

Maryland Soybean Board

Soybean Sampler

FY22 RESEARCH REPORT

Checkoff Research Targets Positive On-Farm Results

The farmer-leaders of the United Soybean Board (USB) cited the importance of checkoff investments in research, education and promotion to add value to U.S. soybeans by building resilience, differentiation and reputation. This aligns with USB's new vision of delivering sustainable soy solutions to every life, every day. The board continues to work to create consistent, long-term domestic and global market opportunities to further demand for U.S.-grown soybeans.

Belinda Burrier, Union Bridge, and Travis Hutchison, Cordova, serve on the USB Board for Maryland.

Specific to research, national checkoff investments target these areas:

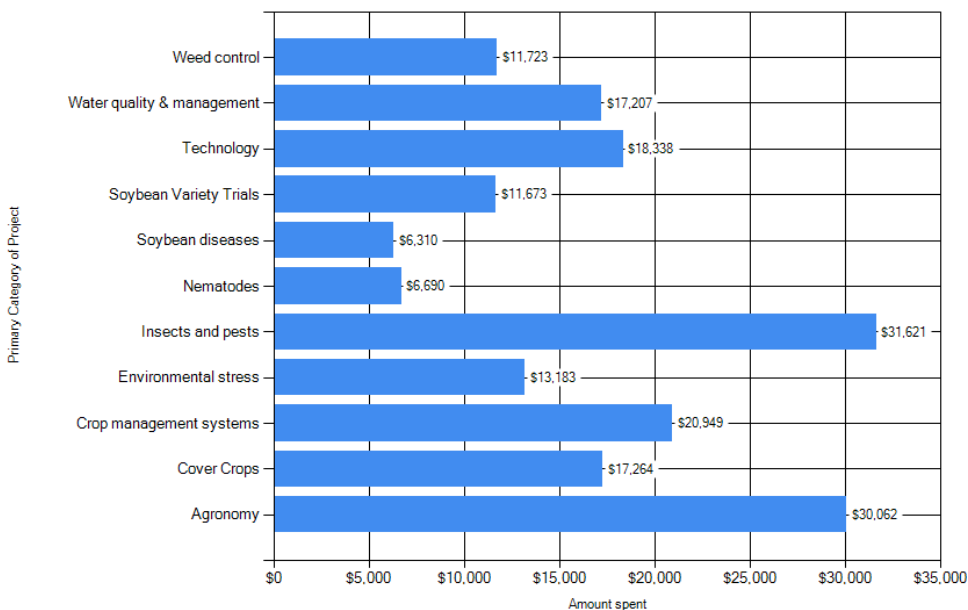
- ✓ Enhance soybean cropping system improvements that reward and support farmers, including the growth of high oleic soybean production to meet demand for specialty soybeans while providing a farmer premium.
- ✓ Further soy's role in the evolving clean energy movement, with investments that support using soybean oil as a feedstock for biodiesel and renewable diesel in marine, rail and on-road applications. Biofuels are the largest industrial use for soybean oil and require investments to reach maximum potential.
- ✓ Develop nutrition and health research that distinguishes U.S. soybean meal's value drivers (amino acids and energy), supports animal health, and builds evidence that discerns U.S. soybean meal from the competition.
- ✓ Improve best management practices through partnerships that lead to faster, real-time dissemination of pest and disease research findings to maximize yield potential.
- ✓ Increase focus on fertilizers and biologicals that support farmers and farming system resilience in an uncertain crop input market environment.

