATTACHMENT 3 PAGE 173**

Members asked a few questions and some discussion ensued.

UofA then introduced the first ***agronomy/alternative***-related continuation research project proposal entitled, "Arkansas Discovery Farms," which was presented before the board, requesting a proposed funding amount of $23,688.00. **ATTACHMENT 3 PAGE 55**

Chairman Freeman then asked if there were any questions and there were none.

UofA then introduced the next agronomy/alternative continuation research project proposal entitled, "Use of Gossypol to Inhibit Reproduction in Domestic Hogs as a Model for Feral Hog Control," which was presented before the board, requesting a proposed funding amount of $60,016.00, which is an amount shared with the AR Corn & Grain Sorghum Promo Board. The presenter clarified that a better representative amount would be around $30,000 for this board. **ATTACHMENT 3 PAGE 59**

Chairman Freeman then asked if there were any questions and there were none.

Chairman Freeman then called for a lunch break at 12:02pm. Meeting recessed.

Meeting resumed at 12:50pm.

UofA then introduced the next agronomy/alternative continuation research project proposal entitled, "Investigating Emerging Production Recommendations for Sustainable Soybean Production," which was presented before the board, requesting a proposed funding amount of $221,278.00. **ATTACHMENT 3 PAGE 63**

The presenter then asked if there were any questions and there were none.

The presenter then moved on to the next agronomy/alternative continuation research project proposal entitled, "Improving Technology Transfer for Profitable and Sustainable Soybean Production," which was presented before the board, requesting a proposed funding amount of $77,846.00. **ATTACHMENT 3 PAGE 67**

The presenter then asked if there were any questions and there were none.

The presenter then moved on to the next agronomy/alternative continuation research project proposal entitled, "Science for Success – Arkansas Support for National Soybean Research and Extension Program," which was presented before the board, requesting a proposed funding amount of $117,488.00. **ATTACHMENT 3 PAGE 71**

Board members asked a few questions from the presenter and some discussion ensued.

UofA then introduced the first ***breeding***-related continuation research project proposal entitled, "Arkansas Soybean Performance Trials," which was presented before the board, requesting a proposed funding amount of $40,270.00. **ATTACHMENT 3 PAGE 75**

The presenter then asked if there were any questions and there were none.

UofA then introduced the next breeding-related continuation research project proposal entitled, "Development of High-yielding Soybean Cultivars with Broad Resilience to Stressors," which was presented before the board, requesting a proposed funding amount of $191,118.00. **ATTACHMENT 3 PAGE 81**

Chairman Freeman then asked if there were any questions and there were none.

The presenter then began the next breeding-related continuation research project proposal entitled, "Utilization of Winter Nursery for Soybean Line Development through Backcrossing," which was presented before the board, requesting a proposed funding amount of $51,000.00. **ATTACHMENT 3 PAGE 85**

Board members asked several questions from the presenter and some discussion ensued.

The presenter then began the next breeding-related continuation research project proposal entitled, "Fast-Tracking MG4 and early MG5 cultivars with southern root-knot nematode resistance," which was presented before the board, requesting a proposed funding amount of $50,584.00. **ATTACHMENT 3 PAGE 89**

Board members asked several questions and some discussion ensued.

The presenter then began the next breeding-related continuation research project proposal entitled, "Soybean Germplasm Enhancement Using Genetic Diversity," which was presented before the board, requesting a proposed funding amount of $187,679.00. **ATTACHMENT 3 PAGE 93**

Chairman Freeman asked if there were any questions and there were none.

The presenter then began the next breeding-related research project proposal entitled, "Genomic Prediction to Enhance the Efficiency of Soybean Breeding," which was presented before the board, requesting a proposed funding amount of $102,087.00. **ATTACHMENT 3 PAGE 97**

Chairman Freeman then asked if there were any questions and there were none.

UofA then introduced the first ***economics***-related continuation research project proposal entitled, "Economic Analysis of Soybean Production and Marketing Practices," which was presented before the board, requesting a proposed funding amount of $7,316.00. **ATTACHMENT 3 PAGE 101**

Chairman Freeman then asked if there were any questions and there were none.

UofA then introduced the first ***entomology***-related continuation research project proposal entitled, "Refining Insect Thresholds in Arkansas Soybean," which was presented before the board, requesting a proposed funding amount of $69,116.00. **ATTACHMENT 3 PAGE 111**

The presenter then asked if there were any questions and there were none.

UofA then introduced the next entomology-related continuation research project proposal entitled, "Impact on Water Quality on Insects," which was presented before the board, requesting a proposed funding amount of $20,001.00. **ATTACHMENT 3 PAGE 117**

Board members asked several questions and some discussion ensued.

UofA then introduced the next ***economics***-related continuation research project proposal entitled, "Soybean Enterprise Budgets," which was presented before the board, requesting a proposed funding amount of $10,000.00. **ATTACHMENT 3 PAGE 105**

Board members asked a few questions from the presenter and some discussion ensued.

UofA then introduced the next ***entomology***-related continuation research project proposal entitled, "Developing Scouting, Threshold, and Management Practices for Stinkbug Complex in Arkansas Soybean," which was presented before the board, requesting a proposed funding amount of $49,102.00. **ATTACHMENT 3 PAGE 121**

Chairman Freeman then asked if there were any questions and there were none.

UofA then introduced the first ***irrigation***-related continuation research project proposal entitled, "Irrigation Water Management for Soybeans: Moving the Needle," which was presented before the board, requesting a proposed funding amount of $205,620.00. **ATTACHMENT 3 PAGE 141**

The presenter then moved on to their next irrigation-related continuation research project proposal entitled, "The Arkansas Irrigation Yield Contest," which was presented before the board, requesting a proposed funding amount of $10,000.00. **ATTACHMENT 3 PAGE 211**

Board members asked several questions from the presenter and some discussion ensued.

Chairman Freeman then called for a break at 2:17pm. Meeting recessed.

Meeting called back to order at 2:35pm.

UofA then introduced the first ***plant pathology***-related continuation research project proposal entitled, "Comprehensive Disease Screening of Soybean Varieties in Arkansas," which was presented before the board, requesting a proposed funding amount of $131,863.00. **ATTACHMENT 3 PAGE 145**

The presenter then asked if there were any questions and there were none.

UofA then introduced the next plant pathology-related continuation research project proposal entitled, "Integrated Management of Nematodes in Arkansas," which was presented before the board, requesting a proposed funding amount of $72,449.00. **ATTACHMENT 3 PAGE 149**

Board members asked several questions of clarification from the presenter and some discussion ensued.

UofA then introduced the next plant pathology-related continuation research project proposal entitled, "Monitor and Management of Fungicide-Resistant Soybean Diseases in Arkansas," which was presented before the board, requesting a proposed funding amount of $50,498.00. **ATTACHMENT 3 PAGE 153**

The presenter then asked if there were any questions and there were none.

UofA then introduced the next plant pathology-related continuation research project proposal entitled, "Developing a Satellite-Based Field Scouting Tool," which was presented before the board, requesting a proposed funding amount of $14,860.00. **ATTACHMENT 3 PAGE 157**

Member Hartz asked what the differences between this project and the previous similar project presented earlier in the day. The presenter answered that you can get different information and data from using the different satellite-based technologies.

The presenter then asked if there were any further questions and there were none.

UofA then introduced the next plant pathology-related continuation research project proposal entitled, "Determining the value of Fungicide Application on Regional, Whole-Farm, Field Level, and within-Field Scales," which was presented before the board, requesting a proposed funding amount of $52,000.00. **ATTACHMENT 3 PAGE 161**

The presenter then asked if there were any questions and there were none.

UofA then introduced the next plant pathology-related continuation research project proposal entitled, "Determining Factors, Associated with Poor Grain Quality," which was presented before the board, requesting a proposed funding amount of $55,000.00. **ATTACHMENT 3 PAGE 165**

Members asked several questions from the presenter and some discussion ensued.

UofA then introduced the next plant pathology-related continuation research project proposal entitled, "Understanding Taproot Decline; A Soybean Disease of Increasing Importance in Arkansas," which was presented before the board, requesting a proposed funding amount of $39,243.00. **ATTACHMENT 3 PAGE 169**

The presenter then asked if there were any questions and there were none.

UofA then introduced the next ***post harvest***-related continuation research project proposal entitled, "Assessment of Broiler Dietary Least Cost Protein Supply via Soybean Genotype Amino Acid Selection Improvements," which was presented before the board, requesting a proposed funding amount of $53,686.00. **ATTACHMENT 3 PAGE 177**

Member Doyle then made a general comment about the importance of amino acid research for soybean production.

Chairman Freeman then asked if there were any questions and there were none.

UofA then introduced the next post harvest-related continuation research project proposal entitled, "An Innovative Approach to Generate Porous Soy Proteins with Enhanced Flavor for the Plant-Based Food Industry," which was presented before the board, requesting a proposed funding amount of $43,955.00. **ATTACHMENT 3 PAGE 181**

Member asked what protein content percentage was contained within the flour, and the presenter answered 40%. Chairman Freeman then asked if there were any further questions and there were none.

UofA then introduced the first ***verification***-related continuation research project proposal entitled, "Soybean Research Verification Program," which was presented before the board, requesting a proposed funding amount of $208,168.00. **ATTACHMENT 3 PAGE 185**

Member Smith made the comment that it was a good bean year for everybody, and asked how much further ahead the verification program was compared to other farmers. The presenter answered that the verification program is always at least eight (8) to ten (10) bushels greater than the state average, and some discussion ensued.

UofA then introduced the first ***weeds***-related continuation research project proposal entitled, "A Team Approach to Weed Management in Soybean," which was presented before the board, requesting a proposed funding amount of $260,807.00. **ATTACHMENT 3 PAGE 189**

Members asked several questions from the presenter and some discussion ensued.

UofA then introduced the next weeds-related continuation research project proposal entitled, "Screening for Soybean Tolerance to Metribuzin," which was presented before the board, requesting a proposed funding amount of $16,226.00. **ATTACHMENT 3 PAGE 195**

Members asked several questions from the presenters and some discussion ensued.

UofA then introduced the next weeds-related continuation research project proposal entitled, "Optimization of Fungal Pathogens AF22 and AF24 as Bioherbicides for Palmer Amaranth (Pigweed)," which was presented before the board, requesting a proposed funding amount of $40,000.00. **ATTACHMENT 3 PAGE 199**

Member Doyle asked if this would qualify as an organic control and the presenter answered that it indeed would.

UofA then introduced the next ***education/promotion*** project proposal entitled, "LeadAR 40th Anniversary," which was presented before the board, requesting a proposed funding amount of $5,000.00. **ATTACHMENT 3 PAGE 207**

The presenter then began the next education/promotion project proposal entitled, "Arkansas Future Ag Leaders Tour," which was presented before the board, requesting a proposed funding amount of $5,000.00. **ATTACHMENT 3 PAGE 213**

The presenter then began the next education/promotion project proposal entitled, "Soybean Science Challenge (SSC)," which was presented before the board, requesting a proposed funding amount of $78,585.00. **ATTACHMENT 3 PAGE 217**

Members asked several questions from the presenter about these education/promotion projects and some discussion ensued.

The next education/promotion project presentation was introduced entitled, "Northeast Rice Research & Extension Center Naming Proposal," which was presented before the board. This project has four (4) different proposed funding amounts for the board to consider: 1) Naming the Center (for $3,000,000), 2) Naming the Research & Extension Wing (for $500,000), 3) Naming Silo #2 (for $250,000), and 4) Naming the Farm Viewing Portal (for $250,000). **ATTACHMENT 4**

Members asked several questions about the project and discussion ensued.

This concluded the UofA research and promotion presentations.

Member Cureton then gave a general comment about how he felt it was somewhat important to have physical reminders of the research and promotion work they do as a board, and some further discussion ensued.

Chairman Freeman then introduced Dr. Nathan McKinney from the UofA to give an additional proposal for the board to consider.

Dr. McKinney laid out a proposal from a company named TMG Seeds based out of Brazil, regarding a joint germplasm exchange between them and UofA's soybean breeding program. The first year of the joint exchange would be $180,000 across several different lines for a period of four years.

The members then thoroughly discussed the proposal Dr. McKinney brought before them. Chairman said that he would like to table this discussion to be revisited at tomorrow's board meeting.

Chairman Freeman then began the discussion regarding the board's nomination of a three-person committee, which is required for the board's procurement or purchasing process with the state government.

Chairman Freeman asked Administrator Bray a few questions about this procurement process and some discussion ensued.

Members then considered several names for the three-person committee for the board's consideration. Discussion tabled until tomorrow's meeting.

Administrator Bray then talked about an email he received from the AR Department of Finance and Administration (DFA) regarding a $4,700 credit refund that the board needs to authorize to Viserion Grain LLC.

Administrator Bray then asked for a motion to authorize the AR DFA to pay the $4,700 credit refund to Viserion Grain LLC on behalf of the board.

Moved by Davis, seconded by Doyle.

Motion carried.

Chairman Freeman then declared the meeting in recess.

John Freeman, Chairman

ARKANSAS SOYBEAN PROMOTION BOARD MEETING—DAY 2
Zoom Option

Minutes

March 8, 2024
8:30 a.m.

Members Present in Person: Josh Cureton, Brad Doyle, Rusty Smith, Douglas Hartz, John Freeman, Donald Morton, Shannon Davis & West Higginbothom

Members Present via Zoom: None

Members Absent: Joe Thrash

Chairman John Freeman commenced the second day of the AR Soybean Promotion Board meeting at 8:39 a.m. and welcomed all members and guests.

Administrator Scott Bray gave a general meeting housekeeping speech to ensure a successful and productive board meeting.

Chairman Freeman then introduced Member Hartz, who highlighted an article from the Arkansas Democrat Gazette applauding the hard work of UofA Agricultural Researchers: Tom Barber, Jason Norsworthy, Tommy Butts, & Nilda Burgos, for their contributions to weed science. Member Hartz emphasized the significance of the weed scientists' research work to the agriculture industry in Arkansas and congratulated the researchers for their awards.

Chairman Freeman then introduced Administrator Bray for any other housekeeping or general meeting announcements.

Clean Fuels Alliance America was then introduced for their promotion proposal presentation before the board, requesting a proposed funding amount for two (2) different projects: 1) "Market Expansion Drive" for $20,000 and 2) "OEMs Maintain and Secure Approvals for B20 and Higher Blends" for $20,000. **ATTACHMENT 5**

Board members asked a few questions from the presenters and some discussion ensued.

Chairman Freeman then introduced the next proposed promotion project presentation from Decision Innovation Solutions, who requested a proposed funding amount for two (2) different project scenarios: 1) "Arkansas Soybean and Soybean Production Consumption and Flow Analysis" for $57,825 and 2) "Optional Components of Analysis" for $10,800. **ATTACHMENT 6**

The presenter then asked if there were any questions from the board members. Board members asked several questions and some discussion ensued.

Chairman Freeman then introduced the next proposed promotion project presentation from the American Soybean Association (ASA), which was presented before the board. **ATTACHMENT 7**

The ASA asked the board for proposed funding amounts for several different projects:

- $6,000 ASAAP Annual Membership
- $6,000 for the ASA Awards Ceremony
- $5,000 in Economic Support and Analysis
- $7,500 in Work Group Annual Membership
- $600 for SoyStats
- $6,000 for Soybean Leadership Academy
- $9,200 for the Young Leader Program State Program

The presenter then asked if there were any questions. The board members asked a few questions about some of ASA's projects and some discussion ensued.

Chairman Freeman then introduced the next proposed promotion project presentation from The World Initiative for Soy in Human Health (WISHH), which was presented before the board. WISHH requested a proposed funding amount of $40,000 for "Finding and Opening Up New U.S. Soy Overseas Markets." **ATTACHMENT 8**

Chairman Freeman then asked if there were any questions and there were none.

Chairman Freeman then introduced the next research project proposal from the Deane Robinson Seed Company, which was presented before the board, requesting a proposed funding amount of $16,215. **ATTACHMENT 9**

Board members asked several questions about the presentation and some discussion ensued.

Chairman Freeman then introduced the next proposed promotion project presentation from the U.S. Soybean Export Council (USSEC), who requested a proposed funding amount for two (2) different project scenarios: 1) "Utilization of U.S. Soy in the Americas" for $15,000 and 2) "USSEC Membership" for $10,000. **ATTACHMENT 10**

The presenter then asked the board if they had any questions and there were none.

Chairman then called for a short break.

Chairman Freeman then called the meeting back to order at 10:40 a.m.

Chairman Freeman then introduced the next research project presentation from the Midsouth Soybean Board, which was presented before the board, requesting a total proposed funding amount of $178,297. **ATTACHMENT 11**

There were a few questions asked about the presentation and some discussion ensued.

The presenter then went into the next proposed promotion project presentation for Grow for the Green Yield Challenge Contest, which was presented before the board, requesting a proposed funding amount of $201,900. **ATTACHMENT 12**

There were a few comments about the presentation and some discussion ensued.

The presenter then went into the next proposed promotion project presentation for the Southwest Soybean Council, which was presented before the board, requesting a proposed funding amount of $10,000 for soy promotional items in the state. **ATTACHMENT 13**

Chairman Freeman then asked if there were any questions and there were none.

This concluded the proposal project presentations before the board.

Chairman Freeman then introduced the board's consideration of funding projects.

With the help of the Department of Agriculture's Chief Financial Officer, Inoussa Zaki, Chairman Freeman wished to address the continuation projects first. Zaki then gave a brief overview of the financials of the board. **ATTACHMENT 14**

Chairman Freeman then asked Zaki how much money the board has available to spend on funding research and promotion projects. Zaki answered that the board has approximately $10,000,000 in reserve that can be used to fund projects, and some discussion ensued.

Chairman Freeman stated that the board tries to save or retain one million dollars in reserve.

Dr. Nathan McKinney then mentioned that their estimate of carryover as of the day of this meeting, was approximately $584,000, also mentioning that they will have a better figure for the board by mid-May. Some discussion ensued.

Member Higginbothom then motioned for the board to fund all the continuation research projects from the UofA for $2,770,610, as well as to fund all the continuation promotion projects from the UofA for $93,585, bringing the total funding amount to a grand total of $2,864,195.

Moved by Higginbothom, seconded by Morton.

Some discussion ensued.

Motion carried.

Member Higginbothom then motioned for the board to fund the two new promotion projects from the UofA entitled, "UADA Feed Kit" for $2,500 and "LeadAR 40th Anniversary" for $5,000, bringing the total funding amount to $7,500 for these two projects.

Moved by Higginbothom, seconded by Doyle.

Motion carried.

The board then discussed the new UofA research project proposals that had been presented, consulting UofA staff on how their scientists/researchers rated each project. Discussion ensued.

During deliberations on each new research project, the board decided to fund certain research projects while opting not to fund others.

Member Davis then motioned for the board to fund the following seven (7) new research projects from the UofA: 1) "Development of a Turn Row Soybean Vegetative Health Analysis Using UAS Imagery for Production Decision Support" for $19,989, 2) "Development of Data Driven Recommendations for Variable Soybean Seeding Rate in Arkansas" for $81,876, 3) "Site Specific Assessment of Soybean Response to in Field Variability Using Remote Sensing" for $75,000, 4) "Phenotypic Assisted by Seed-Level Near-Infrared Information" for $51,117, 5) "Overcoming Soybean Yield Plateau by Leveraging Physiology-Efficient and Yield-Formation Traits" for $83,620, 6) "Economics of Soil Health Practices for Soybeans in Arkansas" for $57,838, & 7) "Screening Ark Soybean Cultivars for Protain Quality as a Novel Food Preservative" for $50,049. This equals to a total funding amount of $419,489 to fund the new research projects.

Moved by Davis, seconded by Hartz.

Motion carried.

The board then asked Zaki how much money the board had spent on funding projects. Zaki answered that the board had allocated $3,291,184 to funding research and promotion projects.

The board proceeded to review the additional project proposals, starting with the Northeast Rice Research & Extension Center, and some discussion ensued.

The board decided to table the decision to fund the Northeast Rice Research & Extension Center proposal until the next board meeting.

The board then contemplated the project proposals from the Clean Fuels Alliance America. Discussion ensued.

Member Smith then motioned for the board to allocate funding in the amount of $40,000 to support both project proposals form the Clean Fuels Alliance America.

Moved by Smith, seconded by Davis.

Motion carried.

The board then proceeded to discuss the remaining research and promotion projects one by one.

The board decided to opt out of funding both proposals from Decision Innovation Solutions.

The board proceeded to discuss the promotion/education proposals from the American Soybean Association (ASA), and some discussion ensued.

Member Morton then motioned for the board to fund all seven (7) promotion projects from the ASA, for a total funding amount of $40,300.

Moved by Morton, seconded by Higginbothom.

Motion carried, with recusals from Doyle & Hartz.

The board then contemplated the proposal from WISHH.

Member Smith then motioned for the board to allocate $40,000 in funding for the promotion project proposal from the World Initiative for Soy in Human Health (WISHH).

Moved by Smith, seconded by Davis.

Motion carried, with recusals from Doyle & Hartz.

The board then contemplated the proposal from the Dean Robinson Seed Company.

Member Morton motioned for the board to allocate $16,215 in funding for the research project proposal from the Dean Robinson Seed Company.

Moved by Morton, seconded by Doyle.

Motion carried.

The board then contemplated the proposals from the U.S. Soybean Export Council.

Member Davis then motioned for the board to allocate a total of $25,000 in funding for both promotion project proposals from the U.S. Soybean Export Council (USSEC).

Moved by Davis, seconded by Smith.

Motion carried.

The members then briefly discussed potentially electing a new liaison representative for USSEC. Discussion tabled.

The board then contemplated the various research proposals from the MidSouth Soybean Board.

Member Higginbothom then motioned for the board to allocate a total of $178,297 in funding to the thirteen (13) research project proposals from the MidSouth Soybean Board.

Moved by Higginbothom, seconded by Hartz.

Motion carried, with recusal from Doyle.

The board then contemplated the promotion proposal from Grow For The Green. Some discussion ensued.

Member Davis then motioned for the board to allocate a total of $201,900 in funding to the Grow for the Green promotion project.

Moved by Davis, seconded by Morton.

Motion carried, with recusals from Doyle & Hartz.

The board then contemplated the promotion proposal from the Southwest Soybean Council.

Member Smith then motioned for the board to allocate a total of $10,000 in funding to the promotion project from the Southwest Soybean Council.

Moved by Smith, seconded by Davis.

Motion carried, with recusals from Doyle & Hartz.

The board then revisited the discussion regarding the board's appointment of a three-person committee that is required for the board's procurement or purchasing process with the state government. Some discussion ensued.

The board then selected Jim Cull, Gary Spencer, and John Freeman, with Scott Bray as an alternate.

Chairman Freeman then asked for a motion to approve the list of names for the committee.

Moved by Davis, seconded by Morton.

Motion carried.

The board then decided to revisit the germplasm exchange discussion from the previous day.

Dr. McKinney quickly recapped this $180,000 offer to the board. Members asked several questions and discussion ensued.

Before adjourning, Zaki gave a brief break down of how much money the board had funded in projects. Zaki said that the board funded $3,842,896 in research and promotion projects.

Chairman Freeman then asked if there were any questions or discussion.

Before adjourning, Member Davis recognized Dr. Nathan McKinney for his hard work and contributions to this board, noting that this would be his last board meeting before his retirement. The board applauded Dr. McKinney and gave him best wishes in retirement.

Meeting adjourned.

John Freeman, Chairman

Arkansas Soybean Promotion Board
Financial Statement
For The Period July 1, 2023 - February 29, 2024

	June 2023	February 2024	Budget 2023
Beginning Balance	$ 6,231,490	$ 9,347,445	$ 7,814,674
Revenue			
Total Collections	$ 10,663,495	$ 8,831,076	$ 6,982,638
Less			
USB Transfer	$ 4,948,222	$ 4,118,051	$ 3,491,319
Other QSSB Transfers	$ 438,553	$ 395,590	$ 447,665
State Collection Fee	$ 317,198	$ 261,787	$ 216,462
Net Transfer to the Board	$ 4,959,521	$ 4,055,648	$ 2,827,192
Other Income	$ 4,276	$ 44,463	
Total Revenue	$ 4,963,797	$ 4,100,110	$ 2,827,192
Expenses			
Promotion	$ 590,162	$ 287,052	$ 661,015
Research	$ 1,239,261	$ 1,585,989	$ 2,705,946
Board Expenses	$ 18,510	$ 9,270	$ 41,004
Total Expenses	$ 1,847,932	$ 1,882,311	$ 3,407,965
Net Effect Change in Accounts Payable		$ 646,901	
Ending Balance	$ 9,347,354	$ 12,212,146	$ 7,233,901
Remaining Allocation			
Other Liabilities	$ 46,691	$ 678,635	
Research	$ 1,485,989	$ 1,119,957	$ -
Promotion	$ -	$ 373,963	
Total Remaining Allocation	$ 1,532,680	$ 2,172,555	$ -
Revenue less Expenses Funds Available	$ 7,814,674	$ 10,039,591	$ 7,233,901

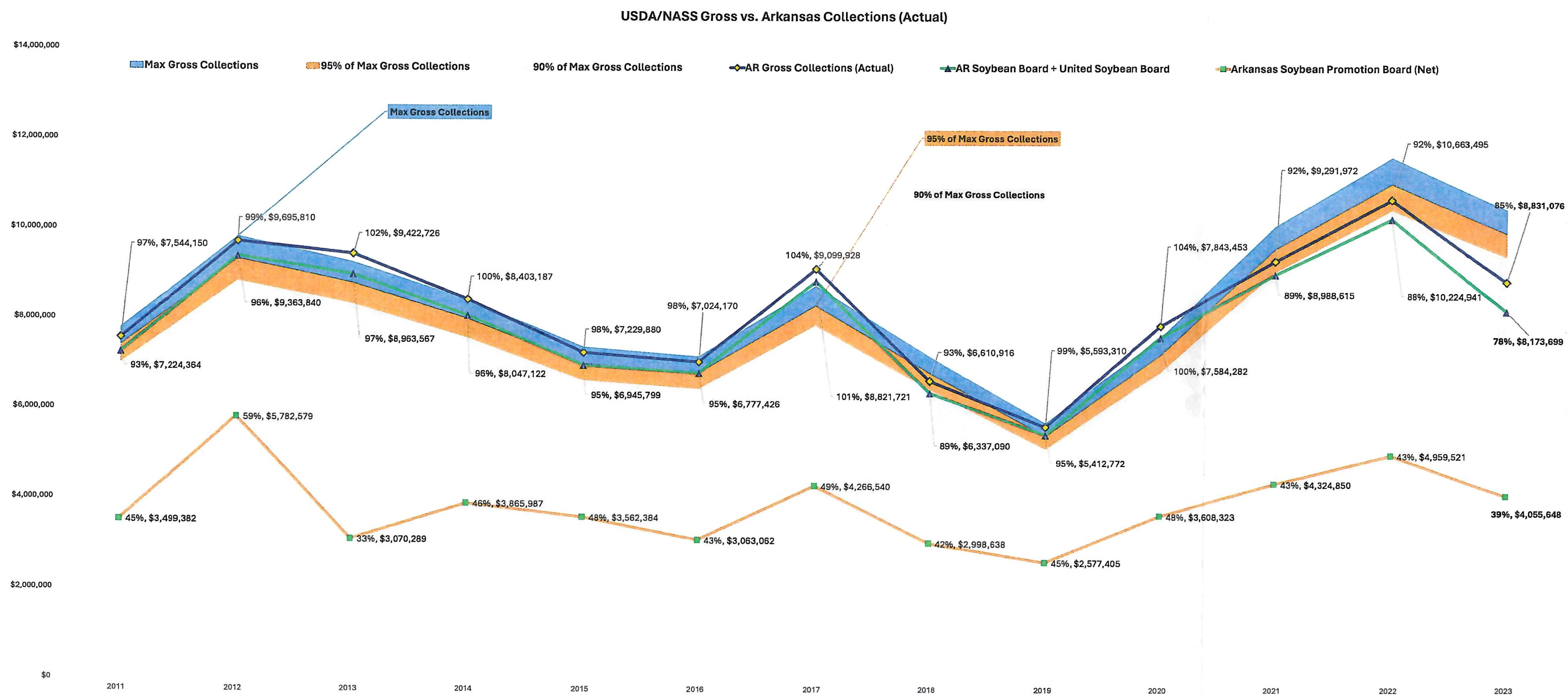
Arkansas Soybean Promotion Board
Annual Collections

	June 2023	January 2024	Budget 2023	Estimated Budget 2024		
USDA Soybean Estimates						
NASS SOYBEANS - ACRES PLANTED	3,180,000	2,980,000	3,180,000	2,980,000	2,980,000	2,980,000
NASS SOYBEANS - ACRES HARVESTED	3,150,000	2,950,000	3,140,000	2,950,000	2,950,000	2,950,000
NASS SOYBEANS - YIELD, MEASURED IN BU	50	53	52	53	53	53
NASS SOYBEANS - PROD, MEASURED IN BU	157,500,000	156,350,000	163,280,000	156,350,000	156,350,000	156,350,000
NASS SOYBEANS - PRICE RCVD, MEASURED IN $ / BU	$ 12.00	$ 13.10	$ 14.20	$ 13.10	$ 13.10	$ 13.10
NASS Value	$ 1,890,000,000	$ 2,048,185,000	$ 2,318,576,000	$ 2,048,185,000	$ 2,048,185,000	$ 2,048,185,000
Implied Checkoff Based on NASS	$ 9,450,000	$ 10,240,925	$ 11,592,880	$ 10,240,925	$ 10,240,925	$ 10,240,925
Total Soybean Checkoff Collections For Arkansas				100%	95%	90%
Assessed Bushels	151,466,018	132,096,854	100,043,795.00	156,350,000	148,532,500	140,715,000
Assessed Bushels Value	2,131,150,000	1,763,782,560	1,368,085,551.00	$ 2,048,185,000	$ 1,848,486,963	$ 1,659,029,850
In State Collections	10,235,500	$ 8,636,411.46	$ 6,843,508.18	$ 9,830,882	$ 8,872,371	$ 7,963,014
Out of State Collections	427,994	$ 194,664.13	$ 139,129.46	$ 404,153	$ 364,748	$ 327,364
Total Checkoff Collections	10,663,495	$ 8,831,075.59	$ 6,982,637.64	$ 10,235,035	$ 9,237,119	$ 8,290,378
Implied Price	$ 14.07	$ 13.35	$ 13.67	$ 13.10	$ 12.45	$ 11.79
Net Collections for Arkansas Soybeans						
Total Checkoff Collections	$ 10,663,495	$ 8,831,076	$ 6,982,638	$ 10,235,035	$ 9,237,119	$ 8,290,378
QSSB Transfer						
Alabama	$ 9	$ -		$ 25,158	$ 22,705	$ 20,378
Colorado		$ -		$ 119	$ 107	$ 96
Florida		$ -		$ 174	$ 157	$ 141
Georgia		$ -		$ 93	$ 84	$ 75
Illinios	$ 1,562	$ 1,092	$ 920	$ 2,458	$ 2,218	$ 1,991
Indiana	$ 288	$ -		$ 169	$ 153	$ 137
Iowa	$ 114	$ -		$ 1,763	$ 1,591	$ 1,428
Kansas		$ -		$ 279	$ 252	$ 226
Kentucky	$ 1,758	$ -		$ 4,434	$ 4,002	$ 3,592
Louisiana	$ 4,491	$ 3,326	$ 2,366	$ 9,718	$ 8,770	$ 7,871
Michigan	$ 4,287	$ -	$ 4,287	$ 2,344	$ 2,115	$ 1,899
Minnesota		$ -		$ 92	$ 83	$ 75
Mississippi	$ 192,887	$ 164,066	$ 129,450	$ 117,344	$ 105,903	$ 95,049
Missouri	$ 202,526	$ 213,655	$ 156,542	$ 165,933	$ 149,755	$ 134,406
Nebraska		$ -		$ 155	$ 140	$ 125
Ohio	$ 2,449	$ -	$ 2,449	$ 4,007	$ 3,616	$ 3,246
Oklahoma	$ 265	$ 1,637	$ 265	$ 26,885	$ 24,264	$ 21,777
Tennessee	$ 24,019	$ 5,533	$ 21,889	$ 26,302	$ 23,738	$ 21,305
Texas	$ 3,645	$ 6,282	$ 21,889	$ 21,639	$ 19,529	$ 17,528
Wisconsin	$ 254	$ -	$ 254	$ 334	$ 302	$ 271
TOTAL QSSB Transfer	$ 438,553	$ 395,590	$ 447,665	$ 409,401	$ 369,485	$ 331,615
United Soybean Board Payment	$ 4,948,222	$ 4,118,051	$ 3,491,319	$ 4,915,441	$ 4,436,185	$ 3,981,507
Arkansas Misc Tax Collection Fee	$ 317,198	$ 261,787	$ 216,462	$ 304,757	$ 275,043	$ 246,853
Net Transfer to the Board	***$ 4,970,080.35***	**$ 4,055,647.65**	**$ 3,135,727.59**	**$ 4,610,684**	**$ 4,161,142**	**$ 3,734,654**
Difference from Budget						
Net Arkansas Assessed Soybean Bushels						
Gross Transfers to the Board	$ 10,235,500.48	$ 8,435,485.76	$ 6,843,508.18	$ 9,830,882	$ 8,872,371	$ 7,963,014
Bushels Assessed	151,466,018	132,096,854	100,043,795	$ 156,350,000	$ 148,532,500	$ 140,715,000
Implied Price	14.07	13.35	13.67	$ 13.10	$ 12.45	$ 11.79
NASS Soybean Production Estimate	157,500,000	156,350,000	163,280,000	$ 156,350,000	$ 156,350,000	$ 156,350,000
Bushel Difference	6,033,982	24,253,146	63,236,205	$ -	$ 7,817,500	$ 15,635,000
Percent of Bushels Assessed	96.2%	84.5%	61.3%	100%	95%	90%
Uncollected Checkoff	$ 424,495	$ 1,619,163	$ 4,323,733	$ -	$ 486,444	$ 921,683
Percent Checkoff Collected	108%	82%	59%	96%	87%	78%
Remainder Due to State	$ 212,247.62	$ 809,581.66	$ 2,161,866.67	$ -	$ 243,222	$ 460,842

2023 Production #s from USDA NASS Forecast Data Released January 12 and February 26 of 2024 .

Arkansas soybean acreage, yield, production, price, and check-off rate with estimated maximum gross collections for years 2011 to 2023

Production Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Fiscal Year, July 1 - June 30	FY-2012	FY-2013	FY-2014	FY-2015	FY-2016	FY-2017	FY-2018	FY-2019	FY-2020	FY-2021	FY-2022	FY-2023	FY-2024
													Estimate
Planted Acres	3,330,000	3,200,000	3,270,000	3,230,000	3,200,000	3,130,000	3,530,000	3,270,000	2,650,000	2,820,000	3,040,000	3,180,000	2,980,000
Harvested Acres	3,280,000	3,150,000	3,240,000	3,200,000	3,170,000	3,090,000	3,500,000	3,210,000	2,610,000	2,800,000	3,000,000	3,140,000	2,950,000
Yield, measured in bushels / acre	38.5	43.5	43.5	49.5	49	47	51	50.5	49	51.5	52	52	54
Production, measured in bushels	126,280,000	137,025,000	140,940,000	158,400,000	155,330,000	145,230,000	178,500,000	162,105,000	127,890,000	144,200,000	156,000,000	163,280,000	159,300,000
Price received, measured in $ / bushels	$12.30	$14.30	$13.10	$10.60	$9.46	$9.83	$9.77	$8.81	$8.87	$10.50	$12.90	$14.20	$13.10
	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Total Estimated Value of Production	$1,553,244,000	$1,959,457,500	$1,846,314,000	$1,679,040,000	$1,469,421,800	$1,427,610,900	$1,743,945,000	$1,428,145,050	$1,134,384,300	$1,514,100,000	$2,012,400,000	$2,318,576,000	$2,086,830,000
Rate	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%
Max Gross Collections	$7,766,220	$9,797,288	$9,231,570	$8,395,200	$7,347,109	$7,138,055	$8,719,725	$7,140,725	$5,671,922	$7,570,500	$10,062,000	$11,592,880	$10,434,150
95% of Max Gross Collections	$7,377,909	$9,307,423	$8,769,992	$7,975,440	$6,979,754	$6,781,152	$8,283,739	$6,783,689	$5,388,325	$7,191,975	$9,558,900	$11,013,236	$9,912,443
90% of Max Gross Collections	$6,989,598	$8,817,559	$8,308,413	$7,555,680	$6,612,398	$6,424,249	$7,847,753	$6,426,653	$5,104,729	$6,813,450	$9,055,800	$10,433,592	$9,390,735
AR Gross Collections (Actual)	$7,544,150	$9,695,810	$9,422,726	$8,403,187	$7,229,880	$7,024,170	$9,099,928	$6,610,916	$5,593,310	$7,843,453	$9,291,972	$10,663,495	$8,831,076
AR Soybean Board + United Soybean Board	$7,224,364	$9,363,840	$8,963,567	$8,047,122	$6,945,799	$6,777,426	$8,821,721	$6,337,090	$5,412,772	$7,584,282	$8,988,615	$10,224,941	$8,173,699
Other Qualified State Soybean Boards	$319,786	$331,970	$459,159	$356,064	$284,081	$246,744	$278,207	$273,826	$180,538	$268,286	$303,357	$438,553	$395,590
United Soybean Board (Net)	$3,503,405	$3,273,364	$5,597,066	$3,923,480	$3,161,306	$3,497,455	$4,281,474	$3,141,139	$2,667,418	$3,731,732	$4,385,343	$4,948,222	$4,118,051
Arkansas Soybean Promotion Board (Net)	$3,499,382	$5,782,579	$3,070,289	$3,865,987	$3,562,384	$3,063,062	$4,266,540	$2,998,638	$2,577,405	$3,608,323	$4,324,850	$4,959,521	$4,055,648
AR Actual Gross Collections % of MGC	97%	99%	102%	100%	98%	98%	104%	93%	99%	104%	92%	92%	85%
AR Soybean & USB % of MGC	93%	96%	97%	96%	95%	95%	101%	89%	95%	100%	89%	88%	78%
QSSB % of MGC	4%	3%	5%	4%	4%	3%	3%	4%	3%	4%	3%	4%	4%
USB % of MGC	45%	33%	61%	47%	43%	49%	49%	44%	47%	49%	44%	43%	39%
AR Soybean % of MGC	45%	59%	33%	46%	48%	43%	49%	42%	45%	48%	43%	43%	39%



USDA/NASS Gross vs. Arkansas Collections (Actual)
$14,000,000
$12,000,000
$10,000,000
$8,000,000
$6,000,000
$4,000,000
$2,000,000
$0
Max Gross Collections
95% of Max Gross Collections
90% of Max Gross Collections
AR Gross Collections (Actual)
AR Soybean Board + United Soybean Board
Arkansas Soybean Promotion Board (Net)
Max Gross Collections
95% of Max Gross Collections
90% of Max Gross Collections
97%, $7,544,150
93%, $7,224,364
45%, $3,499,382
99%, $9,695,810
96%, $9,363,840
59%, $5,782,579
102%, $9,422,726
97%, $8,963,567
33%, $3,070,289
100%, $8,403,187
96%, $8,047,122
46%, $3,865,987
98%, $7,229,880
95%, $6,945,799
48%, $3,562,384
98%, $7,024,170
95%, $6,777,426
43%, $3,063,062
104%, $9,099,928
101%, $8,821,721
49%, $4,266,540
93%, $6,610,916
89%, $6,337,090
42%, $2,998,638
99%, $5,593,310
95%, $5,412,772
45%, $2,577,405
104%, $7,843,453
100%, $7,584,282
48%, $3,608,323
92%, $9,291,972
89%, $8,988,615
43%, $4,324,850
92%, $10,663,495
88%, $10,224,941
43%, $4,959,521
85%, $8,831,076
78%, $8,173,699
39%, $4,055,648
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023

Arkansas Soybean Promotion Board
Interim Public Relations Plan
February 16 – July 1, 2024

ARKANSAS SOYBEAN PROMOTION BOARD

SITUATION

The Arkansas Soybean Promotion Board Marketing & Communications contract is currently in process and likely to take several months to complete. A special procurement order has been awarded to the Communications Group to maintain the board's promotional efforts during this gap period between February 16 and July 1, 2024.

CHALLENGE

Establish continuity and manage the Arkansas Soybean Promotion Board's public relations activities in a manner consistent with the established annual plan, maintaining usual programming with the least amount of interruption and deviation as it navigates the ongoing RFP process.

SOLUTION

Communication Group is committed to serving the Arkansas Soybean Promotion Board as it works to reinstate a formal relationship with its agency of record. Communications Group is offering to continue its services under the temporary agreement and budget of $200,000 – and will engage in the following activities to fulfill this commitment and ensure prompt delivery and success. ComGroup also commits to staying vigilant and prompt in reacting to unplanned opportunities as they arise.

RESPONSIVE INITIATIVES

- ✓ Secured and confirmed transfer of access to all digital properties
- ✓ Conducted routine maintenance and health checks on all digital properties
- ✓ Updated site with current GFTG content
- ✓ Promoted GFTG via social, auxiliary news release distribution
- ✓ Farm & Gin Prep and Coordination

INTERIM PUBLICS RELATIONS PLAN OVERVIEW

FEBRUARY

Deliverable	Description
Interim Plan Development & Processing	Establish plan of action for the interim period, approve, and implement
Re-engage Cursory Social Media Plan & Schedule	Identify priority messages, create and publish essential content for balance of the month, prep for March schedule
2024 Farm & Gin Show	○ Event Plan
	○ Onsite Social Media Plan
	○ Shot Sheet
	○ Booth Prep & Management
	○ Registration Fee
February Edition Bean Brief Newsletter	Develop, produce and distribute February Bean Brief by month's end
Monthly Website Maintenance & Management	Conduct routine health checks, make necessary updates
Media Monitoring & Reporting	Monitor and report any media activity generated by board efforts
Monthly News Release & Distribution	Promote GFTG Challenge Results
Monthly Reporting	Report all activity managed during Feb 16 - 29

MARCH – National Nutrition Month

Deliverable	Description
30-Day Social Media Plan & Schedule	Develop and manage 30-Day social media plan
30-Day Paid Media Materials & Schedule	Place a 30-Day Paid Media Plan
March Edition Bean Brief Newsletter	Develop, produce and distribute March edition by month's end
Monthly Website Maintenance & Management	Conduct routine health checks, make necessary updates
Media Monitoring & Reporting	Monitor and report any media activity generated by board efforts
Monthly News Release & Distribution	National Nutrition Month; Brad Doyle Appointment
Media Pitching	Pitch media re: National Nutrition Month
Annual Funding Meeting	Cover Annual Funding Meeting, note research priorities
Field to Film	Soybean Research Fellow / Career Candidate
2024 Farm & Gin Show	○ Event Plan
	○ Onsite Social Media Plan
	○ Shot Sheet
	○ Booth Prep & Management
	○ Registration Fee
Monthly Reporting	Report all activity managed during March
Monthly QSSB Calls	Attend monthly QSSB Conference Calls

APRIL – National Soyfoods Month

Deliverable	Description
30-Day Social Media Plan & Schedule	Develop and manage 30-Day social media plan
30-Day Paid Media Materials & Schedule	Place a 30-Day Paid Media Plan
April Edition Bean Brief Newsletter	Develop, produce and distribute April edition by month's end
Monthly Website Maintenance & Management	Conduct routine health checks, make necessary updates
Media Monitoring & Reporting	Monitor and report any media activity generated by board efforts
Monthly News Release & Distribution	National Soyfoods Month
Media Pitching	Pitch media re: National Soyfoods Month / Industry Spotlight, DemGaz
Field to Film	Soybean Research Fellow / Career Candidate
Monthly Reporting	Report all activity managed during March
Monthly QSSB Calls	Attend Monthly QSSB Conference Calls
2024 Annual Research Report	Begin production of the 2024 Annual Research Report
Annual QSSB Conference	Attend annual QSSB conference
AWIA Conference	○ Event Plan
	○ Onsite Social Media Plan
	○ Shot Sheet
	○ Booth Prep & Management
	○ Registration Fee
Arkansas FFA Convention	○ Event Plan
	○ Onsite Social Media Plan
	○ Shot Sheet
	○ Booth Prep & Management
	○ Registration Fee

MAY

Deliverable	Description
30-Day Social Media Plan & Schedule	Develop and manage 30-Day social media plan
30-Day Paid Media Materials & Schedule	Place a 30-Day Paid Media Plan
May Edition Bean Brief Newsletter	Develop, produce and distribute May edition by month's end
Monthly Website Maintenance & Management	Conduct routine health checks, make necessary updates
Media Monitoring & Reporting	Monitor and report any media activity generated by board efforts
Monthly News Release & Distribution	2024 GFTG Challenge Application Open
Media Pitching	BBQ Season Recipes
Field to Film	Soybean Research Fellow / Career Candidate
2024 Grow for the Green Challenge Promotion	Promote and market 2024 edition of GFTG
Monthly QSSB Calls	Attend monthly QSSB conference calls
Monthly Reporting	Report all activity managed during March
2024 Annual Research Report	Begin production of the 2024 Annual Research Report

JUNE

Deliverable	Description
30-Day Social Media Plan & Schedule	Develop and manage 30-Day social media plan
30-Day Paid Media Materials & Schedule	Place a 30-Day Paid Media Plan
June Edition Bean Brief Newsletter	Develop, produce and distribute June edition by month's end
Annual Website Integrity Evaluation	Evaluate site's functional integrity, explore necessary upgrades
Monthly Website Maintenance & Management	Conduct routine health checks, make necessary updates
Media Monitoring & Reporting	Monitor and report any media activity generated by board efforts
Monthly News Release & Distribution	TBD
Media Pitching	TBD
Field to Film	Soybean Research Fellow / Career Candidate
Monthly QSSB Calls	Attend monthly QSSB conference calls
Monthly Reporting	Report all activity managed during March
2024 Annual Research Report	Begin production of the 2024 Annual Research Report

JULY

Deliverable	Description
END OF TERM REPORT & FINAL BILLING	FINAL REPORT AND BILLING SUBMITTED BY JULY 10

SITUATION

The Arkansas Soybean Promotion Board Marketing & Communications contract is currently in process and likely to take several months to complete. A special procurement order has been awarded to the Communications Group to maintain the board's promotional efforts during this gap period between **February 16 and July 1, 2024.**

CHALLENGE

Establish continuity and manage the Arkansas Soybean Promotion Board's public relations activities in a manner consistent with the established annual plan, maintaining usual programming with the least amount of interruption and deviation as it navigates the ongoing RFP process.

SOLUTION

ComGroup is committed to serving the Arkansas Soybean Promotion Board as it works to reinstate a formal relationship with its agency of record. ComGroup is offering to continue its services under the temporary agreement and budget of $200,000 – and will engage in the following activities to fulfill this commitment and ensure prompt delivery and success. ComGroup also commits to staying vigilant and prompt in reacting to unplanned opportunities as they arise.

RESPONSIVE INITIATIVES

- ✓ Secured and confirmed transfer of access to all digital properties
- ✓ Conducted routine maintenance and health checks on all digital properties
- ✓ Updated site with current Grow for the Green content
- ✓ Promoted Grow for the Green via social, auxiliary news release distribution
- ✓ Farm & Gin Prep and Coordination

February Deliverables

Deliverable	Description
Interim Plan Development & Processing	Establish plan of action for the interim period, approve, and implement
Re-engage Cursory Social Media Plan & Schedule	Identify priority messages, create and publish essential content for balance of the month, prep for March schedule
2024 Farm & Gin Show	○ Event Plan
	○ Onsite Social Media Plan
	○ Shot Sheet
	○ Booth Prep & Management
	○ Registration Fee
February Edition Bean Brief Newsletter	Develop, produce and distribute February Bean Brief by month's end
Monthly Website Maintenance & Management	Conduct routine health checks, make necessary updates
Media Monitoring & Reporting	Monitor and report any media activity generated by board efforts
Monthly News Release & Distribution	Promote GFTG Challenge Results
Monthly Reporting	Report all activity managed during Feb 16 - 29

March Deliverables

Deliverable	Description
30-Day Social Media Plan & Schedule	Develop and manage 30-Day social media plan
30-Day Paid Media Materials & Schedule	Place a 30-Day Paid Media Plan
March Edition Bean Brief Newsletter	Develop, produce and distribute March edition by month's end
Monthly Website Maintenance & Management	Conduct routine health checks, make necessary updates
Media Monitoring & Reporting	Monitor and report any media activity generated by board efforts
Monthly News Release & Distribution	National Nutrition Month; Brad Doyle Appointment
Media Pitching	Pitch media re: National Nutrition Month
Annual Funding Meeting	Cover Annual Funding Meeting, note research priorities
Field to Film	Soybean Research Fellow / Career Candidate
Monthly QSSB Calls	Attend monthly QSSB Conference Calls

April Deliverables

Deliverables	Description
30-Day Social Media Plan & Schedule	Develop and manage 30-Day social media plan
30-Day Paid Media Materials & Schedule	Place a 30-Day Paid Media Plan
April Edition Bean Brief Newsletter	Develop, produce and distribute April edition by month's end
Monthly Website Maintenance & Management	Conduct routine health checks, make necessary updates
Media Monitoring & Reporting	Monitor and report any media activity generated by board efforts
Monthly News Release & Distribution	National Soyfoods Month
Media Pitching	Pitch media re: National Soyfoods Month / Industry Spotlight, DemGaz
Field to Film	Soybean Research Fellow / Career Candidate
Monthly Reporting	Report all activity managed during March
Monthly QSSB Calls	Attend Monthly QSSB Conference Calls
2024 Annual Research Report	Begin production of the 2024 Annual Research Report
Annual QSSB Conference	Attend annual QSSB conference
AWIA Conference	Event Plan, Onsite Social Media Plan, Shot Sheet, Booth Prep & Management, Registration
Arkansas FFA Convention	Event Plan, Onsite Social Media Plan, Shot Sheet, Booth Prep & Management, Registration

May Deliverables

Deliverable	Description
30-Day Social Media Plan & Schedule	Develop and manage 30-Day social media plan
30-Day Paid Media Materials & Schedule	Place a 30-Day Paid Media Plan
May Edition Bean Brief Newsletter	Develop, produce and distribute May edition by month's end
Monthly Website Maintenance & Management	Conduct routine health checks, make necessary updates
Media Monitoring & Reporting	Monitor and report any media activity generated by board efforts
Monthly News Release & Distribution	2024 GFTG Challenge Application Open
Media Pitching	BBQ Season Recipes
Field to Film	Soybean Research Fellow / Career Candidate
2024 Grow for the Green Challenge Promotion	Promote and market 2024 edition of GFTG
Monthly QSSB Calls	Attend monthly QSSB conference calls
Monthly Reporting	Report all activity managed during March
2024 Annual Research Report	Begin production of the 2024 Annual Research Report

June Deliverables

Deliverable	Description
30-Day Social Media Plan & Schedule	Develop and manage 30-Day social media plan
30-Day Paid Media Materials & Schedule	Place a 30-Day Paid Media Plan
June Edition Bean Brief Newsletter	Develop, produce and distribute June edition by month's end
Annual Website Integrity Evaluation	Evaluate site's functional integrity, explore necessary upgrades
Monthly Website Maintenance & Management	Conduct routine health checks, make necessary updates
Media Monitoring & Reporting	Monitor and report any media activity generated by board efforts
Monthly News Release & Distribution	TBD
Media Pitching	TBD
Field to Film	Soybean Research Fellow / Career Candidate
Monthly QSSB Calls	Attend monthly QSSB conference calls
Monthly Reporting	Report all activity managed during March
2024 Annual Research Report	Begin production of the 2024 Annual Research Report

July Deliverables

Deliverable	Description
END OF TERM REPORT & FINAL BILLING	FINAL REPORT AND BILLING SUBMITTED BY JULY 10

ARKANSAS SOYBEAN PROMOTION BOARD

COMMUNICATIONS GROUP
Marketing | Public Relations
POWERING INSIGHT

Contact: Carson Horn, APR
chorn@comgroup.com | 501-515-0849

ATTACHMENT 3

Development of a turn-row soybean field health analysis scouting tool using UAS imagery

- **Investigator: Jason Davis**
- **Status: New**
- **Budget Request: $19,989**
- **Objectives:**
  - Collect drone imagery of production fields in parallel with the verification program efforts.
  - Correlate imagery with ground observation collected by the verification program.
  - Develop and release a user-friendly software package that leverages the validated workflow for producers, consultants, and agents to use.

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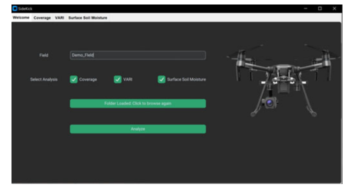
1

Development of a turn-row soybean vegetative health analysis scouting tool using UAS imagery

- Variations in water, pests, and nutrient influence vegetative health & contribute to yield fluctuations.
- Some variation can be mitigated early if detected via scouting; however, whole field efforts are time consuming.
- Drones provide whole field perspective; however, analysis takes expensive hardware and some expertise.
- A user-friendly and robust field modeling tool that processes images in seconds could significantly facilitate scouting efforts.



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2

Development of a turn-row soybean vegetative health analysis scouting tool using UAS imagery

- Prototype software tool has been developed that processes imagery in the field in < 1 min.
  - Evaluates canopy development, vegetative health, and the uniformity of soil moisture.
- Requested funding to further develop, validate, and finalize tool development.
- Funding will be used to pay for partial technician time, travel, and data analysis.

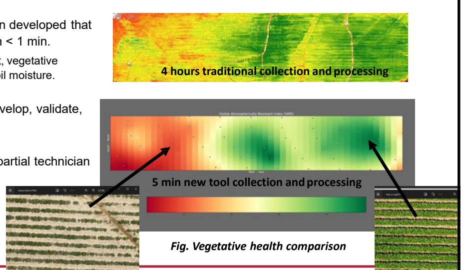

Fig. Vegetative health comparison

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3

Development of Data Driven Recommendations for Variable Soybean Seeding Rate in Arkansas

- **Jeremy Ross and Aurelie Poncet**
- **Status: New**
- **Budget Request: $81,876**
- **Objectives:**
  - **To develop an algorithm that computes the economic optimum seeding rate.**
  - **To evaluate the temporal stability and variability of a VRS prescription maps created from data collected in the same commercial .**
  - **To generalize findings across locations selected to bracket the typical range of field conditions found in Arkansas.**

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4

Development of Data Driven Recommendations for Variable Soybean Seeding Rate in Arkansas

Findings:
- Soybean yield response to seeding rate varies within commercial fields
- Some of that variability could be effectively managed using VRS if adequately implemented
- Management decision regarding VRS can be made using data that are already available to Arkansas soybean producers including soil test results and public web-soil survey information

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5

Site-specific assessment of soybean response to in-field variability using remote sensing.

Investigators: Aurelie Poncet, Mike Hamilton
Status: New
Budget Request: $75,000

Objectives:

1. To quantify and compare in-field soybean yield variability under different irrigation systems.
2. To model relationships between site-specific soybean yield and remote sensing-based vegetation index history.
3. To compare the performance of data collection platforms and evaluate the use of drone remote sensing as an alternative to missing satellite images.

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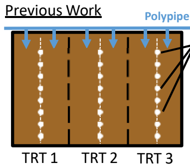
6

Goal: Increase the profitability of irrigated soybean with optimized crop management.

Supporting activities:

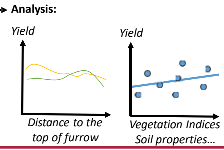
- A. Characterization of soybean yield response to in-field variability.
- B. In-season monitoring of soybean development and health, and correlations with yield.
- C. Definition of data-driven recommendations for optimized crop production.
- D. Decision-support tool development and validation of data-driven recommendations.

Previous Work



Dataset:
- (Relative) Soybean Yield
- Soil survey data
- Soil texture, pH, K, and P
- Stand counts
- Satellite imagery (veg. indices)
- Proximal crop sensing
- Soil water content/temperature

Analysis:



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Proposed Work

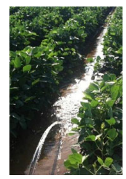
- **6 site-years =** 2 fields/year x 3 years (=3 furrow + 1 flood + 1 pivot irrigated)
- **Data collection:** field history, elevation, soil samples, stand counts, satellite imagery, drone images, hand plant samples, yield

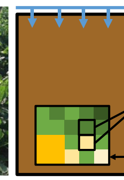
Projected Value

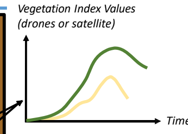
- Integration of precision data into the decision-making process.
- Automation of image processing to produce relevant management information and data-driven recommendations.
- Future web-tool development for decision-support

Thank you for your support!

Example: furrow-irrigated field







Sample vegetation index values computer from satellite images or drones (spatial resolution 90')

Data analysis:
- Characterization of in-field yield variability (magnitude, directionality, spatial distribution).
- Correlations between relative yield and the temporal signature of vegetation indices, including classification of signature patterns, machine learning, and validation.

8

Phenotypic Selection Assisted by Seed-Level Near-Infrared Information

- **Investigators:** Samuel B Fernandes, Caio Canella Vieira
- **Status:** New
- **Budget Request:** $51,117
- **Objectives:**
  1. Determine the efficiency of phenotypic prediction assisted by seed-level near-infrared information
  2. Develop a pipeline that incorporates the near-infrared information in the selection process

9

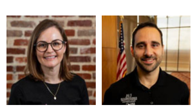
Phenotypic Selection Assisted by Seed-Level Near-Infrared Information

- The same machine utilized for seed counting produces NIR data;
- Use NIR-based phenotypic prediction in the early selection stages as a pre-selection to increase selection intensity and accuracy;
- Increasing the selection intensity and accuracy will **increase the probability of developing a superior cultivar** for soybean growers.

10

Soybean Resistance to Charcoal Rot: A Collaborative Approach Involving Plant Pathology and Soybean Breeding Programs

- **Investigators: Camila Nicolli and Caio Canella Vieira, UofA**
- **Collaborator: Rodrigo Pedrozo, USDA**
- **Status: New**
- **Budget Request: $64,292**
  (70 % personnel and 30% supplies & direct cost)
- **Objectives:**
  1. Survey of Charcoal rot pathogens (*Macrophomina phaseolina*)
  2. Conduct Greenhouse-Based Phenotyping
  3. Development of Disease-Resistant Soybean Cultivars



Plant Pathology Program — Soybean Breeding Program

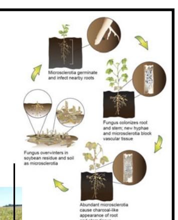
11

Breeding for Charcoal rot

Justification/Problem:
1. Charcoal rot can lead to yield losses in soybean crops unpredictably.
2. Cause roughly 20 million bushels in production losses annually.
3. Needs to conduct early-stage testing of soybean materials to identify genotypes that displays resistance.

Solution: a multi-disciplinary collaboration to incorporate genetic resistance into high-yielding soybean cultivars

1. **2024:** isolates and protocol efficacy is evaluated on pre-commercial soybean breeding lines.
2. **2025:**screenings on 20-30 pre-commercial breeding lines, and novel sources of resistance.
3. **2026:** development of the first resistant breeding populations, as well as field trials using the selected genotypes.



Stunted or wilted plants in patches are the initial symptoms of charcoal rot.

12

Designing Soybean Ideotypes for Adaptation to Weather Variability

- **Investigators: Elvis Elli (PI), Caio Canella Vieira (Co-PI)**
- **Status: New (Year 1 of 3)**
- **Budget Request: $66,122**
- **<u>Objectives:</u>**
  - **(1) Characterize physiological traits of contrasting breeding lines**
  - **(2) Use a simulation model to predict crop growth and development of each breeding line**
  - **(3) Identify favorable traits and/or combinations for increased yields**

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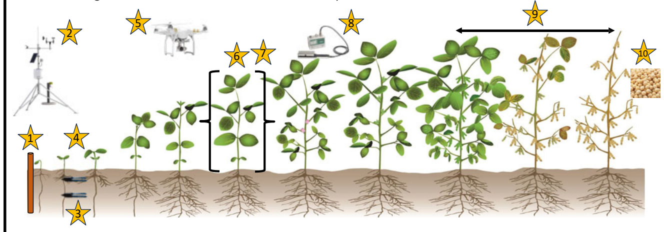
13

1. Soil cores
2. Weather information
3. Soil water and temperature
4. Phenology/node number
5. Drone flights
6. In-season biomass sampling
7. N% & N uptake
8. Leaf area index (LAI)
9. Seed growth rate
10. Yield & Yield components



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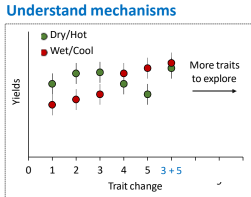
Characterize traits

- N fixation sensitivity to drought
- Water use efficiency
- Leaf development
- Leaf area index duration
- N uptake
- Leaf angle/architecture
- Seed-filling period
- ...

Understand mechanisms



Inform breeders

- High-performing, stable genotypes
- ↑ Yield potential
- ↓ Field testing
- ↑ Resiliency to weather variability

Crop Ideotype
"Combination of plant traits that can result in improved yields and profitability within a defined environment"

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15

Overcoming Soybean Yield Plateau by Leveraging Physiology-Efficient and Yield-Formation Traits

- **Investigators**
  - **Caio Canella Vieira**
  - **Elvis Elli**
- **Status: New (Year 1 of 3)**
- **Budget Request: $83,620**
- **<u>Objectives:</u>**
  - **Characterization of genetically diverse soybean accessions and modern cultivars based on yield-formation and physiology-efficient traits**
  - **Characterization of the genetic architecture of yield-formation and physiology-efficient traits**
  - **Development of breeding populations derived from high-yielding elite modern cultivars and diverse accessions.**

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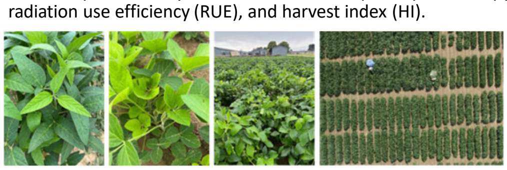
16

Overcoming Soybean Yield Plateau by Leveraging Physiology-Efficient and Yield-Formation Traits

- **<u>Only 18 accessions account for 86% of the genetic basis of soybeans</u>. Over 21,800 possible accessions available in the USDA collection.**
- Yield is represented by solar radiation intercepted by the canopy (Ei), radiation use efficiency (RUE), and harvest index (HI).



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Overcoming Soybean Yield Plateau by Leveraging Physiology-Efficient and Yield-Formation Traits

- **Initial field studies in 2023 to increase seed availability of over 350 genetically diverse accessions.** Structure of genetic diversity ongoing to detect different genetic groups in comparison to our genetics.
- 2024 Plan: Collect phenotypic data associated with Ei, RUE, and HI.
- 2024 Plan: Genomic prediction-based hybridization schemes to maximize population mean and genetic variance
- **Sustainable and long-term increase in intrinsic soybean yield and production in Arkansas and the United States**

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18

Economics of Soil Health Practices for Soybeans in Arkansas

- Drs. Kent Kovacs; Gerson Drescher; Trent Roberts; Michael Daniels; Qiuqiong Huang
- Status: New
- Budget Request: $57,838 (70% personnel, 25% survey, 5% in-state travel)

- Objectives:
  - Get data from fertilization trials on experimental and commercial fields.
  - Producer survey to identify soil health concerns.
  - Decision support tool to help farmers choose between soil health practices.

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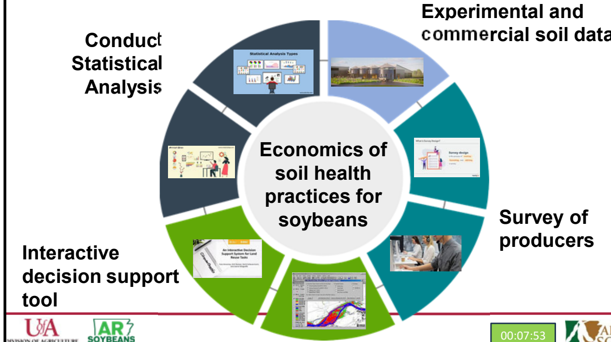

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20

Economics of Soil Health Practices for Soybeans in Arkansas

Value to the soybean industry

- Dynamic decision support tool for producers.
- Extension fact sheets for farmers and certified crop advisors.
- Project information at field days.
- A large and useful dataset to answer questions beyond our objectives.

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21

Predicting the Impacts of Insect Herbivory on Soybeans Across a Salinity Gradient

- Investigators: Drs. Rupesh Kariyat, Natalie Clay, Ben Thrash
- Status: New
- Budget Request: $45,924
- Objectives:
  1. Quantify the effects of soybean tissue sodium concentration on soybean insect herbivore- growth and development
  2. Determine the effect of soybean sodium tissue concentrations on herbivore leaf consumption- area lost and damage
  3. Determine how salinity and herbivory impact soybean performance and yield in the fields

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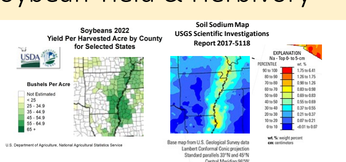
22

Salinity Can Impact Soybean Yield & Herbivory

- Salinity poses major economic and logistical challenges to crop production as irrigation increases salt-affected soils
- Sodium in Plants and Herbivores:
  - Typically decreases plant fitness
  - Taken up in plant tissues
  - Essential for the growth, development, and maintenance of herbivores
  - Can increase herbivore presence and potentially feeding
- Thus, maximizing sustainable production is in part dependent on identifying salinity levels that minimize plant stress and limit herbivory



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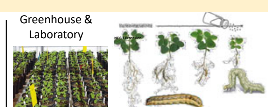
23

Determining Sodium Levels that Maximize Yield & Minimize Herbivory

- Obj. 1 & 2 (2023): Herbivore & Soybean Performance
  - **Greenhouse**: Grow common AR soybean varieties across sodium gradient and measure plant health and leaf sodium concentrations
  - **Laboratory**: Determine specific sodium requirements for FAW & SL performance, herbivory, and growth using leaves from soybeans grown in greenhouse

Greenhouse & Laboratory

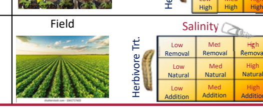


- Obj. 2 & 3 (2024): Salinity Impact on Herbivory (Lab)
  - **Greenhouse trials**: low, medium (optimal), high Na relative to FAW and SL requirements (based on results of Year 1)
  - Use three densities of FAW and SL to determine how salinity and herbivore density impact herbivory

Greenhouse

- Obj. 3 (2025): Salinity Impact on Herbivory (Field)
  - **Field trials**: low, medium (optimal), high Na relative to FAW and SL requirements (based on results of Year 1)
  - Three herbivore treatments: removal, herbivore addition, unmanipulated (natural)

Field



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24

Engineering Synthetic Microbiome Communities to Enhance Soybean Disease Resistance

- **Investigators: Lead Investigators: Dr. Asela J. Wijeratne**
  Co-Investigators: Dr. Edward Brown and Dr. Scott Mangan
- **Status:** New
- **Budget Request: $39,500**
- **Objectives:**

1. Isolate and molecularly identify bacteria from rhizosphere soil
2. Determine antagonistic activities of different bacterial strains against *F. virguliforme in vitro*
3. Construct of SynCom and determine disease resistance *in vitro*
4. Evaluate synthetic communities for disease resistance in greenhouse and field conditions (Second year)

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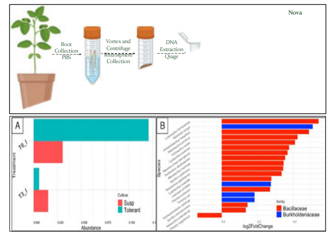
SDS tolerant cultivar suppresses pathogen growth in greenhouses by recruiting beneficial microbes



- Compared rhizosphere microbiomes:
  - SDS-tolerant and susceptible cultivars.
  - Post-pathogen inoculation.
- Bacillaceae and Burkholderiaceae abundances increased in the tolerant cultivar.
- Some Bacillus can suppress of *Fusarium*.
- Burkholderiaceae contains nitrogen fixers.

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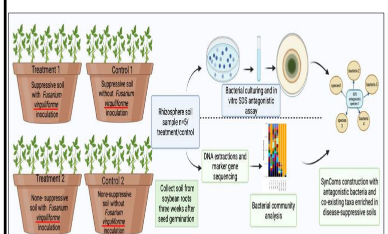
Use of Synthetic Microbial Community to Manage SDS



Value to Soybean Industry:

- **Yield Loss Prevention**: Suppress SDS and prevent yield loss.
- **Delay of Symptom Development**: Suppressing SDS could delay symptom development, leading to greater yield.
- **Sustainable Agriculture**: Enhance soybean growth, mobilize nutrients, alleviate stressors, improve yield, and reduce reliance on synthetic inputs.

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27

Screening Arkansas Soybean Cultivars for Protein Quality as a Novel Food Preservative

- **Investigators:** Mahfuzur Rahman and Caio Canella Vieira
- **Status:** New
- **Budget Request:** $50,049
- **Objectives:**
  - Conduct a comprehensive screening of soybean varieties and fractionate protein-derived bioactive peptides suitable for application as food preservatives.
  - Utilize fractionated peptides to enhance the shelf life of processed food by preventing lipid oxidation and inhibiting microbial growth.
  - Develop breeding materials with improved seed composition to be used as food preservatives.

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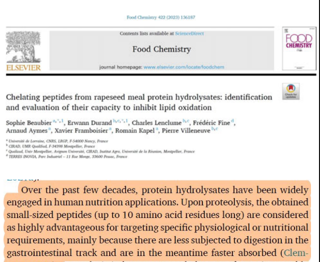
Methods

- Use conventional and industrial methods to soy isolate protein
- The bioactive peptides will be extracted using enzymatic hydrolysis methods
- To evaluate the ability of the peptides to act as preservatives, by assessing the antioxidant and antimicrobial properties of the bioactive peptides.


Food Chemistry 422 (2023) 136187

Contents lists available at ScienceDirect

Food Chemistry

journal homepage: www.elsevier.com/locate/foodchem

Chelating peptides from rapeseed meal protein hydrolysates: identification and evaluation of their capacity to inhibit lipid oxidation

Sophie Beaubier[a,*,1], Erwann Durand[b,c,*,1], Charles Lenclume[b,c], Frédéric Fine[d], Arnaud Aymes[a], Xavier Framboisier[a], Romain Kapel[a], Pierre Villeneuve[b,c]

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[c] Qualisud, Univ Montpellier, Avignon Université, CIRAD, Institut Agro, Université de la Réunion, Montpellier, France
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Over the past few decades, protein hydrolysates have been widely engaged in human nutrition applications. Upon proteolysis, the obtained small-sized peptides (up to 10 amino acid residues long) are considered as highly advantageous for targeting specific physiological or nutritional requirements, mainly because there are less subjected to digestion in the gastrointestinal track and are in the meantime faster absorbed (Clemente, 2000). Proteolysis induces structural changes of proteins notably

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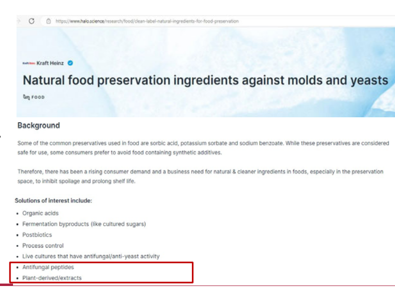
Statement of projected value

- Soybean is the major plant-based protein, and its market is anticipated to be valued at $10.5 billion in 2024, with projections to reach $13.3 billion by 2029.
- The identification of a new application for soy protein-derived peptides could significantly boost the soy protein market.


https://www.halo.science/research/food/clean-label-natural-ingredients-for-food-preservation

Kraft Heinz

Natural food preservation ingredients against molds and yeasts

FOOD

Background

Some of the common preservatives used in food are sorbic acid, potassium sorbate and sodium benzoate. While these preservatives are considered safe for use, some consumers prefer to avoid food containing synthetic additives.

Therefore, there has been a rising consumer demand and a business need for natural & cleaner ingredients in foods, especially in the preservation space, to inhibit spoilage and prolong shelf life.

Solutions of interest include:

- Organic acids
- Fermentation byproducts (like cultured sugars)
- Postbiotics
- Process control
- Live cultures that have antifungal/anti-yeast activity
- Antifungal peptides
- Plant-derived/extracts

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30

Innovating Arkansas Soybean Utilization for Soymilk and Tofu Production

- **Investigators:**
  - Dr. Han-Seok Seo (FDSC)
  - Dr. Mahfuzur Rahman (FDSC)
  - Dr. Caio Canella Vieira (CSES)
- **Status:** New
- **Budget Request:** $63,986
- **Objectives:**
  - Propel the U.S. soybean industry into a leading position in the production of diverse soy-based products, with a special focus on soymilk and tofu.

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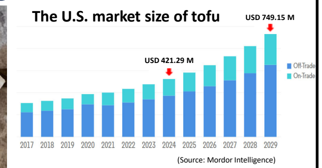
Soymilk

Tofu



Pulmuone Foods USA leading the US tofu market (nearly 70% market share)

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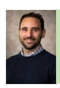
SPECIFIC AIMS

- **Aim 1: Consumer insights and acceptance**
  Identify sensory and non-sensory factors that drive consumer choices and preferences for soymilk and tofu available in the U.S. markets.
- **Aim 2: Soybean cultivar selection**
  Optimize raw material quality to ensure superior end products.
- **Aim 3: Product development and market analysis**
  Develop value-added soymilk and tofu products utilizing selected Arkansas soybean and access their market potential.

Methods

- Han-Seok Seo in FDSC
- Conduct analytical sensory analysis and consumer acceptance test



- Caio Canella Vieira in CSES
- Soybean breeder
- Screen multiple AR soybean varieties

- Mahfuzur Rahman in FDSC
- Develop and optimize soymilk and tofu conditions

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Quantification of Crop Coverage and Weed Pressure for Instantaneous Variable Spraying with UAV(Drone) Computer Vision

- **Investigators:** Dr. Cengiz Koparan, Dr. Jason Davis, Dr. Dongyi Wang
- **Status:** New
- **Budget Request:** $83,598
- **Objectives:**
  - To develop UAV-image-based computer model for instantaneous weed pressure quantifications in soybean.
  - To develop a UAV spraying subsystem for on-the-go spray rate adjustment.
  - To validate proof-of-concept with field experiments in University of Arkansas Agricultural Experiment Station in Fayetteville, AR.

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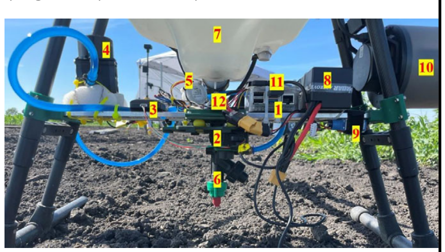
Variable rate spraying sub-system components on the UAV

#	Part Name
1	Onboard computer
2	RGN camera
3	GPS/GNSS u-blox NEO-M8
4	BLDC 6S water pump
5	Flow meter
6	T-jet – best for herbicides
7	Water tank
8	Li-Po battery 14.4V 5,000 mAh
9	Battery eliminator circuit
10	RIDAR – proximity sensor
11	Wi-Fi adapter – image acquisition
12	BLDC speed controller



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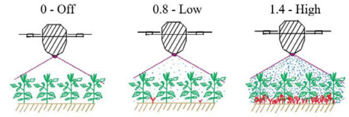
26 Days After Planting
Cloudy at 3 pm

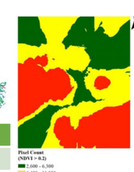
Sensor View

Growth Stage	V3	V3	V3
Pixel Count (NDVI>0.2)	905	5,550	94,084
Count Ratio (%)	1	5	8
Weed Pressure (%)	0	4	7
Spray Rate (L/min)	0 - Off	0.8 - Low	1.4 - High

Variable Rate Spray (Autonomous)



pixel count < 1,000	1,000 < pixel count < 6,000	6,000 < pixel count
Sprayer off	Low rate	High rate



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Arkansas Discovery Farms

Thank You for all Your Support!

- **Mike Daniels and Discovery Farm Team**
- **Status: (Year 3)**
- **Budget Request: $5,000**
- **Objectives:**

1. Provide on-farm verification and documentation of water quality, water use, soil health and climate change services
2. Provide education from on-farm data that will assist producers in achieving both production and environmental goals in support of sustainable farming.

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Important Findings / Accomplishments

- N and P losses are small relative to application
- K losses are of significant economic value
- Cereal Rye Cover Crops are allowing cash crop to extract water from 18 inches compared to 6 inches for non cover situations
- Soil Health in terms of physical and biological parameters need improvement
- Continue to generate much interest from Decision makers, agencies and others that may influence agricultural production

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Use of gossypol to inhibit reproduction in domestic hogs as a model for feral hog control

- **Investigators: B. P. Littlejohn, C. V. Maxwell, T. C. Tsai, M. A. Snider**
- **Status: Year 2 of 3**
- **Budget Request: $60,016/year**
- **Objectives:**
  - **Using domestic hogs as a model for feral hogs, conduct a series of experiments to evaluate the use of feed containing gossypol to inhibit reproductive potential.**
  - **Obtain input from 1) state and federal agencies and 2) collaborators in wildlife biology and population management to prepare for potential future phases of the project.**

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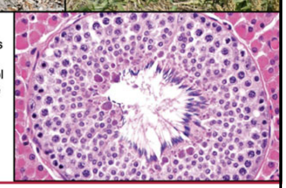
Our *long-term goal* is to assess the potential for gossypol administration in the form of baiting to reduce hog populations in the state of Arkansas



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Year 1 Progress

- Postdoctoral Associate hired (partially funded by grant)
- Gossypol treatments developed (cottonseed oil)
- 24 domestic boars secured as test subjects
  - Boars are currently being trained for semen collection
  - Sperm concentration is being assessed on a weekly basis to determine sexual maturity
- The pilot study will start after 20 boars are determined to be sexually mature:
  - Pilot study will evaluate the influence of gossypol from cottonseed oil consumed by domestic boars on health and reproductive function
    - Semen quality
    - Desire to breed

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Investigating Emerging Production Recommendations for Sustainable Soybean Production

- **Jeremy Ross and Ben Thrash**
- **Status: Year 2 of 3**
- **Budget Request: $148,723**
- **Objectives:**
  - Continue to initiate test demonstrations for controlling economically damaging insect pests that often impact the Early Soybean Production System.
  - Evaluate performance of soybean varieties of different herbicide technologies including Xtend, Enlist, and XtendFlex.
  - Investigate seeding rate and seed treatment interactions of soybean under a wide range of geographic regions and soil textures under different irrigation treatments
  - Examine the potential of using new and innovative production factors, and how they influence soybean yields and profitability.

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Investigating Emerging Production Recommendations for Sustainable Soybean Production

Agronomy

- Jackson County Ext. Center
  - Soybean OVT
  - Soybean/Corn Foliar Feed Study
  - Edamame variety study
- Pine Tree Research Station
  - Plots abandoned due to excessive rainfall after planting and excessive deer damage
- Data presented at one field day and over 25+ meetings

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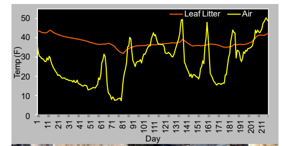
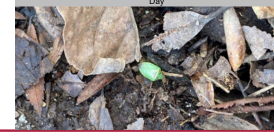
Investigating Emerging Production Recommendations for Sustainable Soybean Production

Entomology:

- Began a regional project to generate a Redbanded Stink Bug prediction model
- Evaluating soybean looper resistance to the diamides and methoxyfenozide
- Conducted evaluated several experimental insecticides for control on soybean insect pests including loopers and stinkbugs
- Continue to evaluate soybean IST's in cover crop environments





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Improving Technology Transfer for Profitable and Sustainable Soybean Production

- **Jeremy Ross and Jason Norsworthy**
- **Status: Year 2 of 3**
- **Budget Request: $77,86**
- **<u>Objectives:</u>**
  - To ensure timely development and distribution of the Soybean Update publications as well as update computer assisted variety selection program.
  - To improve the rate of technology transfer and adaption by the implementation of educational programs.
  - Continue to coordinate state and regional meetings to facilitate the latest soybean production updates.
  - To increase the awareness of county extension agents, consultants, agribusiness representatives, concerned producers of the status, direction, and value of current soybean research and Extension efforts.
  - Publication of the Soybean Research Series.

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Improving Technology Transfer for Profitable and Sustainable Soybean Production

- 2024 Tri-State Soybean Forum was held in Louisiana on Jan. 5, 2024. Very informative presentations and good attendance. 2025 Forum will be in Mississippi.
- 2022 Soybean Research Studies released Dec. 2023
- Soybean varietal publications released
- 25+ meeting where current research findings were presented

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Science for Success – Arkansas Support for National Soybean Research and Extension Program

- **Jeremy Ross**
- **Status: Year 2 of 3**
- **Budget Request: $117,488**
- **<u>Objectives:</u>**
  - **Participate in national soybean research protocols to contribute data for BMP's.**
  - **Contribute data and expertise for Extension publications, social media release, videos, and webinars to deliver BMP's.**
  - **Attend and participate in Science for Success virtual and in-person meetings to develop research efforts, educational material, and team-building activities.**

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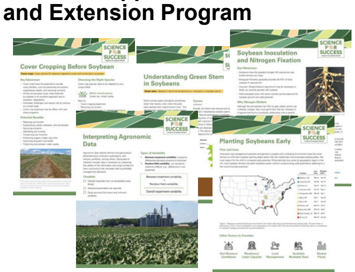
Science for Success – Arkansas Support for National Soybean Research and Extension Program

2023 Results:

- Three national protocols
  - Biological Seed Treatments (Yr. 2)
  - Defoliation/Seed Quality (Yr. 1)
  - Soil Health from long-term rotation
- Workshop at the World Soybean Research Conference – Vienna, AU
- Monthly virtual meetings
- Content Development Meeting – Raleigh, NC
- Outreach Development Meeting – Houston, TX



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2024 SCIENCE FOR SUCCESS WEBINAR SERIES

Savvy Full Season Soybean Management

March 8th: Pre-Season Maturity Group, Planting Date, and Biological Seed Treatment Choices

Fabiano Colet, The Ohio State University
Michael Plumblee, Clemson University
Shawn Conley, University of Wisconsin–Madison
Andre Reis, University of Missouri
Moderated by Emma Grace Matcham, University of Florida

March 15th: In-Season Fertilizer and Fungicide Applications

Jeremy Ross, University of Arkansas
Laura Lindsey, The Ohio State University
Horacio Lopez-Nicora, The Ohio State University
Moderated by Emma Grace Matcham, University of Florida

March 22nd: Late-Season Desiccation Decisions

Rachel Vann, North Carolina State University
Seth Naeve, University of Minnesota
Trent Irby, Mississippi State University
Moderated by Emma Grace Matcham, University of Florida

All webinars will be held at 1 PM ET/12 PM CT.

Register using the QR code or by visiting go.ncsu.edu/savvymanagementregister.

Science for Success is a national team of soybean Extension Specialists from land-grant universities. We collaborate to bring you sound research information on soybean Best Management Practices (BMPs). Science for Success is funded by the United Soybean Board through the checkoff program.

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Arkansas Soybean Performance Trials

- **John Carlin**
- **Status: (Year 2 of 3)**
- **Budget Request: $40,270**
- **Objectives:**
  - To evaluate the performance of soybean varieties and breeding lines across eight locations within the State of Arkansas
  - To enable abiotic (chloride and metribuzin) and biotic screening (disease screening) of the varieties by collaborating PIs.

50

Arkansas Soybean Performance Trials

Significant Findings for Previous Year for Current Studies or Value to Soybean Industry:

Variety selection is a cornerstone of soybean production profitability. The Soybean Variety Trials provide Arkansas Soybean Producers with third party unbiased performance data which aids in making variety selection decisions. The variety testing program also serves as a hub for other projects and PIs.

51

Development of High-yielding Soybean Cultivars with Broad Resilience to Stressors

Investigator(s): Caio Canella Vieira
Year: 1 of 3
Amount Requested: $184,844
Objectives:

Development of high-yielding broadly adapted MG 3L-5E soybean cultivars

1. Hybridization with purpose based on genetic characterization of parental lines
2. Off-season nursery to speed up the development and uniformization of breeding populations
3. Broad phenotypic and genotypic characterization of breeding lines for biotic and abiotic stressors tolerance
4. Genomic-driven breeding values and testing footprint to select superior lines

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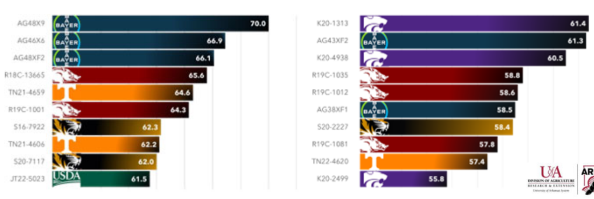
Development of High-yielding Soybean Cultivars with Broad Resilience to Stressors

- R19C-1012 (MG 4L) and R18C-13665 (MG 4L) – **2024 Releases**
- R19C-1035 (MG 4E) and R19-45980 (MG 5E) – **Potential 2025 Releases**



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Development of High-yielding Soybean Cultivars with Broad Resilience to Stressors

Significant Findings for Previous Year for Current Studies or Value to Soybean Industry:

1. **R18-14502 (MG 4L) and R18-14147 (MG 4L, high protein) – 2023 Potential Releases**
2. **First round of E3™-converted lines in yield trials**
3. 18 high-yielding lines in AVT and USDA SUST
4. 280 lines in Finals (replicated, seven locations)
5. 906 lines in Preliminary (replicated, four locations)
6. ~13,000 lines in Progeny (Conventional and E3™)

Ensure the availability of high-yielding cultivars with low costs to Arkansas growers

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Utilization of Winter Nursery for Soybean Line Development through Backcrossing

- **Investigators: Caio Canella Vieira**
- **Status: Year 3 of 3**
- **Budget Request: $51,000**
- **Objectives:**
  - **Fast conversion of advanced high-yielding breeding lines into Enlist-E3® and XtendFlex® in off-season nursery**
  - **Support a steady development of herbicide-tolerant breeding populations and MG4 cultivars**

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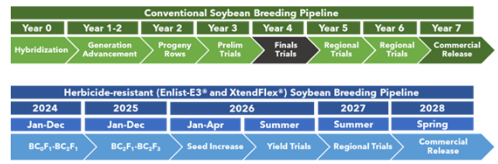
Utilization of Winter Nursery for Soybean Line Development through Backcrossing

- Protocol established to **maximize cost and time efficiency** by converting high-yielding lines advanced into regional trials



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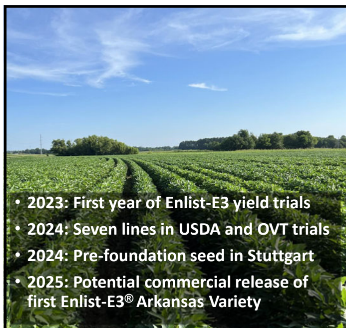

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Fast-tracking MG4 and early MG5 cultivars with southern root-knot nematode resistance

Investigator(s): Caio Canella Vieira, Travis Faske
Year: 3 of 3
Amount Requested: $51,008
Objectives:

Development of MG4 soybean cultivars with SRKN resistance

1. Identify **genetic sources with enhanced resistance to SRKN**
2. Characterize the **response of UARK breeding lines to SRKN** (markers, greenhouse, field)
3. Characterize the **mechanism of SRKN resistance** in soybean cultivars
4. **Develop new breeding populations using novel SRKN-resistant genetic sources**
5. Marker-assisted selection and off-season nursery to **speed-up the development of new SRKN-resistant cultivars**

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Fast-tracking MG4 and early MG5 cultivars with southern root-knot nematode resistance

Significant Findings for Previous Year for Current Studies or Value to Soybean Industry:

1. A total of 43 advanced lines for SRKN resistance (marker/field/greenhouse) **– 7 resistant**
2. **23 breeding populations derived from SRKN-resistant parents** – advancement ongoing
3. Molecular marker screening of ~2,900 single plants ongoing
4. **A total of 8 new crossing combinations** – F_1-F_4 advancement ongoing in Puerto Rico

Improved yield performance and enhanced profit margins in areas where SRKN is a limiting factor for soybean production

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Soybean Germplasm Enhancement Using Genetic Diversity

Investigator(s): Caio Canella Vieira
Year: 1 of 3
Amount Requested: $193,121
Objectives:

Build a strong and sustainable genetic pool in Arkansas

1. Introduction of **novel genetic background** from plant introductions (PIs) and elite germplasm from different growing regions
2. Incorporation of unique **economically important traits** including **grain quality and composition and biotic and abiotic stressors tolerance** using various breeding and selection schemes

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Soybean Germplasm Enhancement Using Genetic Diversity

Significant Findings for Previous Year for Current Studies or Value to Soybean Industry:

1. Lines from various Northern states' breeding programs were used in our crossing block in combination with high-yielding Arkansas-adapted elite cultivars
2. Roughly 30% of PCM lines derived from **Northern genetics**

3.Roughly 20% of Final lines derived from **PI/genetically diverse accessions**

Foundation of generating genetic diversity in our program and can be referred to as 'Discovery Breeding'

Intensify novel allelic combinations and development of unique trait combinations

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Soybean Germplasm Enhancement Using Genetic Diversity

- Economically important traits are being **incorporated and sustained** throughout our breeding pipeline by heavy efforts in phenotypic and genotypic characterization

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Genomic Prediction to Enhance the Efficiency of Soybean Breeding

Investigator(s): Caio Canella Vieira, Samuel Fernandes
Year: 1 of 3
Amount Requested: $101,900
Objectives:

Develop a data-driven and cost-effective soybean breeding pipeline

1. Establishment of training sets based on **historical multi-environment yield and genomic data** from the UARK Soybean Breeding program
2. Development of **genomic prediction models to be implemented early in the breeding pipeline** to select promising genotypes

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Genomic Prediction to Enhance the Efficiency of Soybean Breeding

Significant Findings for Previous Year for Current Studies or Value to Soybean Industry:

1. **Reduce the length of a breeding cycle**, **increase selection intensity and accuracy**, and **improve the rate of genetic gain** using genomics and big data analytic technologies
2. Maximizing the efficiency of a soybean breeding pipeline will **speed up the identification and delivery of superior cultivars** to growers in Arkansas and the United States

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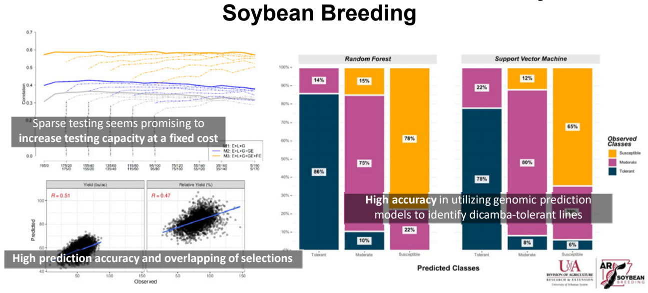
Genomic Prediction to Enhance the Efficiency of Soybean Breeding



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Economic Analysis of Soybean Production and Marketing Practices

Investigator(s): Brian Deaton
Year: New
Amount Requested: $ 7,316

Objectives:

- Conduct an economic analysis of production practices used in the Arkansas Soybean Research Verification Program.
- Verify Extension recommendations. (J. Ross and C. Wilkins)
- Provide Arkansas soybean market summaries for publication on the "Row Crops Blog" online newsletter.

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Economic Analysis of Soybean Production and Marketing Practices

Methods:

- Analyze the economic feasibility of production management decisions in the Soybean Research Verification Program using enterprise budgets.
- Determine production practices that offer producers the highest expected net returns for their soybean enterprises.

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Soybean Enterprise Budgets and Production Economic Analysis

- **Breana Watkins, Instructor**
- **Status: Year 2 of 3**
- **Budget Request: $10,000**
- **<u>Objectives:</u>**
  - **The goal of this project is to provide crop enterprise budgets that are flexible for representing alternative production practices of Arkansas producers.**
  - **Available on the extension website: uaex.uada.edu; search "crop budgets"**

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Estimated Costs and Returns per Acre
RoundupReady2Xtend Soybean
Furrow Irrigated, 12 ac-in., Arkansas, 2024

					Landlord		Tenant
ITEM	UNIT	PRICE	QUANTITY	Total Amount	Share %	Share	Share
INCOME							
Soybean	bu	$ 12.70	60	$ 762.00	0.0%	$ -	$ 762.00
TOTAL INCOME				$ 762.00		$ -	$ 762.00
DIRECT EXPENSES							
LAND EXPENSE							
Cash Land Rent	acre			$ -			$ -
SEED/PLANTS							
Soybean Seed	thous	$ 0.36	150	$ 53.49	0.0%	$ -	$ 53.49
CUSTOM SPRAY AND FERTILIZER							
Ground App[1,2,3,4,5]	appl	$ 8.00	5	$ 40.00	0.0%	$ -	$ 40.00
Aerial App Chem[6,7]	appl	$ 8.50	2	$ 17.00	0.0%	$ -	$ 17.00
Aerial App Fert	lbs	$ 0.085	0	$ -	0.0%	$ -	$ -
FERTILIZERS							
Phosphate (0-46-0)[2]	lbs	$ 0.35	90	$ 31.50	0.0%	$ -	$ 31.50
Potash (0-0-60)[2]	lbs	$ 0.25	100	$ 25.00	0.0%	$ -	$ 25.00
Urea (46-0-0)	lbs	$ 0.25	0	$ -	0.0%	$ -	$ -
HERBICIDES							
Glyphosate[1]	oz	$ 0.16	32	$ 5.12	0.0%	$ -	$ 5.12
2,4-D[1]	oz	$ 0.16	32	$ 5.12	0.0%	$ -	$ 5.12
Metribuzin[3]	oz	$ 2.64	8	$ 21.12	0.0%	$ -	$ 21.12
Tavium[3]	oz	$ 0.55	56.5	$ 31.08	0.0%	$ -	$ 31.08

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2024 Estimate of Farm Machinery Costs per Acre

Implement Name, Description	Total Field Trip Costs per Acre: Fixed Costs	Repairs	Fuel	Labor	Total	Acres per Hour	Hours per Acre
Paratill	$ 11.50	$ 1.77	$ 4.72	$ 1.79	**$ 19.78**	7.83	0.13
Subsoiler, 25 ft.	$ 9.02	$ 1.44	$ 3.59	$ 1.36	**$ 15.41**	10.30	0.10
Subsoiler, 5 shank	$ 17.27	$ 2.49	$ 7.47	$ 2.84	**$ 30.06**	4.95	0.20
Bedder, Rip/Disk	$ 9.10	$ 1.39	$ 2.36	$ 0.90	**$ 13.75**	15.66	0.06
Bedder, Lister	$ 7.23	$ 1.38	$ 2.36	$ 0.90	**$ 11.86**	15.66	0.06
Disk	$ 7.91	$ 1.21	$ 2.04	$ 0.77	**$ 11.93**	18.13	0.06
Bedder, Hipper	$ 7.53	$ 1.10	$ 2.23	$ 0.85	**$ 11.71**	16.58	0.06
Chisel Plow	$ 7.78	$ 1.46	$ 2.24	$ 0.85	**$ 12.33**	16.48	0.06
Harrow	$ 2.81	$ 0.43	$ 1.09	$ 0.49	**$ 4.81**	28.85	0.03
Roller	$ 4.18	$ 0.44	$ 1.57	$ 0.60	**$ 6.79**	23.49	0.04
Bedder-Roller	$ 6.25	$ 0.67	$ 1.89	$ 0.72	**$ 9.52**	19.58	0.05
Ditcher	$ 0.28	$ 0.03	$ 0.12	$ 0.06	**$ 0.49**		
Turbo Tiller	$ 6.37	$ 1.05	$ 1.81	$ 0.69	**$ 9.93**	20.36	0.05
Rotary Harrow (ex. Phillips)	$ 4.30	$ 0.56	$ 1.21	$ 0.46	**$ 6.52**	30.55	0.03
Field Cultivator	$ 4.45	$ 0.84	$ 1.22	$ 0.46	**$ 6.97**	30.29	0.03
Row Crop Cultivator, Irrigation Middles	$ 4.28	$ 0.46	$ 1.43	$ 0.54	**$ 6.72**	25.79	0.04
Sprayer, Tractor Mounted (ft)	$ 1.14	$ 0.19	$ 0.50	$ 0.25	**$ 2.06**	56.73	0.02
Sprayer, Tractor Mounted (row)	$ 1.97	$ 0.35	$ 0.78	$ 0.39	**$ 3.49**	35.93	0.03
Land Plane	$ 4.71	$ 0.54	$ 2.10	$ 0.94	**$ 8.30**	14.89	0.07
Fertilizer, Broadcast Spreader	$ 3.24	$ 0.58	$ 1.23	$ 0.71	**$ 5.75**	25.45	0.04
Do All, Seedbed Finisher	$ 3.56	$ 0.54	$ 1.35	$ 0.51	**$ 5.97**	27.41	0.04
Planter	$ 7.99	$ 2.29	$ 1.74	$ 0.87	**$ 12.90**	17.96	0.06
Planter Twin Row	$ 12.44	$ 3.91	$ 2.06	$ 0.87	**$ 19.28**	17.96	0.06
Plant Grain Drill	$ 14.21	$ 4.30	$ 2.64	$ 1.07	**$ 22.22**	14.00	0.07
Plant No-Till Air Drill	$ 10.52	$ 3.11	$ 2.07	$ 0.84	**$ 16.54**	17.82	0.06
Liquid Fertilizer Applicator	$ 3.27	$ 0.51	$ 1.23	$ 0.60	**$ 5.61**	29.94	0.03
Fertilizer, Knife Rig 12 Row	$ 6.47	$ 1.24	$ 1.76	$ 0.86	**$ 10.32**	20.96	0.05
Polypipe; Roll Out, Punch, Take Up	$ 5.01	$ 0.30	$ 1.40	$ 2.10	**$ 8.82**		
Hooded Sprayer	$ 3.85	$ 0.73	$ 1.34	$ 0.67	**$ 6.59**	20.96	0.05
Levee Pull	$ 0.78	$ 0.09	$ 0.36	$ 0.18	**$ 1.40**		
Levee Pull, Planter/Incorporate	$ 0.92	$ 0.11	$ 0.39	$ 0.19	**$ 1.61**		
Levee Roller-Packer-Shaper	$ 0.36	$ 0.04	$ 0.18	$ 0.09	**$ 0.67**		
Install Gates & Remove	$ 1.01	$ 0.11	$ 0.53	$ 0.80	**$ 2.45**		
Take Down Levees	$ 1.53	$ 0.18	$ 0.71	$ 0.36	**$ 2.78**		
Peanut Digger/Inverter	$ 22.07	$ 4.96	$ 6.97	$ 3.13	**$ 37.13**	4.49	0.22
Peanut Conditioner	$ 16.30	$ 2.63	$ 6.97	$ 3.13	**$ 29.02**	4.49	0.22
Peanut Conditioner & Lifter	$ 15.78	$ 2.43	$ 6.97	$ 3.13	**$ 28.32**	4.49	0.22

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Refining Insect Thresholds in Arkansas Soybean

- **Investigators:** Ben Thrash, Nick Bateman, Glenn Studebaker
- **Status: (Year 3 of 3)**
- **Budget Request: $70,700**

- **Objective 1.** Large on-farm trials and small plot trials with Heligen in different water quality situations will be conducted to determine level of control, longevity in the field, and impact of water quality on control with the virus.
- **Objective 2.** Large on-farm trials and small plot trials with the major pests such as corn earworm, looper and stink bug will be conducted to determine level of control, longevity in the field, and impact of water quality on control with insecticides.
- **Objective 3.** Insecticides will be tested by putting them in different water quality solutions for 12, 24, and 48 hours then spraying in the field to determine impact of water quality and time in solution on subsequent insect control.

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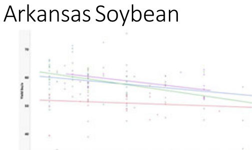
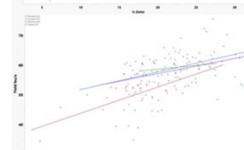
Refining Insect Thresholds in Arkansas Soybean

1. Yield was recorded 4 small plot soybean looper trials this year and 1 stink bug trial in Tillar, Arkansas. Dr. Spurlock flew the looper plots with his drone and our yield and defoliation data. Data indicates we may need to slightly lower our defoliation threshold.
2. Due to the high heat and dry conditions this year slug populations were extremely low across the state and a successful trial could not be conducted.
3. Soybean were sampled in cooperation with MSU and LSU AgCenter to improve stink bug sampling methods in soybean





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72

Impact of Water Quality on Insecticide Applications to Soybean

- **Investigators:** Ben Thrash, Nick Bateman, Glenn Studebaker
- **Status: (Continuing, Year 1 of 3)**
- **Budget Request: $20,000**

- **Objective 1.** Large on-farm trials and small plot trials with Heligen in different water quality situations will be conducted to determine level of control, longevity in the field, and impact of water quality on control with the virus.
- **Objective 2.** Large on-farm trials and small plot trials with the major pests such as corn earworm, looper and stink bug will be conducted to determine level of control, longevity in the field, and impact of water quality on control with insecticides.
- **Objective 3.** Insecticides will be tested by putting them in different water quality solutions for 12, 24, and 48 hours then spraying in the field to determine impact of water quality and time in solution on subsequent insect control.

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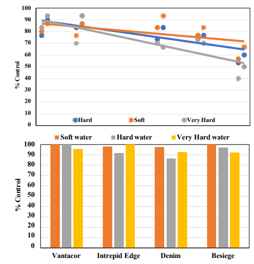
Impact of Water Quality on Insecticide Applications to Soybean

- Taylor Harris (student on this project) has graduated with her masters degree
- Data indicates water with a high hardness or pH significantly reduces the residual control provided by chlorantraniliprole (Besiege, Vantacor, Elevest)
- Results with other insecticides have been less consistent. However, acephate does look to be impacted negatively.



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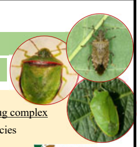
74

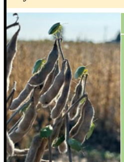
Developing scouting, threshold, and management practices for stinkbug complex (Red banded, Green, and Brown) in Arkansas soybean



Investigator(s): *Drs. Rupesh Kariyat, Neel Joshi, Ben Thrash, Glenn Studebaker, and Nick Bateman*

Year 2 or 3; funding request: $ 49,980

Objective 1: Develop and update scouting methodology and economic thresholds for the soybean stinkbug complex
Objective 2: Develop soybean growth stage injury standards across commonly grown soybean varieties for the stinkbug complex
Objective 3: Estimate host plant resistance traits and their variation across soybean varieties for the three stinkbug species
Objective 4: Evaluate the nutritional quality loss due to stinkbug complex infestation on soybean pods



Current Results from Objectives 1 and 2

- Conducted a comprehensive survey of soybean plots at the University of Arkansas farm from mid-August to mid-Oct.
- Mean abundance of green stink bug measured via sweep net sampling: 1.6 per linear foot of row in late August, increasing to 2.4 stink bugs per linear foot later in the season.
- Species composition determined by collecting stink bugs with sweep nets and identifying samples in the laboratory.
- Southern green stink bug identified as the most dominant species, comprising 96.8% of total stink bugs collected.
- Proportional abundance of other stink bugs was very low at 3.2%.
- Stink bugs were not found in the sampling conducted during the second week of October at the UA research farm.

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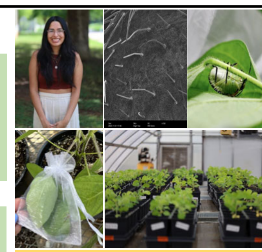
Results from objective 3

As a part of objective 3 and 4 we have grown 18 soybean accessions in the greenhouse and evaluated their resistance and growth traits.

As the first line of defense, soybeans employ leaf trichomes. We have developed a microscope-based density assessment of these defenses (manuscript under review)
In Summer we are evaluating 200 accessions with an Honors student Thesis (also working on article for ***AR Soybean Research Studies***)

Current Bottleneck: Effective rearing of stink bugs in lab

Presented at ESA annual meeting (Maryland; UA Travel Award)
Presented at UA 3M Thesis
Presented at AR Crop Protection Conference, Fayetteville
Presented poster at UA AFLS Gamma Sigma Delta Meeting
Manuscript under review for ***Communicative and Integrative Biology***



Green house and lab experiments @ UA

Benefits to Arkansas Soybean Industry	• ***Resource for developing integrated management practices for the Arkansas Soybean Industry*** • Understanding variety injury and resistance levels will aid in breeding programs for trait identification

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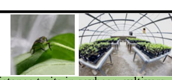
Plans for year 2 and 3



Objective 3: To accomplish objective 3, we will do a comprehensive assessment of insect resistance traits in soybean cultivars grown in different regions of the state (on going).

These will include measuring leaf trichome density and types, secondary metabolites, and volatile organic compounds. In addition, we will also examine induced defenses ***post stinkbug feeding*** (same set of defense traits).

Results from this objective will be the first report of differential defenses against the stinkbug complex in Soybean. Findings from this study objective will be helpful in developing new management strategies as well as stink bug resistance soybean varieties.

Objective 4: To accomplish objective 4, we will carry out both lab and field assessments. We will sample stinkbug(s) infected and un-infected pods from field sites (from objective 1and 2) and from plants grown under controlled environmental conditions in the greenhouse.

This will also assist us in understanding how individual species and their toxins affect the quality of soybean pods, rather than just estimating the yield loss.

Products	• IPM fact sheets (in print and web), MS Thesis (on going), Peer-reviewed publications, Case study on incidence data, posters and presentations (local, regional and national meetings)

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Fertilization of Soybean

- **Investigators:** Trent Roberts and Gerson Drescher

- **Status: Year 2 of 3**
- **Budget Request: $80,641**
- **Objectives:**
  - **Continue long-term P and K trials**
  - **Evaluate new and existing relationships between soil nutrient availability, soybean tissue concentration and soybean yield**
  - **Evaluate the effects of P fertility on soybean yield, selected yield components, the pattern of leaf-P concentration across time, and seed nutrient concentration among nodes.**
  - **Calibrate in season leaf tissue-K concentrations to predict K fertilizer needs to maximize or recover yield during the reproductive growth stages. Assess the use of remote sensing to predict where trifoliolate leaf samples should be collected.**

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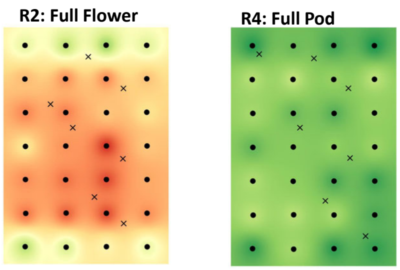
AR East Field Hidden Hunger



+ 60 lb K_2O ac

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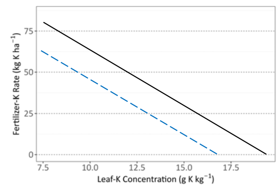
Calibrated In-Season K Rates



15 DAR1

$$f(x) = \begin{cases} 130 - 6.9x & \text{if } x \le 18.9^a \\ 0 & \text{if } x > 18.9^a \end{cases}$$

30 DAR1

$$f(x) = \begin{cases} 119 - 6.9x & \text{if } x \le 17.3^a \\ 0 & \text{if } x > 17.3^a \end{cases}$$

[a] (Slaton et al., 2021)

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Influence of Cover Crops and Soil Health on Soybean

- **Investigators:** Trent Roberts, Gerson Drescher, and Jeremy Ross
- **Status: Year 2 of 3**
- **Budget Request: $60,786**
- **Objectives:**
  - **Implement a field-based leaf sampling protocol for rating soybean varieties as an includer or excluder.**
  - **Provide categorical and numerical response ratings for each cultivar**
  - **Rate degree of mixed reaction soybean cultivars to provide more detailed information**

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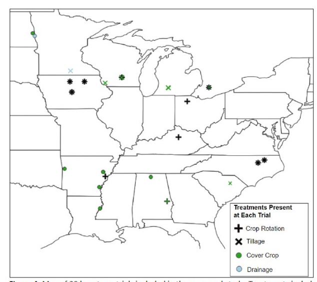
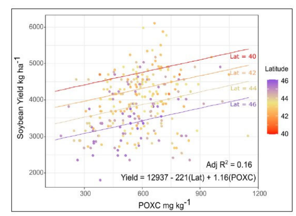


Figure 4. Map of 29 long term trials included in the proposed study. Treatments include crop rotation, tillage, cover crops, and artificial drainage, and some trials have multiple treatments (see Table 2). When points are colored but in the shape of crop rotation (+) or tillage (x) this indicates both treatments are present (e.g. a green "x" is a tillage and cover crop trial).



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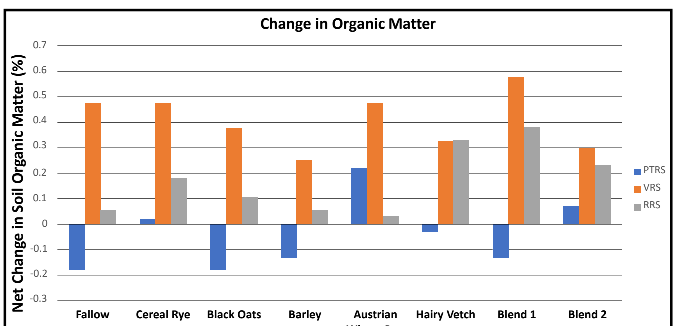

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Field-based Determination of Chloride Tolerance in Soybean

- **Investigators:** Trent Roberts, John Carlin, and Jeremy Ross
- **Status: Year 2 of 3**
- **Budget Request: $50,605**
- **Objectives:**
  - **Implement a field-based leaf sampling protocol for rating soybean varieties as an includer or excluder.**
  - **Provide categorical and numerical response ratings for each cultivar**
  - **Rate degree of mixed reaction soybean cultivars to provide more detailed information**

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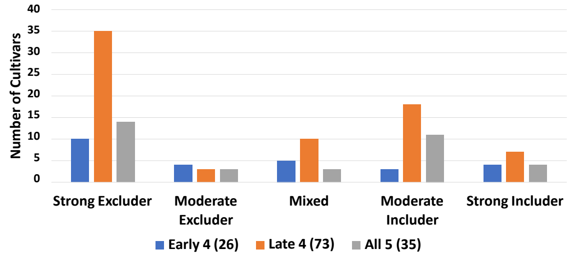
2023 OVT Chloride Rating Results



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Monitoring the Extent of Potassium Deficiency and Chloride Toxicity in Arkansas Soybean Fields

- **Investigators:** Trent Roberts and Jeremy Ross
- **Status: Year 2 of 3**
- **Budget Request: $36,870**
- **<u>Objectives:</u>**
  - **Identify the magnitude and extent of potassium deficiency, including hidden hunger, across a wide range of Arkansas soybean production systems and estimate the associated yield loss.**
  - **Identify the magnitude and extent of chloride toxicity across a wide range of Arkansas soybean production systems and estimate the associated yield loss.**

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Hidden Hunger is Real!

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2023 K and Cl Monitoring Program

- County Agents sampled ~23 soybean production fields at R2 and R4
- At R2 12/23 locations were deficient in K
  - Anticipated yield loss of 8-25%
- At R4 16/23 locations were deficient in K
  - Anticipated yield loss of 10-25%

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Irrigation Water Management for Soybeans: Moving the Needle.

