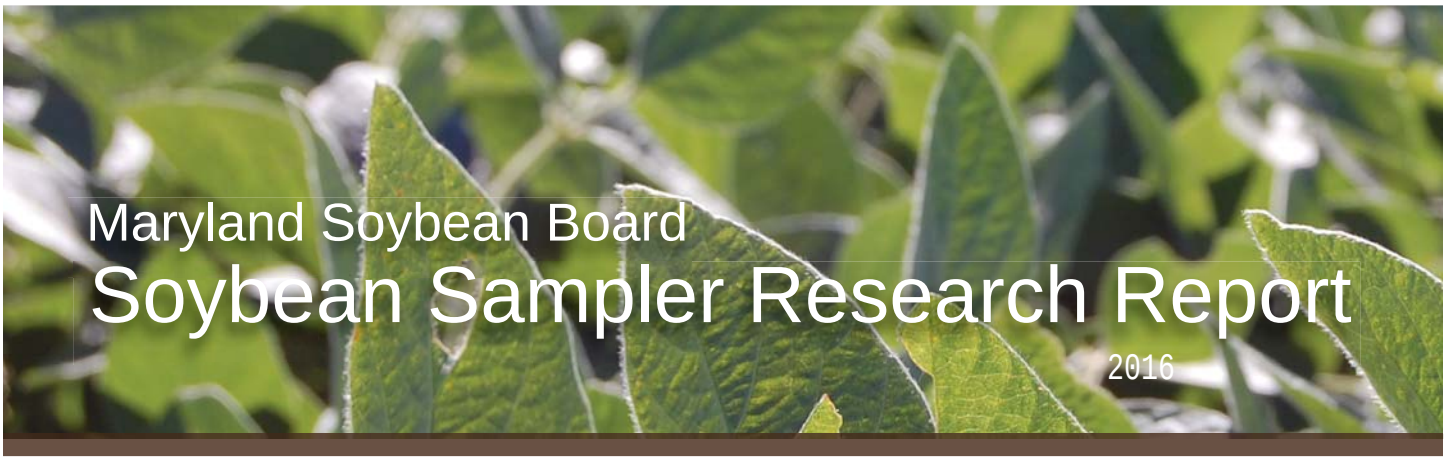

Maryland Soybean Board

Soybean Sampler Research Report

2016

Soybean board funds 16 research projects

The all-farmer Maryland Soybean Board, meeting for two days earlier this year, approved 16 research grant requests for a total of $228,057. It was the largest number of annual grant applications received by the board since it was established in 199l to administer the then-new national soybean checkoff in the state.

The funded research ran the gamut of soybean production techniques from protecting a crop from ravaging insect pests to gauging the impact of runoff from soybean fields on the health of the Chesapeake Bay.

Here's a rundown of the board's funding and a brief description of the project.

$11,656 to Dr. Robert Kratochvil, University of Maryland agronomist, to determine whether an earlier harvest of wheat might improve the yield of the following crop of double crop soybeans. This is part of a new Mid-Atlantic regional effort to boost the performance of double crop beans.

$11,636 also to Dr. Kratochvil to continue his study of the response of full season soybeans to fertilization with poultry manure. In the first year of the research, Kratochvil reported that his field tests indicated neither a positive nor negative response.

$15,000 to Schillinger Genetics chief breeder Billy Rhodes, to continue the seed company's search for non-GMO varieties which offer feed value traits combining high oleic and low linoleic oils and specifically bred to grow in Maryland. Such a variety, the company says, could offer a non-GMO alternative to Plenish and Vistive Gold, the two high oleic soybeans presently on the market.

$29,875 to the U.S. Geological Survey to continue its multi-year task of monitoring the quality of groundwater coming off both irrigated and non-irrigated farm fields along the Upper Chester River. The focus of the study is on nitrogen in the groundwater and both types of fields are being fertilized with poultry manure.

Continued on Page 2...

"Stinky feet, coffee grinders, and 34 cents"

Trypsin is a digestive enzyme that breaks down proteins in the small intestine. Soybeans naturally contain a trypsin inhibitor, which must be heated to be deactivated to unlock the nutritional quality of the feed. The problem is that heating denatures some other proteins in soybean meal.

Billy Rhodes is vice president of research at Schillinger Genetics, but says his more accurate job description is: "I'm a soybean breeder."

Moreover, at Schillinger Genetics, his job means he is a "traditional" soybean breeder. The Maryland- and Iowa-based company focuses on devel-

Continued on Page 6...

Soybean board funds research ...

Continued from Page 1

$26,000 to entomologists Glen Dively and Kelly Hamby who are in the second year of a study of the impact of the repeated use of a neonicotinoid seed treatments in the environment of a crop rotation -- the target and non-target pests, for example, the soil microbes, the following crop -- the ecology in which the seed treatment is applied.

$24,246 to University of Maryland soil scientist Ray Weil to explore the possibility that nutrients deep in the soil are being, as he says, "neglected." He wants to measure the extent and size of deep pools of nitrogen and determine the capacity of roots of early planted cover crops to get down there and use it.

$22,420 also to Dr. Weil, who will test the theory that sulfur may enhance the quality and yield of soybeans. He will measure the extent of sulfur deficiency in a soybean crop and then measure the response of the soybean plants to an application of the chemical element.

$20,000 to Dr. Deb Jaisi, University of Delaware scientist and researcher, to continue his search for the origins and and sources of phosphorous in the Chesapeake Bay. This project is jointly funded with the Delaware Soybean Board. *See story, back cover.*

$5,276 to University of Maryland Extension entomologist Dr. Bill Lamp and his assistant Jessica Grant who, pondering control of the kudzu bug, will explore the number of degree days it requires for the pest to colonize on soybeans.