Maryland Research Focuses on Local Needs

The Maryland Soybean Checkoff Program, made possible by the checkoff investment of Maryland soybean producers, worked with researchers around the state to conduct fourteen projects, many in conjunction with farmers to apply the research in on-farm trials. Contained in this report are the results of projects developed with producer input, and represent some of the challenging production issues growers face in the region. Most of the projects were conducted at multiple locations and, in several cases, across multiple years to improve the reliability of the results presented in this research report. All research within the national soybean checkoff program can be found at:

[HTTPS://SOYBEANRESEARCHINFO.COM](https://soybeanresearchinfo.com)

Contributions by Maryland Soybean Board for 2022



Soybean Fungicide Efficacy, Profitability and Pest Resistance Over Time

✓ *University of Maryland Extension, \$18,839, Andrew Kness, akness@umd.edu*

Fungicides are becoming increasingly popular in full season soybean production. This project provides data that benefits soybean producers through testing of new products and formulations for the management of soybean diseases, such as: fungicide efficacy for managing common fungal diseases of soybean, monitor fungicide resistant pest populations, and track the economic impact of foliar fungicide applications over multiple years and environments unique to Maryland.

In previous years of this study, foliar fungicide applications with the selected products tested here provided some benefit related to improved seed quality and yield in situations where frogeye leaf spot disease pressure was present at measurable levels. Fungicides also significantly increased plant greenness and delayed senescence.

During the 2022 growing season, however, none of the treatments tested yielded significantly different than the non-treated control. This is likely due to the fact that no ratable foliar fungal diseases were present in the plots this year. Without the presence of a pathogen, fungicides have reduced odds of improving yields over non-treated plots.

Relative net profit was calculated by multiplying the bushel increase over the non-treated control by the cash market price for soybean at the time of analysis (14.60/bu for 2022) and subtracting the cost of application. A flat rate of \$26.00 per acre was used for 2022 data; for plot with two applications, \$52 was used. This metric, net profit, was used to compare the economics of the fungicides while accounting for yield and market prices. For the 2022 trials, this comparison yielded no significant differences. However, when compared across all seasons (2022-2023), a single fungicide application at R3 significantly increased profits by an average of \$38 per acre compared to the two-pass program, which lost an average of \$26 per acre.

Future work will be focused on replicating similar experiments over more plot-years to gather more data for Maryland's unique growing conditions and to track pathogen resistance and fungicide profitability over time.

Evaluating Earlier Planting Dates for Increased Soybean Yields

✓ *University of Maryland, \$11,673. Nicole Fiorellino and Andrew Kness, nfiorell@umd.edu*

As production systems shift with the increasingly unpredictable spring weather, farmers are looking for guidance on how they may change planting date to increase resiliency and productivity of their operations – by maintaining or increasing soybean yields. Results of this research project were projected to provide soybean farmers with updated recommendations on planting date for soybeans, namely across different maturity groups. While shifting planting date is a risky decision, this local research data can provide farmers the information to balance the risks and rewards of early planting on their operations.

The project objectives were to 1) Plant full season soybeans at three different dates, 2) Evaluate soybeans for nutrient deficiencies, disorders, or pest pressure, and 3) Compare tissue and soil samples to yield after harvest. Plantings were done at three Maryland locations, Keedysville, Clarksville and Wye, and paired with an evaluation conducted at the University of Delaware. In general, the hypothesis was that earlier planting of full season soybeans would increase yield. However, the predicted response did not occur in either year (2021 or 2022) of the study. It is possible that planting did not occur early enough in the season to maximize vegetative growth, although the first plantings in each year took place as soon as farm crews were able to get into the field.

At Clarksville, there was a general trend of increased yield with early planting across all maturity group categories, however that trend was not as apparent at the Wye location. In fact, the MG 3 and early MG 4 soybeans yielded better with the regular planting date at this location. Results such as these prevent the generation of sweeping recommendations for the state. It is anticipated that the impact of early planting will likely be more apparent in some areas of the state, not necessarily across the entire state. This project will continue in 2023 to observe the impacts of years on these data.

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Phosphorus Runoff from No-till Soils—Do Cover Crops Make it Better or Worse?