- **CG Henry**
- **Status: Year 2 of 3**
- **Budget Request: $205,620**
- **<u>Objectives:</u>**
  - **Document water savings, yield improvements, profitability improvements using an Irrigation Contest. Compare yield and water use differences to document the efficacy and improved profitability of conservation practices.**
  - **Deliver irrigation schools in the winter months.**
  - **Further develop recommendations for surge irrigation and soil moisture sensors. Improve soil water information about Arkansas soils and paper and mobile app development for sensors. Test new ideas on how to improve water retention curve development methods.**
  - **Improve ability to measure and document water use through new cloud meter telematics delivered to the irrigator during the season.**
  - **Improve implementation of CHS, through poly pipe printer development.**
  - **Improve cover crop crimper design for furrow irrigation.**

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Sensor Scouts with the mobile app

- 2 scouts (AR and MS county) information used on 4,640 acres. About 30 fields. Used manual read sensors some telemetry units, and provided bi-weekly recommendations using the mobile app.
- 86% of time producers thought app recommendation was accurate.
- 66% of time producers reduced irrigations
- 80% said scouts improved growers knowledge of sensors.
- 33% would like scouts, 33% would like to buy and read sensors themselves, 33% are undecided.
- About half reported the scouts reduced their labor needs for irrigation.

Irrigation Schools

2 schools delivered in 2024, 1 cancelled

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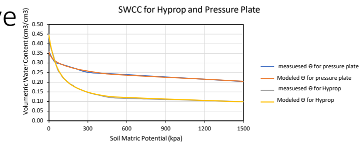
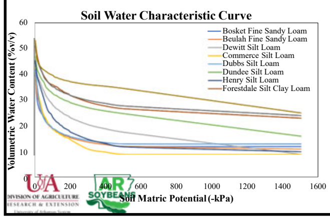
Retention Curve Results





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MOST CROP PER DROP

Arkansas Irrigation Yield Contest

	Soil Moisture Sensors	Pipe Planner	Furrow Irrigated Rice	Surge Valves
2023	85	100	54	22
2022	81	79	64	12
2021	87	97	80	35
2020	42	100	73	16
2019	40	43	38	28
2018	50	73	50	44

Karl Garner
1st place Soybeans
88.4 BPA
5.05 Bushels Per Inch WUE

WUE's are increasing over time. Contest is getting harder to win.

Request $10,000 for cash prizes for winn

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John Allen McGraw
2nd place Soybeans
80.7 BPA
4.80 Bushels Per Inch WUE

Star City, Arkansas (Lincoln County)

ALSO placed in #1 row rice and #2 soybeans

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Walnut Ridge, Arkansas (Lawrence, County)

Frank Binkley
3rd place Soybeans
89.5 BPA
4.14 Bushels Per Inch WUE

93

Comprehensive Disease Screening of Soybean Varieties in Arkansas

Investigator(s): Travis Faske, Terry Spurlock, and Joanna (Asia) Kud

Year: New 1 of 3

Amount Requested: $131,863

Objectives:

1. Screen UA OVT entries for frogeye leaf spot (Faske).
2. Screen UA OVT entries for southern stem canker (Spurlock).
3. Screen UA OVT entries for southern root-knot in GH (Greer/Kud) and field (Faske).
4. Provide results to UA Variety Testing by years-end (All).

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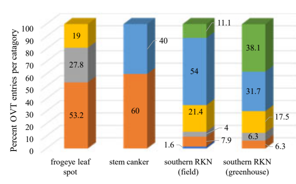
Comprehensive Disease Screening of Soybean Varieties in Arkansas

2023: Good screen for all diseases for 126 entries

1. FLS – most (>50%) are at least MR
2. SC – 40% were S
3. SRKN – 13% were at least MR
   1. Most were MG V

- Results allow informed decision on variety selection
- Results were posted on VT website and published in Soybean Update



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95

Integrated Management of Soybean Nematodes in Arkansas

Investigator(s): Travis Faske and Asia (Joanna) Kud (Amanda Greer)

Year: 2 of 3

Amount Requested: $72,449

Objectives:

1. Determine field efficacy of nematicides (Faske)
2. Evaluate varieties for resistant to the southern RKN (Faske/Emerson)
3. Promote sampling by SPB sponsored nematode assays (Faske/Greer)
4. Extend and educate clientele… blog articles, production meetings. (All)

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Integrated Management of Soybean Nematodes in Arkansas

Significant observations:

1. Seed treatments do not reduce RKN galling, but ILEVO and Trunemco had >2 bu/ac yield benefit 50% of the time across three-years of trials on a susceptible variety.

2. Results of field screen are posted in November on Row Crops Blog, UA-CES website, and Soybean Research Series

Table 1. Field performance of several MG IV soybean varieties in a southern root-knot nematode infested field. The soil texture was a sandy loam soil (59% sand, 36% silt, and 5% clay). (Pf = 873 second-stage juveniles/100 cm^3 soil.)

Variety[a]	Percent root system galled[c]	Yield (bu/A)
Pioneer 43A42X (Check)	0.1 f[b]	76.7 a
GoSoy GS493E22N	8.6 ef	74.4 a
Pioneer P46A36X	2.5 f	72.9 a
Delta Grow DG49E90	4.9 f	68.4 a
Delta Grow DG4940 (Check)	1.0 f	66.9 a
Invictis B4921E	10.2 def	66.6 a
NK44-Q5E3S	14.8 c-f	61.6 ab
Progeny P4806XFS	28.5 b-e	45.1 bc
Delta Grow DG46XF54	51.1 ab	28.0 cd
Delta Grow DG4880 GLY (Check)	38.7 abc	26.7 cd
Delta Grow DG48XF42	32.5 a-d	26.6 cd
Invictis A4862XF	39.71 abc	25.7 cd
Donmario Seed DM48F53	32.9 a-e	23.1 d
Delta Grow DG44XF75	40.4 abc	23.1 d
Gateway Seed 45XFS	58.8 a	20.1 d
Delta Grow DG49XF29 (Check)	27.33 a-e	19.5 d

[a] Roundup Ready, Enlist, Xtend, & Xtend Flex variety.
[b] Means with different letters within a column indicate a significant difference at $\alpha = 0.05$ according to Tukey's HSD test.
[c] Susceptibility categories based on % root system galled: 0-1.0 = VR, 1.1-4.0 = R, 4.1-9.0 = MR, 9.1-20.0 = MS, 20.1-40.0 = S, 40.1-100.0 = VS.)

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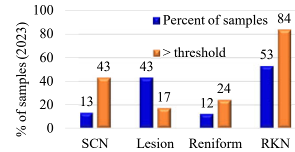
Integrated Management of Soybean Nematodes in Arkansas

Significant observations:

1. Fall conditions favored soil sampling compared to 2022.

Samples processed:
835 in 2021
100 in 2022
500 in 2023

2. Extend: Data are reported on Row Crops Website, production meetings, interviews, videos, and soybean research series reports.



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Monitor and Management of Fungicide-Resistant Soybean Diseases in Arkansas

Investigator(s): Travis Faske and Ken Korth

Year: 3 of 3

Amount Requested: $50,498

Objectives:

1. Evaluate the efficacy and timing of fungicides, to control S-R FLS and other foliar diseases (Faske & Korth).
2. Investigate the risk and existence of fungicide-resistance in *Cercospora* spp. and other foliar diseases to SDHI fungicides (Faske & Korth).
3. Develop and extend fungicide-resistance management strategies to delay or prevent fungicide-resistant diseases (Faske & Korth).

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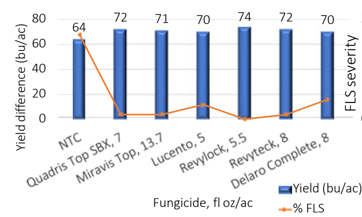
Monitor and Management of Fungicide-Resistant Soybean Diseases in Arkansas

Significant Findings of 2023:

- FLS severity was low (1.5% on NTC)
- Fungicides had a positive impact on yield protection (range of 5 to 10 bu/ac) in one but not a second experiment.
- These fungicides continue to be effective but yield protection each year is not a guarantee.



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100

Developing a satellite-based field scouting tool

Investigator(s): Terry Spurlock and Jeremy Ross

Status: Year 2 of 3

Budget Request: $14,860

Stated Goal: To develop a tool that uses publicly available satellite imagery to increase scouting efficiency by locating areas in fields that should be scouted

Specific Objectives:

1.Work with farmers, consultants, and county agents to locate test fields each year. Most of these fields will beArkansas Soybean Verification fields. We expect to scout approximately 10 fields peryear.

2.Run the tool weekly on each verification field and scout areas of fields the tool locates at least once prior to V6, once at R3/R4 and once at R6.

3. Collect relevant data relating to soybean health and productivity (stand, weed populations, diseases present, insect counts, etc.) at each area the tool locates as well as soil samples from areas the tool frequently locates.

4. Test different vegetation indexes and mathematical models to determine the best single model or combination of models for field scouting.

5. Year 3 – deploy the beta version of the tool to be used by county agents, consultants, scouts, and/or farmers.

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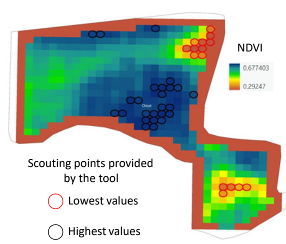
Developing a satellite-based field scouting tool

- Multiple vegetation indices were calculated from satellite imagery. We used 12 different indexes including normalized difference vegetation index (NDVI) to determine scouting points.
- Fields were scouted where the tool identified areas with the highest values and lowest values.
- Points with the highest values always had green, healthy looking soybean plants.
- Points with the lowest values had numerous issues, specifically, low wet areas, stunted plants, open middles, weeds, and soilborne disease.
- Soil samples were collected from a subset of fields/points.
- As an example, the field at right had:
  - pH of 6.5 across the points with the highest values
  - pH of 5.1 across points with the lowest values
  - free-living nematodes, an indication of soil health, were about 3x higher in points with the highest values



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Determining the value of fungicide application using on-farm trials

Investigator(s): Terry Spurlock and Jason Davis

Status: Year 2 of 3

Budget request: $ 52,000

Stated Goal: To cooperate with farmers, consultants, and county agents to determine when and where a **fungicide application or fungicide + product(s) marketed to improve plant health** protects a soybean crop and adds value above the input cost.

1. **Specific Objectives: Work with farmers or consultants on their farms** to determine the value of product applications if applied across the entirety of their soybean acreage. **This project is targeted to early-career farmers that may struggle with these decisions.**
2. **Test products that the farmer and consultants would like to see.** They guide the test. Products will be applied within label specifications. However, individual rates will be determined by the manufacturers' and retailers' representatives. Products will be applied as they are sold.
3. **Utilize strip trials combined with spatial analysis to** allow integration of whole-field product efficacy with remote sensing technology (aerial imagery via UAVs and satellites, soil maps, and yield monitor data) to answer additional questions regarding within-field product efficacy, disease spread, and within-field difference in impacts of foliar diseases.
4. **Utilize drones** to apply products and determine efficacy against traditional ground applications both site-specifically and whole-plot.

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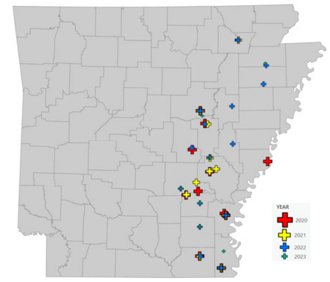
Determining the value of fungicide application using on-farm trials

Findings:

1. We have completed **41 on-farm trials** since this project started in 2020 (figure left).
2. Yield data collected indicates most significant responses to fungicide application came when fields were **R3 mid-July and later**.
3. Products with a strobilurin component are far less effective than expected. **There is confirmed resistance to strobilurin fungicides in both frogeye leaf spot and target spot.**
4. Averaging across all locations where target spot and frogeye leaf spot occurred, **products with strobilurin components only protected 1.5 bu/A above the nontreated** and did not pay for the cost of application.



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Determining factors associated with poor grain quality in soybean and management options

Investigator(s): Terry Spurlock and Nick Bateman

Status: Year 3 of 3

Budget Request: $ 55,000

Stated Goal: Determine the major factors affecting soybean seed quality and develop management strategies for growers to avoid quality losses

Specific Objectives:

1. Determine differences in grain quality caused by fungal diseases and disorders among varieties in the official variety trial at Rohwer Station annually (Spurlock).

2.Establish an early and a late planted fungicide trial at Rohwer Station each year based on data collected from the previous season's official variety trial. Varieties with significantly higher diseases impacting grain quality will be chosen for these trials. The aim will be to determine the impact of various fungicide timings on varieties that have shown susceptibility to diseases and disorders negatively impacting grain quality (Spurlock).

3.Samples will be taken from on-farm fungicide trials (4 – 5 trials annually) at harvest and sent to Riceland Foods in Stuttgart for grading and the Spurlock Lab to determine levels of diseases and disorders that impact grain quality (Spurlock).

4.Grain will be sampled from multiple stink bug trials throughout the state with significantly different levels of stinkbug or other insect feeding and grain quality determined. (Bateman)

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Determining factors associated with poor grain quality in soybean and management options

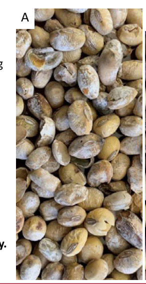
Findings to this point:
Phomopsis seed decay (A) and Purple seed stain (B) are the main fungal diseases impacting grain quality in Arkansas.

Our data suggests stink bug feeding has not increased diseases impacting grain quality.

Decreases in grain quality typically correlate to these factors:

1. Weather between maturity and harvest - wet weather increases disease.
2. Maturity group – varieties maturing when the weather is more conducive to quality issues (wet) increases disease.
3. Length of time between maturity and harvest - nothing good can happen after maturity, the longer mature soybeans sit in a field the worse quality will be.
4. **Fungicides applied. Our data suggest that there is fungicide resistance within Phomopsis that can negatively impact grain quality. This is dependent on the type and timing of fungicide applied.**

A



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106

Understanding Taproot decline and orange leaf spot; soybean diseases of increasing importance in Arkansas

Investigator(s): Terry Spurlock

Status: Year 2 of 3

Budget request: $ 39,243

Stated Goal: To determine management strategies for taproot decline and determine the causal agent for orange leaf spot, a disease generating questions by consultants and industry representatives

Specific Objectives:

1. Determine the regional distribution of taproot decline and determine the disease's impact on yield.
2. Determine management strategies for taproot decline (variety, seed treatment, and in-furrow fungicides).
3. Determine the causal agent of orange leaf spot and its impact on yield.
4. Train a master's student in applied plant pathology and pest management.

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107

Understanding Taproot decline and orange leaf spot; soybean diseases of increasing importance in Arkansas

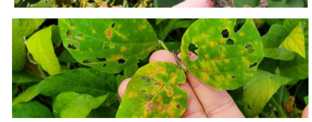
Findings to this point:

Taproot decline

- Taproot decline is a severe yield limiting disease in all parts of Arkansas where it occurs.
- It is best controlled by crop rotation away from continuous soybean, moving the AB line in fields, and in-furrow applications of thiophanate-methyl at 20 fl oz/acre.
- Some varieties have slight tolerance to taproot decline but none have been found that are resistant.
- There appears to be diversity in the pathogen populations. This relates to they way the fungus infects and how it responds to fungicide treatments.
- In 2023, there was significant damage from taproot decline in northeast Arkansas. To our knowledge, this had not been observed in this area in past years.

Orange spot

- A new disease of soybean, tentatively called **orange leaf spot**, has generated numerous questions and concerns among consultants and industry representatives.
- The impact to yield of this disease in unclear, as is the pathogen that causes this disease.
- We continue working to isolate and confirm the pathogen that causes the disease.



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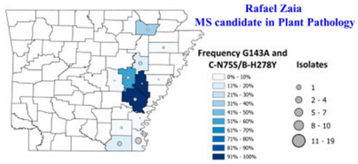
108

Monitor and Management of Fungicide-Resistant Soybean Diseases in Arkansas

Significant Findings of 2023:

1. QoI- and SDHI – resistant strains of Target Spot were confirmed in a few Arkansas counties



2. These data are used to update the Plant Disease Control Guide and extend at production meetings.

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109

Effects of inclusion of soybean oil in beef heifer diets on heifer development, reproductive function, and calf growth performance

- **Investigators:** Elizabeth Kegley, Jeremy Powell, Charles Looney, Brittni Littlejohn, Robin Cheek, and Kirsten Midkiff
- **Status:** New
- **Budget Request:** $48,940
- **Objectives:** To determine the effect of feeding soybean oil -
  - to bred heifers on uterine artery hemodynamics
  - to bred heifers on morphometric measurements and growth of resulting calves from birth until weaning
  - in developing beef heifer diets on successful conception and reproductive tract scores
  - in developing beef heifer diets on economic viability in developing beef heifer diets

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Preliminary Results and Plan for 2024 Funding

- In January, 37 heifers (42% of heifers on control diet; 53% of heifers on soybean oil diet from project funded in 2023) were confirmed pregnant by artificial insemination (AI).
  - We propose to measure the development of these calves both in utero, at birth, and through weaning to find any long-term effects of fetal programming
- In addition, we propose to repeat the 2023 heifer development project obtaining additional data on pregnancy rates and economic impact of supplementing soybean oil.

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111

Effects of inclusion of soybean oil in beef heifer diets on heifer development, reproductive function, and calf growth performance

Value to Soybean Industry:

- The market for soybean oil in livestock production is small, with 68% of soybean oil being used for human consumption, 25% for biodiesel and bioheat, and 7% converted into industrial uses like paint, plastic, and cleaner (Stowe, 2022).
- Much about the cattle industry is focused on the cost of inputs and their return on investment.
- Circumstances such as dramatic weather conditions, poor forage quality, and other events can place strain on both producers and cattle.
- Supplementation with additional fats like soybean oil may be more economical for increasing energy and cattle performance when the prices of grains are high (Marx, 2022).
- **The use of soybean oil could positively benefit reproductive performance in developing beef heifers and, in turn, enhance demand for soybean oil in cattle feeding rations.**

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112

Assessment of broiler dietary least cost protein supply via soybean genotype amino acid selection improvements

- Investigators: Mike Kidd & Andrea Acuna-Galindo (PhD student: Savannah Wells-Crafton)
- Status: Year 3 of 3
- Budget Request: $46,826
- Objectives:

1) Develop and identify soybean lines with optimal amino acid composition for broilers.
2) Test developed soybean lines against standard soybeans in broilers.

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Methods

- Soybean Line Selection
  - Selection of soybean varieties from seed bank for increased AA content (particularly those not commercially available in feed-grade form)
- Broiler Growth trials
  - Soybeans processed into SBM and incorporated into broiler diets.
  - Inclusion level vs. formulation
- Future Studies
  - Digestibility

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Results and Impact

- Performance
  - Study 1: Numerical improvement in FCR
  - Study 2: Same performance w/ 2% less inclusion
- Cost of formulation
  - Diet cost reduced- driven by higher amino acid & oil content
- Identity Preservation

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115

An Innovative Approach to Generate Porous Soy Proteins with Enhanced Flavor for the Plant-Based Food Industry

- **Investigator:** Ali Ubeyitogullari
- **Status:** Year 2 of 3
- **Budget Request:** $43,955
- **Goal:** To generate functionalized soy protein particles with an improved flavor profile using a novel supercritical carbon dioxide (SC-CO_2) technology and 3D food printing.
- **Objectives:**
  - Extract off-flavors (i.e., polyunsaturated fatty acids, aldehydes, ketones, and alcohols) from defatted soybean flour - ***value added products + increased health benefits.***
  - Extract soy protein isolate from off-flavor-removed, defatted soybean flour using an alkaline extraction method, and generate soy protein micro-and nanoparticles - ***improved functionality + enhanced nutritional quality.***
  - Load model dairy flavoring compounds into the microstructure of the produced protein particles using SC-CO_2, and generate alternative cream cheese using the functionalized soy protein isolates and 3D food printing- ***create new markets.***

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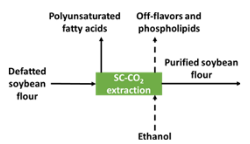
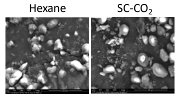
An Innovative Approach to Generate Porous Soy Proteins with Enhanced Flavor for the Plant-Based Food Industry



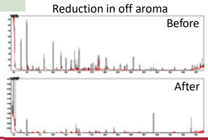
Functional properties
Oil extraction yield
Oil absorption capacity
Water absorption capacity
Swelling capacity
Foaming capacity and stability
Color
Particle size

Soybean flour | Defatted soybean flour | SC-CO_2-treated soybean flour

Hexane | SC-CO_2



Reduction in off aroma



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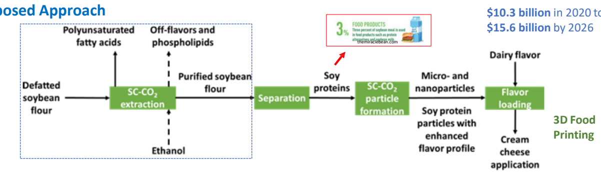
An Innovative Approach to Generate Porous Soy Proteins with Enhanced Flavor for the Plant-Based Food Industry

Proposed Approach

$10.3 billion in 2020 to **$15.6 billion** by 2026



Value to Soybean Industry

- Maximize the value of soy proteins.
- Create new markets for soybeans in the food industry:
  (1) Alternative plant proteins, and
  (2) Soybean flours.
- Produce health-promoting new ingredients.
- Increase profitability of soybean growers in Arkansas.

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Soybean Research Verification Program

- **Jeremy Ross**
- **Status: Year 2 of 3**
- **Budget Request: $208,168**
- **Objectives:**
  - **Conduct field trials to verify that high yields can be profitably produced with research-based recommendations.**
  - **Aid researchers in identifying areas for further study.**
  - **Improve recommendations**
  - **Utilize the SRVP to improve producers', County Extension Agents', and crop consultants' knowledge about soybean production recommendation.**
  -

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Soybean Research Verification Program

2023 Soybean Research Verification Program Fields
Coordinators: Chris Elkins & Chad Norton

County	Agent	Cooperator	Variety	Production System	Year	Planting Date	Row Spacing	Acres
Arkansas	Phil Horton	Wil-Dar Farms	Pioneer P45A40LX	Early Season Irrigated	1	3/29	38" twin	80
Chicot	Kurt Beaty	Salt and Pepper Farms	Asgrow AG46X6	Early Season Irrigated	1	4/16	38" twin	60
Cross	Jenna Martin	Stephens Farms	Virtue 4520S	Full Season Irrigated	1	5/8	30"	70
Drew	Scott Hayes	Michael Oltmann	Asgrow AG46X0	Early Season Irrigated	1	4/19	30"	35
Greene	Dave Freeze, Lance Blythe	Distretti Farms	Innvictis B4841E	Full Season Irrigated	2	5/8	30"	65
Jackson	Matthew Davis	Mike Jones	Pioneer P48A14E	Full Season Irrigated	1	5/17	30"	40
Jefferson	Brady Harmon	Brett Stewart	Pioneer P46A36X	Early Season Irrigated	1	3/22	38" twin	50
Lawrence	Bryce Baldridge, Courteney Sisk	Hicks Family Ag.	Stine 46EE20	Early Season Irrigated	1	4/11	30"	70
Lonoke	Keith Perkins, Andrew Bolton	Jordan Lynch	Asgrow AG46F3	Full Season Irrigated	2	5/4	30"	100
Mississippi	Alan Beach, Ethan Brown	DMS Farms	Becks 4991X2	Early Season Irrigated	1	4/11	38" twin	70
Poinsett	Jeffery Works, Craig Allen	Cale Reddmann	Asgrow AG46FX3	Late Season Irrigated	1	6/21	7.5"	35
Randolph	Mike Andrews	Scott Brown	Pioneer P52A14SE	Full Season Irrigated	1	5/8	7.5"	40
St.Francis	Sarah Stone	Lizza Clarie Farms	Pioneer 46A20LX	Early Season Irrigated	1	4/1	38" twin	30
White	Jerrod Haynes	Hambrick Farms	Armor 46-E50	Full Season Irrigated	1	5/15	30"	40
Yell	Brandon Yarbery, Bob Powell	Ault Farm	Pioneer P48A14E	Full Season Irrigated	1	5/10	30"	32

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Soybean Weed Management: A Team Approach for Improved Control and Profitability

Investigator(s): Bob Scott (Tommy Butts moved to Purdue) , Tom Barber, Jason Norsworthy, and Nilda Burgos
Status: Year 2 of 3
Amount Requested: $260,807

Objectives:

1. To continue testing suspected resistant weed biotypes sent from county agents and soybean producers for herbicide resistance, particularly for glufosinate and auxin herbicide resistance, documenting the level of resistance and distribution, and determining the effectiveness of alternate herbicide modes-of-action on resistant biotypes
2. To quantify the potential of multiple herbicide-resistant Palmer amaranth and other confirmed resistant weeds to spread in Arkansas by determining control programs, ecological fitness, and geographic distribution of resistant biotypes, and resistance and dispersal mechanisms likely to cause population expansion
3. To identify and evaluate effective management programs (both short-term and long-term) for multiple herbicide-resistant Palmer amaranth including glufosinate and auxin herbicide resistance
4. To evaluate the effectiveness of various agronomic practices (double crop, cover crop, etc.) for suppressing problematic weeds of Arkansas soybean production systems
5. To determine how herbicide performance and selectivity are affected by environmental conditions, application procedure, application technologies, herbicide tank-mixture, weed species, and growth stage to develop more efficient and reliable herbicide weed management strategies

Objectives:

6. To evaluate long term programs (chemical and cultural) to reduce the soil weed seedbank. These programs will include trials designed to study methods of destroying weed seed post-harvest and evaluate new harvest weed seed destruction equipment
7. To evaluate the viability of new technologies (herbicides, traits, application tech, etc.) as they emerge for efficacy and the ability to safely apply in the agricultural and external environment
8. To evaluate fall-applied residual herbicides effectiveness on problematic Arkansas weeds (i.e.,Italian ryegrass) and the resulting impact on spring burndown applications
9. To evaluate herbicide program costs and resulting soybean yields to determine profitability potential of weed management options
10. To provide rapid transfer of weed control information to growers through multiple outreach methods such as publications, blog posts, Weeds AR Wild podcasts, videos, text messages, and many others

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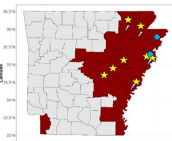
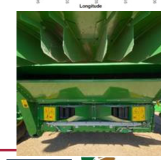
Soybean Weed Management: A Team Approach for Improved Control and Profitability

Significant Findings from Previous Year for Current Studies or Value to Soybean Industry:

- > 100 trials conducted: Fayetteville, Keiser, Lonoke, Marianna, Newport, Rohwer and Tillar, AR
- Confirmed 2,4-D, Dicamba resistance in pigweed – 4 counties
- Metabolic resistance in pigweed increasing statewide. Continue to evaluate impact and investigate solutions – most recent concern = fluridone (Brake)
- 4 BMP economic analysis studies conducted with weed control programs in Xtendflex and Enlist beans
  - Highest returns and weed control with multiple herbicide MOA at planting. Overlapping residuals provided best overall control
- Identified glyphosate-resistant Poa (bluegrass) population
- >10 studies evaluating glyphosate-resistant Italian ryegrass control
- Will continue work on pairing row-spacing, planting dates with residuals to determine best management practices to reduce pigweed flushes.
- Yellow nutsedge, prickly sida (teaweed) and morningglory studies ongoing
- Continue to investigate seed destruction (2 Redekop units) at Keiser and Newport – long term study close to finalization





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Soybean Weed Management: A Team Approach for Improved Control and Profitability

Significant Findings for Previous Year for Current Studies or Value to Soybean Industry:

- Technology
  - MagrowTec magnet assisted sprayer – minimal impact to spray deposition and drift reduction – probably not worth the $$
  - Spray drone (T30) coverage studies with paraquat: 2 and 5 GPA was compared to 10 GPA application by ground. 5 GPA from drone looks good, but 2 GPA was questionable. Issues with battery life and tank capacity at 5 GPA.
  - John Deere See & Spray – Effectively reduced total herbicide applied but residuals are still key to system success.
- Outreach
  - MP44 **>3000 downloads** and **>6000 hard copies distributed**
  - Soybean Research Series Reports – **8 submitted** in recent publication
  - Media outlets (Successful Farming, Delta Farm Press, etc.)
  - Regional, National, and International Presentations
  - Weeds AR Wild podcast **(19 episodes, ~10,000 downloads)**
  - Field Days & Personal Interactions **(~30,000 direct contacts**
  - Texting service **418 subscribers**

ARKANSAS ROW CROPS RADIO

Get weed control updates immediately
Opt-in to our UAEX Field Crop Extension Specialist Text Service!
Text "weeds" to:
(501) 300-8883.

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123

Screening for Soybean Tolerance to Metribuzin

- **Investigators: Jason Norsworthy and**
- **Status: (Year 3 of 3)**
- **Budget Request: $16,226**
- **<u>Objectives:</u>**
  - To assess the tolerance to metribuzin of soybean varieties entered in the Arkansas OVT and to provide rapid transfer of information regarding the level of tolerance or sensitivity of Arkansas-grown soybean varieties to metribuzin

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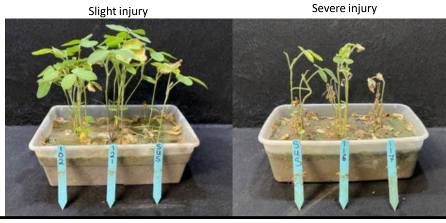
Screening for Soybean Tolerance to Metribuzin

Value to Soybean Industry:

- **Metribuzin-containing products are commonly used for pigweed control in AR soybean (Boundary, Trivence, Authority MTZ, Tricor DF, Tripzin ZC, Canopy, Cloak, Intimidator, Moccasin MTZ)**
- **On difficult-to-control pigweed populations, the most effective control will be obtained with metribuzin plus another herbicide at planting**

Slight injury | Severe injury



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125

Optimization of fungal pathogens AF22 and AF24 as bioherbicides for Palmer amaranth (pigweed)

Investigators: Burt Bluhm, UADA-Fayetteville; Kelly Cartwright, ARI, Inc.

- **Status: Year 2 of 3**
- **Budget Request: $40,000**
- **<u>Objectives:</u>**
  - **Develop isolates AF22 and AF24 as biological control agents/bioherbicides of pigweed.**
  - **Identify host-specific toxins produced by isolates AF22 and AF24 for bioherbicide development.**
  - **Actively pursue commercialization of bioherbicide products derived from AF22 and AF24.**

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126

UADA Feed Kits

- Allison Harman and Dr. Mark Russell
- Status: New
- Budget Request: $2,500
- Objectives:
  - Provide each Arkansas county with a resource for youth and adult education.
  - Source as much feed as possible from Arkansas farms and businesses.
  - Increase awareness of the different commodities used as livestock feeds.
  - Increase a county's ability to train 4-H Animal Science contest teams.

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What is a UADA Feed Kit?

36 feed samples in plastic jars (3-4 oz. samples) → Feed Identification Guide → Plastic container for the kit

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128

What is the impact of a UADA Feed Kit?

- Available to every county
- Arkansas sourced
- Wide variety of educational applications
  - Feed identification in 4-H Animal Science contests
  - Educating producer groups
  - Educational displays at County Fair

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129

LeadAR 40th Anniversary

- **Investigators: Julie Robinson**
- **Status: New**
- **Budget Request: $5,000**
- **Objectives of LeadAR:**
  - Understand complex cultural, social and economic issues impacting Arkansas
  - Improve participants ability to interact and work with others
  - Deepen understanding of social, economic and political systems in order to effectively bring about change
  - Develop critical thinking and decision making skills to become a better citizen and leader
  - Connect to people and resources that can help make a difference
- **Objectives:**
  - Acquaint participants with the goals of the Arkansas Soybean Promotion Board and its efforts.
  - Support the continuation of the LeadAR program.

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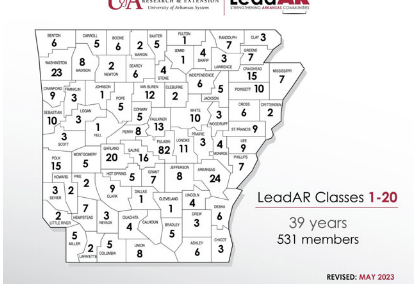

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UofA DIVISION OF AGRICULTURE
RESEARCH & EXTENSION
University of Arkansas System
LeadAR
CELEBRATING 40 YEARS

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132

Arkansas Future Ag Leaders Tour

- **Investigators: Julie Robinson and Jeremy Ross**
- **Status: Year 3 of 3**
- **Budget Request: $5,000**
- **Objectives:**
  - **Increase participant's employability in agricultural careers.**
  - **Acquaint participants with the vast resources, market segments, and services available through Arkansas' number one industry.**
  - **Provide participants with a "bird's eye view" of current employment opportunities in the Arkansas agriculture industry.**
  - **Increase student's options and opportunities by networking with future employers.**

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Significant Findings for Previous Year for Current Studies or Value to Rice Industry:

1. The Arkansas Future Ag Leaders Tour helps create a more prepared and informed workforce that better understands the needs and dynamics of the farmers and producers that they will serve in their agricultural related careers across the state.
2. Addresses some job readiness skills that have been identified as deficient by employers.
3. Touring across the state makes students aware of what jobs are available in the state and in local communities all across Arkansas.
4. 15 Participants / 7 Universities / 6 Majors

Quotes:

- "I learned that there are way more ag jobs in AR than I thought."
- "I will use this experience to lead others and grow or carry this knowledge to others."
- "I will use the knowledge I have received from the many speakers on the job."
- "I learned that Ag careers are about passion for agriculture and helping people."

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Soybean Science Challenge

- **Investigators: Julie Robinson and Jeremy Ross**
- **Status: Year 3 of 3**
- **Budget Request: $78,585**
- **Objectives:**
  - **Develop and deliver original educational resources/curriculum to Arkansas junior high and high school students.**
  - **Increase awareness and knowledge of the value of soybeans to the Arkansas economy and potential careers supporting Agricultural sustainability among Arkansas junior high and high school students.**
  - **Increase knowledge of the diversity of soy products and uses among Arkansas junior high and high school students.**
  - **Increase participation in applied research by Arkansas junior high and high school students supporting soybean production.**
  - **Development of state-wide educational partnerships to leverage ASPB resources.**
  - **Actively engage students in the "co-creation" of knowledge and reward outstanding student researchers through the Soybean Science Challenge research awards.**
  - **Reach out to science teachers to consider using Soybean Science Challenge online education resources and curriculum in their classroom.**
  - **Share resources with teachers to bring Arkansas soybean research and education into classrooms nationally.**

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2024-2025

Soybean Promotion Board Proposals/Budgets

March 7th, 2024

Submitted to:

Tab

Davis, J (1)

Arkansas Soybean Promotion Board – 2024-2025 Proposal

Title: Development of a turn-row soybean vegetative health analysis software tool using UAS imagery for production decision support.

Lead Investigators: Jason Davis, Extension Specialist in Remote Sensing and Pesticide Application

Co-Investigators:

Status: New, Year 1 of 3

Research Areas: Agronomy/Alternative

Stated Goal: Produce and validate a user-friendly remote sensing tool that models field health in near real-time for turnrow analysis of soybean fields using drones.

Specific Objectives:

(1) Collect drone imagery of production fields in parallel with the verification program efforts.

(2) Correlate remotely sensed measurements with ground referenced information already being collected with the verification program.

(3) Develop and release a user-friendly software package that leverages the validated workflow for producers, consultants, and agents to use.

Methods:

1. Drone imagery will be collected on multiple dates in participating verification fields. Established treatments in large plots will be imaged using an automated mission. Imagery will be collected in conjunction with verifications programs scouting events to be used as part of workflow validation.
2. A user-friendly software package (downloadable executable program) or web-tool (hosted on UAEX website) will be developed that uses the validated workflow to produce turn-row field maps and reports for field health as measured by canopy closure and relative vegetative health.
3. Imagery will be processed in both the proposed "turn-row" workflow and in a traditional workflow to compare the accuracies, computing requirements, and time demands of each.
4. Targeted mapping analysis will be relative variations in crop canopy estimates, analysis of variations in vegetative health across fields, and soil wetting uniformity.

Planned Milestones:

Year 1 –Imagery collected and correlated with ground referenced information from verification program. Initial software framework to be established using Year 1 data and results will be presented at crop production meetings, blog postings, and other avenues of information.

Year 2 – Additional imagery will be collected and validated, updating workflow calculations as needed to reach desirable accuracy. The updated workflow will be coded in a further developed software framework. If software tools perform to a desirable level of accuracy, they will be released. If further development is needed, Year 3 funding may be requested.

Year 3 – Workflow and software framework will be finalized, and tool will be made available.

Value to Soybean Industry:

Field variability often influences site-specific yield. Some variability can be minimized when robust and regular scouting routines inform production decisions enabling mitigation of water issues, early weed and disease detections, and nutrient deficiencies. However, intensive scouting of each field is time consuming and cumbersome. Current drone technology can be used to gain a whole field perspective when proper processing is applied to collected data; however, these processes require expertise and time outside of the field to locate areas of interest. A user-friendly and robust field modeling tool that processes in seconds and leverages the automated data collection capabilities of drones could significantly facilitate scouting events. If a whole field can be imaged and processed into actionable data in less than 5 minutes, then subsequent informed strategic scouting could maximize localization and, in some cases, early mitigation of field variability.

Budget Justifications/Explanation of Travel and Direct Costs:

The budget reflects personnel, travel, and some miscellaneous supplies for fieldwork and data analysis. Specifically, partial support for a program technician to assist with field work, data collection and training imagery annotation is requested. Additionally, funding for travel to and from plot locations to collect imagery and ground reference data. Miscellaneous supplies related to plot work, drone maintenance, and data storage and analysis.

University of Arkansas System Division of Agriculture
Promotion Board Budget

Davis, Jason *Development of a turn-row soybean vegetative health analysis using UAS imagery for production decision*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	New
Lead Investigator	Davis, Jason	**Co-PI #1**	
Co-PI #2		**Co-PI #3**	
Department	CSES Crop, Soil, Environmental Science		
Commodity Board	Soybean Promotion Board		
Project Title	Development of a turn-row soybean vegetative health analysis using UAS imagery for production decision support.		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

	Davis, Jason				Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI	CES	CES					
		X					

Fulltime Personnel

Position Title	Name (if position is filled)	% Time	Salaries				Total	AES	CES
Technician		25%	$10,250				$10,250	$0	$10,250
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
Subtotal: Salaries			$10,250	$0	$0	$0	$10,250	$0	$10,250

Graduate Student

Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.

Name (if position is filled)	% Time	Wages				Total	AES Portion	CES Portion
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
	Tuition					$0	$0	$0
Subtotal: Graduate Student		$0	$0	$0	$0	$0	$0	$0

Hourly

	Wages				Total	AES Portion	CES Portion
Hourly-Personnel					$0	$0	$0
Hourly-Students					$0	$0	$0
Subtotal: Hourly	$0	$0	$0	$0	$0	$0	$0

Fringe Benefits

Fringe benefits are calculated when salary and wage amounts are entered above.

	Benefits				Total	AES Portion	CES Portion
Fulltime Personnel	$3,239	$0	$0	$0	$3,239	$0	$3,239
Graduate Students	$0	$0	$0	$0	$0	$0	$0
Hourly Personnel	$0	$0	$0	$0	$0	$0	$0
Hourly-Students	$0	$0	$0	$0	$0	$0	$0
Subtotal: Fringe Benefits	$3,239	$0	$0	$0	$3,239	$0	$3,239
Personnel Total	$13,489	$0	$0	$0	$13,489	$0	$13,489

Travel

Justify out-of-state travel in proposal.

	Travel				Total	AES Portion	CES Portion
In-State	$3,500				$3,500	$0	$3,500
Out-of-State					$0	$0	$0
Travel Total	$3,500	$0	$0	$0	$3,500	$0	$3,500

University of Arkansas System Division of Agriculture
Promotion Board Budget

Davis, Jason — *Development of a turn-row soybean vegetative health analysis using UAS imagery for production decision*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$3,000				$3,000	$0	$3,000
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$3,000	$0	$0	$0	$3,000	$0	$3,000
	Total for Proposal	$19,989	$0	$0	$0	$19,989	$0	$19,989

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

Ecosystems (Rice Only)		%	Davis, Jason				Total	
	Grand Prairie	0%	$0	$0	$0	$0	$0	
	Mississippi Delta		$0	$0	$0	$0	$0	
	White River		$0	$0	$0	$0	$0	
	Totals	0%	$0	$0	$0	$0	$0	*Must match the proposal total.*

Tab

Ross, J (5)

Arkansas Soybean Promotion Board – 2024-2025 Proposal

Title: Development of data-driven recommendations for variable soybean seeding rate in Arkansas.

Lead Investigators: Jeremy Ross

Co-Investigators: Aurelie Poncet and Greenway Equipment

Status: New: Year 1 of 3

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Agronomy

Stated Goal:

In the past three years, a method was developed to quantify site-specific soybean yield response to seeding rate, identify the drivers of in-field yield variability, and generate a posteriori prescription maps for variable-rate seeding (VRS). The created maps described in-field changes in the agronomic optimum seeding rate (proven to maximize site-specific soybean yield). Findings showed that:

- Soybean yield response to seeding rate varies within commercial fields.
- Some of that variability could be effectively managed using VRS if adequately implemented.
- Management decisions regarding VRS can be made using data that are already available to Arkansas soybean producers including soil test results and public web-soil survey information.

The project goal is to develop data driven VRS recommendations for Arkansas soybeans. The following next steps are needed to meet the project goal:

A. Comparison of findings across growing seasons, to generate a priori VRS prescriptions that minimize risk from weather variability.
B. Economic analysis, to emphasize profitability rather than yields.
C. Implementation of the proposed methodology in new locations, to increase the dataset size, improve the model's prescriptive capabilities, and develop more reliable recommendations.
D. On-farm validation of the created data driven VRS recommendations.
E. Decision-support tool (e.g., web tool) development, to make the created VRS recommendations accessible to Arkansas producers, crop consultants, and other agricultural stakeholders.

Specific Objectives:

This project addresses steps A to C, and we propose the following specific objectives:

1. To develop an algorithm that computes the economic optimum seeding rate from the predicted site-specific yield response to seeding rate, cost of soybean seeds, and crop prices.
2. To evaluate the temporal stability and variability of a posteriori VRS prescription maps created from data collected in the same commercial fields and a minimum of two growing seasons.
3. To generalize findings across locations selected to bracket the typical range of field conditions found in Arkansas.

Methods:

This study will be conducted on-farm. One of the fields previously used for this research, plus one new production field, will be selected per year. The participating producers will use John Deere guidance and yield monitoring systems (preferred), and be competent with yield monitoring, yield mapping, and variable-rate technologies. They will also have a historical record of crop rotations and planting/soil testing data. Preference will also be given to growers interested in multi-year studies. Preferred field size will be 80+ acres. Five seeding rate treatments of 75, 100, 125, 150, and 175 thousand seeds per acre will be applied in strips to bracket the University Planting Prescription. Treatments will be replicated 4 to 5 times in a field, and each treatment strip will be created from 1 or 2 consecutive planter passes. The seeding rate treatments will be established by the growers in collaboration with the project PIs. The following data will then be collected by the project PIs: soil samples for routine soil testing and texture analysis, stand counts, and hand samples of plants. Data will be collected at a 1 sample per acre resolution. Soil mapping units will be identified using the USDA-NRCS web soil survey. Sentinel-2 satellite images will be downloaded from public data repositories (spatial resolution: 30 ft. Notes regarding plant stress and pest pressure will be taken as needed. Field elevation will be characterized using the digital elevation model gathered from the USGS public database. Flow accumulation will be computed from the field elevation data to characterize field hydrology. Yield monitor data will be collected at harvest.

Statistical analysis will be conducted:

- To characterize in-field changes in soybean yield response to seeding rate, identify the drivers of site-specific variability, and determine if VRS could be used to manage the observed variability.
- To determine the agronomic and economic optimum site-specific seeding rates and generate a posteriori prescription maps for variable soybean seeding rate.
- To assess the temporal stability and variability of the optimum site-specific soybean seeding rates and generate optimized a priori prescriptions.

Different models and computation methods will be considered. Meta-analysis of results will be computed to generalize findings and optimize model performance and computing times. Results from the meta-analysis will support the development of practical and relevant recommendations for variable soybean seeding rate in Arkansas.

Planned Milestones:

- Identify criteria on which VRS prescriptions may be based.
- Develop an algorithm that uses historical field data to predict whether VRS technology could be beneficial in a field.
- Define the most relevant method to generate prescription maps for variable soybean seeding rate.
- Automation of data analysis and processing for future implementation into a web-tool.

Value to Soybean Industry: The development of precision planting and variable-rate technologies provides new opportunities for soybean producers to control and optimize seeding densities. However, few recommendations exist to help guide growers in their variable rate seeding decisions and few studies have been conducted to evaluate which field factors most greatly influence optimum seeding rates.

Budget Justifications/Explanation of Travel and Direct Costs: Out-of-state travel funds will be used for presentation of data at national meetings. The $5,000 amount will be used for routine soil testing and soil texture analysis.

University of Arkansas System Division of Agriculture
Promotion Board Budget

Ross, Jeremy — *Development of data-driven recommendations for variable soybean seeding rate in Arkansas.*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	New
Lead Investigator	Ross, Jeremy	**Co-PI #1**	Poncet, Aurelie
Co-PI #2		**Co-PI #3**	
Department	CSES Crop, Soil, Environmental Science		
Commodity Board	Soybean Promotion Board		
Project Title	Development of data-driven recommendations for variable soybean seeding rate in Arkansas.		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

	Ross, Jeremy	Poncet, Aurelie			Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI	CES	AES					

Fulltime Personnel

Position Title	Name *(if position is filled)*	% Time	Salaries				Total	AES	CES
Program Assoc	Wesley France	15%		$7,000			$7,000	$7,000	$0
Program Assoc	Randy Miller	20%	$11,772				$11,772	$0	$11,772
Program Tech	Rollins Elam	20%	$8,200				$8,200	$0	$8,200
							$0	$0	$0
							$0	$0	$0
		Subtotal: Salaries	$19,972	$7,000	$0	$0	$26,972	$7,000	$19,972

Graduate Student

Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.

Name *(if position is filled)*	% Time	Wages				Total	AES Portion	CES Portion
MS Student			$7,600			$7,600	$7,600	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
	Tuition		$4,300			$4,300	$4,300	$0
	Subtotal: Graduate Student	$0	$11,900	$0	$0	$11,900	$11,900	$0

Hourly

	Wages				Total	AES Portion	CES Portion
Hourly-Personnel	$7,500	$3,200			$10,700	$3,200	$7,500
Hourly-Students					$0	$0	$0
Subtotal: Hourly	$7,500	$3,200	$0	$0	$10,700	$3,200	$7,500

Fringe Benefits

Fringe benefits are calculated when salary and wage amounts are entered above.

	Benefits				Total	AES Portion	CES Portion
Fulltime Personnel	$6,311	$2,212	$0	$0	$8,523	$2,212	$6,311
Graduate Students	$0	$319	$0	$0	$319	$319	$0
Hourly Personnel	$593	$253	$0	$0	$845	$253	$593
Hourly-Students	$0	$0	$0	$0	$0	$0	$0
Subtotal: Fringe Benefits	$6,904	$2,784	$0	$0	$9,688	$2,784	$6,904
Personnel Total	$34,376	$24,884	$0	$0	$59,260	$24,884	$34,376

Travel

Justify out-of-state travel in proposal.

	Travel				Total	AES Portion	CES Portion
In-State	$5,000	$4,000			$9,000	$4,000	$5,000
Out-of-State		$1,000			$1,000	$1,000	$0
Travel Total	$5,000	$5,000	$0	$0	$10,000	$5,000	$5,000

University of Arkansas System Division of Agriculture

Promotion Board Budget

Ross, Jeremy *Development of data-driven recommendations for variable soybean seeding rate in Arkansas.*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$2,500	$116			$2,616	$116	$2,500
	Fertilizer/Chemicals					$0	$0	$0
	Publication		$5,000			$5,000	$5,000	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs	Sample Analysis	$5,000				$5,000	$0	$5,000
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$7,500	$5,116	$0	$0	$12,616	$5,116	$7,500
	Total for Proposal	$46,876	$35,000	$0	$0	$81,876	$35,000	$46,876

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

Ecosystems (Rice Only)	%	Ross, Jeremy	Poncet, Aurelie			**Total**	
Grand Prairie	0%	$0	$0	$0	$0	$0	
Mississippi Delta		$0	$0	$0	$0	$0	
White River		$0	$0	$0	$0	$0	
Totals	0%	$0	$0	$0	$0	$0	***Must match the proposal total.***

Tab

Poncet (9)

Arkansas Soybean Promotion Board – 2024-2025 Proposal

Title: Site-specific assessment of soybean response to in-field variability using remote sensing.

Lead Investigators: Aurelie Poncet, Assistant Professor of Precision Agriculture

Co-Investigators: Mike Hamilton, Extension Irrigation Instructor

Status: New: Year 1 of 3

Research Areas: Agronomy, Irrigation

Stated Goal: The project goal is to increase the profitability of irrigated soybean production with optimized crop management. To meet this goal, the following tasks must be completed:

A. Characterization of soybean yield response to in-field variability.
B. In-season monitoring of soybean development and health, and correlations with yield.
C. Definition of data-driven recommendations for optimized crop production.
D. Decision-support tool development and validation for delivery of data-driven recommendations.

The proposed project addresses tasks A and B. Research from the past three years was conducted under the assumptions that most yield variability in furrow-irrigated fields occurs parallel to the irrigation furrows, and that the remote sensing-based vegetation indices collected at any one time between full flowering (R2) and the beginning of maturity (R7) strongly correlates with yield. The results demonstrated that, as expected, significant in-field soybean yield variability occurred in commercial furrow-irrigated fields. However, the magnitude of variability and spatial distribution of yields were difficult to predict. Moreover, in-field soybean yield variability was associated with spatial changes in soil properties and crop growth, but weak correlations were found between the yield and remote sensing-based vegetation indices computed from the beginning of pod formation (R3) to full seed (R6). These findings supported the idea that remote sensing imagery can be used to monitor soybean development in production fields, but the initial assumptions and approach should be revised to better account for the multi-dimensional nature of in-field variability and the complexity of interaction at play. The proposed approach is complementary to the previous work and will help improve model performance by accounting for two-dimensional spatial effects, expending the project scope to other irrigation strategies (e.g., overhead and flood irrigation), and correlating yield with temporal changes in remote sensing-based vegetation indices rather than relying on single index values.

Specific Objectives:

1. To quantify and compare in-field soybean yield variability under different irrigation systems.
2. To model relationships between site-specific soybean yield and remote sensing-based vegetation index history.
3. To compare the performance of data collection platforms and evaluate the use of drone remote sensing as an alternative to missing satellite images.

Methods:

<u>Objective 1:</u> Two commercial soybean fields will be selected each year so that data are collected in a total of 3, 1, and 2 fields managed using furrow, flood, and pivot irrigation, respectively. The rainfed corners from the pivot-irrigated fields will be considered as non-irrigated controls. The project PIs will work with the participating producers and their crop consultants to collect field history and yield monitor data at harvest. Soil samples, stand counts, and hand plant samples will be collected to characterize soil pH, plant

essential nutrient availability, plant population, plant biomass, and yield component estimates. Elevation (3.3-ft resolution) and soil survey data will be downloaded from public data repositories (free). Time-domain reflectometry (TDR) sensors will be installed at a minimum of 4 relevant locations per field to monitor spatiotemporal changes in soil water content and temperature. Tensiometers will also be installed in one location per field (side-by-side with a TDR station) to monitor the crop water stress status. The yield monitor data will be cleaned and normalized to emphasize relative differences in yield within a field. Spatial statistics will be computed to characterize in-field changes in soybean yield. The following metrics will be considered and used to compare results among fields: magnitude of variability, directionality, and spatial distribution pattern. Additional statistics will be computed to identify the drivers of variability, model site-specific relationships between soybean yield and field conditions, and filter out unexplained variability from the yield data.

Objectives 2 and 3: Sentinel-2 (30-ft resolution, 10-day return time) and Landsat-8 (90-ft resolution, 8-day return time) satellite images will be gathered from public (free) data repositories. Drone images will be collected weekly from the fourth trifoliate stage (V4) to full seed (R6), and every other week from full seed to maturity. Each field will be divided into 90-ft grids associated with median relative yield and relevant vegetation index values computed from each available image. Spatiotemporal analysis will then be conducted to correlate the yield data with temporal changes in vegetation indices. Separate analyses will be conducted for each data source, and additional analysis will be computed to determine if drone images can be used as a substitute for missing satellite images.

Planned Milestones:

- Characterize in-field soybean yield variability in different production systems.
- Quantify the spatial distribution of explainable in-field yield variability.
- Correlate soybean yield data with the site-specific remote sensing-based vegetation index history
- Compare model performance with different image spatial and temporal resolutions.
- Evaluation of drone remote sensing as an alternative to satellite remote sensing.

Value to Soybean Industry: Satellite and drone remote sensing technology provides producers with high spatial and high temporal resolution images that can be used to monitor crop development and health, predict yield, and identify management zones in a field. That information may then be used to fine-tune the current extension recommendations and inform farm operational and economic planning. However, no data-driven recommendations are available to help integrate that data into the producers' decision-making process. This project will establish the foundation upon which the needed data-driven recommendations can be established.

Budget Justifications/Explanation of Travel and Direct Costs: Personnel funds are requested for partial support of a program associate and graduate student. Graduate student support includes stipend and tuition. Personnel funds are also requested for support of hourlies. All personnel will help with data collection, processing, and analysis. Travel funds are requested for data collection and participation in relevant out-of-state conferences including the 2024 ASA-CSSA-SSSA Annual International Meeting. Supply funds and other direct costs are requested to purchase a tablet for data collection, sensors (including telemetry), and miscellaneous field supplies. Supply funds are also requested to participate in remote sensing equipment maintenance and pay for manuscript publication fees.

University of Arkansas System Division of Agriculture
Promotion Board Budget

Poncet, Aurelie *Site-specific assessment of soybean response to in-field variability using remote sensing.*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	New
Lead Investigator	Poncet, Aurelie	**Co-PI #1**	Hamilton, Mike
Co-PI #2		**Co-PI #3**	
Department	CSES Crop, Soil, Environmental Science		
Commodity Board	Soybean Promotion Board		
Project Title	Site-specific assessment of soybean response to in-field variability using remote sensing.		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

			Poncet, Aurelie	Hamilton, Mike			Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI			AES	CES					

Fulltime Personnel

Position Title	Name *(if position is filled)*	% Time	Salaries				Total	AES	CES
Program associate	Wesley France	20%	$9,500				$9,500	$9,500	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Subtotal: Salaries	$9,500	$0	$0	$0	$9,500	$9,500	$0

Graduate Student

Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.

Name *(if position is filled)*	% Time	Wages				Total	AES Portion	CES Portion
MS Student	75%	$15,000				$15,000	$15,000	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
	Tuition	$5,000				$5,000	$5,000	$0
	Subtotal: Graduate Student	$20,000	$0	$0	$0	$20,000	$20,000	$0

Hourly

	Wages				Total	AES Portion	CES Portion
Hourly-Personnel		$12,000			$12,000	$0	$12,000
Hourly-Students					$0	$0	$0
Subtotal: Hourly	$0	$12,000	$0	$0	$12,000	$0	$12,000

Fringe Benefits

Fringe benefits are calculated when salary and wage amounts are entered above.

	Benefits				Total	AES Portion	CES Portion
Fulltime Personnel	$3,002	$0	$0	$0	$3,002	$3,002	$0
Graduate Students	$630	$0	$0	$0	$630	$630	$0
Hourly Personnel	$0	$948	$0	$0	$948	$0	$948
Hourly-Students	$0	$0	$0	$0	$0	$0	$0
Subtotal: Fringe Benefits	$3,632	$948	$0	$0	$4,580	$3,632	$948
Personnel Total	$33,132	$12,948	$0	$0	$46,080	$33,132	$12,948

Travel

Justify out-of-state travel in proposal.

	Travel				Total	AES Portion	CES Portion
In-State	$2,518	$5,000			$7,518	$2,518	$5,000
Out-of-State	$750	$4,000			$4,750	$750	$4,000
Travel Total	$3,268	$9,000	$0	$0	$12,268	$3,268	$9,000

University of Arkansas System Division of Agriculture
Promotion Board Budget

Poncet, Aurelie *Site-specific assessment of soybean response to in-field variability using remote sensing.*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$1,850	$5,452			$7,302	$1,850	$5,452
	Fertilizer/Chemicals					$0	$0	$0
	Publication	$1,850				$1,850	$1,850	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs	Tensiometer purchase + tablet		$7,500			$7,500	$0	$7,500
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$3,700	$12,952	$0	$0	$16,652	$3,700	$12,952
	Total for Proposal	$40,100	$34,900	$0	$0	$75,000	$40,100	$34,900

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

		%	Poncet, Aurelie	Hamilton, Mike			Total	
Ecosystems (Rice Only)	Grand Prairie	0%	$0	$0	$0	$0	$0	
	Mississippi Delta		$0	$0	$0	$0	$0	
	White River		$0	$0	$0	$0	$0	
	Totals	0%	$0	$0	$0	$0	$0	***Must match the proposal total.***

Tab

Fernandes

(13)

Arkansas Soybean Promotion Board – 2024-2025 Proposal

Title: Phenotypic Selection Assisted by Seed-Level Near-Infrared Information

Lead Investigators: Samuel B Fernandes

Co-Investigators: Caio Canella Vieira

Status (i.e., New, Year 2 of 3, Year 2 of 2, etc.): New (Year 1 of 3)

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Breeding

Stated Goal: The successful development of superior cultivars in breeding programs depends on the maximization of the genetic variance, selection accuracy, and selection intensity, as well as on minimizing the length of breeding cycles. While optimizing those parameters has been the recipe for high genetic gain for decades, the dynamism of target environments combined with the genotype-by-environment interaction makes identifying the best line a challenging task. Thus, any breakthrough in developing a new cultivar requires the adoption of new approaches or new technology. Genomic selection (GS), i.e., the selection of lines based on molecular marker information rather than phenotypic evaluation, is an example of a groundbreaking method currently used by breeding programs of all major crops. The main point where GS is beneficial is reducing the breeding cycle, which increases genetic gain. Another advantage is the possibility of increasing the selection intensity. One recent strategy successfully applied in different crops is to use seed-level Near-Infrared (NIR) information to assist in predicting phenotypic performance. This approach relies on utilizing NIR data to estimate the similarity among individuals. Like in GS, breeders can develop a statistical model to predict the performance of lines that have not been phenotyped. <u>The main advantage of this approach is reduced cost and labor intensity</u>, as the NIR data can be obtained with the same machine utilized to count seeds when preparing for field trials. Given the reduced cost, <u>the NIR-based phenotypic prediction can serve as a pre-selection prior to running GS, so resources for genotyping can be efficiently applied</u>. Consequently, an increased selection intensity can be utilized in the selection process. Furthermore, <u>this approach can be used in the early selection stages, where experiments with replications are not possible given the amount of seed available per family</u>. This could potentially increase selection accuracy. In this proposal, we aim to develop a NIR-based prediction model that can be used by the UARK Soybean Breeding program alone or in combination with genomic selection to increase selection intensity and selection accuracy, resulting in an increased genetic gain. We will collect NIR data from seeds of lines that have been phenotyped in the field in 2023, as well as lines that will be tested in 2024 by the UARK Soybean Breeding program. Developing a pipeline that incorporates NIR data into the soybean selection process will be a creative alternative to increasing the rate of genetic gain while maintaining similar resource utilization.

Specific Objectives: In this proposal, our specific goals are: <u>i) determine the efficiency of phenotypic prediction assisted by seed-level near-infrared information;</u> ii) <u>develop a pipeline that incorporates the near-infrared information in the selection process.</u> The overall objective of this proposal is to provide the UARK Soybean Breeding program with a cost-effective alternative that can be utilized in combination with GS to increase the selection intensity and selection accuracy, improving the efficiency of the program.

Methods: This proposal will leverage phenotypic information from previous and future field experiments conducted at the UARK Soybean Breeding program. The phenotypic data will include yield, seed composition, and biotic and abiotic tolerance traits. The first step will be to collect near-infrared information from seeds of more than 1,000 breeding lines generated in the program. This data will be obtained with a

QSorter® machine recently purchased by the soybean breeding program. Once this data is collected, we will develop statistical and machine-learning models that use seed-level NIR data to predict phenotypic performance. Similar to what has been done in other crops (Robert et al., 2022), the statistical models evaluated will include a linear mixed model with a NIRs-based relationship matrix. The machine learning models will use the LightGBM approach and it will incorporate the same relationship matrix. All models will be evaluated using cross-validation, i.e., we will compare the phenotypic data already available to phenotypic predictions based on NIR and determine how accurate these predictions are. All of these models will be trained on the phenotypic data mentioned above. The next step after developing prediction models is to run individual seeds through the QSorter® and, based on the NIR reads, obtain a prediction of phenotypic performance for each individual, allowing for a selection of the best-predicted lines. Finally, the prediction obtained will be compared with the actual performance of the selected lines in the field.

Planned Milestones:

Activity Description	2024				2025				2026			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Analyze phenotypic data available at the breeding program	**X**	**X**			**X**	**X**			**X**	**X**		
Collect near-infrared information from individual seeds		**X**	**X**			**X**	**X**			**X**	**X**	
Develop near-infrared-based prediction models				**X**	**X**			**X**	**X**			
Select the best individuals from F_2 populations based on prediction models						**X**				**X**		
Field evaluations of selected lines							**X**	**X**			**X**	**X**
Publish research results												**X**

Value to Soybean Industry: Two factors determine the efficiency of a breeding program in identifying high-quality and high-performance cultivars, namely, selection intensity and selection accuracy. Increasing the number of lines evaluated and the accuracy with which soybean lines are selected will increase the probability of developing a superior cultivar for soybean growers.

Budget Justifications/Explanation of Travel and Direct Costs ($51,117): The majority of the budget is dedicated to an experienced graduate student ($24,000 base, $7,500 tuition, and $1,008 benefits) who will work on collecting the NIR data and developing statistics and machine-learning models. An additional $6,580 is requested for 10% of an FTE research technician. A total of $3,000 in out-of-state travel is requested to attend and present results in scientific meetings and for the student to participate in short courses relevant to this research. A total of $5,529 is requested for both a license of ASReml, state-of-the-art software for fitting linear mixed models with access to 16 cores, and a computer in which ASReml will be installed ($2,529 for ASReml and $3,000 for the computer) and $3,500 for supplies related to obtaining seed NIR data.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Samuel B Fernandes *Phenotypic Selection Assisted by Seed-Level Near-Infrared Information*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	New
Lead Investigator	Samuel B Fernandes	**Co-PI #1**	Canella Vieira, Caio
Co-PI #2		**Co-PI #3**	
Department	CSES Crop, Soil, Environmental Science		
Commodity Board	Soybean Promotion Board		
Project Title	Phenotypic Selection Assisted by Seed-Level Near-Infrared Information		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

			Samuel B Fernandes	Canella Vieira, Caio			Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI			AES	AES					
Fulltime Personnel									
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
		10%		$5,000			$5,000	$5,000	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Subtotal: Salaries	$0	$5,000	$0	$0	$5,000	$5,000	$0
Graduate Student									
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
		100%	$24,000				$24,000	$24,000	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Tuition	$7,500				$7,500	$7,500	$0
		Subtotal: Graduate Student	$31,500	$0	$0	$0	$31,500	$31,500	$0
Hourly									
			Wages				**Total**	**AES Portion**	**CES Portion**
		Hourly-Personnel					$0	$0	$0
		Hourly-Students					$0	$0	$0
		Subtotal: Hourly	$0	$0	$0	$0	$0	$0	$0
Fringe Benefits									
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
		Fulltime Personnel	$0	$1,580	$0	$0	$1,580	$1,580	$0
		Graduate Students	$1,008	$0	$0	$0	$1,008	$1,008	$0
		Hourly Personnel	$0	$0	$0	$0	$0	$0	$0
		Hourly-Students	$0	$0	$0	$0	$0	$0	$0
		Subtotal: Fringe Benefits	$1,008	$1,580	$0	$0	$2,588	$2,588	$0
		Personnel Total	$32,508	$6,580	$0	$0	$39,088	$39,088	$0
Travel									
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
		In-State					$0	$0	$0
		Out-of-State	$3,000				$3,000	$3,000	$0
		Travel Total	$3,000	$0	$0	$0	$3,000	$3,000	$0

University of Arkansas System Division of Agriculture
Promotion Board Budget

Samuel B Fernandes *Phenotypic Selection Assisted by Seed-Level Near-Infrared Information*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$5,529	$3,500			$9,029	$9,029	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$5,529	$3,500	$0	$0	$9,029	$9,029	$0
	Total for Proposal	$41,037	$10,080	$0	$0	$51,117	$51,117	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

Ecosystems (Rice Only)		%	Samuel B Fernandes	Canella Vieira, Caio			**Total**	
	Grand Prairie	0%	$0	$0	$0	$0	$0	
	Mississippi Delta		$0	$0	$0	$0	$0	
	White River		$0	$0	$0	$0	$0	
	Totals	0%	$0	$0	$0	$0	$0	***Must match the proposal total.***

Tab

Nicolli (17)

Arkansas Soybean Research and Promotion Board – 2024-2025 Proposal

Title: Enhancing Soybean Resistance to Charcoal Rot: A Collaborative Approach Involving Plant Pathology and the Soybean Breeding Program

Lead Investigators: Camila Nicolli, Assistant Professor – Extension Plant Pathology - University of Arkansas
Co-Investigators: Caio Canella Vieira, Assistant Professor of Soybean Breeding, University of Arkansas
Rodrigo Pedrozo, Southeast Dale Bumpers National Rice Research Center, USDA

Status: New (Year 1 of 3)

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Plant Pathology and Breeding

Stated Goal: Our overarching mission is to advance the resilience and sustainability of soybean production in Arkansas by incorporating genetic resistance into high-yielding soybean cultivars. Specifically, we will focus our efforts on furthering soybean resistance to charcoal rot [*Macrophomina phaseolina* (Tassi) Goid]. Across the United States, charcoal rot is estimated to cause roughly 20 million bushels in production losses annually (Bradley et al., 2021). In Arkansas, it accounts for approximately 5 million bushels in production losses annually (Bradley et al., 2021). Over the past two decades, charcoal rot represented the highest cumulative losses per acre caused by diseases in Arkansas ($550 per acre). This accounts for approximately 30% of total cumulative economic losses per acre caused by diseases in the state ($1,886) (Bandara et al., 2020). Our collaborative approach aims to screen a wide range of genetically diverse soybean accessions and breeding lines for resistance to charcoal rot through greenhouse-based phenotyping to identify novel sources of resistance. Ultimately, identified new sources will be used in the development of disease-resistant soybean cultivars. Data generated from the screening will be used to identify significant marker-trait associations, leading to the development of molecular markers for marker-assisted selection. We believe genetic resistance to charcoal rot can be identified and incorporated into the breeding program resulting in cultivars that will suffer minimal losses from this important disease.

Specific Objectives:

1. **Survey of Charcoal rot pathogens:** Understand the diversity of *Macrophomina phaseolina* in Arkansas through sampling charcoal rot pathogens to obtain a population for subsequent testing in soybean genotypes.
2. **Conduct Greenhouse-Based Phenotyping:** screen genetically diverse soybean accessions and breeding lines developed by the Soybean Breeding Program for disease reaction to charcoal rot.
3. **Development of Disease-Resistant Soybean Cultivars:** our foremost goal is to develop soybean cultivars with enhanced resistance to prevalent diseases in Arkansas. Our primary focus is on reducing the vulnerability of soybean crops to the economically significant fungal disease charcoal rot. In addition, our secondary objective is to characterize the genetic architecture of resistance to charcoal rot and develop molecular marker-based tools to optimize our efficiency for trait discovery.

Methods:

1. **Survey of Charcoal rot pathogen:** Samples exhibiting symptoms of charcoal rot from various counties within Arkansas will be gathered to establish a comprehensive collection of the pathogen. In the Plant Pathology Program laboratory, these samples will undergo isolation to extract the fungi,

which will then be preserved for multiple inoculation experiments across various soybean genotypes.

2. **Conduct Greenhouse-Based Phenotyping:** 20-30 pre-commercial soybean breeding lines will be planted each year to be artificially inoculated with a population of charcoal rot pathogen and standard disease rating. The inoculations will be carried out by Plant Pathology program with experience on screening for breeding, in a greenhouse located at the Rice Research & Extension Center (RREC) in Stuttgart where the plants can be acclimatized to the temperature and humidity necessary for the development of the disease. Concurrently, a panel of genetically diverse soybean accessions will undergo similar screening to identify novel sources of resistance, as well as characterize the genetic architecture of soybean resistance to charcoal rot through genome-wide association studies (GWAS).
3. **Development of Disease-Resistant Soybean Cultivars:** Breeding lines identified as resistant will serve as parental lines to the development of new high-yielding, charcoal rot-resistant breeding populations. In addition, novel genetic sources identified as resistant may be stacked to improve resistance levels. It is expected that 5-10 new breeding populations will be developed each year. GWAS will be conducted by combining the greenhouse-based phenotype and high-dimensional molecular markers. Depending on the nature of the trait, marker-assisted selection and/or genomic prediction models will be deployed across our breeding pipeline to select resistant genotypes.

Planned Milestones: In year 1, we will initiate the process of gathering charcoal rot samples from diverse counties, delineating the distribution of charcoal rot isolates, and assessing the protocol's efficacy on these isolates across various pre-commercial soybean breeding lines. In the second year, we will conduct screenings on 20-30 pre-commercial breeding lines. In addition, genetically diverse accessions will be screened to identify novel sources of resistance as well as generate the needed dataset for GWAS. In year 3, the development of the first resistant breeding populations will be completed and field trials will be conducted. We anticipate finalizing the phenotyping of genetically diverse accessions for GWAS by year 3. Each year within this project will contribute to accumulating valuable information and data, building a robust foundation for the identification of novel traits related to charcoal rot resistance in soybeans.

Value to Soybean Industry: By thoroughly assessing disease resistance traits in diverse soybean cultivars, we optimize the breeding process, identifying new genetic sources and creating molecular tools. This optimization positively impacts chemical interventions against Charcoal rot. These advantages extend to farmers, industry, and the environment, laying the groundwork for sustainable agriculture. This approach mitigates economic losses, promotes efficient resource use, and establishes the foundation for resilient soybean practices. Our team's expertise in greenhouse screening for diseases underscores our capability for this project. In summary, phenotyping for charcoal rot in soybeans offers rapid cultivar development, certainty in plant resistance, and enhances the soybean value chain's sustainability by reducing productivity losses and increasing overall profitability.

Budget justification/Explanation of Travel and Direct Costs ($64,292):

It is requested a total of $16,450 for a Research Associate ($12,500 base, $3,950 benefits) and $28,882 for a graduate student ($21,000 base, $7,000 tuition, and $882 benefits) to work on the project. $2,500 is requested for in-state travel to collect notes and attend scientific conferences, and $15,500 in supplies including laboratory supplies for cultivating pathogens, soil potting, planting boxes, fertilizer, tags, and stakes. A total of $960 for Rice Research & Extension Center greenhouse maintenance.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Nicolli, Camila *Enhancing Soybean Resistance to Charcoal Rot: A Collaborative Approach Involving Plant Pathology and*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	New
Lead Investigator	Nicolli, Camila	**Co-PI #1**	Canella Vieira, Caio
Co-PI #2		**Co-PI #3**	
Department	ENPL Entomology and Plant Pathology		
Commodity Board	Soybean Promotion Board		
Project Title	Enhancing Soybean Resistance to Charcoal Rot: A Collaborative Approach Involving Plant Pathology and Soybean Breeding		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

	Nicolli, Camila	**Canella Vieira, Caio**			**Total Board Funding Requested**	**AES Portion**	**CES Portion**
Select "AES" or "CES" for each PI	CES	AES					

Fulltime Personnel

Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
Research Associate		25%		$12,500			$12,500	$12,500	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Subtotal: Salaries	$0	$12,500	$0	$0	$12,500	$12,500	$0

Graduate Student

Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.

Name *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
Bruna Ronning	100%	$21,000				$21,000	$0	$21,000
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
	Tuition	$7,000				$7,000	$0	$7,000
	Subtotal: Graduate Student	$28,000	$0	$0	$0	$28,000	$0	$28,000

Hourly

	Wages				**Total**	**AES Portion**	**CES Portion**
Hourly-Personnel					$0	$0	$0
Hourly-Students					$0	$0	$0
Subtotal: Hourly	$0	$0	$0	$0	$0	$0	$0

Fringe Benefits

Fringe benefits are calculated when salary and wage amounts are entered above.

	Benefits				**Total**	**AES Portion**	**CES Portion**
Fulltime Personnel	$0	$3,950	$0	$0	$3,950	$3,950	$0
Graduate Students	$882	$0	$0	$0	$882	$0	$882
Hourly Personnel	$0	$0	$0	$0	$0	$0	$0
Hourly-Students	$0	$0	$0	$0	$0	$0	$0
Subtotal: Fringe Benefits	$882	$3,950	$0	$0	$4,832	$3,950	$882
Personnel Total	$28,882	$16,450	$0	$0	$45,332	$16,450	$28,882

Travel

Justify out-of-state travel in proposal.

	Travel				**Total**	**AES Portion**	**CES Portion**
In-State	$1,000	$1,500			$2,500	$1,500	$1,000
Out-of-State					$0	$0	$0
Travel Total	$1,000	$1,500	$0	$0	$2,500	$1,500	$1,000

University of Arkansas System Division of Agriculture
Promotion Board Budget

Nicolli, Camila *Enhancing Soybean Resistance to Charcoal Rot: A Collaborative Approach Involving Plant Pathology and*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$10,000	$5,000			$15,000	$5,000	$10,000
	Fertilizer/Chemicals	$500				$500	$0	$500
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$960	$0	$0	$0	$960	$0	$960
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$11,460	$5,000	$0	$0	$16,460	$5,000	$11,460
	Total for Proposal	$41,342	$22,950	$0	$0	$64,292	$22,950	$41,342

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

		%	Nicolli, Camila	Canella Vieira, Caio			Total	
Ecosystems (Rice Only)	Grand Prairie	0%	$0	$0	$0	$0	$0	
	Mississippi Delta		$0	$0	$0	$0	$0	
	White River		$0	$0	$0	$0	$0	
	Totals	0%	$0	$0	$0	$0	$0	*Must match the proposal total.*

Tab

Elli

(21)

Arkansas Soybean Promotion Board – 2024-2025 Proposal

Title: Designing Soybean Ideotypes for Adaptation to Weather Variability

Lead Investigators: Elvis F. Elli

Co-Investigators: Caio Canella Vieira

Status (i.e., New, Year 2 of 3, Year 2 of 2, etc.): New (year 1 of 3)

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Breeding (and Agronomy/Crop Physiology)

Stated Goal: Increased occurrence of weather extremes such as droughts, flooding, and high temperatures poses a series of challenges to sustaining future crop yields. Current year-to-year weather variability is large and is expected to increase in the context of future climate change. Crop improvement, agronomic advances, and climate change are not incremental but continuous. Our ability to identify consistent genetic and agronomic solutions across environments is limited by complex interactions among genotype, environment, and management (GxExM). Traditional multi-environment field experiments, while valuable for exploring GxExM, are generally time-consuming and resource-intensive. Additional methods include remote sensing, statistical/genomic selection models, and the use of crop growth models (CGMs), such as APSIM (Agricultural Production Systems sIMulator). CGMs are frameworks that include modules to simulate soil water balance, soil carbon and nitrogen (N) cycling, crop growth and development, and their interactions. GGMs provide a unique opportunity to integrate collaborative efforts among crop physiologists and plant breeders to identify favorable traits that contribute to high-performing, stable genotypes for target environments through the incorporation of biological and physiological knowledge. A major challenge in using GCM is the large number of parameters required for model calibration, which limits our capacity to perform cultivar-specific calibrations and explore genetic differences. In this project, we aim to collect high-resolution information on crop growth and development traits of soybean cultivars with different genetic backgrounds to calibrate a CGM and identify key traits for the selection of superior genotypes with enhanced resilience to extreme weather events.

Specific Objectives: **(1)** Conduct field experiments to characterize physiological traits of 20 contrasting soybean genotypes; **(2)** calibrate and evaluate a CGM for the 20 soybean genotypes; and **(3)** use a well-calibrated version of the CGM to identify favorable traits for ideotype designing and quantify GxExM interactions.

Methods:

Objective 1: We will select 15 contrasting soybean genetic materials (including breeding lines and diverse soybean accessions) and 5 modern cultivars to capture variability in trait characteristics and yield potential. We will grow these materials in three contrasting environments within the UADA Research & Extension Centers. Experiments will be conducted with a randomized complete block design and three replications. The following traits will be measured: green and yellow leaf area index, phenology, above-ground biomass and partitioning to different organs, crop growth rate at critical period (R3 to R6), canopy coverage, plant N uptake, pod and seed number, and final yields. Measurements will be taken approximately every two weeks. All crop management practices will follow the University of Arkansas Cooperative Extension Service recommendations. At the end of year one, we will have yield data of 180 plots and approximately 1500 in-season samples of biomass partitioning for further tissue N analysis.

Objective 2: Experimental data from *Objective 1* will be used to develop crop model parameters for the 20 genotypes. We will further evaluate the ability of the APSIM model to simulate yield differences across genotypes. Soil information required to run the model will be derived from SSURGO (Soil Survey Geographic Database). Daily weather data (maximum and minimum temperature, solar radiation, and rainfall) will be retrieved from local weather stations and/or satellite-based data.

Objective 3: Using a well-calibrated version of APSIM from *Objective 2,* we will run the model over 30 historical weather years (1990-2020) to enhance our understanding of year-to-year yield variations due to weather among the 20 genetic materials. Further, we will run a scenario analysis by changing relevant traits (e.g., seed-filling period, leaf N concentration, leaf expansion) within realistic ranges obtained from *Objective 1* to identify the most relevant traits for specific weather-year conditions (e.g., warm/dry, cool/wet years) and locations.

Planned Milestones:

Work Plan and Timeline	Year 1				Year 2				Year 3			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Objective 1: Conduct field experiments to characterize physiological traits of 20 contrasting soybean genotypes												
Conduct field experiments												
Collect in-season sampling												
Data analysis and quality control												
Objective 2: Calibrate and evaluate a crop growth model (APSIM) for the 20 soybean materials												
Set up APSIM for the studied sites												
Develop APSIM cultivar coefficients												
Model testing and evaluation												
Objective 3: Use a well-calibrated version of the crop growth model to identify favorable traits for ideotype designing and quantify GxExM interactions												
Creating historical weather files (30-years)												
Run long-term yield simulations												
Simulate and rank favorable traits												

Value to Soybean Industry: The envisioned outcome of this project is designing soybean ideotypes. Breeding is among the most sustainable long-term strategies to increase crop resilience year-to-year weather variability and future climate change. Our proposed approach can provide a unique and efficient opportunity to inform breeders of relevant traits that could benefit yields in target environments. This project aims to characterize the physiology behind 20 soybean materials with different genetic backgrounds to enhance our understanding of mechanisms underlying yields. Then, we will use a crop simulation model to gain insight into favorable traits for ideotype designing. Ideotypes then could provide breeders with a systems framework with target traits and their combinations to increase yield potential. This could enhance the selection of superior genotypes and reduce the amount of field testing. This project has great potential to generate fundamental knowledge for further integrating crop models with whole-genome prediction in future studies.

Budget Justifications/Explanation of Travel and Direct Costs ($66,122):
Funds are requested for 100% support of a graduate student who will be assigned to this project ($22,000 base, $7,600 tuition, $924 benefits) and $7,553 for an undergraduate visiting scholar ($7,000 base, $553 benefits) to work on the project. In-state travel funds ($7,500) are requested for in-season data collection across the experimental sites. Out-of-state travel funds ($2,000) are requested to present preliminary research findings at the 2024 ASA-CSSA-SSSA conference in San Antonio, TX. Supplies and other direct expenses ($16,500) are requested for lab and field supplies (e.g., bags, stakes, seeds) and plant analysis. A total of $2,045 is requested for research station maintenance.

University of Arkansas System Division of Agriculture
Promotion Board Budget

Elli, Elvis *Designing Soybean Ideotypes for Adaptation to Weather Variability*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	
Lead Investigator	Elli, Elvis	**Co-PI #1**	Vieira, Caio Canella
Co-PI #2		**Co-PI #3**	
Department	CSES Crop, Soil, Environmental Science		
Commodity Board	Soybean Promotion Board		
Project Title	Designing Soybean Ideotypes for Adaptation to Weather Variability		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

			Elli, Elvis	Vieira, Caio Canella			Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI			AES	AES					
Fulltime Personnel									
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Subtotal: Salaries	$0	$0	$0	$0	$0	$0	$0

	Graduate Student								
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
		100%	$22,000				$22,000	$22,000	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Tuition	$7,600				$7,600	$7,600	$0
		Subtotal: Graduate Student	$29,600	$0	$0	$0	$29,600	$29,600	$0

	Hourly						
	Wages				**Total**	**AES Portion**	**CES Portion**
Hourly-Personnel		$7,000			$7,000	$7,000	$0
Hourly-Students					$0	$0	$0
Subtotal: Hourly	$0	$7,000	$0	$0	$7,000	$7,000	$0

Fringe benefits are calculated when salary and wage amounts are entered above.

	Fringe Benefits						
	Benefits				**Total**	**AES Portion**	**CES Portion**
Fulltime Personnel	$0	$0	$0	$0	$0	$0	$0
Graduate Students	$924	$0	$0	$0	$924	$924	$0
Hourly Personnel	$0	$553	$0	$0	$553	$553	$0
Hourly-Students	$0	$0	$0	$0	$0	$0	$0
Subtotal: Fringe Benefits	$924	$553	$0	$0	$1,477	$1,477	$0
Personnel Total	$30,524	$7,553	$0	$0	$38,077	$38,077	$0

Justify out-of-state travel in proposal.

	Travel						
	Travel				**Total**	**AES Portion**	**CES Portion**
In-State	$6,000	$1,500			$7,500	$7,500	$0
Out-of-State	$2,000				$2,000	$2,000	$0
Travel Total	$8,000	$1,500	$0	$0	$9,500	$9,500	$0

University of Arkansas System Division of Agriculture
Promotion Board Budget

Elli, Elvis *Designing Soybean Ideotypes for Adaptation to Weather Variability*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$3,000	$1,500			$4,500	$4,500	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs	Tissue Nitrogen Analysis	$12,000				$12,000	$12,000	$0
Station Maintenance	SAREC, Fayetteville	$715	$0	$0	$0	$715	$715	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$665	$0	$0	$0	$665	$665	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$665	$0	$0	$0	$665	$665	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$17,045	$1,500	$0	$0	$18,545	$18,545	$0
	Total for Proposal	$55,569	$10,553	$0	$0	$66,122	$66,122	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

		%	Elli, Elvis	Vieira, Caio Canella			Total	
Ecosystems (Rice Only)	Grand Prairie	0%	$0	$0	$0	$0	$0	
	Mississippi Delta		$0	$0	$0	$0	$0	
	White River		$0	$0	$0	$0	$0	
	Totals	0%	$0	$0	$0	$0	$0	***Must match the proposal total.***

Tab

Vieira (25)

Arkansas Soybean Promotion Board – 2024-2025 Proposal

Title: Overcoming Soybean Yield Plateau by Leveraging Physiology-Efficient and Yield-Formation Traits

Lead Investigators: Caio Canella Vieira

Co-Investigators: Elvis Elli

Status (i.e., New, Year 2 of 3, Year 2 of 2, etc.): New (Year 1 of 3)

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Breeding

Stated Goal: Soybean breeding programs have achieved significant success in developing cultivars with improved yield and superior resilience to biotic and abiotic stressors. Despite remarkable advancements, current soybean yield potential is reaching a plateau resulting from limited genetic diversity and reduced possibility of breakthrough allelic combinations. This concern is particularly relevant in modern breeding programs that heavily rely on recycling elite materials through elite-by-elite hybridization schemes. Yield can be expressed as a result of three main physiological processes including cumulative solar radiation interception by the canopy (Ei), radiation use efficiency (RUE), and harvest index (HI, ratio of seed yield to total above-ground biomass). Reports of Ei in soybeans range from 40 to 70%, suggesting that a significant portion of available solar radiation is not efficiently captured by the canopy (Edwards et al., 2005; Lopez et al., 2022). Hence, improving Ei efficiency by modifying canopy architecture could substantially contribute to higher soybean yields. RUE has been reported within the range of 2.3 to 4.3% (Lee et al., 1986; Long et al., 2006; Lopez et al., 2022), which is substantially lower than the theoretical maximum RUE of 9.4% (Sinclair and Muchow, 1999). Maximizing RUE through enhancements in leaf angle (upright leaves) and reduction of antenna size (preventing the trapping of excess energy) can directly contribute to higher soybean yields. HI has been estimated within the ranges of 0.40 to 0.50 (Edwards et al., 2005; de Bruin and Pedersen, 2009; Lopez et al., 2022), leaving as much as 50% opportunity for improvement given the theoretical maximum HI of 0.60 (Austin et al., 1980). Therefore, this research proposal aims to increase soybean yield potential by identifying and incorporating physiology-efficient and yield-formation traits in a population consisting of genetically diverse soybean accessions.

Specific Objectives: The proposal is structured around three specific objectives: **i)** characterization of genetically diverse soybean accessions and modern cultivars based on yield-formation and physiology-efficient traits; **ii)** characterization of the genetic architecture of yield-formation and physiology-efficient traits; **iii)** development of breeding populations derived from high-yielding elite modern cultivars and diverse accessions.

Methods:

Objective 1: Around 250 genetically diverse soybean accessions (PI) will be phenotyped for yield-formation and physiology-efficient traits including Ei, RUE, and HI using a UAV-based image platform. These comprise a subset of the USDA Soybean Germplasm Collection. Cumulative solar radiation interception by the canopy (Ei) will be measured as the size of the canopy throughout the season as this has been reported to have a 1:1 relationship with Ei (Purcell, 2000; Kawasaki et al., 2016; Lopez et al., 2022). The time-series observation of canopy growth will be multiplied by the daily photosynthetic active radiation (PAR) available which is estimated at 48.7% of total solar radiation (Zhu et al., 2008). Solar radiation use efficiency (RUE) will be determined by assessing the ratio between dry biomass at both late vegetative and late reproductive stages and the cumulative PAR intercepted leading up to each biomass collection. Harvest index (HI) will be calculated as the ratio between dry seed weight (adjusted to zero moisture) and dry biomass collected at R8 (full maturity) from a single 2.1 m row.

Objective 2: The genetic architecture of each trait (Ei, RUE, and HI) will be characterized based on genome-wide association studies (GWAS). Two models will be implemented to detect significant marker-trait associations including BLINK (Huang et al., 2019) and a model that allows the inclusion of population structure in interaction with the environment (G×E) to account for variable patterns of genotype responses in different environments (Canella Vieira et al, 2022).

Objective 3: Bi-parental breeding populations including a high-yielding elite modern cultivar and a diverse accession showing superior physiology-efficient and yield-formation traits will be developed. An off-season nursery will be used to conduct hybridization schemes as well as generation advancement (three growing seasons in a year). Breeding lines with yield potential superior to the elite and PI parents will represent the first generation of physiology-efficient, high-yielding materials. These will be available for further recombination with elite materials through hybridization schemes.

Planned Milestones:

Proposed Activities	Year 1				Year 2				Year 3			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Obj. 1. Characterize soybean genotypes based on yield-formation and physiology-efficient traits												
Select Plant Materials	*X*	*X*										
Conduct Field Trials		*X*	*X*	*X*		*X*	*X*	*X*				
Estimate Ei, RUE, and HI		*X*	*X*			*X*	*X*					
Obj. 2. Characterize the genetic architecture of yield-formation and physiology-efficient traits												
GWAS for Ei, RUE, and HI			*X*	*X*	*X*		*X*	*X*	*X*			
Obj. 3. Develop breeding populations derived from high-yielding elite cultivars and diverse accessions												
Develop bi-parental populations				*X*	*X*	*X*	*X*					
Generation advancement (F_1-F_4)						*X*	*X*	*X*	*X*	*X*	*X*	*X*
Grow progeny rows										*X*	*X*	

Value to Soybean Industry: The historical selection of superior soybean genotypes has been largely based on highly dynamic environmental conditions of target environments. This raises the hypothesis of whether intrinsic improvements in yield-formation traits have been accomplished or breeding programs have sustained high-yielding varieties by mainly targeting stress resilience traits and genetically engineered herbicide tolerance. <u>The main goal of this proposal is to identify genetic variation in diverse accessions associated with physiology-efficiency and yield-formation traits using genomic, phenomics, and advanced statistical analytics for a sustainable and long-term increase in soybean yield and production in Arkansas and the United States.</u>

Budget Justifications/Explanation of Travel and Direct Costs ($83,620): It is requested a total of $16,450 for 25% of an associate/post-doc ($12,500 base, $3,950 benefits), $30,424 for a graduate student ($22,000 base, $7,500 tuition, and $924 benefits), and $15,106 for an undergraduate visiting scholar ($14,000 base, $1,106 benefits) to work on the project. $11,000 is requested for in-state travel to collect notes and attend scientific conferences, and $8,000 in supplies including seeds, shipping, planting boxes, tags, and stakes. A total of $2,640 for research station maintenance and planting fees.

University of Arkansas System Division of Agriculture
Promotion Board Budget

Canella Vieira, Caio *Overcoming Soybean Yield Plateau by Leveraging Physiology-Efficient and Yield-Formation Traits*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	New
Lead Investigator	Canella Vieira, Caio	**Co-PI #1**	Elli, Elvis
Co-PI #2		**Co-PI #3**	
Department	CSES Crop, Soil, Environmental Science		
Commodity Board	Soybean Promotion Board		
Project Title	Overcoming Soybean Yield Plateau by Leveraging Physiology-Efficient and Yield-Formation Traits		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

			Canella Vieira, Caio	Elli, Elvis			Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI			AES	AES					
Fulltime Personnel									
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
Program Associate		25%		$12,500			$12,500	$12,500	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
Subtotal: Salaries			$0	$12,500	$0	$0	$12,500	$12,500	$0
Graduate Student									
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
		100%	$22,000				$22,000	$22,000	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Tuition		$7,500				$7,500	$7,500	$0
Subtotal: Graduate Student			$29,500	$0	$0	$0	$29,500	$29,500	$0
Hourly									
			Wages				**Total**	**AES Portion**	**CES Portion**
Hourly-Personnel			$14,000				$14,000	$14,000	$0
Hourly-Students							$0	$0	$0
Subtotal: Hourly			$14,000	$0	$0	$0	$14,000	$14,000	$0
Fringe Benefits									
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
Fulltime Personnel			$0	$3,950	$0	$0	$3,950	$3,950	$0
Graduate Students			$924	$0	$0	$0	$924	$924	$0
Hourly Personnel			$1,106	$0	$0	$0	$1,106	$1,106	$0
Hourly-Students			$0	$0	$0	$0	$0	$0	$0
Subtotal: Fringe Benefits			$2,030	$3,950	$0	$0	$5,980	$5,980	$0
Personnel Total			$45,530	$16,450	$0	$0	$61,980	$61,980	$0
Travel									
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
In-State			$8,500	$2,500			$11,000	$11,000	$0
Out-of-State							$0	$0	$0
Travel Total			$8,500	$2,500	$0	$0	$11,000	$11,000	$0

University of Arkansas System Division of Agriculture
Promotion Board Budget

Canella Vieira, Caio *Overcoming Soybean Yield Plateau by Leveraging Physiology-Efficient and Yield-Formation Traits*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$4,000	$4,000			$8,000	$8,000	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$1,245	$0	$0	$0	$1,245	$1,245	$0
	RIRE, Stuttgart	$1,395	$0	$0	$0	$1,395	$1,395	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$6,640	$4,000	$0	$0	$10,640	$10,640	$0
	Total for Proposal	$60,670	$22,950	$0	$0	$83,620	$83,620	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

		%	Canella Vieira, Caio	Elli, Elvis			Total
Ecosystems (Rice Only)	Grand Prairie	0%	$0	$0	$0	$0	$0
	Mississippi Delta		$0	$0	$0	$0	$0
	White River		$0	$0	$0	$0	$0
	Totals	0%	$0	$0	$0	$0	$0

Must match the proposal total.

Tab

Kovacs (29)

Arkansas Soybean Promotion Board – 2024-2025 Proposal

Title: Economics of Soil Health Practices for Soybeans in Arkansas
Lead Investigators: Kent Kovacs
Co-Investigators: Gerson Drescher; Michael Daniels; Qiuqiong Huang; Trenton Roberts
Status (i.e., New, Year 2 of 3, Year 2 of 2, etc.): New
Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest): Agronomy/Alternative, Economics, Fertility
Stated Goal: Identify soybean practices for soil health and climate change resiliency to support Arkansas farmers in profitability while protecting water and air quality, and human health

Specific Objectives: Leverage a funded 2022 project from the USDA AFRI program to:

1) Collect data on fertilization trials to identify responses to i) no tillage with cover crop species at the UADA's Pine Tree Research Station (PTRS), Rohwer Research Station, and Vegetable Research Station for soybean and double-crop soybean systems, ii) no tillage with cover crop for the PTRS corn and soybean rotation, and iii) commercial soybean fields managed with soil conservation practices through the Arkansas Discovery Farm program.

2) Use the field data to identify gaps in the information needed to determine the economics of soil health and climate change practices and construct a producer survey to identify Arkansas farmers' responses to soil health and climate change concerns. The questions will concern soil health goals, major decisions for current soil health practices, practices tried in the past, reasons for not using conservation practices, perception of declines in soil health, and recommendations to help producers achieve soil health goals. Phone numbers will come from the Arkansas Natural Resources Division, Farm journal, Dun & Bradstreet, and Data Informatix. The target number of survey responses is three hundred.

3) Model farm production to determine the profit maximizing mix of soil health practices. Develop an interactive decision support tool that farmers can access online to determine profitability. Examine farmers' adoption and duration of use of soil health practices. The outcome will be a synthesis of which factors matter for the adoption and duration of practices and discussions on why such factors matter in the context of Arkansas production systems.

Methods: *Method 1. Design survey, key informant interviews, and survey of producers:* We will first examine the results of the fertilization trials in Arkansas and the soil health practices. A focus group with soybean producers will include at least 10 farmers. The results of the fertilization trials, the focus group of Arkansas producers, and NASS data for the designated study area will inform the development of our survey of producers. We will conduct one-on-one interviews to ground truth the survey with the understanding of the soil health context, decision-making processes, and sources of information used to make decisions. Key informants will be identified through state and organizational directories, recommendations of the Promotion Board, and Extension personnel.

A survey will be conducted to collect information on the socio-economic factors affecting whether producers adopt and the duration of use of soil health practices. The data from the survey will enrich information in the National Agricultural Statistics Service (NASS) data. The survey will cover practices that are not surveyed in the NASS data (e.g., muriate of potash, triple superphosphate, and various cover crop species) but are being promoted in Arkansas. The survey will include questions that can help us determine the soil health and beliefs of producers. Project personnel will design and administer the survey, analyze the survey results, and determine the sampling strategies and other logistics.

Method 2. Create an interactive decision support tool: Create a decision support tool to model dynamic farm production that tracks outcomes such as the crop mix, practice adoption, soil degradation, aquifer depletion, and farm profits. The tool will be accessible to farmers through the internet. Farmers will be able to select the county in Arkansas to run the model. Once the tool is complete, this will be useful for incorporating soil and water conservation into annual crop budget projections.

Method 3. Conduct statistical Analysis: Econometric analysis will be used to identify the factors that influence farmers' decision of adoption and duration of use of soil health practices using the NASS data and data from the survey. The dependent variable is the length of time until the use of the practice stops. The independent variables include farm-specific factors such as field size and soil type, farmer-specific factors such as age and/or years of experience on farm and education, technology-specific factors such as costs and labor requirements, and institutional factors such land ownership. Also, data on whether farmers encountered events such as parched fields, frost, or extreme heat will be included.

We will compare the practices from the field trials with the practices that we observe producers use based on the survey. This will consist of the chemical, physical, and/or biological soil health indices that are sensitive to short- and long-term agronomic practices in soybean production systems; the use of alternative soil health indices; assessment of the impact of long-term fertilizer-P and -K rates application on crop yield and soil health; evaluation of how soil tillage practices affect soil C sequestration and soil health in soybean production systems; and an investigation of the contribution of different cover crop species in improving soil health and soil C sequestration.

Planned Milestones:

Task	March 1 – June, 2024	July – August, 2024	September -December, 2025	January – February 28, 2026
Focus group and key informant interviews	X			
Design and conduct survey	X	X	X	
Statistical and modeling analysis			X	X
Write up results and outreach			X	X

Value to Soybean Industry: This research will increase understanding of how long- and short-term soil conservation and nutrient management practices affect soil health indexes, crop yield, and farm economics in Mid-South US soybean production systems. The information will be used to develop a dynamic decision support tool. Also, there will be the development of extension documents geared toward farmers and Certified Crop Advisors to make information more accessible to non-scientists. The project information will be available at field days, such as Arkansas Soil Health Field Day, so that the impact of soil conservation practices on soil health will be demonstrated and discussed with stakeholders. The project will generate a large and useful dataset with the potential to answer questions beyond our objectives.

Budget Justifications/Explanation of Travel and Direct Costs:

The research scientist and program associates provide the labor necessary to design and conduct the survey, develop an interactive decision support tool, and conduct the statistical analyses. The in-state travel is necessary for the focus group and personal interviews needed to improve the survey.

University of Arkansas System Division of Agriculture
Promotion Board Budget

Kovacs, Kent — *Economics of Soil Health Practices for Soybeans in Arkansas*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	New
Lead Investigator	Kovacs, Kent	**Co-PI #1**	Drescher, Gerson
Co-PI #2	Daniels, Mike	**Co-PI #3**	Huang, Qiuqiong
Department	AEAB Agricultural Economics & Agribusiness		
Commodity Board	Soybean Promotion Board		
Project Title	Economics of Soil Health Practices for Soybeans in Arkansas		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

			Kovacs, Kent	Drescher, Gerson	Daniels, Mike	Huang, Qiuqiong	Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI			AES	AES	CES	AES			
Fulltime Personnel									
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
Research Scientist	Kovacs, Kent	40%	$28,000				$28,000	$28,000	$0
Program Associate				$5,000			$5,000	$5,000	$0
Program Associate					$5,000		$5,000	$0	$5,000
Program Associate						$5,000	$5,000	$5,000	$0
							$0	$0	$0
		Subtotal: Salaries	$28,000	$5,000	$5,000	$5,000	$43,000	$38,000	$5,000
Graduate Student									
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Tuition					$0	$0	$0
		Subtotal: Graduate Student	$0	$0	$0	$0	$0	$0	$0
Hourly									
			Wages				**Total**	**AES Portion**	**CES Portion**
		Hourly-Personnel					$0	$0	$0
		Hourly-Students					$0	$0	$0
		Subtotal: Hourly	$0	$0	$0	$0	$0	$0	$0
Fringe Benefits									
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
		Fulltime Personnel	$8,848	$1,580	$1,580	$1,580	$13,588	$12,008	$1,580
		Graduate Students	$0	$0	$0	$0	$0	$0	$0
		Hourly Personnel	$0	$0	$0	$0	$0	$0	$0
		Hourly-Students	$0	$0	$0	$0	$0	$0	$0
		Subtotal: Fringe Benefits	$8,848	$1,580	$1,580	$1,580	$13,588	$12,008	$1,580
		Personnel Total	$36,848	$6,580	$6,580	$6,580	$56,588	$50,008	$6,580
Travel									
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
		In-State	$1,250				$1,250	$1,250	$0
		Out-of-State					$0	$0	$0
		Travel Total	$1,250	$0	$0	$0	$1,250	$1,250	$0

University of Arkansas System Division of Agriculture
Promotion Board Budget

Kovacs, Kent *Economics of Soil Health Practices for Soybeans in Arkansas*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies					$0	$0	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$0	$0	$0	$0	$0	$0	$0
	Total for Proposal	$38,098	$6,580	$6,580	$6,580	$57,838	$51,258	$6,580

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

		%	Kovacs, Kent	Drescher, Gerson	Daniels, Mike	Huang, Qiuqiong	**Total**	
Ecosystems (Rice Only)	Grand Prairie	0%	$0	$0	$0	$0	$0	
	Mississippi Delta		$0	$0	$0	$0	$0	
	White River		$0	$0	$0	$0	$0	
	Totals	0%	$0	$0	$0	$0	$0	*Must match the proposal total.*

Tab

Kariyat (33)

Arkansas Soybean Promotion Board – 2024-2025 Proposal

Title: Predicting the impacts of herbivory across a salinity gradient in AR Soybeans

Lead Investigators: Drs. Rupesh Kariyat, Natalie Clay

Co-Investigators: Dr. Ben Thrash

Status (i.e., New, Year 2 of 3, Year 2 of 2, etc.): New Proposal: Year 1 of 3; Amt: 45,924$

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds):

Stated Goal: Determine how salinity impacts soybean herbivory and yield to determine optimal sodium levels for minimizing herbivory and maximizing yield.

Specific Objectives:

1) Quantify the effects of soybean sodium tissue concentrations on insect herbivore performance

2) Determine the effect of soybean sodium tissue concentrations on herbivore leaf consumption

3) Determine how salinity and herbivory impact soybean performance and yield in the fields

Methods:

Rationale and Hypothesis: Plant growth is highly dependent on soil factors such as moisture, salinity, and nutrients. Salinity, in particular, poses major economic and logistical challenges to crop production as irrigation increases salt-affected soils. However, sodium is essential for the growth, development, and maintenance of herbivores and can increase herbivore presence and potentially feeding. Herbivores likely expend less time and energy maintaining a sodium balance in high- than low-salinity conditions. Consequently, we predict that insect herbivore damage and abundance will be highest on soybean leaves grown in high-salinity conditions. Alternatively, herbivore damage may increase on low-salinity soybean leaves if herbivores compensate for sodium deficiencies by increasing their consumption of vegetative tissue. This research will determine optimal sodium conditions to minimize herbivore herbivory while maximizing soybean productivity.

Objectives 1 & 2: Fall Armyworm (FAW; *Spodoptera frugiperda*) and Soybean looper (SL; *Chrysodexis includens*) are two major herbivore pests impacting soybean yield in Arkansas. We will use laboratory experiments to determine specific sodium requirements for FAW and SL performance, impacts on soybean leaf concentrations, and how soybean sodium concentration impacts FAW and SL herbivory and growth. First, we will use laboratory feeding trials to determine optimal dietary sodium concentrations for FAW and SL. FAW and SL will be fed artificial diets across a sodium gradient based on literature values, and our previous work. Second, we will grow soybean under greenhouse conditions across a sodium gradient matching commonly encountered soil salinities. Soybean plant characteristics will be measured to determine sodium impacts on soybean productivity and leaves will be measured sodium content. Leaves will then be provided to the herbivores to measure percent leaf consumed and FAW and SL growth, development, fitness, and mortality rates. Commonly grown AR soybean varieties will be used for all the experiments.

Planned Milestones:

2023: Conduct laboratory feeding trials and greenhouse soybean growth trials (Obj. 1 and 2)

2024: In greenhouse trials, we will use three sodium concentrations representing a low, medium (optimal), and high concentration relative to FAW and SL requirements based on results from laboratory feeding trials in year 1. Soybean plants will be grown in these three sodium conditions. We will then use a factorial experiment across three densities of FAW and SL that represent a range of commonly encountered field herbivore densities and the three sodium concentrations to tease apart how soybean sodium concentration may impact herbivore behavior (i.e., increasing rates of cannibalism) and ultimately herbivory (percent leaf consumption should decrease if cannibalism increases) (Obj. 2 and 3).

2025: We will use factorial field experiments that manipulate salinity and herbivory to measure in situ herbivore and plant performance across natural and irrigation-derived salinity gradients. In unsprayed focal low-salinity soybean fields, we will augment salinity levels to match two elevated (medium, and high) sodium concentrations determine from year 1 experiments. Plants will then be subject to three treatments: herbivore removal, herbivore addition, and unmanipulated plots. From these experiments we will determine and separate the effects of sodium and herbivory on soybean yield in situ. Unmanipulated plots may reveal novel sodium x soybean food web interactions (Obj. 3).

Value to Soybean Industry: Soybean response to changes in salinity is highly variable based on varieties and few studies have examined potential interactions between salinity and herbivory. Herbivore sodium requirements far exceed that of plant requirements and herbivores concentrate sodium 10-100 times above plants levels. Nutrient shortfalls force herbivores to increase time and energy spent acquiring essential nutrients to avoid performance deficits. In this way, the nutritional disparity between consumers and their food can affect the rates of herbivory across salinity gradients. Sodium can be limiting for herbivores and their activity and abundance often increase with salinity, and it is likely there are potential interactions among salinity, plant and herbivore nutrition, and their effects on herbivore and plant fitness. Plant tissue sodium concentrations increase on saline soils and insects acquire sodium from saline environments via ingestion of salty water or salt accumulated on or in diet substrates. **This likely renders heavily irrigated soybean fields as sodium hotspots that support increased pest populations. Thus, maximizing plant health and sustainable production in agroecosystems is in part dependent on identifying salinity levels that minimize plant stress and limit herbivore performance**.

This research will generate valuable data for integrated pest management and production of soybean for Arkansas. Mitigating high-salinity soils and herbivore outbreaks is costly; by identifying the maximum sodium levels that 1) plants can tolerate while maximizing yield and 2) simultaneously constrain herbivore performance and densities below economic loss thresholds, soybean farmers can maximize cost-effective strategies for salinity and pest control. Project outcomes will be published in top-notch peer-reviewed journals, presented at national conferences, and disseminated to soybean farmers. We also plan to produce extension bulletins with recommendation for producers after years 1 and 2.

University of Arkansas System Division of Agriculture
Promotion Board Budget

Rupesh Kariyat *Predicting the impacts of herbivory across a salinity gradient in AR soybeans*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	New
Lead Investigator	Rupesh Kariyat	**Co-PI #1**	Ben Thrash
Co-PI #2	Natalie Clay	**Co-PI #3**	
Department	Entomology and Plant Pathology		
Commodity Board	Soybean Promotion Board		
Project Title	Predicting the impacts of herbivory across a salinity gradient in AR soybeans		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

	Rupesh Kariyat	Ben Thrash	Natalie Clay		Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI	AES	CES	AES				

Fulltime Personnel

Position Title	Name *(if position is filled)*	% Time	Salaries				Total	AES	CES
Graduate Student			$7,700		$7,700		$15,400	$15,400	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
Subtotal: Salaries			$7,700	$0	$7,700	$0	$15,400	$15,400	$0

Graduate Student

Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.

Name *(if position is filled)*	% Time	Wages				Total	AES Portion	CES Portion
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
Tuition		$4,700		$4,700		$9,400	$9,400	$0
Subtotal: Graduate Student		$4,700	$0	$4,700	$0	$9,400	$9,400	$0

Hourly

	Wages				Total	AES Portion	CES Portion
Hourly-Personnel		$3,000			$3,000	$0	$3,000
Hourly-Students	$1,000		$2,000		$3,000	$3,000	$0
Subtotal: Hourly	$1,000	$3,000	$2,000	$0	$6,000	$3,000	$3,000

Fringe Benefits

Fringe benefits are calculated when salary and wage amounts are entered above.

	Benefits				Total	AES Portion	CES Portion
Fulltime Personnel	$2,433	$0	$2,433	$0	$4,866	$4,866	$0
Graduate Students	$0	$0	$0	$0	$0	$0	$0
Hourly Personnel	$0	$237	$0	$0	$237	$0	$237
Hourly-Students	$7	$0	$14	$0	$21	$21	$0
Subtotal: Fringe Benefits	$2,440	$237	$2,447	$0	$5,124	$4,887	$237
Personnel Total	$15,840	$3,237	$16,847	$0	$35,924	$32,687	$3,237

Travel

Justify out-of-state travel in proposal.

	Travel				Total	AES Portion	CES Portion
In-State	$2,000		$2,000		$4,000	$4,000	$0
Out-of-State					$0	$0	$0
Travel Total	$2,000	$0	$2,000	$0	$4,000	$4,000	$0

University of Arkansas System Division of Agriculture
Promotion Board Budget

Rupesh Kariyat *Predicting the impacts of herbivory across a salinity gradient in AR soybeans*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$4,000		$2,000		$6,000	$6,000	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$4,000	$0	$2,000	$0	$6,000	$6,000	$0
	Total for Proposal	$21,840	$3,237	$20,847	$0	$45,924	$42,687	$3,237

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

		%	Rupesh Kariyat	Ben Thrash	Natalie Clay		**Total**
Ecosystems (Rice Only)	Grand Prairie	0%	$0	$0	$0	$0	$0
	Mississippi Delta		$0	$0	$0	$0	$0
	White River		$0	$0	$0	$0	$0
	Totals	0%	$0	$0	$0	$0	$0

Must match the proposal total.

Tab

Wijeratne

(37)

Arkansas Soybean Promotion Board – 2024-2025 Proposal

Title: ***Engineering Synthetic Microbiome Communities to Enhance Soybean Disease Resistance***
Lead Investigators: ***Asela J. Wijeratne***
Co-Investigators: ***Edward Brown and Scott Mangan***
Status (i.e., New, Year 2 of 3, Year 2 of 2, etc.): ***New***
Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): ***Plant Pathology***

Stated Goal: Sudden death syndrome (SDS) is a devastating fungal disease of soybean caused by *Fusarium virguliforme* and inflicts detrimental effects on both yield and quality, causing a loss of 326 million bushels (3.4 billion US dollars) to U.S. growers (Crop Protection Network). Current management strategies for SDS rely primarily on fungicides and tolerant cultivars, but effectiveness can vary depending on the specific conditions and the severity of the disease. There is growing recognition that beneficial microbes can enhance plant disease tolerance as an alternative to conventional disease management practices. In one study, SDS disease was found to be suppressed in certain soil types, likely arising from the soil microbiota[1]. Our own preliminary work found that a SDS-tolerant cultivar suppresses the pathogen growth under greenhouse conditions compared to a susceptible cultivar by recruiting beneficial microbes (Fig. 01). However, the exact identity of microbial taxa or their combinations causing SDS suppression remains unclear.

The overarching goal of our proposed research is to create Synthetic Microbial Communities (SynComs) and test their effect on suppressing SDS. SynComs are purposefully assembled groups of microbial species based on their probability for coexistence and overall net positive benefits to a host organism. Our preliminary studies have identified potential species for these communities (Fig. 01). We hypothesize that these SynComs, when combined in a specific ratio, will manage SDS more effectively and provide better protection than individual strains. This approach, which has not yet been explored, holds the potential for the development of innovative strategies for managing this devastating disease effectively.

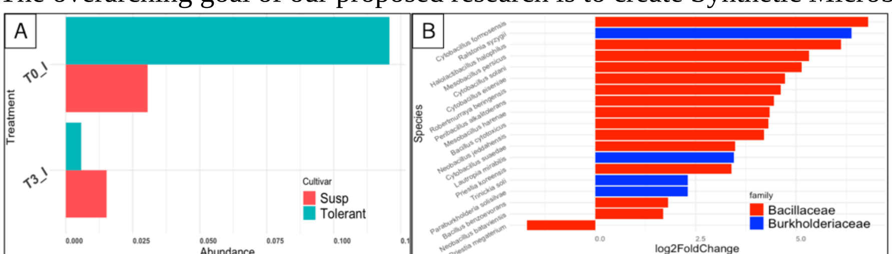

Figure 01. *A). F. virguliforme* abundance reduced faster in the SDS-tolerant cultivar from inoculation (V3: T0_I) to R6 (T3_I) stage, compared to the susceptible cultivar. *B).* The SDS-tolerant cultivar's rhizosphere, two bacterial families, Bacillaceae and Burkholderiaceae, known to boost plant health, were more prevalent than in the susceptible cultivar.

Specific Objectives: **1.** Isolate and molecularly identify bacteria from rhizosphere soil; **2.** Determine antagonistic activities of different bacterial strains against *F. virguliforme in vitro*; **3.** Construct of SynCom and determine disease resistance *in vitro*; **4.** Evaluate synthetic communities for disease resistance in greenhouse and field conditions.