✓ *University of Maryland, \$17,207, Raymond Weil, rweil@umd.edu*

Several mechanisms by which cover crops could affect the loss of phosphorus (P) were investigated in this research to provide data on how a range of cover crop practices following both corn and soybean crops impact the loss of P by surface runoff. These included: 1) Reduce the volume of runoff water from a storm, 2) Increase the amount of rain required to start runoff from fields, 3) Reduce the concentration of P-carrying sediment in runoff water, and 4) Increase the concentration P dissolved in runoff water. This research shows the actual runoff volume and P concentration from single species or multi-species cover crops. Data has been generated from research plots and farm fields using simulated and natural rain events during the cover crop season.

Utilizing the Cornell sprinkler infiltrometer to generate simulated rainfall and runoff has been very useful to evaluate the impact of three years of enhanced cover crop management on the potential for soils to absorb heavy rainfall and lose nutrients in runoff. The initial infiltration rate is very high but declines quickly as the soil becomes saturated and within less than half an hour reaches a steady state that reflects the saturated hydraulic conductivity of the soil. Despite infiltration being one of the most spatially variable soil properties, the simulated rainfalls were consistent enough to detect significant differences among cover crop treatments and between crop residue types.

The type of crop residue (corn or soybean) had a significant influence on two important hydrologic parameters. It can be seen that it took longer for runoff to begin in soybean residue-covered plots than in corn residue plots. Similarly, under soybean residue, the infiltration rate was almost 50% higher than under corn residue.

Due to later than ideal establishment in fall, cover crop growth before winter dormancy this year was considerably less than in previous years. This is typical of many places in Maryland where conditions for early planting of cover crops were not favorable in fall of 2022. Even though the cover crops this year were quite small, covering only 15-20% of the ground, the impact of three years of enhanced cover crop management was measurable in the soil hydraulic parameters. Both the rye and the 3-way cover crop had similar infiltration rates of 1.2 to 1.4 inches per hour, and these were significantly higher than the 0.7 inch per hour infiltration rate for the no-cover plots.

This is important and new information that illustrates some of the long-term benefits of well managed cover cropping. Higher infiltration rates should translate into considerably less runoff during large rainfall events. This means that watersheds in which cropland has been cover cropped for a number of years should contribute less to flooding and water pollution and should infiltrate more water and store it for later use by cash crops.

Total sediment loss was very low from these plots well armored with both crop residue and cover crop growth. The only exception was one date in December when rainfall simulations ran for two days after a very cold week and found that the soil was still frozen at a depth of about 3 cm. This resulted in significant sediment loss, slower infiltration, and greater runoff. But the relationship with cover crops still applied.

Both inorganic and organic forms of the dissolved nitrogen and phosphorus associated with the runoff from these plots will be analyzed to assess the long-term impact of enhanced cover cropping on nutrient loss potential.

Management of Herbicide Resistant Italian Ryegrass and Other Problem Weeds Prior to Soybean Planting

✓ *University of Maryland, \$11,723, Kurt Vollmer and Alan Leslie, kvollmer@umd.edu*

Italian ryegrass is an annual weed that farmers are having difficulty controlling. This species not only reduces yields in crops like wheat and barley, but also interferes with corn and soybean planting. In no-till systems, many farmers use glyphosate-based products to manage Italian ryegrass before spring planting; however, farmers in Maryland are seeing a lack of control with this herbicide. This research evaluated methods for controlling Italian ryegrass prior to soybean planting.

Field trials were conducting using glyphosate and combinations of glyphosate and other herbicides to control both fall and spring flushes of Italian ryegrass. The best methods for controlling Italian ryegrass occurred when glyphosate was applied with clethodim or when glyphosate-based treatments were applied sequentially in both the fall and spring. However, glyphosate alone provided poor Italian ryegrass control. An analysis of the field population confirmed it to have a 2-fold level of resistance to the standard application rate of glyphosate at 1.25 lb. per acre. As a result, different herbicides and tactics need to be evaluated for Italian ryegrass management prior to soybean planting.