Methods: **1.** For the first objective, we will plant an SDS-tolerant variety, CZ4979X (a maturity group 4.9 cultivar procured from BASF), in 40 pots. Each pot will contain five seeds, and the soil for these pots will be obtained from fields known to either suppress or not suppress SDS (Fig. 02). We will introduce the pathogen *F. virguliforme* to half of the pots for each soil type while the other half will serve as controls. We will collect soil samples around the soybean roots three weeks post-germination. We will extract DNA from a portion of the soil samples to sequence the 16S ribosomal RNA (rRNA) and estimate microbial abundance and composition of the inoculated and uninoculated rhizosphere in suppressive soils compared to non-suppressive soils. In addition, we will extract DNA from surface-sterilized root samples and assess the pathogen load in roots to evaluate the pathogen's ability to infect the roots. The second portion of the soil samples will be diluted and cultured on two selective media, tryptic soy agar (TSA) and Reasoner's 2A agar (R2A), to cater to diverse bacterial growth preferences. After incubation at room temperature, we will identify distinct bacterial colonies using PCR and specific primers. The DNA fragments obtained will be sequenced and compared with databases for species identification.

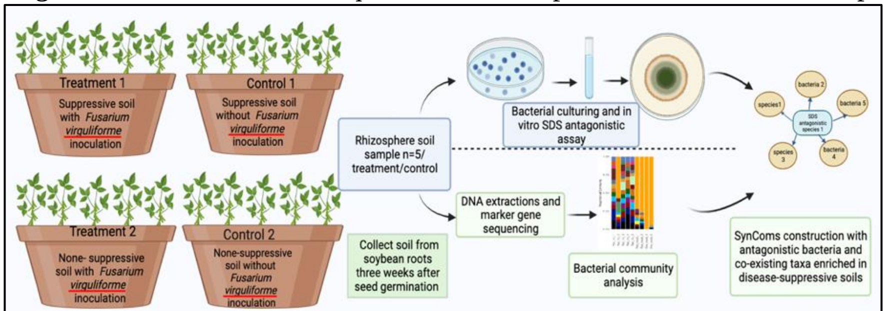

Figure 02. This schematic shows the steps of the proposed project.

2. Our second objective will test bacterial isolates' ability to fight *F. virguliforme in vitro* dual culture assays on 1/4 TSA or R2A medium. Control Petri dishes will be inoculated with pathogen-colonized agar discs. We will compare the radial growth of the pathogen in bacterial-inoculated petri dishes to control Petri dishes and calculate the percent inhibition of radial growth. Bacteria showing antagonistic activity will be used for SynCom construction.

3. For our third objective, we will create SynComs with bacterial isolates showing antagonism and their co-occurring taxa enriched in disease-suppressive soils (information derived from Objective 1 and our previous study). These combinations (SynComs) will be evaluated for their ability to suppress *F. virguliforme in vitro* using a similar approach described in Objective 2.

4. During our second year, SynComs, with the highest antagonistic activity from Objective 3 will be selected to evaluate under greenhouse and field conditions to assess their ability to suppress SDS.

Planned Milestones:

- Summer 2024: Initiate and complete Objective 1.
- Fall 2024: Initiate and complete Objective 2.
- Fall 2024 to Spring 2025: Initiate and complete Objective 3.
- Spring 2025 to Fall 2025: Initiate and complete Objective 4.

Value to Soybean Industry:

1. **Yield Loss Prevention**: SDS causes up to 40% annual yield loss (about $350 per acre). Novel approaches, such as developing effective SynComs that suppress SDS, would help prevent this loss.
2. **Delay of Symptom Development**: Given delaying symptom development by one week can save about 3.5 bushels of soybean seed per acre, a SynCom suppressing SDS could extend this delay, leading to even greater savings.
3. **Sustainable Agriculture**: SynComs has a broader impact on sustainable agriculture. They can enhance soybean growth, mobilize nutrients, and alleviate biotic and abiotic stressors. This improves yield and reduces reliance on synthetic fertilizers and pesticides, leading to cost savings and environmental benefits.

In summary, the benefits of SynComs span from immediate financial savings for growers to long-term gains in sustainability and food security.

Budget Justifications/Explanation of Travel and Direct Costs: Supplies: The request for $35,000 to cover the purchase of the following: chemicals (e.g., buffers and organic solvents, etc.), bioreagents (e.g., kit for sample preparation for high-throughput sequencing, PCR, primers, etc.), and consumables (e.g., centrifuge tubes, filter pipette tips, and gloves, culture media etc.). ABI facility user fee: $3,500 is requested to access instruments in the genomic core, high-speed centrifuges, clean bench hood, greenhouse growth chamber, etc. Travel: $1,000 is requested to travel to different fields to collect soil samples. (Total: $39,500)

Reference:

1. Srour, A. Y. *et al.* Unraveling Microbial and Edaphic Factors Affecting the Development of Sudden Death Syndrome in Soybean. *https://doi.org/10.1094/PBIOMES-02-17-0009-R* **1**, 91–101 (2017)

University of Arkansas System Division of Agriculture
Promotion Board Budget

Asela Wijeratne — *Engineering Synthetic Microbiome Communities to Enhanced Soybean Disease Resistance*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	
Lead Investigator	Asela Wijeratne	**Co-PI #1**	Scott Mangan
Co-PI #2	Edward Brown	**Co-PI #3**	
Department	XASU Experimental Station ASU		
Commodity Board	Soybean Promotion Board		
Project Title	Engineering Synthetic Microbiome Communities to Enhanced Soybean Disease Resistance		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

			Asela Wijeratne	Scott Mangan	Edward Brown		Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI									
			X	X	X				
Fulltime Personnel									
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
Subtotal: Salaries			$0	$0	$0	$0	$0	$0	$0
Graduate Student									
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Tuition					$0	$0	$0
Subtotal: Graduate Student			$0	$0	$0	$0	$0	$0	$0
Hourly									
			Wages				**Total**	**AES Portion**	**CES Portion**
Hourly-Personnel							$0	$0	$0
Hourly-Students							$0	$0	$0
Subtotal: Hourly			$0	$0	$0	$0	$0	$0	$0
Fringe Benefits									
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
Fulltime Personnel			$0	$0	$0	$0	$0	$0	$0
Graduate Students			$0	$0	$0	$0	$0	$0	$0
Hourly Personnel			$0	$0	$0	$0	$0	$0	$0
Hourly-Students			$0	$0	$0	$0	$0	$0	$0
Subtotal: Fringe Benefits			$0	$0	$0	$0	$0	$0	$0
Personnel Total			$0	$0	$0	$0	$0	$0	$0
Travel									
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
In-State					$1,000		$1,000	$0	$0
Out-of-State							$0	$0	$0
Travel Total			$0	$0	$1,000	$0	$1,000	$0	$0

University of Arkansas System Division of Agriculture
Promotion Board Budget

Asela Wijeratne — *Engineering Synthetic Microbiome Communities to Enhanced Soybean Disease Resistance*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$35,000				$35,000	$0	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs	Sequencing and ABI user fee	$3,500				$3,500	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$38,500	$0	$0	$0	$38,500	$0	$0
	Total for Proposal	$38,500	$0	$1,000	$0	$39,500	$0	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

		%	Asela Wijeratne	Scott Mangan	Edward Brown		Total	
Ecosystems (Rice Only)	Grand Prairie	0%	$0	$0	$0	$0	$0	
	Mississippi Delta		$0	$0	$0	$0	$0	
	White River		$0	$0	$0	$0	$0	
	Totals	0%	$0	$0	$0	$0	$0	*Must match the proposal total.*

Tab

Rahman (41)

Arkansas Soybean Promotion Board – 2024-2025 Proposal

Title: Screening Arkansas Soybean Cultivars for Protein Quality as a Novel Food Preservative

Lead Investigators: Mahfuzur Rahman

Co-Investigators: Caio Canella Vieira

Status (i.e., New, Year 2 of 3, Year 2 of 2, etc.): **New**

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): **Post-Harvest, Breeding**

Stated Goal:

Synthetic food preservatives are used in food processing to reduce the spoilage of food and increase the shelf life. However, the rising concerns regarding potential health risks associated with these synthetic preservatives have led consumers to exhibit hesitancy in their use. A promising solution involves the utilization of natural bioactive peptides as preservatives by preventing lipid oxidation, inhibiting pathogenic microorganism growth, and increasing the shelf life of processed foods. Genetically modified microorganisms (GMOs) have been leveraged to produce microbial peptides that serve as effective preservatives for food.

Soy protein-derived peptides have demonstrated numerous health benefits, including anti-hypertensive, anti-cancer, immunomodulatory, anti-inflammatory, cholesterol-lowering, and gut-protective effects. The utilization of these health-promoting soy protein-derived peptides to replace synthetic preservatives would be of great interest to the food processing industries. The production of these peptides from soybeans developed in Arkansas provides potential financial benefits to growers and the Arkansas soybean industry by introducing a new market for soybean-derived products. <u>Therefore, the goal of this project is to investigate the potential of utilizing the seed protein of Arkansas soybeans as a food preservative.</u>

Specific Objectives:

1. Conduct a comprehensive screening of soybean varieties to fractionate protein-derived bioactive peptides suitable for application as food preservatives.
2. Utilize fractionated peptides to enhance the shelf life of processed food by preventing lipid oxidation and inhibiting microbial growth.
3. Develop breeding materials with improved seed composition to be used as food preservatives.

Methods:

In the first year, a total of 10 high-protein soybean breeding lines will undergo thorough screening to assess their potential as food preservatives. Soybean seed protein will be extracted using established methods employed by industries. In brief, proteins will undergo alkaline extraction (pH 9.0) with isoelectric precipitation (pH 4.5). The bioactive peptides will be extracted from the protein isolates using existing industrial methods, employing enzymatic hydrolysis methods under suitable pH and temperature conditions. To evaluate the ability of the peptides to act as preservatives, the lipid and microbial growth inhibition capacities will be tested by assessing the antioxidant and antimicrobial properties of the extracted bioactive peptides. The soybean breeding lines demonstrating the best antioxidant and antimicrobial properties will be selected for comparison against synthetic preservatives in the second year.

In the second year, we will compare the potential of soy bioactive peptides with that of natural preservatives in various food products. The extracted peptides will be integrated into a liquid food (fruit juice), a viscous food (mayonnaise), and a solid food (cookies), and these formulations will be compared with synthetic preservatives (such as sodium benzoate and EDTA). Quality assessments, short-term storage studies, and accelerated shelf-life studies will be conducted to evaluate the effectiveness of peptides in comparison to chemical preservatives. We will correlate this data with breeding to develop soybean lines with optimal preservative performance.

Seed composition, including seed protein, oil, and amino acids, will be used as proxies to identify genetic resources with potential optimal preservative performance. Lines with superior preservative performance will be used as parental stocks to develop new breeding populations. Within developed populations, progenies will be screened for seed composition, and lines with desirable seed components will undergo preservative performance tests as described in Objectives 1 and 2.

Planned Milestones:

2024: Conduct experiments to isolate protein from 10 high-protein Arkansas soybean breeding lines. Fractionate bioactive peptides and analyze their quality, assessing their ability to prevent lipid oxidation and inhibit microbial growth. Initiate the development of new high-protein breeding populations.

2025: Highly functional peptides from the 2024 study will be applied as preservatives in foods and compared their shelf life to that of chemical preservatives. Publish the results in Arkansas Soybean Research Studies & and a peer-reviewed journal, and present data at national scientific meetings such as Institute Food Technologies. Communicate the outcomes to industry stakeholders, such as Solae and Kerry ingredients, who have the potential to manufacture peptides as preservatives. Continue the development and selection of high-protein breeding populations and lines, respectively.

2026: Yield test high-protein breeding lines with potential optimal preservative performance. Initiate protein isolation and peptide extraction from developed breeding lines. Validate the preservative performance of newly developed breeding lines compared with synthetic preservatives.

Value to Soybean Industry:

In 2022, the plant-based protein market was valued at $8 billion in the U.S., experiencing a 7% increase in dollar sales compared to 2021. Soybean is the major plant-based protein, and its market is anticipated to be valued at $10.5 billion in 2024, with projections to reach $13.3 billion by 2029. While soy protein is being used in food products, utilizing the same protein-derived peptides as preservatives would be of high interest to the food processing industry. Protein-derived peptides are currently available in the market and are expected to experience significant growth, rising from $2.5 million in 2023 to $4.2 million by 2033. Animal-derived proteins and microorganisms serve as the primary sources for these peptides. The identification of a new application for soy protein-derived peptides, particularly in replacing synthetic preservatives with peptides from a plant-derived source, could significantly bolster the soy protein market.

Budget Justifications/Explanation of Travel and Direct Costs:

A total of $32,956 is requested to support a graduate student and an hourly student in extracting and analyzing peptides. Additionally, $2,500 is requested for traveling to a scientific meeting to present data, and $2,500 is allocated for purchasing chemicals and supplies in PI Rahman's lab.

Furthermore, a total of $8,093 is requested to support an hourly visiting scholar in Co-PI Vieira's lab. In addition, $2,500 is requested for travel to install and conduct field experiments, and $1,500 is requested for supplies, including seed composition analysis and planting and harvesting supplies.

University of Arkansas System Division of Agriculture
Promotion Board Budget

Rahman, Mahfuzur *Screening Arkansas Soybean Cultivars for Protein Quality as a Novel Food Preservative*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	New
Lead Investigator	Rahman, Mahfuzur	**Co-PI #1**	Vieira, Caio
Co-PI #2		**Co-PI #3**	
Department	FDSC Food Science		
Commodity Board	Soybean Promotion Board		
Project Title	Screening Arkansas Soybean Cultivars for Protein Quality as a Novel Food Preservative		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

	Rahman, Mahfuzur	Vieira, Caio			Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI	AES	AES					

Fulltime Personnel

Position Title	Name *(if position is filled)*	% Time	Salaries				Total	AES	CES
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Subtotal: Salaries	$0	$0	$0	$0	$0	$0	$0

Graduate Student

Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.

Name *(if position is filled)*	% Time	Wages				Total	AES Portion	CES Portion
Graduate Student	50%	$22,000				$22,000	$22,000	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
	Tuition	$6,795				$6,795	$6,795	$0
	Subtotal: Graduate Student	$28,795	$0	$0	$0	$28,795	$28,795	$0

Hourly

	Wages				Total	AES Portion	CES Portion
Hourly-Personnel	$3,000	$7,500			$10,500	$10,500	$0
Hourly-Students					$0	$0	$0
Subtotal: Hourly	$3,000	$7,500	$0	$0	$10,500	$10,500	$0

Fringe Benefits

Fringe benefits are calculated when salary and wage amounts are entered above.

	Benefits				Total	AES Portion	CES Portion
Fulltime Personnel	$0	$0	$0	$0	$0	$0	$0
Graduate Students	$924	$0	$0	$0	$924	$924	$0
Hourly Personnel	$237	$593	$0	$0	$830	$830	$0
Hourly-Students	$0	$0	$0	$0	$0	$0	$0
Subtotal: Fringe Benefits	$1,161	$593	$0	$0	$1,754	$1,754	$0
Personnel Total	$32,956	$8,093	$0	$0	$41,049	$41,049	$0

Travel

Justify out-of-state travel in proposal.

	Travel				Total	AES Portion	CES Portion
In-State		$2,500			$2,500	$2,500	$0
Out-of-State	$2,500				$2,500	$2,500	$0
Travel Total	$2,500	$2,500	$0	$0	$5,000	$5,000	$0

University of Arkansas System Division of Agriculture
Promotion Board Budget

Rahman, Mahfuzur — *Screening Arkansas Soybean Cultivars for Protein Quality as a Novel Food Preservative*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$2,500	$1,500			$4,000	$4,000	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$2,500	$1,500	$0	$0	$4,000	$4,000	$0
	Total for Proposal	$37,956	$12,093	$0	$0	$50,049	$50,049	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

		%	Rahman, Mahfuzur	Vieira, Caio			Total	
Ecosystems (Rice Only)	Grand Prairie	0%	$0	$0	$0	$0	$0	
	Mississippi Delta		$0	$0	$0	$0	$0	
	White River		$0	$0	$0	$0	$0	
	Totals	0%	$0	$0	$0	$0	$0	***Must match the proposal total.***

Tab

Seo (45)

Arkansas Soybean Promotion Board – 2024-2025 Proposal

Title: Innovating Arkansas Soybean Utilization for Soymilk and Tofu Production

Lead Investigators: Han-Seok Seo, Professor, FDSC

Co-Investigators: Mahfuzur Rahman (Assistant Prof., FDSC), Caio Canella Vieira (Assistant Prof., CSES)

Status (i.e., New, Year 2 of 3, Year 2 of 2, etc.): New

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Post-Harvest

Stated Goal:

As global health and sustainability concerns drive the demand for plant-based proteins, soybeans emerge as a key versatile source. This proposal focuses on the development of soymilk and tofu, products with a global consumption footprint, especially in East Asian cultures. The burgeoning Asian population in the U.S. and Arkansas, coupled with a general surge in plant-based diet preferences, presents a ripe opportunity for expanding the soymilk and tofu market. Soymilk's popularity among the lactose intolerant due to its natural lactose-free properties, along with the rising vegan trend, propels the global market for these soy products. In the United States, the tofu market is estimated at $382.76 million in 2023, with projections to reach $749.15 million by 2029 [1]. This growth is reflected in the increasing adoption of tofu by restaurants and fast-food chains as a meat alternative, with an expanding range of products like flavored, marinated, and pre-seasoned tofu appealing to diverse consumer bases [1]. Notably, the current market for soymilk and tofu is not dominated by major players, indicating a significant potential for leadership through innovation. However, challenges such as off-flavors in soy-based products hinder their popularity among those unfamiliar with soybean-based meals. Understanding and addressing the factors influencing U.S. consumers' acceptance and purchase intent for soymilk and tofu is therefore imperative.

Soybeans constitute Arkansas's largest row crop, covering 3.1million acres, with the state ranking fourth nationally in soybean usage and tenth in production [2]. While most Arkansas-grown soybeans are destined for animal feed, certain cultivars hold promise for soymilk and tofu production. Despite this potential, a systematic approach to leverage Arkansas-grown soybeans for soymilk and tofu has been lacking. This initiative aims to catalyze the local soybean industry, shifting the focus toward value-added products like soymilk and tofu. Leveraging Arkansas's substantial soybean production and expertise in soybean breeding, processing, and sensory science, we aim to stimulate increased cultivation of suitable soybean varieties, thereby strengthening both the soybean and the broader soy-based industries.

Specific Objectives:

Our overarching goal is to propel the U.S. soybean industry into a leading position in the production of diverse soy-based products, with a special focus on soymilk and tofu. We are committed to establishing a viable proof of concept that utilizes Arkansas soybeans to create appealing and healthful products. By targeting specific consumer segments, we intent to maximize product acceptability and increase purchase rates. We hypothesize that strategic consumer segmentation will significantly enhance the acceptability and purchasing intent for soymilk and tofu. This project is grounded in the belief that demonstrating this through initial proof-of-principle results will gain extramural funding. Such funding is anticipated to further fuel in-depth studies, thereby refining, and expanding upon our initial research concept.

To realize these goals, we have three specific aims:

- **Aim 1: Consumer insights and acceptance** – Identify sensory and non-sensory factors that drive consumer choices and preferences for soymilk and tofu by analyzing consumer perceptions, acceptance, and purchase intentions for soymilk and tofu available in the U.S. markets.

- **Aim 2: Soybean cultivar selection** – Optimize raw material quality to ensure superior end products by evaluating and selecting Arkansas soybean cultivars that are best suited for the production of high-quality soymilk and tofu.
- **Aim 3: Product development and market analysis** – Develop value-added soymilk and tofu products utilizing selected Arkansas soybean and assess their market potential.

Methods:

The proposed project will be conducted by a multidisciplinary team. Seo (PI), a sensory and consumer scientist, will investigate sensory and non-sensory factors influencing consumer acceptance of soymilk and tofu and examine marketability of the products that will be developed in this project. Rahman (Co-PI) specializes in plant-based ingredient processing, and he will prepare soymilk and tofu samples using soybeans grown in Arkansas and analyze physicochemical and functional properties of the samples. Vieira (Co-PI), a soybean breeder, will offer and select Arkansas soybeans suitable for soymilk and tofu samples.

- **Aim 1 (Year 1):** In the first year, we will conduct comprehensive sensory analyses. This phase will involve both trained panelists and untrained consumer panelists to characterize the sensory profiles of various soymilk and tofu products commercially available in the market. We will also examine the physicochemical properties of these products. Advanced statistical analyses will be employed to integrate sensory and physicochemical data, thereby identifying key factors that influence consumer perception, acceptance, and intent to purchase.
- **Aim 2 (Year 2):** In the second year, our team will collaborate with soybean breeders to assess the sensory, physicochemical, and functional properties of soymilk and tofu made from Arkansas-grown soybeans. This comparative analysis will inform our selection of the most suitable Arkansas soybean cultivars for producing high-quality soymilk and tofu.
- **Aim 3 (Year 3):** The final year will focus on developing value-added soymilk and tofu products, building upon the insights gained from the second year. These new products will be optimized and benchmarked against existing commercial offerings, evaluating them for sensory acceptance and market potential.

Planned Milestones:

Milestones	2024 (Year 1)	2025 (Year 2)	2026 (Year 3)
Aim 1 (Testing commercially soymilk and tofu products)			
Aim 2 (Selecting Arkansas soybean cultivars)			
Aime 3 (Developing soymilk and tofu products)			
Publications and extramural grants			

Value to Soybean Industry:

The proposed project presents a significant opportunity to enhance the utilization of Arkansas's soybeans through the development of value-added soymilk and tofu products. Capitalizing on the project's outcomes, soybean breeders and key industry professionals will be equipped to innovate and introduce novel soybean varieties and groundbreaking products. This project will also make substantial contributions to the health and well-being of soy consumers in Arkansas.

Budget Justifications/Explanation of Travel and Direct Costs:

A funding request totaling $63,986 is proposed to support essential components of the project: (1) personnel: a post-doctoral associate ($10,966), a program technician ($18,862), and an hourly worker ($2,158), (2) domestic travel expenses for material collection and purchase ($1,000), (3) supplies ($11,000), and (4) other direct costs for sensory analyses ($20,000).

References

[1] Mordor Intelligence, 2023. United States tofu market size & share analysis – Growth trends & forecasts up to 2029. https://www.mordorintelligence.com/industry-reports/united-states-tofu-market

[2] Arkansas Farm Bureau, 2023. Soybeans. https://www.arfb.com/pages/arkansas-agriculture/commodity-corner/soybean/.

University of Arkansas System Division of Agriculture
Promotion Board Budget

Seo, Han-Seok — *Innovating Arkansas Soybean Utilization for Soymilk and Tofu Production*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	New
Lead Investigator	Seo, Han-Seok	**Co-PI #1**	Rahman, Mahfuzur
Co-PI #2	Vieira, Caio Canella	**Co-PI #3**	
Department	FDSC Food Science		
Commodity Board	Soybean Promotion Board		
Project Title	Innovating Arkansas Soybean Utilization for Soymilk and Tofu Production		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

			Seo, Han-Seok	**Rahman, Mahfuzur**	**Vieira, Caio Canella**		**Total Board Funding Requested**	**AES Portion**	**CES Portion**
Select "AES" or "CES" for each PI			AES	AES	AES				
Fulltime Personnel									
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
Post-Doctoral Associate		17%		$8,333			$8,333	$8,333	$0
Program Technician		30%	$14,333				$14,333	$14,333	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Subtotal: Salaries	$14,333	$8,333	$0	$0	$22,666	$22,666	$0
Graduate Student									
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Tuition					$0	$0	$0
		Subtotal: Graduate Student	$0	$0	$0	$0	$0	$0	$0
Hourly									
			Wages				**Total**	**AES Portion**	**CES Portion**
		Hourly-Personnel		$2,000			$2,000	$2,000	$0
		Hourly-Students					$0	$0	$0
		Subtotal: Hourly	$0	$2,000	$0	$0	$2,000	$2,000	$0
Fringe Benefits									
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
		Fulltime Personnel	$4,529	$2,633	$0	$0	$7,162	$7,162	$0
		Graduate Students	$0	$0	$0	$0	$0	$0	$0
		Hourly Personnel	$0	$158	$0	$0	$158	$158	$0
		Hourly-Students	$0	$0	$0	$0	$0	$0	$0
		Subtotal: Fringe Benefits	$4,529	$2,791	$0	$0	$7,320	$7,320	$0
		Personnel Total	$18,862	$13,124	$0	$0	$31,986	$31,986	$0
Travel									
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
		In-State	$500				$500	$500	$0
		Out-of-State	$500				$500	$500	$0
		Travel Tota	$1,000	$0	$0	$0	$1,000	$1,000	$0

University of Arkansas System Division of Agriculture
Promotion Board Budget

Seo, Han-Seok *Innovating Arkansas Soybean Utilization for Soymilk and Tofu Production*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$3,000	$5,000	$3,000		$11,000	$11,000	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs	Sensory analysis	$20,000				$20,000	$20,000	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesborc	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$23,000	$5,000	$3,000	$0	$31,000	$31,000	$0
	Total for Proposa	$42,862	$18,124	$3,000	$0	$63,986	$63,986	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

Ecosystems (Rice Only)		%	Seo, Han-Seok	Rahman, Mahfuzur	Vieira, Caio Canella		Total	
	Grand Prairie	0%	$0	$0	$0	$0	$0	
	Mississippi Delta		$0	$0	$0	$0	$0	
	White River		$0	$0	$0	$0	$0	
	Totals	0%	$0	$0	$0	$0	$0	*Must match the proposal total.*

Tab

Koparan
(49)

Arkansas Soybean Promotion Board – 2024-2025 Proposal

Title: Quantification of Crop Coverage and Weed Pressure for Instantaneous Variable Spraying with UAV Computer Vision

Lead Investigators: Cengiz Koparan

Co-Investigators: Jason Davis, Dongyi Wang

Status (i.e., New, Year 2 of 3, Year 2 of 2, etc.): New

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Weeds, Breeding, Post-Harvest

Stated Goal: Unmanned Aerial Vehicles (UAVs) are revolutionizing agriculture, providing valuable data for crop monitoring. Yet, challenges like data processing and post-analysis hinder their full potential. Our project will help bridge this gap by integrating computer vision with UAVs, offering real-time weed pressure assessment. Our goal is to evaluate a UAV-based computer vision system that quantifies weed pressure in soybean plots.

Specific Objectives: Weeds are unwanted plants that naturally grow in the fields and cause crop yield reduction due to competition for nutrient, water, and sunlight. Postemergence and preharvest weed management require appropriate timing because a delay in weeding may increase the weed population for the following year. Continuous use of non-residual herbicides with same sites of action encourages herbicide resistance and motivates the development of new resistant weed populations. Reducing the dependency on herbicide usage while maintaining a timely weed management practice is needed to reduce costs, minimize environmental impact, and reduce herbicide carryover. The objective of this research is to develop a subsystem for an Unmanned Aerial Vehicle (UAV) that can instantaneously adjust spray rate while measuring weed density in soybean fields. The system will determine the spray rate based on instantaneous image analysis, therefore enabling automated smart UAV sprayer control.

Methods: The UAV sprayer (DJI MG-1) has autonomous flight capabilities along with obstacle avoidance, ground distance control, 10 L of spray tank capacity, and the ability to determine spray rate based on the pre-selected area to be sprayed. Current practice by determining the spray rate before take-off based on pre-determined application area is not a variable rate spraying capability, hence the objective of this research is to expand the capabilities of the current UAV sprayers. The UAV sprayer will be used as a platform that carries the custom design Variable Rate Spraying (VRS) subsystem for proof-of-concept. The VRS subsystem will continually collect images from the established soybean research plots and calculate the spray rate based on weed pressure while the UAV flown at approximately 1 m spraying altitude (Figure 1).

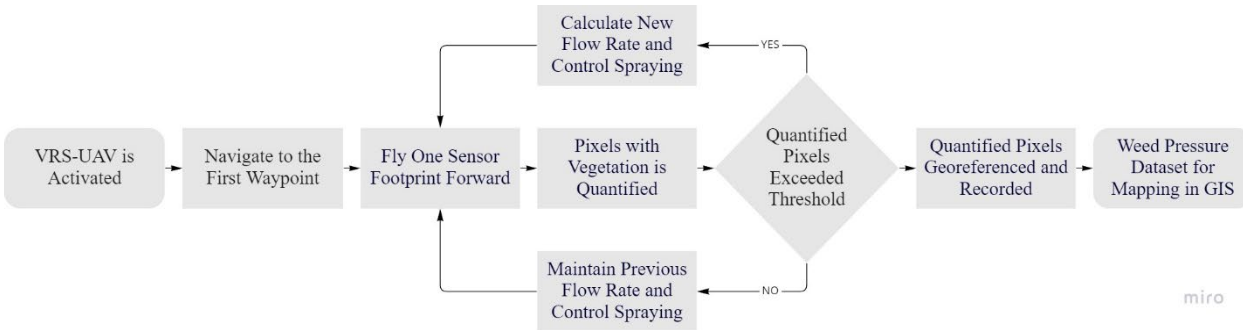

Figure 1. The flowchart of proposed image-based UAV variable rate spraying subsystem.

The UAV-VRS system will be tested indoor and outdoor over soybean planted research plots at the Arkansas Agricultural Experiment Station. System spray distribution performance evaluation will be made based on image-based droplet analysis (Zhu et al., 2011). Performance evaluation in terms of spray rate variation and water droplet distribution in an established soybean field will be made with corresponding weed pressure and variable rate application maps. Pre-classified flow rates are going to be determined by the onboard computer during a UAV spraying operation.

Planned Milestones: The proposed project will form a foundation for broader research by providing preliminary results, a better perspective and core knowledge for recent advancements in see-and-spray technology. This research will provide edge computing and machine vision algorithms for future artificial intelligence related advancement in agricultural robotics.

Value to Soybean Industry: Weed management is one of the most important agricultural practices that is crucial for crop production. Worldwide, weed competition causes severe yield reduction in wheat (23%), soybean (37%), rice (37%), maize (40%), cotton (36%), and potato (30%) (Oerke, 2006). Yearly, 50% yield loss of corn was caused by weeds that is equivalent to 148 million tons with an economic loss over $26.7 billion in North America (Soltani et al., 2016). Application of plant protection chemicals is an established agronomic procedure that cannot be abandoned for crop production, especially in mid-to-large size farms. While these chemicals are being applied at fixed rates, variable herbicide applicators are also being used in precision agriculture. Precision techniques of herbicide spraying are made based on aerial or ground remote sensing of weed intensity to optimize chemical output (Da Costa Lima & Ferreira Mendes, 2020). Chemical output optimization helps to reduce environmental and economic burdens by applying fewer chemicals where needed, in comparison to fixed rate herbicide application.

Budget Justifications/Explanation of Travel and Direct Costs: Funds will be used for two graduate student salaries that includes tuition per year. Funds will be used for out-of-state conferences, publications, and for research presentations and professional meetings including S1069 multistate research meetings. Direct expenses will include microcomputers for prototyping, sensors, and other electrical and mechanical components. The research collaborators have sprayer UAVs in the inventory.

References

Da Costa Lima, A., & Ferreira Mendes, K. (2020). Variable Rate Application of Herbicides for Weed Management in Pre- and Postemergence. In. IntechOpen. https://doi.org/10.5772/intechopen.93558

Oerke, E. C. (2006). Crop losses to pests. *The Journal of Agricultural Science*, *144*(1), 31-43. https://doi.org/10.1017/S0021859605005708

Soltani, N., Dille, J. A., Burke, I. C., Everman, W. J., VanGessel, M. J., Davis, V. M., & Sikkema, P. H. (2016). Potential Corn Yield Losses from Weeds in North America. *Weed technology*, *30*(4), 979-984. https://doi.org/10.1614/WT-D-16-00046.1

Zhu, H., Salyani, M., & Fox, R. D. (2011). A portable scanning system for evaluation of spray deposit distribution. *Computers and Electronics in Agriculture*, *76*(1), 38-43. https://doi.org/https://doi.org/10.1016/j.compag.2011.01.003

University of Arkansas System Division of Agriculture
Promotion Board Budget

Cengiz Koparan *Quantification of Crop Coverage and Weed Pressure for Instantaneous Variable Spraying with UAV Computer*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	New
Lead Investigator	Cengiz Koparan	**Co-PI #1**	Wang, Dongyi
Co-PI #2	Davis, Jason	**Co-PI #3**	
Department	Agricultural Education, Communications and Technology		
Commodity Board	Soybean Promotion Board		
Project Title	Quantification of Crop Coverage and Weed Pressure for Instantaneous Variable Spraying with UAV Computer Vision		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

			Cengiz Koparan	Wang, Dongyi	Davis, Jason		Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI			AES	AES	CES				
Fulltime Personnel									
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Subtotal: Salaries	$0	$0	$0	$0	$0	$0	$0
Graduate Student									
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
	Salary + tuituon	50%	$28,000				$28,000	$28,000	$0
	Salary + tuituon	50%	$28,000				$28,000	$28,000	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Tuition					$0	$0	$0
		Subtotal: Graduate Student	$56,000	$0	$0	$0	$56,000	$56,000	$0
Hourly									
			Wages				**Total**	**AES Portion**	**CES Portion**
		Hourly-Personnel					$0	$0	$0
		Hourly-Students	$8,000				$8,000	$8,000	$0
		Subtotal: Hourly	$8,000	$0	$0	$0	$8,000	$8,000	$0
Fringe Benefits									
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
		Fulltime Personnel	$0	$0	$0	$0	$0	$0	$0
		Graduate Students	$2,352	$0	$0	$0	$2,352	$2,352	$0
		Hourly Personnel	$0	$0	$0	$0	$0	$0	$0
		Hourly-Students	$56	$0	$0	$0	$56	$56	$0
		Subtotal: Fringe Benefits	$2,408	$0	$0	$0	$2,408	$2,408	$0
		Personnel Total	$66,408	$0	$0	$0	$66,408	$66,408	$0
Travel									
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
		In-State	$1,000				$1,000	$1,000	$0
		Out-of-State	$5,000				$5,000	$5,000	$0
		Travel Total	$6,000	$0	$0	$0	$6,000	$6,000	$0

University of Arkansas System Division of Agriculture
Promotion Board Budget

Cengiz Koparan — *Quantification of Crop Coverage and Weed Pressure for Instantaneous Variable Spraying with UAV Computer*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$6,000				$6,000	$6,000	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication	$3,000				$3,000	$3,000	$0
	Statistical Consulting	$1,000				$1,000	$1,000	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$1,190	$0	$0	$0	$1,190	$1,190	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$11,190	$0	$0	$0	$11,190	$11,190	$0
	Total for Proposal	$83,598	$0	$0	$0	$83,598	$83,598	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

		%	Cengiz Koparan	Wang, Dongyi	Davis, Jason		Total	
Ecosystems (Rice Only)	Grand Prairie	0%	$0	$0	$0	$0	$0	
	Mississippi Delta		$0	$0	$0	$0	$0	
	White River		$0	$0	$0	$0	$0	
	Totals	0%	$0	$0	$0	$0	$0	*Must match the proposal total.*

Tab

Daniels (55)

Arkansas Soybean Promotion Board – 2024-2025 Proposal

Title: The Arkansas Discovery Farm Program

Lead Investigators: Mike Daniels

Status (i.e., New, Year 2 of 3, Year 2 of 2, etc.): Year 3 of 3

Research Areas (Verification Program, General Agronomics, Diseases, Insects, Fertility, Irrigation, Weed Control, Misc. Projects): Miscellaneous Project to monitor runoff water quality on private farms to determine nutrient and sediment losses, evaluate conservation practices and verify sustainability of current production practices

Stated Goal: The overall goal of the program is to document sustainable and viable farming systems that remain cost-effective in an environmentally sound manner.

Specific Objectives: Conduct on-farm demonstration and monitoring to assess the need for and effectiveness of conservation practices.

1. Provide on-farm verification and documentation of nutrient and sediment loss reductions and water conservation in support of nutrient management planning and sound environmental farm stewardship.
2. Develop and deliver educational programs from on-farm data that will assist producers in achieving both production and environmental goals in support of sustainable farming.

Methods: The ARDF program, which presently consists of a network of 14 farms throughout Arkansas, is an effective stakeholder-driven conservation demonstration program, where extensive, state-of-the-art water quality monitoring systems are installed on private, working farms including both livestock and row-crop systems to document environmental impact and to demonstrate the potential of NRCS-approved conservation practices' on- and off-farm impacts with respect to documented water quality (Daniels et al., 2018; Daniels et al., 2019), water-use efficiency, and soil health improvements under different

Planned Milestones: Continue on-farm monitoring and data collection to document impact and sustainability as well as empower farmers to educated other farmers using data collected on their farm at field days and tours and educational meetings

Statement of Projected Value: The Discovery Farm Program (ARDF; Sharpley et al., 2015) has emerged as an important educational platform that has been successful in addressing water quality, water use efficiency, and improving soil health. The non-agricultural sector of society including lawmakers, the agricultural supply chain from consumers to large retailers continues to raise questions of natural resource conservation and sustainability as little data exists that documents agriculture's impact on the environment and natural resources. The continuation of this program is critical to helping agriculture document ecosystem services and sustainable use of natural resources and to demonstrate that agricultural producers are voluntarily and proactively addressing sustainability concerns

Budget Justifications/Explanation of Travel and Direct Costs: $): 0.5 FTE salary for Discovery Farm Technician at 0.5 * $36,000 = $18,000 at a fringe rate of 31.6% or $5688 for a total of $23688

University of Arkansas System Division of Agriculture

Promotion Board Budget

Daniels, Mike *Arkansas Discovery Farms*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	Year 3 of 3
Lead Investigator	Daniels, Mike	**Co-PI #1**	
Co-PI #2		**Co-PI #3**	
Department	CSES Crop, Soil, Environmental Science		
Commodity Board	Soybean Promotion Board		
Project Title	Arkansas Discovery Farms		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

							Total Board Funding Requested	AES Portion	CES Portion
			Daniels, Mike						
		Select "AES" or "CES" for each PI	CES						
Fulltime Personnel									
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
DF Tech	Cooper	50%	$18,000				$18,000	$0	$18,000
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Subtotal: Salaries	$18,000	$0	$0	$0	$18,000	$0	$18,000
Graduate Student									
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Tuition					$0	$0	$0
		Subtotal: Graduate Student	$0	$0	$0	$0	$0	$0	$0
Hourly									
			Wages				**Total**	**AES Portion**	**CES Portion**
		Hourly-Personnel					$0	$0	$0
		Hourly-Students					$0	$0	$0
		Subtotal: Hourly	$0	$0	$0	$0	$0	$0	$0
Fringe Benefits									
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
		Fulltime Personnel	$5,688	$0	$0	$0	$5,688	$0	$5,688
		Graduate Students	$0	$0	$0	$0	$0	$0	$0
		Hourly Personnel	$0	$0	$0	$0	$0	$0	$0
		Hourly-Students	$0	$0	$0	$0	$0	$0	$0
		Subtotal: Fringe Benefits	$5,688	$0	$0	$0	$5,688	$0	$5,688
		Personnel Total	$23,688	$0	$0	$0	$23,688	$0	$23,688
Travel									
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
		In-State					$0	$0	$0
		Out-of-State					$0	$0	$0
		Travel Total	$0	$0	$0	$0	$0	$0	$0

University of Arkansas System Division of Agriculture

Promotion Board Budget

Daniels, Mike *Arkansas Discovery Farms*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies					$0	$0	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$0	$0	$0	$0	$0	$0	$0
	Total for Proposal	$23,688	$0	$0	$0	$23,688	$0	$23,688

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

Ecosystems (Rice Only)		%	Daniels, Mike				Total	
	Grand Prairie	0%	$0	$0	$0	$0	$0	
	Mississippi Delta		$0	$0	$0	$0	$0	
	White River		$0	$0	$0	$0	$0	
	Totals	0%	$0	$0	$0	$0	$0	*Must match the proposal total.*

Tab

Littlejohn

(59)

Arkansas Soybean Promotion Board – 2024-2025 Proposal

Title: Use of gossypol to inhibit reproduction in domestic hogs as a model for feral hog control

Lead Investigator: B. P. Littlejohn

Co-Investigators: C. V. Maxwell, T. Tsai, M. A. Snider

Status: Year 2 of 3

Research Areas: Misc. Projects

Stated Goal: To evaluate the use of gossypol to inhibit reproduction in domestic hogs for development of a bait for feral hog control

Specific Objectives:

1. Using domestic hogs as a model for feral hogs, conduct a series of experiments to evaluate the use of feed containing gossypol to inhibit reproductive potential
2. Obtain input from 1) state and federal agencies and 2) collaborators in wildlife biology and population management to prepare for potential future phases of the project

Methods: *Objective 1.* Gossypol from cottonseed has been found to impede reproductive function in various species, including swine. Gossypol consumption has been associated with decreased sperm production and quality in males, suppressed fertility in females, and disruption of pregnancy leading to increased rates of abortion. Our *long-term goal* is to assess the potential for gossypol administration in the form of baiting to reduce hog populations in the state of Arkansas. As the first phase to accomplish this goal, our lab group proposes a series of trials to evaluate the use of gossypol to suppress fertility in sexually mature boars and gilts and to disrupt established pregnancies in sows. These trials will be sequential and conditional on each previous trial. Projects will be repeated and adjusted as necessary prior to starting subsequent trials to improve the effectiveness of methods. Our lab previously evaluated the use of cottonseed containing gossypol to inhibit reproductive function in domestic hogs. Based on findings from the previous studies, methods will be adjusted in the proposed study. Proposed trials will evaluate the use of purified gossypol rather than cottonseed meal. This will 1) minimize nutritional variation in research diets due to varying amounts of cottonseed and 2) minimize cottonseed batch variation, providing a more consistent product that can be used to develop a concentrated commercial product. All diets will be developed and evaluated for palatability. A pilot study will evaluate optimal gossypol concentrations and maximum tolerance. Sexually mature boars (n = 45) will be fed diets containing varying concentrations of gossypol or no gossypol for 30 days. Semen will be collected on a weekly basis during and following the feeding period to determine how quickly and how long gossypol might elicit effects. Libido will be simultaneously evaluated. Pending the need for study repetition and results from the boar trial, adjustments will be made to the experimental design and sexually mature gilts (n = 45) will be fed diets containing gossypol or no gossypol for 30 days (or as appropriately adjusted). Gilts will subsequently be bred to assess reproductive potential. Estrus expression, pregnancy rates, number of cycles to conceive, litter size, offspring survival, and postnatal offspring growth and viability will be assessed. Pending the need for study repetition and the effectiveness of gossypol to inhibit fertility in sexually mature boars and gilts, a third trial will be conducted as the project timeline allows to evaluate the use of gossypol to disrupt gestation. Pregnant females (n = 15) will be fed gossypol or no gossypol for 30 days (or as appropriately adjusted) during early gestation. Abortion rate, litter size, offspring survival, and postnatal offspring growth and viability will be assessed.

Objective 2. Historically, toxicants as methods of feral swine control have not been well accepted by the public and regulatory agencies of the state of Arkansas. In the event gossypol proves to be a viable method to reduce populations of feral hogs, it is essential to have support from state and federal regulatory agencies. Our lab group will seek constructive input from these entities throughout the research process. It is important to note that *Objective 1*, seeks to establish the *proof-of-concept phase* of this project. In the event, *Objective 1* supports the use of gossypol as a viable method of reproductive control in domestic hogs, future phases will be conducted in the field with established collaborators in wildlife biology and population management. Our lab group has recently established working relationships with these collaborators and with the Arkansas Feral Hog Eradication Task Force, all of whom have agreed to be involved and provide input moving forward. Early input from collaborators in wildlife biology and population management will increase the potential for our methods to translate to field conditions, and early input from the Arkansas Feral Hog Eradication Task Force will help us ensure there is a place for such a product in the state of Arkansas.

Planned Milestones: It is anticipated that the proposed project will take up to 3 years to complete. In line with *Objective 1*, a postdoctoral associate has been hired (to be partially funded by this grant). This postdoctoral associate was selected rather than a graduate student due to current availability and needs of the project. Collaborators have met and initiated plans for development of treatment rations and an initial pilot study. A total of 20 boars have been secured as test subjects for the pilot study. Additionally, working relationships for *Objective 2* with state and federal agencies and collaborators in wildlife biology and population management have been established and are continuing to be maintained. Year 2 will primarily focus on conducting the aforementioned pilot study to determine appropriate concentrations of gossypol related to both animal tolerance and effectiveness. The pilot study will evaluate the influence of gossypol on health, behavior, and semen quality. If semen quality is negatively impacted, sampling will continue past the conclusion of the treatment period to determine the duration of treatment effectiveness and long-term impacts on fertility. As stated above, trials conducted in years 2 and 3 will be sequential and conditional on each previous trial. Trials will be repeated and adjusted as necessary prior to starting subsequent trials to improve the effectiveness of methods. Ongoing results will be reported to the Arkansas Soybean Promotion Board on a regular basis.

Value to Soybean Industry: Feral swine are an invasive species reported in at least 35 states in the U.S., a range that has continuously expanded over the past decades. Total estimated damages to crops, habitat, and private property is valued at over 1.5 billion dollars per year in the U.S., and total estimated damage and loss of crops in the state of Arkansas is valued at over 20 million dollars per year. There is an estimated feral hog population of 200,000 head in Arkansas, and the state would need to eliminate around 70% of population (140,000 head) each year to halt population growth. Hunting, trapping, and shooting are common control practices, but are not effective enough to control the population of feral hogs. It is also important to note that currently, Arkansas law only allows poison bait for rodent control. Furthermore, it is imperative that control measures not cause harm to humans, other wildlife, or scavengers. Gossypol is an orally active polyphenolic compound naturally found in cottonseed that has been found to inhibit male reproduction in various species including humans.

Budget Justifications/Explanation of Travel and Direct Costs: The budget for year 2 of the proposed 3-year study includes funds to support salary and benefits for a postdoctoral associate to assist in conducting the proposed research. In state and out of state travel will be necessary for *Objective 2* to maintain communication with state and federal agencies and collaborators in wildlife biology and population management. Out of state travel will also include travel to professional meetings to disseminate research results. Maintenance and operations costs will include cost of animals, feed, sampling supplies, laboratory supplies, feed analyses, semen analyses, and laboratory analyses. Pending the need for study replication, the 3-year study is estimated to require up to 250 hogs at an estimated cost of $220 per animal in feed and maintenance costs.

University of Arkansas System Division of Agriculture
Promotion Board Budget

Brittni P. Littlejohn *Use of gossypol to inhibit reproduction in domestic hogs as a model for feral hog control*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	Year 2 of 3
Lead Investigator	Brittni P. Littlejohn	**Co-PI #1**	Charles V. Maxwell
Co-PI #2	Tsungcheng Tsai	**Co-PI #3**	Miriam A. Snider
Department	Department of Animal Science		
Commodity Board	Soybean Promotion Board		
Project Title	Use of gossypol to inhibit reproduction in domestic hogs as a model for feral hog control		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

			Brittni P. Littlejohn	Charles V. Maxwell	Tsungcheng Tsai	Miriam A. Snider	Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI			AES	AES	AES	AES			
Fulltime Personnel									
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
Postdoctoral Associa	Miriam A. Snider	100%	$26,000				$26,000	$26,000	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Subtotal: Salaries	$26,000	$0	$0	$0	$26,000	$26,000	$0
Graduate Student									
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Tuition					$0	$0	$0
		Subtotal: Graduate Student	$0	$0	$0	$0	$0	$0	$0
Hourly									
			Wages				**Total**	**AES Portion**	**CES Portion**
		Hourly-Personnel					$0	$0	$0
		Hourly-Students					$0	$0	$0
		Subtotal: Hourly	$0	$0	$0	$0	$0	$0	$0
Fringe Benefits									
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
		Fulltime Personnel	$8,216	$0	$0	$0	$8,216	$8,216	$0
		Graduate Students	$0	$0	$0	$0	$0	$0	$0
		Hourly Personnel	$0	$0	$0	$0	$0	$0	$0
		Hourly-Students	$0	$0	$0	$0	$0	$0	$0
		Subtotal: Fringe Benefits	$8,216	$0	$0	$0	$8,216	$8,216	$0
		Personnel Total	$34,216	$0	$0	$0	$34,216	$34,216	$0
Travel									
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
		In-State	$400				$400	$400	$0
		Out-of-State	$400				$400	$400	$0
		Travel Total	$800	$0	$0	$0	$800	$800	$0

University of Arkansas System Division of Agriculture
Promotion Board Budget

Brittni P. Littlejohn — *Use of gossypol to inhibit reproduction in domestic hogs as a model for feral hog control*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$8,000				$8,000	$8,000	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs	Animal Use and Lab Analyses	$17,000				$17,000	$17,000	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$25,000	$0	$0	$0	$25,000	$25,000	$0
	Total for Proposal	$60,016	$0	$0	$0	$60,016	$60,016	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

		%	Brittni P. Littlejohn	Charles V. Maxwell	Tsungcheng Tsai	Miriam A. Snider	**Total**	
Ecosystems (Rice Only)	Grand Prairie	0%	$0	$0	$0	$0	$0	
	Mississippi Delta		$0	$0	$0	$0	$0	
	White River		$0	$0	$0	$0	$0	
	Totals	0%	$0	$0	$0	$0	$0	*Must match the proposal total.*

Tab

Ross (63)

Arkansas Soybean Promotion Board – 2024-2025 Proposal

Title: Investigating Emerging Production Recommendations for Sustainable Soybean Production

Lead Investigators: Jeremy Ross

Co-Investigators: **:** Ben Thrash and other select Extension Soybean Commodity Committee Members

Status (i.e., New, Year 2 of 3, Year 2 of 2, etc.): Year 2 of 3

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Agronomy

Stated Goal: To investigate new and untested management inputs to improve soybean production, maximize grain yield, and maintain seed quality

Specific Objectives:

1. Continue to initiate test demonstrations for controlling economically damaging insect pests that often impact the Early Soybean Production System. These pest complexes include Dectes Stem Borer, Grape Colaspis, Thirps, Potato Leaf Hopper, Soybean Looper, and Stink Bug.
2. Evaluate performance of soybean varieties of different herbicide technologies including Xtend, Enlist, and XtendFlex.
3. Investigate seeding rate and seed treatment interactions of soybean under a wide range of geographic regions and soil textures under different irrigation treatments. Research test will also examine the best replant options for soybean with and without seed treatments.
4. Examine the potential of using new and innovative production factors, and how they influence soybean yields and profitability. Detail research is needed to advise producers in the use of plant growth regulators, alterative fertilizer sources and other soybean production inputs currently not being tested in Arkansas for soybean production sustainability.

Methods:

1. Replicated research trials will be established to evaluate the performance of soybean varieties of the different herbicide technologies compared to popular varieties. These tests will consist of MG IV and MG V varieties at two locations. Measurements will include grain yield, lodging, shatter, and canopy structure.
2. Replicated research trials will be established to investigate the profitability of foliar applications of plant growth regulators, fertilizers, and fungicides to determine their impact on soybean yield and plant health. These data will be used in production meetings and production newsletters to either validate or refute the claims made by the manufacturer.
3. Initiate preliminary studies to determine the impact of insect pest in GMO and conventional production systems. Attempts will be made to expedite sweep sampling evaluation of various pest measures for improved pest management strategies. Additional trials evaluating new and existing insecticides and seed treatments will also be initiated. Trials evaluating the possible interaction between insecticides and commonly used herbicides will also be conducted.

Planned Milestones:

1. Research identifying the most profitable recommendations to be used for all Soybean Production System will be implemented in 2021. These research objectives are to identify

the most productive and most profitable planting date, seeding rate, and row spacing for MG IV and MG V production systems.

2. Evaluate pest management strategies to ensure economic thresholds are established for identifiable pests regardless of sampling technique. Conduct numerous on-farm insecticide/seed treatment evaluations to determine appropriate insecticides for Arkansas soybean pests.

Value to Soybean Industry: Each year Arkansas soybean producers are encouraged by industry to implement new and often untested management inputs to improve soybean production. Many of these inputs are termed by the soybean community as “snake oils” while others may be production practices and are rarely tested under controlled non-biased research trials in order to determine their effectiveness. Many reasons exist for not conducting these trials. A major reason is that some industry members do not want to invest in this testing, but rather use these funds in advertising and marketing of their products. The lack of an effective testing program for these materials can lead to continued use of these products often based simply on “word of mouth” or observations by the manufacturer. The use of these products is often encouraged by the apparent low costs. Producers often comment that “…its only $2 an acre…” and can rarely document a yield benefit. This industry has the potential of costing the Arkansas soybean producers million of dollars each year without accurate research trials to support or refute the use of these products or practices.

Budget Justifications/Explanation of Travel and Direct Costs: Out-of-state travel will be used to attend, participate and present research data at regional and national meetings such as the ASA Annual Meeting, Tri-State Soybean Forum, and Commodity Classic. Monies in this budget category will be used to pay in part for the service contracts on research equipment, maintenance and repair cost of research equipment, and GPS subscriptions.

University of Arkansas System Division of Agriculture
Promotion Board Budget

Ross, Jeremy — *Investigating Emerging Production Recommendations for Sustainable Soybean Production*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	Year 2 of 3
Lead Investigator	Ross, Jeremy	**Co-PI #1**	Thrash, Ben
Co-PI #2		**Co-PI #3**	
Department	CSES Crop, Soil, Environmental Science		
Commodity Board	Soybean Promotion Board		
Project Title	Investigating Emerging Production Recommendations for Sustainable Soybean Production		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

	Ross, Jeremy	Thrash, Ben			Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI	CES	CES					

Fulltime Personnel

Position Title	Name *(if position is filled)*	% Time	Salaries				Total	AES	CES
Program Tech	Rollins Elam	40%	$16,400				$16,400	$0	$16,400
Program Assoc.	Randy Miller	40%	$23,543				$23,543	$0	$23,543
Program Assoc.	Nathan Pearrow	40%	$26,910				$26,910	$0	$26,910
Program Assoc.	Lauren Amos	40%		$17,950			$17,950	$0	$17,950
Program Assoc.	Andrew Plummer	30%		$15,500			$15,500	$0	$15,500
		Subtotal: Salaries	$66,853	$33,450	$0	$0	$100,303	$0	$100,303

Graduate Student

Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.

Name *(if position is filled)*	% Time	Wages				Total	AES Portion	CES Portion
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
	Tuition					$0	$0	$0
	Subtotal: Graduate Student	$0	$0	$0	$0	$0	$0	$0

Hourly

	Wages				Total	AES Portion	CES Portion
Hourly-Personnel	$12,000	$3,500			$15,500	$0	$15,500
Hourly-Students					$0	$0	$0
Subtotal: Hourly	$12,000	$3,500	$0	$0	$15,500	$0	$15,500

Fringe Benefits

Fringe benefits are calculated when salary and wage amounts are entered above.

	Benefits				Total	AES Portion	CES Portion
Fulltime Personnel	$21,126	$10,570	$0	$0	$31,696	$0	$31,696
Graduate Students	$0	$0	$0	$0	$0	$0	$0
Hourly Personnel	$948	$277	$0	$0	$1,225	$0	$1,225
Hourly-Students	$0	$0	$0	$0	$0	$0	$0
Subtotal: Fringe Benefits	$22,074	$10,847	$0	$0	$32,920	$0	$32,920
Personnel Total	$100,927	$47,797	$0	$0	$148,723	$0	$148,723

Travel

Justify out-of-state travel in proposal.

	Travel				Total	AES Portion	CES Portion
In-State	$10,000				$10,000	$0	$10,000
Out-of-State	$2,500				$2,500	$0	$2,500
Travel Total	$12,500	$0	$0	$0	$12,500	$0	$12,500

University of Arkansas System Division of Agriculture
Promotion Board Budget

Ross, Jeremy *Investigating Emerging Production Recommendations for Sustainable Soybean Production*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$7,500				$7,500	$0	$7,500
	Fertilizer/Chemicals	$2,500				$2,500	$0	$2,500
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs	Service Contract/Equipment Re	$30,000				$30,000	$0	$30,000
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$15,750	$0	$0	$0	$15,750	$0	$15,750
	PTST, Colt	$4,305	$0	$0	$0	$4,305	$0	$4,305
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$60,055	$0	$0	$0	$60,055	$0	$60,055
	Total for Proposal	$173,482	$47,797	$0	$0	$221,278	$0	$221,278

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

		%	Ross, Jeremy	Thrash, Ben			Total
Ecosystems (Rice Only)	Grand Prairie	0%	$0	$0	$0	$0	$0
	Mississippi Delta		$0	$0	$0	$0	$0
	White River		$0	$0	$0	$0	$0
	Totals	0%	$0	$0	$0	$0	$0

Must match the proposal total.

Tab

Ross (67)

Arkansas Soybean Promotion Board – 2024-2025 Proposal

Title: Improving Technology Transfer for Profitable and Sustainable Soybean Production

Lead Investigators: Jeremy Ross

Co-Investigators: Jason Norsworthy

Status (i.e., New, Year 2 of 3, Year 2 of 2, etc.): Year 2 of 3

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Alternative

Stated Goal: To ensure that improved production practices for soybean production in Arkansas are distributed in a timely manner

Specific Objectives:

1. To ensure timely development and distribution of the Soybean Update publications as well as update computer assisted variety selection program.
2. To improve the rate of technology transfer and adaption by the implementation of educational programs that impart critical decision-making information at advisory and producer level for improved profitability for sustainable soybean production systems (non-irrigated and irrigated), including the use of weekly electronic soybean reports (e-mail and blog) and timely newsletters such as Arkansas Weekly Soybean Report.
3. Continue to coordinate state and regional meetings to facilitate the latest soybean production updates. These will include the Arkansas Soybean Research Summit, Tri-State Soybean Forum, as well as other events deemed necessary by emerging production problems.
4. To increase the awareness of county extension agents, consultants, agribusiness representatives, concerned producers of the status, direction, and value of current soybean research and Extension efforts.
5. Publication of the Soybean Research Series, which will be an on-line archive of yearly reports of the projects funded by the Arkansas Soybean Promotion Board.

Methods:

1. Procure personnel and equipment to develop and disseminate the *Arkansas Soybean Update* and the new variety selection website by December each year.
2. Assist with development of the *Arkansas Row Crops Blog*, *Arkansas Weekly Soybean Report*, and *Soybean Notes* newsletters, and other educational materials including slide sets, fact sheets, and other related soybean production materials for county Extension agents, consultants and producers.
3. Organize State and/or regional SRVP/Technology Transfer, country tours and production clinics to evaluate Soybean Research Verification Program fields, Extension demonstrations and innovative producer successes.
4. Assist with the organization of in-depth educational meetings such as the Arkansas Soybean/Corn Research Conference, Tri-State Soybean Forum, and short courses, seminars at county, area or statewide meetings.
5. PI's with projects funded by the Arkansas Soybean Promotion Board will submit articles to be reviewed and published in the Soybean Research Series. These articles will serve as yearly reports to the Arkansas Soybean Promotion Board.

Planned Milestones:

1. Development and dissemination of the *Arkansas Soybean Update* by December 2023.
2. Update and dissemination of the new variety selection website to assist soybean growers with variety selection program by December 2024.
3. Develop and disseminate the Arkansas Weekly Soybean Report, Soybean Notes, and Weekly Blog Post weekly throughout the 2024 production season.
4. Assist with County Extension Agents and Agricultural Experiment Stations to provide soybean production updates, field days, and other methods of information delivery for critical production solutions throughout the 2024 production season.
5. Publish articles in the 2023 Soybean Research Series by November 2024.

Value to Soybean Industry: In 2023, the University of Arkansas, Division of Agriculture tested over 155 different soybean cultivars in the Commercial Cultivar Test. At last count, ten soybean seed companies were either headquartered or had an invested interest in Arkansas. Each of these different companies attempt to gain their market share of the estimated 3 plus million acres each year. Due to the large economic investment and critical nature of soybean variety selection, producers need a method to compare these cultivars in a way to ensure maximum production with little risk to pests such as soybean diseases and nematodes.

The Soybean Update publications, as well as a new variety selection website, are readily accepted as a means to help producers with these decisions. Each of these reports provide a summary of yields, disease ratings, nematode evaluations, and other agronomic information for those varieties tested in Arkansas for at least two years. This is evident in the dissemination each year. Historically, these publications have been distributed to over 9,000 clientele each year through the County Extension offices throughout the State. In addition, the new soybean variety selection website will be accessed by a least 1,000 clientele annually. While the success of each of these is obvious, the timeliness of producing and disseminating these materials needs to be more efficient.

Budget Justifications/Explanation of Travel and Direct Costs: $3,500 for equipment for producing and filming podcast and virtual meetings; $1,000 for software.

University of Arkansas System Division of Agriculture
Promotion Board Budget

Ross, Jeremy *Improving Technology Transfer for Profitable and Sustainalbe Soybean Produciton*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	Year 2 of 3
Lead Investigator	Ross, Jeremy	**Co-PI #1**	Norsworthy, Jason
Co-PI #2		**Co-PI #3**	
Department	CSES Crop, Soil, Environmental Science		
Commodity Board	Soybean Promotion Board		
Project Title	Improving Technology Transfer for Profitable and Sustainalbe Soybean Produciton		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

			Ross, Jeremy	**Norsworthy, Jason**			**Total Board Funding Requested**	**AES Portion**	**CES Portion**
		Select "AES" or "CES" for each PI	CES	AES					
Fulltime Personnel									
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
Program Assoc.	Randy Miller	10%	$5,886				$5,886	$0	$5,886
Program Tech.	Rollins Elam	10%	$4,100				$4,100	$0	$4,100
Program Assoc.	Amy Tallent	50%	$32,500				$32,500	$0	$32,500
							$0	$0	$0
							$0	$0	$0
		Subtotal: Salaries	$42,486	$0	$0	$0	$42,486	$0	$42,486
Graduate Student									
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Tuition					$0	$0	$0
		Subtotal: Graduate Student	$0	$0	$0	$0	$0	$0	$0
Hourly									
			Wages				**Total**	**AES Portion**	**CES Portion**
		Hourly-Personnel		$5,500			$5,500	$5,500	$0
		Hourly-Students					$0	$0	$0
		Subtotal: Hourly	$0	$5,500	$0	$0	$5,500	$5,500	$0
Fringe Benefits									
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
		Fulltime Personnel	$13,426	$0	$0	$0	$13,426	$0	$13,426
		Graduate Students	$0	$0	$0	$0	$0	$0	$0
		Hourly Personnel	$0	$435	$0	$0	$435	$435	$0
		Hourly-Students	$0	$0	$0	$0	$0	$0	$0
		Subtotal: Fringe Benefits	$13,426	$435	$0	$0	$13,860	$435	$13,426
		Personnel Total	$55,912	$5,935	$0	$0	$61,846	$5,935	$55,912
Travel									
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
		In-State	$5,000				$5,000	$0	$5,000
		Out-of-State					$0	$0	$0
		Travel Total	$5,000	$0	$0	$0	$5,000	$0	$5,000

University of Arkansas System Division of Agriculture
Promotion Board Budget

Ross, Jeremy *Improving Technology Transfer for Profitable and Sustainalbe Soybean Produciton*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$4,000				$4,000	$0	$4,000
	Fertilizer/Chemicals					$0	$0	$0
	Publication	$2,500				$2,500	$0	$2,500
	Statistical Consulting					$0	$0	$0
Other Direct Costs		$4,500				$4,500	$0	$4,500
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$11,000	$0	$0	$0	$11,000	$0	$11,000
	Total for Proposal	$71,912	$5,935	$0	$0	$77,846	$5,935	$71,912

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

Ecosystems (Rice Only)		%	Ross, Jeremy	Norsworthy, Jason			Total	
	Grand Prairie	0%	$0	$0	$0	$0	$0	
	Mississippi Delta		$0	$0	$0	$0	$0	
	White River		$0	$0	$0	$0	$0	
	Totals	0%	$0	$0	$0	$0	$0	*Must match the proposal total.*

Tab

Ross (71)

Arkansas Soybean Promotion Board – 2024-2025 Proposal

Title: Science for Success – Arkansas Support for National Soybean Research and Extension Program

Lead Investigators: Jeremy Ross

Co-Investigators:

Status (i.e., New, Year 2 of 3, Year 2 of 2, etc.): Year 2 of 3

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Agronomy

Stated Goal: Participate in the Science for Success program by conducting soybean production research and contributing to educational materials that will be distributed at the local, regional, and national level.

Specific Objectives: With this project, we will be able to develop and distribute research-based information to soybean farmers in Arkansas and across the U.S. on emerging best management practices (BMP's). We will contribute to the Science for Success program by expanding previously successful efforts with the continued development of soybean BMP's through both the effective summarization of existing data and the generation of new data driven information that will allow soybean farmers to increase revenue and invest in sustainable on-farm practices.

Methods:

1. Participate in national soybean research protocols to contribute data for BMP's.
2. Contribute data and expertise for Extension publications, social media releases, videos, and webinars to deliver BMP's at the local, regional, and national level.
3. Attend and participate in Science for Success virtual and in-person meetings to develop common-theme localized research efforts, Extension educational materials, and team-building activities.

Planned Milestones:

1. Conduct in-field soybean research trials to generate data for BMP's (National Biological Product Study; National N and S Study; etc.)
2. Participate in monthly Science for Success virtual meetings, attend and participate in three in-person Science for Success meeting during the year, and attend and contribute to one in-person Extension educational materials meeting in August 2023.
3. Contribute to social media outreach through posting field observations during the growing season and contributing short videos of Science for Success content.

Value to Soybean Industry: The Science for Success program is a collaborative team of Extension personnel from diverse soybean growing regions across the U.S. Individuals within this group are using grants like this one to leverage funding and support from local QSSB's to conduct the needed research to generate soybean BMP's. Through this group, we can generate research data across diverse environments in a shorter timeframe than would be possible from a single state or regional program. Since the inception of the Science for Success program, this group has generated national data that has contributed to educational materials on foliar nutrient products and additional sulfur fertility of soybean. We have also developed national publication from existing knowledge and data generated from local QSSB funding on management decisions across growth stages, soybean planting dates, soybean seeding rates, and optimal row spacing for soybean production. Research data and Extension publications are available on multiple platforms including individual state websites, the Soybean Research and Information

Network and the Crop Protection Network. Research data and Extension educational materials generated from this project will benefit soybean growers from Arkansas to the national level.

Budget Justifications/Explanation of Travel and Direct Costs: The $10,000 in in-state travel will be used to travel to research locations throughout the growing season to conduct the needed research; the $5,000 in out-of-state travel will be used to attend meetings where Extension publications will be generated and discussion of research topics

University of Arkansas System Division of Agriculture
Promotion Board Budget

Ross, Jeremy *Science for Success - Arkansas Support for National Soybean Research and Extension Program*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	Year 2 of 3
Lead Investigator	Ross, Jeremy	**Co-PI #1**	
Co-PI #2		**Co-PI #3**	
Department	CSES Crop, Soil, Environmental Science		
Commodity Board	Soybean Promotion Board		
Project Title	Science for Success - Arkansas Support for National Soybean Research and Extension Program		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

			Ross, Jeremy				Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI			CES						
Fulltime Personnel									
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
Program Assoc.	Randy Miller	30%	$17,657				$17,657	$0	$17,657
Program Tech	Rollins Elam	30%	$12,300				$12,300	$0	$12,300
Program Assoc.	Amy Tallent	50%	$32,500				$32,500	$0	$32,500
							$0	$0	$0
							$0	$0	$0
		Subtotal: Salaries	$62,457	$0	$0	$0	$62,457	$0	$62,457
Graduate Student									
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Tuition					$0	$0	$0
		Subtotal: Graduate Student	$0	$0	$0	$0	$0	$0	$0
Hourly									
			Wages				**Total**	**AES Portion**	**CES Portion**
		Hourly-Personnel	$5,000				$5,000	$0	$5,000
		Hourly-Students					$0	$0	$0
		Subtotal: Hourly	$5,000	$0	$0	$0	$5,000	$0	$5,000
Fringe Benefits									
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
		Fulltime Personnel	$19,736	$0	$0	$0	$19,736	$0	$19,736
		Graduate Students	$0	$0	$0	$0	$0	$0	$0
		Hourly Personnel	$395	$0	$0	$0	$395	$0	$395
		Hourly-Students	$0	$0	$0	$0	$0	$0	$0
		Subtotal: Fringe Benefits	$20,131	$0	$0	$0	$20,131	$0	$20,131
		Personnel Total	$87,588	$0	$0	$0	$87,588	$0	$87,588
Travel									
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
		In-State	$10,000				$10,000	$0	$10,000
		Out-of-State	$5,000				$5,000	$0	$5,000
		Travel Total	$15,000	$0	$0	$0	$15,000	$0	$15,000

University of Arkansas System Division of Agriculture
Promotion Board Budget

Ross, Jeremy *Science for Success - Arkansas Support for National Soybean Research and Extension Program*

	Maintenance & Operations						
	M&O				Total	AES Portion	CES Portion
Supplies	$7,000				$7,000	$0	$7,000
Fertilizer/Chemicals	$2,500				$2,500	$0	$2,500
Publication					$0	$0	$0
Statistical Consulting					$0	$0	$0
Other Direct Costs					$0	$0	$0
Station Maintenance SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
Jackson County Ext. Center	$2,700	$0	$0	$0	$2,700	$0	$2,700
PTST, Colt	$2,700	$0	$0	$0	$2,700	$0	$2,700
RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
Rosen Center	$0	$0	$0	$0	$0	$0	$0
SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
M & O Total	$14,900	$0	$0	$0	$14,900	$0	$14,900
Total for Proposal	$117,488	$0	$0	$0	$117,488	$0	$117,488

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

Ecosystems (Rice Only)	%	Ross, Jeremy				Total	
Grand Prairie	0%	$0	$0	$0	$0	$0	
Mississippi Delta		$0	$0	$0	$0	$0	
White River		$0	$0	$0	$0	$0	
Totals	0%	$0	$0	$0	$0	$0	*Must match the proposal total.*

Tab
Carlin (75)

Arkansas Soybean Promotion Board – 2024-2025 Proposal

Title: Arkansas Soybean Performance Trials

Lead Investigators: John Carlin

Co-Investigators:

Status (i.e., New, Year 2 of 3, Year 2 of 2, etc.): Year 2 of 3

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Agronomy

Stated Goal: To provide unbiased soybean variety performance data to Arkansas Soybean Producers and, regional, national, and international seed companies for use in marketing, variety placement, and variety selection.

Specific Objectives:

1. To evaluate the performance of soybean varieties and breeding lines across eight locations within the State of Arkansas
2. To enable abiotic (chloride and metribuzin) and biotic (disease screening) screening of the varieties by collaborating PIs.
3. To evaluate the performance of soybean varieties and breeding lines under flooded conditions across three locations within the State of Arkansas

Methods:

The Arkansas Soybean Performance Tests are conducted at the Northeast Research and Extension Center (NEREC) at Keiser, the Vegetable Research Station (VRS) near Kibler, the Lon Mann Cotton Research Station (LMCRS) near Marianna, the Jackson County Extension Center (JCEC) near Newport, the Pine Tree Research Station (PTRS) near Colt, the Rohwer Research Station (RRS) near Rohwer, and the Rice Research and Extension Center (RREC) near Stuttgart.

To facilitate field operations and to allow for fairer comparisons between varieties and strains, entries are divided into three maturity ranges based on information provided by the originating company or institution; they are RM 4.0–4.4, RM 4.5–4.9, and RM 5.0–5.9. Within each test, entries are arranged as a randomized complete block design with three replications. Plots in all tests are 2 or 4 rows wide depending on location and 20–21 feet in length. Seeds are packaged for recommended planting rates and will planted with a cone or vacuum research plot planter.

To facilitate field operations and to allow for comparisons between varieties and strains under flooded conditions, entries are divided into two maturity ranges based on information provided by the originating company or institution; they are RM 4.0–4.9, and RM 4.5–4.9, and RM 5.0–5.9. Within each test, entries are arranged as a split-split-plot design with three replications. Plots in all tests are 4 rows wide and 20–21 feet in length. Flood stress is applied at the V2-V3 growth stage, by pulling a levee around each block and filling randomly assigned bays with irrigation water until then tops of the beds are covered with approximately 1 inch of water. Water is maintained for 5-7 days after which normal irrigation resumes.

Plots are managed with location specific cultural practices to ensure quality and uniformity. During the growing season flower and pubescence color will be collected and compared against provided phenotypic data. Prior to harvest plots will be visually rated for shattering and lodging. Shattering ratings will be carried out using the following scale: 1. no shattering 2. 1–3% shattered 3. 4–8% shattered 4. 9–19% shattered 5. 20% or more shattered Lodging ratings will be recorded on a scale from 1 to 5 based on the following criteria: 1. Almost all plants erect. 2. Either all plants leaning slightly or a few plants down. 3. Either all plants leaning moderately, or 25–50% of the plants down. 4. Either all plants leaning considerably, or 50-80% of the plants down. 5. All plants down badly. Average plant height will be recorded in inches for each plot in the first replication of each test.

The two interior rows of each 4-row plot or the entirety of 2-row plots will be harvested for yield determination. Percent moisture will be recorded for all harvested seed, and plot weights were adjusted to 13% moisture. Plot weights of all tests will then be converted to yield in bushels per acre (bu./ac). Statistical analysis for grain yield (bu./ac) will be conducted using Duncan's Multiple Range Test (MRT) with GENOVIX® (AGRONOMIX Software).

Planned Milestones:

<u>Prep-to-Planting</u>

Call for entries will be sent out in February, experiments will be designed in March, entries will be packaged and laid in planting order in March-April. Packaged seed for collaborative test will be provided to PIs as-soon-as-possible. Early planted test will be planted the first week of April with the full season test being planted as-soon-as-possible there after dependent of the receipt of seed from participants.

<u>Maintenance and notetaking</u>

Plot will be walked and maintained through the growing season. Notes for flower color, pubescence, lodging, shattering and plant height will be taken prior to harvest

<u>Harvest and Data analysis</u>

Plots will be harvested at maturity data will be made available in excel on the AAES website within two weeks of harvest. A research series publication will be generated and published at end of year.

Value to Soybean Industry: Variety selection is a key component to the profitability of soybean production. The data generated by the performance trials is valuable to Arkansas soybean producers because it allows them to make informed variety selection decisions. The data by the trials is also used by Seed companies to market and place varieties appropriately.

Budget Justifications/Explanation of Travel and Direct Costs: Funds are being requested to partially support a Program Associate position based at the Rice Research and Extension Center in Stuttgart, Arkansas. This position will be responsible for all field activities and will serve as the point person on notetaking, plot maintenance, planting, and harvest. While new to the program, this position is not an additional cost. With the continued decline in soybean entries due to company consolidation and off-target herbicide drift the Arkansas Crop Variety Improvement Program has been reorganized to best steward available resources and entry fees. Reorganization of the variety testing program ensured that only the salary and benefits of two FTEs are to be allocated to testing fees. However, as mentioned above the decrease in entries has diminished the programs' ability to execute the variety trials with adequate carryover for equipment maintenance and replacement. By moving a variety testing position to Stuttgart, we will eliminate much of the annual travel expenses while decreasing wear and tear on vehicles. However, a large participant notified the variety testing program that they will no longer be testing non-dicamba tolerant soybean varieties. Non-dicamba tolerant soybean varieties represented 25% of the program's total entries this year. In response to being informed that a large participant will only be testing dicamba tolerant lines the prudent decision was to request funding. As demonstrated in previous funding request, the Arkansas Crop Variety Improvement Program will withdraw funding request if the program can adjust and bring in alternative revenue through testing services or increased participation. This year funding request is approximately $12,000 less than the previous year due to increased funding from private testing.

University of Arkansas System Division of Agriculture
Promotion Board Budget

John Carin — Arkansas Soybean Performance Trials

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	Year 2 of 3
Lead Investigator	John Carin	**Co-PI #1**	
Co-PI #2		**Co-PI #3**	
Department	ACVIP / DREX		
Commodity Board	Soybean Promotion Board		
Project Title	Arkansas Soybean Performance Trials		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

							Total Board Funding Requested	AES Portion	CES Portion
			John Carin						
Select "AES" or "CES" for each PI			AES						
Fulltime Personnel									
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
Program Associate	Jonathan McCoy	50%	$30,600				$30,600	$30,600	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Subtotal: Salaries	$30,600	$0	$0	$0	$30,600	$30,600	$0
Graduate Student									
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Tuition					$0	$0	$0
		Subtotal: Graduate Student	$0	$0	$0	$0	$0	$0	$0
Hourly									
			Wages				**Total**	**AES Portion**	**CES Portion**
		Hourly-Personnel					$0	$0	$0
		Hourly-Students					$0	$0	$0
		Subtotal: Hourly	$0	$0	$0	$0	$0	$0	$0
Fringe Benefits									
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
		Fulltime Personnel	$9,670	$0	$0	$0	$9,670	$9,670	$0
		Graduate Students	$0	$0	$0	$0	$0	$0	$0
		Hourly Personnel	$0	$0	$0	$0	$0	$0	$0
		Hourly-Students	$0	$0	$0	$0	$0	$0	$0
		Subtotal: Fringe Benefits	$9,670	$0	$0	$0	$9,670	$9,670	$0
		Personnel Total	$40,270	$0	$0	$0	$40,270	$40,270	$0
Travel									
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
		In-State					$0	$0	$0
		Out-of-State					$0	$0	$0
		Travel Total	$0	$0	$0	$0	$0	$0	$0

University of Arkansas System Division of Agriculture
Promotion Board Budget

John Carin *Arkansas Soybean Performance Trials*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies					$0	$0	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$0	$0	$0	$0	$0	$0	$0
	Total for Proposal	$40,270	$0	$0	$0	$40,270	$40,270	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

Ecosystems (Rice Only)		%	John Carin				Total	
	Grand Prairie	0%	$0	$0	$0	$0	$0	
	Mississippi Delta		$0	$0	$0	$0	$0	
	White River		$0	$0	$0	$0	$0	
	Totals	0%	$0	$0	$0	$0	$0	*Must match the proposal total.*

Tab

Vieira (81)

Arkansas Soybean Promotion Board – 2024-2025 Proposal

Title: Development of High-yielding Soybean Cultivars with Broad Resilience to Stressors

Lead Investigators: Caio Canella Vieira

Co-Investigators:

Status (i.e., New, Year 2 of 3, Year 2 of 2, etc.): Year 2 of 3

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Breeding

Stated Goal: The University of Arkansas has a legacy of developing and releasing high-yielding conventional and herbicide-resistant soybean varieties, particularly determinates in MG 5. The proposal presented has the goal of maximizing the efficiency of the current soybean breeding pipeline and includes breeding operations to support the development of new high-yielding MG4 and MG5 soybean varieties with both conventional, Enlist-E3®, and XtendFlex® backgrounds. We aim to utilize data-driven solutions across all stages of the breeding pipeline, including molecular marker-assisted design hybridization schemes; off-season nursery approaches to speed up the development and advancement of breeding populations; genomic-driven breeding values to select lines to be advanced, as well as leveraging the testing network within the University of Arkansas research stations. The incorporation of modern techniques into a breeding pipeline allows the identification and selection of the most promising individuals earlier in the breeding pipeline, which not only reduce costs, time, and space but enhance genetic gain by reducing the length of the breeding cycle, increasing selection intensity, as well as allowing the breeders to have a clear knowledge of the genetics of the materials early in the pipeline. This data-driven breeding pipeline has been widely adopted by the private sector but is still not present in public programs. Our goal is to lead this transition and make the Arkansas program a national reference in modern soybean breeding.

Specific Objectives: The specific objectives of this proposal include i) hybridization with purpose based on genetic characterization of parental lines; ii) aggressive off-season nursery population development; iii) broad phenotypic and genotypic characterization of breeding lines for biotic and abiotic stressors tolerance; and iv) selective testing footprint across target environments within the University research stations' network.

Methods: The proposed breeding approach is summarized in figure 1. Overall, the goal is to have breeding lines ready to be tested and characterized in three years, which pending satisfactory yield performance across multiple locations, can be entered into an intensive testing network earlier. This pipeline can be further improved by the implementation of genomic selection in 'Progeny Rows – Year 2', which is discussed in detail in the submitted proposal 'Genomic Prediction to Enhance the Efficiency of Soybean Breeding'. In summary, parental lines will be chosen out of USDA Northern and Southern trials from Arkansas and other programs based on yield performance, as well as needs from different projects. All parental lines will be genotyped using a genome-wide marker panel to characterize their response to multiple biotic and abiotic stressors, as well as establish genetic similarities and simulate superior combinations. F_1 seeds will be sent to off-season nurseries in November of each year and quickly advanced to the F_4 stage over 18 months. $F_{4:5}$ seeds will return to Arkansas to be tested in progeny rows. In this stage, UAV-based yield estimation will be combined with the breeder's notes to select lines that will compose the preliminary stage. In the preliminary stage, all lines will be genotyped using a genome-wide marker panel to characterize their response to multiple biotic and abiotic stressors and estimate breeding values based on molecular markers. These will be tested for yield across replicated trials within the UARK testing network. Lines with superior yield performance and adaptability, as well as favorable responses to biotic and abiotic stressors, will be moved into the advanced stage. From there, a smaller pool of genotypes will be intensively tested for yield and adaptation across locations in Arkansas and other mid-south States. Superior lines will then be entered in multiple regional trials, including the Arkansas State Variety Testing and the USDA Uniform Trials. These entries will also undergo conversion to both Enlist-E3® and XtendFlex® in an off-season nursery (details on proposal Utilization of Winter Nursery for Soybean Line Development through Backcrossing).

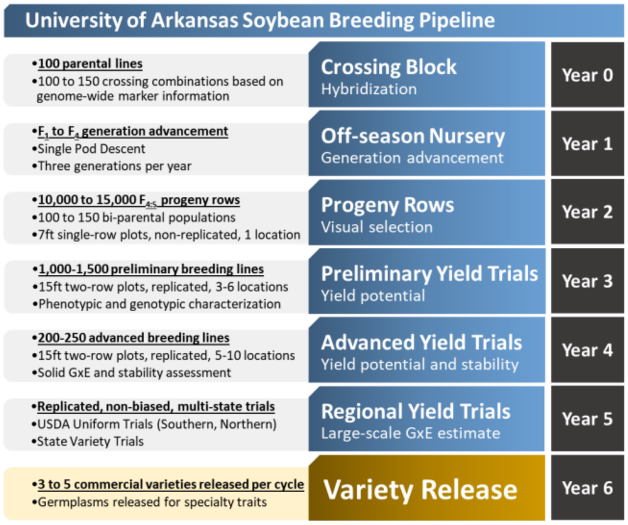

Figure 1. Summarized breeding pipeline for the University of Arkansas Soybean Breeding program.

Planned Milestones: Milestones include successfully completing the planned hybridization schemes (100-150); obtaining pure and homogeneous progeny rows from off-season nursery (10,000-15,000); selecting and conducting preliminary (1,000-1,500) and advanced trials (200-250); characterizing based on molecular markers and phenotypic assays the response to biotic and abiotic stressors as well as yield potential of breeding lines; **Arkansas lines placing on the top 10% of the USDA Uniform Trials.** In the 2023 USDA Uniform Trials, Arkansas lines placed 4th , 5th and 8th out of 31 entries (USDA-4 Early), 4th and 6th out of 27 entries (USDA-4 Late), and 3rd out of 37 entries (USDA-5 Early). In most cases, we were only outperformed by herbicide-resistant commercial checks.

Value to Soybean Industry: Yield, market price, and production cost are important factors in determining the economics of soybean farming. The UA soybean breeding program provides high-yielding cultivars with low costs to growers. Such outcomes not only ensure the availability of high-yielding conventional varieties with low seed cost for Arkansas growers but also serve as crossing germplasm for many public and private breeding programs in the US.

Budget Justifications/Explanation of Travel and Direct Costs ($191,118): It is requested $73,191 for 50% of a research associate and research technician to work on various tasks associated with the project. $21,882 plus $7,500 tuition is requested for a graduate student to work on multi-environment yield stability. $7,500 is requested for in-state travel to collect notes and conduct research plots, and $2,500 for attending the ASA-CSSA-SSSA meeting to present research results. A total of $5,000 in supplies including seeds, shipping, planting boxes, tags, and stakes, $1,500 for publication fees associated with germplasm release, and $22,045 for maintenance fees across the UARK research stations network. Other direct costs ($50,000) include $33,000 for off-season nursery fees including hybridization and generation advancement, $9,000 for a breeding software license, and $8,000 for molecular markers application including trait-specific predictions as well as characterization of biotic and abiotic stressors tolerance.

University of Arkansas System Division of Agriculture
Promotion Board Budget

Canella Vieira, Caio *Development of High-yielding Soybean Cultivars with Broad Resilience to Stressors*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	Year 2 of 3
Lead Investigator	Canella Vieira, Caio	**Co-PI #1**	
Co-PI #2		**Co-PI #3**	
Department	CSES Crop, Soil, Environmental Science		
Commodity Board	Soybean Promotion Board		
Project Title	Development of High-yielding Soybean Cultivars with Broad Resilience to Stressors		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

	Canella Vieira, Caio				Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI	AES						

Fulltime Personnel

Position Title	Name *(if position is filled)*	% Time	Salaries				Total	AES	CES
Research Associate		50%	$30,407				$30,407	$30,407	$0
Research Technician		50%	$25,210				$25,210	$25,210	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Subtotal: Salaries	$55,617	$0	$0	$0	$55,617	$55,617	$0

Graduate Student

Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.

Name *(if position is filled)*	% Time	Wages				Total	AES Portion	CES Portion
	100%	$21,000				$21,000	$21,000	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
	Tuition	$7,500				$7,500	$7,500	$0
	Subtotal: Graduate Student	$28,500	$0	$0	$0	$28,500	$28,500	$0

Hourly

	Wages				Total	AES Portion	CES Portion
Hourly-Personnel					$0	$0	$0
Hourly-Students					$0	$0	$0
Subtotal: Hourly	$0	$0	$0	$0	$0	$0	$0

Fringe Benefits

Fringe benefits are calculated when salary and wage amounts are entered above.

	Benefits				Total	AES Portion	CES Portion
Fulltime Personnel	$17,575	$0	$0	$0	$17,575	$17,575	$0
Graduate Students	$882	$0	$0	$0	$882	$882	$0
Hourly Personnel	$0	$0	$0	$0	$0	$0	$0
Hourly-Students	$0	$0	$0	$0	$0	$0	$0
Subtotal: Fringe Benefits	$18,457	$0	$0	$0	$18,457	$18,457	$0
Personnel Total	$102,573	$0	$0	$0	$102,573	$102,573	$0

Travel

Justify out-of-state travel in proposal.

	Travel				Total	AES Portion	CES Portion
In-State	$7,500				$7,500	$7,500	$0
Out-of-State	$2,500				$2,500	$2,500	$0
Travel Total	$10,000	$0	$0	$0	$10,000	$10,000	$0

University of Arkansas System Division of Agriculture
Promotion Board Budget

Canella Vieira, Caio — *Development of High-yielding Soybean Cultivars with Broad Resilience to Stressors*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$5,000				$5,000	$5,000	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication	$1,500				$1,500	$1,500	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs	External Plots, Nursery, Software	$50,000				$50,000	$50,000	$0
Station Maintenance	SAREC, Fayetteville	$11,160	$0	$0	$0	$11,160	$11,160	$0
	CTST, Marianna	$2,575	$0	$0	$0	$2,575	$2,575	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$1,530	$0	$0	$0	$1,530	$1,530	$0
	RIRE, Stuttgart	$6,780	$0	$0	$0	$6,780	$6,780	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$78,545	$0	$0	$0	$78,545	$78,545	$0
	Total for Proposal	$191,118	$0	$0	$0	$191,118	$191,118	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

		%	Canella Vieira, Caio				Total	
Ecosystems (Rice Only)	Grand Prairie	0%	$0	$0	$0	$0	$0	
	Mississippi Delta		$0	$0	$0	$0	$0	
	White River		$0	$0	$0	$0	$0	
	Totals	0%	$0	$0	$0	$0	$0	*Must match the proposal total.*

Tab

Vieira (85)

Arkansas Soybean Promotion Board – 2024-2025 Proposal

Title: Utilization of Winter Nursery for Soybean Line Development through Backcrossing

Lead Investigators: Caio Canella Vieira

Co-Investigators:

Status (i.e., New, Year 2 of 3, Year 2 of 2, etc.): Year 3 of 3

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Breeding

Stated Goal: Most of our soybean cultivar development efforts have been primarily focused on conventional non-GMO cultivar development. In 2020, a backcrossing program to convert elite conventional breeding lines into Enlist-E3® products initiated the efforts to develop herbicide-resistant cultivars. Recently, we acquired the license to develop XtendFlex® materials. This conversion process occurs exclusively in an off-season nursery in Puerto Rico, intending to turn seven generations in three calendar years. The first Arkansas Enlist-E3® breeding lines were yield tested in 2023, and superior lines were entered into 2024 regional trials (USDA Uniform Trials and Arkansas Variety Testing). A sustainable backcross program for herbicide-resistant product development requires significant investments in multiple years of operations in off-season nurseries, therefore, we are seeking further assistance to supplement the development of Enlist-E3® and XtendFlex® backcrossing in off-season nurseries.

Specific Objectives: Leverage off-season nursery to convert breeding lines into Enlist-E3® and XtendFlex® to support a steady breeding pipeline of herbicide-resistant varieties.

Methods: A modified backcrossing program has been established in 2023 to support a steady and effective delivery of herbicide-resistant cultivars. As demonstrated in Figure 1, our breeding pipeline consists exclusively of conventional, non-GMO breeding lines. Materials selected to enter regional trials (USDA Uniform Trials and Arkansas Variety Testing) will undergo conversion to both Enlist-E3® and XtendFlex® in an off-season nursery.

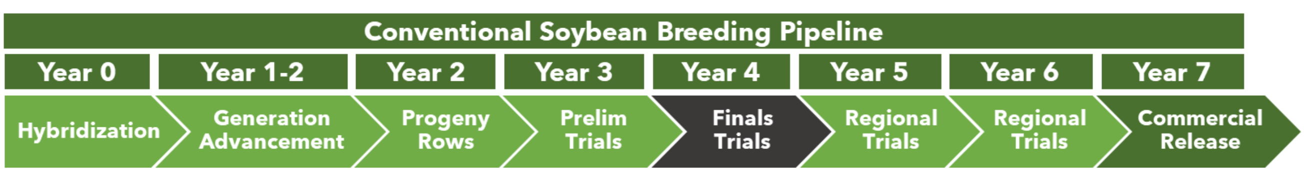

Figure 1. Scheme of the conventional (non-GMO) soybean breeding cultivar development pipeline. Advanced materials selected to enter regional trials (USDA Uniform Trials and Arkansas Variety Testing) will undergo herbicide resistance trait introgression.

<u>The rationale behind maintaining the pipeline exclusively conventional is improved flexibility and operations efficiency</u>. Suppose a conventional breeding line was found to be highly competitive in the Finals Trials (Year 4). With the proposed system, this breeding line can remain conventional (niche market) or be converted into either Enlist-E3® and XtendFlex®. If the breeding line was developed based on a specific herbicide-resistant trait, it would not be possible to convert it to anything else but that herbicide-resistant trait. It also improves our effectiveness in maintaining seed purity as this minimizes cross-contamination.

Materials selected for regional trials (December of each year, for this example we will use the 2023 season) will undergo three rounds of backcrossing (January 2024 – December 2024) followed by three rounds of generation advancement (January 2025 – December 2025) (Figure 2). In each round, plants will be sprayed with either Enlist Duo (Enlist-E3®) or dicamba (XtendFlex®). Once reaching the BC_2F_3 stage, approximately

50 converted single plants per recurrent parent will undergo seed increase (January 2026 – April 2026). Lines will return to Arkansas and be tested for yield in multiple environments in Summer 2026. Superior lines will be moved into regional trials and pre-foundation seed in 2027 and may be proposed for commercial release in Spring 2028. Simultaneously, a new cycle of conversion to Enlist-E3® and XtendFlex® will start each year.

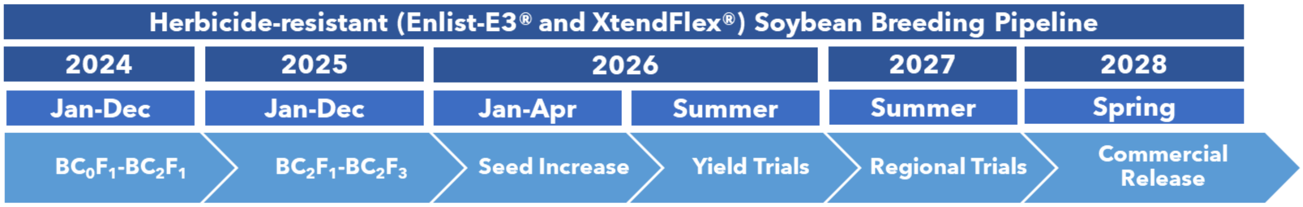

Figure 2. Scheme of herbicide resistance trait introgression. Conventional advanced materials selected to enter regional trials (USDA Uniform Trials and Arkansas Variety Testing) will undergo herbicide resistance trait introgression for two years, followed by two years of yield trials prior to commercial release.

Planned Milestones:

Proposed Activities	Year 1				Year 2				Year 3			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Obj. 1. Introgress Enlist-E3® and XtendFlex® traits into conventional (non-GMO) soybean cultivars												
Backcross BC_0F_1	*X*	*X*										
Backcross BC_1F_1		*X*	*X*									
Backcross BC_2F_1			*X*	*X*								
Backcross BC_2F_1-F_3				*X*	*X*	*X*	*X*	*X*				
Seed Increase								*X*	*X*	*X*		
Yield Trials										*X*	*X*	

Value to Soybean Industry: The University of Arkansas Soybean Breeding Program has been providing high-yielding conventional MG4 and MG5 cultivars at low costs to growers, but it needs to rapidly expand its footprint in herbicide-resistant cultivars. A sustainable and effective backcross program for herbicide-resistant (Enlist-E3® and XtendFlex®) cultivars will improve the accessibility of Arkansas genetics to local growers, allowing them to pick their cultivar of choice with their herbicide resistance package of choice.

Budget Justifications/Explanation of Travel and Direct Costs ($51,000): A total of $3,000 is requested for two visits to the off-season nursery in Puerto Rico to inspect generation advancement and overall project progress. $48,000 is requested to cover the costs of backcross BC_0F_1 to BC_2F_1, as well as one generation of advancement (BC_2F_1-BC_2F_2). This includes the conversion of selected entries from 2023 to both Enlist-E3® and XtendFlex® herbicide resistance traits.

University of Arkansas System Division of Agriculture
Promotion Board Budget

Canella Vieira, Caio *Utilization of Winter Nursery for Soybean Line Development through Backcrossing*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	Year 3 of 3
Lead Investigator	Canella Vieira, Caio	**Co-PI #1**	
Co-PI #2		**Co-PI #3**	
Department	CSES Crop, Soil, Environmental Science		
Commodity Board	Soybean Promotion Board		
Project Title	Utilization of Winter Nursery for Soybean Line Development through Backcrossing		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

			Canella Vieira, Caio				Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI			AES						
Fulltime Personnel									
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Subtotal: Salaries	$0	$0	$0	$0	$0	$0	$0
Graduate Student									
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Tuition					$0	$0	$0
		Subtotal: Graduate Student	$0	$0	$0	$0	$0	$0	$0
Hourly									
			Wages				**Total**	**AES Portion**	**CES Portion**
		Hourly-Personnel					$0	$0	$0
		Hourly-Students					$0	$0	$0
		Subtotal: Hourly	$0	$0	$0	$0	$0	$0	$0
Fringe Benefits									
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
		Fulltime Personnel	$0	$0	$0	$0	$0	$0	$0
		Graduate Students	$0	$0	$0	$0	$0	$0	$0
		Hourly Personnel	$0	$0	$0	$0	$0	$0	$0
		Hourly-Students	$0	$0	$0	$0	$0	$0	$0
		Subtotal: Fringe Benefits	$0	$0	$0	$0	$0	$0	$0
		Personnel Total	$0	$0	$0	$0	$0	$0	$0
Travel									
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
		In-State					$0	$0	$0
		Out-of-State	$3,000				$3,000	$3,000	$0
		Travel Total	$3,000	$0	$0	$0	$3,000	$3,000	$0

University of Arkansas System Division of Agriculture
Promotion Board Budget

Canella Vieira, Caio *Utilization of Winter Nursery for Soybean Line Development through Backcrossing*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies					$0	$0	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs	Off-season nursery fees	$48,000				$48,000	$48,000	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$48,000	$0	$0	$0	$48,000	$48,000	$0
	Total for Proposal	$51,000	$0	$0	$0	$51,000	$51,000	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

		%	Canella Vieira, Caio				Total	
Ecosystems (Rice Only)	Grand Prairie	0%	$0	$0	$0	$0	$0	
	Mississippi Delta		$0	$0	$0	$0	$0	
	White River		$0	$0	$0	$0	$0	
	Totals	0%	$0	$0	$0	$0	$0	*Must match the proposal total.*

Tab

Vieira (89)

Arkansas Soybean Promotion Board – 2024-2025 Proposal

Title: Fast-tracking MG4 cultivars with southern root-knot nematode resistance

Lead Investigators: Caio Canella Vieira

Co-Investigators: Travis Faske

Status: New (Year 1 of 3)

Research Areas: Breeding and Plant Pathology

Stated Goal: The southern root-knot nematode (SRKN) (*Meloidogyne incognita*, Kofoid & White, 1919) is the most important plant-pathogenic nematode of soybean in Arkansas. It has been detected in 32 out of 35 counties sampled from 2014 and 2018 (Ye et al., 2019) and is estimated to cause an average annual yield loss of 8.6 million bushels. Currently, resistance to SRKN is very limited in MG4 commercial soybean cultivars. Based on a recent search for MG4.0 to 5.3 soybean varieties for Arkansas, resistance to SRKN was found in only 4 out of 30 cultivars listed for Pioneer, and 1 out of 34 cultivars for Asgrow. Thus, the development and deployment of MG4 soybean cultivars with SRKN resistance adapted to Arkansas and the mid-South are essential to sustain yield under SRKN pressure. Marker assisted section is a good initial step to quickly select germplasm and breeding lines with the resistance traits; however, it is important to evaluate these selections in the field. Many companies do not have a good field screen, but one has been developed by the co-investigator and is used to evaluate commercial varieties marketed for resistance against the SRKN. Furthermore, there is some evidence that nematode reproduction may be uncoupled from galling thus some partially resistant lines may not reduce nematode densities for the subsequent cropping season. Therefore, this proposal aims to utilize marker assisted selection and field screening to fast-track the development of soybean cultivars with resistance to SRKN in maturity groups 4.

Specific Objectives: The proposal is structured around two specific objectives: i) Characterize the response to SRKN of breeding lines in the Arkansas Soybean Breeding Program using molecular markers, greenhouse pot assays, and field screenings; ii) Develop breeding populations derived from SRKN-resistant parental lines.

Methods:

Objective 1: Preliminary and advanced breeding lines (~1,000) will be screened utilizing molecular markers linked to a well-known genomic region associated with SRKN resistance (Pham et al., 2013). In 2023, a total of 1,300 genotypes were screened with molecular markers and only 48 Arkansas lines showed resistance to SRKN. This emphasizes the pressing need to further develop SRKN-resistant breeding populations adapted to Arkansas and the mid-South. Furthermore, these selected entries will be screened in a SRKN-infested field near Lonoke, AR. Plots will consist of 11’ single row plots with four replications per entry. Those entries that are identified as resistant from markers and low galling in the field will be assessed for reproduction in the greenhouse.

Objective 2: Between 50 to 70 new breeding populations will be developed of which at least one parent is SRKN-resistant. As mentioned in Objective 2, Arkansas germplasm lacks SRKN resistance, and substantial efforts are needed to reverse this condition. In 2023, a total of 74 populations derived from at least one SRKN-resistant parent were developed. In 2024, hybridizations will be conducted in Fayetteville during the summer and populations will be advanced to reach homozygosity in an off-season nursery in Puerto Rico. $F_{4:5}$ progeny rows will return in the Summer of 2026, and selected rows will undergo molecular marker screening to confirm SRKN resistance.

Planned Milestones:

Proposed Activities	Year 1				Year 2				Year 3			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Obj. 1. Characterize SRKN response using molecular markers and greenhouse and field screenings												
Select Plant Materials	*X*			*X*	*X*			*X*	*X*			
Greenhouse Screening		*X*	*X*			*X*	*X*			*X*	*X*	
Field Screening		*X*	*X*			*X*	*X*			*X*	*X*	
Marker-assisted Selection	*X*	*X*	*X*		*X*	*X*			*X*	*X*		
Obj. 2. Develop breeding populations derived from SRKN-resistant parental lines												
Field Hybridization		*X*				*X*				*X*		
Generation advancement	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*
Grow progeny rows		*X*	*X*	*X*		*X*	*X*	*X*		*X*	*X*	*X*

Value to Soybean Industry: Developing soybean cultivars resistant to SRKN is critical for soybean production in Arkansas. Although this proposal does not cover the complete breeding cycle, typically spanning nearly a decade from crossing to product deployment, it provides a series of necessary goals to begin selecting early-maturity soybean lines with resistance to the SRKN. Such lines will be critical for improved performance and enhanced profit margins in areas where SRKN is a limiting factor for soybean production.

Budget Justifications/Explanation of Travel and Direct Costs ($50,584): A total of $31,584 is requested to partially cover two program technicians (one for each program). A total of $3,000 is requested for in-state travel, as well as $16,000 for direct costs. These include $2,000 for breeding supplies, $4,000 for nematode field screening, $5,000 for off-season nursery, and $5,000 for marker-assisted selection. It is important to note that a substantial part of the budget allocated for the development of new breeding populations and multi-environment field trials is being supported by various ongoing projects supported by the Arkansas Soybean Promotion Board, Mid-South Soybean Board, and United Soybean Board.

University of Arkansas System Division of Agriculture
Promotion Board Budget

Canella Vieira, Caio *Fast-tracking MG4 cultivars with southern root-knot nematode resistance*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	New
Lead Investigator	Canella Vieira, Caio	**Co-PI #1**	Faske, Travis
Co-PI #2		**Co-PI #3**	
Department	CSES Crop, Soil, Environmental Science		
Commodity Board	Soybean Promotion Board		
Project Title	Fast-tracking MG4 cultivars with southern root-knot nematode resistance		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

			Canella Vieira, Caio	Faske, Travis			Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI			AES	CES					
Fulltime Personnel									
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
Program Technician		25%	$10,000	$14,000			$24,000	$10,000	$14,000
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
Subtotal: Salaries			$10,000	$14,000	$0	$0	$24,000	$10,000	$14,000
Graduate Student									
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Tuition						$0	$0	$0
Subtotal: Graduate Student			$0	$0	$0	$0	$0	$0	$0
Hourly									
			Wages				**Total**	**AES Portion**	**CES Portion**
Hourly-Personnel							$0	$0	$0
Hourly-Students							$0	$0	$0
Subtotal: Hourly			$0	$0	$0	$0	$0	$0	$0
Fringe Benefits									
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
Fulltime Personnel			$3,160	$4,424	$0	$0	$7,584	$3,160	$4,424
Graduate Students			$0	$0	$0	$0	$0	$0	$0
Hourly Personnel			$0	$0	$0	$0	$0	$0	$0
Hourly-Students			$0	$0	$0	$0	$0	$0	$0
Subtotal: Fringe Benefits			$3,160	$4,424	$0	$0	$7,584	$3,160	$4,424
Personnel Total			$13,160	$18,424	$0	$0	$31,584	$13,160	$18,424
Travel									
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
In-State				$3,000			$3,000	$0	$3,000
Out-of-State							$0	$0	$0
Travel Total			$0	$3,000	$0	$0	$3,000	$0	$3,000

University of Arkansas System Division of Agriculture
Promotion Board Budget

Canella Vieira, Caio *Fast-tracking MG4 cultivars with southern root-knot nematode resistance*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$2,000	$4,000			$6,000	$2,000	$4,000
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs	Molecular Screening + Nursery	$10,000				$10,000	$10,000	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$12,000	$4,000	$0	$0	$16,000	$12,000	$4,000
	Total for Proposal	$25,160	$25,424	$0	$0	$50,584	$25,160	$25,424

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

		%	Canella Vieira, Caio	Faske, Travis			Total	
Ecosystems (Rice Only)	Grand Prairie	0%	$0	$0	$0	$0	$0	
	Mississippi Delta		$0	$0	$0	$0	$0	
	White River		$0	$0	$0	$0	$0	
	Totals	0%	$0	$0	$0	$0	$0	*Must match the proposal total.*

Tab

Vieira (93)

Arkansas Soybean Promotion Board – 2024-2025 Proposal

Title: Soybean Germplasm Enhancement Using Genetic Diversity

Lead Investigators: Caio Canella Vieira

Co-Investigators:

Status (i.e., New, Year 2 of 3, Year 2 of 2, etc.): Year 2 of 3

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Breeding

Stated Goal: As a consequence of domestication and further intense trait-specific breeding (selective sweeps), modern soybean varieties have a significantly narrow genetic base. For instance, over 85% of the parentage of modern cultivars in the United States is derived from only 18 of the thousands of ancestors available. In the Southern United States, 17 ancestors contributed to over 90% of the genes in cultivars adapted to this growing region, making imperative the introduction of genetically diverse materials to improve key economically important traits such as grain quality and composition, as well as biotic and abiotic stressors tolerance. Additionally, the University of Arkansas Soybean Breeding program has historically developed MG5 determinate materials; however, we lack high-yielding, widely adapted MG4 indeterminate genetics. Therefore, the goal of this proposal is to broaden the genetic basis of the University of Arkansas Soybean Breeding program by developing breeding populations derived from the genetics from other regions and historical varieties/landraces from the USDA Soybean Germplasm Collection. These efforts serve as the engine to incorporate the necessary genetic variation to sustainably create competitive products that benefit Arkansas farmers.

Specific Objectives: This proposal is grounded in two specific objectives, including i) <u>introduction of novel genetic background from plant introductions (PIs) and elite germplasm from other growing regions to help build a strong and sustainable genetic pool in Arkansas</u>; ii) <u>incorporation of unique economically important traits including grain quality and composition, as well as biotic and abiotic stressors tolerance using various breeding and selection schemes.</u>

Methods: Previous years of this research have identified several PIs that have acceptable yield, early maturing and indeterminacy combined with unique economic-important traits under diverse genetic backgrounds. In addition, multiple high-yielding elite breeding lines from various northern states' variety testing programs and USDA-Uniform trials were used in our crossing block in combination with high-yielding Arkansas-adapted elite cultivars. Substantial efforts will continue to identify potential genetic sources with desirable traits to be implemented within the genetic pool of the Arkansas program. Leveraging historical datasets, the USDA Soybean Germplasm Collection, and well-trained prediction models, additional genotypes will be identified and implemented as parental lines in our population development pipeline. Simply put, models will be trained based on previous years of the Arkansas yield trials; the breeding values (for instance, yield) of untested genotypes will be estimated, and superior candidates will be included in our program. <u>This will be the foundation of generating genetic diversity in our program and can be referred to as 'Discovery Breeding'</u>. Strategies for hybridization and population development will follow as described in the proposal 'Development of High-yielding Soybean Cultivars with Broad Resilience to Stressors', focusing on the efficiency and timeframe of the pipeline to maximize genetic gain.

Planned Milestones: A major milestone is the development and validation of prediction models based on historical dataset and genome-wide molecular markers. With this, <u>we can simply plug in the molecular</u>

marker information of untested genotypes to estimate their breeding values for multiple economically-important trait in target environments. Additional milestones include precisely identifying and incorporating novel genetics into our program; developing breeding populations derived from these novel genetics, as well as conducting field trials to assess their superiority under real-world conditions.

Value to Soybean Industry: Our breeding program aims to develop early maturing high-yielding cultivars/germplasm with unique economically important traits and local adaptation. For instance, MG4 with RKN resistance under an Enlist background is widely desirable but rare to find. Therefore, the 'Discovery Breeding' stage of our program described in this proposal aims to generate the genetic diversity that can be used to develop and further advance materials with unique traits. The work herein proposed is the engine used to incorporate the genetic variation needed in the soybean breeding program to directly support different projects and research goals.

Budget Justifications/Explanation of Travel and Direct Costs ($187,679): It is requested a total of $73,192 for half-time of a research associate and technician as well as $21,147 for a hourly visiting scholar to work on various tasks associated with the project. $5,000 is requested for in-state travel to collect notes and conduct research plots. A total of $3,000 in supplies including seeds, shipping, planting boxes, tags, and stakes, and $17,340 for maintenance fees across the UARK research stations network. Other direct costs ($68,000) include $42,000 for off-season nursery fees including hybridization and generation advancement, $18,000 for a tractor lease, and $8,000 for molecular markers application including trait-specific predictions as well as characterization of biotic and abiotic stressors tolerance.

University of Arkansas System Division of Agriculture
Promotion Board Budget

Canella Vieira, Caio *Soybean Germplasm Enhancement Using Genetic Diversity*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	Year 2 of 3
Lead Investigator	Canella Vieira, Caio	**Co-PI #1**	
Co-PI #2		**Co-PI #3**	
Department	CSES Crop, Soil, Environmental Science		
Commodity Board	Soybean Promotion Board		
Project Title	Soybean Germplasm Enhancement Using Genetic Diversity		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

			Canella Vieira, Caio				Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI			AES						
Fulltime Personnel									
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
Research Associate		50%	$30,407				$30,407	$30,407	$0
Research Technician		50%	$25,210				$25,210	$25,210	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Subtotal: Salaries	$55,617	$0	$0	$0	$55,617	$55,617	$0
Graduate Student									
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Tuition					$0	$0	$0
		Subtotal: Graduate Student	$0	$0	$0	$0	$0	$0	$0
Hourly									
			Wages				**Total**	**AES Portion**	**CES Portion**
		Hourly-Personnel					$0	$0	$0
		Hourly-Students	$21,000				$21,000	$21,000	$0
		Subtotal: Hourly	$21,000	$0	$0	$0	$21,000	$21,000	$0
Fringe Benefits									
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
		Fulltime Personnel	$17,575	$0	$0	$0	$17,575	$17,575	$0
		Graduate Students	$0	$0	$0	$0	$0	$0	$0
		Hourly Personnel	$0	$0	$0	$0	$0	$0	$0
		Hourly-Students	$147	$0	$0	$0	$147	$147	$0
		Subtotal: Fringe Benefits	$17,722	$0	$0	$0	$17,722	$17,722	$0
		Personnel Total	$94,339	$0	$0	$0	$94,339	$94,339	$0
Travel									
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
		In-State	$5,000				$5,000	$5,000	$0
		Out-of-State					$0	$0	$0
		Travel Total	$5,000	$0	$0	$0	$5,000	$5,000	$0

University of Arkansas System Division of Agriculture
Promotion Board Budget

Canella Vieira, Caio *Soybean Germplasm Enhancement Using Genetic Diversity*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$3,000				$3,000	$3,000	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs	Nursery, Molecular Markers, Tra	$68,000				$68,000	$68,000	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$4,635	$0	$0	$0	$4,635	$4,635	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$3,090	$0	$0	$0	$3,090	$3,090	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$4,635	$0	$0	$0	$4,635	$4,635	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$4,980	$0	$0	$0	$4,980	$4,980	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$88,340	$0	$0	$0	$88,340	$88,340	$0
	Total for Proposal	$187,679	$0	$0	$0	$187,679	$187,679	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

		%	Canella Vieira, Caio				Total	
Ecosystems (Rice Only)	Grand Prairie	0%	$0	$0	$0	$0	$0	
	Mississippi Delta		$0	$0	$0	$0	$0	
	White River		$0	$0	$0	$0	$0	
	Totals	0%	$0	$0	$0	$0	$0	*Must match the proposal total.*

Tab

Vieira (97)

Arkansas Soybean Promotion Board – 2024-2025 Proposal

Title: Genomic Prediction to Enhance the Efficiency of Soybean Breeding

Lead Investigators: Caio Canella Vieira

Co-Investigators: Samuel Fernandes

Status (i.e., New, Year 2 of 3, Year 2 of 2, etc.): Year 2 of 3

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Breeding

Stated Goal: The breeding efficiency of large-scale public soybean breeding programs is limited by lengthy breeding cycles, extensive allocation of resources for multi-environment testing, and the difficulty in identifying breeding targets and ideotypes for a defined environment. The advances in high-throughput genotyping combined with predictive analytics enabled the development of techniques to predict phenotypic values using marker information. This is called genomic prediction, and it has become one of the most important tools in commercial plant breeding programs. Selection of superior breeding lines based on the genomic-estimated breeding values (GEBV) can substantially shorten the breeding cycle, increase selection accuracy and intensity, and maximize genetic gains as it does not rely on extensive multi-year/environment phenotyping of quantitative traits. Public breeding programs have struggled to adopt predictive breeding, mainly due to front cost, limited data availability, and technical constraints. This research proposal aims to develop a data-driven and cost-effective soybean breeding pipeline that can reduce the length of a breeding cycle, increase selection efficiency and accuracy, and improve the rate of genetic gain. Using historical multi-environment data from the UARK Soybean Breeding program, we will integrate information on molecular markers, environmental data, and the interactions that arise between these components to identify superior genotypes early in the pipeline. The efficacy of the proposed pipeline will be evaluated by direct comparison with conventional breeding methods. Metrics of success will include the yield potential of selected genotypes for each methodology, time, labor, and cost of the cycle of each breeding approach. The validation of the proposed pipeline can substantially enhance the rate of genetic gain which translates into higher-yielding soybean varieties. In addition, it is an opportunity to transform the UARK Soybean Breeding program into a leading reference among public programs that fully adopt predictive breeding.

Specific Objectives: Specific goals of this proposal include: i) establishment of a well-curated training set based on multi-environment data from the UARK Soybean Breeding program to develop and validate prediction models; ii) development of prediction models to be implemented early in the breeding pipeline to select promising genotypes. The overall objective of this proposal is to provide a next-generation, data-driven, and cost-effective soybean breeding pipeline that can reduce the length of a breeding cycle, increase selection efficiency and accuracy, and improve the rate of genetic gain using genomics and big data analytic technologies.

Methods: The second year of the project will focus on continuing the development of a database consisting of yield and molecular marker data from thousands of breeding lines tested across Arkansas. This step is critical to 'train the computer' on how to interpret future data that will be plugged into the model. In summary, the model will be trained using both phenotypic (yield) and genotypic (genome-wide molecular markers) data of previously tested breeding lines to **predict untested lines (for instance, progeny rows) using only genotypic data.**

In year 1, we collected data from nearly 1,200 breeding lines which are currently being used to train and validate prediction models. In addition, a total of 1,000 $F_{4:5}$ progeny rows (derived from 10 bi-parental populations) were sampled and are currently being genotyped with the Soy3KSNP chip. In year 2, we anticipate genotyping around 1,100 breeding lines and approximately 1,000 $F_{4:5}$ progeny rows (derived from 10 bi-parental populations).

The yield potential of the progeny rows will be calculated using the developed genomic-enabled trait prediction model. Around 10% with high ranks will be selected and grown in yield trials. As opposed to a conventional breeding pipeline based on 'trial and error' preliminary, intermediate, and advanced yield trials, the proposed pipeline will consist of an elite pool of genotypes tested in a single-year, multi-environmental yield trial. Advanced G×E interaction modeling will be applied to identify superior genotypes with high-yield stability and potential. At this stage, all selected genotypes will have a superior genetic background based on multiple predictive models, a thorough assessment of biotic and abiotic tolerance based on a customized functional marker panel, complete seed composition, and approval based on specific breeder criteria.

Planned Milestones:

Activity Description	2024				2025			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Develop genomic prediction models with genotypic, phenotypic, and environmental data from historical data.	**X**	**X**			**X**	**X**		
Genotype progeny rows from $F_{4:5}$ plants using genome-wide molecular markers.	**X**	**X**			**X**	**X**		
Select superior lines from the progeny rows based on the breeder's scores and the genomic prediction model.			**X**	**X**			**X**	**X**
Evaluate the selection in multi-location yield trials.							**X**	**X**
Enhance the predictive models with newly collected data from yield trials.	**X**			**X**	**X**			**X**
Select proposed releases of each method and evaluate their overall performance.							**X**	**X**

Value to Soybean Industry: Breeding progress is often measured as genetic gain, which is fundamentally dependent on the length of a breeding cycle. The proposed work aims to shorten the traditional breeding pipeline by one year, yet the number of data points per genotype will increase by 30-40% while decreasing the total costs by 15-30%. In summary, maximizing the efficiency of a soybean breeding pipeline will speed up the identification and delivery of superior cultivars to growers in Arkansas and the United States.

Budget Justifications/Explanation of Travel and Direct Costs ($102,087): A large portion of the budget is allocated to an associate (half-time with $30,000 base plus $9,480 benefits) with an extensive technical background in genomic prediction and data analysis, as well as a graduate student ($21,000 base, $7,500 tuition, and $882 benefits) working with statistics and data analysis under Dr. Fernandes supervision. A total of $8,000 in out-of-state travel is requested to attend and present results in scientific meetings. $22,000 is requested to conduct genotyping of breeding lines and progeny rows using a genome-wide molecular marker panel, and $3,225 for one open-access publication.

University of Arkansas System Division of Agriculture
Promotion Board Budget

Canella Vieira, Caio *Genomic Prediction to Enhance the Efficiency of Soybean Breeding*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	Year 2 of 3
Lead Investigator	Canella Vieira, Caio	**Co-PI #1**	Fernandes, Samuel
Co-PI #2		**Co-PI #3**	
Department	CSES Crop, Soil, Environmental Science		
Commodity Board	Soybean Promotion Board		
Project Title	Genomic Prediction to Enhance the Efficiency of Soybean Breeding		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

							Total Board Funding Requested	AES Portion	CES Portion
			Canella Vieira, Caio	Fernandes, Samuel					
Select "AES" or "CES" for each PI			AES	AES					
Fulltime Personnel									
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
Associate		50%	$30,000				$30,000	$30,000	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Subtotal: Salaries	$30,000	$0	$0	$0	$30,000	$30,000	$0
Graduate Student									
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
		100%		$21,000			$21,000	$21,000	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Tuition		$7,500			$7,500	$7,500	$0
		Subtotal: Graduate Student	$0	$28,500	$0	$0	$28,500	$28,500	$0
Hourly									
			Wages				**Total**	**AES Portion**	**CES Portion**
		Hourly-Personnel					$0	$0	$0
		Hourly-Students					$0	$0	$0
		Subtotal: Hourly	$0	$0	$0	$0	$0	$0	$0
Fringe Benefits									
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
		Fulltime Personnel	$9,480	$0	$0	$0	$9,480	$9,480	$0
		Graduate Students	$0	$882	$0	$0	$882	$882	$0
		Hourly Personnel	$0	$0	$0	$0	$0	$0	$0
		Hourly-Students	$0	$0	$0	$0	$0	$0	$0
		Subtotal: Fringe Benefits	$9,480	$882	$0	$0	$10,362	$10,362	$0
		Personnel Total	$39,480	$29,382	$0	$0	$68,862	$68,862	$0
Travel									
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
		In-State					$0	$0	$0
		Out-of-State	$4,000	$4,000			$8,000	$8,000	$0
		Travel Total	$4,000	$4,000	$0	$0	$8,000	$8,000	$0

University of Arkansas System Division of Agriculture

Promotion Board Budget

Canella Vieira, Caio *Genomic Prediction to Enhance the Efficiency of Soybean Breeding*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$22,000				$22,000	$22,000	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication	$3,225				$3,225	$3,225	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$25,225	$0	$0	$0	$25,225	$25,225	$0
	Total for Proposal	$68,705	$33,382	$0	$0	$102,087	$102,087	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

		%	Canella Vieira, Caio	Fernandes, Samuel			Total	
Ecosystems (Rice Only)	Grand Prairie	0%	$0	$0	$0	$0	$0	
	Mississippi Delta		$0	$0	$0	$0	$0	
	White River		$0	$0	$0	$0	$0	
	Totals	0%	$0	$0	$0	$0	$0	***Must match the proposal total.***

Tab

Deaton (101)

ARKANSAS SOYBEAN PROMOTION BOARD
2024-2025 PROPOSAL

Title: Economic Analysis of Soybean Production and Marketing Practices
Lead Investigator: Dr. Brian Deaton, Associate Professor
Status: New
Research Area: Verification Program
Stated Goal: The project will assist producers as they continue to seek opportunities for increasing incomes, decreasing costs, and reducing risks.
Specific Objectives: The overall objective of this study is to provide an economic analysis for the following proposed projects and other Soybean Promotion Board funded projects that would benefit from economic analysis. Specific objectives are:

(1) Conduct an economic analysis of production practices used in the Arkansas Soybean Research Verification Program that impact profitability and verify Extension recommendations. (J. Ross, C. Norton, and C. Wilkins)

(2) Standardize the economic analysis by integrating the 2023 soybean verification program data with data from previous years. This will continue to document the long-term benefits of the Arkansas Soybean Research Verification Program. (J. Ross, C. Norton, and C. Wilkins)

(3) Provide Arkansas soybean cash market summaries for publication on the “Row Crops Blog” online newsletter.

Methods: The economic feasibility of various production management decisions suggested in the Soybean Research Verification Program will continue to be analyzed using enterprise budgets. Specific information related to field operations, inputs, irrigation, and yield will be entered into a computerized budget generator to estimate production costs. The results of this analysis will be presented at county/state/regional/national meetings.

Planned Milestones: **[Objectives 1 & 2 – Ross, Norton, and Wilkins]**

April 10 – Integrate the 2023 soybean verification program data into the historical database that contains data from previous years.

July 15 - Begin electronic coordinator data submission through planting for all cooperators in the Arkansas Soybean Research Verification Program from each respective field.

November 1 - Receive final SRVP production input data reports and begin computer entry. SRVP Coordinators will check items for accuracy after initial entry.

November 15 - Receive final SRVP harvest data reports and begin computer entry. SRVP Coordinators will check added items after initial entry.

December 22 - Complete first draft of SRVP economic analysis tables. SRVP Coordinators will check items after completion.

January 15 - Finish economic analysis for SRVP Report publication and distribution.

[Objective 3 – Various Project Leaders]

Weekly - Provide continued Arkansas soybean cash market summaries for publication through “Row Crops Blog” online newsletter outlet in cooperation with Arkansas State Soybean Agronomist. Work with Communication Group along with other media outlets to provide additional national exposure for the Arkansas soybean industry.

Monthly - Provide soybean economic presentations to county/regional meetings, state research verification tour, and research center field days in-state and otherwise as requested.

Statement of Projected Value: This project extends previous SRVP work to address agronomic issues. Benefits from economic analysis of alternative soybean production strategies assist producers in identifying opportunities to adjust individual costs while providing a significant reduction in the risk levels that producers face. Maintenance of a historical database of annual SRVP data provides valuable time series soybean data for extended research. The results of this analysis enable producers to make management decisions based on profit maximization rather than just maximizing yield.

Budget Justifications/Explanation of Travel and Direct Costs: Activities with state specialists, county agents, and soybean producers within the Tri-State Soybean Forum states require the requested funding for travel.

University of Arkansas System Division of Agriculture
Promotion Board Budget

Brian Deaton — *Economic Analysis of Soybean Production and Marketing Practices*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	
Lead Investigator	Brian Deaton	**Co-PI #1**	
Co-PI #2		**Co-PI #3**	
Department	AFRC		
Commodity Board	Soybean Promotion Board		
Project Title	Economic Analysis of Soybean Production and Marketing Practices		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

							Total Board Funding Requested	AES Portion	CES Portion
			Brian Deaton						
Select "AES" or "CES" for each PI			AES						
Fulltime Personnel									
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Subtotal: Salaries	$0	$0	$0	$0	$0	$0	$0
Graduate Student									
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Tuition					$0	$0	$0
		Subtotal: Graduate Student	$0	$0	$0	$0	$0	$0	$0
Hourly									
			Wages				**Total**	**AES Portion**	**CES Portion**
		Hourly-Personnel	$4,000				$4,000	$4,000	$0
		Hourly-Students					$0	$0	$0
		Subtotal: Hourly	$4,000	$0	$0	$0	$4,000	$4,000	$0
Fringe Benefits									
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
		Fulltime Personnel	$0	$0	$0	$0	$0	$0	$0
		Graduate Students	$0	$0	$0	$0	$0	$0	$0
		Hourly Personnel	$316	$0	$0	$0	$316	$316	$0
		Hourly-Students	$0	$0	$0	$0	$0	$0	$0
		Subtotal: Fringe Benefits	$316	$0	$0	$0	$316	$316	$0
		Personnel Total	$4,316	$0	$0	$0	$4,316	$4,316	$0
Travel									
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
		In-State	$750				$750	$750	$0
		Out-of-State	$750				$750	$750	$0
		Travel Total	$1,500	$0	$0	$0	$1,500	$1,500	$0

University of Arkansas System Division of Agriculture
Promotion Board Budget

Brian Deaton — *Economic Analysis of Soybean Production and Marketing Practices*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
Supplies		$1,500				$1,500	$1,500	$0
Fertilizer/Chemicals						$0	$0	$0
Publication						$0	$0	$0
Statistical Consulting						$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
M & O Total		$1,500	$0	$0	$0	$1,500	$1,500	$0
Total for Proposal		$7,316	$0	$0	$0	$7,316	$7,316	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

Ecosystems (Rice Only)		%	Brian Deaton				Total
	Grand Prairie	0%	$0	$0	$0	$0	$0
	Mississippi Delta		$0	$0	$0	$0	$0
	White River		$0	$0	$0	$0	$0
	Totals	0%	$0	$0	$0	$0	$0

Must match the proposal total.

Tab

Watkins (105)

Arkansas Soybean Promotion Board – 2024-2025 Proposal

Title: Soybean Enterprise Budgets and Production Economics Analysis

Lead Investigators: Breana Watkins, Instructor – Conservation and Crop Budget Economist

Co-Investigators: Dr. Vic Ford, Associate Director – Agriculture and Natural Resources

Status: Year 2 of 3

Research Area: Economics

Stated Goal: The goal of this project is to provide enterprise budgets for crops in production across Arkansas which are easily adaptable for representing alternative production practices of Arkansas producers. The table "Costs and Returns per Acre Roundup Ready 2 XtendFlex Soybean" provides an example of the 2024 soybean enterprise budgets after being completely overhauled within the last year.. Costs and returns analysis utilizing the budgets are conducted by economists to provide research results for a variety of projects. The research verification coordinators utilize production economics analysis to investigate factors impacting farm profitability. The crop enterprise budgets are designed to evaluate solvency as well as determining profitability of various field activities associated with crop production.

Specific Objectives:

(1) Develop base representative field activities of the most common production practices of soybeans in Arkansas.

(2) Collect data for input prices and equipment costs associated with the base representative production activities.

(3) Establish and maintain a computational budget calculator for base representative production practices. The budget calculator is interactive and flexible in order to represent alternative production methods. Crop enterprise budgets are developed with methods that are consistent over all field crops. A total of 28 soybean budgets are produced each fall and are updated throughout the production year consistent with incremental changes in input costs and crop prices received by Arkansas producers.

(4) Update the farm budget program for financial management and public policy analysis. The farm budget program includes an interactive calculator for users to represent unique farm situations and determine breakeven prices and yields for each unique budget.

(5) Create a cost estimate of various farm activities to show the expenses that are incurred for each field activity associated with production.

(6) Investigate the economics of conservation practices in Arkansas, specifically for irrigation, cover crops, and carbon sequestration.

Methods: Crop enterprise budgets will be developed in collaboration with crop and soil science specialists, weed scientists, agronomists, pathologists, and entomologists. Production procedures for base budgets will represent University of Arkansas Division of Agriculture Cooperative Extension recommendations. Unique budgets will be customized for individuals based on Extension recommendations and information from producers.

Planned Milestones: Crop budgets based on Extension recommendations are standards for Arkansas crop production. Individual producers will utilize interactive computational capabilities for representing alternative production practices and determining profit potential with a range of commodity prices and yields. Producers and financial institutions will apply crop enterprise budgets in evaluating costs and returns for aspects of each production year. Public policies affecting producers are investigated by government organizations with crop enterprise budgets that are representative of Arkansas production.

Projected Value to the Soybean Industry: The benefits provided by the economic analysis of alternative soybean production methods provide a significant reduction in financial risk inherent in agricultural production. Arkansas producers will benefit from economic analyses of individual production activities unique to their operations. Unique crop enterprise budgets developed for individual farms are useful for determining credit requirements and planning for the upcoming crop season. Flexible crop enterprise budgets are beneficial for planning production methods to provide greatest potential for financial success. The crop budgets enable farm financial outlooks to be revised during the production season as inputs, input prices, yields, and commodity prices change. Thoroughness of computational methodology and straightforward application facilitates use of the budget calculator by research and extension specialists conducting economic analysis of water use efficiency, weed control, insect management, cover crops, and other aspects of crop production. The crop budget system allows for investigation of public policy changes that affect producers, such as eliminating exemptions for taxes on agricultural inputs like fuel and electricity.

	ACGSPB	CES
	dollars	
Personnel Salaries		
Breana Watkins		7,599.00
Other Personnel	7,599.00	
Benefits	2,401.00	2,401.00
Total Personnel	**10,000.00**	**10,000.00**
Total	**10,000.00**	**10,000.00**

ARKANSAS SOYBEAN PROMOTION BOARD

Estimated Costs and Returns per Acre
Roundup Ready 2 XtendFlex Soybean
Furrow Irrigated, 12 ac-in., Arkansas, 2024

DIVISION OF AGRICULTURE RESEARCH & EXTENSION University of Arkansas System

ITEM	UNIT	PRICE	QUANTITY	Total Amount	Landlord Share	Tenant Share
INCOME						
Soybean	bu	$ 12.70	60	$ 762.00	$ -	$ 762.00
TOTAL INCOME				$ 762.00	$ -	$ 762.00
VARIABLE EXPENSES						
LAND EXPENSE						
Cash Land Rent	acre			$ -		$ -
SEED/PLANTS						
Soybean Seed	thous	$ 0.36	150	$ 53.49	$ -	$ 53.49
CUSTOM SPRAY AND FERTILIZER						
Ground App[1,2,3,4,5]	appl	$ 8.00	5	$ 40.00	$ -	$ 40.00
Aerial App Chem[6,7]	appl	$ 8.50	2	$ 17.00	$ -	$ 17.00
Aerial App Fert	lbs	$ 0.085	0	$ -	$ -	$ -
FERTILIZERS						
Phosphate (0-46-0)[2]	lbs	$ 0.35	90	$ 31.50	$ -	$ 31.50
Potash (0-0-60)[2]	lbs	$ 0.25	100	$ 25.00	$ -	$ 25.00
Urea (46-0-0)	lbs	$ 0.25	0	$ -	$ -	$ -
HERBICIDES						
Glyphosate[1]	oz	$ 0.34	32	$ 10.88	$ -	$ 10.88
2,4-D[1]	oz	$ 0.21	32	$ 6.72	$ -	$ 6.72
Boundary[3]	qt	$ 23.50	1	$ 23.50	$ -	$ 23.50
Gramoxone[3]	oz	$ 0.37	32	$ 11.84	$ -	$ 11.84
Glyphosate[4]	oz	$ 0.34	32	$ 10.88	$ -	$ 10.88
Enlist One[4]	oz	$ 0.42	32	$ 13.44	$ -	$ 13.44
Zidua SC[4]	oz	$ 6.20	3.5	$ 21.70	$ -	$ 21.70
Enlist One[5]	oz	$ 0.42	32	$ 13.44	$ -	$ 13.44
Liberty[5]	oz	$ 0.76	32	$ 24.32	$ -	$ 24.32
INSECTICIDES						
Besiege[6]	oz	$ 2.75	9	$ 24.75	$ -	$ 24.75
FUNGICIDES						
Quadris Top[7]	oz	$ 3.05	10	$ 30.50	$ -	$ 30.50
ADJUVANTS						
HAULING						
Haul Soybean	bu	$ 0.27	60	$ 16.20	$ -	$ 16.20
DRYING						
SUPPLIES						
Polypipe	acre	$ 3.88	1	$ 3.88	$ -	$ 3.88

CROP CONSULTANT/SCOUTING FEE						
Soybean Consultant	acre	$ 7.00	1	$ 7.00	$ -	$ 7.00
CROP INSURANCE						
Soybean Crop Insurance	acre	$ 4.80	1	$ 4.80	$ -	$ 4.80
OPERATOR LABOR						
Tractors	hour	$ 16.54	0.3601	$ 5.96	$ -	$ 5.96
Harvesters	hour	$ 16.54	0.0851	$ 1.41	$ -	$ 1.41
IRRIGATE LABOR						
Special Labor	hour	$ 13.50	0.3625	$ 4.89	$ -	$ 4.89
DIESEL FUEL						
Tractors	gal	$ 3.65	3.488	$ 12.73	$ -	$ 12.73
Harvesters	gal	$ 3.65	2.027	$ 7.40	$ -	$ 7.40
Furrow Irr.	gal	$ 3.65	14	$ 51.73	$ -	$ 51.73
REPAIR & MAINTENANCE						
Tractors/Implements**	acre	$ 7.65	1	$ 7.65	$ -	$ 7.65
Harvesters	acre	$ 7.55	1	$ 7.55	$ -	$ 7.55
Furrow Irr.	acre-in	$ 0.26	12	$ 3.17	$ -	$ 3.17
INTEREST ON OP. CAP.	acre	$ 21.36	1	$ 21.36	$ -	$ 21.36
TOTAL VARIABLE EXPENSES				$ 514.69	$ -	$ 514.69
RETURNS ABOVE VARIABLE EXPENSES				$ 247.31	$ -	$ 247.31
FIXED EXPENSES						
Tractors/Implements	acre	$ 48.28	1	$ 48.28	$ -	$ 48.28
Harvesters	acre	$ 31.76	1	$ 31.76	$ -	$ 31.76
Furrow Irr.	acre	$ 26.33	1	$ 26.33	$ -	$ 26.33
TOTAL FIXED EXPENSES				$ 106.37	$ -	$ 106.37
TOTAL SPECIFIED EXPENSES				$ 621.06	$ -	$ 621.06
RETURNS ABOVE TOTAL SPECIFIED EXPENSES				**$ 140.94**	$ -	**$ 140.94**

Note: Cost of production estimates are based on input prices gathered in fall 2023. These budgets are an adaptation of budgets from MSState following University of Arkansas System Recommendations.

**Implements assumed in use for this budget are as follows: 1 x disk; 1 x field cultivator; 1 x bedder/hipper; 1 x row crop cultivator; 1 x do-all; 1 x planter; 1 x polypipe; roll out, punch, take up

University of Arkansas System Division of Agriculture
Promotion Board Budget

Watkins, Breana — *Soybean Enterprise Budgets and Production Economics Analysis*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	Year 2 of 3
Lead Investigator	Watkins, Breana	**Co-PI #1**	Ford, Vic
Co-PI #2		**Co-PI #3**	
Department	CES Associate Director of Agriculture & Natural Resources		
Commodity Board	Soybean Promotion Board		
Project Title	Soybean Enterprise Budgets and Production Economics Analysis		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

			Watkins, Breana	Ford, Vic			Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI			CES	CES					
Fulltime Personnel									
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
Instructor	Breana Watkins	30%	$7,599				$7,599	$0	$7,599
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Subtotal: Salaries	$7,599	$0	$0	$0	$7,599	$0	$7,599
Graduate Student									
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Tuition					$0	$0	$0
		Subtotal: Graduate Student	$0	$0	$0	$0	$0	$0	$0
Hourly									
			Wages				**Total**	**AES Portion**	**CES Portion**
		Hourly-Personnel					$0	$0	$0
		Hourly-Students					$0	$0	$0
		Subtotal: Hourly	$0	$0	$0	$0	$0	$0	$0
Fringe Benefits									
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
		Fulltime Personnel	$2,401	$0	$0	$0	$2,401	$0	$2,401
		Graduate Students	$0	$0	$0	$0	$0	$0	$0
		Hourly Personnel	$0	$0	$0	$0	$0	$0	$0
		Hourly-Students	$0	$0	$0	$0	$0	$0	$0
		Subtotal: Fringe Benefits	$2,401	$0	$0	$0	$2,401	$0	$2,401
		Personnel Total	$10,000	$0	$0	$0	$10,000	$0	$10,000
Travel									
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
		In-State					$0	$0	$0
		Out-of-State					$0	$0	$0
		Travel Total	$0	$0	$0	$0	$0	$0	$0

University of Arkansas System Division of Agriculture
Promotion Board Budget

Watkins, Breana *Soybean Enterprise Budgets and Production Economics Analysis*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies					$0	$0	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$0	$0	$0	$0	$0	$0	$0
	Total for Proposal	$10,000	$0	$0	$0	$10,000	$0	$10,000

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

		%	Watkins, Breana	Ford, Vic			Total	
Ecosystems (Rice Only)	Grand Prairie	0%	$0	$0	$0	$0	$0	
	Mississippi Delta		$0	$0	$0	$0	$0	
	White River		$0	$0	$0	$0	$0	
	Totals	0%	$0	$0	$0	$0	$0	*Must match the proposal total.*

Tab
Thrash (111)

Arkansas Soybean Promotion Board – 2024-2025 Proposal

Title: Refining insect thresholds in Arkansas soybean
Lead Investigators: Ben Thrash
Co-Investigators: Glenn Studebaker, Nick Bateman
Status: Year 3
Research Area: Entomology

Stated Goal: This project aims to develop cost-effective and sustainable recommendations for the management of the major insect problems in soybean in all regions of Arkansas. Insect management continues to be a major focal point for growers and consultants in Arkansas soybean and developing sound recommendations for the most effective and economical control of insects is key to helping soybean producers maintain profitability. This project addresses various aspects of integrated management of problematic pests associated with soybean production.

Objectives:
Objective 1: Verify/refine thresholds for corn earworm, soybean looper, and the stink bug complex in Arkansas soybean.

Objective 2: Evaluate slug control methods for efficacy and cost effectiveness in Arkansas soybean.

Objective 3: Determine the more efficient sampling methods for wide row, narrow row, and drilled soybean for multiple pests.

Justification: Corn earworm, soybean looper, and the stink bug complex, are the most damaging insect pests of soybean in Arkansas. We have thresholds established for these pests; however, it is good practice to reevaluate these thresholds periodically due to changes in cultivars and management practices across the state. There may also be room for improvement in our current thresholds by adjusting them for soybean growth stage. For example, we know that soybean can compensate from corn earworm injury that occurs during R2 much better than injury occurring at R4, so the threshold could potentially be relaxed during the R2 growth stage. Additionally, the widespread use of the corn earworm virus (Heligen) seems to have brought pod injury to the attention of many growers and consultants because of how closely these fields are being inspected behind a virus application. Many growers and consultants have very low tolerance for pod injury within a soybean field even though soybean can compensate for a relatively large amount of injury from each of these pests. Preliminary research conducted by our colleagues at MS State has shown no yield losses from up to 10% pod damage from corn earworm in plots. This project aims to further improve our thresholds and understand how much pod injury and defoliation can occur before yield loss is realized.

The acreage of seedling soybean damaged by slugs over the past several years is on the rise with some growers replanting as many as three times due to stand loss from a slug infestation. This increase is due to increasingly wet spring weather coupled with the large amount of minimum till/no-till/cover crop acreage in Arkansas. There are very few effective treatments for slugs and those that are effective are very expensive. Deadline, perhaps the most used molluscicide, costs approximately $30/a at the recommended 10 lb/a broadcast rate. Iron chelate is another effective control option however it is currently even more expensive than Deadline. The only other currently recommended control method is tillage which is unacceptable to some growers. Another option is waiting until the weather becomes drier later in the growing season which can help to reduce slug populations, but soybean yield potential often suffers from the planting delay, and this is not always logistically possible. We have conducted some preliminary research using banded and reduced rate applications of deadline to try and make applications more affordable. In this preliminary research banded applications and reduced rates show some promise but more studies need to be conducted to evaluate their effectiveness. We also frequently receive questions on the effectiveness of using fertilizer to “salt” the slug infestation. We are fairly certain that these applications are ineffective however, without data we are not 100% sure.

With the large discrepancy in soybean production practices throughout the state, based on crop rotation and equipment availability it is important that we determine the most efficient sampling methods for these situations. We receive multiple calls every year wanting to know how best to sample beans that are lodging or best time of day for sampling different pests. We need to determine the best time of day to sample and the best tools to use for different planting arrangements to keep growers profitable.

Methods:

Objective 1. Large and small block replicated trials will be sprayed on research stations and cooperating grower fields. Insecticide application timings will be staggered to achieve various levels of injury across plots. Damaged pod counts, defoliation, and damaged seed will be recorded for corn earworm, soybean looper, and stink bugs, respectively. Yields will be recorded in all plots.

Objective 2. Large block trials will be conducted on grower fields experiencing slug injury. Banded and reduced rates of deadline will be applied and stand counts, slug injury, and yield will be recorded. With Deadline being a bait, having a 48-to-72-hour rain free period after application is the normal recommendation to achieve an acceptable level of control. We will make applications around these rainfall timings to determine the minimum rain-free period need to achieve control. The effect of tillage on slug populations will also be evaluated.

Objective 3. Sampling will be conducted using a sweepnet, drop cloth, and visual counts early in the morning, midday, and late afternoon in wide row and narrow beans at multiple planting dates. All pests will be record and correlations will be made to time of day and sampling method.

Planned Milestones:

2021: Initiate field trials for all three objectives.
2022: Field trials will be continued for all objectives.
2023: Analyze three years data and summarize findings to develop management recommendations.

Value to Soybean Industry:

With the current cost of production for soybean, it is critical to maintain profitability and ensure that when insecticide applications are made that they are justified and economical. With soybean ability to compensate for insect damage, it is possible that we are spraying too early in many cases. This project will verify our current thresholds on a large block infield setting that has the potential to reduce many insecticide applications and helping growers maintain maximum profitability.

Budget Justification: Money budgeted for travel will be used to get two and from research locations. Direct cost will be salaries and supplies to conduct field trials.

University of Arkansas System Division of Agriculture
Promotion Board Budget

Thrash, Ben *Refining Insect Thresholds in Arkansas Soybean*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	Year 3 of 3
Lead Investigator	Thrash, Ben	**Co-PI #1**	Bateman, Nick
Co-PI #2	Studebaker, Glenn	**Co-PI #3**	
Department	ENPL Entomology and Plant Pathology		
Commodity Board	Soybean Promotion Board		
Project Title	Refining Insect Thresholds in Arkansas Soybean		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

	Thrash, Ben	Bateman, Nick	Studebaker, Glenn		Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI	CES	CES	CES				

Fulltime Personnel

Position Title	Name *(if position is filled)*	% Time	Salaries				Total	AES	CES
Program Associate	Andrew Plummer	40%	$15,000				$15,000	$0	$15,000
Program Associate	Lauren Amos	25%	$12,000				$12,000	$0	$12,000
Program Associate	Garrett Felts	20%		$7,000			$7,000	$0	$7,000
Program Associate	Mathew Mann	20%			$3,500		$3,500	$0	$3,500
							$0	$0	$0
		Subtotal: Salaries	$27,000	$7,000	$3,500	$0	$37,500	$0	$37,500

Graduate Student

Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.

Name *(if position is filled)*	% Time	Wages				Total	AES Portion	CES Portion
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
	Tuition					$0	$0	$0
	Subtotal: Graduate Student	$0	$0	$0	$0	$0	$0	$0

Hourly

	Wages				Total	AES Portion	CES Portion
Hourly-Personnel	$7,000	$4,500	$3,000		$14,500	$0	$14,500
Hourly-Students					$0	$0	$0
Subtotal: Hourly	$7,000	$4,500	$3,000	$0	$14,500	$0	$14,500

Fringe Benefits

Fringe benefits are calculated when salary and wage amounts are entered above.

	Benefits				Total	AES Portion	CES Portion
Fulltime Personnel	$8,532	$2,212	$1,106	$0	$11,850	$0	$11,850
Graduate Students	$0	$0	$0	$0	$0	$0	$0
Hourly Personnel	$553	$356	$237	$0	$1,146	$0	$1,146
Hourly-Students	$0	$0	$0	$0	$0	$0	$0
Subtotal: Fringe Benefits	$9,085	$2,568	$1,343	$0	$12,996	$0	$12,996
Personnel Total	$43,085	$14,068	$7,843	$0	$64,996	$0	$64,996

Travel

Justify out-of-state travel in proposal.

	Travel				Total	AES Portion	CES Portion
In-State	$1,600	$1,520	$1,000		$4,120	$0	$4,120
Out-of-State					$0	$0	$0
Travel Total	$1,600	$1,520	$1,000	$0	$4,120	$0	$4,120

University of Arkansas System Division of Agriculture
Promotion Board Budget

Thrash, Ben *Refining Insect Thresholds in Arkansas Soybean*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies					$0	$0	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$0	$0	$0	$0	$0	$0	$0
	Total for Proposal	$44,685	$15,588	$8,843	$0	$69,116	$0	$69,116

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

		%	Thrash, Ben	Bateman, Nick	Studebaker, Glenn		Total	
Ecosystems (Rice Only)	Grand Prairie	0%	$0	$0	$0	$0	$0	
	Mississippi Delta		$0	$0	$0	$0	$0	
	White River		$0	$0	$0	$0	$0	
	Totals	0%	$0	$0	$0	$0	$0	*Must match the proposal total.*

Tab

Thrash (117)

Arkansas Soybean Promotion Board – 2024-2025 Proposal

Title: Impact of water quality on insecticide applications to soybean
Lead Investigators: Ben Thrash
Co-Investigators: Nick Bateman, Glenn Studebaker
Status: Year 1 of 3 (continuing)
Research Area: Entomology

Stated Goal:
This project aims to determine the effect of water quality on insecticide applications made in soybean. In recent years, we continue to see a wide range of efficacy for insecticide applications for control of insects pests. Depending on location, there can be a wide range in the level of control observed for a particular insecticide. For example, a pyrethroid application may achieve 90% control in one location and less than 50% at another location. We know that pyrethroids are subject to alkaline hydrolysis, which can reduce efficacy of the insecticide in situations where water pH is too high. We also have observed that insecticide applications made with herbicides can impact the efficacy of an insecticide application. In recent years, nucleopolyhedroviruses (NPV such as Heligen) have been used by many growers for control of corn earworm, *Helicoverpa* zea. Mostly, control has been very good, while in other locations control was not satisfactory. It is known that NPV efficacy can be severely affected by high pH water. Many areas are subject to water with a high pH (pH greater than 8.5). Also, one of the questions we are often asked about is the impact of holding an insecticide spray solution for an extended period of time in the tank, due to rainfall, mechanical, or other issues. How is the efficacy of the insecticide impacted by prolonged time in the tank? The goal of this study is to document differences in control due to water quality and develop sustainable recommendations to manage the impact of water quality insecticide efficacy. The most expensive insecticide application for our producers is the one that doesn't achieve effective control of the target pest. With the rising cost of insecticides it is crucial for the grower to achieve an effective level of control. Insect management continues to be a major focal point for growers and consultants in Arkansas soybean, and developing sound recommendations to maximize control of insect pests for the most effective and economical control of insects is key to helping soybean producers be profitable.

Objectives:
Objective 1: Biopesticides, particularly the viruses, appear to be an alternative to traditional insecticides. In the last two years Heliothis NPV has proven to be very effective for many growers for control of bollworms in soybean. However, there remains much to be learned about the use of these products particularly the effect of water quality on control, tank mixing with other products, and developing sound recommendations for water conditioners. Conducting on-farm trials to determine level of control in high pH water with and without water conditioners and the impact of tankmixing will help us in developing a data set to help us make recommendations on use will be important.

Objective 2: Foliar insecticide applications, with different water quality measures will be compared as well as water conditioning agents to combat issues with high pH and or "hardness" will be compared to determine if insect control can be improved with additives.

Objective 3: Determine the impact of time on insecticides in solution for extended periods of time. In extreme situations where insecticide in the tank in water that has a high pH or high levels of solids for 12, 24 or 48 hours.

Justification:

The cost of insecticides continues to increase for soybean producers and achieving effective control is critical for maintaining yields. The most expensive insecticide application is the one that does not work. Yield loss from insects not controlled plus cost of application is unacceptable and reduces profit for soybean producers. We need to evaluate the differences in control due to water quality issues and develop recommendations for avoiding situations where we do not achieve adequate control of insect pests.

Methods:

Objective 1. Large on-farm trials and small plot trials with Heligen in different water quality situations will be conducted to determine level of control, longevity in the field, and impact of water quality on control with the virus.

Objective 2. Large on-farm trials and small plot trials with the major pests such as corn earworm, looper and stink bug will be conducted to determine level of control, longevity in the field, and impact of water quality on control with insecticides.

Objective 3. Insecticides will be tested by putting them in different water quality solutions for 12, 24, and 48 hours then spraying in the field to determine impact of water quality and time in solution on subsequent insect control.

Planned Milestones:

2021: Initiate field trials for all three objectives.
2022: Field trials will be continued for all objectives.
2023: Analyze three years data and summarize findings to develop management recommendations.

Value to Soybean Industry:

Biopesticides are the wave of the future for caterpillar management in soybean. We need to test these products intensively to help us provide information on how and when to use these products. The cost is roughly one-fourth to one-half the cost of synthetic insecticides so they may provide control much more economically for producers.

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Budget Justification:

Money budgeted for travel will be used to get two and from research locations. Direct cost will be salaries and supplies to conduct field trials.

University of Arkansas System Division of Agriculture
Promotion Board Budget

Thrash, Ben — *Impact of water quality on insecticide applications on soybean*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	Year 3 of 3
Lead Investigator	Thrash, Ben	**Co-PI #1**	Bateman, Nick
Co-PI #2	Studebaker, Glenn	**Co-PI #3**	
Department	ENPL Entomology and Plant Pathology		
Commodity Board	Soybean Promotion Board		
Project Title	Impact of water quality on insecticide applications on soybean		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

			Thrash, Ben	Bateman, Nick	Studebaker, Glenn		Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI			CES	CES	CES				
Fulltime Personnel									
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
Program Associate			$15,198				$15,198	$0	$15,198
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
Subtotal: Salaries			$15,198	$0	$0	$0	$15,198	$0	$15,198
Graduate Student									
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Tuition					$0	$0	$0
Subtotal: Graduate Student			$0	$0	$0	$0	$0	$0	$0
Hourly			**Wages**				**Total**	**AES Portion**	**CES Portion**
Hourly-Personnel							$0	$0	$0
Hourly-Students							$0	$0	$0
Subtotal: Hourly			$0	$0	$0	$0	$0	$0	$0
Fringe Benefits			**Benefits**				**Total**	**AES Portion**	**CES Portion**
Fringe benefits are calculated when salary and wage amounts are entered above. Fulltime Personnel			$4,803	$0	$0	$0	$4,803	$0	$4,803
Graduate Students			$0	$0	$0	$0	$0	$0	$0
Hourly Personnel			$0	$0	$0	$0	$0	$0	$0
Hourly-Students			$0	$0	$0	$0	$0	$0	$0
Subtotal: Fringe Benefits			$4,803	$0	$0	$0	$4,803	$0	$4,803
Personnel Total			$20,001	$0	$0	$0	$20,001	$0	$20,001
Travel			**Travel**				**Total**	**AES Portion**	**CES Portion**
Justify out-of-state travel in proposal. In-State							$0	$0	$0
Out-of-State							$0	$0	$0
Travel Total			$0	$0	$0	$0	$0	$0	$0

University of Arkansas System Division of Agriculture
Promotion Board Budget

Thrash, Ben *Impact of water quality on insecticide applications on soybean*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies					$0	$0	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$0	$0	$0	$0	$0	$0	$0
	Total for Proposal	$20,001	$0	$0	$0	$20,001	$0	$20,001

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

		%	Thrash, Ben	Bateman, Nick	Studebaker, Glenn		Total	
Ecosystems (Rice Only)	Grand Prairie	0%	$0	$0	$0	$0	$0	
	Mississippi Delta		$0	$0	$0	$0	$0	
	White River		$0	$0	$0	$0	$0	
	Totals	0%	$0	$0	$0	$0	$0	***Must match the proposal total.***

Tab

Kariyat (121)

Soybean Promotion Board- Renewal year 2 of 3.

Title: Developing scouting, threshold, and management practices for stinkbug complex (Red banded, Green, and Brown) in Arkansas soybean

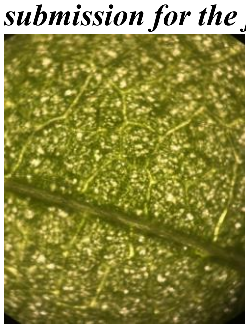
Investigators: Drs. Rupesh Kariyat, Neelendra Joshi, Glen Studebaker, Ben Thrash and Nick Bateman

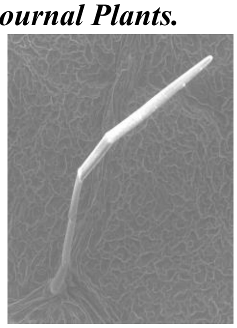
Production System: Soybean

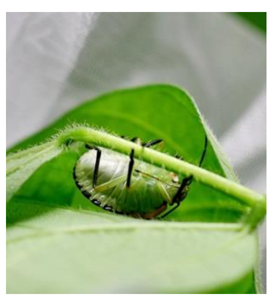
Status: Stated Goal New Proposal Year 2 of 3; requested amount: 49,102$

Progress/Accomplishments:
As a part of Objective 1, we conducted a comprehensive survey of soybean plots located at the University of Arkansas farm from mid-August-October first week. The mean abundance of green stink bug measured in terms of sweep net sampling was 1.6 per linear foot of row in late August and increased considerably later in the season, when the abundance was 2.4 stink bugs per linear foot. To determine the species composition, we collected stink bugs with sweep nets and then identified those samples in the laboratory. In this survey, Southern green stink bug was found to be the most dominant species with 96.8% of total stink bugs collected. The proportional abundance of the brown marmorated stink bugs were very low (3.2%). In 2023 crop season, red banded stink bugs were not found in sampling at UA farm.

As a part of objective 3 and 4 we have grown 18 soybean accessions in the greenhouse and evaluated their resistance and growth traits. As the first line of defense, soybeans employ leaf trichomes. We have developed a microscope-based density assessment and found that regardless of the accessions, fast wilting genotypes had a higher number of trichomes, and leaf underside (abaxial) had higher trichome density. The trichome pictures are below (light and scanning electron microscopy based). In addition, we also followed up these experiments with Southern green stink bugs collected from AES Farm in Fayetteville. We are currently estimating the effects of stink bug damage on defense and growth traits. Detailed results will be presented in annual report. ***And, the graduate student Jessica Ayala who had been working on the project has presented her work at the UA 3 minutes thesis competition, Arkansas Crop Protection Association Annual Meeting, and Entomological Society of America Annual Meeting. In addition, a manuscript based on her work is currently under submission for the journal Plants.***







Figures 1,2,3:

Trichomes in soybean (1,2) and Southern green Stinkbug feeding assay in lab.

Objectives for year 2: In year 2, we will continue the objectives with additional field sampling (objective 1), selection of resistant and tolerant soybean varieties (objectives 2, 3) and will also start analytical chemistry work as detailed in objectives 3 and 4.

1: Develop and update scouting methodology and economic thresholds for the soybean stinkbug complex (Red banded, Green, and Brown)
2: Develop soybean growth stage injury standards across commonly grown soybean varieties for the stinkbug complex.
3: Estimate host plant resistance traits and their variation across soybean varieties for the three stinkbug species under laboratory conditions
4: Evaluate the nutritional quality loss due to stinkbug complex infestation on soybean pods.

Detailed methodology for objectives 3 and 4:
Objective 3: To accomplish objective 3, we will do a comprehensive assessment of insect resistance traits in soybean cultivars grown in different regions of the state. These will include measuring leaf trichome density and types, secondary metabolites, and volatile organic compounds. In addition, we will also examine induced defenses post stinkbug feeding (same set of defense traits). Results from this objective will be the first report of differential defenses against the stinkbug complex in Soybean. More specifically, we aim to individually and in tandem, allow the three species to feed on the varieties and measure the defense traits pre and post infestation. Findings from this study objective will be helpful in developing new management strategies as well as stink bug resistance soybean varieties. Objective 4: To accomplish objective 4, we will carry out both lab and field assessments. Briefly, we will sample stinkbug(s) infected and un-infected pods from field sites (from objective 1and 2) and also from plants grown under controlled environmental conditions in the greenhouse. The pods will then be extracted in organic solvents and will be subjected to metabolic profiling at the UA mass spectrometry center. This analysis will allow us to understand how stinkbug complex (single species and in combination) affects pod quality, and toxin build up. This will also assist us in understanding how individual species and their toxins affect the quality of soybean pods, rather than just estimating the yield loss.

Milestones and Timeline:

2023: Set up field trials and small plot experiments for objectives 1 and 2 (completed). 2024: Based on year 1, select resistant, tolerant, and sustainable soybean varieties relevant to Arkansas, and set up lab-based screening study detailed in objective 3, while continuing the field assessment studies (Obj. 1 and 2).

Statement of projected value:

Stinkbugs have been traditionally a major pest in Soybean production, but more recently, with the sporadic onset of Red banded Stink Bug, the possibility of severe damage across various soybean cultivars in the state has expanded. Unfortunately, unlike corn ear worm, Arkansas doesn't have an updated threshold recommendations and an assessment of injury levels, specific symptoms, and cultivar resistance traits for the stink bug complex (which are three

different hemipteran pest species). More importantly, a long term (3 year) field monitoring on incidence, development and dispersal of these species has not been undertaken in the state. This project which combines continuous field assessment, complimented with small plot experiments (with selected varieties and replicated trials), and detailed lab-based assays will be a tremendous resource for developing integrated management practices for stink bug complex that has the potential to be a major concern for soybean producers in the state.

University of Arkansas System Division of Agriculture
Promotion Board Budget

Rupesh Kariyat — *Developing scouting, threshold, and management practices for stinkbug complex in AR soybeans*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	Year 2 of 3
Lead Investigator	Rupesh Kariyat	**Co-PI #1**	Neelendra Joshi
Co-PI #2	Ben Thrash	**Co-PI #3**	Glenn Studebaker
Department	Entomology and Plant Pathology		
Commodity Board	Soybean Promotion Board		
Project Title	Developing scouting, threshold, and management practices for stinkbug complex in AR soybeans		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

	Rupesh Kariyat	Neelendra Joshi	Ben Thrash	Glenn Studebaker	Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI	AES	AES	CES	CES			

Fulltime Personnel

Position Title	Name (if position is filled)	% Time	Salaries				Total	AES	CES
Graduate student		50%	$8,000	$8,000			$16,000	$16,000	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
Subtotal: Salaries			$8,000	$8,000	$0	$0	$16,000	$16,000	$0

Graduate Student

Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.

Name (if position is filled)	% Time	Wages				Total	AES Portion	CES Portion
		$4,500	$3,500			$8,000	$8,000	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
Tuition						$0	$0	$0
Subtotal: Graduate Student		$4,500	$3,500	$0	$0	$8,000	$8,000	$0

Hourly

	Wages				Total	AES Portion	CES Portion
Hourly-Personnel			$4,000	$3,000	$7,000	$0	$7,000
Hourly-Students	$1,000				$1,000	$1,000	$0
Subtotal: Hourly	$1,000	$0	$4,000	$3,000	$8,000	$1,000	$7,000

Fringe Benefits

Fringe benefits are calculated when salary and wage amounts are entered above.

	Benefits				Total	AES Portion	CES Portion
Fulltime Personnel	$2,528	$2,528	$0	$0	$5,056	$5,056	$0
Graduate Students	$189	$147	$0	$0	$336	$336	$0
Hourly Personnel	$0	$0	$316	$237	$553	$0	$553
Hourly-Students	$7	$0	$0	$0	$7	$7	$0
Subtotal: Fringe Benefits	$2,724	$2,675	$316	$237	$5,952	$5,399	$553
Personnel Total	$16,224	$14,175	$4,316	$3,237	$37,952	$30,399	$7,553

Travel

Justify out-of-state travel in proposal.

	Travel				Total	AES Portion	CES Portion
In-State	$2,000	$1,000	$600	$1,450	$5,050	$3,000	$2,050
Out-of-State					$0	$0	$0
Travel Total	$2,000	$1,000	$600	$1,450	$5,050	$3,000	$2,050

University of Arkansas System Division of Agriculture
Promotion Board Budget

Rupesh Kariyat — *Developing scouting, threshold, and management practices for stinkbug complex in AR soybeans*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$3,000	$1,500	$800	$800	$6,100	$4,500	$1,600
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$3,000	$1,500	$800	$800	$6,100	$4,500	$1,600
	Total for Proposal	$21,224	$16,675	$5,716	$5,487	$49,102	$37,899	$11,203

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

		%	Rupesh Kariyat	Neelendra Joshi	Ben Thrash	Glenn Studebaker	Total	
Ecosystems (Rice Only)	Grand Prairie	0%	$0	$0	$0	$0	$0	
	Mississippi Delta		$0	$0	$0	$0	$0	
	White River		$0	$0	$0	$0	$0	
	Totals	0%	$0	$0	$0	$0	$0	*Must match the proposal total.*

Tab

Roberts (125)

Arkansas Soybean Promotion Board – 2024-2025 Proposal

Title: Fertilization of Soybean

Lead Investigators: Trenton Roberts

Co-Investigators: Gerson Drescher and Jeremy Ross

Status: Year 2

Research Areas: Fertility

Stated Goal:

The overall mission of this research is to identify potential yield limitations via soil and plant analysis and aid in the prevention of soybean yield loss attributed to insufficient (or toxic) mineral nutrition. The specific goals addressed with this project are to 1) continue short- and long-term phosphorus (P) and potassium (K) fertilization trials, 2) continue to evaluate soybean fertilization strategies with macro and micronutrients, 3) investigate remote sensing technologies and 4) assess nutrient concentration variability at the production scale.

Specific Objectives:

1. Continue long-term P and K fertilizer rate trials established at the Pine Tree Research Station in 2000 (PTRS) and Rice Research Experiment Station in 2007 (RREC) to examine soil-test trends and crop yield responses to fertilization rates.
2. Continue to evaluate existing and develop new correlation calibration relationships between soil-test P (or K) alone and soybean yield and leaf nutrient concentration in response to P (or K) fertilization.
3. Evaluate the effects of P fertility on soybean yield, selected yield components, the pattern of leaf-P concentration across time, and seed nutrient concentration among nodes.
4. Calibrate in season leaf tissue-K concentrations to predict K fertilizer needs to maximize or recover yield during the reproductive growth stages. Assess the use of remote sensing to predict where trifoliolate leaf samples should be collected.

Methods:

1. Short- and Long-term Studies: Potassium rate studies at PTRS established in 2000 and P and K rate studies at the RREC established in 2007 will be maintained with their existing, annually applied treatments (0, 40, 80, 120, and 160 lb P_2O_5 and K_2O/acre) and grown in rotation with rice. Data will continue to be collected from the long-term corn and soybean rotational site. Soil samples will be taken annually from long-term trials and tissue nutrient concentrations and yield will continue to be evaluated. Short-term trials that evaluate new fertilizers (e.g., Aspire), evaluate nutrient application strategies, and support the needs of developing/evaluating critical leaf nutrient levels will be continued to ensure that new technology or products are fairly evaluated to advise growers on their use.

2. Replicated field trials will be established at experiment stations across the state with varying levels of soil test K to elicit varying levels of K deficiency. Treatments will include a non-treated check, a yield maximizing K rate applied preplant, and several in-season K rates applied at 15, 30, and 45 days after R1. Leaf samples will be collected at each fertilizer application to calibrate the K rate needed to maximize soybean grain yield based on tissue-K concentration.

3. The research will be performed at the PTRS within a long-term P fertility study. The trial is a

randomized complete block design with four blocks that contain three fertilizer sources (monoammonium phosphate (MAP) without potash; MAP + muriate of potash, and MicroEssentials SZ + Aspire] with each fertilizer-P source applied at 0, 30, 60, and 120 and lb P_2O_5/acre. The site is furrow irrigated and cropped with a 1:1 soybean and corn rotation. Mature leaf samples will be collected during vegetative growth (V4-V6) and then weekly for 10 weeks beginning at the R1 stage to measure leaf-P concentrations from the MAP + muriate of potash fertilizer-P source applied at 0, 30, and 60 lb P_2O_5/acre. At maturity, six whole mature plants will be collected from an interior row, dissected (two nodes and two internodes/node section) and plant tissues from each dissected node segment will be separated into (i) stem internodes, (ii) pods, and (iii) seeds to evaluate soybean seed yield, yield components (number of pods and seeds, and seed abortion), and seed nutrient concentration responses among nodes to P fertility.

Planned Milestones:

The proposed research trials will be conducted for three years beginning in 2023. Research results will be published annually in the Wayne Sabbe Arkansas Soil Fertility Studies Research Series or Soybean Research Series to serve as a permanent, accessible record of results that will also serve to inform clientele within and outside of Arkansas. Information will also be disseminated annually via county educational meetings and at regional and international professional meetings as deemed appropriate. The outcomes of annual research results will help guide the research for subsequent years and lead to the development of new tools for Arkansas soybean producers.

Value to Soybean Industry:

Soybean fertilization costs represent about one-fifth of the total operating expenses budgeted for full-season soybean grown on silt loam soils. Accurate identification of P- and K-deficient soils and knowledge of other yield-limiting nutrients will enable recommendations to be refined so that the correct fertilizer sources and rates are applied at the times and frequency required to maximize yield and sustain soil productivity. Long-term fertilization trials are invaluable for verifying that recommended P and K fertilizer rates are sufficient for sustainable production and, as illustrated by our development of critical leaf-K concentrations for developing tissue-based interpretations to verify sufficient crop nutrition. Correlating and calibrating nutrient information from soil and tissue analyses is a long-term process that requires a large number of site-years with a wide range of soil properties to ensure soil test recommendations are as accurate and precise as possible. The ability to accurately diagnose P and K deficiency and an improved understanding of how nutrient deficiencies influence individual yield components will positively impact soybean production economics and the environment. With current advancements in remote sensing and the adaptability of new platforms to unmanned aerial systems there is the opportunity for assessing soybean nutritional status using aerial imagery. Developing tools that will allow producers to identify potential nutrient deficiencies before they can be detected through deficiency symptomology can help ensure that nutrients such as P and K are no longer yield-limiting factors in Arkansas soybean production systems.

Budget Justifications/Explanation of Travel and Direct Costs:

The out-of-state travel included in this proposal is to cover a portion of the cost for graduate students to attend professional scientific meetings which in this calendar year will include the international annual agronomy meetings in San Antonio, TX. Attendance at these meetings allows presentations to be made concerning the research work conducted and for increased education by attending other scientific presentations and workshops. In-state travel and salary are budgeted for field data collection. Publication is budgeted for manuscript publication in a peer-reviewed journal.

University of Arkansas System Division of Agriculture
Promotion Board Budget

Roberts, Trenton *Fertilization of Soybean*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	Year 2 of 3
Lead Investigator	Roberts, Trenton	**Co-PI #1**	Drescher, Gerson
Co-PI #2		**Co-PI #3**	
Department	CSES Crop, Soil, Environmental Science		
Commodity Board	Soybean Promotion Board		
Project Title	Fertilization of Soybean		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

	Roberts, Trenton	Drescher, Gerson			Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI	AES	AES					

Fulltime Personnel

Position Title	Name *(if position is filled)*	% Time	Salaries				Total	AES	CES
Program Associate	Joe Shafer	25%	$15,000				$15,000	$15,000	$0
Program Associate	Steph Williamson	10%	$6,600				$6,600	$6,600	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Subtotal: Salaries	$21,600	$0	$0	$0	$21,600	$21,600	$0

Graduate Student

Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.

Name *(if position is filled)*	% Time	Wages				Total	AES Portion	CES Portion
New PhD	25%	$6,000				$6,000	$6,000	$0
New MS	25%		$6,000			$6,000	$6,000	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
	Tuition	$3,300	$1,700			$5,000	$5,000	$0
	Subtotal: Graduate Student	$9,300	$7,700	$0	$0	$17,000	$17,000	$0

Hourly

	Wages				Total	AES Portion	CES Portion
Hourly-Personnel					$0	$0	$0
Hourly-Students	$1,000	$2,000			$3,000	$3,000	$0
Subtotal: Hourly	$1,000	$2,000	$0	$0	$3,000	$3,000	$0

Fringe Benefits

Fringe benefits are calculated when salary and wage amounts are entered above.

	Benefits				Total	AES Portion	CES Portion
Fulltime Personnel	$6,826	$0	$0	$0	$6,826	$6,826	$0
Graduate Students	$252	$252	$0	$0	$504	$504	$0
Hourly Personnel	$0	$0	$0	$0	$0	$0	$0
Hourly-Students	$7	$14	$0	$0	$21	$21	$0
Subtotal: Fringe Benefits	$7,085	$266	$0	$0	$7,351	$7,351	$0
Personnel Total	$38,985	$9,966	$0	$0	$48,951	$48,951	$0

Travel

Justify out-of-state travel in proposal.

	Travel				Total	AES Portion	CES Portion
In-State	$4,500	$3,000			$7,500	$7,500	$0
Out-of-State	$1,500	$1,500			$3,000	$3,000	$0
Travel Total	$6,000	$4,500	$0	$0	$10,500	$10,500	$0

University of Arkansas System Division of Agriculture
Promotion Board Budget

Roberts, Trenton *Fertilization of Soybean*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$1,500	$1,000			$2,500	$2,500	$0
	Fertilizer/Chemicals	$1,000	$500			$1,500	$1,500	$0
	Publication		$1,500			$1,500	$1,500	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs	Lab Analysis	$3,500	$2,750			$6,250	$6,250	$0
Station Maintenance	SAREC, Fayetteville	$1,450	$0	$0	$0	$1,450	$1,450	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$6,750	$0	$0	$0	$6,750	$6,750	$0
	RIRE, Stuttgart	$1,240	$0	$0	$0	$1,240	$1,240	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$15,440	$5,750	$0	$0	$21,190	$21,190	$0
	Total for Proposal	$60,425	$20,216	$0	$0	$80,641	$80,641	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

		%	Roberts, Trenton	Drescher, Gerson			Total	
Ecosystems (Rice Only)	Grand Prairie	0%	$0	$0	$0	$0	$0	
	Mississippi Delta		$0	$0	$0	$0	$0	
	White River		$0	$0	$0	$0	$0	
	Totals	0%	$0	$0	$0	$0	$0	*Must match the proposal total.*

Tab

Roberts (129)

Arkansas Soybean Promotion Board – 2024-2025 Proposal

Title: Influence of Cover Crops and Soil Health on Soybean

Lead Investigators: Trenton Roberts

Co-Investigators: Gerson Drescher and Jeremy Ross

Status: Year 2

Research Areas: Agronomy and Fertility

Stated Goal: To investigate the short-term and long-term benefits of cover crop implementation on corn and soybean yield, nutrient use efficiency, water use efficiency and soil health.

Specific Objectives:

1. Evaluate the effects of soil sample collection timing on soil health results and their interpretation.

2. Identify how winter cover crop species influences corn and soybean yield performance and soil physical characteristics related to water holding capacity and irrigation.

3. Monitor soil physical and chemical parameters related to soil health and productivity as influenced by a corn and soybean rotation with varying winter cover crop species.

Methods:

1. Field-scale, large-block trials will be implemented to look at the influence of cover crop species on soil health, soil physical and chemical characteristics specifically related to soil water holding capacity and irrigation. Implementation of cover crops and no-till production practices will influence the amount of soil organic matter and ultimately the crop performance and water use efficiency. Soil samples will be taken annually within the trial to gain baseline information of characteristics such as soil texture, organic C, organic N, soil organic matter via weight loss on ignition and basic soil fertility levels. During the initiation of the trial samples will be taken prior to cash crop planting each season to monitor the effects of the cover crop treatments within the corn and soybean rotations.
2. In order to gain information on the influence of winter cover crop species selection on soybean yield and irrigation efficiency data will be collected each year over the course of the experiment to determine both the long and short-term effects. Conversion to no-till and introduction of cover crops can lead to initial yield lags, but overtime often lead to yield increases.
3. Soil samples for soil health analysis will be collected each month for an entire year to determine how time of sampling impacts soil health results. Samples will be collected

from all four of the soybean cover crop trials located across the state. Only selected treatments will be sampled, but the same treatments will be sampled at all locations.

4. Each season soil samples will be collected and compared to see how crop rotation and cover crop species influence the soil health index. Statistical analysis will help determine which cover crop treatment has the greatest influence on soil health over both the short and long-term.

Planned Milestones:

Data will be collected annually and compiled over time to compare the short-term and long-term effects of winter cover crop species selection. It may take several years for these systems to reach equilibrium due to the changes of both cover cropping and no-till management practices. Our goal is to monitor these changes to help aid producers in nutrient management for soybean through the implementation of cover crops into a corn soybean rotation and explain performance of the overall field system by describing diseases and indicators of soil health such as soil microbial communities and soil physical properties. Results will be reported each year at county and regional meetings and in the refereed scientific literature at the completion of the study.

Value to Soybean Industry: Winter cover crops have been promoted based on the environmental benefits of reduced erosion and nutrient loss. Limited work has been done to date on species selection and cultural management practices for effective use of winter cover crops in Arkansas corn and soybean rotational systems. Identifying the correct species, planting date and fertilization needs are essential for effective cover crop use and continued profitability of our soybean production systems. Costs and challenges of winter cover crops will be easily offset by: 1) the potential decrease in fertilizer needs 2) improved soil conditions that lead to better growth or reduced irrigation needs and 3) reduction in environmental impacts that threaten the long-term sustainability of Arkansas corn and soybean production. Inclusion of winter cover crops can have both short-term and long-term impacts on corn and soybean production. Understanding how cover crop species selection and cultural management practices is one of the most important steps in realizing the benefits of their effective use.

Budget Justifications/Explanation of Travel and Direct Costs: The out of state travel included in this proposal is to cover a portion of the cost for graduate students to attend professional scientific meetings which in this calendar year will include the international annual agronomy meetings in San Antonio, TX. The attendance at these meetings allows presentations to be made concerning the research work conducted and also for increased education by attending other scientific presentations and workshops. In-state travel and salary are budgeted for field data collections.

University of Arkansas System Division of Agriculture
Promotion Board Budget

Roberts, Trenton *Influence of Cover Crops and Soil Health on Soybean*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	Year 2 of 3
Lead Investigator	Roberts, Trenton	**Co-PI #1**	
Co-PI #2		**Co-PI #3**	
Department			
Commodity Board			
Project Title	Influence of Cover Crops and Soil Health on Soybean		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

			Roberts, Trenton				**Total Board Funding Requested**	**AES Portion**	**CES Portion**
Select "AES" or "CES" for each PI			AES						
Fulltime Personnel									
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
Program Tech	Carri Scott	10%	$4,800				$4,800	$4,800	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Subtotal: Salaries	$4,800	$0	$0	$0	$4,800	$4,800	$0
Graduate Student									
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
	New MS	100%	$20,000				$20,000	$20,000	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Tuition	$6,600				$6,600	$6,600	$0
		Subtotal: Graduate Student	$26,600	$0	$0	$0	$26,600	$26,600	$0
Hourly									
			Wages				**Total**	**AES Portion**	**CES Portion**
		Hourly-Personnel					$0	$0	$0
		Hourly-Students	$2,000				$2,000	$2,000	$0
		Subtotal: Hourly	$2,000	$0	$0	$0	$2,000	$2,000	$0
Fringe Benefits									
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
		Fulltime Personnel	$1,517	$0	$0	$0	$1,517	$1,517	$0
		Graduate Students	$840	$0	$0	$0	$840	$840	$0
		Hourly Personnel	$0	$0	$0	$0	$0	$0	$0
		Hourly-Students	$14	$0	$0	$0	$14	$14	$0
		Subtotal: Fringe Benefits	$2,371	$0	$0	$0	$2,371	$2,371	$0
		Personnel Total	$35,771	$0	$0	$0	$35,771	$35,771	$0
Travel									
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
		In-State	$5,500				$5,500	$5,500	$0
		Out-of-State	$1,500				$1,500	$1,500	$0
		Travel Total	$7,000	$0	$0	$0	$7,000	$7,000	$0

University of Arkansas System Division of Agriculture
Promotion Board Budget

Roberts, Trenton *Influence of Cover Crops and Soil Health on Soybean*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$1,500				$1,500	$1,500	$0
	Fertilizer/Chemicals	$1,500				$1,500	$1,500	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs	Lab Analysis	$6,000				$6,000	$6,000	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$3,375	$0	$0	$0	$3,375	$3,375	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$2,844	$0	$0	$0	$2,844	$2,844	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$2,796	$0	$0	$0	$2,796	$2,796	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$18,015	$0	$0	$0	$18,015	$18,015	$0
	Total for Proposal	$60,786	$0	$0	$0	$60,786	$60,786	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

		%	Roberts, Trenton				Total	
Ecosystems (Rice Only)	Grand Prairie	0%	$0	$0	$0	$0	$0	
	Mississippi Delta		$0	$0	$0	$0	$0	
	White River		$0	$0	$0	$0	$0	
	Totals	0%	$0	$0	$0	$0	$0	***Must match the proposal total.***

Tab

Roberts (133)

Arkansas Soybean Promotion Board – 2024-2025 Proposal

Title: Field-based determination of chloride tolerance in soybean

Lead Investigators: Trenton Roberts and Jeremy Ross

Co-Investigators: John Carlin

Status: Year 2

Research Areas: Agronomy and Breeding

Stated Goal:

Implement a field-based assessment of chloride tolerance in soybean which will provide a more accurate representation of which soybean cultivars are classified as includers, excluders and mixed reaction types.

Specific Objectives:

1. Implement a field-based leaf sampling protocol for rating soybean varieties as an includer or excluder.
2. Provide annual evaluation of soybean cultivar reaction to chloride both as a categorical response of includer, excluder and mixed as well as a numerical rating system that indicate the relative degree of chloride tolerance amongst varieties.
3. Rate the degree of mixed reaction soybean populations so that producers can make informed cultivar selections that best fit their production systems and desired soybean characteristics.

Methods:

1. **Leaf Cl samples from field trials for categorizing variety Cl ratings:** Leaf samples will be collected from all maturity groups at a single location hosting Arkansas Soybean Variety Yield Trials (e.g., Rohwer). The leaf-Cl concentrations and uniformity among replicates and site-years will indicate whether variety leaf-Cl concentration behaves uniformly and is a good indicator or Cl inclusion or exclusion by the root system. To determine whether varieties are mixed populations of includers and excluders, individual plants (up to 16 plants per plot) will be sampled individually and the tissue analyzed for Cl. This type of sampling and analysis is needed to determine whether individual plants have the same Cl inclusion/exclusion mechanism. Once varieties are accurately characterized and ‘standard varieties’ identified field trials can eventually be initiated to examine management effects (row spacings, flat planted vs beds, etc…) on Cl uptake. Information will be included in the variety trial summary.

Planned Milestones:

The proposed research trials will be conducted for three years beginning in 2023, this will be the first year of the trial. Annual chloride tolerance ratings will be provided to the Extension soybean agronomist which will be added to official variety trial results and posted online. Research results will be published annually in the Soybean Research Series to serve as a permanent, accessible record of results that will also serve to inform clientele within and outside of Arkansas. Information will also be disseminated annually via county educational meetings and at regional and international professional meetings as deemed appropriate.

Value to Soybean Industry:

Clarifying whether a variety is truly a Cl includer or excluder is important to soybeans produced on poorly drained soils in areas with irrigation water having high Cl (most of eastern Arkansas). The current greenhouse screening method does not provide a robust rating system for varieties. A field screening technique is logical, time efficient, and a method that can be easily adopted by any seed company for in-house variety screening. The data collected from these trials will be compiled with other cultivar evaluation to provide Arkansas soybean producers with reliable field-based information to make well informed cultivar section decisions.

Budget Justifications/Explanation of Travel and Direct Costs:

In-state travel and salary are budgeted for field data collections.

University of Arkansas System Division of Agriculture
Promotion Board Budget

Roberts, Trenton *Field-based Determination of Chloride in Soybean*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	Year 2 of 3
Lead Investigator	Roberts, Trenton	**Co-PI #1**	
Co-PI #2		**Co-PI #3**	
Department	CSES Crop, Soil, Environmental Science		
Commodity Board	Soybean Promotion Board		
Project Title	Field-based Determination of Chloride in Soybean		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

	Roberts, Trenton				Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI	AES						

Fulltime Personnel

Position Title	Name *(if position is filled)*	% Time	Salaries				Total	AES	CES
Program Tech	Carri Scott	50%	$24,000				$24,000	$24,000	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Subtotal: Salaries	$24,000	$0	$0	$0	$24,000	$24,000	$0

Graduate Student

Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.

Name *(if position is filled)*	% Time	Wages				Total	AES Portion	CES Portion
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
	Tuition					$0	$0	$0
	Subtotal: Graduate Student	$0	$0	$0	$0	$0	$0	$0

Hourly

	Wages				Total	AES Portion	CES Portion
Hourly-Personnel					$0	$0	$0
Hourly-Students	$3,000				$3,000	$3,000	$0
Subtotal: Hourly	$3,000	$0	$0	$0	$3,000	$3,000	$0

Fringe Benefits

Fringe benefits are calculated when salary and wage amounts are entered above.

	Benefits				Total	AES Portion	CES Portion
Fulltime Personnel	$7,584	$0	$0	$0	$7,584	$7,584	$0
Graduate Students	$0	$0	$0	$0	$0	$0	$0
Hourly Personnel	$0	$0	$0	$0	$0	$0	$0
Hourly-Students	$21	$0	$0	$0	$21	$21	$0
Subtotal: Fringe Benefits	$7,605	$0	$0	$0	$7,605	$7,605	$0
Personnel Total	$34,605	$0	$0	$0	$34,605	$34,605	$0

Travel

Justify out-of-state travel in proposal.

	Travel				Total	AES Portion	CES Portion
In-State	$5,500				$5,500	$5,500	$0
Out-of-State					$0	$0	$0
Travel Total	$5,500	$0	$0	$0	$5,500	$5,500	$0

University of Arkansas System Division of Agriculture
Promotion Board Budget

Roberts, Trenton *Field-based Determination of Chloride in Soybean*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$2,500				$2,500	$2,500	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs	Lab Analysis	$8,000				$8,000	$8,000	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$10,500	$0	$0	$0	$10,500	$10,500	$0
	Total for Proposal	$50,605	$0	$0	$0	$50,605	$50,605	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

		%	Roberts, Trenton				Total	
Ecosystems (Rice Only)	Grand Prairie	0%	$0	$0	$0	$0	$0	
	Mississippi Delta		$0	$0	$0	$0	$0	
	White River		$0	$0	$0	$0	$0	
	Totals	0%	$0	$0	$0	$0	$0	*Must match the proposal total.*

Tab

Roberts (137)

Arkansas Soybean Promotion Board – 2024-2025 Proposal

Title: Monitoring the Extent of Potassium Deficiency and Chloride Toxicity in Arkansas Soybean Fields

Lead Investigators: Trenton Roberts and Jeremy Ross

Co-Investigators: Gerson Drescher

Status: Year 2

Research Areas: Agronomy, Fertility, Verification

Stated Goal: Determine the extent of potassium deficiency and chloride toxicity in Arkansas soybean production fields and identify potential yield gaps caused by these two yield limiting factors.

Specific Objectives:

1) Identify the magnitude and extent of potassium deficiency, including hidden hunger, across a wide range of Arkansas soybean production systems and estimate the associated yield loss.
2) Identify the magnitude and extent of chloride toxicity across a wide range of Arkansas soybean production systems and estimate the associated yield loss.

Methods:

1) Fields will be selected in conjunction with the county extension agents and Soybean Verification coordinators that have a history of "yield lag", exhibit unknown yield limitations or the producer has shown interest in using in-season tissue monitoring as a management tool. Trifoliolate leaf samples will be collected from the uppermost fully expanded leaf at the R2 and R4 growth stages. Selected fields will be grid sampled to provide additional information on the variability of both potassium deficiency and chloride toxicity. However, most fields will be sampled using a composite analysis from predetermined management zones. These zones will be delineated based on soil textural changes, yield maps or other reliable information. At least 18 trifoliolate leaves will be collected and composited from each management zone. In the event that fields are grid sampled, at least 12 leaves will be collected to form a composite sample within each grid cell. Data will be collected from the producer including but not limited to, soil texture, planting date, cultivation practices, water source, soil test values, fertilization practices, previous crop history with yield where available, cultivar planted and chloride toxicity rating. A report will be provided to the county agent as well as the producer that outlines the potential of potassium deficiency or chloride toxicity reducing their overall yield potential with an associated projected yield and profit loss. The statewide data will be combined over years to identify areas of the state where fertilization practices or cultivar selection can be altered to increase producer yield and profitability. Areas where yields are reduced by either of these two yield limiting factors will be targeted with educational programs to help mitigate their effects on soybean yield.

Planned Milestones:

The proposed monitoring project will be conducted for three years beginning in 2023, this will be the first year of the trial. Annual reports will be provided to the county extension agents, producers, and the Extension soybean agronomist. Results will be published annually in the Soybean Research Series to serve as a permanent, accessible record of results that will also serve to inform clientele within and outside of Arkansas. Information will also be disseminated annually via county educational meetings and at regional and international professional meetings as deemed appropriate.

Value to Soybean Industry:

Recent research has suggested that hidden hunger of potassium in soybean may be more widespread than currently thought and leading to a significant loss in soybean yield potential and producer profit. There are many areas of the state that are either not fertilized properly or are intentionally under fertilized due to budget constraints. The results of this monitoring program will help us identify the extent to which hidden hunger is costing Arkansas soybean producers and help target educational activities where they are most needed and will have the greatest net impact. In many areas where producers are not happy with their soybean yields there is a chance that chloride toxicity may be the underlying cause of their poor yields. With irrigation water quality and quantity continuing to decline across the state the problem of chloride toxicity will only continue to grow. Based on our work with hidden hunger of potassium in soybean we believe there is the potential that we are experiencing some hidden toxicity with chloride that is lowering our soybean yield potential without the obvious visual deficiency symptoms that we typically associate with chloride toxicity. The implementation of this monitoring program will help us identify problem areas of chloride toxicity, areas that may become problematic in future and provide soybean producers with some insight as to whether improved variety selection could help with their soybean yields.

Budget Justifications/Explanation of Travel and Direct Costs:

In-state travel and salary are budgeted for field data collections.

University of Arkansas System Division of Agriculture
Promotion Board Budget

Roberts, Trenton — *Monitoring the Extent of Potassium Deficiency and Chloride Toxicity in Arkansas Soybean Fields*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	Year 2 of 3
Lead Investigator	Roberts, Trenton	**Co-PI #1**	Ross, Jeremy
Co-PI #2		**Co-PI #3**	
Department	CSES Crop, Soil, Environmental Science		
Commodity Board	Soybean Promotion Board		
Project Title	Monitoring the Extent of Potassium Deficiency and Chloride Toxicity in Arkansas Soybean Fields		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

			Roberts, Trenton	Ross, Jeremy			Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI			AES	CES					
Fulltime Personnel									
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
Program Associate	Steph Williamson	12%	$7,500				$7,500	$7,500	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Subtotal: Salaries	$7,500	$0	$0	$0	$7,500	$7,500	$0
Graduate Student									
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Tuition					$0	$0	$0
		Subtotal: Graduate Student	$0	$0	$0	$0	$0	$0	$0
Hourly									
			Wages				**Total**	**AES Portion**	**CES Portion**
		Hourly-Personnel					$0	$0	$0
		Hourly-Students					$0	$0	$0
		Subtotal: Hourly	$0	$0	$0	$0	$0	$0	$0
Fringe Benefits									
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
		Fulltime Personnel	$2,370	$0	$0	$0	$2,370	$2,370	$0
		Graduate Students	$0	$0	$0	$0	$0	$0	$0
		Hourly Personnel	$0	$0	$0	$0	$0	$0	$0
		Hourly-Students	$0	$0	$0	$0	$0	$0	$0
		Subtotal: Fringe Benefits	$2,370	$0	$0	$0	$2,370	$2,370	$0
		Personnel Total	$9,870	$0	$0	$0	$9,870	$9,870	$0
Travel									
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
		In-State	$1,500	$5,000			$6,500	$1,500	$5,000
		Out-of-State					$0	$0	$0
		Travel Total	$1,500	$5,000	$0	$0	$6,500	$1,500	$5,000

University of Arkansas System Division of Agriculture
Promotion Board Budget

Roberts, Trenton — *Monitoring the Extent of Potassium Deficiency and Chloride Toxicity in Arkansas Soybean Fields*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$1,500	$1,500			$3,000	$1,500	$1,500
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs	Sample Analysis and Shipping	$13,500	$4,000			$17,500	$13,500	$4,000
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$15,000	$5,500	$0	$0	$20,500	$15,000	$5,500
	Total for Proposal	$26,370	$10,500	$0	$0	$36,870	$26,370	$10,500

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

Ecosystems (Rice Only)		%	Roberts, Trenton	Ross, Jeremy			Total	
	Grand Prairie	0%	$0	$0	$0	$0	$0	
	Mississippi Delta		$0	$0	$0	$0	$0	
	White River		$0	$0	$0	$0	$0	
	Totals	0%	$0	$0	$0	$0	$0	*Must match the proposal total.*

Tab

Henry (141)

Arkansas Soybean Promotion Board – 2024-2025 Proposal

Title: Irrigation Water Management for Soybeans: Moving the Needle.

Principle Investigators: C. G. Henry, U of Arkansas, T. Spurlock, UAEX; **Collaborators:** A. Ponchet, U of Arkansas - Fayetteville
Production System: All
Status: Year 2 of 3

Goal: This project is an effort to develop and promote the use and application of irrigation water management and improve yield and yield stability for irrigated soybeans in Arkansas. The primary focus is to refine and adapt tools for mid-south soybean production.

Objectives: The objective of this project is research, document and demonstrate irrigation water management practices on working soybean farms through an Irrigation Yield Contest Demonstration. These practices include the implementation of Computerized Hole Selection, Surge irrigation, soil moisture monitoring, ET based scheduling, irrigation initiation and irrigation termination.

1. Document water savings, yield improvements, profitability improvements using an Irrigation Contest. Compare yield and water use differences to document the efficacy and improved profitability of conservation practices.
2. Deliver irrigation schools in the winter months.
3. Further develop recommendations for surge irrigation and soil moisture sensors. Improve soil water information about Arkansas soils and paper and mobile app development for sensors. Test new ideas on how to improve water retention curve development methods.
4. Improve ability to measure and document water use through new cloud meter telematics delivered to the irrigator during the season.
5. Improve implementation of CHS, through poly pipe printer development.
6. Improve cover crop crimper design for furrow irrigation.

Methods:

We propose to continue our work by integrating research results with the on-farm demonstration program through the Arkansas Irrigation Yield Contest. Contestants are increasing the average water use efficiency over time. Considerable effort has been placed on documenting the water use of soybeans using sap flow. The next step is to further develop tools for growers to use this new knowledge. Focus of this project will be to further analyze the data and deliver the results through the mobile app to adjust for yield goal.

There are on average 20 contestants annual that participate in the irrigation yield contest. Many of the contestants also attended irrigation schools on surge and soil moisture sensors. The contest coupled with irrigation schools have resulted in increased awareness and implementation of IWM practices and the programs provide key data on how to achieve sustainability in the mid-south. Schools are 6 hours and include meals and this project defers the some of the cost of the supplies. Industry has responded in support of the contest by matching the cash prize donated by the board with in-kind donations making the total prize for the contest over $100,000. A comprehensive survey of the contest impact is currently underway.

A primary focus of the project will be to better document soil series retention curve differences for better resolution for irrigators when using soil moisture sensors. Soil samples at all of the major soil types in Arkansas have been collected and retention curves developed, but the data analysis is still on-going. A post-doc is continuing the work of the graduate student to complete the additional work recommended from the published thesis. This additional work is expected to develop or improve the methodology for relating retention curves to matric potential sensors.

We will continue to develop and improve the tools such as a new computerized irrigation scheduler under development that will interface with the poly pipe printer for a seamless on-the-fly CHS solution. We have developed a working mobile app and working prototype and will be testing it on farmer fields in 2023. Coding the of CHS tools is about 80% completed.

The program is developing a new and novel flowmeter with telemetry and analytics for irrigators, prototypes will be testing on irrigation contest fields.

A cover crop crimper has been developed for furrow irrigation, a sixth-generation design will be tested in 2024. Cover crop crimping is not currently feasible in furrow irrigated production systems, this will give growers an alternative to herbicide termination of covers.

The summary of the findings will be reviewed and the results will be made available to growers, consultants, and others through the mobile apps we publish, public meetings, extension and research publications, the internet, county extension training, and on-farm visits.

Planned Milestones: April 1, 2023 to March 31, 2026 (three cropping seasons). Currently requesting funding for year 1.

Value to the Soybean Industry: Consistently high soybean yields are essential for sustaining profitable soybean production systems in Arkansas. Previous research has shown that delays in irrigation initiation, scheduling, and termination can limit yields and that the effects can vary from season to season and among maturity groups and soil types. Given the substantial investments needed to irrigate soybean fields, identification of practical irrigation scheduling methods that increase the odds for higher yields and better seed quality would be in the best interests of Arkansas soybean producers. Past work with on-farm demonstration has shown a reduction in water use by 24% with no yield penalty.

Our efforts to improve and make implementation of IWM easier through a better CHS tool, ability to print the plan on the pipe real time, improving surge irrigation and flow measurement will reduce the cost and labor and improve the accurate implementation of IWM. New technology for furrow irrigators such as the cover crop crimper will allow growers to reduce tillage improving infiltration for irrigation. The cloud meter has the potential to be a real game-changer akin to yield monitors for combines.

Justifications (Budget): The budget includes labor for Henry’s staff. Supplies to support the IWM contest, plot work, crimper, meter and water retention laboratory. Supplies and staff to support the CHS pipe printer project, novel meters and surge valve, mobile app development, and graduate student. Purchase of a poly pipe toolbar, supplies for meters, valves, steel, parts, machining, meals for schools, contract services for repairs or engineering.

University of Arkansas System Division of Agriculture
Promotion Board Budget

Henry, Christopher *Irrigation Water Management for Soybeans: Moving the Needle*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	Year 2 of 3
Lead Investigator	Henry, Christopher	**Co-PI #1**	
Co-PI #2		**Co-PI #3**	
Department	BAEG Biological & Agricultural Engineering		
Commodity Board	Soybean Promotion Board		
Project Title	Irrigation Water Management for Soybeans: Moving the Needle		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

			Henry, Christopher				Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI			AES						
Fulltime Personnel									
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
Program Associate	Dorsa Darikendeh	70%	$43,000				$43,000	$43,000	$0
Program Specialist	Shruti Vaman	30%	$35,000				$35,000	$35,000	$0
Program Specialist	Nathan Blankenship	30%	$32,000				$32,000	$32,000	$0
Program Associate	Russ Parker	10%	$8,000				$8,000	$8,000	$0
							$0	$0	$0
		Subtotal: Salaries	$118,000	$0	$0	$0	$118,000	$118,000	$0
Graduate Student									
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Tuition					$0	$0	$0
		Subtotal: Graduate Student	$0	$0	$0	$0	$0	$0	$0
Hourly			**Wages**				**Total**	**AES Portion**	**CES Portion**
		Hourly-Personnel	$8,000				$8,000	$8,000	$0
		Hourly-Students					$0	$0	$0
		Subtotal: Hourly	$8,000	$0	$0	$0	$8,000	$8,000	$0
Fringe Benefits			**Benefits**				**Total**	**AES Portion**	**CES Portion**
Fringe benefits are calculated when salary and wage amounts are entered above.		Fulltime Personnel	$37,288	$0	$0	$0	$37,288	$37,288	$0
		Graduate Students	$0	$0	$0	$0	$0	$0	$0
		Hourly Personnel	$632	$0	$0	$0	$632	$632	$0
		Hourly-Students	$0	$0	$0	$0	$0	$0	$0
		Subtotal: Fringe Benefits	$37,920	$0	$0	$0	$37,920	$37,920	$0
		Personnel Total	$163,920	$0	$0	$0	$163,920	$163,920	$0
Travel			**Travel**				**Total**	**AES Portion**	**CES Portion**
Justify out-of-state travel in proposal.		In-State	$6,000				$6,000	$6,000	$0
		Out-of-State	$4,000				$4,000	$4,000	$0
		Travel Total	$10,000	$0	$0	$0	$10,000	$10,000	$0

University of Arkansas System Division of Agriculture
Promotion Board Budget

Henry, Christopher *Irrigation Water Management for Soybeans: Moving the Needle*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$19,700				$19,700	$19,700	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs	Steel, meals, contract work	$12,000				$12,000	$12,000	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$31,700	$0	$0	$0	$31,700	$31,700	$0
	Total for Proposal	$205,620	$0	$0	$0	$205,620	$205,620	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

Ecosystems (Rice Only)		%	Henry, Christopher				Total	
	Grand Prairie	0%	$0	$0	$0	$0	$0	
	Mississippi Delta		$0	$0	$0	$0	$0	
	White River		$0	$0	$0	$0	$0	
	Totals	0%	$0	$0	$0	$0	$0	*Must match the proposal total.*

Tab

Faske (145)

Arkansas Soybean Promotion Board: 2024-2025 Proposal

Title: Comprehensive Disease Screening of Soybean Varieties in Arkansas

Investigators: Travis Faske, Terry Spurlock, and Joanna Kud

Co-Investigators: Michael Emerson, Amanda Tolbert, and Amanda Greer

Status: 1/3 (ongoing since 1990)

Stated Goal: To provide independent evaluation of new soybean cultivars for resistance to major diseases and nematodes and post the information on Arkansas Variety Testing Website.

Specific Objectives: (PI for each objective)

1. Screen all entries in the University of Arkansas Official Variety Testing (OVT) program for frogeye leaf spot in field plots at the Jackson County Extension Center for on-farm (Faske).
2. Screen all entries in the UA OVT program for southern stem canker using toothpicks inoculations at the Rohwer Research Station (RRS) (Spurlock).
3. Screen all entries in UA OVT program for southern root-knot at the SWREC (Kud/Greer) and in an on-farm field (Faske).
4. Provide complete package of screening information to Jeremy Ross and other CES personnel by years-end (Emerson).

Methods:
Cultivars and experimental entries of the Arkansas OVT and advanced Arkansas breeding lines will be evaluated in a replicated design in field or greenhouse screen.

Frogeye leaf spot: Utilize our field nursery location at the NES where overhead irrigation and space are available. Inoculum to conduct the screen will be produced using laboratory facilities in the Lonoke Extension Center (LEC).

Southern stem canker: We will hand-inoculate 10-12 individual plants in single-row plots using infested toothpicks. Plots will be maintained to promote disease and all plants will be rated for stem canker and other foliar diseases. Inoculum to conduct the screen will be produced using laboratory facilities at the SEREC.

Southern Root-knot Nematode: Varieties will be screened in a greenhouse at SWREC. Inoculum to conduct the screen will be produced on-site. Varieties will also be included in single-row plots in a field screen near Kerr, AR.

Planned Milestones: All screens will be completed, and results will be summarized, analyzed, and posted on the UAF Variety Testing website (www.aaes.uark.edu/variety-testing) and delivered to the CES soybean specialist for the Soybean Update and SOYVA.

Value to the Soybean Industry: Most growers select cultivars based primarily on yield performance. Unfortunately, while yield potential is an important factor in cultivar selection, the yield of a cultivar may be drastically reduced by soybean diseases. In Arkansas, resistance to several common soybean pathogens is as important as yield potential in selecting an appropriate cultivar. Soybeans are grown on about 3.5 million acres in the state each year, with a value of about $500,000,000 annually. Diseases cost $25,000,000 per year in lost yield and quality statewide, by some estimates. Each year, well over 200 new soybean cultivars become available to Arkansas growers. Many of these cultivars are accompanied by little or no information on their resistance to diseases or nematodes. Since only one variety will be grown in a particular field, choosing the best variety can be a difficult decision. This program provides comprehensive information on the disease package that each new cultivar contains prior to widespread planting of the cultivars in the state, lowering the risk of severe disease losses due to incorrect cultivar selection.

Budget Justification: Proposed funding would support personnel (full-time and hourly) to conduct disease screens at each of the three locations (LEC, SWREC, and SWREC). Kud will serve as AES support for funds for those personnel at Hope. A reasonable level of travel expenses is included to pick up seed and supplies to conduct individual trials. Supplies would include relevant materials such as sand, pots, identification tags in the greenhouse screens or fuel or repairs to planter or spray equipment for field trials.

University of Arkansas System Division of Agriculture
Promotion Board Budget

Faske, Travis — *Comprehensive Disease Screening of Soybean Varieties in Arkansas*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	New
Lead Investigator	Faske, Travis	**Co-PI #1**	Spurlock, Terry
Co-PI #2	Kud, Joanna	**Co-PI #3**	
Department	ENPL Entomology and Plant Pathology		
Commodity Board	Soybean Promotion Board		
Project Title	Comprehensive Disease Screening of Soybean Varieties in Arkansas		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

	Faske, Travis	Spurlock, Terry	Kud, Joanna		Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI	CES	CES	AES				

Fulltime Personnel

Position Title	Name *(if position is filled)*	% Time	Salaries				Total	AES	CES
Program Associate			$35,000				$35,000	$0	$35,000
Program Associate				$28,000			$28,000	$0	$28,000
					$20,000		$20,000	$20,000	$0
							$0	$0	$0
							$0	$0	$0
		Subtotal: Salaries	$35,000	$28,000	$20,000	$0	$83,000	$20,000	$63,000

Graduate Student

Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.

Name *(if position is filled)*	% Time	Wages				Total	AES Portion	CES Portion
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
	Tuition					$0	$0	$0
	Subtotal: Graduate Student	$0	$0	$0	$0	$0	$0	$0

Hourly

	Wages				Total	AES Portion	CES Portion
Hourly-Personnel	$6,000	$2,000	$2,000		$10,000	$2,000	$8,000
Hourly-Students					$0	$0	$0
Subtotal: Hourly	$6,000	$2,000	$2,000	$0	$10,000	$2,000	$8,000

Fringe Benefits

Fringe benefits are calculated when salary and wage amounts are entered above.

	Benefits				Total	AES Portion	CES Portion
Fulltime Personnel	$11,060	$8,848	$6,320	$0	$26,228	$6,320	$19,908
Graduate Students	$0	$0	$0	$0	$0	$0	$0
Hourly Personnel	$474	$158	$158	$0	$790	$158	$632
Hourly-Students	$0	$0	$0	$0	$0	$0	$0
Subtotal: Fringe Benefits	$11,534	$9,006	$6,478	$0	$27,018	$6,478	$20,540
Personnel Total	$52,534	$39,006	$28,478	$0	$120,018	$28,478	$91,540

Travel

Justify out-of-state travel in proposal.

	Travel				Total	AES Portion	CES Portion
In-State	$3,000	$2,000			$5,000	$0	$5,000
Out-of-State					$0	$0	$0
Travel Total	$3,000	$2,000	$0	$0	$5,000	$0	$5,000

University of Arkansas System Division of Agriculture
Promotion Board Budget

Faske, Travis *Comprehensive Disease Screening of Soybean Varieties in Arkansas*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$1,000	$1,000	$2,000		$4,000	$2,000	$2,000
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$1,715	$0	$0	$0	$1,715	$0	$1,715
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$1,130	$0	$0	$1,130	$0	$1,130
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$2,715	$2,130	$2,000	$0	$6,845	$2,000	$4,845
	Total for Proposal	$58,249	$43,136	$30,478	$0	$131,863	$30,478	$101,385

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

Ecosystems (Rice Only)		%	Faske, Travis	Spurlock, Terry	Kud, Joanna		Total	
	Grand Prairie	0%	$0	$0	$0	$0	$0	
	Mississippi Delta		$0	$0	$0	$0	$0	
	White River		$0	$0	$0	$0	$0	
	Totals	0%	$0	$0	$0	$0	$0	*Must match the proposal total.*

Tab

Faske (149)

Arkansas Soybean Promotion Board: 2024-2025 Proposal

Title: Integrated Management of Soybean Nematodes in Arkansas

Investigators: Travis Faske and Joanna Kud

Co-Investigators: Michael Emerson and Amanda Greer

Status: Year 2 of 3

Research Areas: Plant Pathology

Stated Goal: To determine the significance and potential risk of plant-parasitic nematodes on soybean in Arkansas. To evaluate currently-existing methods for controlling nematodes in soybean, and to test newly emerging control technology and resistant cultivars. Encourage producers and consultants to sample for nematodes in soybean fields. Finally, develop sustainable, economically feasible nematode management strategies for Arkansas producers.

Specific Objectives:

1. Determine the efficacy and practicality of currently-labeled nematicides for nematode management in soybean; Evaluate new nematicides, including seed treatment nematicides and products that may not currently have a soybean label, for efficacy and practical (economic) potential. (Faske/Emerson)

2. Evaluate the field performance of currently available and new soybean cultivars with reported resistance to root-knot nematodes. (Faske/Emerson)

3. Characterize resistance to reniform nematodes in soybean. (Faske/Kud)

4. Promote the importance of sampling soybean fields for soybean nematodes and identify the most important species of soybean nematode that affect soybean production by offering “free” nematode assays sponsored by the SPB. (Faske and Kud/Greer)

5. Assess and extend the use of cultural practices to manage populations of soybean nematodes (Faske/ Emerson)

6. Extend and educate clientele on the distribution of important soybean nematodes in the state. Develop and deliver strategies for sustainable management of nematodes through use of existing resistance, nematicides, and crop rotation to minimize economic effects of nematodes. (Faske/Kud)

Methods:

Objective 1. Commercial fields naturally infested by economically important soybean nematodes will be used for small-plot experiments to determine efficacy (and practicality) of applying labeled seed-applied nematicides (and new soil-applied nematicides). Particular emphasis will be placed on combining nematicide treatments with a range of RKN-nematode resistant cultivars.

Objective 2. Cultivars that are reported as having nematode resistance, those identified through our annual cultivar screening efforts, and any cultivar that may have utility will be evaluated for field performance in infested fields in small-plot trials.

Objective 3. Conduct greenhouse trials to determine resistance to reniform nematodes in southern RKN-resistant soybean varieties and characterize the mechanism of resistance.

Objective 4. During the past six cropping seasons, the Nematode Diagnostic Lab (NDL) has promoted the need to sample for soybean nematodes by offering free assays sponsored by the soybean promotion board. This program has been very successful and well received by producers and consultants. Through these assays we are able to determine those species that are increasing in severity and the most important to producers.

Objective 5. Assess the use of crop rotation sequences for suppression of soybean nematode population densities in existing rotational studies and on-farm sites. Assess the impact of corn regrowth on southern RKN densities in soybean fields.

Objective 6. Education platform will consist of but not limited to the traditional approach with fact sheets, soybean research series, and production meetings, but also electronic delivery of information on root-knot resistant varieties on Row Crop Website, videos and raise awareness using twitter.

Planned Milestones: Each year we will report information on resistant soybean varieties on the row crops website and distribute at productions meetings. Each year we will report on the status of the ongoing survey by the Nematode Diagnostic Lab to keep sampling a priority for producers. Data from individual trials will be presented at county and regional meetings.

Value to Soybean Industry: Our study will benefit farmers in several areas. First, we will evaluate both existing and new soybean cultivars with reported resistance to the southern root-knot nematode to determine their actual level of performance in production fields. We will identify those cultivars that will mitigate nematode damage under our field environments and with local races and biotypes. We will also begin to develop an experience base as well as an experimental data base on the use and impact of nematicides in managing soybean nematodes, and we will look at an integrated approach of cultivars, chemicals and cropping systems (e.g. furrow-irrigated rice) for more effective management practices.

Budget Justification: Proposed funding would support personnel (full-time associates and hourly) to conduct field trials, collect data, harvest, and processing nematodes samples. A portion of Kud’s budget is for hourlies and associate at Hope and she will oversee their portion of those funds. The student salary will be in her lab in Fayetteville. Travel is for use of university vehicle mileage to conduct field trials and transport soil samples to NDL. Supplies would include relevant materials such as but not limited to sand, fuel for equipment, plots stakes, water, bleach, bags, tags, and other general supplies for greenhouse and field trials. The direct cost consist of vouchers for 400 ($15/sample) sponsored nematode assays for Arkansas farmers and consultants to monitor soybean nematodes in a crop rotation system where soybeans are utilized. Overall, there is an increase in budget from last year due to support in travel and increase in cost for nematode assays.

University of Arkansas System Division of Agriculture
Promotion Board Budget

Faske, Travis *Integrated Management of Soybean Nematodes in Arkansas*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	Year 2 of 3
Lead Investigator	Faske, Travis	**Co-PI #1**	Kud, Joanna
Co-PI #2		**Co-PI #3**	
Department	ENPL Entomology and Plant Pathology		
Commodity Board	Soybean Promotion Board		
Project Title	Integrated Management of Soybean Nematodes in Arkansas		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

	Faske, Travis	Kud, Joanna			Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI	CES	AES					

Fulltime Personnel

Position Title	Name *(if position is filled)*	% Time	Salaries				Total	AES	CES
Program Associate			$25,000				$25,000	$0	$25,000
Program Associate				$5,000			$5,000	$5,000	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Subtotal: Salaries	$25,000	$5,000	$0	$0	$30,000	$5,000	$25,000

Graduate Student

Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.

Name *(if position is filled)*	% Time	Wages				Total	AES Portion	CES Portion
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
	Tuition					$0	$0	$0
	Subtotal: Graduate Student	$0	$0	$0	$0	$0	$0	$0

Hourly

	Wages				Total	AES Portion	CES Portion
Hourly-Personnel	$10,000	$2,000			$12,000	$2,000	$10,000
Hourly-Students		$3,000			$3,000	$3,000	$0
Subtotal: Hourly	$10,000	$5,000	$0	$0	$15,000	$5,000	$10,000

Fringe Benefits

Fringe benefits are calculated when salary and wage amounts are entered above.

	Benefits				Total	AES Portion	CES Portion
Fulltime Personnel	$7,900	$1,580	$0	$0	$9,480	$1,580	$7,900
Graduate Students	$0	$0	$0	$0	$0	$0	$0
Hourly Personnel	$790	$158	$0	$0	$948	$158	$790
Hourly-Students	$0	$21	$0	$0	$21	$21	$0
Subtotal: Fringe Benefits	$8,690	$1,759	$0	$0	$10,449	$1,759	$8,690
Personnel Total	$43,690	$11,759	$0	$0	$55,449	$11,759	$43,690

Travel

Justify out-of-state travel in proposal.

	Travel				Total	AES Portion	CES Portion
In-State	$3,000	$500			$3,500	$500	$3,000
Out-of-State					$0	$0	$0
Travel Total	$3,000	$500	$0	$0	$3,500	$500	$3,000

University of Arkansas System Division of Agriculture
Promotion Board Budget

Faske, Travis *Integrated Management of Soybean Nematodes in Arkansas*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$1,000	$6,500			$7,500	$6,500	$1,000
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs			$6,000			$6,000	$6,000	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$1,000	$12,500	$0	$0	$13,500	$12,500	$1,000
	Total for Proposal	$47,690	$24,759	$0	$0	$72,449	$24,759	$47,690

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

Ecosystems (Rice Only)		%	Faske, Travis	Kud, Joanna			Total	
	Grand Prairie	0%	$0	$0	$0	$0	$0	
	Mississippi Delta		$0	$0	$0	$0	$0	
	White River		$0	$0	$0	$0	$0	
	Totals	0%	$0	$0	$0	$0	$0	*Must match the proposal total.*

Tab

Faske (153)

Arkansas Soybean Promotion Board: 2024-2025 Proposal

Title: Monitor and Management of Fungicide-Resistant Soybean Diseases in Arkansas

Principle Investigator: Travis Faske and Ken Korth

Status: 3 of 3 (2022 to 2025)

Research Areas: Plant Pathology

Goal: Develop practical management strategies to manage fungicide-resistant foliar diseases (i.e. QoI-resistant frogeye leaf spot, target spot, Cercospora leaf blight). Determine the potential risk of triazole-resistance and SDHI-resistance in various fungal diseases and develop guidelines to reduce the impact of all fungicide-resistant diseases to maximum profit for the Arkansas soybean producers.

Objectives:

1. Evaluate the efficacy and timing of fungicides, labeled and experimental, to control strobilurin-resistant FLS and other foliar diseases (Faske).

2. Investigate the risk and existence of fungicide-resistance in *Cercospora* fungi and other foliar diseases to DMI and SDHI fungicides (Faske & Korth).

3. Develop fungicide-resistance management strategies to delay or prevent fungicide-resistant diseases (Faske).

Methods:

Objective1: Strobilurin-resistant frogeye leaf spot (S-R FLS) has been detected in nearly all soybean producing counties across the state and in the Mid-South. The chemical industry has responded by releasing numerous premix fungicides, which vary in efficacy to control S-R FLS from excellent to poor. Strobilurin resistance is also concern for Cercospora Leaf Blight and Target spot. A good example of a poor fungicide is Priaxor, which was identified to be ineffective in university trials in controlling Cercospora foliar and seed infection. Given that new fungicides are introduced into the market each year, an unbiased evaluation of fungicide efficacy is needed to prevent the use of ineffective fungicides. Additionally, some growers are using a solo triazole program to control S-R FLS; however, the timing of triazole fungicides needs to be re-evaluated as they appear more effective when applied earlier than previously recommended. The limited control by some triazole fungicides suggests that triazole-resistance is developing in our population of FLS. Finally, we will investigate the unnecessary application of fungicides applied automatically at R3 compared to an IPM approach with solo triazole and premix fungicides across several soybean varieties. Each year we have been successful in conducting foliar fungicide trials at the Jackson County Extension Center (JCEC) where irrigation is used to promote disease development, which promotes success in fungicide screens.

Objective 2: The use of triazole (Demethylation Inhibitors; DMI) fungicides has increased and is now the primary chemistry used to manage S-R FLS. Triazole-resistant strains of *C. sojina* and C. *kikuchii* has been reported in Louisiana, which suggest that strains of these pathogens are also present Arkansas. In field trials it has been observed that some triazole fungicides are less effective than others, which suggests the presence of triazole-resistance strains. Confirmation of triazole-resistance is a multi-year project because this resistance is quantitative rather than qualitative. Additionally, the risk of S-R in minor fungal diseases like brown spot and target spot, which have increased in severity in recent years, needs to be investigated to determine the reason for their increase in severity and to be proactive in developing a management strategy, if necessary. Finally, the newest fungicides are the succinate dehydrogenase inhibitors or SDHI, which vary in their control of S-R FLS and have a high to moderate risk for developing resistance. Baseline trials are needed to determine if and when these fungicides are losing efficacy. Fungal isolates will be collected and screened to investigate if there has been a shift toward triazole-resistance and SDHI-resistance in *Cercospora* spp. and other prominent foliar diseases. Finally, the distribution of S-R FLS will be extended to the SW corner of Arkansas where resistant strains have yet to be confirmed.

Objective 3: Applied research is needed to develop practical fungicide resistant management strategies to delay or prevent the increase of such diseases in soybean. This information will be extended to producers in a variety of deliverables, which include management strategy articles posted on the Arkansas Row Crops website, updates to the fungicide efficacy tables in the MP-154 and presentations on fungicide resistance at production meetings and field days. Results from these studies will be published in the soybean research series and used to update a fact sheet on fungicide-resistant management of foliar soybean diseases.

Planned Milestones: Several foliar fungicide trials will be established each year at the NES as outlined in objective one. Fungal isolates will be collected each year and evaluated for resistance to various fungicide chemistries at the Lonoke Extension Center and UAF outlined in objective two. Finally, data from these studies will be used each year to extend the most current management strategies to the Arkansas producers as outlined in objective three.

Value to the Soybean Industry: Our study will benefit farmers in several areas. First, the detection and confirmation of a new fungicide-resistant disease would prevent the unnecessary application of an ineffective fungicide, thus saving money. Further, early detection of the potential pitfalls of new chemistries like SDHI with a similar mode of action to the strobilurins would help to develop baselines for fungicide efficacy, thus loss of efficacy could be confirmed and prevent fungicide failures. Finally, multiple-years of data are needed to confirm losses to triazole fungicides, which is among the most common fungicide used in Arkansas in soybean and if ineffective would be equally important to farmers. Finally, we aim to use and deploy the information collected from these studies to provide practical solutions for the control of fungicide-resistant soybean diseases in Arkansas.

Budget Justification: The proposed budget supports personnel (full-time and hourly/students) to conduct trials/experiments, maintain, and collect data at JCEC or UAF. Travel would be primarily for mileage to pay for use of university vehicle or rental car to travel to and from field locations, an overnight stay maybe necessary depending on field activities (i. e. sampling…). Supplies would include those appropriate for such experiments as described such as but not limited to stakes, tags, supplies for planter or sprayer repair, petri dishes, media, reagents, general lab supplies.

University of Arkansas System Division of Agriculture
Promotion Board Budget

Faske, Travis — *Monitor and Management of Fungicide-Resistant Soybean Diseases in Arkansas*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	Year 3 of 3
Lead Investigator	Faske, Travis	**Co-PI #1**	Korth, Ken
Co-PI #2		**Co-PI #3**	
Department	ENPL Entomology and Plant Pathology		
Commodity Board	Soybean Promotion Board		
Project Title	Monitor and Management of Fungicide-Resistant Soybean Diseases in Arkansas		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

			Faske, Travis	Korth, Ken			Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI			CES	AES					
Fulltime Personnel									
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
Program technician			$18,000				$18,000	$0	$18,000
Program technician				$8,000			$8,000	$8,000	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
Subtotal: Salaries			$18,000	$8,000	$0	$0	$26,000	$8,000	$18,000
Graduate Student									
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Tuition					$0	$0	$0
Subtotal: Graduate Student			$0	$0	$0	$0	$0	$0	$0
Hourly									
			Wages				**Total**	**AES Portion**	**CES Portion**
Hourly-Personnel			$7,000				$7,000	$0	$7,000
Hourly-Students				$2,000			$2,000	$2,000	$0
Subtotal: Hourly			$7,000	$2,000	$0	$0	$9,000	$2,000	$7,000
Fringe Benefits									
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
Fulltime Personnel			$5,688	$2,528	$0	$0	$8,216	$2,528	$5,688
Graduate Students			$0	$0	$0	$0	$0	$0	$0
Hourly Personnel			$553	$0	$0	$0	$553	$0	$553
Hourly-Students			$0	$14	$0	$0	$14	$14	$0
Subtotal: Fringe Benefits			$6,241	$2,542	$0	$0	$8,783	$2,542	$6,241
Personnel Total			$31,241	$12,542	$0	$0	$43,783	$12,542	$31,241
Travel									
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
In-State			$2,000	$500			$2,500	$500	$2,000
Out-of-State							$0	$0	$0
Travel Total			$2,000	$500	$0	$0	$2,500	$500	$2,000

University of Arkansas System Division of Agriculture
Promotion Board Budget

Faske, Travis — *Monitor and Management of Fungicide-Resistant Soybean Diseases in Arkansas*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$2,000	$500			$2,500	$500	$2,000
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$1,715	$0	$0	$0	$1,715	$0	$1,715
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$3,715	$500	$0	$0	$4,215	$500	$3,715
	Total for Proposal	$36,956	$13,542	$0	$0	$50,498	$13,542	$36,956

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

Ecosystems (Rice Only)		%	Faske, Travis	Korth, Ken			Total	
	Grand Prairie	0%	$0	$0	$0	$0	$0	
	Mississippi Delta		$0	$0	$0	$0	$0	
	White River		$0	$0	$0	$0	$0	
	Totals	0%	$0	$0	$0	$0	$0	*Must match the proposal total.*

Tab

Spurlock

(157)

Arkansas Soybean Promotion Board – 2024-2025 Proposal

Title: Developing a satellite-based field scouting tool

Lead Investigators: Dr. Terry Spurlock**,** Extension Plant Pathologist**,** Department of Entomology and Plant Pathology, Division of Agriculture

Co-Investigators: Dr. Jeremy Ross, Extension Soybean Agronomist, Department of Crop, Soil, and Environmental Sciences, Division of Agriculture

Status: Year 2

Research Areas: Plant Pathology, Precision AG, IPM

Stated Goal: To develop a tool that uses publicly available satellite imagery to increase scouting efficiency by locating areas in fields that should be scouted

Specific Objectives:

1. Work with farmers, consultants, and county agents to locate test fields each year. Most of these fields will be Arkansas Soybean Verification fields. We expect to scout approximately 10 fields per year.

2. Run the tool weekly on each verification field and scout areas of fields the tool locates at least once prior to V6, once at R3/R4 and once at R6.

3. Collect relevant data relating to soybean health and productivity (stand, weed populations, diseases present, insect counts, etc.) at each area the tool locates as well as soil samples from areas the tool frequently locates.

4. Test different vegetation indexes and mathematical models to determine the best single model or combination of models for field scouting.

5. Year 3 – deploy the beta version of the tool to be used by county agents, consultants, scouts, and/or farmers.

Methods: For each field, a polygon shapefile will be drawn to represent the field boundary. All fields will be joined as a single file and these data entered into the tool. The tool will be run weekly on all fields through maturity. As fields reach maturity, they will be removed from the model. The model will use multiple vegetation indexes, normalized difference vegetation index (NDVI), simple ratio (SR), optimized vegetation index (OSAVI), difference vegetation index (DVI), and others, calculated from satellite data that is downloaded weekly. From these indices, three mathematical models will be calculated, 10 points in 4 categories: high, medium high, medium low, and low, a global Moran's I, and high and low outliers calculated using the interquartile range method, to locate field areas to be scouted. After each run of the tool, a file with point data representing areas of the fields to be scouted will be created for each field. These files will then be opened, visualized, and located using a GPS enabled smart phone. For each area scouted, data will be collected within a 5-meter area. Data to be collected will be stand, percent weed coverage, diseases present, and other relevant data describing the field condition. For areas the tool repeatedly locates, a soil sample will be collected prior to harvest. Soil samples will be stored in a -80 celsius freezer for future analysis. At the time of scouting, each point will be designated as 'healthy' or 'unhealthy' to confirm that visual observation agrees or disagrees with the category designated by the model run. Data will be analyzed using a t-test to determine differences between what each model run located.

Planned Milestones: After each field season, a detailed and concise report will be presented to cooperating farmers, consultants, and county agents explaining the findings of the tool within their test fields. Each year, a summary of findings will be provided to the Arkansas Soybean Promotion Board as required. Required progress reports will also be provided. At the conclusion of year 2, a 'beta' version of the tool will be made available to select county offices for use and further testing in year 3.

Value to Soybean Industry: A working satellite-based scouting tool has been developed to address inefficiency in our current field scouting procedures. This project seeks to validate the tool and provide a more efficient way to learn as much as possible as quickly as possible about soybean fields on a weekly basis. As farm sizes increase and the amount of acreage consultants are required to scout increases, an updated scouting procedure is needed that will direct scouts to the most important areas of fields and allow more informed decisions to be made and decrease the likelihood of missed pest pressure or unnecessary product applications.

Budget Justifications/Explanation of Travel and Direct Costs: The budget accounts for travel to and from field locations using Monticello as a home base. We expect most field locations to be in southeastern Arkansas. The Spurlock laboratory has hired a specific person to complete data collection with experience in weed science, entomology, and plant pathology. A portion of her hourly wage (April 1 to October 1) is accounted for in the budget at an estimated 30 hours per week.