Despite the increasing number of glyphosate-resistant weeds, glyphosate's ability to control many weed species prior to planting continues to be an important component in conservation agriculture. In 2022, growers were concerned about the lack of or cost of glyphosate. Field trials were conducted to assess alternative herbicides to glyphosate for preplant weed control. Results showed that glufosinate and paraquat were as effective as glyphosate-based treatments in controlling several emerged grass and broadleaf weed species. Therefore, these two herbicides may also provide an effective alternative to glyphosate-based treatments.

Pesticide Application and Cover Crop Seeding Using Drones

✓ *University of Maryland, \$9,556, Andrew Kness and Erika Crowl, akness@umd.edu*

Drones are becoming increasingly popular in agriculture for not only imagery, but also product application. The main benefit to apply crop production products in soybean and corn is that it offers a feasible method for in-season foliar product application to fields that are smaller, fragmented, or irregularly shaped, without the potential for damaging the crop with a ground spray rig. Additionally, they are more nimble and have the potential to achieve application to field edges that would be missed by aircraft. Finally, drones are much less intrusive to curious neighbors who often raise concerns when they see an aircraft applying products to fields. This project investigates the viability and authenticity of benefits using drones for pesticide application and seeding cover crops.

Using spray cards and water, the spray coverage of agricultural drones was tested at various application volumes, including

1.5, 2.5, and 5 gallons per acre. It was concluded that drones can achieve similar droplet density, volume median diameter, and coverage as planes and helicopters at spray volumes between 2.5-5.0 gallons per acre. The efficacy of drone-applied fungicides to corn was tested at the Western Maryland Research and Education Center. There were no significant differences in yield, moisture or test weight between any treatments.

Based on the data analyzed in this project, researchers have confidence that drones can deliver an adequate amount of product and achieve, at the very least, similar spray coverage at 2.0-5.0 gallons per acre as a helicopter or fixed-wing aircraft. No yield benefit was observed to the fungicide application in this test, which is likely a function of low and late foliar disease pressure.

This project also evaluated cover crop establishment flown on standing corn using a drone applicator on cooperating local farms. Research was conducted using drones to seed cover crops into agronomic crops in small, irregularly shaped fields with rolling terrain otherwise not suitable for aerial seeding using a fixed-wing aircraft or helicopter.

Data collected shows the potential for aerial seeding a radish cover crop with drones as a viable method for establishing cover crops, and offers a method for planting early cover crops for many farmers that do not have access to a helicopter or plane. Future work will be done to fully understand the feasibility of seeding cover crops with drones, as well as to perform outreach and education for farmers interested in using this technology for both purposes.

University of Maryland Soybean Variety Trials – Check Varieties

✓ *University of Maryland, 11,673, Nicole Fiorellino and Louis Thorne, nfiorellino@umd.edu*

The goal of the Soybean Variety Trials is to provide Maryland producers with an unbiased source of performance data comparing commercially-available varieties to make decisions that maximize profitability on their operations. It is important to evaluate seed varieties across the geographic and climatic regions of the state so farmers across the state can select varieties appropriate for their specific conditions as well as varieties with performance stability. As weather conditions continue to be unpredictable and variable, there is value in selecting soybean varieties that perform well across variable conditions to minimize risk of profit loss.

Results of the University of Maryland Soybean Variety trials for the 2022 growing season can be found at the MD Crops page on the Department of Plant Science and Landscape Architecture website at <https://psla.umd.edu/extension/md-crops>. In the soybean variety trials results document, data is presented separately by location of the trials and maturity group. The selection of a variety based solely on performance at one location is not recommended. It is better to select variety based upon performance over a number of locations and years, if possible. To compare the performance of each variety across the test locations, relative yield was included in the report. Relative yield is the ratio of the yield of a variety at a location to the mean yield of all the varieties at that location expressed in percentage. A variety that has a relative yield consistently greater than 100 across all testing locations is considered to have excellent stability.