University of Arkansas System Division of Agriculture
Promotion Board Budget

Spurlock, Terry *Developing a satellite-based field scouting tool*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	Year 2 of 3
Lead Investigator	Spurlock, Terry	**Co-PI #1**	Ross, Jeremy
Co-PI #2		**Co-PI #3**	
Department	ENPL Entomology and Plant Pathology		
Commodity Board	Soybean Promotion Board		
Project Title	Developing a satellite-based field scouting tool		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

	Spurlock, Terry	Ross, Jeremy			Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI	CES	CES					

Fulltime Personnel

Position Title	Name *(if position is filled)*	% Time	Salaries				Total	AES	CES
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Subtotal: Salaries	$0	$0	$0	$0	$0	$0	$0

Graduate Student

Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.

Name *(if position is filled)*	% Time	Wages				Total	AES Portion	CES Portion
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
	Tuition					$0	$0	$0
	Subtotal: Graduate Student	$0	$0	$0	$0	$0	$0	$0

Hourly

	Wages				Total	AES Portion	CES Portion
Hourly-Personnel	$10,000				$10,000	$0	$10,000
Hourly-Students					$0	$0	$0
Subtotal: Hourly	$10,000	$0	$0	$0	$10,000	$0	$10,000

Fringe Benefits

Fringe benefits are calculated when salary and wage amounts are entered above.

	Benefits				Total	AES Portion	CES Portion
Fulltime Personnel	$0	$0	$0	$0	$0	$0	$0
Graduate Students	$0	$0	$0	$0	$0	$0	$0
Hourly Personnel	$790	$0	$0	$0	$790	$0	$790
Hourly-Students	$0	$0	$0	$0	$0	$0	$0
Subtotal: Fringe Benefits	$790	$0	$0	$0	$790	$0	$790
Personnel Total	$10,790	$0	$0	$0	$10,790	$0	$10,790

Travel

Justify out-of-state travel in proposal.

	Travel				Total	AES Portion	CES Portion
In-State	$3,000				$3,000	$0	$3,000
Out-of-State					$0	$0	$0
Travel Total	$3,000	$0	$0	$0	$3,000	$0	$3,000

University of Arkansas System Division of Agriculture
Promotion Board Budget

Spurlock, Terry *Developing a satellite-based field scouting tool*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$1,070				$1,070	$0	$1,070
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$1,070	$0	$0	$0	$1,070	$0	$1,070
	Total for Proposal	$14,860	$0	$0	$0	$14,860	$0	$14,860

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

Ecosystems (Rice Only)		%	Spurlock, Terry	Ross, Jeremy			Total
	Grand Prairie	0%	$0	$0	$0	$0	$0
	Mississippi Delta		$0	$0	$0	$0	$0
	White River		$0	$0	$0	$0	$0
	Totals	0%	$0	$0	$0	$0	$0

Must match the proposal total.

Tab

Spurlock

(161)

Arkansas Soybean Promotion Board – 2024-2025 Proposal

Title: Determining the value of fungicide application using on-farm trials

Lead Investigators: Dr. Terry Spurlock**,** Extension Plant Pathologist**,** Department of Entomology and Plant Pathology, Division of Agriculture

Co-Investigators: Dr. Jason Davis, Application Technology Specialist, Division of Agriculture

Status: Year 2

Research Areas: Plant Pathology, Precision AG, IPM

Stated Goal: To cooperate with farmers, consultants, and county agents to determine when and where a **fungicide application or fungicide + product(s) marketed to improve plant health** protects a soybean crop and adds value above the input cost.

1. **Specific Objectives: Work with farmers or consultants on their farms** to determine the value of product applications if applied across the entirety of their soybean acreage. **This project is targeted to early-career farmers that may struggle with these decisions.**

2. **Test products that the farmer and consultants would like to see.** They guide the test. Products will be applied within label specifications. However, individual rates will be determined by the manufacturers' and retailers' representatives. Products will be applied as they are sold.

3. **Utilize strip trials combined with spatial analysis to** allow integration of whole-field product efficacy with remote sensing technology (aerial imagery via UAVs and satellites, soil maps, and yield monitor data) to answer additional questions regarding within-field product efficacy, disease spread, and within-field difference in impacts of foliar diseases.

4. **Utilize drones** to apply products and determine efficacy against traditional ground applications both site-specifically and whole-plot.

Methods: Strip trials will be established on farms prior to R1. Trial locations will be determined by the farmers, likely based on questions regarding past field performance. Strips' width will be determined by the farmers combine header width and will likely extend the length of the field. Treatments will consist of at least an untreated control, a fungicide of the farmers choosing and a comparable standard, replicated. Trials will be approximately 30-40 acres in total size (divided into at least 9 fungicide plots). Treatments will be applied between R3-R5. Data will be collected at 10 - 20 locations per strip both by visual rating and using drones guided by GPS at application and then again at R6. Yield data will be provided by the farmer or collected using a weigh wagon. Data will be analyzed spatially after each field season and product efficacy determined by field location and within field locations. At select locations, additional treatments of the fungicide standard will be applied aerially by drone.

Planned Milestones: Each year, a report will be made available to cooperating farmers, consultants, and county agents explaining in detail the findings of the trial at their location. Results will be presented at production meetings in addition to being made available on the Arkansas Row Crops Blog and Twitter after each field season. After three more field seasons, the results will be published in refereed scientific literature. These results will also be used in a planned precision agriculture training series for crop consultants, farmers, and county agents through the Cooperative Extension Service.

Value to Soybean Industry: This research aims to answer difficult questions asked by farmers and consultants as to the value added by foliar applications of various aggressively marketed products. It also will generate data that should be used to develop site-directed disease scouting tools making disease scouting more efficient and less expensive as well as answer questions regarding the value of fungicide application using drones.

Budget Justifications/Explanation of Travel and Direct Costs: The budget reflects personnel, travel, and supply cost to move equipment, mark strips, and apply products in 10 -12 on-farm field trial locations in 10-12 different counties. Labor dollars are the greatest expense with specific needs for field rating of diseases and UAV operations at multiple time points throughout the growing season. A graduate student stipend and tuition is included as this student will be using these trials as part of his master’s project.

University of Arkansas System Division of Agriculture
Promotion Board Budget

Spurlock, Terry — *Determining the value of fungicide application using on-farm trials*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	Year 2 of 3
Lead Investigator	Spurlock, Terry	**Co-PI #1**	Davis, Jason
Co-PI #2		**Co-PI #3**	
Department	ENPL Entomology and Plant Pathology		
Commodity Board	Soybean Promotion Board		
Project Title	Determining the value of fungicide application using on-farm trials		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

	Spurlock, Terry	Davis, Jason			Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI	CES	CES					

Fulltime Personnel

Position Title	Name (if position is filled)	% Time	Salaries				Total	AES	CES
Technician	Robert Hoyle	30%	$13,000				$13,000	$0	$13,000
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Subtotal: Salaries	$13,000	$0	$0	$0	$13,000	$0	$13,000

Graduate Student

Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.

Name (if position is filled)	% Time	Wages				Total	AES Portion	CES Portion
Rafael Zaia	50%	$9,000				$9,000	$0	$9,000
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
	Tuition	$3,250				$3,250	$0	$3,250
	Subtotal: Graduate Student	$12,250	$0	$0	$0	$12,250	$0	$12,250

Hourly

	Wages				Total	AES Portion	CES Portion
Hourly-Personnel		$11,500			$11,500	$0	$11,500
Hourly-Students					$0	$0	$0
Subtotal: Hourly	$0	$11,500	$0	$0	$11,500	$0	$11,500

Fringe Benefits

Fringe benefits are calculated when salary and wage amounts are entered above.

	Benefits				Total	AES Portion	CES Portion
Fulltime Personnel	$4,108	$0	$0	$0	$4,108	$0	$4,108
Graduate Students	$378	$0	$0	$0	$378	$0	$378
Hourly Personnel	$0	$909	$0	$0	$909	$0	$909
Hourly-Students	$0	$0	$0	$0	$0	$0	$0
Subtotal: Fringe Benefits	$4,486	$909	$0	$0	$5,395	$0	$5,395
Personnel Total	$29,736	$12,409	$0	$0	$42,145	$0	$42,145

Travel

Justify out-of-state travel in proposal.

	Travel				Total	AES Portion	CES Portion
In-State	$3,000	$3,000			$6,000	$0	$6,000
Out-of-State					$0	$0	$0
Travel Total	$3,000	$3,000	$0	$0	$6,000	$0	$6,000

University of Arkansas System Division of Agriculture
Promotion Board Budget

Spurlock, Terry — *Determining the value of fungicide application using on-farm trials*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$1,855	$2,000			$3,855	$0	$3,855
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$1,855	$2,000	$0	$0	$3,855	$0	$3,855
	Total for Proposal	$34,591	$17,409	$0	$0	$52,000	$0	$52,000

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

		%	Spurlock, Terry	Davis, Jason			Total	
Ecosystems (Rice Only)	Grand Prairie	0%	$0	$0	$0	$0	$0	
	Mississippi Delta		$0	$0	$0	$0	$0	
	White River		$0	$0	$0	$0	$0	
	Totals	0%	$0	$0	$0	$0	$0	*Must match the proposal total.*

Tab

Spurlock

(165)

Arkansas Soybean Promotion Board – 2024-2025 Proposal

Title: Determining factors associated with poor grain quality in soybean and management options

Lead Investigators: Dr. Terry Spurlock and Dr. Nick Bateman, UA Division of Agriculture

Status: Year 3

Stated Goal: Determine the major factors affecting soybean seed quality and develop management strategies for growers to avoid quality losses

Specific Objectives:

1. Determine differences in grain quality caused by fungal diseases and disorders among varieties in the official variety trial at Rohwer Station annually (Spurlock).

2. Establish an early and a late planted fungicide trial at Rohwer Station each year based on data collected from the previous season's official variety trial. Varieties with significantly higher diseases impacting grain quality will be chosen for these trials. The aim will be to determine the impact of various fungicide timings on varieties that have shown susceptibility to diseases and disorders negatively impacting grain quality (Spurlock).

3. Samples will be taken from on-farm fungicide trials (4 – 5 trials annually) at harvest and sent to Riceland Foods in Stuttgart for grading and the Spurlock Lab to determine levels of diseases and disorders that impact grain quality (Spurlock).

4. Grain will be sampled from multiple stink bug trials throughout the state with significantly different levels of stinkbug or other insect feeding and grain quality determined. Additionally, samples will be sent to Fayetteville for fungal pathogen identification that may be related to damage caused by insect feeding (Bateman).

Methods/Approach

Objective 1: The official variety trial is planted at Rohwer Station each year to determine susceptibility of varieties to stem canker and other foliar diseases that may occur. This trial will also be used to determine varietal susceptibility to diseases and disorders that impact grain quality. The trial will be planted very late (after June 30) to maximize disease pressure and limit the opportunity for herbicide drift. Plots will be planted 2-rows wide on 38-inch rows and 10ft long. Each variety will be replicated three times. Plots will be harvested with a mid-sized combine equipped with a research weigh system. During harvest, approximately 16 oz of grain will be collected from each plot just before it enters the weigh system on the plot combine. Levels of fungal diseases on grain (purple seed stain, Phomopsis seed decay, and others) and other disorders will be determined and analyzed by variety.

Objective 2: Five varieties will be chosen from the previous year's variety trial at Rohwer Station and planted in two separate trials on two different planting dates. The first trial will be planted between the last week in April and first week of May. The second will be planted mid-June. Both trials will be planted with plots 2-rows wide on 38-inch rows and 10ft long. Treatments will be 5 varieties with four fungicide timings (nontreated, R3, R5, and R3 + R5) and each treatment replicated three times in a randomized complete block. Plot harvest, sampling, and diseases and disorders impacting grain quality will be determined in a similar way to objective 1.

Objective 3: As part of another project, 10-12 large block on-farm fungicide trials (approximately 30-60 acres) are conducted in counties throughout the state and consist of 3-4 fungicide treatments, with a nontreated control and treatments replicated three times. Foliar disease levels and yields for each treatment are determined and reported back to the cooperating grower. Many of these trials have plot yields determined with a weigh wagon. At harvest, approximately one gallon of grain will be sampled from each block through the weigh wagon sample collection door. Samples will be sent to Riceland Foods in Stuttgart and graded according to their standards then sent to the Spurlock lab in Monticello where diseases impacting grain quality will be determined. These findings will be reported to each cooperating grower in addition to the foliar disease ratings and yields from each fungicide treatment.

Objective 4: Soybean plots will be established in high and low stink bug areas. Two varieties will be planted in a split-block arrangement, with one side receiving weekly sprays for stink bugs and the other side never receiving stink bug applications. After harvest, seed will be rated for stink bug damage, and samples will also be processed for pathogen presence. These studies will be repeated at an early and late planting date.

Planned Milestones:

- Determine the impact that variety alone will have on seed quality
- Observe factors impacting the most common diseases related to soybean grain quality loss
- Evaluate how stink bugs can compound seed quality issues
- Determine best management practices to protect growers from quality losses and disseminate those results at county and regional meetings
- Publish results annually in the Arkansas Soybean Research Series and at the conclusion of the three-year study, publish cumulative findings in a major scientific journal such as Phytopathology.

Value to Soybean Industry: Best management practices will be determined to avoid soybean quality losses and minimize profit loss. These practices will encompass sound IPM, including variety selection and determination of fungicide/insecticide application timing.

Budget Justifications/Explanation of Travel and Direct Costs: The budget reflects the costs of sampling and processing soybean pod samples from tests scattered around the state. Because the methods call for sampling tests planted for other objectives, the weather may present opportunities at more or fewer trial locations. Reactionary travel and labor are budgeted accordingly. Laboratory processing of samples requires typical cleaning and plating of samples, sorting emerging colonies of microorganisms in Petri dishes, and identification by microscopically observed characteristics and molecular methods. A significant portion of M/O is used for laboratory supplies to accomplish these tasks.

University of Arkansas System Division of Agriculture
Promotion Board Budget

Spurlock, Terry *Determining factors associated with poor grain quality in soybean and management options*

Year	2024/2025	**Project Year**	Year 3 of 3
Lead Investigator	Spurlock, Terry	**Co-PI #1**	Bateman, Nick
Co-PI #2		**Co-PI #3**	
Department	ENPL Entomology and Plant Pathology		
Commodity Board	Soybean Promotion Board		
Project Title	Determining factors associated with poor grain quality in soybean and management options		

Version: 6.0 (11/01/2023)

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

	Spurlock, Terry	Bateman, Nick			Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI	CES	CES					

Fulltime Personnel

Position Title	Name (if position is filled)	% Time	Salaries				Total	AES	CES
Program Technician	Robert Hoyle	8%	$5,000				$5,000	$0	$5,000
Program Associate	Amanda Tolbert	20%	$10,000				$10,000	$0	$10,000
Program Associate	Garrett Felts	25%		$14,000			$14,000	$0	$14,000
							$0	$0	$0
							$0	$0	$0
		Subtotal: Salaries	$15,000	$14,000	$0	$0	$29,000	$0	$29,000

Graduate Student

Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.

Name (if position is filled)	% Time	Wages				Total	AES Portion	CES Portion
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
	Tuition					$0	$0	$0
	Subtotal: Graduate Student	$0	$0	$0	$0	$0	$0	$0

Hourly

	Wages				Total	AES Portion	CES Portion
Hourly-Personnel	$6,000				$6,000	$0	$6,000
Hourly-Students		$3,500			$3,500	$0	$3,500
Subtotal: Hourly	$6,000	$3,500	$0	$0	$9,500	$0	$9,500

Fringe Benefits

Fringe benefits are calculated when salary and wage amounts are entered above.

	Benefits				Total	AES Portion	CES Portion
Fulltime Personnel	$4,740	$4,424	$0	$0	$9,164	$0	$9,164
Graduate Students	$0	$0	$0	$0	$0	$0	$0
Hourly Personnel	$474	$0	$0	$0	$474	$0	$474
Hourly-Students	$0	$25	$0	$0	$25	$0	$25
Subtotal: Fringe Benefits	$5,214	$4,449	$0	$0	$9,663	$0	$9,663
Personnel Total	$26,214	$21,949	$0	$0	$48,163	$0	$48,163

Travel

Justify out-of-state travel in proposal.

	Travel				Total	AES Portion	CES Portion
In-State	$2,000	$1,000			$3,000	$0	$3,000
Out-of-State					$0	$0	$0
Travel Total	$2,000	$1,000	$0	$0	$3,000	$0	$3,000

University of Arkansas System Division of Agriculture
Promotion Board Budget

Spurlock, Terry — *Determining factors associated with poor grain quality in soybean and management options*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$1,796	$1,051			$2,847	$0	$2,847
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$990	$0	$0	$0	$990	$0	$990
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$2,786	$1,051	$0	$0	$3,837	$0	$3,837
	Total for Proposal	$31,000	$24,000	$0	$0	$55,000	$0	$55,000

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

Ecosystems (Rice Only)		%	Spurlock, Terry	Bateman, Nick			Total	
	Grand Prairie	0%	$0	$0	$0	$0	$0	
	Mississippi Delta		$0	$0	$0	$0	$0	
	White River		$0	$0	$0	$0	$0	
	Totals	0%	$0	$0	$0	$0	$0	*Must match the proposal total.*

Tab

Spurlock

(169)

Arkansas Soybean Promotion Board – 2024-2025 Proposal

Title: Understanding Taproot decline and orange leaf spot; soybean diseases of increasing importance in Arkansas

Lead Investigators: Terry Spurlock, Extension Plant Pathologist, UA Division of Agriculture

Co-Investigators:

Status: Year 2

Research Areas: Plant Pathology, IPM

Stated Goal: To determine management strategies for taproot decline and determine the causal agent for orange leaf spot, a disease generating questions by consultants and industry representatives

Specific Objectives:

1. Determine the regional distribution of taproot decline and determine the disease's impact on yield.
2. Determine management strategies for taproot decline (variety, seed treatment, and in-furrow fungicides).
3. Determine the causal agent of orange leaf spot and its impact on yield.
4. Train a master's student in applied plant pathology and pest management.

Methods:

1. **Determine the distribution across the soybean production area in Arkansas.** Images representative of field symptoms and signs will be made available to county agents, farmers, and consultants via email, text groups, and Twitter to identify fields with taproot decline. Samples will be collected to confirm disease. Identification of taproot decline will be conducted from fields where the disease was observed using traditional culturing on Petri dishes and coupled with PCR based methods. Fields confirmed to have taproot decline will be recorded by GPS location and marked on a larger regional map and made available on the Arkansas Row Crops Blog and Twitter.

2. **a. Determine disease severity on commonly planted varieties.** A field trial will be planted at an on-farm location in a field that has had severe taproot decline. Approximately 10 to 20 varieties will be planted in a randomized complete block and replicated 5 times. Varieties' susceptibility to taproot decline will be determined. An inoculated variety trial will also be planted at the Rohwer Research Station. If a suitable location for an on-farm trial cannot be found, the trial at Rohwer will be expanded. Stand counts, vigor, disease symptomology, and yield differences will be determined in variety trials.

   b. Determine the efficacy of seed treatment and in-furrow fungicides against the disease. Taproot decline isolates will be placed on Petri dishes containing media amended with various concentrations of fungicides and fungal growth measured against untreated controls. Fungicides significantly inhibiting growth will be moved to inoculated field trials in year 2 and 3. Field trials will be replicated treatments of soybean varieties (various levels of resistance to taproot decline, if known), inoculated and not inoculated, with various seed treatment fungicides, or with or without in-furrow fungicides.

   c. Determine the field distribution and yield impact of the disease in fields. Points (100) will be marked by GPS in a representative area in fields with taproot decline. The number of diseased plants and stand losses will also be determined at each point along with sampling to determine soil texture and fertility. Spatial analysis will be completed to determine if correlations exist between disease severity and yield loss using farmer provided yield data.

3. **Determine the causal pathogen for orange leaf spot.** Where the disease occurs, soybean leaf samples will be collected and transported to the lab for further testing. The pathogen will be isolated using standard testing and attempts made to inoculate healthy soybean plants in the growth chamber or greenhouse to determine the pathogen responsible for this disease.
4. **A master's student will be trained in applied plant pathology and pest management.** The student's research objectives will be focused on determining the best management practices for taproot decline of soybean.

Planned Milestones: Results will be presented at production meetings in addition to being made available on the Arkansas Row Crops Blog and Twitter after each field season. After three field seasons, the results will be published in refereed scientific literature.

Value to Soybean Industry: Data will continue to be collected on the regional distribution of taproot decline occurrence and yield losses. While we have found products that show some efficacy in laboratory trials and field trials, their value with respect to yield protection is still in question. Varietal recommendations are likely our most effective tool and must be made from field testing of market available varieties each year to provide up to date and relevant information to our growers. In addition, establishing an understanding of the interaction with cultivars and alternative ways that symptoms express themselves on the plant will be critical to continue characterizing the diseases or potential complex interactions. Understanding the regional distribution, commercially available seed treatment efficacy, and varietal susceptibilities are necessary for successful management of this taproot decline in Arkansas.

Additionally, a new disease of soybean, tentatively called orange leaf spot, has generated numerous questions and concerns among consultants and industry representatives. The impact to yield of this disease in unclear, as is the pathogen that causes this disease. However, in some fields it has been observed to be severe. Because of this, our preliminary testing should be to determine the pathogen that causes this disease and then, if successful, determine the varieties that are most susceptible to the disease.

Budget Justifications/Explanation of Travel and Direct Costs: Station plot and maintenance fees cover on-station trials at the Rohwer Research station. The travel and supply line items will allow for reactionary data collection when commercial fields are located with moderate to severe taproot decline. Supply also covers laboratory processing of samples including baiting of taproot decline from soil using toothpicks and Petri dishes for plating of samples on growth media, classification, and selection of emerging fungal colonies in Petri dishes, and identification by molecular methods.

University of Arkansas System Division of Agriculture
Promotion Board Budget

Spurlock, Terry — Understanding Taproot decline and orange leaf spot; soybean diseases of increasing importance in Arkansas

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	Year 2 of 3
Lead Investigator	Spurlock, Terry	**Co-PI #1**	
Co-PI #2		**Co-PI #3**	
Department	ENPL Entomology and Plant Pathology		
Commodity Board	Soybean Promotion Board		
Project Title	Understanding Taproot decline and orange leaf spot; soybean diseases of increasing importance in Arkansas		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

	Spurlock, Terry				Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI	CES						

Fulltime Personnel

Position Title	Name *(if position is filled)*	% Time	Salaries				Total	AES	CES
Program Associate	Mandy Tolbert	25%	$11,000				$11,000	$0	$11,000
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Subtotal: Salaries	$11,000	$0	$0	$0	$11,000	$0	$11,000

Graduate Student

Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.

Name *(if position is filled)*	% Time	Wages				Total	AES Portion	CES Portion
MS student	50%	$11,000				$11,000	$0	$11,000
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
	Tuition	$3,250				$3,250	$0	$3,250
	Subtotal: Graduate Student	$14,250	$0	$0	$0	$14,250	$0	$14,250

Hourly

	Wages				Total	AES Portion	CES Portion
Hourly-Personnel	$5,000				$5,000	$0	$5,000
Hourly-Students					$0	$0	$0
Subtotal: Hourly	$5,000	$0	$0	$0	$5,000	$0	$5,000

Fringe Benefits

Fringe benefits are calculated when salary and wage amounts are entered above.

	Benefits				Total	AES Portion	CES Portion
Fulltime Personnel	$3,476	$0	$0	$0	$3,476	$0	$3,476
Graduate Students	$462	$0	$0	$0	$462	$0	$462
Hourly Personnel	$395	$0	$0	$0	$395	$0	$395
Hourly-Students	$0	$0	$0	$0	$0	$0	$0
Subtotal: Fringe Benefits	$4,333	$0	$0	$0	$4,333	$0	$4,333
Personnel Total	$34,583	$0	$0	$0	$34,583	$0	$34,583

Travel

Justify out-of-state travel in proposal.

	Travel				Total	AES Portion	CES Portion
In-State	$2,000				$2,000	$0	$2,000
Out-of-State					$0	$0	$0
Travel Total	$2,000	$0	$0	$0	$2,000	$0	$2,000

University of Arkansas System Division of Agriculture
Promotion Board Budget

Spurlock, Terry *Understanding Taproot decline and orange leaf spot; soybean diseases of increasing importance in Arkansas*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$2,000				$2,000	$0	$2,000
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$660	$0	$0	$0	$660	$0	$660
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$2,660	$0	$0	$0	$2,660	$0	$2,660
	Total for Proposal	$39,243	$0	$0	$0	$39,243	$0	$39,243

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

		%	Spurlock, Terry				Total	
Ecosystems (Rice Only)	Grand Prairie	0%	$0	$0	$0	$0	$0	
	Mississippi Delta		$0	$0	$0	$0	$0	
	White River		$0	$0	$0	$0	$0	
	Totals	0%	$0	$0	$0	$0	$0	*Must match the proposal total.*

Tab

Kegley (173)

Arkansas Soybean Promotion Board – 2024-2025 Proposal

Title: Effects of inclusion of soybean oil in beef heifer diets on heifer development, reproductive function, and calf growth performance

Lead Investigators: Elizabeth Kegley, Jeremy Powell, Charles Looney, Brittni Littlejohn, Robin Cheek, and Kirsten Midkiff

Status (i.e., New, Year 2 of 3, Year 2 of 2, etc.): New

Research Areas: Post-Harvest

Stated Goal: The goal of this proposed research is to assess how feeding a supplement containing soybean oil to developing heifers during the breeding season affects uterine artery hemodynamics and the growth performance of resulting calves from birth through weaning, and to gather additional data on reproductive efficiency to support previous research performed on developing heifers.

Specific Objectives: The objectives of the first study are to determine: 1) the effect of feeding soybean co-products to bred heifers on uterine artery hemodynamics; and 2) the effect of feeding soybean co-products to bred heifers on morphometric measurements and growth of resulting calves from birth until weaning. In addition, objectives of the second study are to gather additional data to determine: 1) the effect of feeding soybean oil in developing beef heifer diets on successful conception and reproductive tract scores; and 2) the effect of feeding soybean oil on economic viability in developing beef heifer diets.

Methods: Study 1 – The first study will use bred heifers developed on a supplement containing soybean oil (ASPB funded project for 2023). The heifers used are from a trial with 80 heifers assigned randomly to 1 of 2 treatment groups (n = 4 pastures/treatment), being 1) control group fed an isonitrogenous and isocaloric grain supplement with no soy product; and 2) treated group fed grain supplemented with soybean oil at 2% of total diet dry matter intake. Supplements were offered beginning approximately 30 days after weaning (June 2023) and continued through the breeding season (February 2024).
<u>Uterine Artery Hemodynamics:</u> 37 heifers (17/40 heifers on control diet; 20/38 heifers on soybean oil diet) were confirmed pregnant by artificial insemination (AI) at 35 days of gestation. On 180 and 250 days of gestation, body weights will be taken, and an ultrasound performed on these heifers to assess uterine artery hemodynamics. An ultrasound probe used to locate the left and right uterine arteries and uterine blood flow for both will be calculated.
<u>Calf Performance:</u> Beginning in August 2024, within 24 hours of birth, all calves (from any of the 80 heifers that bred) will be weighed, and date of birth, calf sex, sire of calf based on AI or natural service pregnancy confirmation will be recorded. Body weights and morphometric measurements (head length, head circumference, curved crown rump length, heart girth circumference, abdominal girth circumference, and hip height) will be taken on all calves at birth, 90 days, and at weaning (May 2025).
Study 2 – For the second study, 72 nulliparous heifers (having no previous births) will be sorted randomly into 1 of 8 pastures (n = 9 heifers/pasture) and pastures will be assigned randomly to 1 of 2 treatment groups (n = 4 pastures per treatment), being 1) control group fed an isonitrogenous

and isocaloric grain supplement with no soy product; and 2) treated group fed grain supplemented with soybean oil at 2% of total diet dry matter intake. Supplements will be offered beginning approximately 60 days after weaning (July 2024, 9 months old) and will continue through the breeding season (February 2025). When heifers reach approximately 15 months of age (day 140), they will be synchronized and then bred by AI. Cattle will be exposed to a bull 10 days following AI. Bulls will remain with heifers for 60 days. Confirmed pregnancy will be determined at approximately 45 and 90 days after AI. Confirmation of successful AI pregnancies and overall pregnancy rates will be recorded for analysis. All costs associated with the development of beef heifers will be recorded and assessed for economic impact. Data will be combined with data obtained for developing heifers for 2023-2024.

Planned Milestones: Reproductive efficiency of cattle can decline for many reasons, including factors relating to poor nutrition like failure to conceive or exhibit estrus, or losses of viable pregnancy. Thus, the need to determine methods to decrease the instance of these losses is imperative. Feeding supplemental fats like soybean oil can affect a variety of physiological processes due to the increased energy density of the diet, which has been shown to have positive effects on reproduction in cattle (Funston, 2004). However, inconsistent results with calf birth and weaning weights, and cow body condition scores (Alexander et al., 2002) have created a need for determining definitive management strategies to improve production and reproductive parameters. Additionally, there has been little investigation on how feeding soybean oil to developing heifers during the breeding season will affect blood flow or calf performance. This research could provide useful information for producers supplementing females with soybean co-products during early pregnancy, and possibly influence reproductive parameters in developing females and early embryonic development of beef calves.

Value to Soybean Industry: Soybean products, particularly soybean meal, are a primary staple for poultry diets, but the beef cattle industry accounts for only 6.8% of soybean meal use in 2019 and 2020 (ASA, 2021). Also, the market for soybean oil in livestock production is slim, with most soybean oil being used for human consumption, biodiesel and bioheat, and industrial uses like paint, plastic, and cleaner (Stowe, 2022). Much about the cattle industry is focused on the cost of inputs and the revenue that producers receive, ultimately determining if producers have the additional funds to supplement cattle during the year. Supplementation with additional fats like soybean oil may be more economical for increasing energy and performance when the prices of grains are too high (Marx, 2022). This could create a greater use of soybean products among cattle producers, where reproduction and performance are important to a producer's bottom line.

Budget Justifications/Explanation of Travel and Direct Costs: $48,940

Cattle Management (animal health products, feed, labor; 72 weaned heifers for 253 days × $1.25/day; 60 bred heifers that will calve for 365 days × $0.70/day)	$36,930
Breeding Costs (PGF, GnRH, Estrotect patches, CIDRs, semen; 72 heifers × $55/heifer)	$3,960
Ultrasound Use (72 heifers × 3 times × $20/time; 37 bred heifers × 2 times × $20/time; costs include some in-state travel for scientist)	$5,800
Feed analyses	$750
Travel to Scientific Meeting	$1,500

University of Arkansas System Division of Agriculture
Promotion Board Budget

Kegley, Beth — *Effects of inclusion of soybean oil in beef heifer diets on heifer development, reproductive function, and calf*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	New
Lead Investigator	Kegley, Beth	**Co-PI #1**	Powell, Jeremy
Co-PI #2	Looney, Charles	**Co-PI #3**	Littlejohn, Brittni
Department	ANSC Animal Sciences		
Commodity Board	Soybean Promotion Board		
Project Title	Effects of inclusion of soybean oil in beef heifer diets on heifer development, reproductive function, and calf growth performance		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

			Kegley, Beth	Powell, Jeremy	Looney, Charles	Littlejohn, Brittni	Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI			AES	AES	AES	AES			
Fulltime Personnel									
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
Subtotal: Salaries			$0	$0	$0	$0	$0	$0	$0
Graduate Student									
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Tuition						$0	$0	$0
Subtotal: Graduate Student			$0	$0	$0	$0	$0	$0	$0
Hourly			**Wages**				**Total**	**AES Portion**	**CES Portion**
Hourly-Personnel							$0	$0	$0
Hourly-Students			$3,520				$3,520	$3,520	$0
Subtotal: Hourly			$3,520	$0	$0	$0	$3,520	$3,520	$0
Fringe Benefits			**Benefits**				**Total**	**AES Portion**	**CES Portion**
Fringe benefits are calculated when salary and wage amounts are entered above.		Fulltime Personnel	$0	$0	$0	$0	$0	$0	$0
		Graduate Students	$0	$0	$0	$0	$0	$0	$0
		Hourly Personnel	$0	$0	$0	$0	$0	$0	$0
		Hourly-Students	$25	$0	$0	$0	$25	$25	$0
Subtotal: Fringe Benefits			$25	$0	$0	$0	$25	$25	$0
Personnel Total			$3,545	$0	$0	$0	$3,545	$3,545	$0
Travel			**Travel**				**Total**	**AES Portion**	**CES Portion**
Justify out-of-state travel in proposal.		In-State	$2,500				$2,500	$2,500	$0
		Out-of-State	$1,500				$1,500	$1,500	$0
Travel Total			$4,000	$0	$0	$0	$4,000	$4,000	$0

University of Arkansas System Division of Agriculture
Promotion Board Budget

Kegley, Beth *Effects of inclusion of soybean oil in beef heifer diets on heifer development, reproductive function, and calf*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$34,895				$34,895	$34,895	$0
	Fertilizer/Chemicals	$5,000				$5,000	$5,000	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs	Analytical Services	$1,500				$1,500	$1,500	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$41,395	$0	$0	$0	$41,395	$41,395	$0
	Total for Proposal	$48,940	$0	$0	$0	$48,940	$48,940	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

Ecosystems (Rice Only)		%	Kegley, Beth	Powell, Jeremy	Looney, Charles	Littlejohn, Brittni	**Total**	
	Grand Prairie	0%	$0	$0	$0	$0	$0	
	Mississippi Delta		$0	$0	$0	$0	$0	
	White River		$0	$0	$0	$0	$0	
	Totals	0%	$0	$0	$0	$0	$0	*Must match the proposal total.*

Tab

Kidd (177)

Arkansas Soybean Promotion Board - 2022-2023 Proposal

Year 3 or 3 Resubmission (2023-2024)

Title: Assessment of broiler dietary least cost protein supply via soybean genotype amino acid selection improvements

Lead Investigator:

Michael T. Kidd, Professor, Poultry Nutrition and Management, Department of Poultry Science

Co-Investigator:

Andrea Acuna-Galindo, Program Associate: Molecular Laboratory Operations, Department of Crop, Soil, and Environmental Sciences

Status: New submission of 3-year proposal

Research Areas:

Breeding, Processing, Utilization, Economics, Post-Harvest, Co-products

Stated Goal:

To develop, identify, harvest, crush, and feed soybeans with improved traits to broilers, and assess broiler live performance, carcass yields, and economics.

Specific Objectives:

1) Develop and identify soybean lines with optimal amino acid composition for broilers.
2) Test developed soybean lines against standard soybeans in broilers.

Methods:

Methods and sequence of events by quarter of the year for the proposed funding.

Year	2022				2023				2024				2025			
Quarter	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
PhD student[1]					(assistantship, fringe benefits, and tuition)											
SB production[2]		1 acre				1 acre				1 acre						
SB processing[3]																
SB development[4]			F1CR		F2CR	F3USA		PC	PC	Pre				Int		
Broiler trials[5]					1	2			3	4			5,6			
Conference talks[6]						PSA	ANC		IPSF	PSA	ANC		IPSF			

[1]Funding for one PhD graduate assistant from 1/2023 to 6/2025.
[2]One acre in Stuttgart for planting and growing the advanced line of soybeans with improved amino acid density.
[3]Processing of control "standard" soybeans and UADA soybeans at Inst-pro Int., Grimes, Iowa, and in 2024, the newly developed soybean line.
[4]New amino acid density soybean line development (traits selected from GRIN seed bank) represents F1 and F2 populations in Costa Rica (CR) fall 2022/winter 2023; F3 generation in USA summer 2023; Progeny (P) rows in Chile (C) fall 2023/winter 2024 for production of lines: Preliminary (Pre) 2024, Intermediates (Int) 2025, and Finals (F) 2026.

[5]Six broiler trials will be conducted. Trials 1-3 will measure bird performance, processing attributes, and economics of improved UADA soybeans versus standard soybeans. Trials 4-6 will test standard soybeans to improved advanced line/newly created preliminary and intermediate line in broilers on performance, processing attributes, and economics.
[6]Funded student will disseminate data for funded work at the International Poultry Scientific Forum in January, the Annual Poultry Science Association meeting in July, and the Arkansas Nutrition Conference in September.

The advanced line soybeans (improved amino acid density) will be crushed in identical conditions as standard beans and experimentally assessed in least cost feed formulated diets and fed to broilers in three floor pen trials, as well as the new line of soybeans. The new line of soybeans will be developed after selection of seed traits by using least cost feed parametrics for amino acid traits important in broiler nutrition, and with traits that lead to future sustainable feed solutions. Specific amino acids targeted will be cysteine, histidine, phenylalanine, tyrosine, alanine, glutamine, proline, and serine because these amino acids are not produced readily in pure form and will allow for protein diet reductions when present at higher amounts in soybeans. Further, this new line will have a higher value ($), pending formulation constraints than standard soybean meal, which may lead to the newly developed soybeans being considered a “new soybean ingredient”, rather than a soybean meal commodity.

Planned Milestones:

In six broiler feeding trials, improved soybean lines with amino acid traits will be assessed for poultry industry application via bird performance and carcass yield based economics.

Value to Soybean Industry:

The improved line of soybeans and subsequent meal will allow for broiler companies to feed birds less protein which reduces farm greenhouse gas emissions, reduces bird water intake, and improves bird welfare. The soybean industry can consider scalable production of the former seeds based on yields and identity preserved economics.

Budget Justifications/Explanation of Travel and Direct Costs:

	Year 1	Year 2	Year 3
Student Assistantship	18000	18000	9000
Student F & A	1048	1048	524
Student Tuition	6795	6795	3171
Winter Nursery: Costa Rica	980	1183	
Progeny Rows: Chile			8935
Soybean Processing, Crush	3500	3500	3500
HPLC Amino Acid Profiles	600	600	600
Broiler Feed & Milling	6000	6000	6000
Broiler trials (6, 2/year)	5500	5500	5500
Broiler Processing plant	3000	3000	3000
Travel (4 conferences)[1]	600	1200	600
	46023	46826	40830

[1]Represents the speaking at the International Poultry Scientific Forum in January held in Atlanta and the Annual Poultry Science Association meeting in July twice each (four conferences), as the Arkansas Nutrition Conference in September is local and there are no significant cost incurred.

University of Arkansas System Division of Agriculture
Promotion Board Budget

Kidd, Michael *Assesment of broiler dietary least cost protein supply via soybean genotype amonoacids*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	Year 3 of 3
Lead Investigator	Kidd, Michael	**Co-PI #1**	Andrea Acuna-Galindo
Co-PI #2		**Co-PI #3**	
Department	POSC Poultry Science		
Commodity Board	Soybean Promotion Board		
Project Title	Assesment of broiler dietary least cost protein supply via soybean genotype amonoacids		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

			Kidd, Michael	Andrea Acuna-Galindo			Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI			AES						
				X					
Fulltime Personnel									
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Subtotal: Salaries	$0	$0	$0	$0	$0	$0	$0
Graduate Student									
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
	Graduate Student	100%	$18,000				$18,000	$18,000	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Tuition	$6,795				$6,795	$6,795	$0
		Subtotal: Graduate Student	$24,795	$0	$0	$0	$24,795	$24,795	$0
Hourly									
			Wages				**Total**	**AES Portion**	**CES Portion**
		Hourly-Personnel					$0	$0	$0
		Hourly-Students					$0	$0	$0
		Subtotal: Hourly	$0	$0	$0	$0	$0	$0	$0
Fringe Benefits									
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
		Fulltime Personnel	$0	$0	$0	$0	$0	$0	$0
		Graduate Students	$756	$0	$0	$0	$756	$756	$0
		Hourly Personnel	$0	$0	$0	$0	$0	$0	$0
		Hourly-Students	$0	$0	$0	$0	$0	$0	$0
		Subtotal: Fringe Benefits	$756	$0	$0	$0	$756	$756	$0
		Personnel Total	$25,551	$0	$0	$0	$25,551	$25,551	$0
Travel									
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
		In-State					$0	$0	$0
		Out-of-State	$600				$600	$600	$0
		Travel Total	$600	$0	$0	$0	$600	$600	$0

University of Arkansas System Division of Agriculture
Promotion Board Budget

Kidd, Michael *Assesment of broiler dietary least cost protein supply via soybean genotype amonoacids*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies					$0	$0	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs	sb Processing+ HPLC AA profiles	$27,535				$27,535	$27,535	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$27,535	$0	$0	$0	$27,535	$27,535	$0
	Total for Proposal	$53,686	$0	$0	$0	$53,686	$53,686	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

		%	Kidd, Michael	Andrea Acuna-Galindo			Total
Ecosystems (Rice Only)	Grand Prairie	0%	$0	$0	$0	$0	$0
	Mississippi Delta		$0	$0	$0	$0	$0
	White River		$0	$0	$0	$0	$0
	Totals	0%	$0	$0	$0	$0	$0

Must match the proposal total.

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(1ум)

Arkansas Soybean Promotion Board – 2024-2025 Proposal

Title: An innovative approach to generate porous soy proteins with enhanced flavor for the plant-based food industry

Lead Investigator: Ali Ubeyitogullari

Status: Year 2 of 3

Research Areas: Post-Harvest

Stated Goal:

Soybean, a vital legume crop, has received great attention due to its protein (40-41%) and oil (20-24%) composition. Soybeans are mainly utilized as animal feed (~78%) and food for human consumption (~15%) in the U.S., where 84% of the soybean fraction used for human consumption is soybean oil. In addition, 97% of soy proteins are fed to poultry and livestock while only 3% of soy proteins are being utilized for human consumption, underestimating the full value of soy proteins. However, there is <u>an increasing demand for plant proteins to develop alternative plant-based food products</u>, including meat, cheese, milk, cream, and mayonnaise. Therefore, the food industry is immensely searching for alternative, inexpensive, and nutritious plant protein sources. Soy proteins can be a great alternative in meeting the demand for plant proteins since they are inexpensive, abundant, and have all essential amino acids as well as provide several health benefits, including reducing the risk of cardiovascular diseases, cancer, diabetes. Soy proteins are being increasingly accepted for human nutrition due to their unique composition and unmatched qualities resembling animal-sourced proteins. Also, soy proteins carry FDA's health claim in potentially reducing the risk of coronary heart disease. <u>Yet, there are several hurdles preventing the widespread food applications of soy proteins</u>. These include undesirable sensory attributes due to off-flavors such as beany, painty, metallic and bitter flavor, and the presence of trypsin inhibitors decreasing protein digestibility. Despite recent progress, however, there is much room for improvement and many untapped possibilities for innovative strategies to be developed before realizing the full potential of soy proteins in food applications.

Thus, <u>*the goal of this project*</u> is to generate functionalized soy protein particles with improved flavor profile using a novel SC-CO_2 technology and 3D food printing. SC-CO_2 loading of flavoring compounds (*i.e.,* dairy flavors) into soy proteins provides a unique opportunity to increase their utilization in alternative dairy products while eliminating the use of any toxic organic solvent.

In the first year of the project, a Ph.D. student was hired to work on this project. This Ph.D. student will continue conducting the experiments, collecting & analyzing the data, and writing manuscripts. Whole soybeans were obtained from Riceland Foods. The whole soybeans were ground and defatted. The SC-CO_2 extraction unit was developed to extract off-flavors from the defatted soybean flour. Four different soybean flour samples were prepared. These include (i) SC-CO_2 treatment at 40 MPa, 60 C for 4h, (ii) a sequential SC-CO_2 treatment at 40 MPa, 60 °C for 4h followed by 15 MPa, 60 °C for 2 h, (iii) hexane extraction at room temperature, and (iv) Soxhlet extraction. Currently, we are analyzing the defatted soybean flours for their volatile compounds, color, protein content, water absorption index, oil absorption capacity, and swelling power. By the end of the project's first year, we will have selected the best conditions for obtaining soybean flours with enhanced flavor. These findings will be included in our winter progress report.

Specific Objectives:

1. Extract off-flavors (*i.e.,* polyunsaturated fatty acids, aldehydes, ketones, and alcohols) from defatted soybean flour using a sequential pure SC-CO_2 and ethanol-modified SC-CO_2.
2. Extract soy protein isolate from off-flavor-removed, defatted soybean flour using an alkaline extraction method, and generate soy protein micro-and nanoparticles using an SC-CO_2-assisted particle formation system.
3. Load model dairy flavoring compounds into the microstructure of the produced protein particles using SC-CO_2, and generate alternative cream cheese using the functionalized soy protein isolates and 3D food printing.

Methods:

Objective 2. Soy proteins will be extracted from defatted and off-flavor-removed soybean flour using a conventional protein extraction method. The extracted proteins will be dissolved in deionized water (pH 8.0) and used for particle formation in an SC-CO_2 system. The protein solution will be fed to a coaxial spray nozzle using a high-pressure pump (SFT-25), while SC-CO_2 will be supplied to the outer tube of the coaxial nozzle using a syringe pump. Both will be sprayed into a precipitation vessel where SC-CO_2 will act as an antisolvent and decrease the pH, leading to the formation of protein particles. The protein particles will be dried using continuous SC-CO_2 drying, which eliminates the surface tension and, in turn, minimizes shrinkage during drying. Proteins will be tested for their digestibility using an in vitro simulated digestion. Protein particles will be characterized using SEM, FTIR, and XRD. Furthermore, protein particles' zeta-potential, particle size, color, and water solubility will be determined.

Objective 3. Porous protein particles and a dairy flavor (*i.e*., delta-dodecalactone) will be loaded into separate compartments of a high-pressure vessel. The loading conditions, namely temperature (40-60 °C), pressure (30-40 MPa), and time (0.5-2 h), will be optimized for the highest loading capacity. Flavor-loaded proteins will be used to generate alternative cream cheese, where the tofu-like gel will be blended with soybean oil. Soy protein pastes at different concentrations will be tested for their 3D printability for their potential plant-based food applications. Flavor-loaded proteins will be characterized for their microstructure, solubility, and flavor release. Sensory attributes of functionalized soy protein-based cream cheese will be investigated, and compared with that produced using commercial soy proteins as well as commercial cream cheese.

Planned Milestones:

The generation of soy protein particles using an SC-CO_2-assisted particle formation system will be studied in the second year. In the third year, a model dairy flavoring compound will be loaded into the soy proteins, and they will be tested in cream cheese.

Value to Soybean Industry:

The current uses of soy proteins in the food industry are limited to tofu, soymilk, and a few other food products with minimal soy protein content due to mainly the undesired flavor of soy proteins. The proposed SC-CO_2-based approach allows us to generate functionalized soy protein particles with a clean neutral flavor, enhanced digestibility, and reduced allergenicity. By SC-CO_2 loading platform along with 3D food printing, various flavors can be loaded into the porous soy protein structure for specific food applications. This can potentially increase the soy protein market share as the plant-based protein market is expected to grow from $10.3 billion in 2020 to $15.6 billion by 2026. Overall, the proposed research will maximize the utilization of soy proteins in foods, produce new health-promoting food ingredients from soy proteins, offer sustainable plant proteins for human consumption, and minimize waste generation. Considering the soybean production in Arkansas (one of the top 10 soybean-producing states), this research will contribute to Arkansas's economy by enhancing the functionality and flavor of soy proteins.

Budget Justifications/Explanation of Travel and Direct Costs:

Funds are requested to support a graduate student and cover tuition for the graduate student. Also, funds are requested for direct expenses like materials and supplies (i.e., high-pressure tubing and valves, glassware, chemicals, digestive enzymes) in the lab, and service lab usage fees (SEM, XRD, and FTIR service fees). Out-of-state travel is requested to present findings at professional conferences (e.g., IFT) in the U.S., to share the data with the food industry, and increase the visibility of the University.

University of Arkansas System Division of Agriculture
Promotion Board Budget

Ubeyitogullari, Ali *An innovative approach to generate porous soy proteins with enhanced flavor for the plant-based food industry*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	Year 2 of 3
Lead Investigator	Ubeyitogullari, Ali	**Co-PI #1**	
Co-PI #2		**Co-PI #3**	
Department	FDSC Food Science		
Commodity Board	Soybean Promotion Board		
Project Title	An innovative approach to generate porous soy proteins with enhanced flavor for the plant-based food industry		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

			Ubeyitogullari, Ali				**Total Board Funding Requested**	**AES Portion**	**CES Portion**
Select "AES" or "CES" for each PI			AES						
Fulltime Personnel									
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
Subtotal: Salaries			$0	$0	$0	$0	$0	$0	$0
Graduate Student									
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
	Sumanjot Kaur	100%	$20,000				$20,000	$20,000	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Tuition	$6,795				$6,795	$6,795	$0
Subtotal: Graduate Student			$26,795	$0	$0	$0	$26,795	$26,795	$0
Hourly									
			Wages				**Total**	**AES Portion**	**CES Portion**
Hourly-Personnel							$0	$0	$0
Hourly-Students							$0	$0	$0
Subtotal: Hourly			$0	$0	$0	$0	$0	$0	$0
Fringe Benefits									
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
Fulltime Personnel			$0	$0	$0	$0	$0	$0	$0
Graduate Students			$840	$0	$0	$0	$840	$840	$0
Hourly Personnel			$0	$0	$0	$0	$0	$0	$0
Hourly-Students			$0	$0	$0	$0	$0	$0	$0
Subtotal: Fringe Benefits			$840	$0	$0	$0	$840	$840	$0
Personnel Total			$27,635	$0	$0	$0	$27,635	$27,635	$0
Travel									
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
In-State							$0	$0	$0
Out-of-State			$3,000				$3,000	$3,000	$0
Travel Total			$3,000	$0	$0	$0	$3,000	$3,000	$0

University of Arkansas System Division of Agriculture
Promotion Board Budget

Ubeyitogullari, Ali — *An innovative approach to generate porous soy proteins with enhanced flavor for the plant-based food industry*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$10,000				$10,000	$10,000	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs	User fees (i.e., SEM, XRD, GC, FT	$3,320				$3,320	$3,320	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$13,320	$0	$0	$0	$13,320	$13,320	$0
	Total for Proposal	$43,955	$0	$0	$0	$43,955	$43,955	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

Ecosystems (Rice Only)		%	Ubeyitogullari, Ali				Total
	Grand Prairie	0%	$0	$0	$0	$0	$0
	Mississippi Delta		$0	$0	$0	$0	$0
	White River		$0	$0	$0	$0	$0
	Totals	0%	$0	$0	$0	$0	$0

Must match the proposal total.

Tab

Ross (185)

Arkansas Soybean Promotion Board – 2024-2025 Proposal

Title: Soybean Research Verification Program

Lead Investigators: Jeremy Ross

Co-Investigators: Chris Elkins and Coordinator to be hired

Status (i.e., New, Year 2 of 3, Year 2 of 2, etc.): Year 2 of 3

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Verification

Stated Goal: To verify University of Arkansas, Division of Agriculture recommendation for soybean production, and to maintain an economic data base of production practices on a large-scale field basis.

Specific Objectives:

1. To conduct field trials to verify that high yields can be profitably produced by coordinating the implementation of all research-based recommendations.
2. To aid researchers in identifying areas of soybean production and marketing that need further study.
3. To improve recommendations which contribute to profitable soybean production utilizing both irrigated and non-irrigated production of both early season (indeterminate) and conventional (determinate) varieties into economically sustainable soybean production systems for the Arkansas farmers.
4. To utilize the Soybean Research Verification Program (SRVP) concept to maintain and improve producers, County Extension Agents' and other crop advisors' soybean production and marketing expertise.

Methods: Farmer-cooperators are selected in soybean-producing counties and the soybean crop grown at the cooperator's expense under the technical direction of the SRVP coordinators. Computerized soil test and variety selection programs and jointly developed Research/Extension weed, insect, and disease programs are utilized. All production practices are based on current Extension Service recommendations. Complete records of field operations are maintained for economic analyses of individual fields.

Planned Milestones: The 2024 Arkansas SRVP will consist of approximately 20 fields representing different production systems for the various soybean production regions within the state. Data obtained from these studies will be evaluated against the objectives. SRVP coordinators will meet with farmer-cooperators during the winter to determine variety, pesticide, and other agronomic practices, which will be utilized during the growing season. SRVP coordinators will make weekly visits to each SRVP field during the growing season to monitor and evaluate each field's progress. Economic data collected during the growing season will be calculated and reported in a final yearly report. SRVP data will be presented at County production meetings and other meetings deemed appropriate.

Value to Soybean Industry: Soybean yields in Arkansas continue to increase but yields can increase more if Arkansas soybean farmers adopt and implement new technology. To increase the state's yield average, new technology including "Precision Agriculture" must be quickly transferred from the University researcher to the soybean producer. The SRVP allows soybean producers to observe University of recommended production practices being implemented on typical producer fields across the state. The SRVP provides for faster adoption of new and existing technology for improved soybean production efficiency for both irrigated and non-irrigated production. The SRVP also demonstrates the profitability of recommended production systems in "real world" high-yield (irrigated environments and also the variable non-irrigated environments and offers an opportunity to enhance cooperating producers' and county Extension agents' marketing expertise.

Budget Justifications/Explanation of Travel and Direct Costs: Both SRVP coordinators travel to each field on a weekly basis during the growing season. Before and after the growing season, coordinators are traveling to meet with potential cooperators and County Agents to plan the coming season and participating in State meeting by presenting SRVP data. Cooperating County Agents are provided two one-way trips to visit their SRVP field twice a week. Out-of-state travel is included in the budget to provide both SRVP coordinators the opportunity to participate in national meetings such as the Commodity Classic or ASA meetings. Additional Direct Cost are $2,000 for cell phone/MiFi charges, $5,600 for four additional soil sensor packages (Decision King Lite, 4 Watermark Sensors, and 6-month PK Link subscription), and $3,500 for cell service for soil moisture sensors.

University of Arkansas System Division of Agriculture
Promotion Board Budget

Ross, Jeremy *Soybean Research Verification Program*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	Year 2 of 3
Lead Investigator	Ross, Jeremy	**Co-PI #1**	
Co-PI #2		**Co-PI #3**	
Department	CSES Crop, Soil, Environmental Science		
Commodity Board	Soybean Promotion Board		
Project Title	Soybean Research Verification Program		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

			Ross, Jeremy				Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI			CES						
Fulltime Personnel									
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
Program Assoc	Chris Elkins	95%	$60,528				$60,528	$0	$60,528
Program Assoc	TBD	95%	$61,750				$61,750	$0	$61,750
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Subtotal: Salaries	$122,278	$0	$0	$0	$122,278	$0	$122,278
Graduate Student									
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Tuition					$0	$0	$0
		Subtotal: Graduate Student	$0	$0	$0	$0	$0	$0	$0
Hourly									
			Wages				**Total**	**AES Portion**	**CES Portion**
		Hourly-Personnel					$0	$0	$0
		Hourly-Students					$0	$0	$0
		Subtotal: Hourly	$0	$0	$0	$0	$0	$0	$0
Fringe Benefits									
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
		Fulltime Personnel	$38,640	$0	$0	$0	$38,640	$0	$38,640
		Graduate Students	$0	$0	$0	$0	$0	$0	$0
		Hourly Personnel	$0	$0	$0	$0	$0	$0	$0
		Hourly-Students	$0	$0	$0	$0	$0	$0	$0
		Subtotal: Fringe Benefits	$38,640	$0	$0	$0	$38,640	$0	$38,640
		Personnel Total	$160,918	$0	$0	$0	$160,918	$0	$160,918
Travel									
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
		In-State	$25,000				$25,000	$0	$25,000
		Out-of-State	$4,000				$4,000	$0	$4,000
		Travel Total	$29,000	$0	$0	$0	$29,000	$0	$29,000

University of Arkansas System Division of Agriculture
Promotion Board Budget

Ross, Jeremy *Soybean Research Verification Program*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$5,000				$5,000	$0	$5,000
	Fertilizer/Chemicals					$0	$0	$0
	Publication	$750				$750	$0	$750
	Statistical Consulting					$0	$0	$0
Other Direct Costs	Cell Service/Soil Moisture Servic	$12,500				$12,500	$0	$12,500
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$18,250	$0	$0	$0	$18,250	$0	$18,250
	Total for Proposal	$208,168	$0	$0	$0	$208,168	$0	$208,168

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

		%	Ross, Jeremy				Total	
Ecosystems (Rice Only)	Grand Prairie	0%	$0	$0	$0	$0	$0	
	Mississippi Delta		$0	$0	$0	$0	$0	
	White River		$0	$0	$0	$0	$0	
	Totals	0%	$0	$0	$0	$0	$0	*Must match the proposal total.*

Tab

Butts (189)

Arkansas Soybean Promotion Board – 2024-2025 Proposal

Title: Soybean Weed Management: A Team Approach for Improved Control and Profitability
Lead Investigator: Tommy Butts
Co-Investigators: Tom Barber, Jason Norsworthy, and Nilda Burgos
Status (i.e., New, Year 2 of 3, Year 2 of 2, etc.): Year 2 of 3
Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Weeds and Education

Stated Goal: To evaluate new and emerging weed control technologies, rapidly identify herbicide-resistant weeds, determine their distribution, determine their mechanisms of resistance, and develop viable, unbiased solutions for managing these weeds. In addition, research focused on reducing the soil weed seedbank and controlling other problematic weeds for soybean producers in Arkansas will be conducted. The identification and implementation of diversified control strategies and the rapid information exchange between the grower, Extension personnel, and researchers will be prioritized.

Specific Objectives:

1. To continue testing suspected resistant weed biotypes sent from county agents and soybean producers for herbicide resistance, particularly for glufosinate and auxin herbicide resistance, documenting the level of resistance and distribution, and determining the effectiveness of alternate herbicide modes-of-action on resistant biotypes
2. To quantify the potential of multiple herbicide-resistant Palmer amaranth and other confirmed resistant weeds to spread in Arkansas by determining control programs, ecological fitness, and geographic distribution of resistant biotypes, and resistance and dispersal mechanisms likely to cause population expansion
3. To identify and evaluate effective management programs (both short-term and long-term) for multiple herbicide-resistant Palmer amaranth including glufosinate and auxin herbicide resistance
4. To evaluate the effectiveness of various agronomic practices (double crop, cover crop, etc.) for suppressing problematic weeds of Arkansas soybean production systems
5. To determine how herbicide performance and selectivity are affected by environmental conditions (such as planting date, soil texture, climatic conditions), herbicide tank-mixture, weed species, and growth stage to develop more efficient and reliable herbicide management strategies
6. To evaluate long term programs (chemical and cultural) to reduce the soil weed seedbank. These programs will include trials designed to study methods of destroying weed seed post-harvest and evaluate new harvest weed seed destruction equipment
7. To evaluate the viability of new technologies (herbicides, traits, etc.) as they emerge for efficacy and the ability to safely apply in the agricultural and external environment
8. To evaluate fall-applied residual herbicides effectiveness on problematic Arkansas weeds (i.e., Italian ryegrass) and the resulting impact on spring burndown applications
9. To evaluate herbicide program costs and resulting soybean yields to determine profitability potential of weed management options
10. To develop RNAi technology for potential use as a novel tool for integrated weed management
11. To provide rapid transfer of weed control information to growers through multiple outreach methods such as publications, blog posts, Weeds AR Wild podcasts, videos, text messages, and many others

Methods: Approximately 100 applied research and demonstration trials will be conducted on-farm and on experiment stations at Rohwer, Newport, Stuttgart, Pine Tree, Lonoke (greenhouse), Fayetteville (field, greenhouse, laboratory), Keiser, Marianna, and other on-farm locations as needed to determine the most effective control options for problematic weeds in soybean production systems. Both, currently registered soybean herbicides and anticipated technologies will be evaluated. Trials will include comparisons of herbicide performance in early-season, full-season, and double-cropped soybean at all application timings. Most field trials will be 15 to 30 treatments in four-row or drill-seeded plots with four replications. Further field trials determining the effectiveness of weed seed destruction methods for long-term program approaches to weed management will be conducted. Field trials will be established to evaluate fall-applied residual herbicides to investigate their effectiveness on Italian ryegrass and the impact on required herbicides and input costs for spring burndowns. All data will be statistically analyzed, and experiments will be repeated to provide accurate results to growers. Data from these trials will be applicable across soybean production systems and will be used to update the annual MP44 publication “Recommended Chemicals for Weed and Brush Control”.

Suspected resistant weeds from fields where herbicide failure occurred will be evaluated relative to known susceptible standards for resistance under controlled conditions. If failure still occurs, dose response experiments will be conducted to confirm resistance and determine the level of resistance relative to susceptible populations and labeled herbicide use rates. Laboratory experiments will be conducted to investigate herbicide absorption and translocation, metabolism, and target site mutation as possible resistance mechanisms. Determining resistance mechanisms will assist the development of management strategies to slow further resistance development. Ecological fitness experiments will also be conducted to compare the relative competitiveness of resistant and susceptible biotypes. Laboratory and greenhouse experiments will be conducted to test potential RNAi agents for weed control. These agents would provide a novel tool to aid in weed management and potential herbicide resistance solutions.

Planned Milestones: Experiments will be established, evaluated, and harvested in a timely manner in accordance with established Arkansas soybean production systems. Data will be analyzed and presented to growers through multiple outreach methods and in scientific meetings each year. Refereed journal articles will be published when deemed appropriate. Data from all trials will be incorporated into annual publications, newsletters, blog posts, Weeds AR Wild podcasts, videos, fact sheets, and text message blasts wherever appropriate. In addition, results will be published in the annual Soybean Research Series.

Value to Soybean Industry: Proper weed control accounts for a significant portion of annual budgeted production expenses. The rapid adoption and widespread use of soybean weed control information has been of great value to Arkansas growers. This project will allow growers to closely follow the discovery of herbicide-resistant and new problematic weed species through timely information which will assist with the management of these weeds on their farms. The discoveries of multiple glyphosate-resistant weed species and other herbicide resistance such as PPO-inhibitor, VLCFA-inhibitor, glufosinate, and auxin-resistant Palmer amaranth in Arkansas soybean fields has been a direct result of Soybean Board Funding. Failure to adequately control these weeds can result in total crop loss. The development of herbicide resistance to new technologies is also a concern and will be addressed by this program. Finally, identifying IWM opportunities to enhance program approaches and determining best use practices of new precision technologies will help weed control and grower profitability. If the introduction of diverse strategies and scientifically-supported recommendations generated from this research can save even $10/acre of input costs, that would provide an annual savings of $35 million total for Arkansas soybean growers.

Budget Justifications/Explanation of Travel and Direct Costs: This proposal requests $260,807 for total funding to be split between 4 PI’s operating in a team. Of the total requested, $209,612 (80%) is requested for personnel expenses, including partial funding of 5 full-time program associates/technicians and funds for hourly workers. The personnel described is essential for the successful implementation of more than 100 field trials conducted at a minimum of 8 locations across Arkansas, as well as greenhouse experiments and resistance screenings of Palmer amaranth populations to 2 different sites-of-action herbicides plus a small sampling of other problematic weeds and herbicides as requested. Funding requested also includes $7,750 for in-state travel to cover expenses associated with the multi-location research conducted across the state. The remaining budget requested ($43,445) is for M&O including research supplies necessary to conduct the proposed research, equipment maintenance, and research station trial fees. The most efficient means to conduct an effective weed management research program in soybean is through a team approach. To facilitate the rapid development of a database for soybean herbicide recommendations, multiple project leaders at several field locations are needed to address the objectives of this weed management project.

University of Arkansas System Division of Agriculture
Promotion Board Budget

Butts, Thomas *Soybean Weed Management: A Team Approach for Improved Control and Profitability*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	Year 2 of 3
Lead Investigator	Butts, Thomas	**Co-PI #1**	Barber, Tom
Co-PI #2	Norsworthy, Jason	**Co-PI #3**	Burgos, Nilda
Department	CSES Crop, Soil, Environmental Science		
Commodity Board	Soybean Promotion Board		
Project Title	Soybean Weed Management: A Team Approach for Improved Control and Profitability		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

	Butts, Thomas	Barber, Tom	Norsworthy, Jason	Burgos, Nilda	Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI	CES	CES	AES	AES			

Fulltime Personnel

Position Title	Name *(if position is filled)*	% Time	Salaries				Total	AES	CES
Program Tech	Smith	80%	$32,000	$0	$30,000	$0	$62,000	$30,000	$32,000
Program Assoc	Davis	25%	$15,000	$0	$0	$0	$15,000	$0	$15,000
Program Assoc	Doherty	40%	$0	$29,000	$0	$0	$29,000	$0	$29,000
Program Tech	Hill	20%	$0	$10,000	$0	$0	$10,000	$0	$10,000
Program Assoc	Rangani	70%	$0	$0	$0	$40,000	$40,000	$40,000	$0
		Subtotal: Salaries	$47,000	$39,000	$30,000	$40,000	$156,000	$70,000	$86,000

Graduate Student

Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.

Name *(if position is filled)*	% Time	Wages				Total	AES Portion	CES Portion
		$0	$0	$0	$0	$0	$0	$0
		$0	$0	$0	$0	$0	$0	$0
		$0	$0	$0	$0	$0	$0	$0
		$0	$0	$0	$0	$0	$0	$0
		$0	$0	$0	$0	$0	$0	$0
	Tuition	$0	$0	$0	$0	$0	$0	$0
	Subtotal: Graduate Student	$0	$0	$0	$0	$0	$0	$0

Hourly

	Wages				Total	AES Portion	CES Portion
Hourly-Personnel	$0	$0	$4,000	$0	$4,000	$4,000	$0
Hourly-Students	$0	$0	$0	$0	$0	$0	$0
Subtotal: Hourly	$0	$0	$4,000	$0	$4,000	$4,000	$0

Fringe Benefits

Fringe benefits are calculated when salary and wage amounts are entered above.

	Benefits				Total	AES Portion	CES Portion
Fulltime Personnel	$14,852	$12,324	$9,480	$12,640	$49,296	$22,120	$27,176
Graduate Students	$0	$0	$0	$0	$0	$0	$0
Hourly Personnel	$0	$0	$316	$0	$316	$316	$0
Hourly-Students	$0	$0	$0	$0	$0	$0	$0
Subtotal: Fringe Benefits	$14,852	$12,324	$9,796	$12,640	$49,612	$22,436	$27,176
Personnel Total	$61,852	$51,324	$43,796	$52,640	$209,612	$96,436	$113,176

Travel

Justify out-of-state travel in proposal.

	Travel				Total	AES Portion	CES Portion
In-State	$0	$3,000	$4,750	$0	$7,750	$4,750	$3,000
Out-of-State	$0	$0	$0	$0	$0	$0	$0
Travel Total	$0	$3,000	$4,750	$0	$7,750	$4,750	$3,000

University of Arkansas System Division of Agriculture
Promotion Board Budget

Butts, Thomas *Soybean Weed Management: A Team Approach for Improved Control and Profitability*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$0	$0	$9,000	$8,500	$17,500	$17,500	$0
	Fertilizer/Chemicals	$0	$0	$0	$0	$0	$0	$0
	Publication	$0	$0	$0	$0	$0	$0	$0
	Statistical Consulting	$0	$0	$0	$0	$0	$0	$0
Other Direct Costs		$0	$0	$0	$0	$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$1,750	$0	$1,750	$1,750	$0
	CTST, Marianna	$0	$5,400	$0	$0	$5,400	$0	$5,400
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$6,250	$0	$6,250	$6,250	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$3,875	$4,600	$0	$0	$8,475	$0	$8,475
	PTST, Colt	$0	$0	$2,300	$0	$2,300	$2,300	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$1,770	$0	$0	$1,770	$0	$1,770
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$3,875	$11,770	$19,300	$8,500	$43,445	$27,800	$15,645
	Total for Proposal	$65,727	$66,094	$67,846	$61,140	$260,807	$128,986	$131,821

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

Ecosystems (Rice Only)		%	Butts, Thomas	Barber, Tom	Norsworthy, Jason	Burgos, Nilda	Total	
	Grand Prairie	0%	$0	$0	$0	$0	$0	
	Mississippi Delta		$0	$0	$0	$0	$0	
	White River		$0	$0	$0	$0	$0	
	Totals	0%	$0	$0	$0	$0	$0	*Must match the proposal total.*

Tab

Norsworthy

(195)

Arkansas Soybean Promotion Board – 2023-2024 Proposal

Title: Screening for Soybean Tolerance to Metribuzin

Lead Investigator: Jason K. Norsworthy

Co-Investigator: Jeremy Ross

Status: 3 of 3

Stated Goal: To evaluate commercial soybean varieties for tolerance to metribuzin and make information readily available to growers.

Specific Objectives:

1) To assess the tolerance to metribuzin of soybean varieties entered in the Arkansas OVT.
2) To provide rapid transfer of information regarding the level of tolerance or sensitivity of Arkansas grown soybean varieties to metribuzin.

Methods: All soybean varieties entered in the Arkansas OVT will be sown in a replicated experiment in the greenhouse and evaluated for tolerance to metribuzin. The experiment will be conducted using a silt loam soil, and metribuzin will be applied preemergence at 0.5 lb ai/A, which is a slightly higher than labeled rate for this soil type. This rate will ensure adequate tolerance of those varieties deemed "tolerant" or to have "slight injury". Injury to soybean will be evaluated at 14 and 21 days after treatment on a 0 to 10 scale, where 0 equals no injury and 10 equal complete soybean death. Each variety will then be placed in one of three categories based on its sensitivity to metribuzin, with these being slight injury, moderate injury, or severe injury.

Planned Milestones: Evaluations of soybean varieties will take place in the greenhouse in the fall of the year. Results from the evaluation will be made available on the Extension website (uaex.edu) prior to the first of the year and shared with growers at county and state-wide production meetings.

Value to Soybean Industry: Metribuzin (Sencor or Lexone) was used by most Arkansas soybean growers prior to adoption of Roundup Ready in the mid- to late 1990's. Metribuzin is a broad-spectrum residual herbicide that provides a high level of control of Palmer amaranth, the most problematic weed of Arkansas soybean today. Soybean varieties differ in tolerance to metribuzin; hence, annual testing of available varieties was routine prior to Roundup Ready soybean to allow growers to best match a variety with their anticipated use of metribuzin. Now that preemergence, residual herbicides are once again a major component of weed management in Arkansas soybean, screening of soybean varieties for tolerance to metribuzin is needed. In addition to metribuzin alone products, such as Metri, Metribuzin, etc., a variety of metribuzin-containing products are being promoted and used by Arkansas soybean growers. Some of these products include Canopy (metribuzin + chlorimuron), Authority MTZ (metribuzin + sulfentrazone), and Boundary (metribuzin + S-metolachlor). The metribuzin rate in these products is less than that which will provide effective control when metribuzin is used alone. The reason for the lower rates of metribuzin in these products is because the sensitivity of the current soybean varieties to metribuzin is unknown; hence, a low rate is applied to minimize the risk of injury to the most sensitive varieties. Soybean producers in Arkansas would greatly benefit from being able to use a full rate of metribuzin in soybean, especially considering that PPO-resistant Palmer amaranth was documented in 12 counties in Northeast Arkansas. Our field research indicates that metribuzin needs to be a major component of the preemergence weed control program on any acre for which the PPO herbicides failed, especially those north of I40. We currently recommend a full rate of metribuzin plus a chloroacetamide on every PPO-resistant pigweed acre.

Budget Justification: My program associate, Dr. Rodrigo Botelho, will be responsible for conducting and evaluating the screening. His time is budgeted at 18% of his annual salary along with fringe benefits. For supplies, which include trays and plot stakes, a total of $750 has been budgeted, and $1000 is requested for greenhouse rental where the screening will be conducted. The total request is for $16,226.

University of Arkansas System Division of Agriculture
Promotion Board Budget

Norsworthy, Jason *Screening for Soybean Tolerance to Metribuzin*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	Year 3 of 3
Lead Investigator	Norsworthy, Jason	**Co-PI #1**	
Co-PI #2	Ross, Jeremy	**Co-PI #3**	
Department	CSES Crop, Soil, Environmental Science		
Commodity Board	Soybean Promotion Board		
Project Title	Screening for Soybean Tolerance to Metribuzin		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

			Norsworthy, Jason		Ross, Jeremy		Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI			AES		CES				
Fulltime Personnel									
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
Program Associate	Rodrigo Botelho	18%	$11,000				$11,000	$11,000	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Subtotal: Salaries	$11,000	$0	$0	$0	$11,000	$11,000	$0
Graduate Student									
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Tuition					$0	$0	$0
		Subtotal: Graduate Student	$0	$0	$0	$0	$0	$0	$0
Hourly									
			Wages				**Total**	**AES Portion**	**CES Portion**
		Hourly-Personnel					$0	$0	$0
		Hourly-Students					$0	$0	$0
		Subtotal: Hourly	$0	$0	$0	$0	$0	$0	$0
Fringe Benefits									
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
		Fulltime Personnel	$3,476	$0	$0	$0	$3,476	$3,476	$0
		Graduate Students	$0	$0	$0	$0	$0	$0	$0
		Hourly Personnel	$0	$0	$0	$0	$0	$0	$0
		Hourly-Students	$0	$0	$0	$0	$0	$0	$0
		Subtotal: Fringe Benefits	$3,476	$0	$0	$0	$3,476	$3,476	$0
		Personnel Total	$14,476	$0	$0	$0	$14,476	$14,476	$0
Travel									
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
		In-State					$0	$0	$0
		Out-of-State					$0	$0	$0
		Travel Total	$0	$0	$0	$0	$0	$0	$0

University of Arkansas System Division of Agriculture
Promotion Board Budget

Norsworthy, Jason *Screening for Soybean Tolerance to Metribuzin*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$750				$750	$750	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs	Greehouse rental	$1,000				$1,000	$1,000	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$1,750	$0	$0	$0	$1,750	$1,750	$0
	Total for Proposal	$16,226	$0	$0	$0	$16,226	$16,226	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

Ecosystems (Rice Only)		%	Norsworthy, Jason		Ross, Jeremy		**Total**
	Grand Prairie	0%	$0	$0	$0	$0	$0
	Mississippi Delta		$0	$0	$0	$0	$0
	White River		$0	$0	$0	$0	$0
	Totals	0%	$0	$0	$0	$0	$0

Must match the proposal total.

Tab

Bluhm (199)

Arkansas Soybean Promotion Board – 2024-2025 Proposal

Title: Optimization of fungal pathogens AF22 and AF24 as bioherbicides for Palmer amaranth (pigweed)

Lead Investigator: Burt Bluhm, UADA-Fayetteville

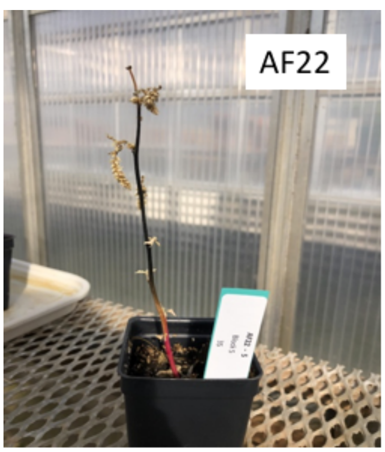
Collaborator: Kelly Cartwright, Agricultural Research Initiatives, Inc.

Status (i.e., New, Year 2 of 3, Year 2 of 2, etc.): Year 2 of 3

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Weeds

Stated Goal: Herbicide-resistant Palmer amaranth (pigweed) is one of the most frustrating management issues for Arkansas soybean production. Biological Controls (bioherbicides) based on fungal pathogens have been commercialized for some weed pests, but not pigweed. In previous work supported by the Arkansas Soybean Promotion Board, fungal pathogens were isolated from pigweed throughout Arkansas to identify viable biological control candidates. Recently, isolates AF22 and AF24 have emerged as highly promising candidates. *The goal of this project is to create commercially viable bioherbicides targeting Palmer amaranth based on fungal isolates AF22 and AF24.*

Background: In work previously funded by the Arkansas Soybean Promotion Board, we identified two fungal pathogens from pigweed (AF22 and AF24) that consistently kill young pigweed plants with a high degree of virulence (first image). Both isolates induce lethality with rapid stem colonization and necrosis, leaving a black, carbon-like residue of dead tissue. These symptoms suggested that AF22 and AF24 produce a host-specific toxin, further evidence of which is rapid wilting, foliar necrosis, and death of pigweed plants exposed to culture filtrates (within 48 hours after exposure; middle and right images). The production of a pigweed-specific toxin by AF22 and AF24 is significant for commercialization, as the pathogens could be applied directly (or in a bioherbicide cocktail) to kill pigweed, or the toxin produced by the pathogens could be used/adapted into a more conventionally formulated, host-specific chemical herbicide.



Specific Objectives:

1. *Develop isolates AF22 and AF24 as biological control agents/bioherbicides of pigweed.*
2. *Identify host-specific toxins produced by isolates AF22 and AF24 for bioherbicide development.*
3. *Actively pursue commercialization of bioherbicide products derived from AF22 and AF24.*

Methods: *Objective 1.* We have collected promising data about the effectiveness and host specificity of AF22 and AF24. In the next stage of development, we need to optimize various parameters that are critical for commercialization, including delivery method(s), product formulation, fermentation parameters for inoculum production, storage conditions, and efficacy in field conditions. We are working to improve commercially relevant traits of AF22 and AF24 through non-transgenic genome editing, and we are also using genome editing to further increase aggressiveness of both isolates. Additionally, for EPA/federal registration of biological control products, certain information needs to be collected about environmental persistence, host range of the pathogens, taxonomic identification of AF22 and AF24 via molecular analyses, and other statutory requirements.

Objective 2. In parallel with the activities described in Objective 1, we will focus on identifying and analyzing the host-specific toxin(s) produced by AF22 and AF24. Our preliminary analyses indicate the toxin is a secondary metabolite, rather than a protein toxin. We have fractionated secondary metabolites from culture filtrates, and are working to determine the bioactivity of specific fractions (lethality of pigweed) so that we can perform metabolic profiling on active fractions. Metabolomic analyses will be performed with state-of-the art instrumentation at the Arkansas Statewide Mass Spectrometry facility. We will link potential toxins to specific biochemical pathways through genomic analyses. We will ultimately confirm the identity of the toxin(s) through a combination of biochemical, genetic, and molecular techniques. Upon conclusive identification, we will develop strategies for large-scale production & development as a chemical herbicide (exact details will depend on the chemical structure of the compound(s)).

Objective 3. We have reached the ‘tipping point’ at which the commercialization process can launch in earnest. We are currently in the process of filing an invention disclosure for AF22 and AF24 as biological control agents of pigweed. The next step will be filing for patent protection, followed by creating a licensing structure for the products. Possible avenues include a partnership with Agricultural Research Initiatives (Dr. Kelly Cartwright, president), the formation of a new start-up company to launch commercialization, or licensing of the technology to an existing agricultural biotech entity. For the first two options, we anticipate this project will be highly competitive for additional sources of support, such as USDA-SBIR and NSF-STTR funding. Both of these federal programs can dramatically accelerate the commercialization of novel technologies during early stages of product development. Bluhm and Cartwright have successfully collaborated to obtain support from these programs on other projects.

Planned Milestones: In Year 1, we made substantial progress on trait development/optimization of AF22 and AF24 (Obj. 1), are working to make a preliminary structural identification of the toxin (Obj. 2), and collected information required to obtain patent protection as per the invention disclosure (Obj. 3). In Year 2, we will address any potential roadblocks to using AF22 and AF24 as bioherbicides (Obj. 1), confirm preliminary toxin structural data (Obj. 2), and continue the process of applying for patent protection (Obj. 3). In Year 3, we will continue to optimize AF22 and AF24 while addressing regulatory requirements (Obj. 1), conclusively identify the toxin(s) along with underlying biosynthetic genes (Obj. 2), and develop the licensing structure to allow commercialization of products (Obj. 3).

Value to Soybean Industry: Herbicide-resistant weeds are the most problematic and expensive pest management issue in row-crop agriculture. Attempts to control ‘super’ weeds can cost \$30-50 per acre, and as much as \$150/acre if hand-rouging is required. Herbicide-resistant pigweed has played a large role in forcing producers to consider options such as Xtend soybeans, which potentially limits the diversity of soybean varieties available to producers, and are controversial due to off-target effects of dicamba.

Budget Justifications/Explanation of Travel and Direct Costs: Funds are requested for laboratory experiments pertaining primarily to bioherbicide development and toxin analyses. Funds for out-of-state travel are requested for project participants to present project results at one or more scientific meetings.

University of Arkansas System Division of Agriculture
Promotion Board Budget

Bluhm, Burt *Optimization of fungal pathogens AF22 and AF24 as bioherbicides for Palmer amaranth (pigweed)*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	Year 2 of 3
Lead Investigator	Bluhm, Burt	**Co-PI #1**	Kelly Cartwright
Co-PI #2		**Co-PI #3**	
Department	ENPL Entomology and Plant Pathology		
Commodity Board	Soybean Promotion Board		
Project Title	Optimization of fungal pathogens AF22 and AF24 as bioherbicides for Palmer amaranth (pigweed)		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

			Bluhm, Burt	Kelly Cartwright			Total Board Funding Requested	AES Portion	CES Portion
		Select "AES" or "CES" for each PI	AES						
				X					
Fulltime Personnel									
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
Program Associate		25%	$10,000				$10,000	$10,000	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Subtotal: Salaries	$10,000	$0	$0	$0	$10,000	$10,000	$0
Graduate Student									
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Tuition					$0	$0	$0
		Subtotal: Graduate Student	$0	$0	$0	$0	$0	$0	$0
Hourly									
			Wages				**Total**	**AES Portion**	**CES Portion**
		Hourly-Personnel	$5,000				$5,000	$5,000	$0
		Hourly-Students					$0	$0	$0
		Subtotal: Hourly	$5,000	$0	$0	$0	$5,000	$5,000	$0
Fringe Benefits									
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
		Fulltime Personnel	$3,160	$0	$0	$0	$3,160	$3,160	$0
		Graduate Students	$0	$0	$0	$0	$0	$0	$0
		Hourly Personnel	$395	$0	$0	$0	$395	$395	$0
		Hourly-Students	$0	$0	$0	$0	$0	$0	$0
		Subtotal: Fringe Benefits	$3,555	$0	$0	$0	$3,555	$3,555	$0
		Personnel Total	$18,555	$0	$0	$0	$18,555	$18,555	$0
Travel									
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
		In-State	$500				$500	$500	$0
		Out-of-State	$3,500				$3,500	$3,500	$0
		Travel Total	$4,000	$0	$0	$0	$4,000	$4,000	$0

University of Arkansas System Division of Agriculture
Promotion Board Budget

Bluhm, Burt *Optimization of fungal pathogens AF22 and AF24 as bioherbicides for Palmer amaranth (pigweed)*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$9,445				$9,445	$9,445	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs	Subcontract - Kelly Cartwright	$8,000				$8,000	$8,000	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$17,445	$0	$0	$0	$17,445	$17,445	$0
	Total for Proposal	$40,000	$0	$0	$0	$40,000	$40,000	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

		%	Bluhm, Burt	Kelly Cartwright			Total	
Ecosystems (Rice Only)	Grand Prairie	0%	$0	$0	$0	$0	$0	
	Mississippi Delta		$0	$0	$0	$0	$0	
	White River		$0	$0	$0	$0	$0	
	Totals	0%	$0	$0	$0	$0	$0	*Must match the proposal total.*

Tab

Harman (203)

Arkansas Soybean Promotion Board – 2024-2025 Proposal

Title: University of Arkansas System Division of Agriculture Feed Kits

Lead Investigators: Allison Harman

Co-Investigators: Dr. Mark Russell

Status (i.e., New, Year 2 of 3, Year 2 of 2, etc.): New

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Education

Stated Goal:
To provide each of the 75 Arkansas county Extension offices with a UADA Feed Kit as an educational resource and training tool for youth and adult animal science programs. Arkansas agriculture is more than a $20 billion industry producing significant amounts of U.S. livestock and crop production. The goal of this resource is to increase the quality of educational efforts by UADA county agents at no expense to the county budget. This project was previously completed in 2015 but was not accessible to all counties due to cost and limited scale. Feedback from county agents indicates that the counties that still have access to the kits are missing feed or are missing answer keys. Use of an educational feed kit will increase awareness of feeding options for livestock, focus on Arkansas grown feed grains, and emphasize the importance of our agricultural industries in Arkansas.

Specific Objectives:
- Provide each Arkansas county with a resource for youth and adult education.
- Source as much feed as possible from Arkansas farms and businesses.
- Increase awareness of the different commodities used as livestock feeds.
- Increase a county's ability to train 4-H Animal Science contest teams.

Methods:
Each kit will contain 3 or 4-ounce samples of 36 feedstuffs commonly utilized in livestock rations. These feeds will be sourced as locally as possible with emphasis on utilizing Arkansas farms and businesses. Each county will be provided with a plastic bin to hold the plastic jars containing the feed. Each feed jar will be filled and labeled with a number that corresponds to the name of the feed on an answer key. The answer key will be a two-sided laminated paper with the list of feeds, logos of the supporting organizations, and brief nutritional information about the feed. Each county will receive a complete UADA Feed Kit by December 2024.

Planned Milestones:
1. Formalization of a detailed project management plan: February
2. Sourcing and accumulating feeds: March
3. Order plastic bins and jars: March
4. Assembly of feed kits and creation of answer key: June
5. Distribution of feed kits to each county office: September
6. Have all UADA Feed Kits to each county office: December

Value to Soybean Industry:
Counties with the previous UADA Feed Kits have emphasized the broad array of educational programs utilizing this resource. The 4-H Livestock Skill-a-thon and Hippology contests have feed identification portions of the contest. Training of these skills is improved by access to tangible feedstuffs. Soybeans are often used in livestock rations in a variety of forms. Producer groups can be educated on the value of adding commodity feeds to supplement livestock rations at reduced costs while being informed about the variety of options and physical characteristics of those feeds. County agents have also indicated the popularity of including livestock feeds as an educational display at county fairs. Arkansas Agriculture consistently ranks in the top one-third of the nation for agricultural cash farm receipts. In 2023, agricultural cash receipts from animals and animal products in Arkansas ranked 10th nationally. Additionally, Arkansas ranked 10th nationally for soybean production in 2022. Given the significant contribution of agriculture to the Arkansas economy and the platform for county agents to educate within their own community, this resource will start conversations and raise awareness on the broad scope of Arkansas agriculture.

Budget Justifications/Explanation of Travel and Direct Costs:
Coordination will be provided by the University of Arkansas System Division of Agriculture Cooperative Extension Service Animal Science team. Estimated cost for the project totals in the amount of $7,500. Program coordinators are requesting $2,500 from the Arkansas Soybean Promotion Board and seeking additional contributions from other commodity and industry groups to fund the total. The greatest expenses for this project are the plastic jars for each feed sample and the bins to contain the kits. Utilizing county agent relationships, we plan to secure donation of most of the feedstuffs included in the kits and source as much of it from Arkansas farms and co-ops as possible.

University of Arkansas System Division of Agriculture
Promotion Board Budget

Harman, Allison *UADA Feed Kits*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	New
Lead Investigator	Harman, Allison	**Co-PI #1**	Russell, Mark
Co-PI #2		**Co-PI #3**	
Department	ANSC Animal Sciences		
Commodity Board	Soybean Promotion Board		
Project Title	UADA Feed Kits		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

	Harman, Allison	Russell, Mark			Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI	CES	CES					

Fulltime Personnel

Position Title	Name *(if position is filled)*	% Time	Salaries				Total	AES	CES
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Subtotal: Salaries	$0	$0	$0	$0	$0	$0	$0

Graduate Student

Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.

Name *(if position is filled)*	% Time	Wages				Total	AES Portion	CES Portion
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
	Tuition					$0	$0	$0
	Subtotal: Graduate Student	$0	$0	$0	$0	$0	$0	$0

Hourly

	Wages				Total	AES Portion	CES Portion
Hourly-Personnel					$0	$0	$0
Hourly-Students					$0	$0	$0
Subtotal: Hourly	$0	$0	$0	$0	$0	$0	$0

Fringe Benefits

Fringe benefits are calculated when salary and wage amounts are entered above.

	Benefits				Total	AES Portion	CES Portion
Fulltime Personnel	$0	$0	$0	$0	$0	$0	$0
Graduate Students	$0	$0	$0	$0	$0	$0	$0
Hourly Personnel	$0	$0	$0	$0	$0	$0	$0
Hourly-Students	$0	$0	$0	$0	$0	$0	$0
Subtotal: Fringe Benefits	$0	$0	$0	$0	$0	$0	$0
Personnel Total	$0	$0	$0	$0	$0	$0	$0

Travel

Justify out-of-state travel in proposal.

	Travel				Total	AES Portion	CES Portion
In-State					$0	$0	$0
Out-of-State					$0	$0	$0
Travel Total	$0	$0	$0	$0	$0	$0	$0

University of Arkansas System Division of Agriculture
Promotion Board Budget

Harman, Allison *UADA Feed Kits*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$2,500				$2,500	$0	$2,500
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$2,500	$0	$0	$0	$2,500	$0	$2,500
	Total for Proposal	$2,500	$0	$0	$0	$2,500	$0	$2,500

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

Ecosystems (Rice Only)		%	Harman, Allison	Russell, Mark			Total
	Grand Prairie	0%	$0	$0	$0	$0	$0
	Mississippi Delta		$0	$0	$0	$0	$0
	White River		$0	$0	$0	$0	$0
	Totals	0%	$0	$0	$0	$0	$0

Must match the proposal total.

Tab

Robinson (207)

Arkansas Soybean Promotion Board – 2024-2025 Proposal

Title: LeadAR 40th Anniversary Celebration
Lead Investigators: Julie Robinson
Status (i.e., New, Year 2 of 3, Year 2 of 2, etc.): 1 of 1
Research Areas: Education

Stated Goal: The year 2024 marks the 40th Anniversary of LeadAR and will be celebrated with the LeadAR 40th Anniversary Banquet to be held at the new Arkansas Museum of Fine Arts in Little Rock on Saturday, April 13, 2024. As LeadAR celebrates four decades of inspiring individuals to excel in their personal and professional lives, we seek sponsorship to support 40th Anniversary activities including the banquet in April.

Specific Objectives:

- Acquaint participants with the goals of the Arkansas Soybean Promotion Board and its efforts.
- Support the continuation of the LeadAR program.

Methods:
The year 2024 marks the 40th Anniversary of LeadAR and will be celebrated with the LeadAR 40th Anniversary Banquet to be held at the new Arkansas Museum of Fine Arts in Little Rock on Saturday, April 13, 2024. The theme, 40 Years of Empowering Leaders: Celebrating the Legacy, Shaping the Future, encapsulates the essence of the 40th anniversary of LeadAR—highlighting the program's rich history of empowering individuals to become effective leaders and change-makers while also looking ahead to the future, envisioning continued growth, and inspiring the next generation of leaders. As we celebrate four decades of inspiring individuals to excel in their personal and professional lives, we seek sponsorship to support 40th Anniversary activities including the banquet in April. By supporting LeadAR, you will be investing in the future of leadership development. Your contribution will be used to facilitate meaningful interactions between present and past participants, mentors, and the wider community, thereby creating a vibrant platform for knowledge exchange and collaborative growth. Sponsorship at the proposed level will include event access, sponsor recognition on all materials, verbal recognition during event, sponsor recognition in 40th Anniversary publication.

Planned Milestones:

1. Creation and dissemination of marketing resources: February - April.
2. Collaboration with news media and community partners to leverage resources: February - April
3. Conduct the LeadAR 40th Anniversary Celebration: April 13, 2024

Value to Soybean Industry:
As the longest serving leadership program in the state, LeadAR is the only leadership development program that has continually focused on bringing attention to agriculture issues across the state from day one. Since LeadAR started in 1984, the program has maintained the goal of recruiting and admitting farmers and rural community leaders. This includes several soybean farmers. Supporting the 40th Anniversary Celebration contributes to the continuation of

the LeadAR program and its goals to bring attention to agriculture and rural community development.

Budget Justifications/Explanation of Travel and Direct Costs:
Coordination will be provided by the University of Arkansas System Division of Agriculture project team, led by Community, Professional, and Economic Development faculty and staff. Monetary support for this project totals in the amount of $40,000. Program coordinators are requesting $5,000 from the Soybean Promotion Board and seeking additional contributions from other commodity and industry groups to fund the total. The greatest expenses for this program are facility rental and food.

University of Arkansas System Division of Agriculture
Promotion Board Budget

Robinson, Julie *LeadAR 40th Anniversary Celebration*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	Year 3 of 3
Lead Investigator	Robinson, Julie	**Co-PI #1**	
Co-PI #2		**Co-PI #3**	
Department	CES Community, Professional, & Economical Development		
Commodity Board	Soybean Promotion Board		
Project Title	LeadAR 40th Anniversary Celebration		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

			Robinson, Julie				Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI			CES						
Fulltime Personnel									
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Subtotal: Salaries	$0	$0	$0	$0	$0	$0	$0
Graduate Student									
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Tuition					$0	$0	$0
		Subtotal: Graduate Student	$0	$0	$0	$0	$0	$0	$0
Hourly									
			Wages				**Total**	**AES Portion**	**CES Portion**
		Hourly-Personnel					$0	$0	$0
		Hourly-Students					$0	$0	$0
		Subtotal: Hourly	$0	$0	$0	$0	$0	$0	$0
Fringe Benefits									
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
		Fulltime Personnel	$0	$0	$0	$0	$0	$0	$0
		Graduate Students	$0	$0	$0	$0	$0	$0	$0
		Hourly Personnel	$0	$0	$0	$0	$0	$0	$0
		Hourly-Students	$0	$0	$0	$0	$0	$0	$0
		Subtotal: Fringe Benefits	$0	$0	$0	$0	$0	$0	$0
		Personnel Total	$0	$0	$0	$0	$0	$0	$0
Travel									
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
		In-State					$0	$0	$0
		Out-of-State					$0	$0	$0
		Travel Total	$0	$0	$0	$0	$0	$0	$0

University of Arkansas System Division of Agriculture
Promotion Board Budget

Robinson, Julie *LeadAR 40th Anniversary Celebration*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$5,000				$5,000	$0	$5,000
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$5,000	$0	$0	$0	$5,000	$0	$5,000
	Total for Proposal	$5,000	$0	$0	$0	$5,000	$0	$5,000

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

		%	Robinson, Julie				Total	
Ecosystems (Rice Only)	Grand Prairie	0%	$0	$0	$0	$0	$0	
	Mississippi Delta		$0	$0	$0	$0	$0	
	White River		$0	$0	$0	$0	$0	
	Totals	0%	$0	$0	$0	$0	$0	***Must match the proposal total.***

Tab

Henry (211)

Arkansas Soybean Promotion Board – 2024-2025 Proposal

Title: The Arkansas Irrigation Yield Contest

Lead Investigators: Chris Henry, Associate Professor, Water Management Engineer, RREC

Status: Year 7

Goal: The University of Arkansas Division of Agriculture has been demonstrating irrigation Water Management Practices on cooperator farms for five years. Experience has shown that when applied effectively water use can be reduced by 24% on average with no yield penalty. Reductions in water use of around 40% have been documented. The adoption rate of Computerized Hole Selection is over 40% indicating that this is now a mainstream practice in Arkansas. However, a significant need still exists to secure the sustainability of irrigated agriculture in Arkansas. It is still unknown and not well documented how much irrigation water use is needed for crops in Arkansas. A critical need is the documentation of the irrigation water use that is possible with a combination of IWM practices and the ingenuity of Arkansas farmers.

Approach: An irrigation yield contest is proposed. No such contest exists that incorporates the competitive nature of maximizing yield with maximizing water use efficiency. Many growers are familiar with the state and National Corn Growers Contest, National Wheat Growers contest and Arkansas's own "Go for the Green" soybean yield contest. The contest would be operated using the existing proposal supporting irrigation water management projects previously and currently proposed to these boards. Current yield contests focus only on yield, where this contest would highlight Arkansas farmer's efforts to improve sustainability and profitability, which are paramount to the future of agriculture.

Planned Milestones: What is proposed is funding directly from each commodity board of $10,000 to fund the first place award the corn irrigation contest. Essentially each commodity board would support the award for its commodity. The boards would provide the award directly to the first place winner $6,000, for second place $3,000 and for third place $1,000. The rules are similar to existing commodity yield contests, with the additional requirement of a propeller flow meter, sealed by the program and that the yield must exceed the county average irrigated yield for the county (to eliminate dryland or severe deficit entries). Contestants will be announced at the annual Arkansas Soil and Water Conservation Conference in Jonesboro, Arkansas in late January 2025.

Value to the Industry: A $10,000 award payable directly to the winner of the contest for the respective commodity is requested to provide an incentive to enter the contest. Support for the contest logistics, advertising, meter loaning, and operation of the contest will be done under the irrigation project.

Tab
Robinson (213)

Arkansas Soybean Promotion Board – 2024-2025 Proposal

Title: Arkansas Future Ag Leaders Tour
Lead Investigators: Julie Robinson
Co-Investigators: Jeremy Ross
Status (i.e., New, Year 2 of 3, Year 2 of 2, etc.): 3 of 3
Research Areas: Education

Stated Goal: A five-day professional development opportunity for undergraduate juniors and seniors enrolled in Colleges of Agriculture or are pursuing agriculture related majors across the state of Arkansas. Agriculture and agriculture related professions are the number one employer in the state. This one-week experience will enhance students' leadership and employability skills, provide first-hand networking opportunities with potential employers, and highlight the vast resources, services, and careers available through Arkansas' agriculture industry. Participants will get to interact with farmers, producers, vendors, and many others that support the agricultural industry in Arkansas. The goal of this tour is to better prepare and inform new graduates. The tour helps participants discover jobs across the state, keeping homegrown talent in-state, and local.

Specific Objectives:
- Increase participant's employability in agricultural careers.
- Acquaint participants with the vast resources, market segments, and services available through Arkansas' number one industry.
- Provide participants with a "bird's eye view" of current employment opportunities in the Arkansas agriculture industry.
- Increase student's options and opportunities by networking with future employers.

Methods:
The third annual Arkansas Future Ag Leaders Tour was hosted in May 2023. Fifteen students from seven universities across the state participated. The tour was successful in connecting students with employers. To continue to provide this same professional development for future agricultural professionals, project coordinators are planning a five-day state-wide tour for undergraduate students who are in their junior and senior year of college. The call for applications will go out to all colleges with agriculture-related academic departments, including Arkansas State University, Arkansas Tech University, Southern Arkansas University, University of Arkansas – Fayetteville, University of Arkansas – Little Rock, University of Arkansas – Monticello, and University of Arkansas – Pine Bluff. The tour will begin at the Arkansas 4-H Center in Little Rock, on Monday, May 13, 2024. Participants will engage in leadership and team building activities to get to know each other and the coordinators. Participants will also participate in professional development activities related to networking, key tips for snagging the job of their dreams, and career advancement strategies. Each day, participants will travel across the state to pre-arranged tour sites to visit facilities and network with professionals. This will allow students to experience first-hand the diversity of opportunities within Arkansas' agriculture industry. Growers, producers, processors, manufacturers, educators, and research facilities will host students across Arkansas.

Planned Milestones:

1. Formalization of a detailed project management and evaluation plan: February
2. Creation and dissemination of marketing resources: February.
3. Applications open: March
4. Coordination of the tour, scheduled for May 13 – 17, including arrangement and confirmation of tour stops including North East Arkansas, North West Arkansas, South East Arkansas, Southwest Arkansas, and Central Arkansas.
5. Communication with participants leading up to the tour: April
6. Conduct the Arkansas Future Ag Leaders Tour: May 13 – 17
7. Collaboration with news media and community partners to leverage resources. Management and utilization of program evaluation data to improve participation experience and outcomes.

Value to Soybean Industry:
The Arkansas Future Ag Leaders Tour helps create a more prepared and informed workforce that better understands the needs and dynamics of the farmers and producers that they will serve in their agricultural related careers across the state. This professional development program addresses some job readiness skills that have been identified as deficient by employers. Other states, such as Georgia and South Carolina, offer similar opportunities for undergraduates for a significant cost. By providing this opportunity for free, many students who would not be able to otherwise afford to pay their way can participate, in addition to missing a week of work in order participate. The greatest value to the soybean industry is that this provides an opportunity to inform and educate future agriculture industry professionals and leaders about challenges facing farmers and producers. In addition, touring across the state makes students aware of what jobs are available in the state and in local communities all across Arkansas.

Budget Justifications/Explanation of Travel and Direct Costs:
Coordination will be provided by the University of Arkansas System Division of Agriculture project team, led by Community, Professional, and Economic Development faculty and staff. Monetary support for this project totals in the amount of $20,000. Program coordinators are requesting $5,000 from the Soybean Promotion Board and seeking additional contributions from other commodity and industry groups to fund the total. The greatest expenses for this program are lodging, meals, and bus rental. Funds will support meals for participants and guest speakers, vehicle usage and mileage, lodging, and materials and supplies. Program coordinators will utilize a coach bus to transport participants across the state. While several meals are usually donated by some of the companies visited, not all meals are covered and there are still mileage and fuel expenses, lodging, and supplies that need to be budgeted.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Robinson, Julie *Arkansas Future Ag Leaders Tour*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	Year 3 of 3
Lead Investigator	Robinson, Julie	**Co-PI #1**	Ross, Jeremy
Co-PI #2		**Co-PI #3**	
Department	CES Community, Professional, & Economical Development		
Commodity Board	Soybean Promotion Board		
Project Title	Arkansas Future Ag Leaders Tour		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

			Robinson, Julie	Ross, Jeremy			Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI			CES	CES					
Fulltime Personnel									
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Subtotal: Salaries	$0	$0	$0	$0	$0	$0	$0
Graduate Student									
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Tuition					$0	$0	$0
		Subtotal: Graduate Student	$0	$0	$0	$0	$0	$0	$0
Hourly									
			Wages				**Total**	**AES Portion**	**CES Portion**
		Hourly-Personnel					$0	$0	$0
		Hourly-Students					$0	$0	$0
		Subtotal: Hourly	$0	$0	$0	$0	$0	$0	$0
Fringe Benefits									
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
		Fulltime Personnel	$0	$0	$0	$0	$0	$0	$0
		Graduate Students	$0	$0	$0	$0	$0	$0	$0
		Hourly Personnel	$0	$0	$0	$0	$0	$0	$0
		Hourly-Students	$0	$0	$0	$0	$0	$0	$0
		Subtotal: Fringe Benefits	$0	$0	$0	$0	$0	$0	$0
		Personnel Total	$0	$0	$0	$0	$0	$0	$0
Travel									
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
		In-State	$5,000				$5,000	$0	$5,000
		Out-of-State					$0	$0	$0
		Travel Total	$5,000	$0	$0	$0	$5,000	$0	$5,000

University of Arkansas System Division of Agriculture
Promotion Board Budget

Robinson, Julie *Arkansas Future Ag Leaders Tour*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies					$0	$0	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$0	$0	$0	$0	$0	$0	$0
	Total for Proposal	$5,000	$0	$0	$0	$5,000	$0	$5,000

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

		%	Robinson, Julie	Ross, Jeremy			Total	
Ecosystems (Rice Only)	Grand Prairie	0%	$0	$0	$0	$0	$0	
	Mississippi Delta		$0	$0	$0	$0	$0	
	White River		$0	$0	$0	$0	$0	
	Totals	0%	$0	$0	$0	$0	$0	*Must match the proposal total.*

Tab

Robinson (217)

Arkansas Soybean Promotion Board – 2024-2025 Proposal

Title: Soybean Science Challenge (SSC)
Lead Investigators: Julie Robinson
Co-Investigators: Jeremy Ross
Status: 1 of 3
Research Areas: Education

Stated Goal: To engage Arkansas junior high and high school science students and teachers in "real-world" Arkansas specific soybean science education through original curriculum and a continuum of educational methods that include: classroom instruction, lab instruction, teacher workshops, teacher and student mentoring, online and virtual live-streaming education; personal mentoring, student-led research and award recognition, and partnerships with state and national educators, agencies and the popular media.

Specific Objectives:
1. Develop and deliver original educational resources/curriculum to Arkansas junior high and high school students.
2. Increase awareness and knowledge of the value of soybeans to the Arkansas economy and potential careers supporting Agricultural sustainability among Arkansas junior high and high school students.
3. Increase knowledge of the diversity of soy products and uses among Arkansas junior high and high school students.
4. Increase participation in applied research by Arkansas junior high and high school students supporting soybean production.
5. Development of state-wide educational partnerships to leverage ASPB resources.
6. Actively engage students in the "co-creation" of knowledge and reward outstanding student researchers through the Soybean Science Challenge research awards.
7. Reach out to science teachers to consider using Soybean Science Challenge online education resources and curriculum in their classroom.
8. Share resources with teachers to bring Arkansas soybean research and education into classrooms nationally.

Methods: The Soybean Science Challenge is first and foremost a real-life "challenge" to students. Students' progress through a 6-level online interactive course that requires the successful completion of learning challenges and quizzes in order to move to the next level. Pre-course and post-course quizzes quantitatively measure student learning. Only after students successfully complete the online challenge (with a score of 80% or greater on all quizzes and the posttest) can they progress to the research challenge. Student research at this juncture is supported by vetted science-based resources, the Soybean Seed Store, and individual consultations with science teachers and students to provide personalized mentoring support. UA Division of Agriculture scientists have been instrumental in delivering customized and age-appropriate instruction and mentoring to Arkansas student scientists. This year's proposal includes adding more lessons in a wider range of topics and working with teachers across the state to implement more workshops. Teachers will also be encouraged to utilize local farmers as guest speakers, and/or encourage farm visits (either virtually or, when possible, face to face) to see first-hand the production process. The Grow Your Own Protein project will continue to be marketed to schools and community gardens, and managed in partnership with the Natural Soybean and Grain Alliance to educate Arkansas students and communities about the value of soy as a food product. The PI (Robinson) will share classroom discussion resources with County Extension Agents and producers, utilizing web sites (https://uaex.edu/soywhatsup and www.themiraclebean.com). These new educational products will be marketed to state-wide (and nation-wide) teachers utilizing Constant Contact electronic newsletters, the *soywhatsup* and *themiraclebean* websites, the ARSTEM and SCIENCE listserv, the Arkansas Science Teachers Association, regional educational cooperatives, through the AG in the Classroom Conference and the National Science Teachers Association Conference, and through various school workshops in partnership with STEM Education Centers and Ed Co-ops. A key success strategy for the SSC has been to produce current and relevant content annually for students and teachers, while reviewing and leveraging state and national resources as well. The currency of content allows students to best connect with local farmers and the importance of Arkansas agriculture to their community and to their state.

The PI (Robinson) will provide leadership for this project, program planning, alignment with Next Generation Science standards, and production of educational and marketing materials. The program coordinator and student educational technician will manage the day-to-day work with teachers, students, and schools. The resources invested by the ASPB in the SSC are significantly leveraged by UA CES faculty support. The program budget includes funding for: a part-time educational coordinator; student hourly support for video & digital media production, online course management, data management; IT and Communications department direct costs associated with the planning, production and management of digital products; supplies and expenses for educational outreach and staffed exhibits; co-sponsorship of the Arkansas ISEF affiliated science fairs; travel to schools and science fairs, and expenses for teacher and student research awards. The Soybean Science Challenge (SSC) utilizes a diverse range of educational methods, supported by the production of original and re-purposed educational products, providing a range of learning opportunities for not only Arkansas junior high and high-school science students and their teachers, but students and teachers across the nation as well. This project supports Arkansas STEM education goals, is aligned with the Next Generation Science Standards (NGSS) and engages junior high and high school students in active learning and the co-creation of knowledge through support of applied student research, and soybean-based classroom lessons. The SSC online curriculum is peer-reviewed and updated annually. The online teacher courses and resources have been approved by the Arkansas Department of Education for professional in-service credit which is renewed annually.

Planned Milestones:

1. Formalization of a detailed project management and evaluation plan: April-May.
2. Creation and dissemination of new educational resources for students and teachers: June-November.
3. Direct communication, mentoring support, & instruction for Arkansas junior high and high school science students.
4. Coordination of the 2025 Regional Science & Engineering Fair Sponsorships/Partnerships: Management responsibilities includes creation and approval of agreements with all fairs, recruitment and support for judges, preparation for and presentation of student awards,

development of press packets for state-wide news releases and posting on soywhatsup, the Miraclebean.com and social media sites December 2024-May 2025. State-wide Science & Engineering Fair partners locations include: NWARSEF (UAF/Fayetteville); NEARSEF (ASU/Jonesboro); CARSEF (UALR/Little Rock); SEARSEF (UAM-Monticello); SWARSEF (SAU/Magnolia); OMRSEF (Hot Springs), the West Central Arkansas Science Fair (ASMSA-Hot Springs), the Arkansas State Science Fair (UCA/Conway), and the FFA State AgriScience Fair (keep?).

5. Continue to work with UA-Pine Bluff to sponsor a Soybean Science Challenge Award at their local fair.
6. Support and present at the Arkansas Science Teachers Association Convention: TBA
7. Ongoing collaboration with news media and community partners to leverage resources. Management and utilization of program evaluation data to improve products and outcomes.

Value to Soybean Industry: The Soybean Science Challenge makes agricultural sustainability relevant and meaningful for Arkansas junior high and high-school students. The success of this project speaks to a significant void that has existed for engaging, timely, and relatable curriculum and education for students that asks them to contribute to the discussion and to actively participate in scholarship that has real meaning. The greatest value to the soybean industry is that we are now "at the table" as the attitudes of our youth are being shaped. Students from across our state and nation are being challenged to understand the complexity of the evolving science undergirding agricultural production, and to critically think about issues regarding food, fuel, feed, research, and agricultural sustainability that will directly impact their futures. Teachers from across the state and nation can access our website and use our free educational resources. We now have the opportunity to show teachers and students nationwide the value and importance of Arkansas agriculture and soybean production.

Budget Justifications/Explanation of Travel and Direct Costs:
The budget for SSC has not changed much over the years, as we have streamlined the project as much as possible. With the cancellation of the Arkansas Curriculum Conference, the SSC staff plan to travel to regional coops and invited presentations to share newly developed curriculum in-state. In the past, the United Soybean Board and Communications Group have provided soybean-related promotion items. However, USB and the Communications Group have limited quantities reserved for trade shows, events, and other meetings approved by the board each year. This leaves the USB and the Communications Group with very little extra materials to share with the Soybean Science Challenge for students and teachers, and we have determined the items to be a big recognition factor for our program and worth the cost. Even with the determined impact of supplies for program recognition, requested supply amounts have decreased while still providing award bags and promotional materials at student-related events to teachers and students alike, and teacher related events such as workshops and conventions. Personnel costs have increased as a result of the planned retirement of the current coordinator in 2024 and need to hire and train a new coordinator, increasing the personnel budget compared to previous years. Having the two coordinators concurrently employed will allow the new coordinator to shadow and learn from the current coordinator, In an attempt to balance costs, supplies, publications, and travel expenses have been decreased.

University of Arkansas System Division of Agriculture
Promotion Board Budget

Robinson, Julie *Soybean Science Challenge*

Version: 6.0 (11/01/2023)

Year	2024/2025	**Project Year**	New
Lead Investigator	Robinson, Julie	**Co-PI #1**	Ross, Jeremy
Co-PI #2		**Co-PI #3**	
Department	CES Community, Professional, & Economical Development		
Commodity Board	Soybean Promotion Board		
Project Title	Soybean Science Challenge		

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

			Robinson, Julie	Ross, Jeremy			Total Board Funding Requested	AES Portion	CES Portion
		Select "AES" or "CES" for each PI	CES	CES					
Fulltime Personnel									
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
Soybean Science Cha	Keith Harris	50%	$25,000				$25,000	$0	$25,000
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Subtotal: Salaries	$25,000	$0	$0	$0	$25,000	$0	$25,000
Graduate Student									
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Tuition					$0	$0	$0
		Subtotal: Graduate Student	$0	$0	$0	$0	$0	$0	$0
Hourly									
			Wages				**Total**	**AES Portion**	**CES Portion**
		Hourly-Personnel	$15,000				$15,000	$0	$15,000
		Hourly-Students					$0	$0	$0
		Subtotal: Hourly	$15,000	$0	$0	$0	$15,000	$0	$15,000
Fringe Benefits									
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
		Fulltime Personnel	$7,900	$0	$0	$0	$7,900	$0	$7,900
		Graduate Students	$0	$0	$0	$0	$0	$0	$0
		Hourly Personnel	$1,185	$0	$0	$0	$1,185	$0	$1,185
		Hourly-Students	$0	$0	$0	$0	$0	$0	$0
		Subtotal: Fringe Benefits	$9,085	$0	$0	$0	$9,085	$0	$9,085
		Personnel Total	$49,085	$0	$0	$0	$49,085	$0	$49,085
Travel									
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
		In-State	$5,000				$5,000	$0	$5,000
		Out-of-State					$0	$0	$0
		Travel Total	$5,000	$0	$0	$0	$5,000	$0	$5,000

University of Arkansas System Division of Agriculture
Promotion Board Budget

Robinson, Julie *Soybean Science Challenge*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$24,000				$24,000	$0	$24,000
	Fertilizer/Chemicals					$0	$0	$0
	Publication	$500				$500	$0	$500
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Jonesboro	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$24,500	$0	$0	$0	$24,500	$0	$24,500
	Total for Proposal	$78,585	$0	$0	$0	$78,585	$0	$78,585

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2022)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	31.60%	7.90%	4.20%	0.70%
CES	31.60%	7.90%	4.20%	0.70%

Complete the following section ONLY if the project will be considered for an Ecosystem.