This was the second year planting trials with a refurbished no-till planter, which was modified and outfitted with a seed delivery system in 2021. Of the MG 3 soybeans, four varieties in the full season test and six varieties in the double crop test had relative yield >100 at all locations in 2022. Two early MG 4 varieties in the full season test and three varieties in the double crop test had relative yield >100 at all locations, while of the late MG 4 varieties, four varieties in the full season test and 11 varieties in the double crop test met this standard. Finally, of the MG 5 varieties, three varieties in the full season and two varieties in the double crop tests met this standard.



Modified no-till planter for no-till planting of all plots in the soybean variety trials.

Developing an Interactive Web App for Calculating Soybean Crop Budgets

✓ University of Maryland, \$8,067, Alan Leslie, aleslie@umd.edu

This project has designed and published a web-based budget tool for calculating soybean crop budgets in a way that is user-friendly, flexible and interactive.



SOYBEAN BUDGET TOOL

The current version of the app can be found using the URL: [HTTPS://AWLESLIE.SHINYAPPS.IO/BUDGET_4/](https://awleslie.shinyapps.io/budget_4/)

The web app includes all of the functions of the previous Excel-based budget tool, with additional flexibility in choices of pest management options and different genetically modified seed packages. All of the options are available to choose and change on the same page, which makes comparing different production options very easy. The former Excel-based budget tool required multiple spreadsheets to compare production costs of growing soybeans with different herbicide tolerance packages. This version allows users to quickly choose between herbicide tolerance packages and changes to show the available pesticide options for each variety of soybean seed. The new online tool also simplifies record-keeping with the built-in option of downloading all of the information entered into the budget in PDF format to save for later reference. This PDF printout includes all field information and will include additional recommendations related to pest management that change depending on the choices selected in the online application. Information entered by users is NOT saved on the server, and is only saved locally on the user's computer by clicking the "Generate Report" button.

Positive feedback has been received about the utility of the web app. A user survey is included to collect recommendations from farmers about how to improve the tool. Some of this feedback has already been incorporated into the current version. Similar budget tools were found from 29 of the 50 states, with Excel spreadsheets the standard method for creating budgets.

Currently the online soybean budget is in its fourth version, and built-in metrics for the website show that the tool is being accessed and used on a regular basis. The plan is to continue to update and modify the budget app through the future, and continue to promote the use of the app by farmers. Costs for different agrichemicals, field operations, fertilizers, and other inputs can be updated annually as new average prices become available. Pesticide options will also be updated as new chemicals come in and old chemicals are phased out of the market. Costs of drying fuel and irrigation are two additional variables that will be considered for future versions of the budget.

To further promote the use of this project and the impact of the funding by the Maryland Soybean Board, all of the files containing codes used to build this online tool have been published in a public digital repository under a GNU General Public Use license. This will allow other users to discover and share the code and potentially modify it for use in other states or for other crops. The repository recognizes the role that the MD Soybean Board has played in funding the start of this tool, and the license will ensure that subsequent versions remain free and open-source for others to use. As the code is updated through subsequent versions of the web app, these revised codes will also be uploaded to the repository and be made available to the public. The intent of this project is to provide accessible and intuitive crop budget planning to help support Maryland soybean farmers, especially through unpredictable financial times.

Evaluating Soybean Variety Performance and Response to Deer Grazing

✓ University of Maryland, \$8,258,
Luke Macaulay, Nicole Fiorellino and
James Lewis, lmacaulay@umd.edu

This research yielded a more detailed understanding of the patterns of deer grazing on soybeans and how these patterns are influenced by precipitation, and gained better insights into yields that can be expected from different forage soybean varieties and how they compared to two conventional soybean varieties.

In terms of deer grazing patterns, it was documented that 74% of grazing activity occurred at night, with 44% of all grazing activity occurring in just five days of June and July. Statistical analysis of precipitation patterns found that grazing was significantly affected by rainfall events, with decreased grazing activity during rainfall events, increasing grazing activity one day following rainfall, and even greater grazing activity the second day after rain.