		%	Robinson, Julie	Ross, Jeremy			Total	
Ecosystems (Rice Only)	Grand Prairie	0%	$0	$0	$0	$0	$0	
	Mississippi Delta		$0	$0	$0	$0	$0	
	White River		$0	$0	$0	$0	$0	
	Totals	0%	$0	$0	$0	$0	$0	***Must match the proposal total.***

ATTACHMENT 4

Northeast Rice Research & Extension Center Naming Proposal

A Presentation to the Arkansas Soybean Promotion Board

Thursday, March 7, 2024

UofA DIVISION OF AGRICULTURE
RESEARCH & EXTENSION
University of Arkansas System

ARKANSAS RICE CHECK-OFF

ARKANSAS SOYBEAN PROMOTION BOARD

Arkansas Soybean Promotion Board

Board Members

Name	Location	Term
Joe Thrash	Houston	2023
John Freeman	Dumas	2023
Josh Cureton	Cash	2023
West Higginbothom	Marianna	2024
Douglas Hartz	Stuttgart	2024
Rusty Smith	Des Arc	2024
Shannon Davis	Bono	2024
Donald Moreton, Jr.	Des Arc	2025
Brad Doyle	Weiner	2025

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The NERREC Team

@NEArkRice

ARKANSAS RICE CHECK-OFF

UofA DIVISION OF AGRICULTURE RESEARCH & EXTENSION University of Arkansas System

Scheduled Completion Date: July 24, 2024

Per Nabholz Construction

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ARKANSAS SOYBEAN PROMOTION BOARD

NERREC Research

Current Research Activities at the NERREC
Rice, Soybean, Corn and Sorghum

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ARKANSAS SOYBEAN PROMOTION BOARD

Rice Research/Demonstration

- Dr. Hardke's ARPT and ARVAT rice trials
- Dr. Sha's Advanced rice breeding lines
- Dr. De Guzman's advanced rice breeding lines
- USDA-ARS research on reducing water use and GHG emissions from rice production
- Dr. Chris Henry's field-level tailwater recirculation system

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Soybean Research/Demonstration

- John Carlin - Soybean variety testing trials
- John Carlin - Soybean flood tolerance testing trials
- Dr. Trent Roberts – Soybean potassium(K) deficiency research
- Dr. Ed Brown (ASU) – Soybean flood tolerance research
- Drs. Green (ASU) and Roberts (UofA) – Long-term row rice/soybean rotation with five cover crop variations

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Corn and Sorghum Research/Demonstration

- John Carlin – Corn variety testing trials
- John Carlin – Sorghum variety testing trials
- Dr. Trent Roberts – Corn potassium (K) deficiency research

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EDUCATION & OUTREACH

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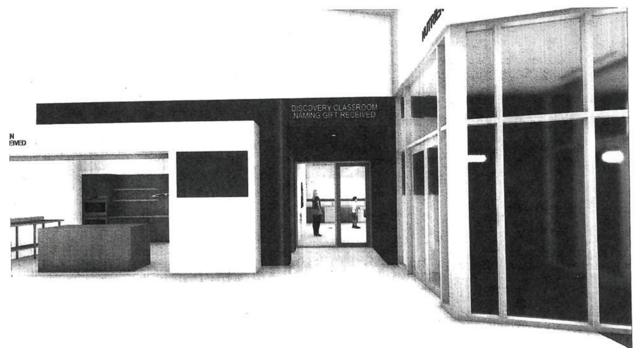
ARKANSAS RICE CHECK-OFF

ARKANSAS SOYBEAN PROMOTION BOARD

Rice Discovery Classroom & Teaching Kitchen



ARKANSAS SOYBEAN PROMOTION BOARD

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Rice Discovery Classroom

ARKANSAS SOYBEAN PROMOTION BOARD

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Vision to Reality

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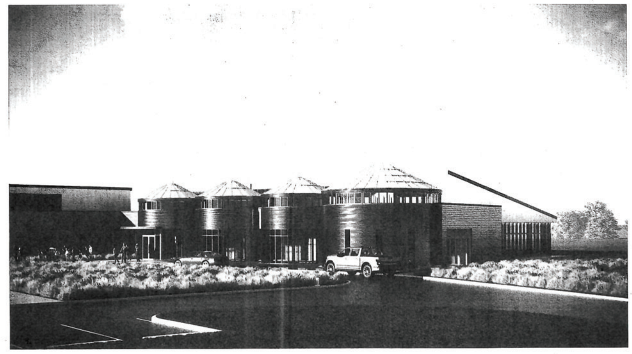
ARKANSAS RICE CHECK-OFF

ARKANSAS SOYBEAN PROMOTION BOARD



ARKANSAS SOYBEAN PROMOTION BOARD
ARKANSAS RICE CHECK-OFF
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ARKANSAS SOYBEAN PROMOTION BOARD
ARKANSAS RICE CHECK-OFF
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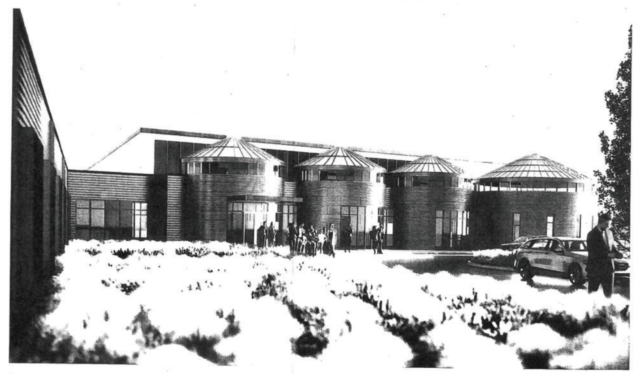

ARKANSAS SOYBEAN PROMOTION BOARD
ARKANSAS RICE CHECK-OFF
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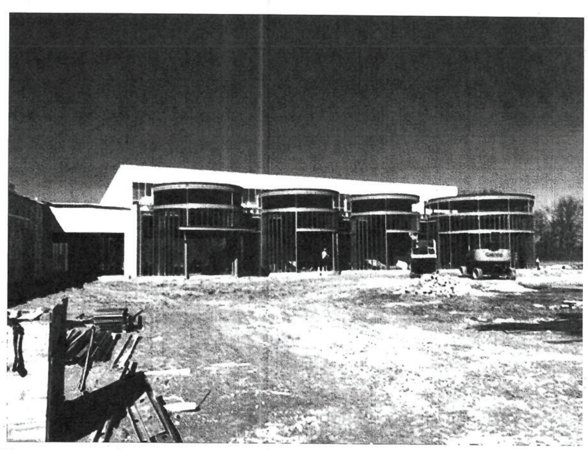

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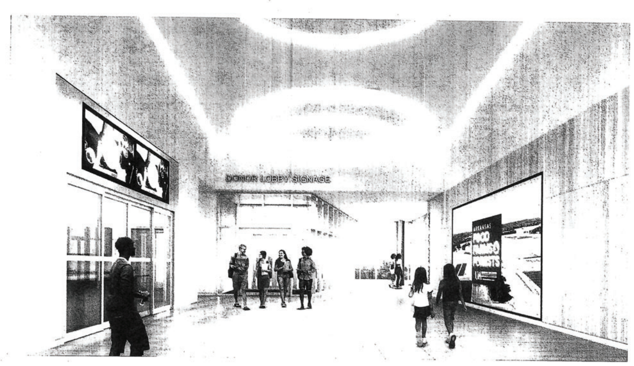

ARKANSAS SOYBEAN PROMOTION BOARD
ARKANSAS RICE CHECK-OFF
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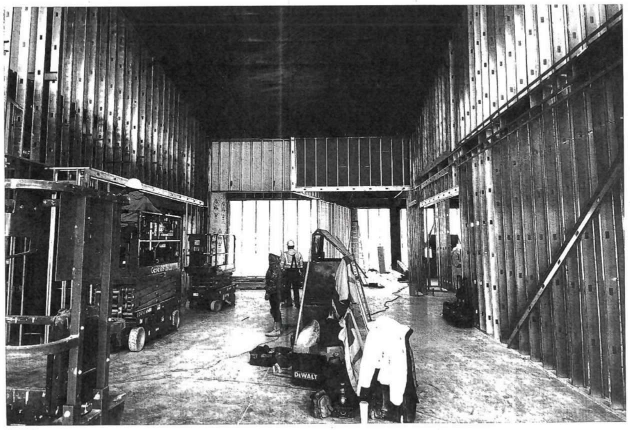
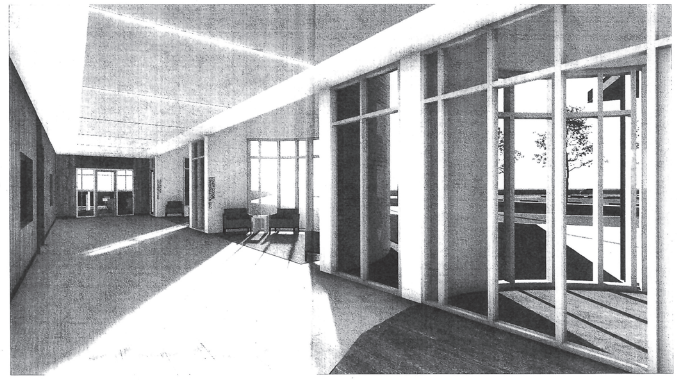
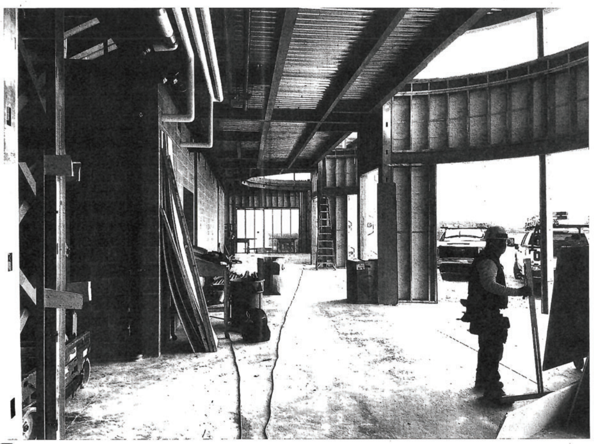


ARKANSAS SOYBEAN PROMOTION BOARD
ARKANSAS RICE CHECK-OFF
DIVISION OF AGRICULTURE RESEARCH & EXTENSION University of Arkansas System



ARKANSAS SOYBEAN PROMOTION BOARD
ARKANSAS RICE CHECK-OFF
DIVISION OF AGRICULTURE RESEARCH & EXTENSION University of Arkansas System



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ARKANSAS RICE CHECK-OFF
DIVISION OF AGRICULTURE RESEARCH & EXTENSION University of Arkansas System

NERREC NAMING OPPORTUNITIES

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ARKANSAS RICE CHECK-OFF
ARKANSAS SOYBEAN PROMOTION BOARD

DIVISION OF AGRICULTURE RESEARCH & EXTENSION University of Arkansas System Northeast Rice Research & Extension Center

ARKANSAS SOYBEAN PROMOTION BOARD

High Visibility Naming Opportunities

1. **Naming the Center ($3,000,000)**
2. ~~Greenway Gift ($2,000,000)~~
   - ~~Greenway Exhibition Hall~~
   - ~~Greenway Shop~~
   - ~~Greenway Building~~
3. ~~Named Silo Boardroom ($500,000)~~
4. **Naming the Research & Extension Wing ($500,000)**
5. ~~Rice Discovery Classroom ($500,000)~~
6. ~~Nutrien Grand Atrium ($400,000)~~
7. ~~Named the Teaching Kitchen ($250,000)~~
8. ~~Named Silo #1 ($250,000)~~
9. **Naming Silo #2 ($250,000)**
10. **Naming the Farm Viewing Portal ($250,000)**

@NEArkRice

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Naming Opportunity #1 Arkansas Soybean Promotion Board Silo

$250,000 Gift

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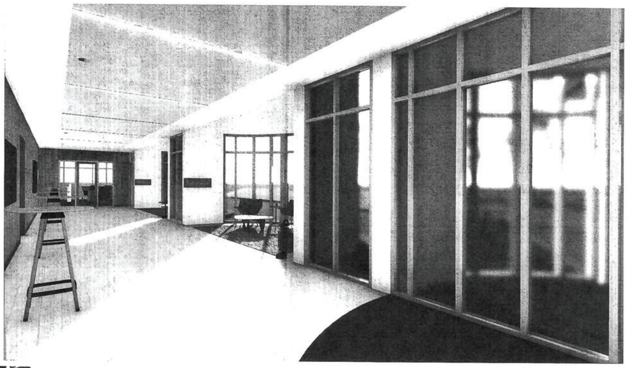
ARKANSAS RICE CHECK-OFF
ARKANSAS SOYBEAN PROMOTION BOARD

Arkansas Soybean Promotion Board Silo



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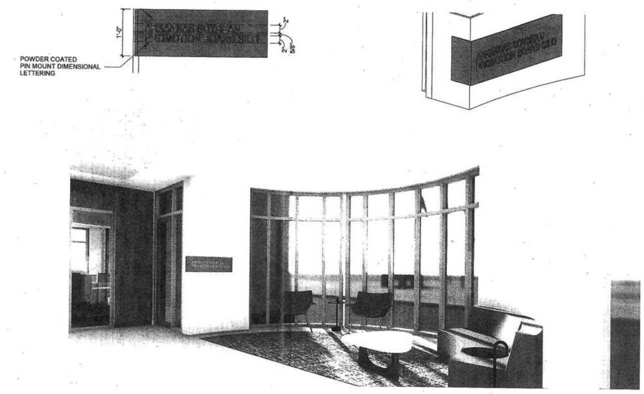
Arkansas Soybean Promotion Board Silo

ARKANSAS SOYBEAN PROMOTION BOARD · ARKANSAS RICE CHECK-OFF · UofA DIVISION OF AGRICULTURE RESEARCH & EXTENSION University of Arkansas System



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Naming Opportunity #2
Arkansas Soybean Promotion Board Farm Viewing Portal

$250,000 Gift

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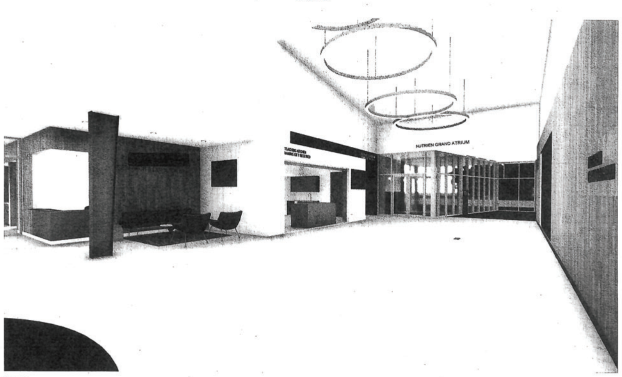
ARKANSAS RICE CHECK-OFF · ARKANSAS SOYBEAN PROMOTION BOARD

Arkansas Soybean Promotion Board Farm Viewing Portal
1 of 3



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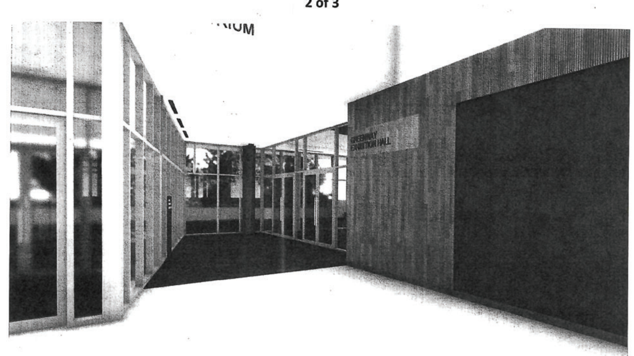
Arkansas Soybean Promotion Board Farm Viewing Portal
2 of 3



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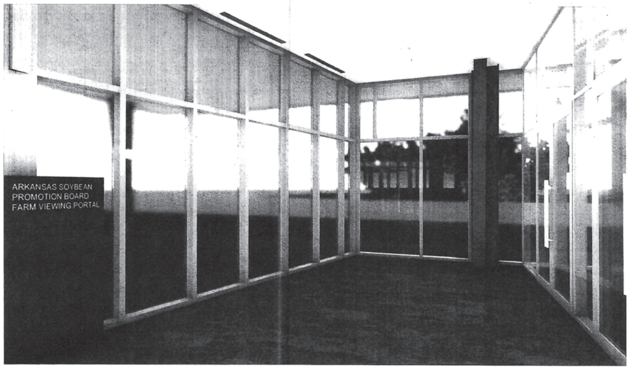
Arkansas Soybean Promotion Board Farm Viewing Portal 3 of 3



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Naming Opportunity #3
Arkansas Soybean Promotion Board Research and Extension Wing

$500,000 Gift Level

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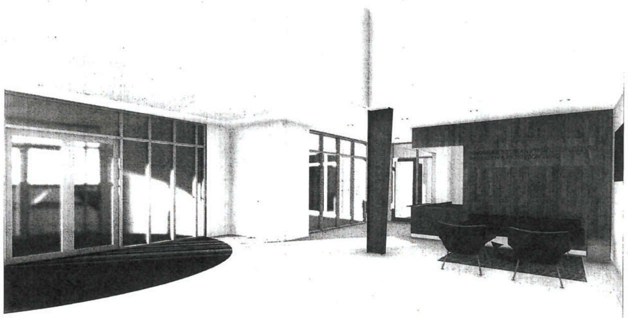
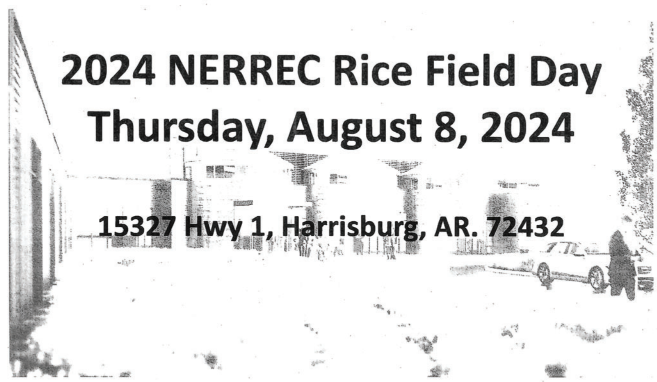
ARKANSAS RICE CHECK-OFF | ARKANSAS SOYBEAN PROMOTION BOARD

Arkansas Soybean Promotion Board Research and Extension Wing



ARKANSAS SOYBEAN PROMOTION BOARD | ARKANSAS RICE CHECK-OFF | UofA DIVISION OF AGRICULTURE RESEARCH & EXTENSION University of Arkansas System



ARKANSAS SOYBEAN PROMOTION BOARD | ARKANSAS RICE CHECK-OFF | UofA DIVISION OF AGRICULTURE RESEARCH & EXTENSION University of Arkansas System

Questions

ARKANSAS SOYBEAN PROMOTION BOARD | ARKANSAS RICE CHECK-OFF | UofA DIVISION OF AGRICULTURE RESEARCH & EXTENSION University of Arkansas System

Clean Fuels
ALLIANCE AMERICA

December 14, 2023

Mr. Scott Bray
Arkansas Department of Agriculture (Arkansas Soybean Promotion Board)
1 Natural Resources Drive
Little Rock, AR 72205

Dear Scott,

Once again, it's proposal season. Thank you for being a generous partner in the past. The mission of Clean Fuels Alliance America (Clean Fuels) is to advance the interests of its members by creating sustainable biodiesel, renewable diesel and sustainable aviation fuel industry growth. Clean Fuels serves as the industry's central coordinating entity and is the single voice for its diverse membership base. Industry growth will be achieved through public affairs, communications, technical and quality assurance programs. We are dedicated to inclusiveness and integrity.

We have included the entire scope of work for each project and the entire project budget as well. This will give your board an idea of the work plan and level of talent we are putting together to move this work forward. Clean Fuels has consistently demonstrated its ability to leverage funding from numerous funders to secure the total funding needed for a project. Therefore, we would welcome any level of financial commitment your organization can make toward the success of this project.

Thank you!

Brad Shimmens
Director of Operations and Membership
Clean Fuels Alliance America

Missouri Headquarters
605 Clark Ave
PO Box 104898
Jefferson City, MO 65110

800.841.5849

Washington, D.C., Office
1331 Pennsylvania Ave, NW
Suite 505
Washington, D.C. 20004

888.246.3437

cleanfuels.org

PROJECT DESCRIPTION 1 of 2

Market Expansion Drive - $20,000

Biodiesel, renewable diesel and sustainable aviation fuel are now a significant part of the U.S. fuel market (6 percent of the national on-road diesel fuel supply in 2022). Additional diesel fuel markets, including rail, shipping, heating, construction and agriculture, are demanding additional clean fuels at an affordable price. Equipment manufacturers are taking a new look at higher blends of biodiesel.

Over many years, Clean Fuels worked with original equipment manufacturers and fleets to build confidence in biodiesel's quality and fuel attributes. To maintain demand and open new markets for the future, Clean Fuels must extend the campaign and build confidence among industries that rely on diesel fuels. Clean Fuels must proactively educate these audiences about the quality, availability and affordability of biodiesel, renewable diesel and sustainable aviation fuel.

Going forward, this project will utilize a combination of advertising, media relations with industry reporters, social media activity and other tactics to promote data on the quality and competitive cost of clean fuels. A key goal will be to develop and amplify third-party testimonials, such as fleet managers, equipment manufacturers and industry experts. The project will also support members' efforts to open new fuel markets by providing brochures and ads targeted to end users. We will continue to reinforce our new brand, which encompasses biodiesel, renewable diesel and sustainable aviation fuel, by strengthening content that will be leveraged across multiple channels. The content strategy will cover multiple audiences including buyers, farmers, makers, members and champions.

How does this project benefit Arkansas soybean farmers?

This project will build confidence among industries that rely on diesel fuels while promoting the technical and sustainability advancements of biodiesel, renewable diesel and sustainable aviation fuel. Clean Fuels Alliance America continues to be the central entity providing support for industry programs and information nationwide. Arkansas soybean producers experience substantial benefits from the growing acceptance and utilization of clean fuels. As the demand for clean energy sources rises, soybean producers find new and expanded markets for their crops, enhancing economic opportunities.

Growth of biodiesel and renewable diesel use has been key to profitability at the soybean producer level as well as throughout the value chain. As a soybean producing state, Arkansas has benefited directly from increased production and use of biodiesel and renewable diesel. MARC-IV Consulting (M4) assisted Clean Fuels in analyzing the impact these fuels have on the soybean value chain. The Enterprise Analysis uncovered the share of the value of United States (U.S.) soybean production that can be attributed to biodiesel and renewable diesel over time. It utilized data from the USDA for crop production and prices and the United Soybean Board on the breakdown of meal and oil consumption by end use. It took a top-down approach to allocate the value of the crop production to soybean oil sold into biodiesel and renewable diesel production. Of the nearly $57 billion in total value in 2021, $16 billion was generated from soybean meal production, $13 billion was generated from production of soybean oil and remaining amounts for the export and other markets. Since approximately 35% of the soybean oil produced in the U.S. was used for biofuels in 2021, biodiesel and renewable diesel accounted for about $4.6 billion or 8.1% of the total production value generated by U.S. soybean farmers.

Stated differently, in 2021 biodiesel and renewable diesel accounted for $1.06 of the value of a bushel of soybeans. In 2021, Arkansas produced approximately 154 million bushels (163.8 million bushels in 2022). Based on the Enterprise Analysis, biodiesel and renewable diesel accounted for $162.7 million in value for Arkansas producers. At the farm level, biodiesel and renewable diesel accounted for almost $27,030 of value for a grower with 500 acres of soybeans. In addition, the U.S. biodiesel and renewable diesel industry now supports more than 75,000 jobs nationwide. In Arkansas, this translates to $795 million in economic activity, almost 1,920 jobs supported, and more than $96 million in wages.

Looking forward, this project, and others being proposed by Clean Fuels, will help ensure year-over-year growth needed to meet the Clean Fuels vision to use six billion gallons by 2030 with significant increases in the use of soybean oil as the industry's primary feedstock for production biodiesel, renewable diesel, sustainable aviation fuel and Bioheat® fuel. The planned outcome of the overall Clean Fuels effort will be to increase 2024 soybean oil use in these markets by more than 800 million pounds from 2023 usage, as benchmarked by federal data sources such as USDA and DOE's Energy Information Administration.

Project Budget – Market Expansion Drive – $20,000

Clean Fuels Time		
Program Staff	2,100 hrs @ $150/hr	$315,000
Support Staff	125 hrs @ $110/hr	$13,750
Advertising		
Nation Branding and education campaign; Brownfield or similar fueling conversations; QSSB publications		$1,364,300
Sponsorships		$10,000
Subcontractors Time and Expense		
Fleishman Hillard or similar – website design and ongoing management		$130,000

Fleishman Hillard or similar – ad development and placement		$137,000
High 5		$65,040
Coordinating meetings		$9,500
Printing		$36,410
Supplies/shipping		$8,000
Travel-Clean Fuels Staff or Ambassador/Speaker	14 trips @ $1,500/trip	$21,000
Total		$2,110,000

PROJECT DESCRIPTION 2 of 2

OEMs Maintain and Secure Approvals for B20+ - $20,000

For the last 30 years, the industry has grown to over 3 billion gallons largely in the on- and off-road transportation fuel market segment. The on-road segment, led by the national truck stop organizations, have been blending biodiesel and renewable diesel for several years to maximize their profitability in the fuel and Renewable Identification Number (RIN) markets. Emerging and growing market segments such as railroad, marine and electrical generation that are hard to electrify are bringing in new engine and equipment manufacturers that need to be brought up to speed on the research and data that exists for both biodiesel and renewable diesel performance and are determining what additional research they need to support biodiesel and renewable diesel blends.

Clean Fuels Alliance America worked diligently over the years to increase the number of vehicle and engine manufacturers that support blends up to B20, realizing that most diesel fuel is consumed by the heavy-duty vehicles. Those same original equipment manufacturers (OEMs) are now under increasing pressure to support decarbonization efforts through development of battery electric, fuel cell and hydrogen propulsion systems while at the same time facing a significant tightening of diesel engine emission regulations. Recently, the Environmental Protection Agency (EPA), as well as regulatory authorities within the California Air Resources Board (CARB), have proposed lowering NOx emission requirements by 90 percent, doubling the full useful life compression-ignition engines that must meet the new emissions standards, as well as including a new light-load duty cycle and new on-board diagnostic requirements. Most OEMs are still unsure what engine and aftertreatment technology they will use in 2027 and beyond to meet the stricter requirements, while some may discontinue diesel engine production due to the stricter diesel emissions requirements and shifting efforts to battery electric, fuel cell and hydrogen technologies.

This past year saw a major shift in the market for low carbon propulsion systems. State legislatures and governors are making moves to strongly encourage electric vehicles and/or set goals for completely fossil free transportation options. The federal government, through the Inflation Reduction Act, is spending billions of dollars to do the same and investing funds in ways to decarbonize the hard to electrify transportation markets that use traditional petroleum distillate fuels such as marine, rail and aviation. A growing number of major private companies are setting carbon reduction and ESG goals to reduce their carbon footprint by 40 to 75 percent by 2030 and net zero carbon by 2050. These moves have had a corresponding and dramatic effect on the low carbon liquid fuel market. The 15 percent carbon reduction provided by 20 percent low carbon liquid fuels like biodiesel or renewable diesel is simply not enough. To achieve the carbon reduction goals of 40 percent, 75 percent or net-zero, low carbon liquid fuel must be used in 50 or 100 percent blend levels.

To this point, in November of 2022, the Truck and Engine Manufacturers Association (EMA) announced a new low carbon fuels concept effort. The stated goal was to generate significant, immediate CO2 reductions from diesel-fueled engines through low carbon fuels through organizing a coalition to work toward wide-spread adoption of a low-carbon, drop-in fuel for diesel applications across EMA member company product lines. They proposed drop-in, low-carbon fuel as a blend of biodiesel and renewable diesel according to market availability and economic viability, topped with petroleum-based diesel stating, renewable diesel content will be supply-limited and cost sensitive, and biodiesel content will be limited by incompatibility with engine and aftertreatment technology. The stated goal is to achieve 7-10 percent low carbon liquid diesel fuels in the short term, 25-30 percent in the midterm and 100 percent in the long-term. EMA plans to accomplish these goals through improved fuel quality controls; revising ASTM biodiesel standards for phosphorous, oxidation stability, acid number and other metals; as well as renewable diesel and biodiesel industry growth through legislative, regulatory and government agency advocacy efforts.

To capitalize on this unique, historic opportunity, Clean Fuels plans to be a leading force in the coalition proposed by EMA through the development of technical projects and programs that will address the technical needs for 25-30 percent penetration of biodiesel and renewable diesel in the midterm (i.e., 2030-time frame) and 100 percent long-term (i.e., 2050) in all diesel engine applications in all markets. This will be a multi-year effort in partnership with the OEM community and other stakeholders. It will be more challenging when considering the major lowering of emissions regulations, which will require new engine and aftertreatment equipment and control systems that are occurring during this same period. However, over the last 30 years Clean Fuels and its lead contractors have an abundance of experience in the bench testing, lab durability testing and field testing needed for B5 and B20 in diesel engines during the 2007-2010 period when Ultra-Low Sulfur Diesel (ULSD) and the first wave of new diesel engine emissions controls were implemented. Clean Fuels and our contractors will use the knowledge, relationships and skills that were successful with B5 and B20 to work with the OEM community on these higher blends.

Based on the past successful efforts with B5 and B20, we anticipate this project will conduct the bench testing, lab durability testing and field testing, with blends from B21-B100, needed to secure ASTM standards for blends up to B100 in diesel engines and after-treatment. Additionally, we will be working with the industry to develop an on-board vehicle blend level sensor for biodiesel concentration; collaborating with leading OEMs to optimize engine operation for various biodiesel blends; and continuing work with the biodiesel production and technology companies to provide biodiesel that will meet the more stringent standards needed for operation of B100 in the new Ultra Low Emissions Diesel Engines (ULEDEs) currently on the design table by the OEMs. This work will involve traditional on-road engines, as well as increased emphasis on off-road engines and applications which are hard to electrify such as railroads, marine and power generation including on-ground, gas turbines. With an eye toward the future, we also anticipate cooperative efforts on other novel future potential platforms such as the new ducted fuel injection technology currently in progress at Sandia National Laboratories. This work will position the clean fuels diesel fuel industry to be a low-carbon option of choice in 2030 and 2050 which is needed to achieve the 6 billion and 15 billion gallons volume goals the industry has set for 2030 and 2050.

How does this project benefit Arkansas soybean farmers?

There are several changes and advancements that will help spur the growth of the industry and the consumption of larger volumes of soybean oil. These include increasing volumes under the Renewable Fuel Standard (RFS), state and local mandates, along with further tax exemptions and credits. Support from original equipment manufacturers (OEMs) will be critical to support such growth. While most support has been for blends up to B20, other sustainability and carbon reduction goals are driving support for biomass-based diesel fuels up to B50 or B100 levels. However, to publicly acknowledge such support, many OEMs are looking for data to support their new positions. This program works cooperatively with engine manufacturers from all fuel application segments to generate the data needed to support OEM positions and any necessary changes to existing fuel quality specifications. Soybean oil, and Arkansas's soybean farmers, will be the largest benefactors of these efforts as the low carbon liquid fuels industry experiences rapid growth over the next several years.

Growth of biodiesel and renewable diesel use has been key to profitability at the soybean producer level as well as throughout the value chain. As a soybean producing state, Arkansas has benefited directly from increased production and use of biodiesel and renewable diesel. MARC-IV Consulting (M4) assisted Clean Fuels in analyzing the impact these fuels have on the soybean value chain. The Enterprise Analysis uncovered the share of the value of United States (U.S.) soybean production that can be attributed to biodiesel and renewable diesel over time. It utilized data from the USDA for crop production and prices and the United Soybean Board on the breakdown of meal and oil consumption by end use. It took a top-down approach to allocate the value of the crop production to soybean oil sold into biodiesel and renewable diesel production. Of the nearly $57 billion in total value in 2021, $16 billion was generated from soybean meal production, $13 billion was generated from production of soybean oil and remaining amounts for the export and other markets. Since approximately 35% of the soybean oil produced in the U.S. was used for biofuels in 2021, biodiesel and renewable diesel accounted for about $4.6 billion or 8.1% of the total production value generated by U.S. soybean farmers.

Stated differently, in 2021 biodiesel and renewable diesel accounted for $1.06 of the value of a bushel of soybeans. In 2021, Arkansas produced approximately 154 million bushels (163.8 million bushels in 2022). Based on the Enterprise Analysis, biodiesel and renewable diesel accounted for $162.7 million in value for Arkansas producers. At the farm level, biodiesel and renewable diesel accounted for almost $27,030 of value for a grower with 500 acres of soybeans. In addition, the U.S. biodiesel and renewable diesel industry now supports more than 75,000 jobs nationwide. In

Arkansas, this translates to $795 million in economic activity, almost 1,920 jobs supported, and more than $96 million in wages.

Looking forward, this project, and others being proposed by Clean Fuels, will help ensure year-over-year growth needed to meet the Clean Fuels vision to use six billion gallons by 2030 with significant increases in the use of soybean oil as the industry's primary feedstock for production biodiesel, renewable diesel, sustainable aviation fuel and Bioheat® fuel. The planned outcome of the overall Clean Fuels effort will be to increase 2024 soybean oil use in these markets by more than 800 million pounds from 2023 usage, as benchmarked by federal data sources such as USDA and DOE's Energy Information Administration.

Project Budget – OEMs Maintain and Secure Approvals for B20+ – $20,000

Clean Fuels Time		
Program Staff	340 hrs @ $150/hr	$51,000
Support Staff	50 hrs @ $110/hr	$5,500
Subcontractors Time and Expense		
Marc-IV		$117,000
NREL, SWRI, CeCert, outside labs, Universities, Engine Companies, Turbine Companies, Railroad Companies, or Major fleets		$924,000
JenMotion, Randy Jennings or similar		$302,500
Membership Dues		$21,000
Miscellaneous-fuel quality testing		$12,000
Supplies-fuel purchases		$50,000
Conference registrations		$3,000
Travel-Clean Fuels Staff	8 trips @ $1,750/trip	$14,000
Total		$ 1,500,000

Clean Fuels
ALLIANCE AMERICA

UNITED STATES

Good for the *Economy*
Good for the *Environment*

CLEAN FUELS: AMERICA'S ECONOMIC ENGINE

U.S. Economic Impact (2021)

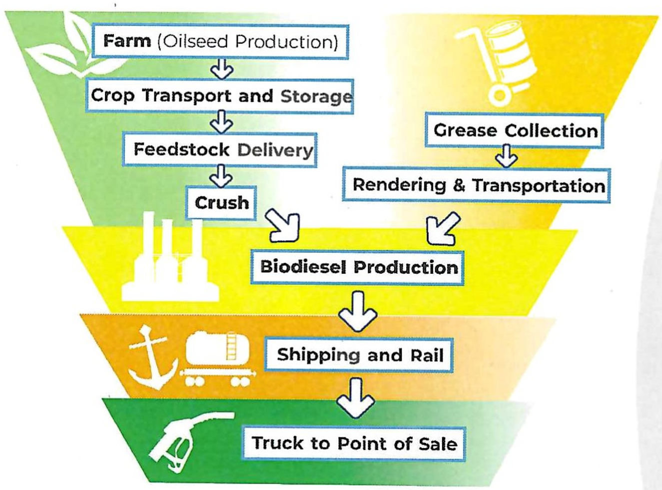
3.1 billion
Gallons

75,200
Jobs

$3.6 billion
Wages Paid

$23.2 billion
Total Economic Impact

The Clean Fuel Value Chain



Current Clean Fuel Production Impact by Sector

Farm Sector
(Oilseed Production)

$7.41 B — 30% of total impact
28,236 jobs
$1.36B wages

Crush Sector
(Oilseed Processing)

$4.97B — 21% of total impact
6,000 jobs
$380M wages

Clean Fuel Production Sector
(Biodiesel and Renewable Diesel)

$9.57B — 41% of total impact
17,120 jobs
$880M wages

PRODUCING MORE CLEAN FUEL ADDS MORE VALUE TO THE U.S. ECONOMY

Increasing homegrown biodiesel and renewable diesel production to meet future demands:

Producing a total of **6 billion** gallons of biodiesel and renewable diesel would support:

187,000 full-time/full-time equivalent jobs
$8.8B wages
$61.6B total economic impact

PLUS the short-term temporary impact ofincreasing supply:

144,500 full-time/full-time equivalent construction jobs
$5.8B wages
$4.3B total economic impact

Sources: LMC International, Economic Impact of Biodiesel onthe US Economy2022. New York September2022.

cleanfuels.org
biodiesel.org
mybioheat.com

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Washington, DC20004
888-246-3437

MO 605 Clark Avenue
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MA 36 Jonspin Road
Suite 235
Wilmington, MA 01887
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Sacramento, CA 95814
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Materials supported by United Soybean Board, soybean farmers and their checkoff.

3/26/2024

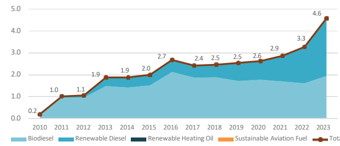
ARKANSAS SOYBEAN BOARD MEETING

3/8/24

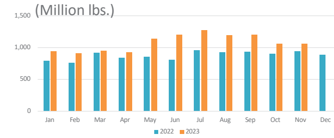
Heather Buechter & Tom Verry
Clean Fuels Alliance America

CLEAN FUEL GROWTH

US Biomass-Based Diesel Consumption
(Billion Gallons)



Soybean Oil Use for BBD
(Million lbs.)



- In 2023
  - U.S. production grew by 1 billion gallons.
  - Soybean oil use for clean fuel averaged 1.08 billion lbs. per month in 2023.
  - Reached 1.2 billion lbs. in recent months.
  - The U.S. became a net importer of fats and oils.
- In 2024
  - U.S. renewable diesel production capacity anticipated to grow 1 billion gallons.

- cleanfuels.org -

3

BIODIESEL, RENEWABLE DIESEL AND SUSTAINABLE AVIATION FUEL

Biodiesel

Typically produced through transesterification, a simple process that reacts a fat or oil with a small amount of alcohol (typically methanol) to produce a diesel-like fuel.

Renewable Diesel

Produced through *hydrotreating*, a process like a traditional refinery operation. This high-heat, high-pressure process produces a fuel that has chemical properties similar to conventional diesel.

Sustainable Aviation Fuel

Produced from a wide variety of raw materials and processes, including sugars, fats, and waste gases.

Primary commercial production utilizes the renewable diesel process.

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FEEDSTOCK OPTIONS FOR BIOMASS-BASED DIESEL

EPA APPROVED PATHWAYS

Distillers Corn Oil

Soybean Oil


Camelina

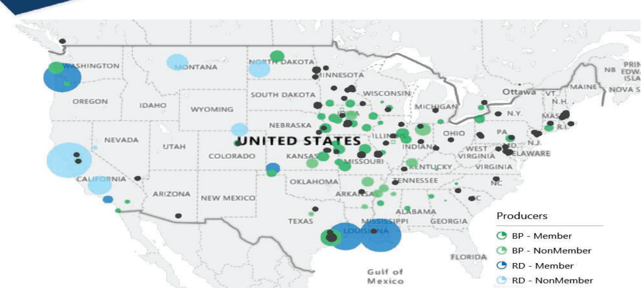
Used Cooking Oil/Yellow Grease

Animal Fats

Canola Oil (biodiesel only)*

** Pathway now approved for Renewable Diesel*

UNITED STATES PRODUCTION



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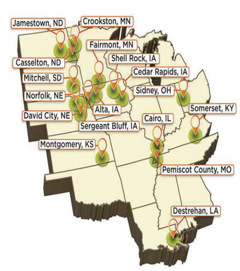
NEW SOYBEAN CRUSH PLANTS



			Annual Crush	Annual Gallons Soyoil	Annual Pounds Soyoil	
ADM	Quincy	IL	15,750,000	24,570,000	186,732,000	
Continental Refining	Somerset	KY	4,987,500	7,780,500	59,131,800	Q4 2022
Shell Rock	Shell Rock	IA	38,500,000	60,060,000	456,456,000	Late 2022
		Total Bushels	59,237,500	92,410,500	702,319,800	
Cargill	Sidney	OH	29,750,000	46,410,000	352,716,000	September 1st
ADM	Spirit Wood	ND	52,500,000	81,900,000	622,440,000	Fall 2023
Purdue	Chesapeake	VA	12,250,000	19,110,000	145,236,000	September 2023
AGP	Sergeant Bluff	IA	17,500,000	27,300,000	207,480,000	September 2023
		Total Bushels	112,000,000	174,720,000	1,327,872,000	
Platimum Crush, LLC	Alta	IA	38,500,000	60,060,000	456,456,000	Q2 2024
MNSP/CGB	Castleton	ND	43,750,000	68,250,000	518,700,000	Late 2024
Bartlett	Montgomery County	KS	38,500,000	60,060,000	456,456,000	Late 2024
Norfolk Crush	Norfolk	NE	38,500,000	60,060,000	456,456,000	Late 2024
Scoular	Goodland	KS	11,000,000	17,160,000	130,416,000	Late 2024
		Total Bushels	170,250,000	265,590,000	2,018,484,000	
Incobrasa	Gilman	IL	42,000,000	65,520,000	497,952,000	2025
SDSP	Mitchell	SD	35,000,000	54,600,000	414,960,000	2025
Bunge/Chevron	Cairo	IL	47,250,000	73,710,000	560,196,000	Fall 2025
Bunge/Chevron	Destrehan	LA	47,250,000	73,710,000	560,196,000	Spring 2025
AGP	David City	NE	50,050,000	78,078,000	593,392,800	Mid 2025
Epitome	Grand Forks	ND	42,000,000	65,520,000	497,952,000	Late 2025
		Total Bushels	263,550,000	411,138,000	3,124,648,800	
Marquis Energy	Hennepin	IL	38,500,000	60,060,000	456,456,000	2026
CHS	Evansville	WI	70,000,000	109,200,000	829,920,000	
		Total Bushels	38,500,000	169,260,000	1,286,376,000	
		All New Capacity	**643,537,500**	**1,113,118,500**	**8,459,700,600**	
Recently Completed	NEW	Expansion				

IMPACT ON ARKANSAS SOYBEAN CROP VALUE

StoneX

Today – Adds 13% to cash soybean price.
- **3/8 – Consolidated Grain & Barge, Sherrill, AR - $11.41 bu.**
- **StoneX (was INTL FC Stone) – Biomass diesel adds $1.50 bu.**

2023 - added $91 per acre in AR or $268,000,000 million additional total value.

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MARKET DRIVERS

NET ZERO CO_2 EMISSIONS 2050

Sustainable Aviation Fuel Grand Challenge

NEW YORK'S CLIMATE LEADERSHIP and COMMUNITY PROTECTION ACT

Amtrak Sets Goal of Net Zero Greenhouse Gas Emissions by 2045

PepsiCo Plans To Be Carbon Neutral By 2040

KEEP PORTLAND WEIRD!

MAERSK

Maersk On Board Journey to Zero Emissions

Stena Bulk

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MARKET DRIVERS - CALIFORNIA DREAMIN!

Low Carbon Fuel Standard

2 Billion Gallons in 2023!

3.4 Billion Gallons 2028? YES!

- **2020 20% of diesel was BD/RD = 800,000,000 gals.**
- **2022 44% of diesel was BD/RD blends = 1.2 billion gals.**
- **2023 60% of diesel was BD/RD blends in first half of year = 2.1 billion gals.**

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BIODIESEL IN MARINE FUEL

- Current law prohibits biomass-based diesel blended into ocean-going vessels from RFS credit.
- Potential legislation to add marine fuel used in ocean-going vessels to off-road transportation fuels that can satisfy RFS obligations.
- "Renewable Fuels in Ocean Going Vessels Act" HR 6681

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MAJOR DIESEL FUEL INDUSTRY CHANGES

- Carbon reduction is now driving the market
- B20 is simply not enough for many policy targets and corporate goals

Industry Is Telling Us:
- B20 minimum in On/Off road Engines, moving toward B30/B50/B100
- B50/B100 in Home Heating Oil
- Marine Fuels Want B50/B100
- Railroads Want Over B20
- Interest in Low Carbon Electrical Generation

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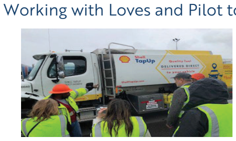
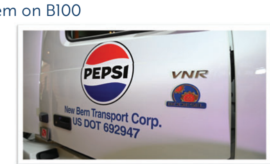
CLEAN FUELS CORPORATE PARTNERS – PEPSICO

pep+ pepsico positive planet + people

OPTIMUS TECHNOLOGIES

- PepsiCo Positive - reduce carbon by 40% by 2030
- RD/BD West Coast
- B100 everywhere else
- Topeka, KS demonstration with Optimus Technologies
- Working with our tech team to establish an ASTM standard for B50 – B100. Pressuring OEMs to approve high blends
- Working with other fleets, Amazon and Walmart to get them on B100
- Working with Loves and Pilot to establish B100 pumps





BIODIESEL GOALS BY RAILROAD

ON "TRACK" TO BE 700 MILLION GAL. BIODIESEL MARKET BY 2034.

Railroad	Goal	Currently
UP	Published 10% by 2025 and 20% by 2030 – currently on track to achieve goals	>6%
CN	Based on currently trend, a 30% target by 2030 is possible	>4.2%
CP	30% target by 2030	>1.4%
NS	20% blend by 2034.	<1%
CSX	No stated goal yet. Testing B20.	<1%
BNSF	No stated goal yet, though will likely align close to UP	?

Move to B20 plus blends contingent on OEM approvals.

2024 CLEAN FUELS PROPOSALS

Market Expansion Drive – $20,000

OEM's Maintain & Secure Approvals for B20+ - $20,000

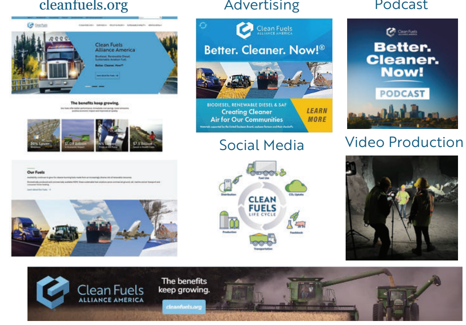
MARKET EXPANSION DRIVE: $20,000 ($2,110,000)

Positions biodiesel, renewable diesel and SAF as the premium low carbon fuel that is available NOW!

- Position BD, RD, SAF as premium low carbon fuels for both the regulatory and voluntary low carbon fuel markets.
- Proactive media campaigns to promote the awareness and support of biodiesel with the public.
- Pushback on:
  - Electric Vehicles
  - Food and Fuel
  - Anti-Combustion

COMMUNICATIONS

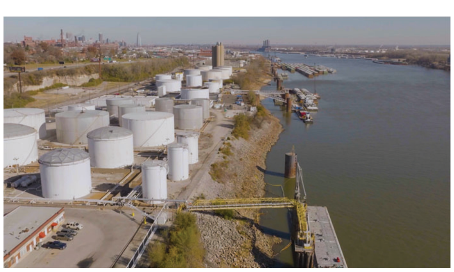
cleanfuels.org | Advertising | Podcast | Social Media | Video Production



Increasing Brand Awareness

- Logo
- Taglines
- Hashtags
- Sponsorships
- Advertising
- Editorials
- Website
- Podcast
- Collaboration with industry communicators

BUILDING CONFIDENCE IN CLEAN FUELS



OEM'S MAINTAIN AND SECURE APPROVALS FOR B20 AND HIGHER BLENDS - $20,000 ($1,500,000)


Provides the technical foundation to support Clean Fuel's "Vison 2020' goals of six billion gallons by 2030.

- Work with major engine manufactures to include B20 and higher blends in the initial testing of the new Ultra-Low Emissions Diesel Engines (ULEDE) that will be required in 2027-2030.
- Efforts with blend level sensors and potential optimization to take advantage of biodiesel emissions
  - Ford/University of Michigan, etc.

New efforts with both marine and railroad applications as corporate governance programs push decarbonization towards blends of B20 and higher."

- Educate OEMs about biodiesel health benefits as measured by the Trinity Study.


QUESTIONS?

Thank You!

Clean Fuels - cleanfuels.org

Email - tverry@cleanfuels.org

Twitter - @FriedRide

Scan for business card

ATTACHMENT 6

To: John Freeman, Arkansas Soybean Promotion Board

Scott Bray, Arkansas Department of Agriculture

From: Spencer Parkinson, Decision Innovation Solutions

Date: February 29, 2024

Re: DIS PROPOSAL: Arkansas Soybean and Soybean Production Consumption and Flow Analysis

Greetings John and Scott:

We are grateful for the opportunity to submit a proposal to handle your economic, policy and spatial research needs. As you will see in our attached proposal, there are several options in fulfilling the requirements of this research.

Given our interaction to date, we consider our proposal and associated optional components a working dialogue and, should it be necessary, look forward to refining our proposal to match you and other stakeholder needs for accurate, engaging research.

Client Interaction Process

The DIS team delivers a combination of skill sets that offer our clients a unique approach to meeting their economic research and analysis needs. Our combination of skillsets and experience offer:

- **Experience, knowledge, and skills** to create and integrate research, analysis, and decision tools with background, in production and/or value-added agriculture and applied economic and statistical theory.
- **Quality** in research and analysis, Value in the end product.
- **Nimbleness** in adapting to client needs with personalized research

In our normal course of business, we follow a five-step client interaction process. These steps are:

1. **Discovery (Overview and Information Gathering):** This phase is primarily confined to determining relevant facts and developing an overview of your project (i.e., availability and cost of required data sets and collaboration needs).
2. **Explore (Establish scope and identify sources):** The overview is used to define the scope and sources of research, including purchased date if necessary.
3. **Evaluate (Research and Analysis):** In this phase we begin the use and/or development of analytical tools to evaluate the research results.
4. **Inform (Report):** Preparation of the final report, including our research methodology, observations regarding relevance to original project goal, and recommendation, if any, regarding potential supplemental research.
5. **Support/Enhancement:** Ongoing assistance with regard to project results. In some cases, additional work is desired that was not part of the initial scope of the project (i.e., after submitting final work, other requirements and/or enhancements may be desired).

Spencer Parkinson
Decision Innovation Solutions

Arkansas Soybean Promotion Board

Arkansas Soybean and Soybean Production Consumption and Flow Analysis

Proposal – February 2024

1 Background

Feed usage by major animal species is one of the most important demand segments for agricultural commodities in the United States. Beginning in 2014, DIS summarized rations and feed usage from independent nutritionist consultants for different species. In 2019, our team realized that in some cases our ingredient usage estimates were higher than what was domestically available, while for a few other ingredients, only a small portion of total available was assumed to be fed. To overcome the errors of under and overutilizing feed ingredients, the RCO model (Ration Cost Optimization model) was developed. Using this new methodology, we now have a better understanding of estimated feed ingredient utilization by state and by species, without over or underutilizing feed ingredients based on total U.S. feed availability.

Due to its logistical assets, climate and quality soils, Arkansas has thriving production and value-added agricultural industries. For example, Arkansas:

- **Contains** 14.5 million acres of workable farmland
- **Harvests:**
  - 3.5 million acres of soybeans annually and is ranked 11th in the nation for soybean production.
  - 597,000 acres of corn annually, 595,00 acres for grain and 2,000 for silage. Arkansas ranks 20th in the nation in the production of corn for grain.
  - 8,000 acres of sorghum annually, 7,000 acres for grain and 1,000 for silage
  - 125,000 acres of wheat and winter wheat annually.
  - 29,000 acres of peanuts annually.
- **Ranks**
  - 2nd in the nation in broiler production; about 2,500 farms in Arkansas produce chickens.
  - 12^{th} in beef cows on farms. Arkansas cattle inventory exceeds 1.7 million head, with 28,292 farms producing cattle.
  - 1st in rice production, producing close to 50 percent of the nation's rice. More than 1.6 million acres are harvested annually in over 40 counties.
- **Produces** 1.1 million pounds of cotton bales, and 371,000 tons of cottonseed. Arkansas is ranked 4th in the nation for the production of cotton and cottonseed.

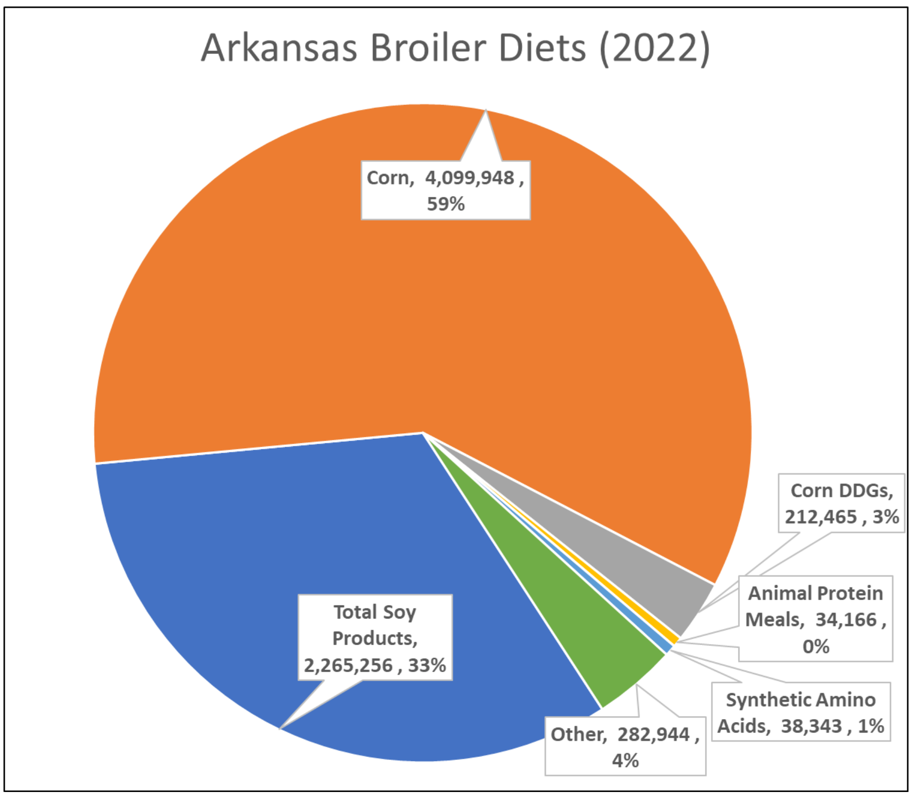
Given the strength of Arkansas agriculture, many opportunities in both production and value-added agriculture lie ahead. Similarly, there are challenges that will need to be overcome for the industry to continue to grow. Many of the challenges that may face Arkansas in the coming years are related to changes caused by trade, production and processing economics (which can be highly dependent on geography) and policy at the state and federal levels. For example:

- Beginning in early 2024, how will the new Cherryvale soybean crush plant (Bartlett Company) in Montgomery County, Kansas affect the movement of commodities (soybeans, soybean meal corn, grain sorghum, etc.) available and fed to the ever-important broiler industry in Arkansas?

- How will (or has) the passage of the Inflation Reduction Act and its incentives to produce renewable diesel and sustainable aviation fuel impact the production economics of Arkansas' broiler industry, which consumes significant volumes of Arkansas-grown feedstuffs?
    - See the following chart DIS created for the United Soybean Board in Summer 2023, which estimates total soy products making up 33% of broiler diets in Arkansas.

Past experience suggests current and upcoming challenges will affect the location, movement, processing and consumption of agricultural commodities produced in Arkansas. Given the interconnectedness of crop and livestock/poultry production and processing in Arkansas and surrounding states, this proposed analysis will help Arkansas soybean producers better adapt to and leverage changing market dynamics to better position the industry for future success.

Additionally, to better understand the historical use of key feed ingredients, including all soy related products, we propose to estimate annual usage of identified ingredients used in the production of Arkansas swine and broiler production.



2 Overview

To better understand how opportunities and challenges may impact Arkansas soybean producers, we propose the following methodological steps for the core analysis. Further details for each proposed step are contained in Section 3. Our proposed methodology for the "core" analysis is organized according to the following high-level elements of analysis:

1. **Animal Unit (AU) Trends**
2. **Broiler and Swine Feed Estimates**
3. **Feed Ingredient Flow Analysis**
4. **Determine Potential Gaps in Feed Supply**

We have also identified a few optional components for consideration by Arkansas Soybean Promotion Board (see Section 5). These optional components have been suggested primarily because completing the core proposal will allow this optional components to be completed more efficiently since the work completed for core proposal naturally lends itself to underpinning the proposed optional components. The optional components included for your consideration are:

1. **Additional Scenarios**
2. **Economic Impact Study from Increased Livestock/Poultry Production**

3 Methodology

Below is an outline of how we would proceed to partner with Arkansas Soybean Promotion Board (Arkansas Soybean). The following outline is based on our understanding of Arkansas Soybean's stated needs and our experience in working with other clients with similar needs.

3.1 Animal Unit (AU) Trends[1]

In order to have feed consumption estimates as accurate as possible, we propose an "AU Trends" aspect to this research. By ensuring we have the correct production and/or inventory values with which to factor per head feed consumption estimates, the overall results will be more robust.

3.1.1 Broilers

Animal units for broilers will be calculated by taking USDA's broiler production for each state and multiplying them by 0.003. Broiler production for states not listed individually in the annual report will be allocated based on that state's percentage of the broiler inventory of broiler inventory for states not individually listed in the annual production report. That percentage is multiplied by the "other states" production in the 2022 annual broiler production report. Production for years in between Census of Agriculture reports is based on an allocation from the most recent Census of Agriculture reports.

3.1.2 Swine

Animal units for hogs will be calculated for 5 segments (sows and boars, and feeder pigs by four weight groups: Less than 50 lbs.; 50-119 lbs.; 120-179 lbs.; and 180 lbs. and up).

For breeding stock (sows and boars), the annual inventory will be as reported in the USDA December Hogs & Pigs Report. The annual state breeding inventory will be multiplied by the breeding hog AU multiplier which in 2020, was 0.416. The breeding hog multiplier reflects an annual average increase in breeding hog slaughter weights of 0.17 lbs./year from a base of 413 lbs. in 2000.

For feeder pigs and market hogs, the annual average inventory will be as reported in the USDA December Hogs & Pigs report in each of the weight groups.

- For hogs less than 50 lbs., the AUs will be calculated as the annual inventory number times the less than 50 lbs. AU multiplier which in 2022, is 0.03. This reflects an average weight of this group of 30 lbs.
- For hogs between 50 lbs. and 119 lbs., the AUs will be calculated as the annual inventory number times the "50-119" AU multiplier which is 0.085. This reflects an average weight of this group of 85 lbs.

[1] In this section we use 2022 as an example but we intend to express all feed consumption estimates annually from 2017-2023.

- For hogs between 120 lbs. and 179 lbs., the AUs will be calculated as the annual inventory number times the "120-179" AU multiplier which is 0.15. This reflects an average weight of this group of 150 lbs.
- For hogs 180 lbs. and greater, the AUs will be calculated as the annual inventory number times the "180+" AU multiplier which in 2022, is 0.235. The multiplier for this group is increasing at an annual average rate of 0.0006 per year.
- Total animal units for hogs will be the sum of AUs for breeding herd, less than 50 lb. hogs, 50-119 lb. hogs, 120-179 lb. hogs and hogs 180 lbs. and greater.

3.2 Broiler and Swine Feed Consumption Estimates[2]

One of the primary objectives of this proposed analysis is to estimate major feed ingredients used by animal species by life stage (as appropriate) for Arkansas and thereby lay the foundation to better understand the current and future (i.e., new soy crush plants in Montgomery County, KS and the Missouri bootheel) movement of soybeans, soybean meal and soybean oil from farms to processors and then to livestock and poultry.

Efforts to ascertain feed ingredients used in this fashion have been undertaken in the past. However, the methodology we propose to utilize differs in some ways. In general, our approach to estimating feed ingredients use starts from the very beginning of the protein production cycle. Rather than beginning with the end (pounds of meat or eggs produced), we focus on the appropriate rations fed to the many segments of animal agriculture, essentially employing a bottom-up approach to estimating feed ingredients usage by animal agriculture segments.

To better understand the current state of the feeding industry, we regularly make targeted contact with industry and university nutritionists and subject matter experts (collectively referred to as SME's) who have many years of practical industry experience. In our discussions with these SME's, we seek to understand the following for each of the animal species under study:

1. **Population** by state/region
    a. Broken out by stage of life, as appropriate
    b. Relevant production and practice trends taking place
        i. Recognition and identification of geographic shifts in production areas taking place as part of a mid- to longer-term trend
        ii. An understanding of "best management practices" with regard to rations that may be changing in a way that has implications for overall demand for feed ingredients and their substitutes
2. **Typical ration ingredients and associated inclusion rates**
    a. Regional differences in production practices and ration ingredient availability and their impact on rations
    b. Characteristic(s) of various feed ingredients that make them attractive for feeding, including if this "attractiveness" varies by species
    c. An understanding of the nutritional profiles of competing substitutes for ingredients which are commonly used in livestock and poultry

[2] In this section we use 2022 as an example but we intend to express all feed consumption estimates annually from 2017-2023.

The above outline is typically used to collect notes in numerous phone, web conference, and email conversations with our chosen SME's. As we discussed the above with SME's, specific conditions unique to some species are typically identified and incorporated in our estimates of feed ingredient use. Further considerations are made for converting livestock and other species production data (which tend to be on calendar year) to a "marketing" year so as to present a more accurate picture with regard to the production and marketing of major feedstuffs. What follows is an explanation of the approach we take to estimate SBM use by species; similar steps are followed for other relevant feed ingredients.

As the inspiration from recipe reverse engineering program used in our pet food analysis in 2019, we propose to use the Multi-Species Ration Cost Optimization model (RCO), as has been used in many projects for other clients. In the earlier year's reports, the RCO was only applied on six major species, i.e., beef cattle, dairy cattle, hogs, broilers, layers and turkeys. With more experience and in consultation with our SME's, the RCO can now be applied to more species the "core six", including sheep, goats, and horses. The condensed methodology behind the RCO model is as follows and will be used for estimating historical feed consumption for broilers and swine:

1. List the possible feed ingredients for a given species
2. For a given species, use and allocate USDA published price points for all relative feed ingredients plus transport fee to estimate the cost for the corresponding feed ingredients.
3. For a given species, breakdown into different stages according to National Research Council (NRC). To determine the majority of nutrient requirements (e.g., energy, crude protein, amino acid, fat and fiber) for all stages, the NRC manual will be used.
4. For a given state/region, apply unique ingredient limitations, to mirror reality.
5. Apply the feed ingredient costs, the nutrient requirements and ingredient limitations into ration cost optimization formulation in Solver of Microsoft Excel to find the optimized cost of feed ration (result shown as g/100g feed) for all stages, for a given state/region, and for a given species.
6. Calculate a weighted average ration for a given state/region and for a given species by stage of life.
7. For each species, inventory numbers are available in monthly and/or annual reports produced by USDA/NASS.
8. For a species, use the weighted average percentage of each ingredient calculated from Step 6, multiply by corresponding inventory/production numbers, corresponding feed consumption, and corresponding days of feeding period to obtain the volume of a given ingredient.
9. Summarize the quantities for a given ingredient for a given species.
10. Reconcile all feed ingredients for all species based on national total availabilities and SME's comments.

3.3 Feed Ingredient Flow Analysis

Quantifying the feed demand for soybean meal, corn, grain sorghum, DDGs and other relevant feed ingredients and analyzing the flows of these products from farm to processors to Arkansas livestock and poultry farms would further assist in the understanding of these important commodities to Arkansas farmers and the potential for additional processing needs within the state. The primary components of this research will be:

- Determine county level feed demand for soybean meal, corn, grain sorghum, DDGs and other relevant feed ingredients based on livestock and poultry production and model rations that DIS has developed.

- Model the flows of feed ingredients from farms to processing plants to livestock/poultry farms, particularly for the broiler industry.

Through previous work that DIS completed for the United Soybean Board and the American Feed Industry Association and as a part of the Missouri Commodity Flow and Infrastructure project and later refinement in work leading up to and including our work in Kansas, we have developed methodology for determining county level feed demand for the major ration components commonly used in poultry production (broilers, eggs and turkey) and in livestock production (cattle, dairy, hogs, sheep). This methodology would be updated to 2023 levels using USDA annual reports in conjunction with data from the most recent (2022) USDA Census of Agriculture to estimate feed demand for soybeans, soybean meal and other relevant feed ingredients.

3.4 Determine Potential Gaps in Feed Supply

With the baseline feed ingredient flow model completed in Section 3.3, the ability to determine potential gaps in local feed supply becomes possible. Livestock and poultry production is increasing but where livestock is being produced changes over time. Using data from recent editions of USDA annual reports and from the USDA Census of Agriculture, the changes in livestock and poultry production at the county level will be quantified and the trends would be projected forward with a 10% increase in total livestock feeding in the state allocated to counties based on trends in livestock feeding for each county's changing dynamics. Once the 10% increase in feed demand is allocated to the counties, a dynamic flow analysis will be used to determine whether gaps in feed supply are found and which feedstuffs may be impacted.

4 Deliverables

As a result of our work surrounding the methodology described in this document, the Arkansas Soybean Promotion Board can expect the following from Decision Innovation Solutions:

- A high-quality report and supporting materials based upon robust, industry-accepted methodology
- Interaction with our team members in an honest, personable, positive and open environment
- Continuous communication with establish checkpoints to ensure expectations are aligned
- Continued support as necessary upon completion of the project
- Final Report/Presentation
- Any selected optional components

5 Options for Consideration

DIS will normally include a few additional analysis options for our client's consideration to have us undertake. In our opinion, these options will enhance the foundational research requested. If any of the optional components are of interest, we will provide additional details on methodology, timeline and financial commitment.

5.1 Additional Scenarios

Using the same approach outlined in Section 3.4, additional scenarios may be of interest to Arkansas soybean producers. A few examples could include:

- Using current livestock and poultry inventories/production, estimate the impact of the new Cherryvale soybean crush plant (Bartlett Company) in Montgomery County, Kansas on the movement of commodities (soybeans, soybean meal and other relevant feed ingredients,) available and fed to the Arkansas broiler industry.

- Estimate the impact of the announcement of a new soybean crush plant in Missouri's bootheel. The addition of a new soybean crush plant in the Mississippi River delta area will likely change soybean flows from a relatively wide area around the new plant, affecting basis and the flows of soybean meal to markets in much of the Mid-south.
- Estimate how the passage of the Inflation Reduction Act and its incentives to produce renewable diesel and sustainable aviation fuel will (or has) impact(ed) the production economics of Arkansas' broiler industry, which consumes significant volumes of Arkansas-grown feedstuffs.

5.2 Economic Impact Study from Increased Livestock/Poultry Production

Due to the relative advantages of raising broilers and swine in Arkansas there may be interest in understanding the construction and operation of new or expanded broiler or swine facilities and/or slaughter and/or processing facilities in Arkansas. The DIS team has extensive experience estimating the direct, indirect and induced effects of changes in local economies such as these.

6 Timeline / Financial Commitment

Below is our estimate of what level of financial commitment would be required from our perspective to work with you in completing the described analysis. The timeline denoted below assumes necessary resources in your office will be available on a timely basis and represents the most time that would be necessary to complete a given phase; a quicker completion of deliverables is possible.

Arkansas Soybean and Soybean Production Consumption and Flow Analysis	Timeline (Est. Completion)	Investment
Animal Unit Trends	6 weeks from agreement	$ 5,400
Broiler and Swine Feed Consumption Estimates (2017-2023)	16 weeks from agreement	$ 17,100
Feed Ingredient Flow Analysis	20 weeks from agreement	$ 23,850
Determine Potential Gaps in Feed Supply	24 weeks from agreement	$ 11,475
Total Investment (Core Analysis)		**$ 57,825**
OPTIONAL Components	**Timeline (Est. Completion)**	**Investment**
Additional Scenarios (per scenario)	TBD	$ 6,975
Economic Impact Study from Increased Livestock/Poultry Production (per study)	TBD	$ 3,825
Total Investment (Optional Components)		**$ 10,800**
Total Investment (Core and Optional Components)		**$ 68,625**

7 Billing and Payment

Unless specified differently in the final agreement, DIS proposes payment of 50% of the project total prior to commencing work on the project with the balance due and payable upon satisfactory completion of the project.

8 The DIS Team

DIS strives to hire the best analysts and economists available, the vast majority of which have direct production and/or value-added agriculture and trade modeling/analysis experience. While it can be difficult to find high-quality talent to meet our clients' needs, we firmly believe the time it takes is well worth the effort. The table below provides detail on some of the DIS team members who may contribute to this project. Additional detail can be found in the ***About Us*** section of our website.

SPENCER PARKINSON
President, CEO, Founding Member

EDUCATION

Utah State University
Bachelor of Science
Accounting
Economics

Royal Agricultural College
International MBA
Agribusiness & Food

WORK EXPERIENCE

- Utah State University Extension
- Iowa Farm Bureau Federation
- Decision Innovation Solutions

AREAS OF EXPERTISE

- Economic Impact Modeling
- Agriculture Policy Analysis
- Project Management
- Feasibility & Due Diligence
- Financial Modeling

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DAVID MILLER
Consulting Chief Economist

EDUCATION

University of Missouri-Columbia
MBA
Finance
Bachelor of Science
Agriculture

Brigham Young University

Valparaiso University

WORK EXPERIENCE

- Miller Family Farms
- University of Missouri Extension
- American Farm Bureau
- Iowa Farm Bureau
- Miller Consulting Services, LLC
- Consulting to Decision Innovation Solutions

AREAS OF EXPERTISE

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- Economic Modeling
- Farm Production Economics
- International Trade
- Commodity Market Analysis

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CINDY HARWOOD
Consulting Business Operations Manager

EDUCATION

St. Ambrose University
Bachelor of Arts
Liberal Arts
Minors
Finance
Psychology

WORK EXPERIENCE

- Pioneer Hi-Bred International, Inc.
- DuPont Pioneer
- Corteva AgriScience
- Hickory Grove Ranch
- Hickory Grove Consulting, LLC
- Consulting to Decision Innovation Solutions

AREAS OF EXPERTISE

- Business Operations
- Project Management
- AGILE Software Development Methodology
- Lean Six Sigma Certified
- Quality Management Systems
- Global Regulatory Compliance – GM Crops

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S. PATRICIA BATRES-MARQUEZ
Senior Research Analyst

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Universidad Centroamericana “José Simeón Cañas” (UCA), El Salvador
Bachelor of Science
Business Administration

WORK EXPERIENCE

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- Bioenergy
- Nutrition

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JING TANG
Statistician

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Food Science
Statistics
Beijing Business & Technology University
Bachelor of Science
Food Science & Technology

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- Data Analyzing & Prediction
- Data Visualization

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KADE GRAFEL
Research Analyst

EDUCATION

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Bachelor of Science
Economics
Minor
Mathematics

WORK EXPERIENCE

- Kansas Department of Agriculture Economics Intern
- Kansas State University Research Assistant
- Federal Reserve Bank of Dallas Discussant
- Decision Innovation Solutions

AREAS OF EXPERTISE

- Data Management and Analysis
- Economic Contribution and Impact Studies

SOFTWARE SKILLS

- STATA, R, IMPLAN, LATEX,

kade@decision-innovation.com | 515.639.2908

9 References

Since our founding in 2007, we have been honored to work with many clients from many different industries. We will gladly provide references upon request that can attest to our reputation, our quality of work, our relationship management, and ease of working with the DIS Team.

10 Final Notes

We are very flexible in terms of the scope and components associated with partnering on this project and want to ensure you receive the best value possible. Our estimates are presented under the assumption that we understand your needs and our understanding of those needs are aligned with your expectations. As such, further clarification may be necessary to refine our estimates; if this turns out to be the case, we politely request further dialogue to more closely align our understanding with your needs.

Our experience in this type of analysis provides us with the expertise to exceed the requirements of your project and, as with other clients, we offer the guarantee that you will receive value from our work or there will be no payment sought. We greatly enjoy this type of work and look forward to assisting you as you work toward helping Arkansas soybean producers better adapt to and leverage changing market dynamics. Please let us know if you have any questions – we look forward to hearing back from you!

Sincerely,

Spencer Parkinson

Decision Innovation Solutions

spence@decision-innovation.com; 515.639.2901

DIS Proposals to the Arkansas Soybean Promotion Board

March 8, 2024

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1

Brief History

- We are an economic research and analysis firm based in Urbandale, Iowa
- Business started in 2007 – celebrated our 15-year anniversary late last year
- At Dave Miller's urging, Sterling Liddell and Spencer Parkinson started the business to handle risk analysis work being done at Iowa Farm Bureau
- We have completed work in more than 20 states and for a few international organizations
- About 80% of our work is related to agriculture and related industries
- The other 20% is for entities including counties and cities and construction and engineering firms, often entailing economic impact work
- Our areas of expertise are:
  - Policy Analysis
  - Feasibility and Due Diligence
  - Economic Impact and Contribution Analysis
  - Spatial and Time Series Analysis
  - Market Analytics

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2

The DIS Process

We partner with clients to conduct research in phases, starting with a discovery phase and continuing through a support and enhancement phase. This ensures research is done on time, on task and on budget.

1. **Discovery (Information Gathering):** This phase is primarily confined to determining relevant facts with regard to your project (i.e., interaction required to ensure final deliverable(s) meet/exceed your needs.
2. **Foundation (Model Framework):** Adoption of appropriate methodology; supported by applying facts gleaned from the Discovery phase (i.e., creation of baseline scenario).
3. **Function (Functional Model):** Once the foundation for our analysis has been determined we begin creating a functioning model as appropriate (i.e., creation of alternative scenarios).
4. **Implementation (Model Integration):** Finalization of analysis, including all scenarios and ancillary analyses conducted as a result of prior phases, including the writing of report(s) as necessary.
5. **Support/Enhancement:** Ongoing assistance with regard to project results. In some cases, additional work is desired that was not part of the initial scope of the project (i.e., after submitting final work, other requirements/enhancements may be desired).

3

The DIS Team

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DAVID MILLER
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EDUCATION
- University of Missouri-Columbia: *MBA* Finance; *Bachelor of Science* Agriculture
- Brigham Young University
- Valparaiso University

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- Pioneer Hi-Bred International, Inc.
- DuPont Pioneer
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4

The DIS Team

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Senior Research Analyst

EDUCATION
- Kansas State University: *Master of Science* Agricultural Economics
- Universidad Centroamericana "José Simeón Cañas" (UCA), El Salvador: *Bachelor of Science* Business Administration

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- Kansas State University Research Assistant
- Federal Reserve Bank of Dallas Discussant
- Decision Innovation Solutions

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WORK EXPERIENCE
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- Select Sires, Mid-America – Intern
- Riverview, LLP – Intern

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- Data Analysis

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5

Feed Flow Analysis for Arkansas' Critical Livestock and Poultry Industries

- **Background on the Proposal**
  - Due to its logistical assets, climate and quality soils, Arkansas has thriving production and value-added agricultural industries.
  - Given the strength of Arkansas agriculture, many opportunities in both production and value-added agriculture lie ahead. Similarly, there are challenges that will need to be overcome for the industry to continue to grow. Many of the challenges that may face Arkansas in the coming years are related to changes caused by trade, production and processing economics (which can be highly dependent on geography) and policy at the state and federal levels. For example:
    - Beginning in early 2024, how will the new Cherryvale soybean crush plant (Bartlett Company) in Montgomery County, Kansas affect the movement of commodities (corn, grain sorghum, soybeans and soybean meal) available and fed to the ever-important broiler industry in Arkansas?
    - How will (or has) the passage of the Inflation Reduction Act and its incentives to produce renewable diesel and sustainable aviation fuel impact the production economics of Arkansas' broiler industry, which consumes significant volumes of Arkansas-grown feedstuffs?
  - Quantifying the feed demand for corn, grain sorghum, soybean meal, DDGs and other relevant feed ingredients and analyzing the flows of these products from farm to processors to Arkansas farms would further assist in the understanding of these important commodities to Arkansas farmers and the potential for additional processing needs within the state.

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Feed Flow Analysis for Arkansas' Critical Livestock and Poultry Industries

- Core Elements of the Proposed Research:
  - **Feed Ingredient Flow Analysis**
    - Determine county level feed demand for corn, grain sorghum, soybean meal and DDGs based on livestock and poultry production and model rations that DIS has developed.
    - Model the flows of corn, grain sorghum, soybean meal and DDGs from processing plants to farms, particularly for the broiler industry.
  - **Determine Potential Gaps in Feed Supply**
    - Livestock and poultry production is increasing but where livestock is being produced changes over time. We will model the change in Arkansas corn and grain sorghum movement from a 10% increase in feed demand.
- **The optional component included for your consideration are:**
  - **Additional Scenarios**
    - Cherryvale soybean crush plant
    - 45Z, 45Q, etc., impact on Arkansas commodity production
- **Proposed Core Budget: $32,850**
  - Additional Scenario(s): $6,975 each

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7

Historical Livestock and Poultry Feed Demand in Arkansas; Economic Impact Study

- **Background on the Proposal**
  - Due to its logistical assets, climate and quality soils, Arkansas has thriving production and value-added agricultural industries.
  - Given the strength of Arkansas agriculture, many opportunities in both production and value-added agriculture lie ahead. Similarly, there are challenges that will need to be overcome for the industry to continue to grow. Many of the challenges that may face Arkansas in the coming years are related to changes caused by trade, production and processing economics (which can be highly dependent on geography) and policy at the state and federal levels. For example:
    - Beginning in early 2024, how will the new Cherryvale soybean crush plant (Bartlett Company) in Montgomery County, Kansas affect the movement of commodities (corn, grain sorghum, soybeans and soybean meal) available and fed to the ever-important broiler industry in Arkansas?
    - How will (or has) the passage of the Inflation Reduction Act and its incentives to produce renewable diesel and sustainable aviation fuel impact the production economics of Arkansas' broiler industry, which consumes significant volumes of Arkansas-grown feedstuffs?
  - Quantifying the feed demand for corn, grain sorghum, soybean meal, DDGs and other relevant feed ingredients and analyzing the flows of these products from farm to processors to Arkansas farms would further assist in the understanding of these important commodities to Arkansas farmers and the potential for additional processing needs within the state.

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8

Historical Livestock and Poultry Feed Demand in Arkansas; Economic Impact Study

- Core Elements of the Proposed Research:
  - **Animal Unit (AU) Trends (2017-2023)**
    - Broilers: Inventory and production
    - Swine: Feeder pigs, market hogs and breeding herd
  - **Broiler and Swine Feed Estimates (2017-2023)**
    - Population by state/region
    - Typical ration ingredients and associated inclusion rates
- **The optional component included for your consideration are:**
  - **Economic Impact Study from Increased Livestock/Poultry Production**
    - Due to the relative advantages of raising broilers and swine in Arkansas there may be interest in understanding the construction and operation of new or expanded broiler or swine facilities and/or slaughter and/or processing facilities in Arkansas.
- **Proposed Core Budget: $29,925**
  - Optional Component, per economic impact study: $3,825 each

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9

Carbon Intensity Implications for Arkansas Commodities

- **Background on the Proposal**
  - Commercial production of broiler chickens and pork production represent two of the largest animal-sourced food sectors in the United States and in Arkansas and offering a compelling case study of production trajectories and environmental footprints.
  - As more food production companies examine their carbon footprints, it brings into the equation the carbon intensity of the feed ingredients used in their production.
  - This proposal focuses on an analysis of the carbon intensity of corn and grain sorghum raised in Arkansas, and an analysis of the carbon intensity of the major feed ingredients used in the production of broiler meat and pork in Arkansas.
  - A current analysis of these feedstuffs will enable Arkansas producers to better communicate the environmental status of their feedstuffs to livestock and poultry producers and to the public.

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Carbon Intensity Implications for Arkansas Commodities

- Core Elements of the Proposed Research:
  - **Calculate the CI Scores of Arkansas Corn and Grain Sorghum**
    - Construct Production Budgets and Profiles
    - Assess the Carbon Intensity of Arkansas Corn and Grain Sorghum
    - Estimate the CI Scores of Arkansas Corn and Grain Sorghum "As Fed"
  - **Estimate the CI Score of the Major Feed Ingredients Used in Arkansas Broiler and Hog Production**
    - Estimate the quantity of the major feed ingredients used in hog and broiler production in Arkansas
    - Ration Cost Optimization (RCO) Model Methodology
    - Assign CI Scores to Each of the Major Feed Ingredients Used in the Production of Arkansas Broilers and Swine
- **The optional component included for your consideration are:**
  - **Expansion of the set of livestock and poultry products for which the feed CI scores will be calculated**
- **Proposed Core Budget: $19,575**
  - Optional Component: $11,250

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Thanks!

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12

2025 ASA Awards Celebration

Arkansas Soybean Promotion Board Proposal

The American Soybean Association has a long and storied history of achievements and leadership. The annual Awards Celebration, held during the Commodity Classic Convention and Trade Show, is an opportunity to recognize the achievements and contributions made by soybean farmers and industry leaders.

The awards program, attended by approximately one thousand soybean growers and industry leaders, is truly a night that soybeans shine, as achievements in research, conservation, and leadership are recognized. This celebration of achievements inspires innovation, enhances collaboration, and builds both confidence and pride in our industry.

The ASA Awards Celebration is a special soybean-focused evening designed to showcase the industry and recognize:

- Honor leadership achievement and outstanding service by soybean growers, state volunteers and industry leaders
- Achievements in soybean production and research
- Highlight key soybean industry initiatives including those of conservation, sustainability and best management practices
- Inspire innovation and drive future soybean industry growth

A $6,000 investment in the 2025 Awards Celebration will provide the Arkansas Soybean Promotion Board with preferred seating through one reserved table. Additionally, Arkansas will be positioned as industry leaders through recognition in:

- Banquet publicity, table signage and the program booklet
- State sponsors will be recognized by name in the banquet video and verbally by the event Emcee and ASA President

The 2025 ASA Awards Celebration will be held in conjunction with Commodity Classic March 2-4, 2025, in Denver, Colorado.

2025 Economic Analysis and Support
Arkansas Soybean Promotion Board

ASA and the Arkansas Soybean Promotion Board have been long-time collaborators, working together to enhance the position of soybean farmers as providers of high quality, dependable and competitive soy and soybean-related products with key influencers and decision makers through the soybean value chain, the agricultural community and in the global marketplace.

ASA's Chief Economist and Economics Department serve a critical role in strategic decision-making by providing analysis. The ability to quantify outcomes helps to provide insight into the impacts of potential policies on soybean farmers. Furthermore, the economics work positions U.S. soybean farmers interests with influencer groups through various tactics. This includes writing articles explaining issues in the soybean sector, delivering presentations along the same lines and communicating with other economists.

Support of the Arkansas Soybean Promotion Board will provide the ASA Chief Economist with additional tools to further demonstrate the strength and importance of U.S. soy. The tactics outlined below provide varied ways to support, reach, interact and engage with individuals who have direct and indirect impacts on the way farming is done.

Economic Analysis and Economic Support – ASA's Chief Economist and Economics Department serve a critical role in strategic decision-making by providing analysis and insights and in positioning U.S. soybean farmers interests with influencer groups through various tactics including but not limited to:

- Economic analysis
- Engagement with carbon and environmental markets and life-cycle analysis
- Work in renewable fuels, transportation and trade
- Ongoing review and support related to the farm safety net
- Interactions with other economists related to baseline analysis for markets, conservation programs and safety net spending
- Communicate soybean issues and policy impacts to audiences
- Interaction with ASA Economist
    - Virtual or in person briefings at Virginia Soybean Association meetings and events by the ASA Economist as requested subject to schedule
    - Receive quarterly threats and opportunities for the soy industry
    - Receive early copies of economic reports generated by ASA
    - Consultations with ASA Economist
        - Discussions of impacts of state or national policy
        - Suggestions for potential researchers to conduct the research/analysis
        - Suggestions on project scope and design, etc.

A $5,000 investment will support this crucial work, providing both qualitative and quantitative support to help drive not only future success but growth in in the U.S. soybean industry. The work will aid in the positioning the importance of soybean production, soy components and products to the U.S. economy and in global trade.

ASA proposes the Arkansas Soybean Promotion Board fund $5,000 in Economic Support and Analysis in 2025.

2025 ASA Innovation to Market (I2M) Work Group Proposal Arkansas Soybean Promotion Board

The Innovation to Market (I2M) Work Group serves as a consultative forum with a goal to facilitate the domestic and international introduction, commercialization and market acceptance of new innovations in seed and crop protection products. The group accomplishes this through interactions with key industry partners, including biotech trait developers, crop protection registrants and developers of gene-edited soybeans and other plant breeding innovations and farmer leaders representing ASA, USB and USSEC.

I2M Objectives

The primary objectives of the Innovation to Market Work are:

- Identify and address challenges and issues impeding the development, commercialization and market acceptance of seed and crop protection products. Examples may include adventitious presence, U.S. and foreign regulatory systems, trade and market barriers, stewardship concerns and education needs.
- Enhance collaboration between soybean growers, soybean organizations and industry partners.
- Create a forum to identify strategies for addressing long-term issues that continue to threaten innovation and productivity in the agriculture industry.
- Identify action areas of mutual interest where soybean growers can work with developers and registrants/member companies to improve the regulatory and market environment for new technologies, both domestically and in overseas markets.
- Facilitate a productive dialogue between developers and registrants and other essential stakeholders to help ensure a stable market environment, trade prospects and greater profit opportunities for U.S. soybean farmers.
- Seek to address asynchronous approvals and making consistent standards and regulatory processes throughout all key export countries.

Meeting Overview

The I2M Work Group meets in person twice a year, with at least one meeting being held in Washington, D.C. Meetings are traditionally held in the winter and late summer.

Member Benefits

Membership in the I2M Work Group allows two participants from the Arkansas Soybean Promotion Board to participate and engage in the I2M Work Group's annual meetings.

Additional membership benefits include:

- Interaction with industry leaders to become more informed on specific challenges facing developers of seed and crop protection products.
- The opportunity to work with industry representatives and members of the soy family to identify strategies to ensure innovations in seed and crop protection remain available to farmers.
- Recognition as an organization that supports the significant work of the I2M Work Group as it protects farmers access to key seed and crop protection tools that enhance their productivity and profitability.
- I2M member organizations are recognized in ASA's communications related to the group's activities.

I2M Work Group Annual Membership – Arkansas Soybean Promotion Board: $7,500

**I2M Work Group membership dues invested by the Arkansas Soybean Promotion Board are applied to meeting operational expenses including speaker fees, room rental, audio visual equipment, food and beverage and meeting materials. Funds are not used for lobbying or advocacy.*

2025 Soybean Leadership Academy
Arkansas Soybean Promotion Board

Soybean Leadership Academy is an elite educational program designed to provide tools and techniques that enable state and national soybean Board and Association leaders to be more effective, efficient and inspired leaders.

Working with top leadership trainers, facilitators and industry experts, **Soybean Leadership Academy** will provide:

- Targeted training to state and national soybean board leaders and top staff, increasing their effectiveness as leaders and as boards
- Enhanced collaboration between state affiliate and national soybean organizations, strengthening the voice of U.S. agriculture
- Interaction between senior soybean leadership and newer board members creating strong peer and networking opportunities

Soybean Leadership Academy will provide two training tracks, one for senior level grower board members and staff leaders and the other for beginning/intermediate board members and managerial level staff. Joint training sessions and networking functions will build camaraderie and further strengthen the soybean industry.

The 2025 **Soybean Leadership Academy** will be held January 8-10. The program format is as follows (all times subject to change):

January 8, 2025 – Day #1
Participants Arrive
6:00 p.m. Welcome Reception & Dinner at Hotel

January 9, 2025 – Day #2

8:00 a.m.	Breakfast
9:00 a.m.	General Session
9:45 a.m.	Break
10:00 a.m.	Breakout Sessions
	Track #1 – Beginning/Intermediate Level Grower Board Members and Managerial Staff
	Track #2 – Top State and National Farmer Leader(s) and Executives Session
12:00 p.m.	Lunch with Speaker
1:30 p.m.	Breakout Sessions – continuation of morning sessions
4:15 p.m.	Break
4:30 p.m.	General Session

January 10, 2025 – Day #3

8:00 a.m.	Breakfast
9:00 a.m.	General Session
12:00 p.m.	Adjourn

Investment
Soybean Leadership Academy is designed for participation by grower leaders and staff. Participating in the program is an investment in both your organization and leadership team.

State and national soybean Boards and Associations are encouraged to invest in Soybean Leadership Academy, providing training for senior level grower leaders, including the state president and chair, as well intermediate level board members with a desire to advance in their leadership journey. Senior and managerial staff participation at the state and national level is also encouraged.

The funding tiers provided below are suggested investment levels. The monies invested will provide for programming, meals, meeting materials and networking activities. Travel and hotel costs will be the responsibility of the participating organization.

2025 Soybean Leadership Academy Funding Tiers

Sponsorship Level	Investment	Suggested Number 0f Participants
Platinum	$25,000 and above	Ten or more participants
Gold	$12,000	Eight (8) participants
Silver	$6,000	Four (4) participants
Bronze	$3,000	Two (2) participants

Under the guidelines established through the adoption of ASA's 2016 Strategic Plan, state affiliates are provided representation on the ASA's Board through a base-level investment. Investment in the **Soybean Leadership Academy** will be counted by ASA towards additional grower representation on ASA's Board of Directors

Sponsors will be recognized throughout the event in program related materials and promotions.

ASA respects the responsibility and authority of the Soybean Promotion, Research and Consumer Information Act (7 U.S.C. 6301-6311) (the "Act") and the Soybean Promotion and Research Order (8 CFR Part 1220) (the "Order") and as such can assure state organizations that the checkoff dollars given and used to fund these programs are not used for lobbying, advocacy or membership generating activities.

American Soybean Association®

2025 SOYSTATS®, A REFERENCE GUIDE TO IMPORTANT SOYBEAN FACTS AND FIGURES

PROGRAM SUMMARY

SoyStats®, a Reference Guide to Important Soybean Facts & Figures, provides a reliable source for immediate and accurate soybean-specific statistics and information. Designed for use by industry, university researchers, media, state affiliates and soy customers including international customers, the annual Guide has proven to be an invaluable and trusted resource for those involved with soybean-related businesses.

SoyStats is distributed to soybean and soy product customers in the United States and in more than 80 countries around the world. It is also made available to many more online at www.SoyStats.com.

Objectives:

- Collect and analyze annual soybean production and utilization data
- Distribute accurate soybean-specific statistics and information
- Publish a printed guide that can be distributed to growers or customers
- Publish information on www.SoyStats.com, expanding the reach of the project globally

A premier soybean industry publication, *SoyStats* affords its investors many valuable promotional opportunities through its publication, online presence and distribution.

***SoyStats* Investors Receive:**

- Printed guides for distribution at their discretion. (Number of guides dependent on investment.)
- Recognition on the back cover of the guide and on the website, www.SoyStats.com
    - SoyStats.com receives approximately 10,000 visits annually from countries around the globe.
- Recognition in ASA's communication vehicles
    - *eBean News*
    - Social Media including Facebook and Twitter
- Additionally, *SoyStats* is distributed broadly to key influencers and media during various events

***SoyStats* Target Audiences:**

- State Affiliates
- Soybean Customers, including international customers
- Industry Representatives
- Media

ASA Requests $600 from the Arkansas Soybean Promotion Board for the 2025 *SoyStats®, a Reference Guide to Important Soybean Facts & Figures.*

Investment Levels

Gold Level—$3,000

- **Receive 600 copies of *SoyStats***
- **Receive Gold sponsor recognition on back cover**

Silver Level—$1,500

- **Receive 300 copies of *SoyStats***
- **Receive Silver sponsor recognition on back cover**

Bronze Level—$600

- **Receive 100 copies of *SoyStats***
- **Receive Bronze sponsor recognition on back cover**

Direct Purchase:
A state QSSB or association can purchase a box of 50 *Soy Stats* Guides at $325.00 or $6.50 each.

2025 Young Leader Program
Arkansas Soybean Promotion Board

In 1984 the Young Leader was started to help identify and train leaders for the soybean industry. Forty years later, the program continues to be a groundbreaker, recognizing the value both partners play in a farming operation and training them equally, encouraging and emphasizing the importance of diversity in the soybean industry. Today, the Young Leader Program continues to set the bar for leadership training in agriculture, identifying and training innovative and engaged growers to serve as the voice of the American farmer (actual age is not a factor).

Structure

The *ASA Corteva Agriscience™ Young Leader* two-phase training program challenges and educates participants. Phase I of the training takes place at the Corteva headquarters in Johnston, Iowa in early December 2024. The program continues in March of 2025 with training held in conjunction with the annual Commodity Classic Convention and Trade Show in Denver, Colorado. A third phase of training is available for a select number of participants from the current class. This third-phase program, scheduled in July 2025, includes participation in the ASA July Board meeting. Traditionally the third phase of training has been limited to 10 members of the current class and interested participants are asked to apply for the limited program spots. Participants for the *Young Leader* Program are sourced from the twenty-six soybean state affiliates and Canada. Each year 45-50 growers take part in the program.

Program Goals and Outcomes

Each phase of the *Young Leader* program is designed to meet specific training goals and deliver clear program objectives. Phase II of the training incorporates feedback from the class to deliver a custom educational experience that reflects the needs of the participants.

Phase I Objectives – 100% Compliant

- Communications Training – including public communication, interpersonal interaction and business leadership including DiSC training
- Soybean industry overview including USB and ASA Updates
- Soybean Industry and Technology Pipeline
- Peer relationship development

Phase II Objectives – 75% Compliant

- Soybeans in the international marketplace
- Soybean and issues updates – provided in part through participation in Commodity Classic
- Business specific training including advanced communications, multi-generational farming
- Personal and Professional Development

Phase III Objectives – 25% Compliant

- Board policies and protocols
- Soybean Issues Update – provided through participation in the ASA Legislative Forum
- An introduction to policy and Hill visits
- Crop Protection Pipeline and Technology

(*See addendum for past program agendas.*)

The *Young Leader* program provides newly identified and upcoming soybean leaders with critical leadership training. Through sessions on communications, organizational leadership and soybean industry updates, participants are better prepared to address state level issues while understanding their national implication. This is especially important as growers assume seats on regional, state and national checkoff and association boards. Additionally, the Young Leader program provides each participant with a peer group of other innovative and progressive farmers. These networks help aid collaboration regionally and nationally and provide solid sounding boards regarding business decisions both for state soybean organizations and their individual farming operations.

Most *Young Leaders* become active members of their state organizations and many take advance leadership positions on their state and national boards and allied grower organizations. Former Young Leaders currently engaged in national leadership include Brad Doyle, ASA Past President, Caleb Ragland, ASA President Committee and Phillip Good, USB Secretary. Many other recent program graduates are in service for both the state and national soybean organizations.

(See addendum for a complete listing of past Young Leaders currently serving national soybean organizations.)

Investment

In 2025 ASA and Corteva Agriscience are again offering the opportunity for state affiliates to partner on the program by providing scholarships via matching funds to cover tuition costs. This option is at the request of state affiliates made during the development of the ASA strategic plan. QSSB involvement in the program will provide the Arkansas Soybean Promotion Board with the opportunity to send additional grower couple(s) as participants in Phase I and Phase II of the *Young Leader* training until the program reaches a total of 52 participants.

2025 ASA Corteva Agriscience Young Leader Budget

The total compliant portion of the budget for the 2025 ASA Corteva Agriscience *Young Leader* Program is $209,000 (inclusive of travel, lodging, meals, meeting materials, speaker's fees, networking events, and program implementation for Phase I, Phase II and 25% of Phase III of the training). ASA and Corteva will continue to fund the non-compliant portion of the program and all compliant portions of the program not matched by QSSBs. Tuition cost estimates per attendee are based upon an average of 45 attendees.
We ask the Arkansas Soybean Promotion Board to invest $9,200 tuition per couple in the 2025 ASA Corteva Young Leader Program. *

A financial expense summary will be provided at the conclusion of the training detailing the expenses and costs as outlined above.

*QSSB's may provide tuition funding for up to two couples in the program.

ASA respects the responsibility and authority of the Soybean Promotion, Research and Consumer Information Act (7 U.S.C. 6301-6311) (the "Act") and the Soybean Promotion and Research Order (8 CFR Part 1220) (the "Order") and as such can assure the soybean growers of Arkansas that the checkoff dollars given and used to fund these programs are not used for lobbying, advocacy or membership generating activities.

2024 ASA Corteva Agriscience Young Leader Program

Phase I: November 27-30, 2023

Lodging: Hilton Garden Inn Des Moines/Urbandale
8600 Northpark Drive
Johnston, IA 50131

Training: Corteva Global Business Center
7000 NW 62nd Ave
Johnston, IA 50131

Monday, November 27, 2023 – *Dress: Casual/Jeans Okay*

5:15 p.m. Meet in Hotel Lobby
6:00 p.m. Welcome Reception/Dinner
- Biaggi's · 5990 University Avenue · West Des Moines, IA 50266

Tuesday, November 28, 2023 - *Dress: Business Casual, No Open-Toe or Open-Heel Shoes*

7:00 a.m. Meet in Hotel Lobby
7:15 a.m. Depart for Corteva
7:30 a.m. Breakfast **Room: 1L**
8:00 a.m. Welcome and Opening Remarks
- Matt Rekeweg, Corteva
- Christine Luelf, ASA

8:15 a.m. ASA Overview
- Josh Gackle (ND), ASA Vice President

8:30 a.m. USB Overview
- Tim Bardole (IA), USB Director

8:45 a.m. USSEC Overview
- Jeff Jorgenson (IA), USSEC Director

9:00 a.m. Corteva Agriscience Overview
- Matt Rekeweg, Industry Relations

9:30 a.m. Young Leader Presentations
10:00 a.m. Break
10:15 a.m. Overview Biotechnology and Gene-Editing Regulatory Environment
- Kevin Diehl, Global Genome Editing Regulatory Policy Leader, Corteva

11:15 a.m. Soybean Industry Panel and Q & A
- Moderator: Matt Rekeweg, Government Affairs & Industry Relations Lead, Corteva
- Panel
  - ASA, USSEC and USB

Noon Lunch/Young Leader Presentations
1:00 p.m. DiSC
- Gary Kahle, Sales Excellence Manager, Corteva

3:00 p.m. Break

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3:15 p.m.	Soybean Market and Business Overview - Mike Dillon, Vice President, Oil Seeds Portfolio, Corteva - Liz Knutson, Pioneer Soybean Marketing Leader, Corteva	
4:15 p.m.	Depart for World Food Prize	
5:00 p.m.	World Food Prize Tour	
5:30 p.m.	Depart World Food Prize for Rubes	
6:00 p.m.	Dinner - Rube's Steakhouse · 3309 Ute Avenue · Waukee, IA 50263	

Wednesday, November 29, 2023 - *Dress: Business Casual, No Solid Green or White Shirts or Logo wear. No Open Toe or Open Heel Shoes*

Videotaping will occur throughout the day in Carver 1D

7:15a.m.	Meet in Hotel Lobby	
7:30 a.m.	Depart for Corteva	
7:45 a.m.	Breakfast	**Room:** 1L
8:30 a.m.	Corteva Tour	
11:00 a.m.	Expectations and Responsibilities - Beth Serrill, Partner, Blethen/Berens	
11:30 a.m.	Young Leader Presentations	
Noon	Lunch/Young Leader Presentations	
1:00 p.m.	Wixted Training	**Room: 1L**
4:30 p.m.	Corteva Reception	**Room: Progress Center**
5:30 p.m.	Depart Corteva	
6:15 p.m.	Dinner - Iowa Tap Room · 215 East Third Street · Des Moines, IA 50309	

Thursday, November 30, 2023

Departures

Breakout Rooms for Wixted Training

- **PDR1**
- **PDR2**
- **PDR3**

11/21/2023

2024 ASA Young Leader Program

Phase II: February 27-March 2, 2024

Lodging, Alumni Reception and Awards Celebration
Hilton Americas

Welcome Reception, Training, Commodity Classic
George R. Brown Convention Center (GRBCC)

Tuesday, February 27, 2024 – *Dress: Casual (Jeans are okay)*

6:00 p.m. Welcome Reception & Dinner — **Room: Lamar Balcony/GRBCC**
(*Guests include ASA Executive Committee, ASA Staff and State Representatives*)

Wednesday, February 28, 2024 – *Dress: Business Casual*

7:30 a.m. Breakfast — **Room: 350F /GRBCC**
8:30 a.m. Welcome and Meeting Overview — **Room: 350DE/GRBCC**
- Matt Rekeweg, Corteva Agriscience
- Christine Luelf, ASA

9:00 a.m. "Leading with Your Story"
- Michele Payn, Cause Matters

11:30 a.m. Lunch — **Room: 350F/GRBCC**
1:00 p.m. Ag Advocacy in the State Capitol Context
- Warren Mayberry, State Government Affairs Director, Corteva

2:00 p.m. Reflections on Young Professionals' Experience in DC Government and Policy Roles
- Turner Bridgforth, Federal Government and Industry Affairs Manager, Corteva

3:00 p.m. Break
3:15 p.m. The Economics of the Soybean Industry
- Scott Gerlt, Ph.D., Chief Economist, ASA

3:45 p.m. The Importance of Engagement
- Caleb & Leanne Ragland, ASA Vice President, Class of '12

4:15 p.m. The Importance of Advocacy
- Christy Seyfert, Executive Director of Government Affairs, ASA

4:45 p.m. Young Leader Forum
5:45 p.m. Meet in Hilton Lobby for Dinner
6:00 p.m. Dinner
- House of Blues · 1204 Caroline St · Houston, TX 77002

Thursday, February 29, 2024 – *Dress: Business Casual/No Logo Wear (Individual and group photos will be taken)*

7:30 a.m. Breakfast — **Room: 350F/GRBCC**
8:30 a.m. "Own it! Grow it! Believe it!" — **Room: 350DE/GRBCC**
- Patty Hendrickson, Hendrickson Leadership Group, Inc

11:30 a.m. Plaque Presentation and Photos
Noon Lunch
Afternoon Enjoy Commodity Classic

Suggested Sessions:

12:45-1:30 p.m. *"The Whole Bean: How U.S. Soy Helps Feed & Fuel the World"*
- *Sponsored by the United Soybean Board/Our Soy Checkoff*
- *1st Floor Trade Show Stage*

Draft: 2/21/2024

2:15-3:15 p.m. — *"Managing Through Drought: A Whole Acre Approach"*
- *Sponsored by Corteva Agriscience*
- *Room: 310*

3:30-4:15 p.m. — *"Coordinating Demand for New Fuels and Opportunities for New Crops"*
- *Sponsored by Clean Fuels Alliance America*
- *Room: 310*

"Positioning Your Farm for Long-Term Success"
- *Sponsored by Purdue University Center for Commercial Agriculture*
- *Room: 320*

6:00 p.m. ASA SoyPAC Auction "Rhinestone Cowboy" *Dress: Western/Rhinestones*
- **OPTIONAL – Please note: non-reimbursable/separate registration required**

Friday, March 1, 2024 – On Your Own During the Day

Suggested Sessions:

7:00-8:15 a.m. — *U.S. Farm Report Taping*
- *Grand Ballroom*

8:30-10:30 a.m. — *General Session featuring Tom Vilsak, U.S. Secretary of Agriculture (invited) and Mike Massimo, former NASA Astronaut and best selling author*
- *Sponsored by Corteva*
- *Convention Center, General Assembly (3rd Floor)*

11:00-11:45 a.m. — *"Bridging The Communications Gap Between Industry and Consumers"*
- *Sponsored by United Soybean Board/Our Soy Checkoff*
- *1st Floor Trade Show Stage*

1:45-2:30 p.m. — *"The Agricultural Outlook"*
- *Sponsored by ASA and USB*
- *Room: 310*

3:00-3:45 p.m. — *"Unlocking the Future of Soybeans Through Innovative Research"*
- *Sponsored by United Soybean Board/Our Soy Checkoff*
- *1st Floor Trade Show Stage*

Dress for Alumni Reception/Awards Celebration: Business/Cocktail

4:00 p.m.	Young Leader Alumni Reception	**Room: Lanier Ballroom L/Hilton**
5:00 p.m.	ASA Awards Celebration (Young Leaders have reserved seating at the program)	**Room: Lanier Ballroom/Hilton**

Saturday, March 2, 2024 – Depart for Home or On Your Own

Suggested Session:

9:00 a.m. *ASA Voting Delegates – Dress: Business/Elevated Casual* ***Room: Lanier Ballroom/Hilton***

Houston Livestock Show and Rodeo

Concert: Hardy

Agenda Draft: 2/21/2024

2023 Young Leader Program

Phase III Agenda July 10-14, 2023

The Westin Washington D.C. City Center
1400 M. Street NW
Washington, DC 20005

Monday, July 10, 2023			**Location**
Travel to Washington, D.C.			
	- *Dress: Casual (Shorts/Jeans are acceptable)*		
6:15 p.m.		Meet in Lobby for Dinner	
6:30 p.m.		- Bobby Vans Grill · 1201 New York Avenue NW · Washington, DC 20005	
Tuesday, July 11, 2023			
	- *Dress: Business (Coat & Tie for Men and Similar Attire for Women.)*		
	- *Breakfast on your own*		
7:00 a.m.		Breakfast – On Own	
8:15 a.m.		Meet in lobby to depart for Corteva	**Corteva**
9:00 a.m.		Introduction to Lobbying - Kyle Kunkler, Director of Government Affairs, ASA	*601 Pennsylvania NW, Suite 650* *Washington, DC* (Entrance on Indiana Street/Fiola Restaurant)
9:30 a.m.		Corteva Update - Connor Hamburg, Nutrien - Joe Bischoff, Cornerstone Government Affairs - Thomas Mills, CropLife America - Janae Brady, American Seed Trade Association	
11:30 p.m.		Return to Westin Hotel	
Noon		ASA Board Lunch - Randy Miller, President, Iowa Soybean Association	**National Housing Center** 1201 15th St NW (across the street from the Westin)
1:15 p.m.		Soy Issues Forum	**National Ballroom (*Westin*)**
5:15 p.m.		Adjourn	
6:30 p.m.		Meet in Lobby for Dinner	
6:45 p.m.		- The Smith · 901 F Street NW · Washington, DC	
Wednesday, July 12, 2023			
	- *Dress: Business (Coat & Tie for Men and Similar Attire for Women)*		
	- *Young Leaders with States for the day (Meals, Hill Visits, Soy Reception and Dinner)*		
5:30-7:30 p.m.		Soy Industry Reception on Capitol Hill - Sponsored by ASA & NOPA	**Dirksen Senate Office Building** Room G-50 50 Constitution Ave NE, Washington, DC 20002

9/14/2023

Thursday, July 13, 2023

- *Dress: Business for Meetings (Coat & Tie for Men and Similar Attire for Women) /Activity (Casual (Shorts/Comfortable Shoes for Walking)*

7:00 a.m.	Breakfast Available	**Vista Terrace (*Westin*)**
8:30 a.m.	ASA Board – General Session	**National Ballroom (*Westin*)**
Noon	Meeting Adjourns	
Afternoon	Lunch on your own	
	On Your Own for Sightseeing	

Suggested Sights: Library of Congress, Smithsonian Museum of Natural History, Holocaust Museum, Air & Space Museum

5:00 p.m.	Meet in Hotel Lobby to travel to dinner
5:30 p.m.	Dinner
	- Farmers, Fishers, Bakers · Harbour at The Georgetown Waterfront 3000 K St NW · Washington, DC 20007
7:30 p.m.	Tour of D.C Monuments with private guide
9:00 p.m.	Return to Hotel

Friday, July 14, 2023

Depart for home

2025 ASA Action Partnership (ASAAP)
Membership Information
Arkansas Soybean Promotion Board

The ASA Action Partnership (ASAAP) is a collaborative effort between all soybean industry sectors with a stake in the growth and profitability of the industry. The forum provides the opportunity for state and national checkoff organizations, ASA state affiliates, industry partners and national grower leaders to engage in work to preserve and protect the interests of the soybean industry.

ASAAP Objectives

- Identify and address challenges and issues facing the soybean industry
- Enhance collaboration between soybean growers, soybean organizations and industry
- Impact overall soybean industry strategy and allocate necessary resources to achieve strategic objectives and goals

Meeting Overview

ASAAP meets formally twice a year. The first is a one-day meeting in March. The annual ASAAP retreat in late summer provides an opportunity for in-depth discussions and industry-wide collaboration.

Member Benefits

Membership in ASAAP allows two participants from Arkansas to participate and engage in ASAAP's annual meetings, attended by soybean industry and grower leaders. Additional membership benefits include:

- ASAAP Updates
- Focus group/farmer advisory council opportunities with members and leaders
- Special recognition of ASAAP Members and Industry Supporters in ASA communications to show appreciation for their support.

ASAAP Funding – ASA State Affiliates and QSSB's*

Membership in ASAAP by ASA's state affiliates and QSSB's is based on the state's annual soybean production.

State Soybean Production	ASAAP Funding Level
40 million bushels of soybeans or greater	$6,000 annual membership
39.9 million bushels of soybeans or less	$1,500 annual membership

ASAAP exists as a collaborative effort to unite industry leaders, grower organizations and soybean grower leaders in creative and forward-thinking dialogue to ensure a secure future for the soybean industry.

The Arkansas Soybean Promotion Board membership in ASAAP, based on the dues formula above is $6,000 for 2025.

**ASAAP membership dues invested by the Arkansas Soybean Promotion Board are applied to meeting operational expenses including speaker fees, room rental, audio visual equipment, food and beverage and meeting materials. Funds are not used for lobbying or advocacy.*

Arkansas - DuPont Young Leaders
1984 - Present

State	Class Year	First	Middle	Spouse	Last	Farm/Company Name	Address	Address #2	City	State	Zip	Home	Work	Cell	Email	Spouse Cell	Spouse Email	County
AR	DYL1984	Thomas	R.	Jan	Jacobs	Jacobs Planting Co Inc	690 Hwy 343 S		DeWitt	AR	72042-3490	(870) 830-1030	(870) 946-1256	(870) 830-1030	tjacobs@d-c1.com			Arkansas
AR	DYL1986	Michael		Lucy	Overstreet		Rt 2 Box 182-A		Osceola	AR	72370							
AR	DYL1987	Gary		Jeannie	Sitzer	Sitzer Family Partners	P O Box 386		Weiner	AR	72479-0386	(870) 684-7117		(870) 761-0434	gsitzer@netscape.net			Poinsett
AR	DYL1988	Tom		Pat	Jones		578 Mountain Base Rd		Pottsville	AR	72858	(501) 967-3508						Pope
AR	DYL1989	Richard		M. Jane	LaFargue		Rt 1, Box 42		Gillett	AR	72055							
AR	DYL1990	Dick		Cindy	Howard		PO Box 69		Clarksdale	AR	72325							
AR	DYL1991	Scott			Everett	Scott Everett Farms	R R 2 Box 173A		McCrory	AR	72101	(501) 731-2945						Woodruff
AR	DYL1991	Johnny	H	Vivian	Wilson		3468 Hwy 259		Hickory Ridge	AR	72347	(501) 697-2993						Cross
AR	DYL1992	W. David		Jennifer	Fogleman	Fogleman Farms	2520 Marion Lake Rd		Marion	AR	72364-9552	(870) 739-4445	(870) 739-4445		dfborn2farm@aol.com			Crittenden
AR	DYL1993	Robert		Mary Ann	Stobaugh	Stobaugh Bros. Farms	17 Bruce Circle		Atkins	AR	72823-7613	(501) 354-8767	(501) 354-8767	501-208-1239	rlstobaugh@gmail.com			Conway
AR	DYL1994	John		Susan	Nance		2708 Hwy 145 S		Newport	AR	72112	(870) 217-1620						Jackson
AR	DYL1994	Robert	H.	Cathy	Seidenstricker	Seidenstricker Farms	P O Box 354		Hazen	AR	72064	(702) 553-0128	(870) 255-3718	(870) 830-5143	rhsfarm@gmail.com			Prairie
AR	DYL1995	Byron	E.	Melanie	Orewiler	Orewiler Farms	174 Whitewood Ln		Crawfordsville	AR	72327-2139	(870) 739-4342	(870) 739-4342	(901) 331-1848				Crittenden
AR	DYL1996	Joseph	G	Krissa	Torian		16 Taylor Circle		Conway	AR	72032	(501) 329-5835	501-327-0547		joetorian@conwaycorp.net			Faulkner
AR	DYL1997	Joseph	W.	Wanda	Whittenton, III	Whittenton Farms	1632 SFC 801		Forrest City	AR	72335	(870) 633-8063			jwwhit@aristotle.net			St Francis
AR	DYL1998	John	S	Kimberly	Cooper	Cooper Family Farms	P O Box 1313		Wynne	AR	72396	(870) 238-7513		8705881631	jcooper2@cablelynx.com			Cross
AR	DYL1999	Jackie	C.	Brenda	Prince	Prince Farms	261 Drye Road		Biscoe	AR	72017-9761	(870) 998-2469		(870) 734-8952	jcpbr549@gmail.com			Prairie
AR	DYL2000	Kevin		Sheryl	Hoke	Kevin Hoke Farms			Jonesboro	AR	72401	(870) 935-4347			hokes@fastdata.net			Craighead
AR	DYL2001					Arkansas Dept of Corrections	Attn: David Farabough	P O Box 500	Grady	AR	71644-0500	(870) 850-8758	(870) 850-8758	(870) 692-6353	david.farabough@arkansas.gov			Lincoln
AR	DYL2002	Joe		Renee	Thrash	River Valley Farms	482 Stony Point Rd		Houston	AR	72070			(501) 514-5631	thrash@tcworks.net			Faulkner
AR	DYL2003	Tim		Dana	Smith		21301 Hwy 17 S		Clarendon	AR	72029	(870) 462-8604	(870) 462-8604		tsprecision@live.com			Monroe
AR	DYL2004	Scott		Susan	Matthews	Matthews Farms Partnership	9852 Senteney Rd		Weiner	AR	72479-9014	(870) 684-7240		(870) 919-4949				Poinsett
AR	DYL2005	Dannie	L.	Robin	Daughhetee	Golden Farms Partnership	3855 Proctor Rd		Proctor	AR	72376-9598	(870) 733-0225		9013311437	farmerdann@aol.com			Crittenden
AR	DYL2006	John		Jill	Allen		1502 Fairway Dr		West Memphis	AR	72301-3825	(870) 739-5567			allenhjallen@aol.com			Crittenden
AR	DYL2007	Tim		Becky	Fisher	Tim Fisher Farm	P O Box 112		Wynne	AR	72396-0112	(870) 238-8467	(870) 238-8467	(870) 208-4330	timfisherfarm@gmail.com			Cross
AR	DYL2009	Stephen	Brad	Joyce	Doyle	Eagle Seed Co	P O Box 308/ 8496 Swan Pond Rd		Weiner	AR	72479-0308	(870) 684-7558	(870) 684-7377	(870) 761-7730	brad@eagleseed.com			Washington
AR	DYL2010	Nathan		Brittni	Wright	Wright Farm Ptsp	9035 Evans Ln		Harrisburg	AR	72432-8063	(870) 578-5579			nhw76@yahoo.com			Poinsett
AR	DYL2011	Andy		Stephanie	Noble	Noble Farms	48 Rasco Ln		DeWitt	AR	72042-9405	(870) 946-2616	(870) 344-0786	(870) 946-2617	noblefarmsinc@yahoo.com			Arkansas
AR	DYL2012	Reid		Jamie	Hornbeck	Hornbeck Brothers	1491 Mary Louise Rd		Dewitt	AR	72042	(870) 344-1046	(870) 830-4920	(870) 344-1048	hornbeckgrainfarms@gmail.com			Arkansas
AR	DYL2013	Ryan		Sara	Bell	Cornerstone Partnership	155 Bell Rd		Des Arc	AR	72040-3501	(501) 516-6057	(501) 516-6057	(501) 516-6057	ryan6057@yahoo.com			Prairie
AR	DYL2014	Adam			Cloninger		P O Box 73		Keo	AR	72083-0073				adamd.cloninger@gmail.com			Lonoke
AR	DYL2015	James			Bisswanger	Bisswanger Farms	403 Bisswanger Road		Ethel	AR	72048	(870) 282-3334	(870) 344-0490		james.bisswanger@yahoo.com			Arkansas
AR	DYL2016	Derek		Amanda	Holden		641 Hwy 13		McRae	AR	72102			(501) 281-0439	dheath_91@hotmail.com			Poinsett
AR	DYL2017	Layne		Ryane	Miles		1103 Crooked Bayou Drive		McGhee	AR	71654			(870) 222-8605	laynemiles@milesfarms.net	(870) 222-7357	ryane@milesfarms.net	USA
AR	DYL2018	James			Wray		6847 Wray Lane		Trumann	AR	72401			(870) 253-4205	jwray1992@gmail.com			Poinsett
AR	DYL2019	Kyle		Stacie	Schlenker	Schlenker Farms	1216 Bryanna Cove		Wynne	AR	72396			(870) 318-5324	kschlenker72404@yahoo.com	(870) 208-6012	scschlenker@att.net	Cross
AR	CYL2020	Caper		Alison	Robinson	K & C Farms, Inc.	178 Robertson Loop		Watson	AR	71674			(870) 644-0087	stevencaper@yahoo.com	(870) 644-0087		Desha
AR	CYL2022	Wes			Kirkpatrick	Rondo Farms	227 Amos Bayou Rd.		Tillar	AR	71670			(870) 222-7260	wkirkpatrick1977@gmail.com			Desha
AR	CYL2024	Terrance			Scott	Scott Farms	1144 Woodfin Rd.		Cotton Plant	AR	72036			(870) 329-7748	scottsfarms@yahoo.com			Woodruff

American Soybean Association

Offices: St. Louis, MO. and Washington, D.C.

Arkansas Soybean Promotion Board 2025 Proposal

Mission and Vision

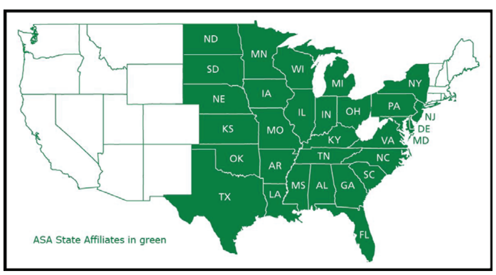
ASA Mission

To advocate for U.S. soy farmers on policy and trade.

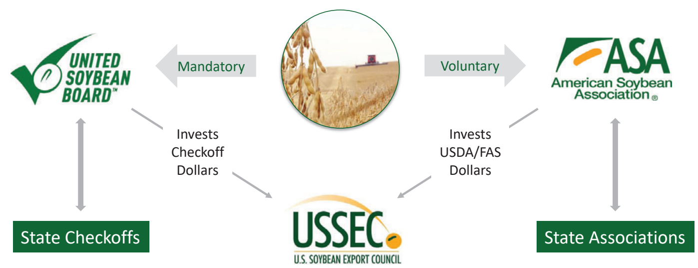
ASA Vision

ASA is the leading soy policy advocate and most sought-after partner and advisor advancing the success and prosperity of U.S. soybean farmers.

26 State/Regional ASA Affiliates Representing 30 Soybean Producing States



Soy Organizational Structure



Working Together as the Soy Family for Farmers

- Tremendous Assets: Checkoff and the Association
- USB-ASA relationship stronger than ever
- Excellent collaboration via USSEC
- ASA–State Affiliate Coordination

ASA Action Partnership (ASAAP)

The primary objectives of the American Soybean Association's Action Partnership are:

- Identify and address challenges and issues facing the soybean industry
- Develop an actionable strategy and allocate necessary resources to achieve strategic objectives and goals
- Collaborate with industry, states and national soybean organizations in the ASAAP

ASAAP meets formally twice a year. The first meeting is a one-day meeting in March and the annual retreat in late summer provides an opportunity for in-depth discussion and collaboration.

ASAAP Membership

Members Include:

Industry: ADM, AGP, BASF, Bayer, Corteva, Chevron Renewable Energy Group, FMC, John Deere, REG, Syngenta, Valent and UPL North America

State Affiliates*:* Arkansas, Delaware, Iowa, Indiana, Kansas, Kentucky, Maryland, Michigan, Minnesota, Missouri, North Carolina, North Dakota, New York, Ohio, South Carolina, South Dakota, Tennessee, Texas, Virginia and Wisconsin

National Organizations: United Soybean Board, U.S. Soybean Export Council, Clean Fuels Alliance America and the Walton Family Foundation

The Arkansas Soybean Board's membership in ASAAP is $6,000 for 2025.

2025 ASA Awards Celebration

The ASA Awards Celebration is an opportunity to recognize and celebrate the achievements and contributions made by soybean farmers and industry.

The banquet showcases the industry and recognizes:

- Leadership achievement and outstanding service by soybean growers, state volunteers and industry leaders
- Highlights key soybean industry initiatives including those in conservation, sustainability, and best management practices
- Inspires innovation and drives future soybean industry growth

Arkansas Soybean Promotion Board 2025 Investment is $6,000.

2025 Economic Analysis and Support

Economic Analysis and Economic Support – ASA's Economist and Economics Department serve a critical role in strategic decision-making by providing analysis and insights and in positioning U.S. soybean farmers interests with influencer groups through various tactics including but not limited to:

- Economic analysis
- Engagement with carbon and environmental markets and life-cycle analysis
- Work in renewable fuels, transportation and trade
- Ongoing review and support related to the farm safety net
- Interactions with other economists related to baseline analysis for markets, conservation programs and safety net spending
- Interaction with ASA Economist
  - Virtual or in person briefings at North Dakota Soybean Council meetings and events by the ASA Economist as requested subject to schedule
  - Receive quarterly threats and opportunities for the soy industry
  - Receive early copies of economic reports generated by ASA
  - Consultations with ASA Economist
    - Discussions of impacts of state or national policy
    - Suggestions for potential researchers to conduct the research/analysis and on project scope and design

ASA proposes the Arkansas Soybean Promotion Board fund $5,000 in Economic Support and Analysis in 2025.

2025 Innovation to Market (I2M) Work Group

The Innovation to Market (I2M) Work Group, is a forum designed facilitate the domestic and international introduction, commercialization and market acceptance of new innovations.

- Identifies and addresses challenges and issues impeding the development, commercialization and market acceptance of seed and crop protection products. Creates a forum to identify strategies for addressing long-term issues that continue to threaten innovation and productivity in the agriculture industry.
- Seek to address asynchronous approvals and making consistent standards and regulatory processes throughout all key export countries.

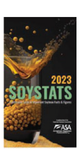
I2M meets in person twice per year. State members may send two participants to the meetings

I2M Work Group Annual Membership – Arkansas Soybean Promotion Board: $7,500.

2025 SoyStats®, A Reference Guide to Important Soybean Facts and Figures

Objectives:

- Collect and analyze annual soybean production and utilization data
- Distribute accurate soybean-specific statistics and information
- Publish a printed guide that can be distributed to growers or customers
- Available at www.SoyStats.com



Investment Request: $600 for 100 printed copies of the 2025 SoyStats.

2025 Soybean Leadership Academy

Soybean Leadership Academy provides:

- Targeted training to state and national soybean board leaders and top staff, increasing their effectiveness as leaders and as boards
- Enhanced collaboration between state affiliate and national soybean organizations, strengthening the voice of U.S. agriculture
- Interaction between senior soybean leadership and newer board members creating strong peer and networking opportunities
- January 8-10, 2025, in Orlando, Florida

Investment Request:

$6,000 investment provides tuition for four (4) Arkansas participants.

2024-25 Young Leader Program State Program

The Young Leader program has identified and trained leaders for the soybean industry for 40 years. The program is a ground-breaker, encouraging diversity by training both partners in the operation.

- Phase I – December 2-5, 2024, in Johnston, Iowa
- Phase II – February 27-March 4, 2025, in Denver, Colorado

We ask the Arkansas Soybean Promotion Board invest $9,200 per couple tuition in the 2025 ASA Corteva Agriscience Young Leader Program.*

Thank you for supporting your state soybean association and the American Soybean Association.

AGREEMENT
BETWEEN
ARKANSAS SOYBEAN PROMOTION BOARD
AND
THE WORLD INITIATIVE FOR SOY IN HUMAN HEALTH (WISHH), MANAGED BY THE AMERICAN SOYBEAN ASSOCIATION

THIS AGREEMENT (the Agreement) is made by and between the Arkansas Soybean Promotion Board and the American Soybean Association (the Association).

WHEREAS, Qualified State Soybean Boards (QSSBs) are authorized to collect assessments under the Soybean Promotion, Research, and Consumer Information Act, 7 U.S.C. §§ 6301-6311 (1999) (the Act);

WHEREAS, the QSSBs are authorized to sponsor projects with any private or public organizations and enter into contracts or agreements to meet the objectives of, and comply with, the Soybean Promotion, Research and Consumer Information Act and Order;

NOW, THEREFORE, for good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the parties hereto do hereby covenant and agree as follows:

SECTION 1: PURPOSE

1.1 Purpose: The Arkansas Soybean Promotion Board has determined that a coordinated management program is necessary to identify, maintain and expand international markets for domestically produced soybeans and soybean proteins. The Association, through WISHH, shall manage international marketing efforts to promote the use of U.S. soy protein in human diets.

1.2 Project Implementation by Association. The Association may develop and implement projects pursuant to this Agreement. The Association shall submit proposals and strategies in a format requested by the ASA/WISHH Committee. The project proposals shall specify the services to be performed and expenses to be incurred within the project proposals. The Association shall not implement any proposed projects unless and until approved by the Committee in formal action. The Association may subcontract to implement such projects.

1.3 Coordination with Outside Funding. Projects and activities conducted under this Agreement should be closely coordinated with activities conducted by the Association with funds provided by other QSSBs, United States Department of Agriculture (USDA), United States Agency for International Development (USAID), corporate sponsors and other funding entities.

1.4 Combined Funding. The Arkansas Soybean Promotion Board and other QSSBs will combine funds to carry out the purpose outlined in Section 1.1. The WISHH Committee has approved a combined QSSB funds budget of $1,442,000 of which this contract is a part of the total amount.

SECTION 2: PAYMENT TERMS

2.1 Period of Agreement. This Agreement for Project Q1000.24 shall commence and be effective as of October 1, 2023 and shall terminate on September 30, 2024.

2.2 Terms of Payment: The Arkansas Soybean Promotion Board agrees to pay ASA $35,000.00 for the services outlined in Section 1.1. The Association shall invoice the Arkansas Soybean Promotion Board the full amount of the contract and will include the contract project number (if applicable).

The Arkansas Soybean Promotion Board shall make payment of all proper invoices issued in compliance with this agreement within thirty (30) days of receiving them.

SECTION 3: TERMS AND CONDITIONS

3.1 Services.

(a) Program Director. Gena Perry is the Executive Director for the WISHH Program managed by the Association pursuant to this Agreement (hereinafter, Executive Director). The Arkansas Soybean Promotion Board staff coordinator shall be the principal contact person at Arkansas Soybean Promotion Board concerning matters arising under this Agreement. In the event the Arkansas Soybean Promotion Board is unable to work with the Executive Director, the Association shall take reasonable steps to resolve any problems and, if necessary, designate a new representative.

(b) Compensation & Administrative Services Costs. The combined general program funds from the QSSBs shall compensate the Association for a portion of the services of those Association employees designated in Attachment A. The Association shall charge no more than $1,442,000 for such services based upon the projected costs set forth in Attachment B. Compensation shall include all benefits, employer-paid taxes and overhead associated with the designated employees. The cost for the administrative services reimbursed by the combined QSSB and program funds shall not exceed the projected costs for each category as described in Attachment B. An additional cost breakdown of QSSB funding can be found in Attachment D.

(c) Work Performed by Association Employees. Association employees who are funded by the combined QSSB funds (Funded Employees) shall keep accurate time records identifying time spent (i) managing and implementing market development programs under the WISHH Program and, (ii) conducting all other activities, including the Association or implementation work (hereinafter Other Work). Funded Employees are employees of the Association, and the combined QSSB funds shall reimburse the Association for the costs of such employees based on actual cost of such employees for the percentage of time that such employees provide services to activities under the WISHH Program. For employees that provide services to both the WISHH Program and the Association's Membership and Policy Department, the amalgamated QSSB funds shall be used to reimburse the Association for the actual cost of such employees for the percentage of time that such employees provide services to the WISHH Program pursuant to this Agreement.

3.2 Expenses.

(a) Allowable Expenses. The Arkansas Soybean Promotion Board funds may be spent by the Association through the WISHH Program for its reasonable, ordinary, and necessary out-of-pocket expenses, administrative services (see Attachment B) and direct costs incurred by the Association on behalf of the Arkansas Soybean Promotion Board to the extent permitted by the Act, Order, and this Agreement.

(b) Overriding Total Cost Limitation. Notwithstanding anything in this Agreement to the contrary, the parties agree that the total Compensation and Reimbursable Expenses under this Agreement shall not exceed $1,442,000 unless modified by WISHH Committee action.

(c) Funding Reconciliation. Within 90 days upon completion of the project, Association shall reconcile actual expenditures to the sum of all billings and the cash payments with the combined QSSB funds. Any funds that were not expensed shall be reimbursed on a pro rata basis to QSSBs contributing at least 5% to the total QSSB budget. In no case shall actual expenditures exceed $1,442,000 unless the budget is amended by the WISHH Committee. Only actual costs, as defined in paragraph 3.2(a) Allowable Expenses and related to the project, shall be billed to the combined QSSB funds.

3.3 Reporting.

(a) The Association will send financial statements on a quarterly basis as soon as they are completed and approved by the WISHH Committee. The Arkansas Soybean Promotion Board may request additional documentation to verify compensation and expenses. Quarterly administrative and strategic reports will be sent January 31, April 30 and July 31. All funding provided to the Association, including funds for staff, overhead, and administration will be supported by project and financial reports substantiating how the combined QSSB funds were used by the project(s).

(b) A final report summarizing all completed work, results and conclusions will be sent to the Arkansas Soybean Promotion Board by October 30. Final financial statements will be sent as soon as they are completed and approved by the ASA Board. The final report shall include information developed during all projects. If the Association cannot finish the final reports by the above-mentioned dates, it shall notify Arkansas Soybean Promotion Board in writing prior to that date.

(c) The Arkansas Soybean Promotion Board may request additional reports or information, as it deems necessary. The Arkansas Soybean Promotion Board staff shall provide guidance to the Association on the content of each of these reports.

SECTION 4. ADDITIONAL PROVISIONS

4.1 Records. The Association shall keep accurate records, books, documents, and papers, involving transactions related to the Agreements (Records) and shall retain records for at least three years beyond the last fiscal year period to which they apply. The Arkansas Soybean Promotion Board and their designated representatives may inspect and audit the Records during regular business hours. The Association shall include in all subcontracts related to the Agreements a provision requiring the subcontractor to retain Records for at least three years after termination of the subcontract or final payment under the subcontract, whichever is later. The provision shall provide that the Association or their duly authorized representatives may inspect, copy and audit such Records. The term "subcontract" as used in this subparagraph excludes (i) purchases under $2,500.00 and (ii) subcontracts or purchase orders for public utility services at rates established for uniform applicability to the general public.

4.2 Evaluation. At the Arkansas Soybean Promotion Board request, the Association shall cooperate with Arkansas Soybean Promotion Board to facilitate the Arkansas Soybean Promotion Board or third-party evaluation of projects or activities conducted pursuant to this Agreement.

4.3 Equipment. Equipment previously purchased with both Association and QSSB funds shall be jointly owned and shall be used solely for carrying out projects conducted pursuant to the Agreement. The Association shall maintain a current inventory of all equipment and furniture purchased by ASA/WISHH with QSSB funds. In the event the WISHH Program is discontinued, the Association will provide an inventory of equipment and property purchased for the WISHH Program with QSSB funds.

4.4 Equal Opportunity. The Association agrees that during the performance of the Agreement, it shall not discriminate against its customers, employees, and applicants for employment on the basis of race, color, national origin, age, disability, sex, gender identity, religion, reprisal, and where applicable, political beliefs, marital status, familial or parental status, sexual orientation, or all or part of an individual's income is derived from any public assistance program or activity conducted. The Association agrees that it will fully comply during the term of the Agreement with any and all applicable Federal, State and local equal employment opportunity statutes, ordinances, and regulations, including, without limitation, Title VII of the Civil Rights Act of 1964, the Age Discrimination in Employment Act of 1967, the Americans with Disabilities Act of 1990, and the Equal Pay Act of 1963. Nothing in this section shall require the Association to comply with or become liable under any statute, ordinance, regulation or rule that does not otherwise apply to the Association.

4.5 No Funds for Influencing Governmental Policy. The Association shall not use any funds advanced or paid by the Arkansas Soybean Promotion Board for the purposes of influencing governmental policy or action, nor other activities, which do not comply with the Soybean Promotion, Research and Consumer Information Act and Order. Congressional members and delegates shall not be admitted to any share or part of this contract or to any benefit to arise there from, unless it is with a corporation for its general benefit. The Association represents and warrants that it has not employed or retained a person or agency to solicit or secure this contract for a commission, percentage, brokerage or contingent fee, except for bona fide employees or established commercial agencies maintained by the Association for the purpose of securing business. If the Association breaches this representation and warranty, the Arkansas Soybean Promotion Board may terminate this contract and pursue all available legal and equitable remedies. Alternatively, the Arkansas Soybean Promotion Board may deduct from the total costs, or otherwise recover, the full amount of such commission, percentage, brokerage or contingent fee.

The Association acknowledges that funding provided from the Arkansas Soybean Promotion Board is soybean checkoff funding and must comply with the Soybean Promotion, Research and Consumer Information Act and Order. It is the responsibility of the Association to ensure that the activities pursuant to this agreement are checkoff compliant.

4.6 Relationship of Parties. The parties agree that the Association and its agents and employees are independent contractors and not officers or employees or agents of the Arkansas

Soybean Promotion Board or the United States Government, or any department, bureau, commission, officer, or employee thereof.

4.7 Assignability. The Association shall not assign this Agreement, in whole or in part, without the approval of the Arkansas Soybean Promotion Board.

4.8 Hold Harmless

(a) To the extent allowed by law, the Arkansas Soybean Promotion Board will hold harmless the Association and its officers, agents and employees for any claims, demands, losses, costs, damages and expenses of every kind in description, to persons or property arising out of or in connection with or occurring during the course of this ~~Contracts~~, where such liability is founded upon or grows out of, in whole or in part, the acts or omissions of any of the officers, employees or agents of the Arkansas Soybean Promotion Board. The Association agrees to indemnify and hold harmless the Arkansas Soybean Promotion Board for any claims, demands, losses, costs, damages or expenses arising out of or in connection with its use of any specific trademark, name, slogan or other material, which the Association furnishes to the Arkansas Soybean Promotion Board for use in the completion of Project.

(b) Either party will promptly notify the other of any lawsuit or other claim alleging any loss or damage for which the other party may be obligated to give indemnity pursuant to paragraph 4.7(a) above. Each party will deliver to the other a copy of the claim and all supporting documents submitted by the claimant. The party responsible for indemnity shall then at its expense undertake to defend, settle or otherwise dispose of the claim. The indemnified party shall refrain from paying the claim, pending conclusion of the proceedings. Each party will fully cooperate with the other in attempting to resolve any claim, provided, however, that neither party shall be obligated to participate in any disposition of a claim if said disposition, by consent judgment, arbitration or otherwise (not including an order for the payment of money) would affect such party's business activities as they relate to products or services other than the product(s) or service(s) on which the claim arose.

4.9 Termination. Either party may terminate the Agreement if the other party commits a material breach. The non-breaching party shall provide the breaching party with written notice of the breach, and, unless the breach cannot be cured, the breaching party shall have 30 days in which to cure the breach (the Cure Period). If the breaching party does not cure the breach in the time allowed, the Agreement shall immediately terminate on receipt of written notice by the non-breaching party. The Arkansas Soybean Promotion Board may terminate the Agreement with 90 days written notice or with 30 days written notice if the Secretary of Agriculture terminates the Order. If the Agreement is terminated pursuant to this section, the Association shall be entitled to all undisputed Compensation and Reimbursable Expenses incurred up to and including the termination date. The Arkansas Soybean Promotion Board may, in its sole discretion, determine whether work-in-progress is complete for payment purposes. For work performed after termination, the parties shall negotiate compensation.

4.10 Governing Law. The Agreement shall be governed by and construed in accordance with the laws of the State of Arkansas without regard to conflicts of law principles.

4.11 Ownership Provisions. With the exception of trademarks or service marks already developed and owned by the subcontractor carrying out the project, the title, rights and interest in any copyrights, materials and information resulting from any activity carried out pursuant to this Agreement shall become the property of ASA/WISHH, which may be licensed by ASA/WISHH. Any funds generated from use of such copyrights, materials and/or information owned by ASA/WISHH shall become income to ASA/WISHH.

4.12 Headings. The Headings contained in the Agreement are for convenience of reference only and shall not affect the interpretation of the Agreement.

4.13 Final Integration/Subsequent Modification. This Agreement includes the final integration of all terms, conditions and agreements of the parties with respect to the subject matter of this Agreement. The parties agree that any prior agreements and any other papers or documents discussing invoicing, billing, reconciliation, or any other aspect of this Agreement that are not expressly referenced and incorporated into this Agreement shall not be used as a basis for construing or interpreting this Agreement. The parties may modify or extend this Agreement only in writing.

4.14 Counterparts. This Agreement may be signed in counterparts.

American Soybean Association

Name: Vickie Wilkes Date November 2, 2023

Title: ASA/WISHH

Arkansas Soybean Promotion Board

Name: Scott Bray Date 11/3/2023

Title: Administrator, AR Soybean Promotion Board

Attachment A
Compensation[1] will be Assessed for the Following Personnel

Position	Incumbent	Job Function
Executive Director	Gena Perry	Directs program aimed at enhancing human well-being through soy by working with populations in the developing world.
Chief Operating Officer	Vickie Wilks	Manages the operations and implementation of contracts, programs and projects between home-office and field personnel. Supervises St. Louis based support staff.
Manager of Program Operations	Eric DeMerit	Manages program administrative and compliance matters for WISHH Program. Administers activity assignments, consultant contracts and payments, travel arrangements, trade team logistics, QSSB contracting, project agreement processing, contracting, government agreements, payables and other program related activities.
Project Director of Global Strategy Engagement	TBD	Responsible for the planning and administering of activities and projects in developing countries/fragile states in Africa. This position includes oversight of the overall programs, program budgets, coordination of efforts of team members, partners, and third-party contractors and/or consultants.
Director of Monitoring & Evaluation	James Bernhardt	Responsible for the overall administration of monitoring and evaluation related functions connected to ASA's USDA funded CAST Cambodia Food for Progress project. This position provides technical direction for the CAST M&E systems, processes, analysis, and reporting.
Project Director-Asia	Alan Poock	Responsible for the planning and administering of activities and projects in developing countries/fragile states in Asia. This position includes oversight of the overall Asia program, program budgets, coordination of efforts of team members, partners, and third-party contractors and/or consultants.
Project Director – Latin America & Special Projects	Marypat Corbett	Responsible for UES annual submission, Cochran Fellowship program, Latin America market development & QSSB proposal development.
New Business Development Lead	TBD	Responsible for oversight of the overall programs, program budgets, coordination of efforts of team members, partners, and third-party contractors and/or consultants and international development trajectory, including business development, for the WISHH Program.
Project Director, CAST	TBD	Responsible for the planning and administering of activities and projects in Cambodia for the CAST project
Project Director, Ivory Coast	TBD	Responsible for the planning and administering of activities and projects for the Ivory Coast Food for Progress project.
Project Manager – Africa	TBD	Responsible for assisting with the planning and administering of activities and projects in the Africa region.

		This position includes oversight of select WISHH projects, program budgets, coordination of efforts of team members, partners, and third-party contractors and/or consultants to ensure quality control and that the activities are carried out according to plan.
Program Coordinator – Special Projects	Leila Payer	Assists with the day to day administrative and programmatic activities; communicates with staff, consultants and partners overseas; supports the overall WISHH program as needed as directed by the WISHH Executive Director and COO.

[1]Combined general program funds from the QSSBs shall compensate the Association for a portion of the services of the Association employees designated in Attachment A. However, if ASA/WISHH secures additional funds, which can be used to pay compensation, then funds for compensation under this agreement will be reallocated to direct cost program expenses. This may also be feasible for Administrative Services costs. If additional ASA/WISHH funds are less than anticipated, the QSSB percentage share may increase in order to cover compensation and administrative costs.

Attachment B

Compensation and Administrative Services Budgets

Compensation & Administrative Services	QSSB Budget	Cost Share with Other Funding Sources	Total WISHH
Compensation (see Section 3.1(b) and Attachment A) HR costs are included as part of TriNet contract billing	$88,000	$1,422,759	$1,510,759
Accounting Services Based on estimated hours at an average billing rate	$47,026	$117,874	$164,900
Operations Cost/IT Support Based on number of WISHH employees	$71,963	$0	$71,963
Building Cost Based on square feet	$81,969	$0	$81,969
Total	**$288,958**	**$1,540,633**	**$1,829,591**

Funds and Program Management Procedures

Overview

ASA/WISHH has specific procedures for the review and payment of invoices, expense reimbursements and contract payments. The procedures followed are detailed below. ASA/WISHH also complies with specific funding source requirements.

All costs billed to ASA/WISHH must relate to the scope of approved project activities and be necessary and reasonable to the planning or completion of the approved activities and must be supported by sufficient underlying documentation.

Procedures

Each week the Manager of Program Operations reviews invoices, expense vouchers and contracts for payment. The Manager of Program Operations uses the Compliance Review Checklist to ensure the accuracy and completeness of each item before it is submitted for payment. The Manager of Program Operations ensures that all relevant documentation is included and that the proper project and expense numbers are noted. The Manager of Program Operations investigates and resolves any questionable items or discrepancies and obtains missing documentation such as receipts. The Manager of Program Operations uploads invoices, expense vouchers and contract packets into Xledger for the Accounting Coordinator to review. The items are then sent to the regional directors and to the Chief Operating Officer to review and approve for payment. These documents, upon approval, bear the electronic approval in the Xledger accounting system.

After invoices, expense vouchers and contracts are approved for payment, the Manager of Program Operations gives hard copies to the ASA/WISHH Accountant. The Accountant reviews each request for payment and its supporting documentation for accuracy, reasonableness and completeness using the Compliance Review Checklist. The Accountant re-computes each expense report. The Accountant investigates and resolves any questionable items or discrepancies. After the review is conducted, the Accountant enters each payable into the accounting system and cuts checks. When a wire transfer payment is needed, the Accountant prepares a bank wire transfer authorization and the associated journal entry. The Accountant gives the checks, wire transfer forms, journal entries, invoices, expense vouchers and contract packets to the Association Accountant for review and signature.

The Association Accountant reviews the materials and then electronically signs the checks, wire transfer forms, and gives all materials to the Chief Finance Officer for review and approval.

<u>Section 1: Procurement of Goods and Services</u>

1.1 The Chief Operating Officer shall review non-contracted expenditures for reasonableness and necessity.

1.2 The ASA/WISHH Committee will approve a budget for equipment purchases. Board approval is required if amount exceeds the approved equipment budget.

1.3 Receipts, invoices or contracts shall be provided for all individual expenses over $25.

1.4 Invoices submitted for payment must be accompanied by a Check Request/Wire Request Form. An invoice must be attached. The Check Request Form must specify the proper account and project numbers. The Manager of Program Operations verifies the account numbers.

1.5 ASA/WISHH will base solicitations for professional and technical services on a clear and accurate description of the requirements for the services to be procured, usually in the form of a scope of work (SOW).

1.6 ASA/WISHH shall conduct competitive bidding processes on contracts paid from QSSB funds unless a subcontractor has been previously identified to conduct the project. In situations where ASA/WISHH believes that competitive bidding is not appropriate, ASA/WISHH will provide the rationale for not conducting competitive bidding and identify the process used to ensure competitive rates were contracted for the project activity. Other funding sources require competitive bidding for contracts over $25,000 (FMD, EMP, QSP and other general contracts) and /or $35,000 (MAP, GBI and ATP) and this is the universal ASA/WISHH standard.

1.7 No employee will participate in the selection or award of a contract in which such employee or the employee's family or partner has a financial interest.

1.8 ASA/WISHH will conduct all contracting in an openly competitive manner. Individuals will develop or draft specifications, requirements, statements of work, invitations for bids, and requests for proposals for procurement of any goods or services.

Section 2: Travel Policies

2.1 Travelers must obtain prior written authorization from the Chief Operating Officer, by completing an Association travel authorization form.

2.2 Association staff and the Chief Operating Officer shall closely monitor travel, lodging and entertainment expenses. The Chief Operating Officer shall evaluate whether contemplated trips are reasonable and necessary.

2.3 Travelers must fly coach or the most economical fare. For international travel, business class is acceptable for checkoff funded air travel. Federal government regulations require U.S.-based travelers to use U.S.-flagged carriers when travel is paid from federal contract funds. Most federal funding sources require that international tickets be coach class and do not allow business class options.

2.4 Domestic Meals & Incidental Expenses (M&IE) shall not exceed $120/day, taken as an average over the length of the trip. International M&IE is reimbursed on a per diem basis per federal travel regulations.

2.5 Air and hotel reservations must be made as far in advance as possible to obtain the most favorable cost.

2.6 Pinnacle Financial Partners Master Card Corporate Cards are to be used for travel-related expenses where possible. Card member is responsible for timely payment so that no interest or penalties are incurred. If any interest or penalties are incurred, they are the card member's responsibility to pay and are not reimbursable.

2.7 All travel-related expenses must be submitted on a Personal Expense Voucher with receipts attached for individual expenses over $25, including lodging and airline ticket receipts. The voucher must show business purpose, date, and location for expenses incurred.

2.8 Travelers using their private vehicles will be reimbursed at the legal rate established by the IRS for that year.

2.9 The foreign exchange rate must be documented. Acceptable documentation includes proof of exchange rate used in obtaining foreign currency, foreign exchange conversion from credit card bill, or documented rate from a foreign exchange rate web site.

2.10 ASA/WISHH will purchase airline tickets for consultants whenever possible. Reimbursement of airline tickets is contingent on the submission of original passenger receipts. Other forms of proof of ticket charge (e-ticket and/or credit card receipt) and proof of travel (boarding pass) can be considered as sufficient documentation on a case-by-case basis.

Section 3: Consulting Services – Domestic and International

3.1 For typical services for which there is a relatively large pool of qualified consultants, fees shall not exceed the level of a U.S. Government employee of the classification GS-15, Step 10 (currently $585.60 per day).

3.2 For services for which very specific qualifications or experience is needed and the pool of qualified consultants is limited, based on objective criteria, ASA/WISHH will negotiate a fee that does not exceed $600 per day.

3.3 When few qualified consultants are available due to specific knowledge, language capability, etc. and who cannot be procured for the daily rates enumerated above, ASA/WISHH will negotiate a contract rate based on the statement of work and qualification criteria. When QSSB funds are used, the statement of work and qualification criteria will be submitted to the ASA/WISHH Board for evaluation.

3.4 ASA/WISHH will write end-result contracts with consultants for specific activities whenever possible. The total contract amount will include the consulting fee, any lodging and meals on a per diem basis, local transportation costs and an amount to cover office supplies and miscellaneous expenses. Unless specified, ASA/WISHH will not reimburse excess expenses. Unless specified, airline tickets are purchased by ASA/WISHH.

3.5 Some contracts based on scopes of work will include only the consulting fee. ASA/WISHH will reimburse actual costs for transportation expenses, office supplies, and miscellaneous expenses up to a specified amount. Other contracts will roll estimated incidental costs into the contract amount.

Attachment C

FY24 Budget Project Listing

Project Description	QSSB Budget Detail	Proposed Budget
Contractual Services		**$124,110**
Contractual services include consultant contracts with KCE Communications, (Senior Advisor), Website maintenance, M&E and Regional Support; Contractual services for strategic planning, Annual Report Video, new project exploration, program implementation and potential new funding proposal development.	124,110	
Meetings, Workshops and Conferences		**$68,800**
Participation in events held by others that share our objectives	22,000	
Committee meeting costs include travel, facility rental, AV, F&B, governance consultant, printing, and postage.	48,800	
Travel		**$19,500**
Travel to domestic destinations for events and Committee meetings including Washington, DC, and other locations to meet with PVOs, multilateral aid and development institutions and funding sources.	4,500	
Travel to international destinations: three trips for current project management, market prospecting and research for future activities and funding.	15,000	
General Program & Project Development		**$100,000**
Project development activities including PVO MOU servicing, exploratory trips, cooperative agreements with PVOs to implement pilot projects, proposal/budget development	100,000	
Project Match Support		**$713,732**
Project Match Support for Market Development Funding that WISHH receives from USDA that requires a participant contribution match. The funding programs include the Emerging Market Program (EMP), Foreign Market Development Funding (FMD, Market Access Funding, (MAP), Global Broad-Based Initiative Funding (GBI), Cochran Program, Agricultural Trade Promotions (ATP)	713,732	
General Project Administration Expenses		**$415,858**
Acct., IT, Operations, Building	200,958	
Compensation	88,000	
Office supplies, printing, computers, software, maintenance, postage, professional development, communications,	47,800	
Other Costs: bank fees, interest, insurance costs, audit fees, dues and subscriptions, website hosting	79,100	
Total		**$1,442,000**

Arkansas Soybean Promotion Board Proposal

PROJECT TITLE: WISHH FY24: The Future of New U.S. Soy Export Sales - Developing & Emerging Markets

BUDGET REQUESTED: $40,000 **FISCAL YEAR**: FY2025 **PROJECT END DATE**: June 30, 2025

PROJECT OVERVIEW: In a time of slowing U.S. soy demand from China and higher soy production and exports from Brazil, ASPB's goal to improve the sustainability and profitability of Arkansas soybean producers and our WISHH goal definitely align. Finding and opening up new U.S. soy export markets will be an important source of Arkansas soybean producers' future revenue. New export markets in developing and emerging countries can add new Arkansas and U.S. soy demand. They also spread soybean producers' export risk across more destinations and can help mitigate trade disruptions. WISHH has demonstrated a solid track record of establishing brand-new U.S. soy customers in markets that have never or rarely imported U.S. soy. New U.S. soy trade has taken root in WISHH countries over the last 10 years. Soy exports into WISHH program countries grew at a compound annual growth rate of 7.51%. By positioning Arkansas and U.S. soy as a vital ingredient for feed and food manufacturers in developing and emerging countries, WISHH can offer soy as a solution to those countries' protein/food supply challenges.

OTHER WISHH FUNDING SOURCES: Investing in WISHH in fiscal 2025, would put Arkansas soybean farmers in the position to leverage well over $10 million in funding from more than 20 other QSSB investors, multiple USDA/Foreign Agricultural Services grants, and United Soybean Board funding along the lines of the FY24 example summarized here:

Funding Source	Amount
USDA FAS, Foreign Market Development and Market Access Program FY25 projects	$5,895,094 (Proposed)
USDA Regional Agricultural Promotion Program	~$27 million from FY24 – FY29 (Submitted 2/2/2024)
USDA Food for Progress grant: Ivory Coast Aquaculture	$4.1 million from FY23-FY28
USDA FAS, Agricultural Trade Promotion Program (ATP)	$3.74 Million from FY19-24
USDA Food for Progress grant: Commercialization of Aquaculture for Sustainable Trade (CAST) grant & 2-year merit-based extension to establish a sustainable aquaculture industry in Cambodia	$17.1 million from FY19 – FY23 & $1.6M 2-year extension FY24-FY25
USDA Emerging Market Program	$741,278
United Soybean Board FY24 Projects	$2,862,000
20+ other QSSBs	$1.5 Million (Requested)

Every year WISHH aggressively seeks non-check off funding sources and submits grant proposals to a variety of federal programs in order to leverage U.S. soybean farmer checkoff investments in the WISHH Program. Over the last seven years, WISHH has successfully leveraged U.S. soybean farmer checkoff investments 6 to 1. The total WISHH budget for fiscal year 2024 is $16 million, with QSSB base funding making up $1,442,000 of that total. A FY2025

$40,000 investment by the ASPB would equate to approximately a 2.8% share of FY25 WISHH QSSB funding. [*Please see Appendix 1 for the example of FY24 QSSB General Funding Budget for WISHH*.]

PROJECT WORK PLAN: WISHH works on three continents and in twenty-eight developing and emerging countries that have long-term, robust population growth projections and high global rankings on protein deficiency and food insecurity. These data equate to very promising demand for protein rich food for decades to come. In addition, over the last five years the regions in which WISHH works have had some of the highest global venture capital and funding investment activity in the logistics/transportation, energy, and financial technology sectors. This matters because these investment sectors help ensure supply and value chains can advance and accommodate growing end-consumer demand for soy.

WISHH will be opening and expanding new export markets in (sub-Saharan Africa) Benin, Burkina Faso, Ethiopia, Ghana, Guinea, Guinea- Bissau, Ivory Coast, Kenya, Mali, Nigeria, Senegal, Sierra Leone, Tanzania, Togo, Uganda, Zambia, (Asia) Cambodia, Myanmar, Sri Lanka, Uzbekistan, Kazakhstan, and (Latin America) Costa Rica, Dominican Republic, El Salvador, Guatemala, Honduras, Nicaragua, and Panama. Our approach involves working with prominent entrepreneurs and influencers in the feed, aquaculture, and food industries. What WISHH has found working exclusively in developing and emerging markets is that before prospective buyers in brand-new markets will import U.S. soy, they must be confident that soy works in their operations, their customers want it, and their businesses can profit from it. Within the feed and food industries in WISHH countries, our demand building tactics are customized for the cultures in which we work and include (1) in-country, U.S. soy representation; (2) providing mentoring and customized technical assistance to support the adoption and use of soy in poultry, pork and aquaculture feed, and in food applications; (3) supplying prospects, new customers, and influencers with in-depth educational experiences that inform and emphasize the intrinsic and extrinsic value of U.S. soy; (4) hosting feed/food technology, marketing or nutrition events which promote and demonstrate the benefits of utilizing U.S. soy; and (5) generating opportunities and fostering business connections between U.S. soy exporters, prospective buyers, Arkansas and other U.S. soybean farmers.

A big part of the 'how' WISHH moves our work forward in developing and emerging countries is by being very intentional with our networking and leveraging of over 60 partners worldwide. Equipment companies, soy protein ingredient suppliers, a stable of feed and food industry experts and mentors, in-country influencers and local associations, and other U.S. commodity promotion organizations enable us to amplify the U.S. soy brand and soy in human health messaging. By working with USDA/FAS country offices, land grant universities and their overseas' sister universities, in-country non-governmental organizations, machine fabricators, and others, we can leverage their in-country work to complement our new soy demand building efforts.

MEASURABLE PROJECT MILESTONES: The following quarterly project activities and timeline which may be adjusted due to changes in U.S. and other target country governments trade policies; conflicts arising within target countries; or travel obstacles such visa issues, human health alerts, highly pathogenic avian influenza (HPAI) and U.S. soy's African Swine Fever travel protocols.

WISHH FY25 Global Activities Timeline (Tentative)	Q1	Q2	Q3	Q4
Securing technical expertise needed & finalizing customized technical assistance consults	X	X	X	X
In-country technical consultant visits	6	14	2	15
Planning and conducting WISHH educational events	2	6	4	2
Trade team planning and member recruitment	X	X	X	X
Escorting trade teams to in-depth technical training/educational events	2	7	7	9
Soy promotion campaigns in Uganda and Ghana	X	X	X	X

PERFORMANCE METRICS: Using generally accepted marketing research best practices, the following WISHH Program Key Performance Indicators will be tracked throughout the year to measure progress and success. Measurements will be collected from participating target audiences utilizing surveys via a web-based application used to manage and describe output and outcomes. The FY25 program Key Performance Indicators and goals for WISHH Developing and Emerging country market sectors will likely be similar to the FY24 KPI and goals listed here:

- 73% of the target audience will continue or expand their use of U.S. soy products.
- 66% of the target audience not currently using U.S. Soy, will indicate they will use U.S. soy products within the year.
- 87% of the target audience will understand the nutritive, economic, or functional benefits of using soy as an ingredient.
- 87% of the target audience will commit to further product research and development incorporating soy.

DELIVERABLES:

- WISHH will provide ASPB quarterly narratives and financial reports: January 31, April 30, and July 31. A Final Report summarizing completed work, results and conclusions will be sent by October 31, 2025. The reports will summarize the progress made on the activities undertaken as well as updates on Key Performance Indicator goals.
- In-person/virtual presentation to update the ASPB on the progress of the WISHH Program.
- Providing Arkansas soybean farmers with ASA/WISHH activities results through a variety of news outlets such as LinkedIn; ASA/WISHH YouTube Channel; WISHH.org; ASA eBean; ASA Magazine; media releases provided to news services, and through the USDA/FAS.
- Upon request and in collaboration with ASPB, additional reports or information will be provided.

BENEFITS TO SOYBEAN GROWERS: WISHH's leveraging efforts will continue throughout Fiscal 2025, with the same goal we have had over the last seven years – to bring in at least an average of an additional $6 for each Qualified State Soybean Board (QSSB) invested dollar received to support U.S. soy's long-term market development work. In addition, the WISHH Program provides opportunities for farmers to travel to Frontier Markets in Sub-Saharan Africa, Asia, and Latin America to gather first-hand proof of the diverse soy trade opportunities under construction in these new U.S. soy destinations.

PROJECT TEAM MEMBERS: WISHH's implementation team has 86 combined years of international business/market development experience, with 83% having lived in countries such as those WISHH currently works in. As a result, the WISHH program staff leverages an extensive and vibrant network of USDA Foreign Agricultural Service staff, international and U.S. industry experts, universities, other U.S. commodity export advocating organizations, as well as non-government organizations. All play key partnership roles throughout the program year – supplying such support as technical short courses/labs; seminar speakers; mentoring; and donating time to build relationships with new customers.

Appendix 1: FY24 QSSB GENERAL FUNDING BUDGET FOR WISHH

FY24 Budget Project Listing		
Project Description	**QSSB Budget Detail**	**Proposed Budget**
Contractual Services		**$124,110**
Contractual services include consultant contracts with KCE Communications, (Senior Advisor), Website maintenance, M&E and Regional Support; Contractual services for strategic planning, Annual Report Video, new project exploration, program implementation and potential new funding proposal development.	124,110	
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General Project Administration Expenses		**$415,858**
Acct., IT, Operations, Building	200,958	
Compensation	88,000	
Office supplies, printing, computers, software, maintenance, postage, professional development, communications,	47,800	
Other Costs: bank fees, interest, insurance costs, audit fees, dues and subscriptions, website hosting	79,100	
Total		**$1,442,000**
Arkansas Soybean Producer's Percentage of QSSB General Budget	$40,000	2.8%

[a] The WISHH QSSB general project implementation budget is approximately 9% of the total WISHH Program 2024 budget of $16 Million.

FY24 Arkansas Soybean Promotion Board
WISHH Program Update & Proposal

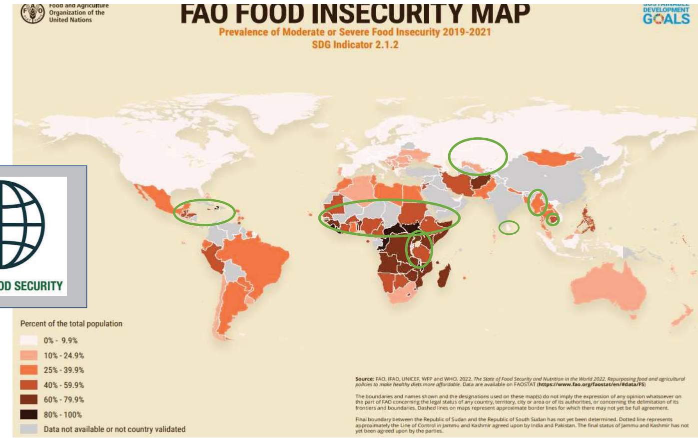
NEW MARKET EXPLORATION AND DEVELOPMENT

DIVERSIFIED STRATEGIC PARTNERSHIPS

GLOBAL FOOD SECURITY

WISHH

GLOBAL FOOD SECURITY



The DEVELOPING AND EMERGING Markets OF TODAY are the home of TOMORROW'S U.S. soy CUSTOMERS and a source of YOUR FUTURE REVENUES

New Market Exploration and Development

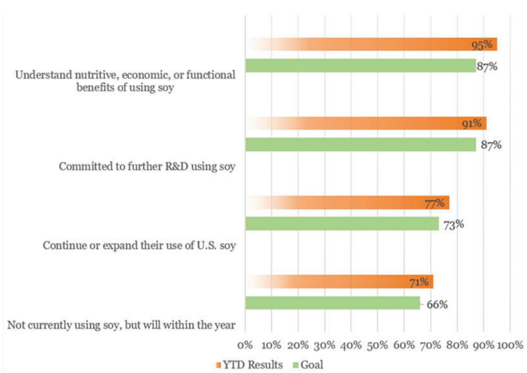
U.S. SOY TRADE

10 Years
(2012 – 2022)

7.51%

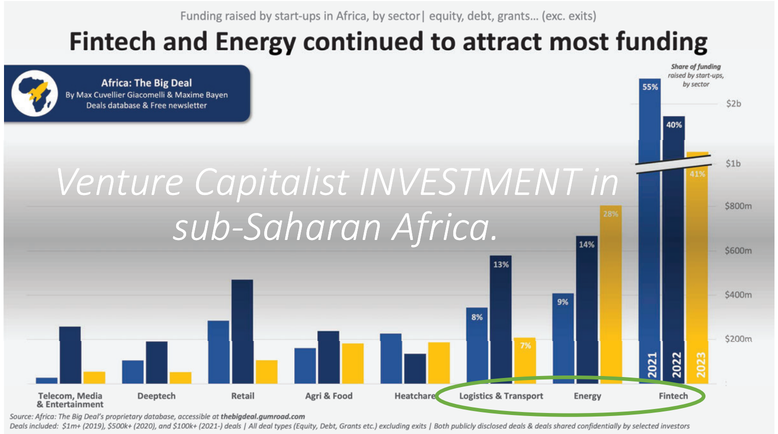
Calculated Average Growth Rate

WISHH FY23 KPI Goals & Final Outcomes

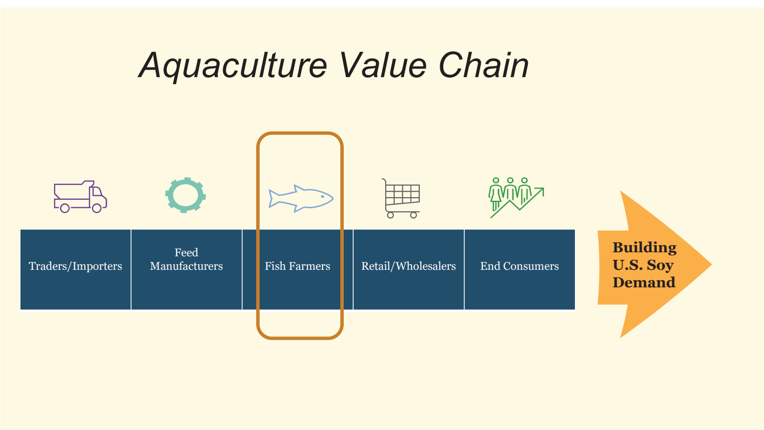


U.S. Soybean farmers ARE NOT the ONLY ONES INVESTING in DEVELOPING and EMERGING Markets.

Source: https://www.flaticon.com/free-icons/invest" title="invest icons">Invest icons created by Freepik - Flaticon


Funding raised by start-ups in Africa, by sector| equity, debt, grants... (exc. exits)
Fintech and Energy continued to attract most funding
Africa: The Big Deal
By Max Cuvellier Giacomelli & Maxime Bayen
Deals database & Free newsletter
Venture Capitalist INVESTMENT in sub-Saharan Africa.
Share of funding raised by start-ups, by sector
$2b
$1b
$800m
$600m
$400m
$200m
55%
40%
41%
28%
14%
13%
9%
8%
7%
2021
2022
2023
Telecom, Media & Entertainment
Deeptech
Retail
Agri & Food
Heatchare
Logistics & Transport
Energy
Fintech


Early Arriving Investors
Cargill
INSTA-PRO INTERNATIONAL
Tyson
Nestlé
KFC
EXTRU-TECH


Aquaculture Value Chain
Traders/Importers
Feed Manufacturers
Fish Farmers
Retail/Wholesalers
End Consumers
Building U.S. Soy Demand


Introducing innovation through technology transfer –
• Pond Aerators- Cambodia
Increasing soy-based fish feed intake!
ASA American Soybean Association
WISHH


Introducing innovation through technology transfer
• Pond Aerators – Ghana
Increasing soy-based fish feed intake!
ASA American Soybean Association
WISHH


Increasing soy-based fish feed intake!
Launching In-Country Extension Services
• Asia and sub-Saharan Africa
ASA American Soybean Association
WISHH


Increasing
soy-based fish feed intake!
Creating Qualified Professionals & New Jobs
• Aquaculture Intern Program in Africa & Asia
ASA American Soybean Association
WISHH


BEFORE they will BUY, they need to be CONFIDENT that …
• Soy works in their operations
• Their customers want it
• Their businesses can profit from it

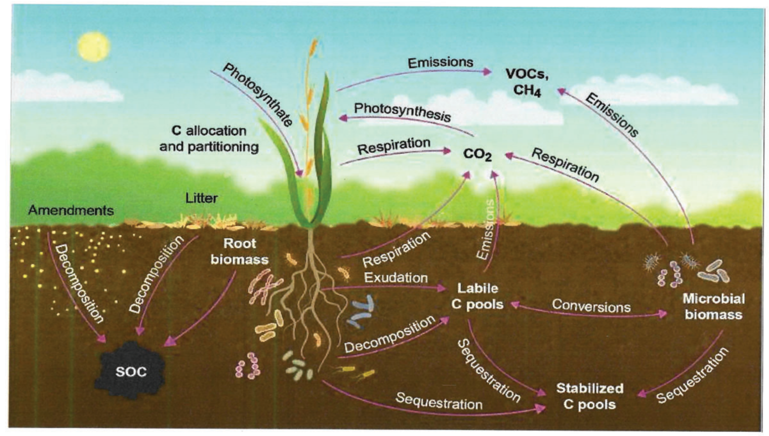

WISHH FY24 Investment Request
Program Funding Request - $40,000
"Finding and Opening Up New U.S. Soy Overseas Markets"
• Global Aquaculture Strategic Plan Deployment
• Roll-out multi-continent independent Aquaculture extension service
• Global Poultry Strategy under construction
• Feed Industry Activities in Kazakhstan – Year 3
• Deliberate Effort to Recruit More Regional Partners
• Developing U.S. Soy Regional Distributor/Brokers


Thank you
WISHH.ORG
ASA American Soybean Association
WISHH

ATTACHMENT 9

Sequestering Carbon in Soybean Production System

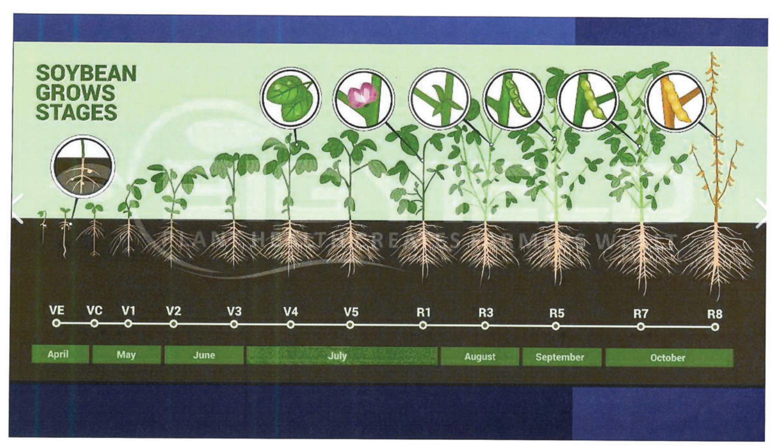
William Johnson Jr., Ph.D., CCA and James Watkins, M.S., CCA
Deane Robinson Seed Company



Agronomics

Grower	Planting Date	Population	Yield	
		thousands	Bu/a	
Padgett	4/13/2023	135	AG 85	P 81
Sweeden	5/19/2023	135	AG 83	P 88
Watkins	4/11/2023	120	AG 89	P 92

Asgrow AG 46XF3 Pioneer P 45A70LX



Sample Analysis

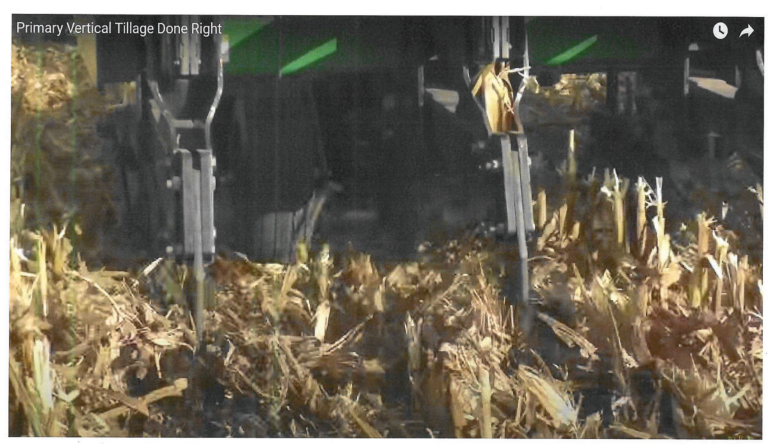
- Waypoint Analytical
- Total dry weight
- Total combustible carbon

Sequestered Carbon

Variety	Root	Stalk	Petioles	Leaves	Pods	Seed	Carbon
	%	%	%	%	%	%	Tons/a
AG 46XF3	6.6	28.0	10.6	23.2	21.3	13.8	7.7
P 45A70E	8.6	27.8	10.9	16.8	21.1	14.5	7.6

Carbon Revenue

- James Hansen, retired NASA Scientist
  - Proposed a $15/ton tax for carbon emissions
  - Proposed a $15/ton tax credit for carbon sequestered
- Soybean carbon credit of $120 per acre



ATTACHMENT 10

Project Title: 2024 USSEC Membership

Funding Request: $10,000

Project Timeline: January 1 – December 30, 2024

Project Overview (Summary): This proposal is to retain membership in the U.S. Soybean Export Council for CY 2023. USSEC works on behalf of our members by helping to build a preference for U.S Soy through various projects, programs, and events. As a member of USSEC, Arkansas Soybean Promotion Board will have access to member only resources including free or discounted registration to regional events, access to subject matter experts and USSEC in-country representatives, as well as access to resources including industry updates, QSSB specific content, and weekly and monthly market insights.

Project Background: USSEC has been a primary "contractor" supporting U.S. soy international marketing needs for over 16 years. The organization employs and partners with some of the world's premier marketing and technical exporters serving all areas of soy utilization. Partnering and collaborating with various U.S. soy stakeholders (including USB, ASA, QSSBs, exporters and other industry professionals), USSEC develops strategic goals and plans specific to each international marketing and utilization need. USSEC's networking ranges from domestic and international industry, academia, media government affairs, logistics, other NGOs supporting U.S. and global agriculture, and most other influences of soy usage and trade.

Benefits to Arkansas Soybean farmers: USSEC works on behalf of our members by helping to build a preference for U.S Soy through various projects, programs, and events. As a member of USSEC, Arkansas Soybean Promotion Board will have access to member only resources including free or discounted registration to regional events, access to subject matter experts and USSEC in-country representatives, as well as access the resources including industry updates, QSSB specific content, and weekly and monthly market insights.

What is the anticipated economic return to soybean farmers or return on investment from this proposal? USSEC has been working in various regions of the world supporting U.S. soy international marketing needs for over 16 years. The organization employs and partners with the world's premier marketing and technical experts serving all areas of soy utilization. Partnering and collaborating with various U.S. soy stakeholders (including USB, ASA, QSSBs, exporters and other industry professionals), USSEC develops strategic goals and plans specific to each international marketing and utilization need. International marketing efforts conducted on behalf of the U.S. soy industry have resulted in a return on investment of $18 per $1 invested.

Project Title: Utilization of U.S. Soy in the Americas

Contact Information: U.S. Soybean Export Council, Lyndsey Erb, lerb@ussec.org
16305 Swingley Ridge Road, Suite 200, Chesterfield, MO 63017

Funding Request: $15,000

Project Overview: Differentiating U.S. soy from its South American competitors is a key aspect of USSEC programing in the Americas region. This project provides support to the Americas region for the promotion of U.S. soybeans and soybean meal through regional conferences, trade team missions, one-on-one meetings, seminars and various events. One of the goals of the project is to continue to provide networking and educational opportunities for key industry professionals in the region to learn more about U.S. soy and connect with U.S. suppliers and associated industries. It is important to regional programming efforts to continue educating customers of the benefits and availability of U.S. soybeans and soybean meal and its ability to support the America's in the changing dynamics of the global soy market. This is a regional effort targeting producer associations, importers, and poultry, aquaculture, and swine producers.

Project Background: The Americas region represents nearly 25% of U.S. soy exports. As a large importer, the Americas also maintains a majority U.S. soy market share vs. competing origins. Given this large market share, investments in the Americas region have a direct impact on U.S. soy demand. But with complicated balance sheets and key market changes in all origins, the threat of South American imports will be high in years to come. Promoting the U.S. soy advantage in animal utilization is a critical part of our quality differentiation strategy. Swine, poultry, and feed manufacturers have an estimated growth rate between 3 and 5% per year. This project aims to help the companies enhance their organic growth rates and to differentiate U.S. Soy to gain market share in selected countries.

Project Deliverables: The key deliverables of this project are:

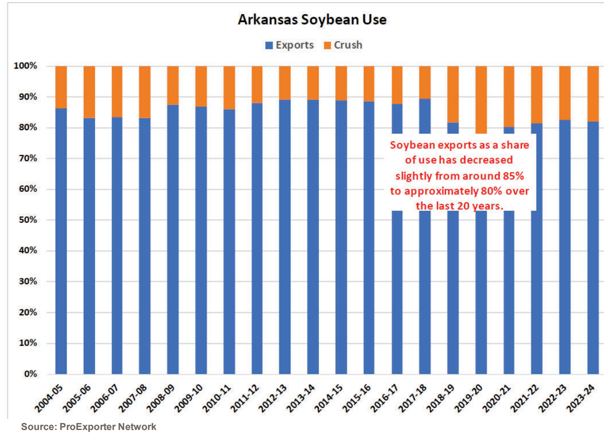
a. Host regional workshops to facilitate identifying real feed/animal technical needs
b. Promote the benefits of U.S. soy as a feed ingredient within the region
c. Identify market needs and communicate how U.S. soy can provide a product to meet the needs of the market.

Benefit to Arkansas Soybean Farmers: The Americas region represents almost 25% of U.S. Soy exports. After China, it is the most important market for U.S. Soy and serves as a natural destination market for Arkansas soy products. Approximately 80% of all soybeans grown in Arkansas are exported, most of them through the Gulf. The Americas has key markets, such as Mexico, that source U.S. soy products both via rail and out of the Gulf. Due to its proximity to the Gulf of Mexico, many Central and Latin American countries will source soybeans and soybean meal out of the Gulf, which has a direct line to Arkansas Soy producers.

USSEC FY24 Proposals

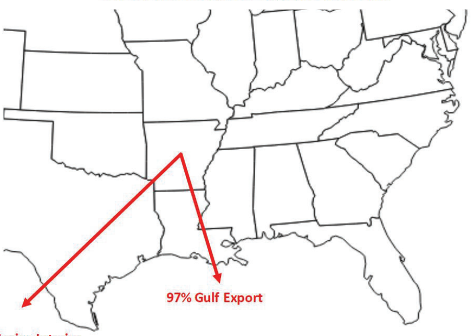
Brianna Metts, Industry Relations Manager
March 8, 2024

US SOY Delivers Solutions | USSEC



Source: ProExporter Network

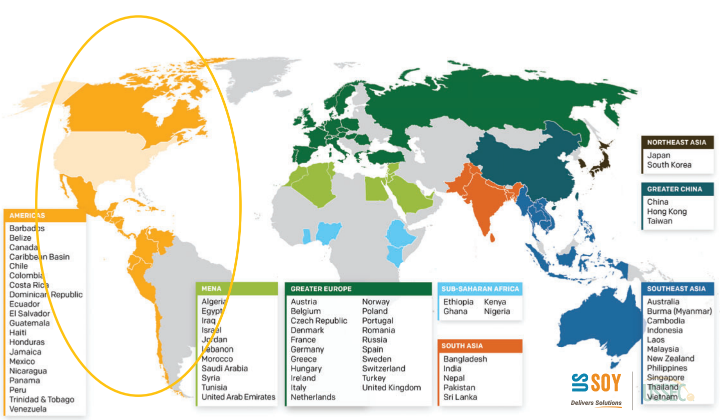
Arkansas Whole Soybean Net Export Disposition



Source: ProExporter Network

Proposal

US SOY Delivers Solutions | USSEC



Utilization of U.S. Soy in the Americas

Requested Funding - $15,000

Who	What	How
• Importers & Crushers • Animal producers • Feed industry	• Education • Demonstration • Highlighting the advantages	• Workshops, seminars • Regional events • One-on-one meetings • Technical assistance • Trade teams

US SOY Delivers Solutions | USSEC

USSEC Membership

Membership Fee: $10,000

- Retain USSEC membership for calendar year 2024

Questions?

ATTACHMENT 11

MIDSOUTH SOYBEAN BOARD

2024 Proposal Summary

Project Title:	LADDER (Large Agricultural Database that Drives Extension and Research)		
PI's Name:	Zach Reynolds	**E-mail Address:**	zach.reynolds@msstate.edu
PI's Title:	Research Project Manager	**Institution:**	Mississippi State University
Mailing Address:	129 Etheredge Hall, 449 Hardy Road		
City/State/Zip:	Mississippi State, MS 39762		
Phone number	662-418-6620		
Additional PIs For this project:	Dave Spencer, Brian Mills		
Research Locations (states)	Mississippi, Louisiana, Arkansas, Missouri		

Timeline: Current Year - FY23		**Multi-Year Project Information** (if applicable):		
		Year 1	**Year 2**	**Year 3**
Start Date:		April 1, 2023	April 1, 2024	April 1, 2025
End Date:		March 31, 2024	March 31, 2025	March 31, 2026
Funds Requested:	$	$55,626	$55,626	$55,626

Program Area (e.g., breeding, management): Irrigation, Fertility, Rotations using soybeans, Research Validation, Producer Communications, Economics

Other related funding:	N/A
Objectives:	Using a large agricultural geodatabase, determine the effects of environment, i.e., CEC, pH, slope, climatic data, and agronomic practices including irrigation, precision ag technology, nutrient management, planting systems, and tillage systems on soybean productivity and profitability at the farm scale. Also, deliver research-based, Extension programming to soybean producers in the Mid-South to stimulate the adoption and proper implementation of geospatially specific agronomic practices that improve grain yield, net returns, and sustainability.
Justification:	Analysis of large-scale, agricultural data can be used to determine the effects of agronomic practices, management philosophies, and environment on crop productivity and profitability.
Exp Setup:	We propose to collect, process, and securely store geospatially specific agronomic and environmental data for the purpose of addressing the MSSB's primary research and Extension concerns. Data will be subject to ANOVA, ANCOVA, and regression techniques.
Summary:	An aggregated geospatial database can help expedite answers to agronomic issues by collecting and analyzing large quantities of data across a variety of management practices in the Mid-South.
Key Metrics:	Data approved for collection by producers will be stored, cleaned, and analyzed for purposes of providing information that will help influence decisions that are economically beneficial for growers in the Mid-South.
Expected Deliverables:	Deliverables for this project include but are not limited to: one on one interactions with producers examining their data, presentations of data at meetings, digital media, or other means.
Benefit to Farmers:	Growers at times can be hesitant to adopt research practices done in small-plot settings. The LADDER program will help alleviate this by validating results at a landscape level. A database such as this also gives universities another tool to provide insight on what agronomic issues have the most economical impact and need to be further investigated for the benefit of growers.
Progress Made:	Conversations with growers have been initiated to express the importance of collecting and analyzing data across the landscape. Processes to collect, store, and analyze large quantities of geospatial data have been determined. To date, 350K+ acres have been collected.

Signature of Principle Investigator: Zach Reynolds Digitally signed by Zach Reynolds Date: 2023.08.15 13:32:56 -05'00' **Date:8/14/2023**

Invoice

Mid-South Soybean Board
1501 N Pierce, Ste 100
Little Rock AR 72207

Date: 10/19//2023
Statement #:
2024 estimate

Bill to: AR Soybean Promotion Board

Comments:

Status	Description	total project	AR Share
renewal	Screening soybean germplasm and breeding soybeans for flood tolerance	175440	58480
renewal	Development of functional ultra-high stearic acid soybean germplasms.	30000	7500
renewal	Development of Climate-Smart High Yield Practices Associated with High-End Biological Treatments and Soybean Related Microbiome Resiliency	60000	12000
renewal	Enhancing Stink Bug Resistance in Midsouth Soybean.	86000	na
renewal	Spray application of double stranded RNA for simultaneous management of multiple soybean fungal and insect diseases.	48234	12060
renewal	How do cover crops impact soil water dynamics and soybean production in Lousiana	23859	5965
renewal	Whole Soy Food Acceptability and Market Viability Study	30615	7654
renewal	Spatial and temporal variation of soil samping affect phosphorus and potassium recommendations for soybean	30000	7500
renewal	Southern root-knot nematode in MG4 soybean: Characterization of the mechanism of resistance and breeding for resistance	75000	18750
renewal	Exploitation of weed species extracts as an effective and environmentally friendly strategy to control insects and deer in soybeans.	39522	9881
new	Ladder (Large Agricultural Database that Drives Extension and Research)	55626	13907
new	Enhancing the Prospects of Sustainable Weed Management and System Productivity through Wheat-Soybean Relay Intercropping in the Midsouth	33400	8350
renewal	Screening and Selecting Non-Xtend Soybeans for Dicamba Tolerance	65000	16250
			$178,297.00

Remittance	
Statement #	2024 estimate
Date	
Amount Due	$178,297.00
Amount Enclosed	

MIDSOUTH SOYBEAN BOARD

2024 Proposal Summary

Project Title:	Southern root-knot nematode in MG4 soybean: Characterization of the mechanism of resistance and breeding for resistance		
PI's Name:	Travis Faske	**E-mail Address:**	tfaske@uada.edu
PI's Title:	Prof. and Ext. Plant Pathologist	**Institution:**	Univ. of Ark. Sys., Div. of Ag.
Mailing Address:	2001 Hwy 70E		
City/State/Zip:	Lonoke, AR		
Phone number	501-266-3657		
Additional PIs For this project:	Tristan Watson - LSU, Henry Nguyen and Grover Shannon – Univ. of MO, Caio Canella - UADA		
Research Locations (states)	Baton Rough, Columbia, Portageville, Fayetteville, and Lonoke		

Timeline: Current Year - FY23		**Multi-Year Project Information** (if applicable):		
		Year 1	**Year 2**	**Year 3**
Start Date:	April 1, 2024			
End Date:	March 31, 2025			
Funds Requested:	$75,000	$	$	$

Program Area (e.g., breeding, management): Nematode Management	
Other related funding:	PIs were funded by USB starting 10/1/2023 to 9/30/2024 for $282,920. Project entitled "Expanding the Genetic Base of Southern Root-knot Nematode Resistance in Soybean"
Objectives:	1.Characterize the mechanism of resistance (MOR) to SRKN in MG4 soy germplasm 2.Characterize and develop new markers for new sources of SRKN resistance 3.Develop MG4 varieties with resistance to the SRKN
Justification:	SRKN is yield-limiting nematode across the Southern U.S. Currently, there are limited SRKN-resistance sources and availability in MG4 varieties.
Exp Setup:	Hypothesis driven lab, greenhouse, and field experiments.
Summary:	This project aims to identify how resistance in soybean affect SRKN development among various genotypes with differing QTL markers and utilize marker assisted selection to develop early maturing varieties with durable resistance against the SRKN.
Key Metrics:	Characterize the MOR against SRKN and develop 3 new early maturing advanced breeding lines/varieties with SRKN resistance.
Expected Deliverables:	Peer-review publications for each specific objective once completed. Deliver information at scientific and production meetings across the Mid-South.
Benefit to Farmers:	The SRKN is annually affecting Mid-South farmers. Resistance to SRKN is limited and though farmers want to utilize genetic resistance, it is often unavailable.
Progress Made:	First round of MOR assays complete, expand to compare nema repo vs. galling, techniques developed for QTL work and two lines in final stages of release

Signature of Principle Investigator:	**Date:**
Travis Faske	8/14/23

This document should remain as a SINGLE PAGE for the BOARD MEMBER'S QUICK REFERENCE. Email form to midsouthsoybean@gmail.com and swsoy@aristotle.net.

MSSB Research One Page Summary

Project Title	**Screening soybean germplasm and breeding soybeans for flood tolerance**				
PI's Name	Grover Shannon		E-mail	shannongj@missouri.edu	
PI's Title	Emeritus Professor		Institution:	The Curators of the University of MO	
Mailing Address	601 Turner Avenue, Turner Avenue Garage, Room 201				
City/State/Zip	Columbia, MO 65211-0001				
Phone number	573/882-7560				
Additional PIs For this project	CO-PI: Francia Ravelombola, Research Scientist, University of MO, srnmv@missouri.edu Cooperators: Caio Viera, caioc@uark.edu University of Arkansas David Moseley, DMoseley@agcenter.lsu.edu Louisiana State University Wilkerson, Tessie twilkerson@drec.msstate.edu Mississippi State University				
Res. Locations (and states involved)	Portageville, Missouri with Mississippi, Louisiana, and Arkansas involved				

Timeline:		**Multi-Year Project Information** (if applicable)		
Current Year - FY23		Year 1	Year 2	Year 3
Start Date		April 1, 2024		
End Date		Mar. 31, 2025		
Funds Requested		$175,440	$	$

Program Area (e.g., breeding, mngt.): Irrigation, research validation/demonstration, producer communications, variety trials, economics, flood tolerance breeding

Objectives	Flooding stress during early and mid-season is becoming severe because of an increased frequency of heavy rainfall in soybean growing areas causing substantial soybean yield reduction. To maintain sustainable soybean production, the proposed research aims to 1) Screen soybean germplasm and commercial cultivars for genetic tolerance to flooding. 2) Incorporate of flood tolerance from identified source(s) into elite soybean cultivars and lines.
Justification	Estimates of the average losses due to flood in the US are approximately $1.5 billion/year. Severe flooding stress in early and mid-seasons occurs in soybean growing areas because of an increased frequency of heavy rainfall, excess irrigation, or rainfall that occurs after an irrigation event. Due to climate change, by 2030, an alarming 30% increase in heavy precipitation events is expected.
Exp Setup	Trials will be conducted in MO, AR, LA and MS to assess the differential responses among soybean varieties, breeding lines and other germplasm to early and late season flooding.
Summary	Genotypes respond differently to early and late season flooding. Tolerant genotypes exposed to excess water suffer 20 to 30% less yield loss. Identifying flood tolerant lines, and varieties land incorporating this trait into elite lines will enable farmers to use flood tolerant varieties in fields prone to flooding.
Key Metrics	Field trials performance due to early and late season flooding; Number of advanced materials in USDA regional trials with enhanced flood tolerance; Number of publications and presentations.
Expected Deliverables	Elite commercial soybean varieties and germplasm with enhanced tolerance to early and late season flooding.
Benefit to midsouth farmers	Flexibility in choice of flood tolerant varieties with a layer of yield protection to reduce losses from excess water.
Progress Made	Several commercial varieties and breeding lines have been identified with consistent tolerance to soil waterlogging. One Arkansas variety was release with high tolerance to flooding.
Signature of Principle Investigator and Authorized Signer--00085149 Grover Shannon C. Megan Faulkner	Date: 8/16/2023

DO NOT GO OVER ONE PAGE. THIS IS A SINGLE PAGE FOR THE BOARD MEMBER'S QUICK REFERENCE.

MSSB Research One Page Summary

Project Title	**Development of functional ultra-high stearic acid soybean germplasms**		
PI's Name	Grover Shannon	E-mail	shannongj@missouri.edu
PI's Title	Emeritus Professor	Institution:	The Curators of the University of MO
Mailing Address	601 Turner Avenue, Turner Avenue Garage, Room 201		
City/State/Zip	Columbia, MO 65211-0001		
Phone number	573/882-7560		
Additional PIs	None		
Research Locations (and states involved)	Portageville, Missouri		

Timeline: **Current Year - FY23**		**Multi-Year Project Information** (if applicable) Year 1	Year 2	Year 3
Start Date		April 1, 2024		
End Date		Mar. 31, 2025		
Funds Requested		$30,000	$	$

Program Area (e.g., breeding, mngt.): Research Validation or Demonstration & Enhancement

Objectives	Identify small deletion, mutant genes, and their effect on increasing stearic acid content (12 to 20%) with little deleterious effects on agronomic traits. Study stability of high stearic acid and high stearic acid combine with high oleic content. Release germplasm with enhanced stearic acid alone and in combination with high oleic acid content.
Justification	High stearic acid in soybean oil would increase the functionality of soybean oil for food and industrial applications. Studies to improve stearic acid content are limited. High stearic acid combined with high oleic content would enhance functionality for soybean oil.
Exp Setup	Trials will be conducted to assess if small genetic deletions improve stearic acid content and will have little effect on agronomic traits. Also determine if high stearic acid content is stable across environments. Select high stearic lines combined with high oleic content.
Summary	Identify small deletion, mutant genes, and their effect on increasing stearic acid content (12 to 20%) with little deleterious effects on agronomic traits. Study stability of high stearic acid and high stearic acid combine with high oleic content. Release germplasm with enhanced stearic acid alone and in combination with high oleic acid content.
Key Metrics	Field trials to study performance of high stearic lines with stable stearic acid content and agronomic performance across environments.
Expected Deliverables	Elite stable, high stearic lines (12 to 20%) with no detrimental effects on yield and other agronomic traits
Benefit to midsouth farmers	New value-added soybeans with enhanced stearic acid and enhanced stearic acid with high oleic content for improved oil functionality for food and industrial applications. Added dollar premiums may be offered for farmers who produce and deliver lines with enhanced oil quality.
Progress Made	Several higher stearic acid lines have been identified and are in preliminary yield trails. Other higher stearic acid lines combined with high oleic content are in plant rows for yield testing in 2024. Genetic studies to determine the effects of small mutant deletions on stearic content is almost complete.

Signature of Principle Investigator and Authorized Signer--00085154	Date: 8/25/2023
Grover Shannon Jeremiah Lotve...	

DO NOT GO OVER ONE PAGE. THIS IS A SINGLE PAGE FOR THE BOARD MEMBER'S QUICK REFERENCE.

MSSB Research Summary Page

Project Title	Spatial and temporal variation of soil sampling affect phosphorus and potassium recommendations for soybean		
PI's Name	Md. Rasel Parvej	E-mail	mrparvej@agcenter.lsu.edu
PI's Title	Assistant Professor	Institution:	Louisiana State University AgCenter
Mailing Address	212-A Macon Ridge Road, Winnsboro, LA 71295		
City/State/Zip	Winnsboro, LA 71295		
Phone number	(318) 435-2908		
Additional PIs For this project	**Jamil Uddin**, fmjuddin@agcenter.lsu.edu; **Melissa Cater,** mcater@agcenter.lsu.edu; **Nathan Slaton,** nslaton@uark.edu; **Gerson Drescher**, gldresch@uark.edu; **Jagmandeep Dhillon**, jagman.dhillon@msstate.edu;		
Research Locations (and states involved)	LSU AgCenter – Macon Ridge & Northeast Research Station, located in Winnsboro, Louisiana. UofA System Division of Ag – Pine Tree Research Station, located in Colt, Arkansas. Mississippi State University – Delta Research & Ext. Center, located in Stoneville, Mississippi.		

Timeline: **Current Year - FY24**		**Multi-Year Project Information** (if applicable)		
		Year 1	Year 2	Year 3
Start Date	**31 March 2023**	**31 March 2023**	**31 March 2024**	**31 March 2025**
End Date	**31 March 2024**	**31 March 2024**	**31 March 2025**	**31 March 2026**
Funds Requested	$ 20,000	$ 20,000	$ 30,000	$ 30,000

Program Area (e.g., breeding, mngt.): Fertility needs (especially P and K) for optimum and economical yield

Objectives	Characterize the effects of sampling time and position, rotational crop, and soil management practices on soil P and K concentrations and fertilizer recommendations for Mid-South soybean.
Justification	Since soil-test P and K concentrations fluctuate spatially and temporally, investigating the effects of soil sampling time and method across different crop rotations and soil management practices will help develop better soil-test-based P and K fertilizer recommendations that optimize soybean yield and profit across Mid-South states.
Exp Setup	Research trials to evaluate spatial and temporal effects of soil sampling on soil-test P and K concentrations will be conducted at the LSU AgCenter from 2022 to 2024 across different sampling positions, crop rotations, soil types, and soil management practices with the additional research sites in Arkansas and Mississippi during 2023 and 2024.
Summary	The multi-year/state research trials will help us develop the best time and way of soil sampling across crop rotation and soil management practices and adjust our fall soil-test values with the predicted maximum soil-test values following summer crop harvest for optimum fertilizer rate that maximizes soybean yield and profit and reduces associated offsite overfertilization impacts.
Key Metrics	Measurements include soil and residue nutrient concentrations and summer crop yield. Results from each year's trials will be presented in extension and professional meetings to improve the knowledge and awareness of ag personnel regarding the best soil sampling strategies for maximum soybean yield and profitability. The final results will be published in a peer-reviewed journal.
Expected Deliverables	We expect to develop research-based soil sampling guidelines for optimum P and K fertilizer recommendations that maximize soybean yield and profit. We also expect to develop regression models to predict the temporal variation of soil-testing values following summer crop harvest and tillage management practices. The outputs of these research trials will help producers adjust their fall soil-test values, minimize fertilizer input and cost, and reduce fertilizer losses.
Benefit to midsouth farmers	Developing the best soil sampling strategies for optimum fertilizer rates that maximize soybean yield will directly benefit approximately 5.6 million acres of Mid-South soybean that receive fertilization, with the possibility of another 4.3 million acres that will likely require fertilization within a short period. The expected outcomes will also help reduce fertilizer amounts and costs.
Progress Made	The project will start on 1 Sep. 2022 after summer crop harvest. We are developing protocols.

Signature of Principle Investigator	Date: 08/17/2023

MIDSOUTH SOYBEAN BOARD

2024 Proposal Summary

Project Title:	Screening and Selecting Non-Xtend Soybeans for Dicamba Tolerance		
PI's Name:	Caio Canella Vieira	**E-mail Address:**	caioc@uark.edu
PI's Title:	Assistant Professor	**Institution:**	University of Arkansas-CSES
Mailing Address:	495 N Campus Walk, Office 105		
City/State/Zip:	Fayetteville, Arkansas, 72701		
Phone number	573-825-1795		
Additional PIs For this project:	Grover Shannon, Emeritus Professor. University of Missouri, FDREEC, 147 W State Highway T, Portageville, MO, 63873. 573-379-5431, shannongj@missouri.edu.		
Research Locations (states)	Arkansas: Marianna, Fayetteville, Kibler, Keiser. Missouri: Portageville.		

Timeline: Current Year - FY23		**Multi-Year Project Information** (if applicable):		
		Year 1	**Year 2**	**Year 3**
Start Date:	April 1, 2024			
End Date:	March 31, 2025			
Funds Requested:	$65,000	$	$	$

Program Area (e.g., breeding, management):	
Related funding:	
Objectives:	Identify natural tolerance to off-target dicamba damage, understand the underlying genetic and physiological basis of this tolerance trait, and deploy varieties with enhanced tolerance to U.S soybean farmers.
Justification:	The EPA has approved the re-registration of dicamba for over-the-top applications until 2025 and it is expected non-Xtend soybeans will continue to be exposed to and suffer losses from the off target dicamba movement.
Exp Setup:	Trials will be conducted to assess the differential responses to off-target dicamba damage, perform mapping studies, and select advanced breeding materials with enhanced tolerance.
Summary:	Genotypes may respond differently to off-target damage. Tolerant genotypes exposed to off-target dicamba may suffer a maximum of 10% yield penalty whereas susceptible genotypes may suffer as much as 40% yield losses.
Key Metrics:	Field trials performance; Quality of data; Number of advanced materials in USDA regional trials with enhanced resistance; Number of publications and presentations.
Expected Deliverables:	Elite non-Xtend soybean varieties with enhanced tolerance to off-target dicamba damage; Genes/QTLs/markers associated with dicamba tolerance; Improved understanding of dicamba and its effects (genetic and physiological) on non-Xtend soybeans.
Benefit to Farmers:	Flexibility, freedom of choice, and a layer of yield protection to off-target dicamba damage provided by genetics regulating natural tolerance and ability to recovery.
Progress Made:	Over five peer-reviewed publications have been published over the course of this study. Many high-yielding lines with tolerance have been advanced in the breeding pipeline.

Signature of Principle Investigator:	**Date:**
Caio Canella Vieira	8-17-23

MIDSOUTH SOYBEAN BOARD

2024 Proposal Summary

Project Title:	Whole Soy Food Acceptability and Market Viability Study				
PI's Name:	Dr. Karen Ballard		**E-mail Address:**	karen@bandblegacyfarms.com	
PI's Title:	CEO		**Institution:**		
Mailing Address:	P.O. Box, 128				
City/State/Zip:	Beedeville, AR 72014				
Phone number	(501) 680-1711				
Additional PIs For this project:					
Research Locations (states)	Arkansas, Missouri, Mississippi, Louisiana, and Texas				
Timeline: Current Year - FY23		**Multi-Year Project Information** (if applicable):			
		Year 1	**Year 2**	**Year 3**	
Start Date:	4/1/23	4/1/2022	4/1/2023	4/1/2024	
End Date:	3/31/24	3/31/2023	3/31/2024	3/31/2025	
Funds Requested:	$29,775	$22,481	$29,775	$30,615	
Program Area (e.g., breeding, management): New Uses of Soybean, Food Grade Soybean, Producer Communications, Economics, and Other: Consumer Research					
Other related funding:	None				
Objectives:	1.Evaluate agronomic viability and profitability of food-grade soy cultivars. 2. Evaluate direct product acceptability of whole soy products through key informant interviews, surveys, and focus groups.3. Evaluate regional market opportunities with school nutrition program directors and USDA food and nutrition officials.4. Disseminate study results and increase knowledge of producers and consumers regarding the value of whole soy foods.				
Justification:	Whole soy foods are not currently accessible through key USDA child nutrition programs. USDA MyPlate includes whole soy foods as a key, reimbursable meal item, but schools have limited access for purchasing. Plant-base protein is a significant market opportunity.				
Exp Setup:	April 2022				
Summary:	Feasibility study for collaborative, regional, soy food system.				
Key Metrics:	USDA child nutrition program market analysis. Consumer acceptability testing. Producer market opportunities report. Profitability analysis for vegetable soybean production.				
Expected Deliverables:	Baseline data on Mid-South vegetable soy production and current market. Consumer acceptability and regional market research with diverse stakeholder groups.				
Benefit to Farmers:	Expanded regional markets through minimally processed whole soy foods purchased through USDA Foods, DoD Fresh, Farm to School programs and local schools.				
Progress Made:	This project is informed through three years of foundational research completed with key stakeholders across production, processing, consumer, and governmental sectors.				
Signature of Principle Investigator:				**Date:**	
Karen Ballard				8/18/23	

MIDSOUTH SOYBEAN BOARD

2024 Proposal Summary

Project Title:	**Development of climate-smart high yield practices associated with high-end biological treatments and soybean related microbiome resiliency**				
PI's Name:	Woo-Suk Chang		**E-mail Address:**	wschang@uta.edu	
PI's Title:	Professor		**Institution:**	University of Texas at Arlington	
Mailing Address:	Room 216, 501 S. Nedderman Dr.				
City/State/Zip:	Arlington, TX 76109				
Phone number	817-272-3280				
Additional PIs For this project:	Dr. James Grichar-Texas A&M; Dr. Paul (Trey) Price-LSU AG; Shawn Clark-Univ. of AR; Dr. Tessie Wilkerson- Miss. State Univ.; Dr. Grover Shannon-Univ. of MO.				
Research Locations (states)	Colt, AR; Winnsboro, LA; Stoneville, MS; Portageville, MO; Port Lavaca, TX.				

Timeline: Current Year - FY23		**Multi-Year Project Information** (if applicable):		
		Year 1	**Year 2**	**Year 3**
Start Date:	3/1/2023	3/1/2023	**3/1/2024**	3/1/2025
End Date:	2/28/2026	2/28/2024	**2/28/2025**	2/28/2026
Funds Requested:	$180,000	$60,000	**$60,000**	$60,000

Program Area (e.g., breeding, management): Cultural Practices (i.e., soil, climate, and nutrition)	
Other related funding:	USB project titled "Development of a drought-tolerant dual-action inoculant with nitrogen fixation and phosphorus solubilization activities and potassium solubilizing inoculant."
Objectives:	To develop climate-smart high yield practices associates with high end biological treatments using microbiome analysis and determine its effects on soybean cultivation with or without a tillage system.
Justification:	Based on previous work in our lab, the soybean rhizosphere under inoculant (i.e., biofertilizer) application shows more resilience than untreated plots, especially in non-irrigated conditions. Establishing climate-smart microbiome repositories will help us identify the key to verifying crucial species for high yield soybean production.
Exp Setup:	RCBD plot design. Soil physiochemical analysis and soybean yield. Microbiome analysis of rhizosphere soils. Tillage and no-tillage systems will be set up to examine microbial communities in the soybean rhizosphere and soybean yield.
Summary:	Collection of rhizosphere soils from identified high yield soybean fields. A repository of soybean rhizosphere microbiome data will be created to identify key player(s). This will gauge what constitutes successful growing conditions and regions on a microbiological data scale. Field study will be conducted to capture snapshots of microbial communities between tillage and no-tillage systems.
Key Metrics:	Publications, presentations, and fact sheets that will assists farmers in the Mid-South.
Expected Deliverables:	Microbiome dataset via co-occurrence networks; development of a soybean-related microbiome repository in the Mid-South; selection of opportune microbial communities.
Benefit to Farmers:	Soil health and resiliency. Carbon credit by adopting a climate-smart practice involved in high-end biological treatments. More sustainable soybean production.
Progress Made:	Preliminary analysis of soybean rhizosphere soils for microbiomes.

Signature of Principle Investigator:	**Date:**
woosukchang	08/17/2023

This document should remain as a SINGLE PAGE for the BOARD MEMBER'S QUICK REFERENCE. Email form to midsouthsoybean@gmail.com and swsoy@aristotle.net.

MIDSOUTH SOYBEAN BOARD

2024 Proposal Summary

Project Title:	Enhancing the Prospects of Sustainable Weed Management and System Productivity through Wheat-Soybean Relay Intercropping in the Midsouth.		
PI's Name:	Jason K. Norsworthy	**E-mail Address:**	jnorswor@uark.edu
PI's Title:	Distinguished Professor	**Institution:**	University of Arkansas
Mailing Address:	1354 West Altheimer Drive		
City/State/Zip:	Fayetteville, AR 72704		
Phone number	479-313-1265		
Additional PIs For this project:	Jeremy Ross		
Research Locations (states)	Arkansas		

Timeline: Current Year - FY23		**Multi-Year Project Information** (if applicable):		
		Year 1	**Year 2**	**Year 3**
Start Date:	03/01/2024			
End Date:	02/28/2025			
Funds Requested:	$33,400		$	$

Program Area (e.g., breeding, management):	Weed Management
Other related funding:	A single year of funding for 2023 was received from the Southern Region IPM Center.
Objectives:	**1-** Determine the weed management outcome and the overall production economics of wheat-soybean relay intercropping in the Midsouth. **2-** Conduct outreach activities to promote stakeholder awareness of relay intercropping as a sustainable weed management tool.
Justification:	The prevalence of herbicide-resistant weeds is escalating in the Midsouthern cropping systems, pointing to the prospects of catastrophic weed management failures. This demands the adoption of a more multidimensional approach to weed management.
Exp Setup:	Field research and outreach
Summary:	This project is an ongoing effort to foster sustainable weed management as well as increased productivity of the Midsouth cropping systems through the implementation of relay intercropping of soybean into wheat. Relay intercropping is vastly different from the historically used double cropped system of wheat and soybean.
Key Metrics:	Determination of weed suppression and weed seed production; analysis of the overall system productivity and economics.
Expected Deliverables:	Deliver information at scientific and production meetings at the local and regional level.
Benefit to Farmers:	Sustained weed management; enhanced system productivity and resilience
Progress Made:	New submission to MSSB.

Signature of Principle Investigator:	**Date:**
	08/04/23

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MIDSOUTH SOYBEAN BOARD

2024 Proposal Summary

<table>
<tr><td>Project Title:</td><td colspan="4">Enhancing Stink Bug Resistance in Midsouth Soybean</td></tr>
<tr><td>PI's Name:</td><td colspan="2">Jeffrey A. Davis</td><td>E-mail Address:</td><td>jeffdavis@agcenter.lsu.edu</td></tr>
<tr><td>PI's Title:</td><td colspan="2">Professor</td><td>Institution:</td><td>LSU AgCenter</td></tr>
<tr><td>Mailing Address:</td><td colspan="4">404 Life Sciences Building</td></tr>
<tr><td>City/State/Zip:</td><td colspan="4">Baton Rouge, LA 70803</td></tr>
<tr><td>Phone number</td><td colspan="4">(225)-578-5618</td></tr>
<tr><td>Additional PIs For this project:</td><td colspan="4">Grover Shannon, University of Missouri</td></tr>
<tr><td>Research Locations (states)</td><td colspan="4">Ben Hur Research Center, Baton Rouge, LA
Fisher Delta Research Center, Portageville, MO</td></tr>
<tr><td colspan="2" rowspan="2">Timeline: Current Year - FY23</td><td colspan="3">Multi-Year Project Information (if applicable):</td></tr>
<tr><td>Year 1</td><td>Year 2</td><td>Year 3</td></tr>
<tr><td>Start Date:</td><td>2022</td><td>04/01/2022</td><td>04/01/2023</td><td>04/01/2024</td></tr>
<tr><td>End Date:</td><td>2025</td><td>03/31/2023</td><td>03/31/2024</td><td>03/31/2025</td></tr>
<tr><td>Funds Requested:</td><td>$259,800</td><td>$86,600</td><td>$86,600</td><td>$86,600</td></tr>
<tr><td colspan="5">Program Area (e.g., breeding, management): breeding, insect management</td></tr>
<tr><td>Other related funding:</td><td colspan="4">United Soybean Board (USB) has conditionally approved funding of up to $97,780.00. This would be for molecular screening and widespread testing amongst MidSouth states.</td></tr>
<tr><td>Objectives:</td><td colspan="4">Public researchers will investigate and incorporate resistance to stink bugs to protect quality and increase yield.</td></tr>
<tr><td>Justification:</td><td colspan="4">Soybean farmers lack resistant varieties for stink bugs that yearly reduce yield and quality. The purpose of this project is to identify and develop sources of resistance for the stink bug complex.</td></tr>
<tr><td>Exp Setup:</td><td colspan="4">Soybean lines from Dr. Shannon will be sent to Dr. Davis for infield evaluations of stink bug resistance. We will assess quality and yield and determine specific mechanisms of resistance. Soybean lines will then advance for further breeding and selection.</td></tr>
<tr><td>Summary:</td><td colspan="4">Breeding selections will be evaluated for stink bug resistance. Resistance will then be incorporated into varieties that are adapted to the Mid-South.</td></tr>
<tr><td>Key Metrics:</td><td colspan="4">High yielding, locally adapted soybean cultivars that are resistant to stink bugs.
Identify and map markers contributing to stink bug resistance to use in marker assisted selection (MAS).</td></tr>
<tr><td>Expected Deliverables:</td><td colspan="4">Improved high-yielding varieties with resistance to stink bugs that reduce insecticide inputs while maintaining quality.</td></tr>
<tr><td>Benefit to Farmers:</td><td colspan="4">Reduced insecticide costs, increased yields, and protected seed quality.</td></tr>
<tr><td>Progress Made:</td><td colspan="4">Forty-two soybean selections from the University of Missouri were sent to Dr. Davis. An additional twenty-six commercial MG IV varieties were also selected for evaluation. Current in-field and in lab testing is ongoing.</td></tr>
<tr><td colspan="4">Signature of Principle Investigator:</td><td>Date:</td></tr>
<tr><td colspan="4">Jeffrey A. Davis</td><td>8/9/2023</td></tr>
</table>

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MIDSOUTH SOYBEAN BOARD

2024 Proposal Summary

Project Title:	Exploitation of weed species extracts as an effective and environmentally friendly strategy to control insects and deer in soybean				
PI's Name:	Te-Ming (Paul) Tseng		**E-mail Address:**	tt1024@msstate.edu	
PI's Title:	Associate Professor		**Institution:**	Mississippi State University	
Mailing Address:	32 Creelman St., 117 Dorman Hall.				
City/State/Zip:	Mississippi State, MS 39762				
Phone number	662-325-4725				
Additional PIs For this project:	Nick Fitzkee, Professor of Chemistry (nanoparticle encapsulation), Mississippi State University, 662-325-1288, nfitzkee@chemistry.msstate.edu.				
Research Locations (states)	Starkville, Mississippi.				
Timeline: Current Year - FY23		**Multi-Year Project Information** (if applicable):			
		Year 1	**Year 2**	**Year 3**	**Year 3**
Start Date:	04/01/2024				
End Date:	03/31/2025				
Funds Requested:	$39,522			$	
Program Area: Insect and Deer Management/Control					
Other funding:	None				
Objectives:	1. Develop Nanoparticle-Coated Repellents: Create repellent formulations (derived from a weed species) coated with nanoparticles to enhance adhesion to leaf surfaces, ensuring sustained protection against herbivores and minimizing wash-off and degradation. 2. Assess Rainfastness of Repellent: Investigate the rainfastness of the developed repellent to determine its duration of effectiveness in deterring herbivore browsing and feeding under simulated rain conditions.				
Justification:	The significant economic impact of herbivore-related crop losses, particularly due to white-tailed deer, highlights the need for effective solutions. Our study focuses on improving a weed-based repellent using tiny particles to stick better to soybean leaves and safeguarding soybean crops from herbivory. Our research helps farmers now and supports eco-friendly farming in the long run.				
Exp Setup:	For the first objective, multiple formulations with varied nanoparticle sizes, compositions, and concentrations will be tested using surface tension, contact angle, and adhesion strength assays. For rainfastness assessment, soybean plants will be cultivated in a controlled greenhouse environment and treated with optimized repellent formulations, followed by simulated rain events of varying intensities and durations.				
Summary:	This proposal tackles major crop losses due to deer, valued at $4.5 billion. The study aims to enhance soybean crop protection by innovatively developing nanoparticle-coated repellents derived from a weed species, and evaluating their rainfastness. By optimizing adhesion and durability, this research offers a multifaceted solution that can bolster agricultural productivity, reduce economic losses, and promote sustainable crop protection practices.				
Key Metrics:	We anticipate confirming at least three of the four weed species to have deer repellent and insecticidal properties, identifying at least three anti-herbivore compounds, and identifying at least five anti-herbivory molecular markers.				
Expected Deliverables:	PowerPoint and Poster presentations (4), publications (1), MS Dissertation (1).				
Benefit to Farmers:	Using these molecular markers, we can screen soybean germplasm for the anti-herbivore trait or use it in molecular breeding to breed these traits into soybean. Soybean with significant anti-herbivore properties will prevent yield losses incurred due to herbivores, especially deer and insects.				
Progress Made:	In 2022, plant extracts from three weed species were evaluated for their repellent effects on soybean plants against herbivores. Promising results were observed, including reduced defoliation and mortality of soybean loopers, with sicklepod demonstrating superior deer-repelling efficacy and maintaining soybean yield.				
Signature of Principle Investigator:				08/09/2023	

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MIDSOUTH SOYBEAN BOARD

2024 Proposal Summary

Project Title:	SPRAY APPLICATION OF DOUBLE STRANDED RNA FOR SIMULTANEOUS MANAGEMENT OF MULTIPLE SOYBEAN FUNGAL AND INSECT DISEASES		
PI's Name:	Zhi-Yuan Chen	**E-mail Address:**	zchen@agcenter.lsu.edu
PI's Title:	Professor	**Institution:**	
Mailing Address:	Dept of Plant Pathology and Crop Physiology, 302 Life Sciences Building, Louisiana State University Agricultural Center		
City/State/Zip:	Baton Rouge, LA 70803		
Phone number	225-578-7850 (office)		
Additional PIs For this project:	None		
Research Locations (states)	Baton Rouge, Louisiana		

Timeline: Current Year - FY24		**Multi-Year Project Information** (if applicable):		
		Year 1	**Year 2**	**Year 3**
Start Date:	04/01/2024			
End Date:	03/30/2025			
Funds Requested:	$48,324	$20,000	$20,000	$48,324

Program Area (e.g., breeding, management): Disease management	
Other related funding:	
Objectives:	1) Fine-tune the conditions to effectively deliver dsRNA into soybean plants; 2) Examine the potential of nano-particles in enhancing dsRNA stability on leaf surface; and 3) Determine the effectiveness of these dsRNAs in simultaneous management of CLB, FLS, and PSS through spray applications in greenhouse/field conditions.
Justification:	Double stranded RNAs (dsRNA) have been shown to travel between host and pathogen/pests and can suppress the expression of its target genes by binding and initiating a sequence specific degradation, and thus achieve the disease control.
Exp Setup:	1) Determine the effectiveness of different methods for delivering dsRNA to plants; 2) Examine the potential of lignin nano-particles in enhancing dsRNA stability on leaf surface. 3) Identify the most potent dsRNAs in reducing soybean fungal diseases.
Summary:	This is a very novel research with great potential that has not been attempted by any other lab in US to manage soybean fungal and possibly insect and nematode diseases.
Key Metrics:	Demonstration of successful delivery of dsRNA using PDS gene, reduced CLB/FLS/PSS disease development, extended protection by dsRNA using nanoparticles.
Expected Deliverables:	1) Optimized method for delivering dsRNA; 2) Identification of key fungal genes to suppress to manage CLB/FLS/PSS; 3) New funding support from USB/USDA/NSF.
Benefit to Farmers:	Reduced yield losses due to fungal pathogens/pests, reduced use of fungicides/ pesticides, operation cost, environmental pollution, and enhanced sustainability.
Progress Made:	We have produced the Avr4, CTB8, Cyp51, and CytB dsRNAs in small scale and are performing initial testing with PDS gene in growth chamber conditions.

Signature of Principle Investigator:	**Date:**
Zhiyuan Chen	08/10/2023

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MIDSOUTH SOYBEAN BOARD

2024 Proposal Summary

Project Title:	How does cover crops impact soil water dynamics and soybean production in Louisiana?				
PI's Name:	Xi Zhang		**E-mail Address:**	xizhang@agcenter.lsu.edu	
PI's Title:	Assistant Professor		**Institution:**	Louisiana State University-Ag Center	
Mailing Address:	262 Research Station Drive				
City/State/Zip:	Bossier City, LA 71112				
Phone number	(318) 408-0983				
Additional PIs For this project:	Changyoon Jeong, Associate Professor, Louisiana State University-Ag Center Email: cjeong@agcenter.lsu.edu, Phone: (318) 408-0975				
Research Locations (states)	Red River Research Station, Louisiana State University-Ag Center Bossier City, LA				
Timeline: Current Year - FY23		**Multi-Year Project Information** (if applicable):			
		Year 1	**Year 2**	**Year 3**	
Start Date:	Apr. 1, 2024	Apr. 1, 2023	Apr. 1, 2024	Apr. 1, 2025	
End Date:	Mar. 31, 2025	Mar. 31, 2024	Mar. 31, 2025	Mar. 31, 2026	
Funds Requested:	$23,859	$20,000	$23,859	$20,000	
Program Area (e.g., breeding, management):					
Other related funding:	N/A				
Objectives:	(1) Estimate the water use by cover crops in diverse soils to quantify their impacts on soil water budget. (2) Investigate the impacts of soil water balance changes due to cover cropping on soybean production.				
Justification:	Cover cropping can conserve soil and water and can be an approach to mitigate drought stress. However, cover crops can deplete soil water when they are growing, and the water use of cover cropping is unclear. The impacts of cover cropping on soil water budget can influence soybean production depending on climate and soil types. Previous studies were conducted mainly in the Midwest. Therefore, quantifying cover cropping and soil water dynamics interactions in Louisiana is essential for evaluating the benefits of cover cropping for soybean production in the Midsouth.				
Exp Setup:	The study will be conducted on soybean fields with different soils in Louisiana. Soil moisture and evapotranspiration data in cover cropped and bare ground plots will be collected during the winter months and summer growing seasons to estimate soil water status and crop water use. Crop parameters will be measured throughout the study period to estimate soybean performance under different treatments.				
Summary:	Cover cropping can be a practice to mitigate drought stress; however, it has potential to impact crop yield due to consumptive water losses through evapotranspiration. This research quantifies the effects of cover cropping on soil water budget and improve cover cropping management to enhance soybean production.				
Key Metrics:	Improvements in soil drought resilience and soybean production				
Expected Deliverables:	Peer-review articles, presentations in professional conferences, field days, and extension publications.				
Benefit to Farmers:	This project incorporates research and outreach to provide research-based information to stakeholders to increase soybean production, strengthen farming systems for long-term profitability, and improve farmers' economic well-being and quality of life.				
Progress Made:	Since April, 2023, we have established no-tillage soybean fields with different soils in Red River Research Station in Northwest LA. A weather station has been built for collecting data to calculate evapotranspiration.				
Signature of Principle Investigator:				**Date:**	
Xi Zhang				Aug. 15, 2023	

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1

2024 Research Funding Approval

MSSB Member State	Approval
Texas	✓
Louisiana	✓
Mississippi	✓
Missouri	✓
Arkansas	

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2024 - TOTAL RESEARCH BENEFIT TO MIDSOUTH FARMERS	$2,247,793.00	Cost to AR $178,297
MULTI REGION BUDGET 2024	$1,408,497.00	No cost to AR; Funded by USB
RED BANDED STINKBUG PROJECT	$86,600.00	No cost to AR; Funded by MSSB
MSSB BUDGET 2024	$752,696.00	Cost to AR; $178,297.00
TOTAL RESEARCH BENEFIT TO MIDSOUTH FARMERS	$2,247,793.00	No Cost to AR; $2,069,496.00

3

Multi-Region Coordination Projects: USB Funded

Field Phenotyping Using Machine Learning Tools integrated with Genetic Mapping to Address Heat and Drought Induced Flower Abortion in Soybean. (PI Jagadish, Tx Tech) $400,156.00

Development and Expansion of Disease Management Decision-Making Tools Across Multiple Soybean Regions. (PI Bradley, Univ KY) $315,000

Developing and releasing high-yielding soybean varieties/germplasm with climate-resilience and genetic diversity across maturity group 00 to VIII (Bo Zhang, VA Tech) - $334,542

Quantifying Nitrogen Credits from Soybean (Michael Mulvaney, MS State) - $358,799

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ARKANSAS SOYBEAN PROMOTION BOARD

Arkansas Funding Request	MSSB Budget 2024 -$752,696
Renewals	$156,040.00
New	$22,257.00
Total Ask for Arkansas	$178,297.00

Enhancing Stink Bug Resistance in Midsouth Soybean.
PI – J. Davis - $86,000.00 – **No request from AR**

5

STATUS	2024 MIDSOUTH SOYBEAN BOARD APPROVED PROJECTS	PROJECT TOTAL COST	ARKANSAS REQUESTED FUNDS
Renewal	Screening soybean germplasm and breeding soybeans for flood tolerance	$175,440	$58,480
Renewal	Development of functional ultra-high stearic acid soybean germplasms.	$30,000	$7,500
Renewal	Development of Climate-Smart High Yield Practices Associated with High-End Biological Treatments and Soybean Related Microbiome Resiliency	$60,000	$12,000
Renewal	Enhancing Stink Bug Resistance in Midsouth Soybean.	$86,000	N/A
Renewal	Spray application of double stranded RNA for simultaneous management of multiple soybean fungal and insect diseases.	$48,234	$12,060
Renewal	How do cover crops impact soil water dynamics and soybean production in Louisiana	$23,859	$5,965
Renewal	Whole Soy Food Acceptability and Market Viability Study	$30,615	$7,654
Renewal	Spatial and temporal variation of soil sampling affect phosphorus and potassium recommendations for soybean	$30,000	$7,500
Renewal	Southern root-knot nematode in MG4 soybean: Characterization of the mechanism of resistance and breeding for resistance	$75,000	$18,750
Renewal	Exploitation of weed species extracts as an effective and environmentally friendly strategy to control insects and deer in soybeans.	$39,522	$9,881
NEW	Ladder (Large Agricultural Database that Drives Extension and Research)	$55,626	$13,907
NEW	Enhancing the Prospects of Sustainable Weed Management and System Productivity through Wheat-Soybean Relay Intercropping in the Midsouth	$33,400	$8,350
Renewal	Screening and Selecting Non-Xtend Soybeans for Dicamba Tolerance	$65,000	$16,250
		$752,696.00	$178,297.00

6

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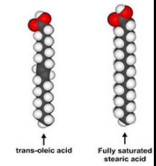
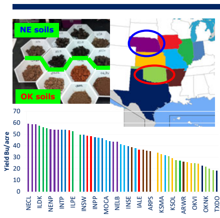
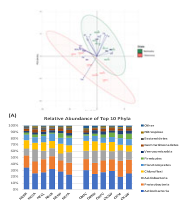


8

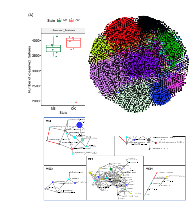
Dev. of Climate-Smart High Yield practices Associated with High-End Biological Treatments and SB Related Microbiome resiliency. Chang, UTA, $60,000; AR $12,000



Soybean yield from 9 states. Nebraska (NE) shows the highest yield, while Oklahoma (OK) shows the lowest yield. NE and OK have been selected for the microbiome and network analysis to identify key players in soils to contributing the highest soybean yield.



PCA analysis of soil physicochemical properties and relative abundance of top 10 phyla in NE and OK soils. Potassium (K) is a key nutrient that is positively correlated with the high soybean yield.



Network analysis. A total of 34 modules have been identified. Among them, 5 modules are associated with higher soybean yield. Within the 5 modules, N-fixing rhizobia and P- or K-solubilizing bacteria are likely key players for the highest soybean yield in NE.