Anecdotally, there was some evidence of deer preferring later maturing forage soybeans later in the season, which may provide relief to conventional soybeans during the full pod, beginning seed, and full seed stages (R4, R5, and R6) of development. A buffer of forage soybeans was planted around an irrigated cornfield, and it was believed that the reduction in damage was well worth the investment and losses of yield from the buffer strip itself.

While progress has been made towards understanding what varieties produce the best yields under a moderate deer grazing situation, the highly variable nature of both deer grazing and deer populations has limited findings. Deer grazing intensity at the Wye Research & Education Center was not as high as expected in 2021, possibly due to a die-off of deer from Epizootic Hemorrhagic Disease in the fall of 2020. This led to only moderate levels of deer damage, which produced counterintuitive results. Adjustments to research methods will provide more confidence in the difference in yields under grazing and non-grazing situations.

Assessing the Efficacy of Foliar Fungicides Applied through Irrigation for Soybean Production

✓ *University of Delaware, \$6,310, Alyssa Koehler and James Adkins, akoehler@udel.edu*

Center pivot irrigation is widely used across the Mid-Atlantic. Irrigation research has historically been conducted in the semi-arid Southwest US, with limited adaptability to Maryland and Delaware due to climate and soil differences. In recent years there has been an effort to optimize irrigation practices specifically for the Mid-Atlantic. As improvements are made in irrigation timing and nutrient management, new questions, such as the addition of fungicides to irrigation, have been raised.

The goal of this research is to assess the efficacy of fungicides applied via fungigation in comparison to ground rig applications to inform application method recommendations for soybean farmers. Objectives included:

- 1) Quantify soybean foliar disease severity in response to fungicide treatments applied through irrigation,
- 2) Compare efficacy of soybean foliar disease management in ground rig versus irrigation applied fungicides, and
- 3) Disseminate research results to Mid- Atlantic irrigated farmers.

In 2022, disease pressure was limited with insufficient disease levels to take severity ratings. Ground rig applications had higher Normalized Difference Red Edge (NDRE) values indicating higher chlorophyll content in plants receiving fungicide application by this method. Although there were visual differences in NDRE, no effect on yield was observed. Further replications of this experiment will be conducted in 2023 to gain additional data comparing fungicide application by ground rig versus fungigation at various timings in soybeans.

From the initial assessment, both fungigation and ground rig application are options for fungicide application and are best applied at the recommended R3 timing.

Effect of Planting Date on Seasonal Timing of Pest Complexes and Insecticide Efficacy

✓ *University of Maryland, \$19,548, Kelly Hamby and Lasair ni Chochlain, khamby@umd.edu*

To better understand full season soybean pest risks and the timing of management interventions in Maryland full season soybean, research was conducted to 1) Assess the effects of two planting dates on the timing, abundance, and economic impacts of slugs, insects, and pathogens across two soybean planting dates; 2) Determine the control efficacy and economic benefits of adding a pyrethroid insecticide to the postemergence herbicide application; and 3) Ascertain whether the insecticide application resulted in secondary pest outbreaks. Because pest pressure varies from site to site and year to year, multiple years of data in multiple locations will provide the most robust results.

Soybean planted in late April/early May seems to experience slightly higher pest pressure compared to June plantings; especially slug pressure, pods damaged, lodged stems, and damaged seeds. A yield benefit was not detected from using insecticides at the postemergence herbicide timing, with small reductions in defoliation severity and incidence. As for potential non-target effects, there was no evidence of late season pest outbreaks, and a small reduction in beneficials was observed in visual samples. Sweep net and sticky card analyses are ongoing, and this study will be repeated in the 2023 season to capture year to year variation in pest pressure.

After one year of data collection in two fields at two sites in Maryland full season soybeans, little value was found in adding a pyrethroid insecticide to the postemergence herbicide application. Pest pressure was not economic and yield was not improved. This effect was consistent across two planting dates, one in early May and the other in early June. Earlier planted plots did experience slightly higher pest pressure; however, planting date also did not impact yield in this study. Another year of data will help determine whether this application regularly mismatches with Maryland insect pest pressure.

Field Evaluation of Resistance Sources for Management of Soybean cyst Nematode

✓ *University of Delaware, \$6,310, Alyssa Koehler, akoehler@udel.edu*

Soybean cyst nematode (SCN) is the most significant and damaging nematode pest affecting soybeans in Delaware and on Maryland's Eastern Shore. SCN has been present in Delaware since 1979 prompting growers to rely on resistant varieties, primarily using the PI88788 resistance source. However, additional control strategies are needed as SCN populations have begun reproducing readily on these once resistant cultivars.

A five-replication field trial was conducted in 2021 and 2022 to evaluate two additional resistance genes, Peking and PI89772, compared to lines with PI88788, for stand emergence, control of SCN, and yield differences. Soybean maturity group had the largest impact on yield, but the PI89772 resistance gene had the lowest numerical value of SCN at the end of the season in both years and numerically lower nematode reproductive factor than PI88788. If PI89772 is introduced to maturity groups appropriate for the region, this resistance source should be considered as an option to alternate with PI88788 in effort to reduce in-season nematode population increases.

Planting Green: Extending the Growing Season to Get More Payback from Cover Crops

✓ *University of Maryland, \$20,949, Raymond Weil, rweil@umd.edu*

This research weighed the benefits and challenges of using cover crops and letting them grow longer in spring, including planting green into standing living cover crops. Replicated experiments were conducted at two sites with contrasting coastal plain soils at the University Beltsville CMREC research farm. Each site had early-planted cover crop plots (rye cover crop and rye-radish-clover mix cover crop) and no cover crop control plots in both corn and soybean residue. Results showed large increases in biomass carbon added to soil and N fixed by legumes was 2 to 4 times greater with early or mid-May instead of early April termination. There was no drag on soybean or corn yields with either practice so long as a mixture with brassicas and/or legumes was planted.

Also studied was the impact of cover crop termination timing on slug damage to both soybeans and corn seedlings on slug-infested silty soil with restricted drainage. Slug numbers and damage to soybeans were moderate and the same whether cover crops were used and planted green or not. Slugs were observed feeding on the still-living cover crop tissue when soybean seedlings emerged in the late-kill planted-green treatments. The timing of cover crop termination also had little effect on slug damage or stand establishment.

The use of the two cover crops did not generally reduce crop stand density achieved, even when planting green. The only slight, but statistically significant stand reduction was for soybeans planted into the dead residue of the early-killed 3-species cover crop mix, which may have been an allelopathic effect of short-lived toxins produced by the decomposition of those residues.

The data indicates that cover crops had little effect on soil temperature or moisture this year. Soybean yields were relatively high (58 bu/acre average) and unaffected by cover crop treatments. Corn yields, in contrast, were relatively low in 2022, but significantly increased by the cover crops, especially the 3-species mix. In summary, this project generated important information on how to better use cover crops for improved soil quality, reduced crop stress, enhanced nutrient and carbon cycling, and profitability.

Planting into Green Cover Crops to Reduce Deer Grazing of Soybean Seedlings

✓ *University of Maryland, \$12,073, Luke Macaulay, Nicole Fiorellino, James Lewis and Raymond Weil, lmacaulay@umd.edu*

Deer are the leading cause of crop damage by wildlife in Maryland, with most recent government estimates showing approximately \$10 million in losses annually, with 77% of those losses attributable to deer. Maryland in particular faces greater challenges than many other soybean growing areas in the country due to smaller field sizes that are more often interspersed with and bordered by forested areas that provide refuge for deer, which emerge to graze highly palatable and nutritious soybeans.