9

Enhancing Stink Bug Resistance in Midsouth Soybean (Start 2022); J. Davis LSU; $86,600 AR-$0

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Life table statistics of redbanded stink bug feed soybean pods

Variety	r_m	R_o	T	Damage Index
S21-21938	-0.018	0.6	31.4	1.52 ± 0.05 b
S21-22039	0.123	38.1	29.6	1.82 ± 0.04 a
S21-21883	0.163	126.7	29.6	1.75 ± 0.08 a
S21-22089	0.129	80.2	34.1	1.82 ± 0.08 a
S21-22008	0.047	4.0	29.6	1.50 ± 0.06 b

End goal: Low damage index with low to negative intrinsic rate of increase

r_m, intrinsic rate of increase; R_o, net reproductive rate; T, mean generation time

10

Screening and Selecting Non-Xtend Soybeans for Dicamba Tolerance. (2020) Canella-Vieria, AR

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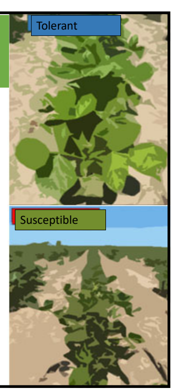

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Exploitation of weed species extracts as an effective control of insects and deer in soybean (2022)

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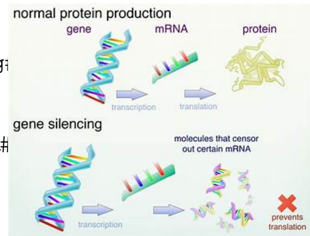

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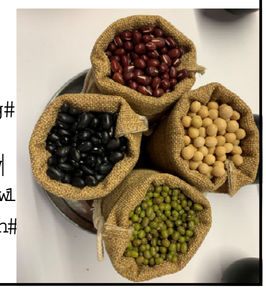

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16

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17

LADDER – Large Agricultural Database that Drives Extension and Research.

NEW

- Z. Reynolds, MS State; Total -$55,626, AR - $13,907
- Using a large database determine environmental effects of
  - CEC, pH, slope, climate, ag practices, nutrient mngt, planting, tillage on soybean production.
- Deliverables – producer data will be used to influence economic decisions for midsouth growers.

18

NEW

Enhancing the Prospects of Sustainable Weed Management and System Productivity through Wheat-Soybean Relay Intercropping in the Midsouth (2024).

- Norsworthy; Total $33,400; AR $8,350
- Obj- 1) determine weed mngt effects of intercropping soybean and wheat 2) promote awareness of relay intercropping
  - Determination of weed suppression
  - Weed seed analysis
  - Economic analysis
  - Measure productivity
  - Deliver data to the public
  - Project near completion

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ATTACHMENT 12

Arkansas Soybean Promotion Board Funding Request-2024

<u>TITLE</u>: Recognizing Soybean Production Excellence by the continuance of the "Grow for the Green Yield Challenge Contests"

<u>INVESTIGATORS</u>: Arkansas Soybean Association – Appointed Committee

<u>PRODUCTION SYSTEM</u>: Alternative

<u>STATUS</u>: Existing

<u>STATED GOAL</u>: To recognize Arkansas soybean producers that obtain very high grain yields and encouraged other Arkansas soybean producers to strive for increased grain yields.

<u>OBJECTIVES</u>:

1. To recognize and award Arkansas producers who have developed management programs that result in very high grain yields by region.
2. To obtain detailed information from participating Arkansas producers regarding management practices employed to obtain exceptionally high soybean grain yields with differing production systems. The development of a high yield soybean production database program that would be available to producers.
3. To share top grower management practices for the various soybean production systems with other Arkansas soybean producers.

<u>APPROACH</u>: This enhanced and expanded proposal builds on the foundation of interest and participation generated by the former "**Race for 100**" Yield Challenge and the current ASPB funded Arkansas "**Grow for the Green Yield Challenge"** contests. This proposal, if funded, will continue to reward Arkansas soybean producers who are able to obtain exceptionally high soybean grain yields with cash and other awards with special recognition to the top three contest participants within each major Arkansas soybean production region of the state. Additionally, this project wishes to recognize crop advisors who assisted these producers in obtaining exceptions soybean grain yields (see figure below):

<u>Information Dissemination</u>: Beginning In 2013 the ARSA **summarized the production practices** of the winners and all of the participants from across the state in a booklet format entitled" 2013 Race for 100 Bushels/Acre Soybean Yield Contest and the 2013 "Grow for the Green Soybean Yield Challenge". This booklet format was also used in all contests since (2014-2023) and the data provided by the participants competing in the "Grow for the Green Soybean Yield Challenge" was distributed at the Arkansas Soybean Association annual meeting, ASPB Soybean/Corn Conferences, MidSouth Farm & Gin Show and placed on both the ASPB and the ARSA websites in January of 2025. A discussion and overview discussion by Dr. Jeremy Ross of the management practices utilized by these outstanding soybean producers was included in the booklets and again this information is also available on both websites.

Based on the continued interest by Arkansas soybean producers and to enable these producers to assess the new innovations in soybean production as it develops with the state, the ARSA is proposing the following 2024 ASPB Proposal entitled "**The Arkansas 2024 Grow for the Green Yield Challenge".**

District 1 = Northeast Delta (East of Crowley's Ridge);
District 2 = Northeast (West of Crowley's Ridge)
District 3 = White River Basin;
District 4 = Central & Grand Prairie;
District 5 = East Central Delta;
District 6 = Southeast Delta
District 7 = Western (remaining production regions within the state);
Non-GMO Statewide category = Producer(s) who utilizes a non-GMO soybean variety (without regard to production region)
Champion of Champions – 100 bushel winners compete against each other

The monetary prize for placing first, second or third within each Division (1-7 and non-GMO) is as follows: 1st place - $7,500, 2nd place $5,000, 3rd place $2,500.

The Champion of Champions division consists of those producers who have achieved the 100 bu/a. A competition among the best in the state. This budget shows that the Champion division is currently shown at $5000. Additional funds will be used to recognize the 100 bushel club members with a dinner.

Any producers who obtain soybean grain yields of 100.00 Bu/A or greater for the 1st time will be inducted into the 100 Bushel Club (receive a 100 bushel plaque & watch) and will be eligible to split $5000. Note: *any producers who are new additions to the 100 Bushel Club will be eligible for an expense paid trip for 2 (travel, housing- 2 nights, registration) to Commodity Classic.*

Producers who turn in their harvest report and do not place in their division will receive $100 and be placed in a drawing for $1000. The goal is to get additional producers to report their harvest yields. Currently about ½ of the entries turn in yields. In 2021, the 61% of those entered turned in their harvest information

INFORMATION GATHERED: Details such as entry dates, field location, agronomic information and grain yield certification will be included on the harvest form. A very detailed template was created electronically in 2020 for each contestant to complete to gather the information other producers need to achieve the high yields.

The data obtained from this form (template) will be analyzed and/or evaluated by the Arkansas Soybean Association, University of Arkansas Division of Agriculture and the Arkansas Soybean

Research and Promotion Board (ASPB) to further assist the soybean producers of this state. Funds provided for this project were authorized by the ARSPB from the soybean check-off program.

Arkansas Soybean Promotion Board (ASBP) Sponsorship

a. ASPB financial sponsorship of "Grow for the Green Challenge
b. Producer Recognition
    I. ARSA Web Site
    II. ASPB Web Site
    III. Publicity (Local, State and Regional Publications)
    IV. Presentations at conferences (National Conservation Tillage Meeting) by state agronomist-Jeremy Ross and top-producers.
c. Distribute production practices information of high yielding soybean producers

PLANNED MILESTONES: Each year this project (yield contest) will be evaluated based on grower participation and grain yields obtained and reported to the Soybean Promotion Board. Yield levels for the various soybean production systems and monetary awards will be evaluated and may be tweaked by Arkansas Soybean Association Yield committee (rules have not be evaluated for 2024 yet)

VALUE TO SOYBEAN INDUSTRY: Arkansas soybean producers are constantly faced with economic and agronomic challenges. These challenges require continual improvement by the grower to obtain increased soybean grain yields and to adopt or utilize new and more efficient technological production practices. This project will help document the present grain yield potential of each production system and provide economic incentive to strive for maximum grain yields regardless of system.

Budget -attached

TOTAL YIELD CONTESTS FUNDING REQUEST - $205,5000

BUDGET NOTES: This budget contains $8,000 to be provided to the U of A System Division of Agriculture to use for travel expenses to field plots for the involved county agent and/or county agent trip to Commodity Classic as the Division sees fit. Additionally, this budget contains a request of $400 to be made available to pay designated yield certifying officials at $50 a plot. Approved Contest Officials (ACO) would not be eligible for the award on a field they are the paid consultant or have a conflict of interest with (seed company, chemical company rep etc.).

For 2024 –If feasible we would like to hold a dinner for the 100 bushel club. Some have asked for an opportunity to visit and share with other producers. A casual event where they could chat.

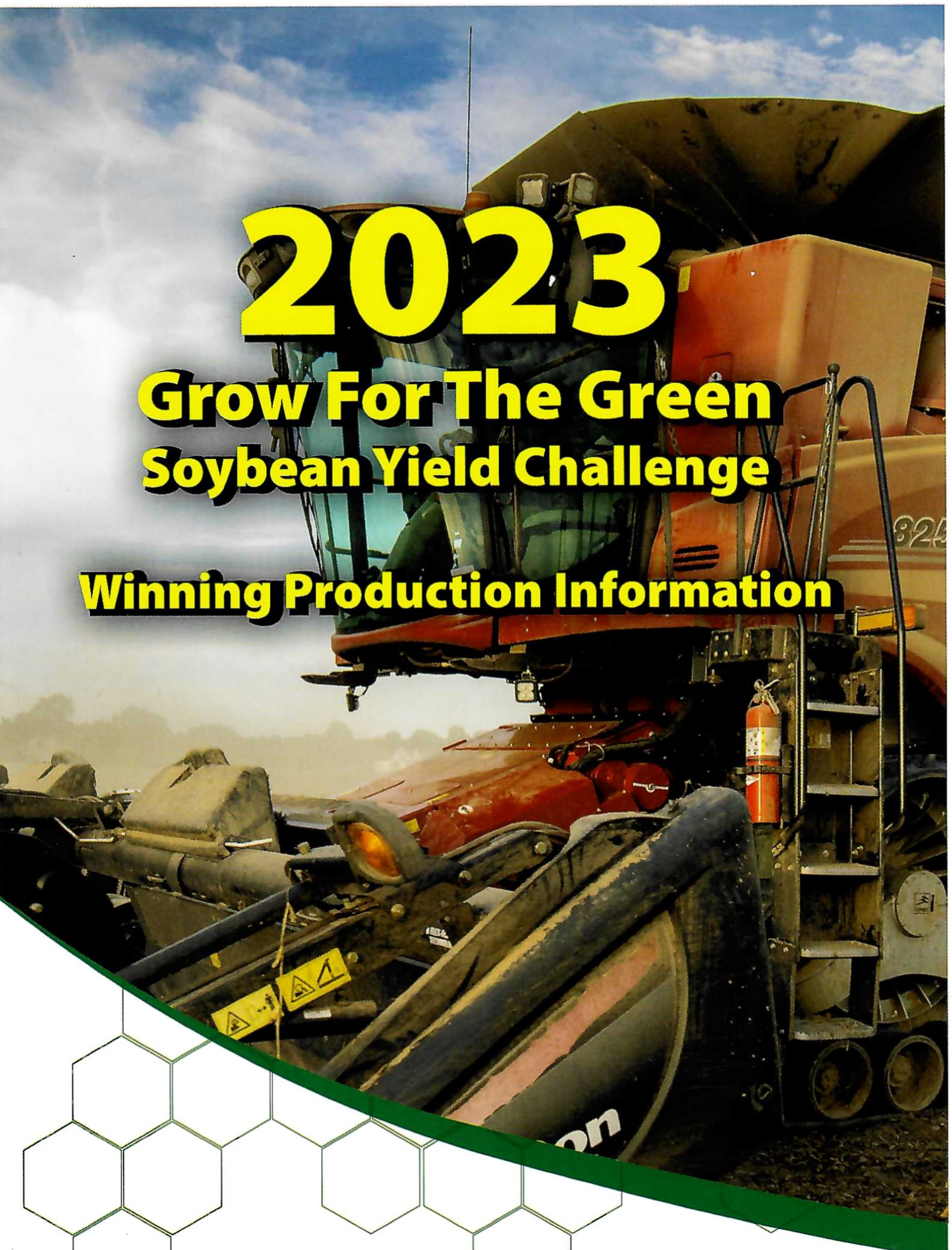
2024 budget proposal

8 districts ($15,000 each)	120000
Champion of Champions	5000
Payment/drawing for harvest reports	5000
CES travel	8000
Judge reimbursement	400
Administrative ($48 per hour)	8000
Advertising	21000
Printing/postage	12000
Misc (Plaques etc)	3500
Commodity Classic (new 100 bushel club)	7500
Awards lunch - ARSA Annual Meeting	1500
Sponsorship of ARSA Annual Meeting	1000
100 bushel club (new producers Reaching 100 bushel/acre)	5000
100 bushel dinner	3000
Watch for 100 bushel club	1000
total requested	201900

2023

Grow For The Green
Soybean Yield Challenge

Winning Production Information



ARKANSAS SOYBEAN PROMOTION BOARD

UofA DIVISION OF AGRICULTURE RESEARCH & EXTENSION University of Arkansas System

ARKANSAS Soybean Association

Soybean Yield Contests in Arkansas

In 1999, the Arkansas Soybean Association established a yield contest with prizes being awarded to the top two or three producers in the state. Prizes were provided by equipment dealers and various seed companies.

The Race for 100 Soybean Yield Contest was established in 2007 by the Arkansas Soybean Promotion Board with administration by the Arkansas Soybean Association as a challenge for Arkansas soybean producers in addition to the Arkansas Soybean Association's yield contest. With the support of the Arkansas Soybean Promotion Board, the Association's contest transitioned to the Grow for the Green Soybean Yield Challenge in 2011. The contests were established as a way to share contestants' agronomic practices and methods of achieving high soybean yields in Arkansas.

In 2013, the 100 Bushel barrier was broken by Matt Miles, Nelson Crow and Eddie Tackett. They became the original members of the Arkansas 100 Bushel Club. Since then, a total of 35 soybean growers have surpassed the 100-bushel mark with nine growers yielding over 100 bu/ac multiple times. The record yield for the Grow for the Green (GFTG) Yield Challenge was achieved in 2021 when Neil Culp recorded a yield of 130.784 bu/ac.

In the following pages of the booklet are some of the important management practices that these top soybean producers employed to obtain soybean grain yields that equal or exceed 60 bu/ac, and often exceeding 90 or even 100 bu/ac. In general, (but not always), these same management practices are supported by the basic and applied research conducted by the University of Arkansas System Division of Agriculture's research scientists and extension specialists.
In 2023, two new growers reached the 100 bu/ac level. Jeff Wells achieved 102.424 bu/ac and Mark Williams harvested 101.611 bu/ac.

Three producers already in the 100 Bushel Club reached the 100-bushel goal again in 2023. These producers were: Matt Miles for the ninth time with 110.722 bu/ac; Layne Miles for the sixth time with 115.270 bu/ac; and Tim Fisher for the second time with 102.090 bu/ac.

For many GFTG producers, the 2023 cropping season started out better than the last two years due to drier conditions early in the season. During late-May and June, the lack of appreciable rainfall and warmer than normal temperatures reduced disease pressure and caused an increase in the number of irrigations events. However, July was exceptionally wet with normal temperatures and many producers obtained higher grain yields than were seen in previous years. The Arkansas GFTG Challenge encompasses seven geographical areas with differing soil textures and environmental conditions.

This book contains the names of the top producing contestants by district. Again, some of the more common (but not altogether exclusive) production practices used by nearly all GFTG participants included April plantings, indeterminate MG IV varieties, fungicide applications, and timely irrigation events. GFTG producers work hard to ensure adequate drainage and irrigation capabilities. Commercial fertilizers and/or chicken litter were also common additions as well as outstanding pest control measures. Although the addition of corn into the rotation is credited by producers as a real plus in their quest to increase soybean yields, outstanding yields were obtained behind cotton, rice, and soybean.

What the results do not reflect is the timeliness of management practices. Experience suggests that timely management practices are being applied to these soybean fields by the GFTG producers before the crop is subjected to significant yield decreasing stresses.

For full contest details, visit **TheMiracleBean.com**

Acknowledgement

The Arkansas Grow for the Green Yield Challenge is funded with Arkansas soybean grower checkoff funds allocated by the Arkansas Soybean Promotion Board to be administered by the Arkansas Soybean Association. This entire program is indebted to the outstanding cooperation from faculty, County Agents, and staff of the University of Arkansas System Division of Agriculture, Cooperative Extension Service with additional assistance from Certified Crop Advisors, Agriculture Consultants, and others. In many instances, the county extension faculty of the University of Arkansas System Division of Agriculture as well as private consultants and other interested parties worked closely with the producers to achieve the yields depicted in this booklet and their assistance in yield verification is much appreciated.

Complete production information on all harvested entries will be made available on the websites of the Arkansas Soybean Promotion Board, **TheMiracleBean.com** and the Arkansas Soybean Association, **ArkansasSoybean.com**.

*Dr. Jeremy Ross is the Extension Agronomist – Soybean/Professor within the Crop, Soil, and Environmental Sciences Department, University of Arkansas System Division of Agriculture, Cooperative Extension Service.

For additional information:
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1501 N Pierce, Suite 100
Little Rock AR 72207
501-666-1418 office
501-666-2510 fax
swsoy@aristotle.net
ArkansasSoybean.com

For full contest details, visit **TheMiracleBean.com**

Division One: *Northeast Delta*
Clay
Craighead
Crittenden
Cross (East of Crowley's Ridge)
Greene
Mississippi
Poinsett

Jeff Wells — Final Yield (bu/ac): 102.424

County: Greene
Variety: Pioneer 47A64X
Seed Trait: Dicamba
Previous Crop: beans, corn, beans
Seeding Rate/Ac: 116,000
Planting Date: 4/8/23
Soil Type: Fountain Silt Loam
Seed Treatment: Warden CX2 - 1.98 per unit
Fertilizer: Chicken litter (1.5 ton 11/5/23), 00-90 (150 lb. 4/11/23), Boron Maxim (1 pt. 5/16 smf 8/2)
Row Spacing: Twin row 38"
Pre-Plant Herbicide: Roundup 1 qt, Verdict 3/20/23
Post-Emergence Herbicide: Engenia (12.8 oz 5/16) Roundup (1qt 5/16) Outlook (12.8 oz 5/16) Anthem Max (3 oz 5/26), Roundup (1 qt 5/26)
Irrigation Method/Frequency: Furrow (6/5,6/12, 6/19, 6/26, 7/10, 7/17, 7/24, 8/7, 8/14, 8/21, 8/28)
Harvest Date: 10/3/23

Casey Hook — Final Yield (bu/ac): 96.094

County: Craighead
Variety: Agrigold 4094XF
Seed Trait: Dicamba
Previous Crop: beans, corn, cotton
Seeding Rate/Ac: 108,000
Planting Date: 3/29/23
Soil Type: Silt Loam Falaya
Seed Treatment: Agrishield, Saltro
Fertilizer: AMS 100 lb. 5/20/23
Row Spacing: Twin row 38"
Pre-Plant Herbicide:
Pre-Emergence Herbicide: Gramoxone 32 oz, Outlook 12.8 oz 3/30/23
Post-Emergence Herbicide: Roundup 32 oz, Xtendimax 22 oz, Anthem Max 3.2 oz on 4/30/23
Insecticide:
Fungicide: Revytek 8 oz 5/25/23
Foliar Treatment: Full Sun (64 oz), Level up (32 oz), Amino (32 oz) Bioforge (8 oz) on 5/25/23
Irrigation Method/Frequency: Furrow 8 times
Harvest Aid: Paraquat 16 oz 8/16/23
Harvest Date: 8/28/23

Roger Reddick — Final Yield (bu/ac): 94.332

County: Greene
Variety: Pioneer 48A60X
Seed Trait: Dicamba
Previous Crop: corn, beans, corn
Seeding Rate/Ac: 123,802
Planting Date: 4/11/23
Soil Type: Askew Silt Loam
Seed Treatment: Pioneer PPST
Fertilizer: chicken litter (1 ton/ ac 4/1/23), 0-3-100-18 (4/3/23) Coron 10-0-10 1 gal/acre 6/20 & 7/14)
Row Spacing: 38"
Pre-Plant Herbicide:
Pre-Emergence Herbicide:
Post-Emergence Herbicide: Engenia (12/8 oz 5/25), Roundup Pmax 3 (28 oz/acre 5/30), Engenia (12/8 oz/1 6/28), Roundup PMax3 (28 oz 7/3)
Insecticide: Warrier 2 (2 oz 6/20)
Fungicide: Miravis Top (13.7 oz/1 6/20), Miravis Top (7 oz/a 7/24)
Foliar Treatment:
Irrigation Method/Frequency: Alt furrow 6/12,6/19,6/24, 6/29, 7/5,7/11,7/16,7/21,7/28, 8/4 2 inch each
Harvest Aid:
Harvest Date: 10/11/23

Kevin Milliken

Final Yield (bu/ac): 84.543

County: Clay
Variety: Agrigold 4620
Seed Trait: Dicamba
Crop: corn, beans, corn
Seeding Rate/Ac: 120,000
Planting Date: 3/28/23
Soil Type: Silt Loam Falaya
Seed Treatment:
Fertilizer: P (250 units in fall), K (100 units in fall)
Row Spacing: 30"
Pre-Plant Herbicide: Zidua Pro 3 oz Feb 16
Pre-Emergence Herbicide:
Post-Emergence Herbicide:
XtendiMax, 10 oz, May 1
Insecticide: Karate 2 oz May 1
Fungicide: Miravis Top, 13 oz, June 2
Foliar Treatment: Boron (16 oz), May 1, Foliar K (1 gal), June 2, Cal Borh (16 oz) June 2
Irrigation Method/Frequency: Furrow every 5 days 1.5", 8 times
Harvest Aid: Sharpen 1 ox Aug 28
Harvest Date: 9/18/23

Allen Griffin

Final Yield (bu/ac): 81.506

County: Greene
Variety: Asgrow AG46X6
Seed Trait: Dicamba
Previous Crop: beans corn, corn
Seeding Rate/Ac: 125,000
Planting Date: 4/13/12
Soil Type: Jackport Silty Clay Loam
Seed Treatment: Cruiser Max
Fertilizer: Potash (100 #), TSP (100 #) April 13, Poultry litter 2 tons Nov 1, 2022
Row Spacing: Potash (100 #), TSP (100 #) April 13, Poultry litter 2 tons Nov 1, 2022
Pre-Plant Herbicide:
Pre-Emergence Herbicide: Boundry 1.5 pt. April 13
Post-Emergence Herbicide: Engenia (12.8 oz) June 1, Roundup Weather Max (2 qt) May 15
Insecticide:
Fungicide: MiravisTop (13.7 oz) June 20
Foliar Treatment:
Irrigation Method/Frequency: Furrow 6/17, 6/27, 7/4, 7/17,7/24, 7/31, 8/7, 8/24, 9/1, 9/12
Harvest Aid:
Harvest Date: 10/20/23

Austin Murray

Final Yield (bu/ac): 78.100

County: Greene
Variety: Asgrow AG47XF2
Seed Trait: Xtend
Previous Crop: corn, beans, corn
Seeding Rate/Ac: 115,000
Planting Date: 5/4/23
Soil Type: Amagon Silt Loam
Seed Treatment:
Fertilizer: Phosphorus (30 lb.), Potassium (120 lb.) MM Boron (10 lb.)
Row Spacing: 30"
Pre-Plant Herbicide:
Pre-Emergence Herbicide: Antares Complete (2.5 pt.)
Post-Emergence Herbicide: Glyphosate (32 oz), Xtendimax (22 oz)
Insecticide:
Fungicide:
Foliar Treatment:
Irrigation Method/Frequency: Furrow 6 times
Harvest Aid:
Harvest Date: 10/9/23

Kevin Murray

Final Yield (bu/ac): 70.825

County: Greene
Variety: Asgrow AG46X6
Seed Trait: Xtend
Previous Crop: corn, beans, corn
Seeding Rate/Ac: 115,000
Planting Date: 5/6/23
Soil Type: Beulah fine sandy loam
Seed Treatment:
Fertilizer: Phosphorus (30 lb.), Potassium (100 lb.), MM boron (10 lb.) Chicken litter (2000 lb.)
Row Spacing: 30"
Pre-Plant Herbicide:
Pre-Emergence Herbicide: Antares Complete (2.5 pt.)
Post-Emergence Herbicide: Glyphosate (32 oz), Xtendimax (22 oz)
Insecticide:
Fungicide:
Foliar Treatment:
Irrigation Method/Frequency: furrow 6 times
Harvest Aid:
Harvest Date: 10/11/23

Mark Williams Final Yield (bu/ac): 101.611

County: Clay
Variety: Asgrow AG46X6
Seed Trait: Dicamba
Previous Crop: rice, beans rice
Seeding Rate/Ac: 135,000
Planting Date: 4/3/23
Soil Type: Silt Loam
Seed Treatment: Cruisermaxx/ vibrance
Fertilizer: poultry litter (2 tons Sept. 2022), 0-18-36 (150 lb. Sept. 2022)
Row Spacing: 30″
Pre-Plant Herbicide: Valor (3 oz 10/27/22)
Pre-Emergence Herbicide: Visor S-Moc (16 oz 4/10), Metribuzin (8.5 oz), Glyphosate (32 oz)
Post-Emergence Herbicide: Select (16 oz), Engenia (12.8 oz), Volacept, (16 oz) Visor S-Moc (16 oz) on 5/26
Insecticide:
Fungicide: Miravis Top (13.7 oz 7/1)
Foliar Treatment:
Irrigation Method/Frequency: furrow 6 times
Harvest Aid: paraquat (16 oz 9/18)
Harvest Date: 10/10/23

Adam Fisher Final Yield (bu/ac): 94.635

County: Cross
Variety: Pioneer 42A84E
Seed Trait: RR LL
Previous Crop: corn, beans, corn
Seeding Rate/Ac: 105000
Planting Date: 4/15/23
Soil Type: Calloway Silt Loam
Seed Treatment: Lumigen
Fertilizer: 20-20 Micropack, chicken litter (2 tons/acre) Potash (250 lb./acre), DAP (150 lb./ac) on 4/12
Row Spacing: 30″
Pre-Plant Herbicide: Dual (8 oz) Verdict (5 oz) on 4/17
Pre-Emergence Herbicide:
Post-Emergence Herbicide: Liberty (32 oz) Generic Select (5/4)
Insecticide: Beseige (13.7 oz) 7/10
Fungicide: Miravis Top (13.7 oz 7/10)
Foliar Treatment: Foliar K ran with Miravis Top
Irrigation Method/Frequency: furrow 2 inches 4 times
Harvest Aid: Gramoxone (16 oz) 9/5/23
Harvest Date: 9/22/23

Nick Ragsdell Final Yield (bu/ac): 91.136

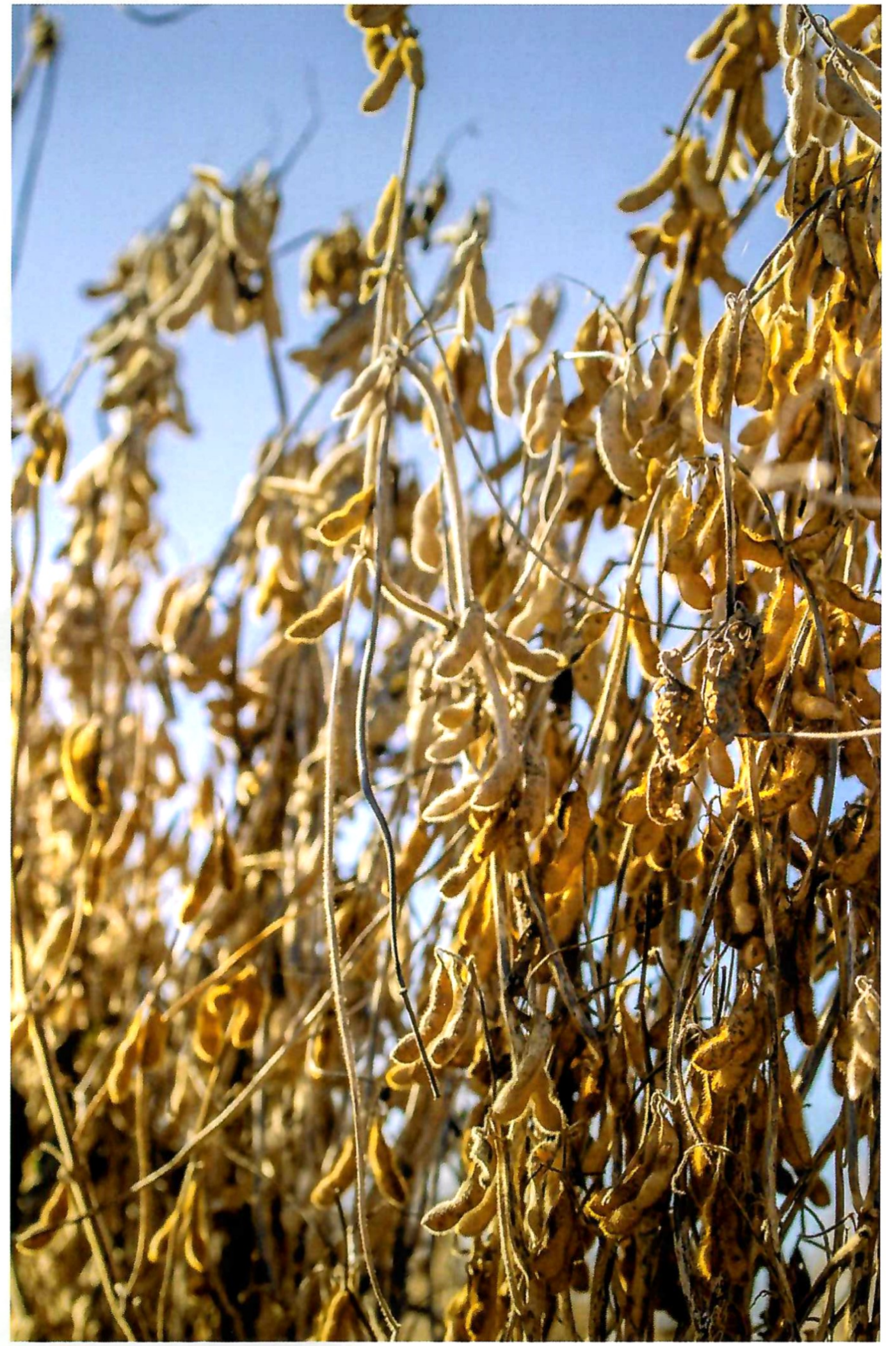
County: Randolph
Variety: Asgrow AG47XF2
Seed Trait: Xtend
Previous Crop: rice, beans, beans
Seeding Rate/Ac: 120000
Planting Date: 4/10/23
Soil Type: Silt Loam
Seed Treatment:
Fertilizer: 0-60-120 4/10/23
Row Spacing: 30″
Pre-Plant Herbicide: Boundary (2 pt.) 4/10/23
Pre-Emergence Herbicide:
Post-Emergence Herbicide: Roundup (32 oz) 5/1; Xtendimax (22 oz) 5/10; Xtendimax (22 oz) 6/1
Insecticide:
Fungicide: Miravis (13 oz) 6/15
Foliar Treatment:
Irrigation Method/Frequency: furrow 5/20, 5/30, 6/5, 6/15, 6/23, 7/1, 7/10, 7/20, 8/1
Harvest Aid: Gramoxone (14 oz) 8/15
Harvest Date: 10/12/23

Brad Gray Final Yield (bu/ac): 80.615

County: Greene
Variety: 48A60X
Seed Trait: Dicamba
Previous Crop: beans, beans, corn
Seeding Rate/Ac: 124000
Planting Date: 5/4/23
Soil Type: Wivillefine sandy loam
Seed Treatment: Warden CXII
Fertilizer: EKL BioStim 2sal/a on 5/20, Potash 100 lb. on 4/10
Row Spacing: 30″
Pre-Plant Herbicide:
Pre-Emergence Herbicide: Presidual 1.5 pt. 4/25
Post-Emergence Herbicide: Engenia 12.8 oz on 6/1 & 6/10
Insecticide:
Fungicide: Miravis 13.7 oz 7/5
Foliar Treatment:
Irrigation Method/Frequency: furrow - 9 times
Harvest Aid:
Harvest Date: 10/3/23

Josh Cabe Final Yield (bu/ac): 76.044

County: Poinsett
Variety: Beck's 4886
Seed Trait: Xtend
Previous Crop: rice, beans, rice
Seeding Rate/Ac: 127000
Planting Date: 5/3/23
Soil Type: Henry Silt Loam
Seed Treatment: Escalate Nemasect SDS+
Fertilizer: 0-20-60 Aspire 4/28
Row Spacing: 37″ twin
Pre-Plant Herbicide: Generic Roundup (1 qt), 2,4-D (1 qt) 3/11/23
Pre-Emergence Herbicide: Anthem Max (3.25 oz) 5/3
Post-Emergence Herbicide: Generic Roundup (40 oz) Liberty (1 qt) 4/30; Outlook (16 oz) 6/8; Select (8 oz) 6/27
Insecticide:
Fungicide: Concept. Agritek BioHealth (1 qt) 6/27
Foliar Treatment: Concept. Agritek Cal Bor (1 qt), Foliar K (2 qt) 6/37
Irrigation Method/Frequency: furrow 3 " 8/28,9/18
Harvest Aid:
Harvest Date: 10/25/23



For full contest details, visit **TheMiracleBean.com**

Richard Walker — Final Yield (bu/ac): 93.011

County: Jackson
Variety: Pioneer 45A40LX
Seed Trait: Xtend
Previous Crop: corn, beans, corn
Seeding Rate/Ac: 140000
Planting Date: 5/6/23
Soil Type: Silt Loam
Seed Treatment: Lumigen, Graph-Ex SA
Fertilizer: Chicken Litter (2 tons) 11/22, Potash (15lb.) 4/23
Row Spacing: 30″
Pre-Plant Herbicide:
Pre-Emergence Herbicide: Gramoxone (28 oz), Zidua sc (3.25 oz), Metribuzin 75DF (4 oz) 5/6
Post-Emergence Herbicide: Liberty (32 oz) 5/17 & 6/7; Outlook (12.8oz), Clethodim (12 oz) 6/7
Insecticide: Warrior II (2 oz) 7/5
Fungicide: Miravis Top (13.7 oz)7/5
Foliar Treatment: CropKarb (1 qt), MicroVite (1 qt) Boron Plus (8 oz) 7/5; Gainer 20-20-20 (5 lb.) 7/26
Irrigation Method/Frequency: furrow 6 times
Harvest Aid: Gramoxone (11 oz) 9/15
Harvest Date: 10/13/23

Isaac Davis — Final Yield (bu/ac): 81.573

County: Independence
Variety: Becks 4885
Seed Trait: LL Dicamba RR
Previous Crop: corn, beans, corn
Seeding Rate/Ac: 140000
Planting Date: 4/11/23
Soil Type: Sandy loam
Seed Treatment: Becks Escalate, Illevo, Tow.O
Fertilizer: Potash (100 lb. 3/20)
Row Spacing: 7.5″
Pre-Plant Herbicide:
Pre-Emergence Herbicide: Glystar (32 oz) Metribuzin (6 oz), Dual (16 oz) on 4/12
Post-Emergence Herbicide: Surmise 5 (16 oz), Anthem Maxx (3 oz) on 5/17, Glystar (32 oz) AMS 1% on 6/7
Insecticide: Beseige (5.8 oz) 7/3
Fungicide: Lucento (3.3 oz) 7/3
Foliar Treatment: Cal Bor (16 oz) Foliar K (64 oz) on 7/3
Irrigation Method/ Frequency: Pivot 1″ 5/29, 6/15,6/23,7/3,7/27,8/6 (2″),8/21
Harvest Aid: Gramoxone (10.6 oz) & nonionic 1% on 9/1
Harvest Date: 9/15/23

Terry Fuller — Final Yield (bu/ac): 81.289

County: Monroe
Variety: Pioneer 45A40LX
Seed Trait: Dicamba
Previous Crop: corn, beans, corn
Seeding Rate/Ac: 130000
Planting Date: 5/7/23
Soil Type: Dabbs Silt Loam
Seed Treatment: cruiser Max (3/22 oz), Vibrance (3.22 oz)
Fertilizer: Potash (214 lb.), TSP (171 lb.) 10/30/22
Row Spacing: 7/5″
Pre-Plant Herbicide: Glyphosate (32 oz) Dicamba (8 oz)
Pre-Emergence Herbicide: Paraquat (32 oz) Ledger (24 oz)
Post-Emergence Herbicide: Glyphosate (32 oz), Glufosinate (32 oz) Metolachlor (16 oz)
Insecticide:
Fungicide:
Foliar Treatment: MicroVite (16 oz) PercPlus (32 oz)
Irrigation Method/ Frequency: furrow 7/6,7/18,7/28,8/7,8/16,8/21
Harvest Aid: gramoxone (12 oz) 9/7/23
Harvest Date: 9/21/23

Greg King — Final Yield (bu/ac): 78.356

County: Jackson
Variety: Nk 48-H3XFS
Seed Trait: Xtend
Previous Crop: corn, beans, corn
Seeding Rate/Ac: 140000
Planting Date: 5/15/23
Soil Type: Silt Loam
Seed Treatment: Cruiser, GraphEx SA
Fertilizer: Chicken Litter (2 tons) 11/22, Potash (150lb.) 4/23
Row Spacing: 30"
Pre-Plant Herbicide:
Pre-Emergence Herbicide: Gramoxone (28 oz), Zidua sc (3.25 oz), Metribuzin 75DF (4 oz) 5/15
Post-Emergence Herbicide: Liberty (32 oz) Roundup (32 oz) 5/31; Liberty (32 oz) Outlook (12.8 oz) 6/14
Insecticide: Warrior II (2 oz) 8/30
Fungicide: Miravis Top (13.7 oz) 7/19
Foliar Treatment: Crop Kabb (1 qt) 7/19; Gainer 20-20-20 (5 lb.) 8/30
Irrigation Method/Frequency: furrow 6 times
Harvest Aid: Gramoxone (11 oz) 9/26
Harvest Date: 10/20/23

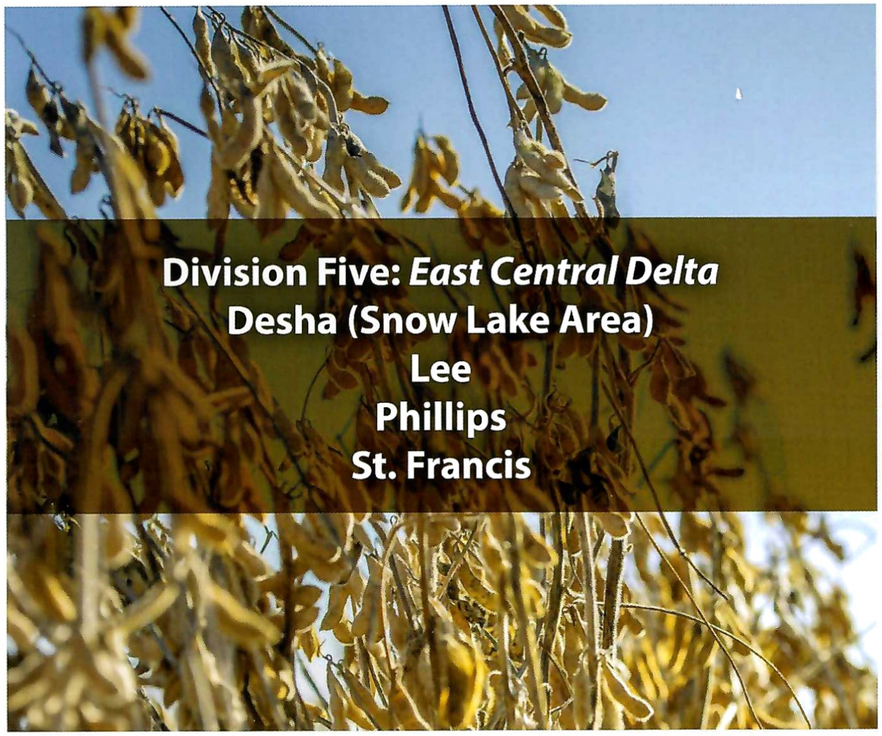
For full contest details, visit **TheMiracleBean.com**

David Strohl Final Yield (bu/ac): 96.282

County: Prairie
Variety: Asgrow 47F2
Seed Trait: RR LL Dicamba
Previous Crop: corn, beans, corn
Seeding Rate/Ac: 134000
Planting Date: 4/1/23
Soil Type: Silt loam
Seed Treatment: Cruiser Max 4 oz
Fertilizer: 55-18.4-31.4-4. on 4/11
Row Spacing: 30"
Pre-Plant Herbicide: Roundup 32 oz
Pre-Emergence Herbicide: Metribuzin (5 lb.) Zidua (3.25 oz) 4/1/23
Post-Emergence Herbicide: Liberty (32 oz) Makaze (36 OZ0 Outlook (14 oz) 5/10
Insecticide:
Fungicide: Priaxor (4 oz) 7/17
Foliar Treatment:
Irrigation Method/Frequency: row on 6/5,6/12,6/28,7/23,7/31
Harvest Aid: Gramoxone (16 oz) 8/25
Harvest Date: 9/13/23

Taylor Burdett Final Yield (bu/ac): 93.224

County: Arkansas
Variety: Pioneer 47A64
Seed Trait: RR
Previous Crop: beans, corn, beans
Seeding Rate/Ac: 130000
Planting Date: 3/30/23
Soil Type: Silty clay loam
Seed Treatment: Revise
Fertilizer: Split app/pre-plant
Row Spacing: 30"
Pre-Plant Herbicide: Envy Intense (32 oz), Weddone LV-6 (16 oz)
Pre-Emergence Herbicide: Zidua SC (2 oz)
Post-Emergence Herbicide: Envy Intense (32 oz), Vamous (8 oz), Zidua SC (2.5 oz)
Insecticide:
Fungicide: Miravis Top (13/7 oz)
Foliar Treatment:
Irrigation Method/Frequency: furrow 5 times 6/2-8/18
Harvest Aid: Gramoxone (16 oz) 8/25
Harvest Date: 9/16/23



Division Five: *East Central Delta*
Desha (Snow Lake Area)
Lee
Phillips
St. Francis

Allen Culp Final Yield (bu/ac): 99.365

County: Phillips
Variety: Asgrow AG48X9
Seed Trait: Dicamba
Previous Crop: corn, beans, corn
Seeding Rate/Ac: 130000
Planting Date: 4/2/23
Soil Type: Silt Loam
Seed Treatment: Cruiser Max 8 oz
Fertilizer: Carbon Complete 4 gal on 3/20/23
Row Spacing: 30"
Pre-Plant Herbicide: Roundup (32 oz) Dicamba (16 oz) 3/5
Pre-Emergence Herbicide:
Post-Emergence Herbicide: Roundup (32oz), Tavium (56 oz), Drift Knot (12.8 oz), Salrata (16 oz) 4/24
Insecticide: Bifentrin (5 oz)
Fungicide: Miravis Top (13.7 oz)
Foliar Treatment: Carbon K (64 oz) 5/20
Irrigation Method/Frequency: furrow 6/1,6/17,6/23,7/1,7/14
Harvest Aid: Gramoxone 22 oz on 8/25
Harvest Date: 9/8/23

Blake Culp Final Yield (bu/ac): 95.928

County: Phillips
Variety: Asgrow AG48X9
Seed Trait: Dicamba
Previous Crop: beans, cotton, corn
Seeding Rate/Ac: 130000
Planting Date: 4/1/23
Soil Type: Silt Loam
Seed Treatment: Cruiser Max 8 oz
Fertilizer: carbon Complete 4 gal on 3/23/23
Row Spacing: 30"
Pre-Plant Herbicide: Roundup (32 oz) Dicamba (16 oz) 3/5
Pre-Emergence Herbicide:
Post-Emergence Herbicide: Roundup (32oz), Tavium (56 oz), Drift Kot (12.8 oz), Salrata (16 oz) 4/24
Insecticide: Bifentrin (5 oz)
Fungicide: Miravis Top (13.7 oz)
Foliar Treatment: Carbon K (64 oz) 5/20
Irrigation Method/Frequency: furrow 6/1,6/17,6/23,7/1,7/10
Harvest Aid: Gramoxone 22 oz on 8/25
Harvest Date: 9/8/23

Parker Rohrscheib Final Yield (bu/ac): 90.614

County: Phillips
Variety: Asgrow AG48X9
Seed Trait: Dicamba
Previous Crop: beans, beans, corn
Seeding Rate/Ac: 150000
Planting Date: 4/2/23
Soil Type: Silt Loam
Seed Treatment: CMV
Fertilizer: K (150 lb.) P (100lb.)
Row Spacing: 15"
Pre-Plant Herbicide: Roundup (26 oz) First Shot (.6 oz) 3/15
Pre-Emergence Herbicide: Boundary (32 oz) 4/15
Post-Emergence Herbicide: Engenia (12.8 oz) Outlook (12.8 oz) Select (12 oz)
Insecticide: Beseige (8 oz)
Fungicide: Miravis Top (13.8 oz)
Foliar Treatment:
Irrigation Method/Frequency: Row water 6 times
Harvest Aid: Gramoxone (11 oz)
Harvest Date: 9/25/23

For full contest details, visit **ArkansasSoybean.com**

Brian Chastain — Final Yield (bu/ac): 89.360

County: Phillips
Variety: Agrigold 4742XF
Seed Trait: LL Dicamba
Previous Crop: corn, beans, corn
Seeding Rate/Ac: 135000
Planting Date: 4/15/23
Soil Type: Silt Loam
Seed Treatment: Agrishield
Fertilizer: Chicken Litter (1 ton) 3/12/23
Row Spacing: 40" twin row
Pre-Plant Herbicide:
Pre-Emergence Herbicide: Intimidator (1 qt)
Post-Emergence Herbicide: Tavium (56 oz)
Insecticide: Sniper (3.5 oz)
Fungicide: Miravis Top
Foliar Treatment: Nutri FEKE (1 pt.) 5/20; Boron (10 oz) 6/7
Irrigation Method/Frequency: furrow 1 inch 6/10,7/15,7/25,7/31, 8/10,8/20,8/30
Harvest Aid: Gramoxone (1 pint) 9/5
Harvest Date: 9/19/23

Terry Tolar — Final Yield (bu/ac): 88.879

County: Phillips
County: Tolar-Lakeridge Farms
Variety: Asgrow 43X0
Seed Trait: RR Dicamba
Previous Crop: beans, beans, beans
Seeding Rate/Ac: 140000
Planting Date: 4/19/12
Soil Type: Silt Clay Loam
Seed Treatment: Cruiser Max 3.5 oz
Fertilizer: Phosphate (50#), Potash (175 #) on 4/18
Row Spacing: 15"
Pre-Plant Herbicide:
Pre-Emergence Herbicide: Fierce EZ (6 oz) 4/19
Post-Emergence Herbicide: Tavium (56 oz) 5/24
Insecticide: Beseige (8 oz) 7/20
Fungicide: Miravis Top (13.7 oz)
Foliar Treatment: k-Fuel (1 gal) Boron 10% (1 qt) on 6/26
Irrigation Method/Frequency: furrow 6/26,7/19,7/31,8/9,8/19
Harvest Aid: Branded (10oz) 9/6
Harvest Date: 9/21/23

DJ Mallard — Final Yield (bu/ac): 87.047

County: Phillips
Variety: Asgrow AG48FX9
Seed Trait: RR Dicamba
Previous Crop: beans, corn, beans
Seeding Rate/Ac: 140000
Planting Date: 5/7/23
Soil Type: Silt Loam
Seed Treatment: CMV
Fertilizer: K (150 lb.) P (100lb.) 5/20/23
Row Spacing: 15"
Pre-Plant Herbicide: 15"
Pre-Emergence Herbicide: Roundup (26 oz) First Shot (6 oz) 3/20
Post-Emergence Herbicide: Zidua (3.25 oz) 5/10
Insecticide: Engenia (12.8 oz) Outlook (12.8 oz) Select (12 oz)
Fungicide: Miravis Top (13.8 oz)
Foliar Treatment:
Irrigation Method/Frequency: Row water 5 times
Harvest Aid: Gramoxone (11.5 oz)
Harvest Date: 9/23/23

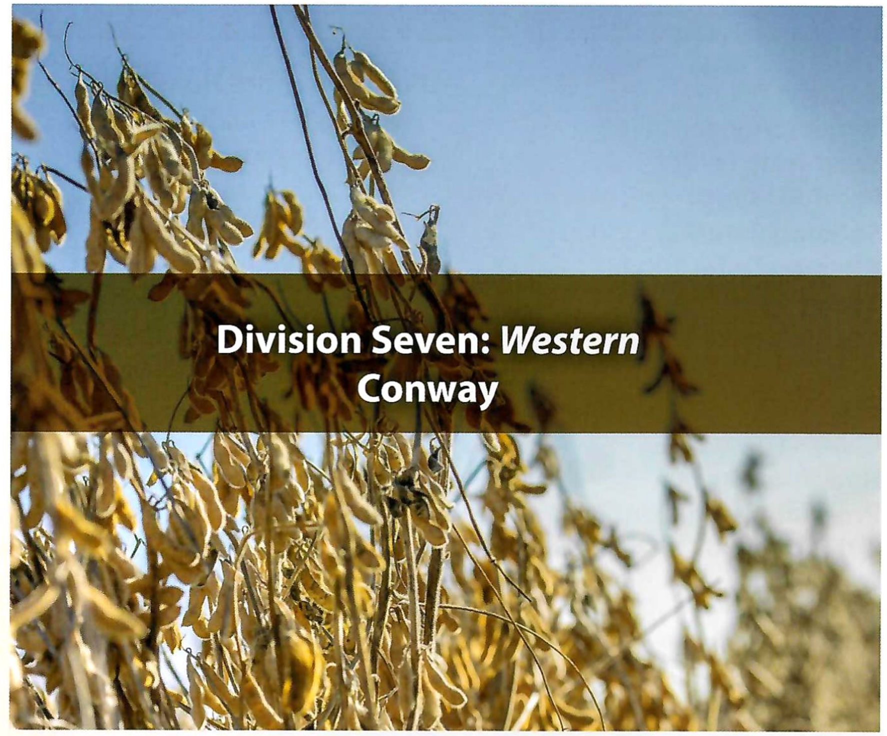
Leonard Rohrscheib Jr. — Final Yield (bu/ac): 86.099

County: Phillips
Variety: Asgrow AG48FX0
Seed Trait: Dicamba, Flex
Previous Crop: beans, corn, beans
Seeding Rate/Ac: 150000
Planting Date: 4/15/23
Soil Type: Silt Loam
Seed Treatment: CMV
Fertilizer: K (150 lb.) P (100 lb.) 4/13/23
Row Spacing: 15"
Pre-Plant Herbicide: Roundup (26 oz) First Shot (.6 oz) 33/15
Pre-Emergence Herbicide: Boundary (32 oz) 4/15
Post-Emergence Herbicide: Engenia (12.8 oz) Outlook (12.8 oz) Select (12 oz)
Insecticide: Beseige (8 oz)
Fungicide: Miravis Top (13.8 oz)
Foliar Treatment:
Irrigation Method/Frequency: Row water 6 times
Harvest Aid: Gramoxone (11 oz)
Harvest Date: 9/22/23

For full contest details, visit **ArkansasSoybean.com**

John Allen McGraw Final Yield (bu/ac): 85.521

County: Lincoln
Variety: LS 4795XS
Seed Trait: Dicamba
Previous Crop: beans, rice, beans
Seeding Rate/Ac: 112000
Planting Date: 3/31/23
Soil Type: Portland Clay
Seed Treatment: Cruiser Max 4.18 oz per 100 lb. seed
Fertilizer: 0-0-22 - 143 lb., Potash (80 lb.) Oct 22
Row Spacing: 30"
Pre-Plant Herbicide: Roundup (1 qt) Fierce (6.6 oz) 3/31
Pre-Emergence Herbicide:
Post-Emergence Herbicide: Engenia (18.6 oz) K-Leaf (1.5 pt.) Roundup (1 qt) 6/1
Insecticide: Bifentrin (1 gal-20) on 6/13 & 6/21
Fungicide:
Foliar Treatment:
Irrigation Method/Frequency: well 4350 gal on 7/12 & 7/24
Harvest Aid:
Harvest Date: 9/13/23



Blake & Chris Mans Final Yield (bu/ac): 92.256

County: Yell
Variety: Pioneer P48A14E
Seed Trait: Enlist
Previous Crop: beans, corn, corn
Seeding Rate/Ac: 140000
Planting Date: 4/8/23
Soil Type: Silt Loam
Seed Treatment:
Fertilizer: chicken litter (2 ton) 10/2022
Row Spacing: 30"
Pre-Plant Herbicide: Glyphosate (32 oz)
Pre-Emergence Herbicide: Metribuzin (5 oz), Metolachlor (1 pt.), Gramoxone (32 oz)
Post-Emergence Herbicide: Glyphosate (32 oz), Enlist (32 oz), Dual (1 pt.)
Insecticide:
Fungicide:
Foliar Treatment:
Irrigation Method/Frequency: furrow 4 times
Harvest Aid:
Harvest Date: 9/21/23

Ronnie Cross — Final Yield (bu/ac): 86.333

County: Yell
Variety: Agrigold 4707
Seed Trait: Enlist
Previous Crop: corn, beans, corn
Seeding Rate/Ac: 135000
Planting Date: 5/8/23
Soil Type:
Seed Treatment: Delt Ag Seed 1 oz
Fertilizer: litter 1 ton 2/27, Nutri Charge (10 oz 5/8)
Row Spacing: 30"
Pre-Plant Herbicide: Roundup/2-4/d (1 qt) 4/30
Pre-Emergence Herbicide: Dual/Metribuzin (1 pt./3 oz) 5/8
Post-Emergence Herbicide: Roundup/Enlist (1 qt) 6/22
Insecticide:
Fungicide: Miravis Top (13 oz) 7/19
Foliar Treatment:
Irrigation Method/Frequency: row 8/20, 8/30
Harvest Aid:
Harvest Date: 10/17/23

Justin Crow — Final Yield (bu/ac): 82.277

County: Pope
Variety: Pioneer 48A14E
Seed Trait:
Previous Crop: soy, corn, corn
Seeding Rate/Ac: 125000
Planting Date: 4/12/23
Soil Type: sandy loam
Seed Treatment:
Fertilizer:
Row Spacing:
Pre-Plant Herbicide:
Pre-Emergence Herbicide: Atares Complete (28 oz), Gramaxone (32 oz)
Post-Emergence Herbicide: Glyphosate (32 oz), Enlist (32 oz), Dual (32 oz)
Insecticide:
Fungicide: Quadris Top (7 oz)
Foliar Treatment:
Irrigation Method/Frequency: Furrow 6 times
Harvest Aid:
Harvest Date: 9/26/23

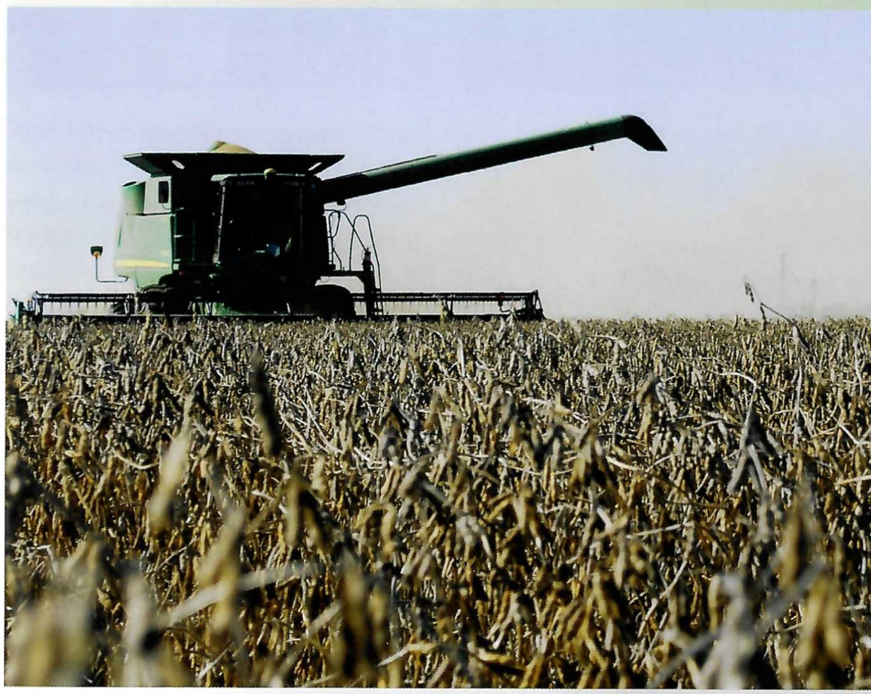
Division Eight: *Conventional*

Dennis Stephens — Final Yield (bu/ac): 87.153

County: Cross
Variety: Virtue 4520
Seed Trait:
Previous Crop: corn, beans, corn
Seeding Rate/Ac: 118000
Planting Date: 4/10/23
Soil Type: silt loam
Seed Treatment: cruiser max
Fertilizer: chicken litter 1 ton, Aspire 100 lb. 4/3/23, Foliar K 24 oz 7/27/23
Row Spacing: 30"
Pre-Plant Herbicide: Mad Dog 1 qt, First Shot .75 oz 4/3
Pre-Emergence Herbicide: ORO-HSMOC 1 pt., Verdict 5 oz, Outlook 8 oz on 4/11
Post-Emergence Herbicide: Prefix 2.25, Permit Plus .75 oz, ORO-HSMOC 1 pt., Select 10 oz on 5/23: Blazer 1 pt., Basagran 1 pt. 6/20
Insecticide:
Fungicide: Miravis Top 13.7 oz 7/12. Cal Bor 1 pt. 7/12
Foliar Treatment:
Irrigation Method/Frequency: furrow 4 times
Harvest Aid:
Harvest Date: 9/27/23

Riley Stephens — Final Yield (bu/ac): 82.585

County: Cross
Variety: Virtue 4520
Seed Trait:
Previous Crop: corn, beans, corn
Seeding Rate/Ac: 118000
Planting Date: 4/10/23
Soil Type: silt loam
Seed Treatment: cruiser max
Fertilizer: chicken litter 1 ton, carbon complete 30 gal on 3/30, foliar k 24 oz on 7/27
Row Spacing: 30″
Pre-Plant Herbicide: first shot .75 oz 4/3/23
Pre-Emergence Herbicide: ORO-HSMOC 1 pt., Verdict 5 oz, Outlook 8 oz on 4/11
Post-Emergence Herbicide: Prefix 2.25, Liberty (unintentional) 10 oz, Permit Plus .75 oz, ORO-HSMOC 1 pt., Select 10 oz on 5/23: Blazer 1 pt., Basagran 1 pt. 6/20
Insecticide:
Fungicide: Miravis Top 13.7 oz 7/12
Foliar Treatment:
Irrigation Method/Frequency: furrow 4 times
Harvest Aid:
Harvest Date: 10/13/23



For full contest details, visit **TheMiracleBean.com**

Layne Miles - *Late Entry* — Final Yield (bu/ac): 115.270

County: Ashley
Variety: Asgrow AG46X0
Seed Trait: Xtend
Previous Crop: beans, corn, beans
Seeding Rate/Ac: 140000
Planting Date: 3/30/23
Soil Type: Loam
Seed Treatment: cruiser max
Fertilizer: Litter (1.5) 9/15/22, VR Potash (100) 5/8/23
Row Spacing: 38″
Pre-Plant Herbicide: Gramoxone (32 oz)3/31
Pre-Emergence Herbicide: Boundary (12.8 oz) Gramoxone (32 oz) 3/31
Post-Emergence Herbicide: Tavium (56.7 oz) Roundup (25.6) 5/15/23
Insecticide: bifenthrin (3.6 oz) 5/30
Fungicide: Miravis top (13.7 oz) 5/30
Foliar Treatment: Blend K products (2 gal), Humic (32 oz), PGR (12.8 oz) sugar 1 lb.) Boron (1 box) 5/30
Irrigation Method/Frequency: furrow 5 times 2 inch
Harvest Aid: Gramoxone (16 oz) 8/17
Harvest Date: 8/25/23

Matt Miles - *Late Entry* Final Yield (bu/ac): 110.722

County: Ashley
Variety: Agrigold 2910XF
Seed Trait: RR LL Dicamba
Previous Crop: beans, corn, beans
Seeding Rate/Ac: 140000
Planting Date: 3/22/23
Soil Type: Sandy Loam
Seed Treatment: cruiser max 8 oz
Fertilizer: Litter (1.5) 9/15/22; VR Potash (100) 5/8/23
Row Spacing: 38"
Pre-Plant Herbicide: Gramoxone (32 oz)3/31
Pre-Emergence Herbicide: Boundary (12.8 oz) Gramoxone (32 oz) 3/31
Post-Emergence Herbicide: Tavium (56.7 oz) Roundup (25.6) 5/15/23
Insecticide: bifenthrin (3.6 oz) 5/30
Fungicide: Miravis Top (13.7 oz) 5/30
Foliar Treatment: Blend K products (2 gal), Humic (32 oz), PGR (12.8 oz) sugar (1 lb.) Boron (1 box) 5/30
Irrigation Method/Frequency: furrow 2 in 5 times
Harvest Aid: Gramoxone (16 oz) 8/17
Harvest Date: 8/23/23

Tim Fisher Final Yield (bu/ac): 102.090

County: Cross
Variety: Pioneer 42A84E
Seed Trait: Enlist /E3
Previous Crop: corn, beans, corn
Seeding Rate/Ac: 105000
Planting Date: 4/15/23
Soil Type: Calloway Silt Loam
Seed Treatment: Lumigen
Fertilizer: 20-20 Micro pack, Chicken Litter (2 t/a), Potash (250 lb./a), DAP (150 lb./a) on 4/12/23
Row Spacing: 30"
Pre-Plant Herbicide: Dual (8 oz) Verdict (5 oz) 4/17
Pre-Emergence Herbicide:
Post-Emergence Herbicide: Liberty (32 oz) Generic Select (12 oz) 5/4
Insecticide: Beseige 13.7 oz 7/10
Fungicide: Miravis Top 13oz 7/102
Foliar Treatment:
Irrigation Method/Frequency: 12" pipe 4 times 2" each
Harvest Aid: Gramoxone (16 oz) 9/5
Harvest Date: 9/20/23

Ronnie Ragsdell Final Yield (bu/ac): 98.622

County: Lawrence
Variety: Asgrow AG47XF2
Seed Trait: Xtend
Previous Crop: rice, beans, beans
Seeding Rate/Ac: 120000
Planting Date: 4/11/23
Soil Type: Silt Loam
Seed Treatment:
Fertilizer: 0-69-120 on 4/10
Row Spacing: 30"
Pre-Plant Herbicide: Boundary (2 Pt) 4/10
Pre-Emergence Herbicide:
Post-Emergence Herbicide: Roundup (32 oz) 5/1, Xtendimax (22 oz) 5/10, Xtendimax (22 oz) 6/1
Insecticide:
Fungicide: Miravis Top (13 oz) 6/15
Foliar Treatment:
Irrigation Method/ Frequency: furrow 5/20, 5/30, 6/5,6/15,6/23,7/1,7/10, 7/20,8/1
Harvest Aid: Gramoxone (14 oz) 8/15
Harvest Date: 10/3/23

Charles Galloway Final Yield (bu/ac): 98.312

County: Woodruff
Variety: Agrigold G4910XF
Seed Trait: RR LL Dicamba
Previous Crop: corn, beans, corn
Seeding Rate/Ac: 14,000
Planting Date: 4/19/23
Soil Type: Dabbs Sandy Loam
Seed Treatment: Intego Suite, Graphx 3.2 oz
Fertilizer: Poultry Litter (2 ton) 3/15
Row Spacing: 30"
Pre-Plant Herbicide: Roundup (1 qt), 2,4D (1.5 pt.)
Pre-Emergence Herbicide: Anthem Max (2.75 oz) Paraquat (1 pt.)
Post-Emergence Herbicide: Engenia (12.8 oz), Sentris (4 oz), Clethodim (10 oz) on 5/1 & 5/25
Insecticide: Vantacor (1.2 oz) Lambda (3.6 oz) 7/20
Fungicide: Rebytek (7oz) 8/11
Foliar Treatment:
Irrigation Method/Frequency:
Harvest Aid: paraquat (10 oz) 8/20
Harvest Date: 9/26/23

Perry Galloway
Final Yield (bu/ac): 95.112

County: Woodruff
Variety: Agrigold G4910XF
Seed Trait: RR LL Dicamba
Previous Crop: corn, beans, corn
Seeding Rate/Ac: 140000
Planting Date: 4/19/23
Soil Type: Dabbs Sandy Loam
Seed Treatment: Intego Suite, Graphx 3.2 oz
Fertilizer: Poultry Litter (2 ton) 3/15
Row Spacing: 30″
Pre-Plant Herbicide: Roundup (1 qt), 2,4D (1.5 pt.)
Pre-Emergence Herbicide: Anthem Max (2.75 oz) Paraquat (1 pt.)
Post-Emergence Herbicide: Engenia (12.8 oz), Sentris (4 oz), Clethodim (10 oz) on 5/1 & 5/25
Insecticide: Vantacor (1.2 oz) Lambda (3.6 oz) 7/20
Fungicide: Rebytek (7oz) 8/11
Foliar Treatment:
Irrigation Method/Frequency:
Harvest Aid: paraquat (10 oz) 8/20
Harvest Date: 9/22/23

Neil Culp
Final Yield (bu/ac): 93.773

County: Phillips
Variety: Asgrow AG48X9
Seed Trait: Dicamba
Previous Crop: cotton, beans, corn
Seeding Rate/Ac: 130000
Planting Date: 4/1/23
Soil Type: silt loam
Seed Treatment: cruiser max 8 oz
Fertilizer: carbon complete 4 gal 3/20/23
Row Spacing: 30″
Pre-Plant Herbicide: Roundup (32 oz) Dicamba (16 oz) 3/5
Pre-Emergence Herbicide:
Post-Emergence Herbicide: Roundup (32 oz), Tavium (56 oz), Drift Knot (12.8 oz) Salrata (16 oz)
Insecticide: Bifentrin 5 oz 5/12
Fungicide: Miravis Top (13.7 oz) 5/12
Foliar Treatment: Carbon K (64 oz) 5/20
Irrigation Method/Frequency: furrow 6/1,6/17,6/23,7/1,7/14
Harvest Aid: Gramoxone 22 oz 8/25
Harvest Date: 9/8/23

Linwood Wells
Final Yield (bu/ac): 92.911

County: Greene
Variety: Pioneer 47Z64X
Seed Trait: Dicamba RR
Previous Crop: corn, beans, corn
Seeding Rate/Ac: 116000
Planting Date: 4/10/23
Soil Type: Fountain Silt Loam
Seed Treatment: Warden CX2 1.98 per unit
Fertilizer: Chicken litter (1.5 ton)11/5/22, 0-0-9- (150 lb.) 4/10/23, Boron Maxin (1 pt.) 5/10 & 8/1
Row Spacing: 38″ twin
Pre-Plant Herbicide: Roundup (1 qt) Verdict (5 oz) 3/20
Pre-Emergence Herbicide:
Post-Emergence Herbicide: Engenia (12.8 oz), Roundup (1 qt), Outlook (12.8 oz) on 5/16; Anthem Max (3 oz) Roundup (1qt) on 5/26
Insecticide:
Fungicide: Priaxor (4 oz) 8/1
Foliar Treatment:
Irrigation Method/Frequency: Furrow 6/5,6/12,6/19,6/26, 7/10, 7/17, 7/24,8/7,8/14,8/21,8/28
Harvest Aid:
Harvest Date: 10/3/23

Davis Bell
Final Yield (bu/ac): 91.410

County: Prairie
Variety: Pioneer 44A21X
Seed Trait: RR Dicamba
Previous Crop: corn, beans, corn
Seeding Rate/Ac:
Planting Date: 4/3/23
Soil Type: Silt Loam
Seed Treatment:
Fertilizer: MES10 (200 lb.), Potash (150lb.), Aspire (100 lb.) 4/2
Row Spacing:
Pre-Plant Herbicide: Makaze (40 oz) 2/18
Pre-Emergence Herbicide: Outlook (12.8 oz), Infuse (16 oz), Metribuzin 75DF (5 oz) 4/3
Post-Emergence Herbicide:
Insecticide:
Fungicide: Miravis Top (13.7 oz) 6/23
Foliar Treatment:
Irrigation Method/Frequency: Furrow 6 times
Harvest Aid: Gramoxone (16 oz) 9/4
Harvest Date: 9/15/23

Mike Hook

Final Yield (bu/ac): 88.424

County: Craighead
Variety: Agrigold 4094XF
Seed Trait: Dicamba
Previous Crop: beans, beans, corn
Seeding Rate/Ac: 108000
Planting Date: 4/4/23
Soil Type: Clay
Seed Treatment: Agrishield, Saltro
Fertilizer: Potash (100 lb.) 4/30
Row Spacing: 38" twin
Pre-Plant Herbicide:
Pre-Emergence Herbicide: Gramoxone (32 oz) Zidua (3.2 oz) 4/6
Post-Emergence Herbicide: Roundup (32 oz), Dicamba (12 oz), Anthem Maxx (3.2 oz) 5/2
Insecticide:
Fungicide: Revytek (8 oz) 5/26
Foliar Treatment: C-Cat (32 zx), Full Sun (64 oz), X Cyte (8 oz) 5/26
Irrigation Method/Frequency: Furrow 9 times
Harvest Aid: Paraquat (16 oz) 9/10
Harvest Date: 9/25/23

Brandon Cain

Final Yield (bu/ac): 86.428

County: White
Variety: Asgrow AG46XF3
Seed Trait: LL RR Dicamba
Previous Crop: corn, beans, corn
Seeding Rate/Ac: 120000
Planting Date: 4/12/23
Soil Type:
Seed Treatment: Helena Seed Shield
Fertilizer: 0-0-60 200 lb. 4/10
Row Spacing: 30"
Pre-Plant Herbicide: Glyphosate (42 oz), Dicamba (12 oz)
Pre-Emergence Herbicide:
Post-Emergence Herbicide: Glyphosate (32 oz), Generic Dual (16 oz), Dicamba (12.3 oz)
Insecticide: Bifentrin (6.4 oz)
Fungicide: Revytek (8 oz)
Foliar Treatment: Dropkick (1qt)
Irrigation Method/Frequency: Furrow 5 times
Harvest Aid:
Harvest Date: 10/2/23

Mary Galloway

Final Yield (bu/ac): 85.744

County: Woodruff
Variety: Asgrow AG47XF2
Seed Trait: RR LL Dicamba
Previous Crop: corn, beans, corn
Seeding Rate/Ac: 140000
Planting Date: 5/24/23
Soil Type: Dabbs Sandy Loam
Seed Treatment: Intego Suite, Graphx 3.2 oz
Fertilizer: Poultry Litter (2 ton) 3/15
Row Spacing: 30"
Pre-Plant Herbicide: Roundup (1 qt) 2,4_d (1.5 pt.)
Pre-Emergence Herbicide: Anthem Max (2.75 oz), Paraquat (1 pt.)
Post-Emergence Herbicide: Engenia (12.8 oz), Sentris (4 oz), Clethodim (10 oz) on 5/1 & 5/25
Insecticide: Vantacor (1.2 oz) Lambda (3.6 oz) 7/20
Fungicide: Rebytek (7oz) 8/11
Foliar Treatment:
Irrigation Method/Frequency:
Harvest Aid: paraquat (10 oz)
Harvest Date: 10/17/23

This board, with a goal of improving the sustainability and profitability of the soybean industry in Arkansas, is responsible for distributing funds from the checkoff. Funds are used primarily for research and Extension projects conducted by the University of Arkansas System Division of Agriculture's Experiment Station and Cooperative Extension Service.

For additional information:
Arkansas Soybean Association
1501 N Pierce, Suite 100, Little Rock AR 72207
501-666-1418 office
501-666-2510 fax
swsoy@aristotle.net
ArkansasSoybean.com

Photography courtesy of the Arkansas Soybean Promotion Board

ATTACHMENT 13

Southwest Soybean Council
1501 N Pierce, Suite 100
Little Rock AR 72207
501-666-1418 (office)
501-666-2510 (fax)
swsoy@aristotle.net

Memo

To: John Freeman
ASPB, Chair

From: Dawn Howe, Executive Director

Date: March 4, 2024

Re: Grant for Soy Promotional Items

I want to extend my thanks to you and the rest of the Arkansas Soybean Promotion Board for providing funds for soy promotional items in the state. They have been provided to: teachers, county agents, health care professionals, ag safety camps, nutrition educators, and producers across the state. We are getting the word out about some of the many uses of soybeans.

I currently have coloring books, crayons and soy activity books in the office but have depleted the funds from the 2015 grant. I have funds remaining but need to order more soy crayons and coloring books which will use the remaining funds.

I would like to request a renewal of the grant from 2014 for an amount of $10,000 to be used to purchase promotional items as needed, pay for shipping, and cover the cost of the labor ($45 per hour) involved with the preparation of these items. I would like to have the flexibility to purchase additional promotional items (educational kits) and/or brochures from the United Soybean Board.

I have people (teachers and extension personnel) that request quantities of 1000+ each year.

I have enclosed a proposed budget for the new grant, financial statement of the funds from the 2015 grant, bank ledger from 2014 grant, and a list of individuals who received the items.

Please let me know if you need any additional information. I appreciate the consideration of the board in this request. Ideally you can provide this in one check for me to have available as needed but I understand that USB rules may limit your ability to do this.

Cc: Scott Bray

Promotion Grant - June 2015		May 31, 2023
	month	Project to date
Opening Balance 6/1/15		54.95
new grant		20000.00
Total		20054.95
Expenses		
Soynuts		
Coloring books		2150.00
Crayons		8204.46
Soy Foods Guides		625.00
Activity books		945.00
Labor	202.50	2512.50
Misc (labels for soynuts)		
Copies	0.37	1.33
Soystats	96.50	421.50
Hand Sanitizer		
postage/shipping		633.47
Total expense	299.37	15493.26
Funds remaing (9-1-22)		**4561.69**

Check Register

ASPB Grant
3/4/2024

Date	Num	Transaction		Payment	C	Deposit	Balance
6/8/2015	DEP	ASPB				20,000.00	20,054.95
		memo:	promotion project 2015				
		cat:	Promotion Grant				
6/8/2015		SWS Monthly Billing		338.55			19,716.40
		memo:	nov 2014-may 2015				
		SPLIT	Labor				
		Labor 7 x 40		280.00			
		Postage shipping		45.60			
		misc exp soyfoods guides				0.00	
		Copies copies				0.00	
		Postage shipping		12.95			
11/11/2015	4623	Imprint Publishing - Communique		1,775.00			17,941.40
		memo:	inv 4864 captain soybean 5000				
		cat:	Promotion-aspb Grant				
12/16/2015		SWS Monthly Billing		246.00			17,695.40
		memo:	june 1-nov 30 2015				
		SPLIT	Labor				
		Labor 5 x 40		200.00			
		Postage shipping		46.00			
		misc exp soyfoods guides				0.00	
		Copies copies				0.00	
5/11/2016		Swsbc Monthly Billing		332.90			17,362.50
		memo:	dec 1m 2015-apr 30, 2016				
		SPLIT	Hours				
		Hours march		80.00			
		Hours april		200.00			
		shipping		52.90			
6/1/2016	4681	Dixon-Ticonderoga Company		1,730.47			15,632.03
		memo:	inv 1588370				
		cat:	Promotion-aspb Grant				
6/16/2016	4686	Imprint Publishing - Communique		625.00			15,007.03
		memo:	why cross rd				
		cat:	Promotion-aspb Grant				
10/17/2016		SWS Monthly Billing		208.85			14,798.18
		memo:	5/1/16-9/30/16				
		SPLIT	Labor				
		Labor 3 x $0		120.00			
		Postage shipping		88.55			
		misc exp soyfoods guides				0.00	
		Copies copies		0.30			
4/17/2017		SWS Monthly Billing		253.65			14,544.53
		memo:	10/1/16-3/31/17				
		SPLIT	Labor				
		Labor		180.00			

Date	Num	Transaction	Payment	C	Deposit	Balance
		4.5 x 40				
		Postage	73.35			
		shipping				
		misc exp			0.00	
		soyfoods guides				
		Copies	0.30			
		copies				
9/14/2017		SWS Monthly Billing	193.40			14,351.13
		memo: 4/1/17-8/31/17				
		SPLIT Labor				
		Labor	160.00			
		4 x 40				
		Postage	33.40			
		shipping				
		misc exp			0.00	
		soyfoods guides				
		Copies			0.00	
		copies				
11/29/2017		SWS Monthly Billing	132.81			14,218.32
		memo: 9/1/17-11/27/17				
		SPLIT Labor				
		Labor	100.00			
		2.5 x 40				
		Postage	32.45			
		shipping				
		misc exp			0.00	
		soyfoods guides				
		Copies	0.36			
		copies				
8/12/2018		SWS Monthly Billing	532.30			13,686.02
		memo: 12/1/17-7/31/18				
		SPLIT Labor				
		Labor	180.00			
		4 x 45				
		Postage	27.30			
		shipping				
		misc exp	325.00			
		soystats				
		Copies			0.00	
		copies				
9/13/2018	4881	Dixon-Ticonderoga Company	824.26			12,861.76
		cat: Reim-ASPB				
10/18/2018		SWS Monthly Billing	96.40			12,765.36
		memo: 8/1/18-9/30/18				
		SPLIT Labor				
		Labor	45.00			
		1 x 45				
		Postage	51.40			
		shipping				
11/7/2018	4897	Communique, Inc	2,150.00			10,615.36
		memo: inv 5340 - 5000 color bookd				
		cat: Promotion-aspb Grant				
4/8/2019		SWS Monthly Billing	390.97			10,224.39
		memo: 10/1/18-3/31/19				
		SPLIT Labor				
		Labor	315.00			
		7 x 45				
		Postage	37.75			
		shipping				
		Postage	37.75			

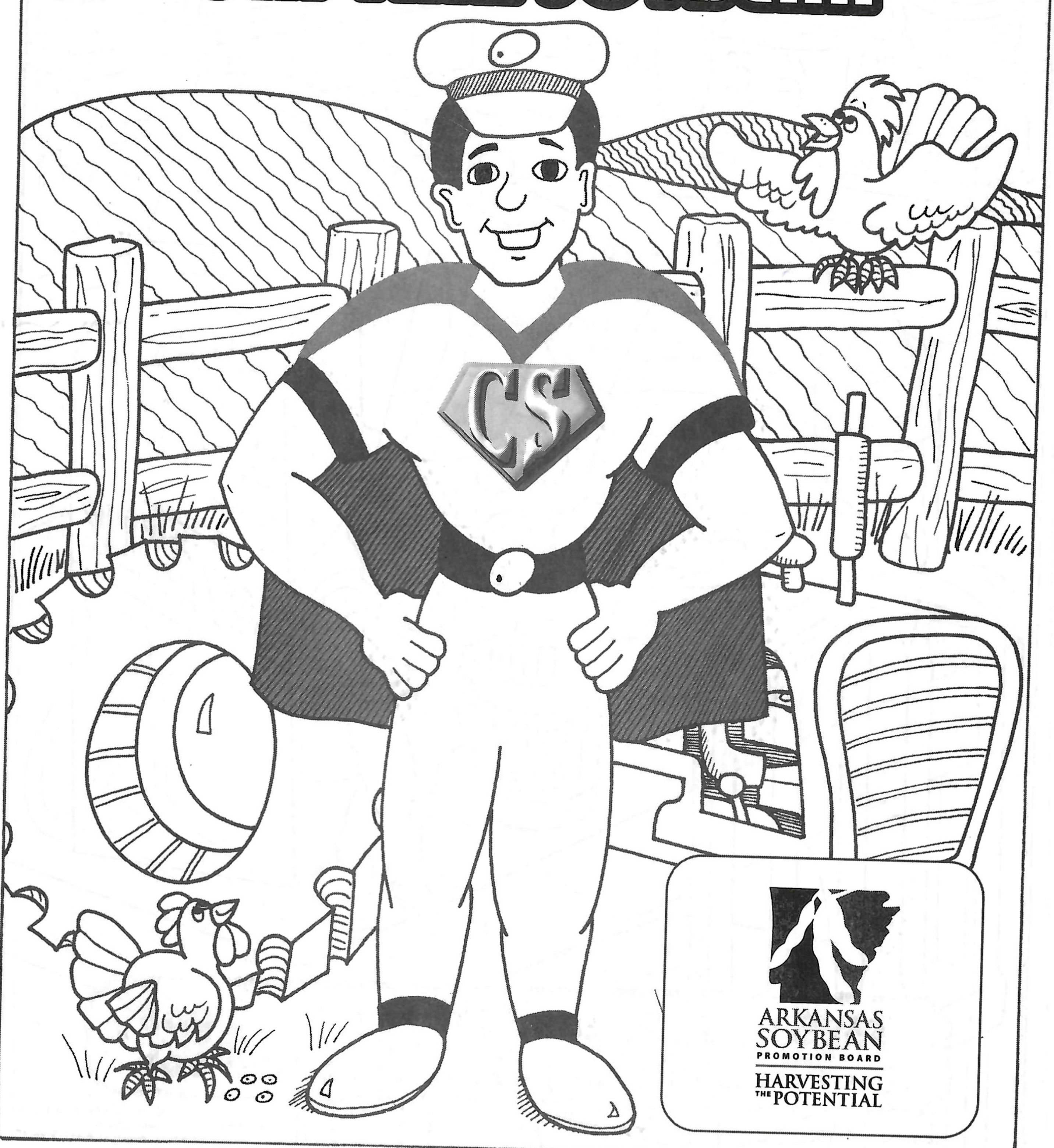
Date	Num	Transaction	Payment	C	Deposit	Balance
		shipping				
		Postage	0.47			
		mail				
7/29/2021		SWS Monthly Billing	151.90			10,072.49
		memo: 4/1/19-6/30/21				
		SPLIT Labor				
		Labor	90.00			
		7 x 45				
		Postage	19.95			
		shipping				
		Postage	11.85			
		shipping				
		Postage	30.10			
		shipping				
11/18/2021	5144	Dixon-Ticonderoga Company	1,583.69			8,488.80
		cat: Reim-ASPB				
12/22/2021		Sws Monthly Billing	211.70			8,277.10
		memo: 7/1/21-11/30/21				
		SPLIT Postage				
		Postage	8.55			
		Labor	180.00			
		shipping	23.15			
6/6/2022	5182	Imprint Publishing - Communique	945.00			7,332.10
		memo: inv 5894 1000 chicken				
		cat: Promotion-aspb Grant				
6/20/2022	5190	Imprint Publishing - Communique	2,291.04			5,041.06
		memo: inv 5173 - 5000 cap soy				
		cat: Promotion-aspb Grant				
9/1/2022		SWS Monthly Billing	180.00			4,861.06
		memo: 12/1/21-8/31/22				
		SPLIT Labor				
		Labor	180.00			
		4 X 45				
6/21/2023		SWS Monthly Billing	299.37			4,561.69
		memo: 9/1/22-5/31/23				
		SPLIT Labor				
		Labor	202.50			
		Copies	0.37			
		shipping	96.50			

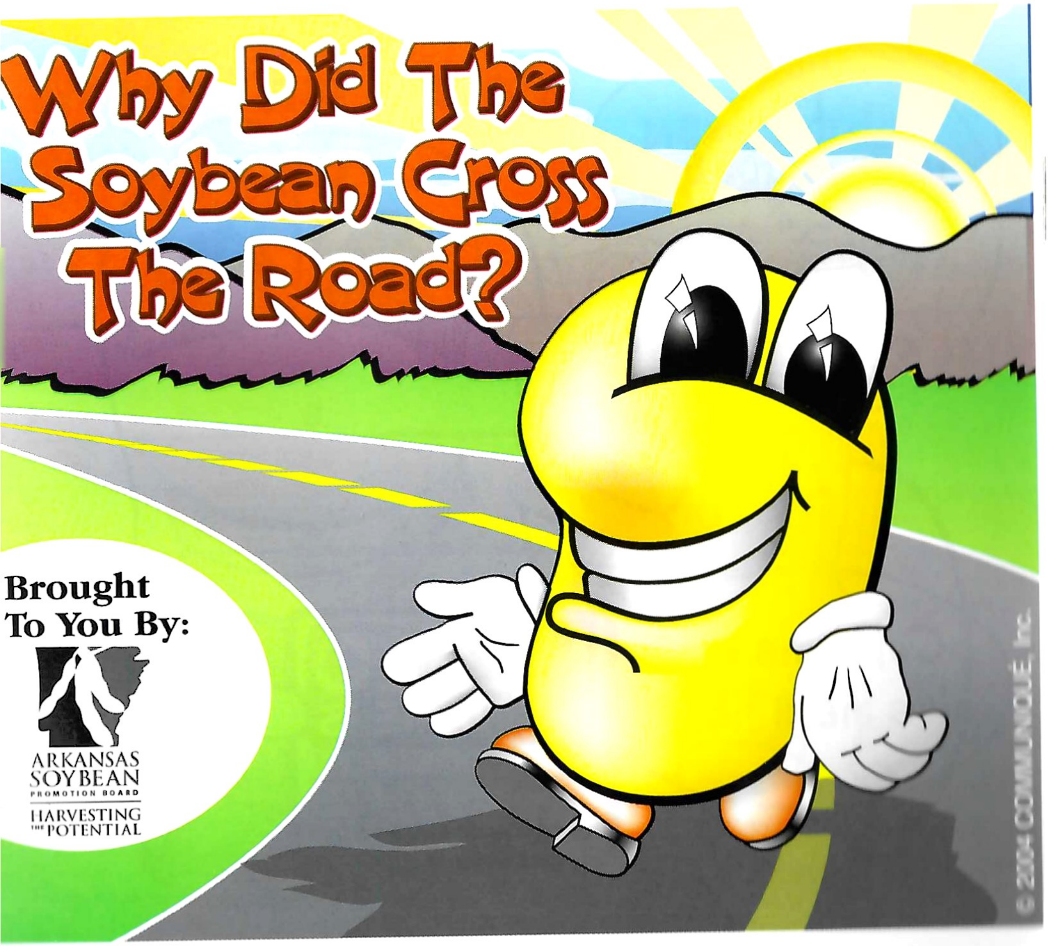
new grant funds - May 2015

soynuts	crayons	color books	bert/bio	activity	biodiese	soyfoods	hand sani						
100	100			100			100		John Jones	Glenrose	ag teachers co	6/10/2015	picked up
120	120	120							Sandra Mason	Conway	class	8/27/2015	28.1
40						40			Joe Thrash	Houston	field tour	9/17/2015	picked up
	100	100		30					Sheila Stephens	Fordyce	Safety Day	10/5/2015	
100	100	100		75		100			lyn wilson	lr	AR curriculum	11/2/2015	picked up
50	30	25		25		10	12		arsa mtg			1/26/2016	
257	257	257							Carolyn Hubbell	batesville	nutrition olym	3/16/2016	52.9
	800	800							Lauren Brown	El Dorado	farm fair	4/28/2016	88.55
	288	150		100		200			Jeremy Ross	Lonoke	misc	8/10/2016	delivered
400	400	400							lyn wilson	lr	AR curriculum	9/26/2016	picked up
	900								Hank Chaney	conway	farm roundup	3/15/2017	
251	251	251							Carolyn Hubbell	batesville	nutrition olym	3/8/2017	47.3
	20								David Walt	dumas	classroom	3/8/2017	7.2
	129	129		190					Denise Albert	lr	Anthony Scho	3/29/2017	delivered
	100	100							Lauren Brown	El Dorado	farm fair	3/29/2017	18.85
	500	500							Sarah Henry Metzger	searcy	ag day/fair	8/30/2017	dropped of
	300			300					Sherry Pfaffenberger	dewit	Safety Day	8/30/2017	
	100	100							Sheila Stephens	Fordyce	Safety Day	9/27/2017	13.6
	50	50							Donna Frizzell	stuttgart	classroom	9/27/117	18.45
	200	200		50		100			lyn wilson	lr	curric	10/22/2017	picked up
	1200	1200							Renee Thrash	conway	roundup	4/1/2018	
	269	269							Carolyn Hubbell	batesville	nutrition olym	3/14/2018	
	400	400							Brandy Gardner	Harrisburg	envirothon	8/6/2018	
	500	500							Diedre Young	lr		10/24/2018	dropped of
	300								Sherry Pfaffenberger	dewitt	Safety Day	10/2/2018	
	110								Sheila Stephens	Fordyce	Safety Day	10/2/2018	37.75
	800								Christy Poindexter	lr		10/4/2018	dropped of
	240	240							Carolyn Hubbell	batesville	nutrition olym	2/28/2019	37.75
	125	125							Diedre Young		school	3/25/2019	
	130	130							beth buterbaugh	searcy		3/25/2019	19.95
	100	100							Diedre Young		science challe	3/25/2019	
	400	1200							renee thrash	Conway	roundup	3/25/2019	

	250	250						amy tallent		extension	5/8/2019	dropped o
	190	190		75				Diedre Young	guy perkins		27-Mar	
	100	100						Diedre Young		extension	5/8/2019	
	200	2500						Diedre Young		National AG ir	6/19/2019	picked up
	75	40		35				Sheila Stephens	Fordyce	safe day	10/10/2019	11.85
	100			100				Diedre Young	white hall		11/18/2019	picked up
March 2020-March 2021 Covid												
	550	300		250				Diedra Young	earth day		4/7/2021	dropped o
	600	600						Diedra Young		ag teachers	7/12/2021	dropped o
	300							Millie Collins	wynne	snap	10/25/2021	23.15
	100	100	20	20				Diedra Young	farm burea		11/29/2021	picked up
	60	60						Diedra Young	1/2nd grade		12/9/2021	picked up
	85	85		50				Diedra Young	high school		4/11/2022	picked up
	1000	1000						Kami	conway	ag round up	4/11/2022	picked up
	500	500		200				Diedra Young	high schoo	newport	5/4/2022	picked up
		400						brandy cox	ag day	poinsett coun	9/21/2022	mailed
	30	30						Diedra Young	k		3/21/2023	picked up
	450	450						Bethany Gammill	farm fair	union county	4/28/2023	mailed
	2000	2000		10				deidra Young	thunderbirds stem day		10/18/2023	picked up
	1000	1000						Joe Thrash			2/24/2024	picked up
	200							Lori Wilson		Wynne	3/4/2024	

A DAY WITH CAPTAIN SOYBEAN

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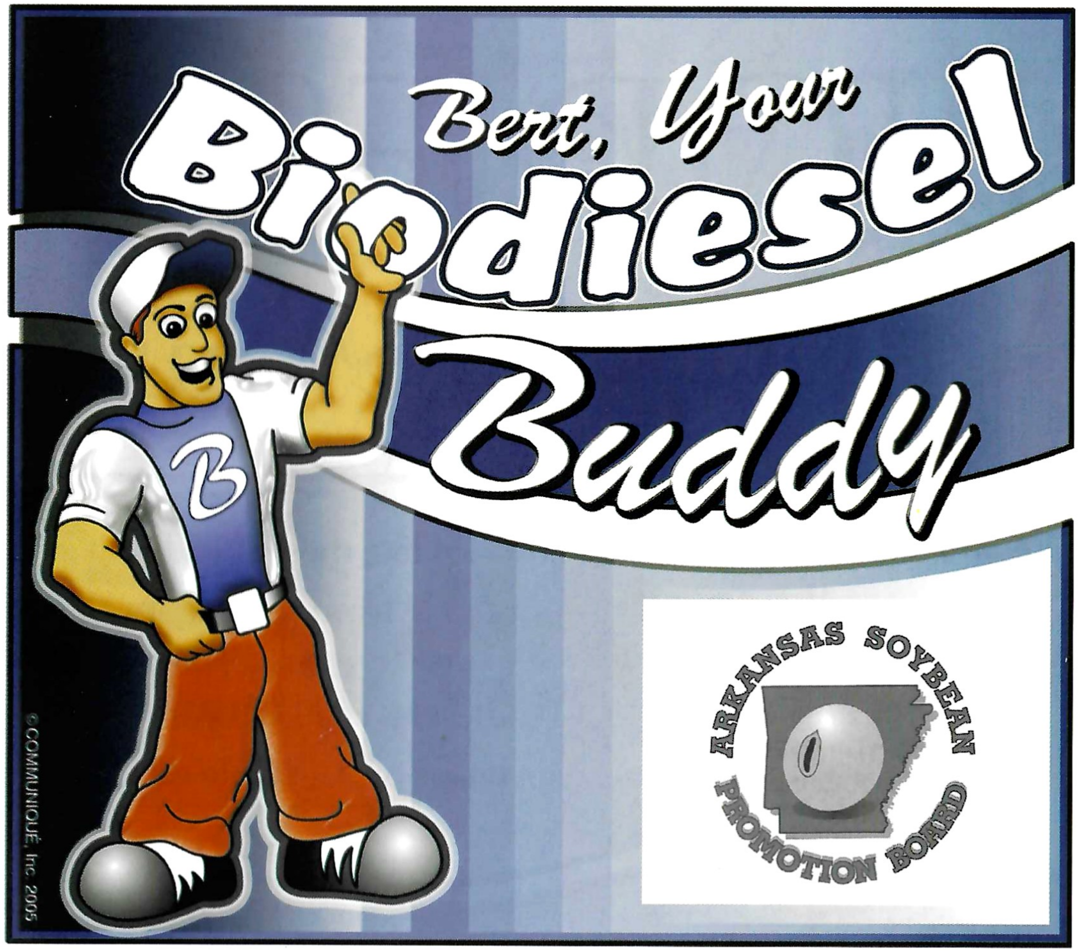
Bert, Your Biodiesel Buddy
ARKANSAS SOYBEAN PROMOTION BOARD
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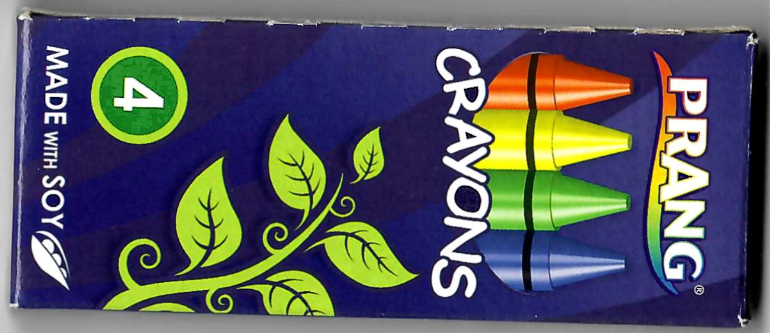
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ATTACHMENT 14

Request Type	Cat.	Institution/Vendor	Project Title	2024-2025 Proposals	2024-2025 Board Recommendation	2024-2025 Board Approved Funding	Presentation Order
New	Research	U of A Division of Agriculture	Development of a Turn Row Soybean Vegetative Health Analysis Using UAS Imagery for Production Decision Support	$19,989.00	f	$19,989.00	1
New	Research	U of A Division of Agriculture	Development of Data Driven Recommendations for Variable Soybean Seeding Rate in Arkansas	$81,876.00	f	$81,876.00	2
New	Research	U of A Division of Agriculture	Site Specific Assessment of Soybean Response to In Field Variability Using Remote Sensing	$75,000.00	f	$75,000.00	3
New	Research	U of A Division of Agriculture	Phenotypic Assisted by Seed-Level Near-Infrared Information	$51,117.00	f	$51,117.00	4
~~New~~	~~Research~~	~~U of A Division of Agriculture~~	~~Enhancing Soybean Resistance to Charcoal Rot:A Collaborative Approach Involving Plant Pathology and the Soybean Breeding Program~~	~~$64,292.00~~	x	~~$0.00~~	~~5~~
~~New~~	~~Research~~	~~U of A Division of Agriculture~~	~~Designing Soybean Ideotypes for Adaptation to Weather Variability~~	~~$66,122.00~~	x	~~$0.00~~	~~6~~
New	Research	U of A Division of Agriculture	Overcoming Soybean Yield Plateau by Leveraging Physiology-Efficient and Yield-Formation Traits	$83,620.00	f	$83,620.00	7
New	Research	U of A Division of Agriculture	Economics of Soil Health Practices for Soybeans in Arkansas	$57,838.00	f	$57,838.00	8
New	Research	U of A Division of Agriculture	~~Predicting the impacts of herbivory across a salinity gradient in AR Soybeans~~	~~$45,924.00~~	x	~~$0.00~~	~~10~~
~~New~~	~~Research~~	~~U of A Division of Agriculture~~	~~Engineering Synthetic Microbiome Communities to Enhance Soybean Disease Resistance~~	~~$39,500.00~~	x	~~$0.00~~	~~9~~
New	Research	U of A Division of Agriculture	Screening Ark Soybean Cultivars for Protein Quality as a Novel Food Proservative	$50,049.00	f	$50,049.00	11
~~New~~	~~Research~~	~~U of A Division of Agriculture~~	~~Innovating Arkansas Soybean Utilization for Soymilk and Tofu Production~~	~~$63,986.00~~	x	~~$0.00~~	~~12~~
~~New~~	~~Research~~	~~U of A Division of Agriculture~~	~~Quantification of Crop Coverage and Weed Pressure for Instantaneous Variable Spaying with UAV Computer Vision~~	~~$83,598.00~~	x	~~$0.00~~	~~13~~
Continuation	Research	U of A Division of Agriculture	Discovery Farm YR 3/3	$23,688.00	f	$23,688.00	20
Continuation	Research	U of A Division of Agriculture	Use of Gossypol to Inhibit Reproduction in Domestic Hogs as a Model for Feral Hog Control YR 2/3	$30,000.00	f	$30,000.00	21
Continuation	Research	U of A Division of Agriculture	Investigating Emerging Production Recommendations for Sustainable Soybean Production YR 2/3	$221,278.00	f	$221,278.00	22
Continuation	Research	U of A Division of Agriculture	Improving Technology Transfer for Profitable an Sustainable Soybean Production YR 2/3	$77,846.00	f	$77,846.00	23
Continuation	Research	U of A Division of Agriculture	Science for Success - Arkansas Support for National Soybean Research and Extension Program YR 2/3	$117,488.00	f	$117,488.00	24
Continuation	Research	U of A Division of Agriculture	Arkansas Soybean Performance Trials YR 2/3	$40,270.00	f	$40,270.00	25
Continuation	Research	U of A Division of Agriculture	Development of High-yielding Soybean Cultivars with Broad Resilience to Stressors YR 2/3	$191,118.00	f	$191,118.00	26
Continuation	Research	U of A Division of Agriculture	Utilization of Winter Nursery for Soybean Line Development through Backcrossing YR 2/3	$51,000.00	f	$51,000.00	27
Continuation	Research	U of A Division of Agriculture	Fast-tracking MG4 and early MG5 cultivars with southern root-knot nematode resistance YR 1/3	$50,584.00	f	$50,584.00	28
Continuation	Research	U of A Division of Agriculture	Soybean Germplasm Enhancement Using Genetic Diversity YR 2/3	$187,679.00	f	$187,679.00	29
Continuation	Research	U of A Division of Agriculture	Genomic Prediction to Enhance the Efficiency of Soybean Breeding YR 2/3	$102,087.00	f	$102,087.00	30
Continuation	Research	U of A Division of Agriculture	Economic Analysis of Soybean Production and Marketing Practices YR 2/3	$7,316.00	f	$7,316.00	31
Continuation	Research	U of A Division of Agriculture	Soybean Enterprise Budgets YR 2/3	$10,000.00	f	$10,000.00	34
Continuation	Research	U of A Division of Agriculture	Refining Insect Thresholds in Arkansas Soybean YR 3/3	$69,116.00	f	$69,116.00	32
Continuation	Research	U of A Division of Agriculture	Impact on Water Quality on Insects YR 1/3	$20,001.00	f	$20,001.00	33
Continuation	Research	U of A Division of Agriculture	Developing Scouting, Threshold and Management Practices for Stinkbug YR 2/3	$49,102.00	f	$49,102.00	35
Continuation	Research	U of A Division of Agriculture	Fertilization of Soybean YR 2/3	$80,461.00	f	$80,461.00	14
Continuation	Research	U of A Division of Agriculture	Influence of Cover Crops and Soil Health on Soybean YR 2/3	$60,786.00	f	$60,786.00	15
Continuation	Research	U of A Division of Agriculture	Field Based Determination of Chloride in Soybean YR 2/3	$50,605.00	f	$50,605.00	16
Continuation	Research	U of A Division of Agriculture	Monitoring the Extent of Potassium Deficiency and Chloride Toxicity in Arkansas Soybean Fields YR 2/3	$36,870.00	f	$36,870.00	17
Continuation	Research	U of A Division of Agriculture	Irrigation Water Management for Soybeans: Moving the Needle YR 2/3	$205,620.00	f	$205,620.00	36
Continuation	Research	U of A Division of Agriculture	Comprehensive Disease Screening of Soybean Varieties in Arkansas YR 1/3	$131,863.00	f	$131,863.00	37
Continuation	Research	U of A Division of Agriculture	Integrated Management of Nematodes in Arkansas YR 2/3	$72,449.00	f	$72,449.00	38
Continuation	Research	U of A Division of Agriculture	Monitor and Management of Fungicide-Resistant Soybean Diseases in Arkansas YR 3/3	$50,498.00	f	$50,498.00	39
Continuation	Research	U of A Division of Agriculture	Developing a Satellite-Based Field Scouting Tool YR 2/3	$14,860.00	f	$14,860.00	40
Continuation	Research	U of A Division of Agriculture	Determining the Value of Fungicide Application on Regional, Whole-Farm, Field Level, and Within-Field Scales YR 2/3	$52,000.00	f	$52,000.00	41
Continuation	Research	U of A Division of Agriculture	Determining factors associated with poor grain quality YR 3/3	$55,000.00	f	$55,000.00	42
Continuation	Research	U of A Division of Agriculture	Understanding Taproot Decline; A Soybean Disease of Increasing Importance in Arkansas YR 2/3	$39,243.00	f	$39,243.00	43
Continuation	Research	U of A Division of Agriculture	The effects of the inclusion of soybean oil in beef cow diets on reproductive and calf performance YR 2/3	$48,940.00	f	$48,940.00	19
Continuation	Research	U of A Division of Agriculture	Assessment of Broiler Dietary Least Cost Protein Supply via Soybean Genotype Amino Acid Selection Improvements YR 3/3	$53,686.00	f	$53,686.00	44
Continuation	Research	U of A Division of Agriculture	An Innovative Approach to Generate Porous Soy Proteins with Enhanced Flavor for the Plant-Based Food Industry YR 2/3	$43,955.00	f	$43,955.00	45
Continuation	Research	U of A Division of Agriculture	Soybean Research Verification Program YR 2/3	$208,168.00	f	$208,168.00	46
Continuation	Research	U of A Division of Agriculture	A Team Approach to Weed Management in Soybean YR 2/3	$260,807.00	f	$260,807.00	47
Continuation	Research	U of A Division of Agriculture	Screening for Soybean Tolerance to Metribuzin YR 3/3	$16,226.00	f	$16,226.00	48
Continuation	Research	U of A Division of Agriculture	Optimization of Fungal Pathogens AF22 and AF24 as Bioherbicides for Palmer Amaranth (Pigweed) YR 2/3	$40,000.00	f	$40,000.00	49
New	Promotion	U of A Division of Agriculture	USDA Feed Kits	$2,500.00	f	$2,500.00	18
New	Promotion	U of A Division of Agriculture	LeadAR 40	$5,000.00	f	$5,000.00	50
Continuation	Promotion	U of A Division of Agriculture	The Arkansas Irrigation Yield Contest YR 7	$10,000.00	f	$10,000.00	53
Continuation	Promotion	U of A Division of Agriculture	Arkansas Future Ag Leaders Tour YR 2/3	$5,000.00	f	$5,000.00	51
Continuation	Promotion	U of A Division of Agriculture	Soybean Science Challenge (SSC) YR 1/3	$78,585.00	f	$78,585.00	52
~~New~~	~~Promotion~~	~~Communications Group~~	~~Public Relations Activities~~	~~$0.00~~	x	~~$0.00~~	~~99~~
New	Promotion	Clean Fuels Alliance America	Market Expansion Drive	$20,000.00	f	$20,000.00	80
New	Promotion	Clean Fuels Alliance America	OEM(Original Equipment Manufacturers) Maintain and Secure Approvals for B20+	$20,000.00	f	$20,000.00	81
~~New~~	~~Promotion~~	~~Decision Innovation Solutions~~	~~Arkansas Soybean and Soybean Production Consumption and Flow Analysis (Core Analysis)~~	~~$57,825.00~~	x	~~$0.00~~	~~82~~
~~New~~	~~Promotion~~	~~Decision Innovation Solutions~~	~~Optional Components of Analysis~~	~~$10,800.00~~	x	~~$0.00~~	~~83~~
New	Promotion	American Soybean Association	2025 ASAAP Annual Membership	$6,000.00	f	$6,000.00	84
New	Promotion	American Soybean Association	2025 Awards Celebration Sponsorship	$6,000.00	f	$6,000.00	85

New	Promotion	American Soybean Association	2025 Economic Support and Analysis Sponsorship	$5,000.00	f	$5,000.00	86
New	Promotion	American Soybean Association	I2M (Innovation to Market) Work Group Annual Membership	$7,500.00	f	$7,500.00	87
New	Promotion	American Soybean Association	2025 SoyStats (Sponsorhsip)	$600.00	f	$600.00	88
New	Promotion	American Soybean Association	2025 Soybean Leadership Academy Sponsorship	$6,000.00	f	$6,000.00	89
New	Promotion	American Soybean Association	Young Leader two-phase training program tuition	$9,200.00	f	$9,200.00	90
New	Promotion	The World Initiative For Soy in Human Health (WISHH)	The Furture of New U.S. Soy Export Sales - Developing & Emerging Markets	$40,000.00	f	$40,000.00	92
Continuation	Research	Dean Robinson Seed Co	Sequestering Carbon in Soybean Production System YR 2/3	$16,215.00	f	$16,215.00	93
New	Promotion	U.S. Soybean Export Council	2024 USSEC Membership	$10,000.00	f	$10,000.00	94
New	Promotion	U.S. Soybean Export Council	Utilization of U.S. Soy in the Americas	$15,000.00	f	$15,000.00	94
New	Research	MidSouth Soybean Board	Screening soybean germplasm an breeding soybeans for flood tolerance	$58,480.00	f	$58,480.00	94
New	Research	MidSouth Soybean Board	Development of functional ultra-high stearic acid soybean	$7,500.00	f	$7,500.00	94
New	Research	MidSouth Soybean Board	Development of Climate-Smart High Yield Practices Associated with High-End Biological Treatments and Soybean Related Microbiome Resiliency	$12,000.00	f	$12,000.00	94
New	Research	MidSouth Soybean Board	Enhencing Stink Bug Resistance in Midsouth Soybean	$0.00	f	$0.00	94
New	Research	MidSouth Soybean Board	Spray application of double stranded RNA for simultaneous management of multiple soybean fungal and insect diseases.	$12,060.00	f	$12,060.00	94
New	Research	MidSouth Soybean Board	How to cover crops impact soil water dynamics and soybean production in Louisiana	$5,965.00	f	$5,965.00	94
New	Research	MidSouth Soybean Board	Whole Soy Food Acceptability and Market Viability Study	$7,654.00	f	$7,654.00	94
New	Research	MidSouth Soybean Board	Spatial and temporal variation of soil sampling effect phosphorus and potassium recommendations for soybean	$7,500.00	f	$7,500.00	94
New	Research	MidSouth Soybean Board	Southern root-knot nematode in MG4 soybean	$18,750.00	f	$18,750.00	94
New	Research	MidSouth Soybean Board	Exploitation of weed species extracts as an effective and environmentally friendly strategy to control insects and deer in soybeans	$9,881.00	f	$9,881.00	94
New	Research	MidSouth Soybean Board	Ladder (Large Agricultural Database that Drives Extension and Research)	$13,907.00	f	$13,907.00	94
New	Research	MidSouth Soybean Board	Enhancing the Prospects of Sustainable Weed Management and System Productivity	$8,350.00	f	$8,350.00	94
New	Research	MidSouth Soybean Board	Screening and Selectin Non-Xtend Soybean Relay Intercropping in the Midsouth	$16,250.00	f	$16,250.00	94
New	Promotion	Southwest Soybean Council	Soy Promotional Items in the State	$10,000.00	f	$10,000.00	94
New	Promotion	Grow for the Green	Recognizing Soybean Production Excellence by the continuation of the "Grow for the Green" Yield Challenge Contests.	$201,900.00	f	$201,900.00	94
~~New~~	~~Promotion~~	~~U of A Division of Agriculture R~~	~~Northeast Rice Research & Extension Center Naming Proposal Naming Opportunity # 1 (Silo)~~	~~$250,000.00~~	~~TBD~~	~~$0.00~~	~~94~~
~~New~~	~~Promotion~~	~~U of A Division of Agriculture R~~	~~Northeast Rice Research & Extension Center Naming Proposal Naming Opportunity # 2 (Farm Viewing Portal)~~	~~$250,000.00~~	~~TBD~~	~~$0.00~~	~~94~~
~~New~~	~~Promotion~~	~~U of A Division of Agriculture R~~	~~Northeast Rice Research & Extension Center Naming Proposal Naming Opportunity # 3 (Research and Extension Wing)~~	~~$500,000.00~~	~~TBD~~	~~$0.00~~	~~94~~

Row Labels	Grand Total 2024-2025 Proposals	Grand Total 2024-2025 Board Approved Funding
Promotion	**$1,526,910**	**$458,285**
Continuation	$93,585	$93,585
New	$1,433,325	$364,700
Research	**$3,748,033**	**$3,384,611**
Continuation	$2,786,825	$2,786,825
New	$961,208	$597,786
Grand Total	**$5,274,943**	**$3,842,896**

Row Labels	Sum of 2024-2025 Proposals	Sum of 2024-2025 Board Approved Funding
Continuation	**$ 2,880,410.00**	**$ 2,880,410.00**
Promotion	**$ 93,585.00**	**$ 93,585.00**
U of A Division of Agriculture	$ 93,585.00	$ 93,585.00
Research	**$ 2,786,825.00**	**$ 2,786,825.00**
Dean Robinson Seed Co	$ 16,215.00	$ 16,215.00
U of A Division of Agriculture	$ 2,770,610.00	$ 2,770,610.00
New	**$ 2,394,533.00**	**$ 962,486.00**
Promotion	**$ 1,433,325.00**	**$ 364,700.00**
American Soybean Association (ASAS)	$ 40,300.00	$ 40,300.00
Clean Fuels Alliance America	$ 40,000.00	$ 40,000.00
Communications Group	$ -	$ -
Decision Innovation Solutions	$ 68,625.00	$ -
Grow for the Green	$ 201,900.00	$ 201,900.00
Southwest Soybean Council	$ 10,000.00	$ 10,000.00
The World Initiative For Soy in Human Health (WISHH)	$ 40,000.00	$ 40,000.00
U of A Division of Agriculture	$ 7,500.00	$ 7,500.00
U of A Division of Agriculture Research & Extension	$ 1,000,000.00	$ -
U.S. Soybean Export Council	$ 25,000.00	$ 25,000.00
Research	**$ 961,208.00**	**$ 597,786.00**
MidSouth Soybean Board	$ 178,297.00	$ 178,297.00
U of A Division of Agriculture	$ 782,911.00	$ 419,489.00
Grand Total	**$ 5,274,943.00**	**$ 3,842,896.00**