This ongoing research is being conducted to determine if planting into green cover crops will help soybean seedlings to establish to the state where they are more resilient to moderate grazing.

Fertilizing Cover Crops: Do You Have to Put Some In to Get More Out?

✓ *University of Maryland, \$22,570, Raymond Weil, Melissa Stefun and James Lewis, rweil@umd.edu*

The objectives of this project were to determine whether small nitrogen applications in fall can increase cover crop nitrogen-capture benefits with apparent nitrogen use efficiency exceeding 100%, and to develop an in-field nitrate-test for evaluating where fall nitrogen fertilization of cover crops is justified.

The research involved field experiments at several sites over three years. Multiple types of cover crops were interseeded into standing corn. Starting with 2020, neither the nitrogen (N) concentrations in the cover crop tissue nor the cover crop dry matter produced by December following N application in October showed large responses.

For the following year, the N was applied to the interseeded cover crop at early corn senescence instead of waiting until after corn harvest, a difference of about five weeks or 4-500 growing degree days. In these experiments, nitrogen uptake by the cover crops varied significantly by plant species or type of tissue (radish root versus radish shoot).

It was readily apparent that for each of the cover crop types there was virtually no difference in N uptake whether fertilizer was applied or not. The responses fell far short of the 20 kg N/ha that would have confirmed the goal of stimulating additional uptake exceeding the amount of N applied.

Therefore, the result shows that the application of even small amounts of N fertilizer to cover crops in early Fall is not recommended if the objective is to enhance the reduction of N losses by leaching over the winter and spring.



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Current Checkoff Research Underway


Local research to provide soybean farmers in Maryland with the latest in best management options to protect their crops and the environment, while helping crops to thrive, is a priority of the Maryland Soybean Board. For the 2023 growing season, the farmer-led board approved 13 research grants, totaling \$194,550 in checkoff investment. Projects receiving 2023 funding:

University of Delaware


- ✓ Continued Assessment of Soybean Foliar Fungicide Efficacy when Applied through Irrigation, \$9,494, *Alyssa Koehler*
- ✓ Identifying and culturing slug parasitic nematodes in Maryland, \$8,106, *Dr. Michael Crossley*


University of Maryland

- ✓ Earlier Planting Date and Decreased Population Impacts on Full Season Early Maturity Soybeans, \$26,544, *Nicole Fiorellino*
- ✓ Effect of Planting Date on Seasonal Timing of Pest Complexes and Insecticide Efficacy, \$22,735, *Kelly Hamby and Lasair ní Chochlain*
- ✓ Evaluating Deer Preferences for Soybean Varieties and other Diversionary Food Plot Crops, \$15,943, *Luke Macaulay*
- ✓ Evaluation of Burndown Treatments for Herbicide Resistant Weeds in Full and Double Crop Soybeans, \$7,701, *Ben Beale and Alan Leslie*
- ✓ Integrating Flame-Weeding for Early Season Weed Control in Soybeans, \$14,343, *Kurt Vollmer, Alan Leslie and Dwayne Joseph*
- ✓ Participation in National Evaluation of Soybean Biological Seed Treatments, \$10,436, *Nicole Fiorellino*
- ✓ Phosphorus Runoff from No-till Soils—Do Cover Crops Make It Better or Worse?, \$23,164, *Raymond Weil*
- ✓ Soybean Fungicide Efficacy, Profitability, and Pest Resistance Over Time, \$11,105, *Andrew Kness*
- ✓ Spring Management of Cover Crops—How Termination Timing effects Soybean Growth and Yield, \$27,086, *Raymond Weil*
- ✓ Understanding the Farm Estate Planning and Succession Planning Needs in Maryland, \$2,000, *Paul Goeringer*
- ✓ University of Maryland Soybean Variety Trials – Check Varieties, \$15,893, *Nicole Fiorellino*




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