$7,043 to Caroline County Extension ag agent Jim Lewis for evaluating various soybean maturity groups for their performance under irrigation. This is part of a regional effort to explore varying production practices to increase the yields of double crop beans.

$6,450 to Dr. Jason Wight, field trial coordinator at the University of Maryland, to evaluate the performance of the most popular varieties from the major seed companies, and provide objective performance data under Maryland's cropping systems and environments.

$9,090 also to Dr. Wight to explore the effects of neonicotinoid seed treatments, seeding rates and cropping system effects on soybean growth, yield, quality and other concerns including early season insect pressure. Wight will educate Maryland growers on his findings as well.

$5,000 to two University of Maryland researchers -- Dr. Patrick Kangas and Dr. Cheng Wei -- to test and develop a good quality and low cost fish food by mixing soybean meal and algae.

$6,165 to St. Mary's County ag agent Ben Beale to evaluate the performance of several residual pre-plant herbicides in the control of Palmer amaranth. The weed has become resistant to the glysophate herbicides such as Roundup and increasingly problematic in Maryland.

$20,500 to Dr. Wendy Peer of University of Maryland Department of Plant Science, for two related projects: Improving the photosynthesis and yield of soybeans and increasing bioavailable iron and zinc in soybean seeds.

$7,500 to Dr. Simon Zebelo, a researcher at the University of Maryland Eastern Shore, who proposes to develop "environmentally sustainable alternative practices" for the control of the kudzu bug in Maryland.

He is shooting for "low input, alternative management tactics which will reduce pesticide use, reduce human health risks and minimize adverse non-target effects of the use of toxic insecticides."

About the Maryland Soybean Board

Success for soybean farmers in today's market takes more than just a good harvest. The Maryland Soybean Board administers soybean checkoff funds collected in the state for programs and projects that benefit Maryland's soybean farmers and industry. It is directed by the Maryland farmers shown below.

The soybean checkoff is supported entirely by soybean farmers with individual contributions of 0.5 percent of the market price per bushel sold each season.

On a national level, the efforts of the checkoff are directed by the United Soybean Board, composed of 70 volunteer farmer-leaders often nominated by their state-level checkoff organizations, called Qualified State Soybean Boards, or QSSBs. The Maryland Soybean Board is a QSSB.

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Neonics getting second look at University of Maryland

Neonicotinoids are getting bad press associated with pollinator protection issues; they're also called in question because they are prophylactic and not applied in response to a problem.

What's the cumulative effect of back-to-back use?

Galen Dively and Kelly Hamby aim to find out. With $26,000 in soybean checkoff funding they will investigate the impact of repeated use of neonicotinoid-treated seed on non-target invertebrates and soil microbes.

Says Hamby: "Neonics and fungicides are the typical presentation. They're both coated on the seed, resulting in less human exposure and a longer residual activity. Think of it as a soil applied systemic insecticide."

In 2015 test plots at Beltsville and the Wye research center, the pair looked the effects of repeated thiamethoxam and imidacloprid seed treatments on yield, plant pest diversity; soil pest diversity, soil microbial activity, and neonic residue in winter annual weeds and flowers.

Using various traps and tests to check for insects – pitfall traps, litter sweeps and more – they also checked on response from plants – does it help germination? Does it help at 6-plus weeks, when you expect the chemical to dissipate? They checked again at 12 weeks and at harvest.

So far: They saw more pirate bugs and predatory thrips in untreated plots, a finding they said was not surprising, and overall, populations of both beneficial insects and plant enemies were higher in untreated plots.

Not surprisingly, researchers saw more pirate bugs and predatory thrips in untreated plots.

Overall, higher numbers of both beneficial insects and plant enemies were found in untreated plots.

There was a slight increase in number of plant seedlings that emerged in the Gaucho-treated fields at one week, but no significant difference in yield.

This spring they were measuring wheat germination and the effect on early season flowers and the pollinators that rely on them. That part of the study is funded through the state grain checkoff, administered by the Maryland Grain Producers Utilization Board.

Fellow UMd researcher Jason Wight also will be looking into neonicotinoid seed treatments, seeding rate, and cropping system effects on soybean growth, yield, quality and returns.

With $9,090 in soybean checkoff funding, Wight will launch five replications at the Wye and Beltsville, using various seeding rates and treatments including Cruiser, Gaucho and fungicide only.

Wight also is interested in the relationship of these seed treatments to incidences of Soybean Vein Necrosis Virus, perhaps because the treatments may halt the early season aphid population.

Getting a Jump on Palmer

"With good rain, Palmer amaranth can grow one to two inches per day," says Ben Beale, UMd Extension educator based in St. Mary's County. "Within a week of planting, if you didn't get out there with a residual, you're done."

With $6,165 in soybean checkoff funding, Beale will test the efficacy of pre-plant herbicides for control of Palmer amaranth.

In a 2015 on-farm study of six pre-emergent herbicide treatments, significant differences in control emerged, with residual herbicides providing 14-35 days of control.

The research indicated further measures will need to be implemented to adequately control Palmer, including follow-up residual herbicides applied four to five weeks after planting and timely application of post emergent herbicide treatments.

The weed has naturalized in St. Mary's County and other parts of Maryland and is resistant to Roundup as well as other herbicides, including ALS inhibitor technologies.

Beale will evaluate several chemistries of residual pre-plant herbicides as well as mixtures, and evaluate strategies to extend the length of control.

Growers are encouraged to use multiple control methods, such as tillage, rotating modes of action, rotating crops, cleaning equipment between infested fields and even hand pulling isolated weeds.

"Cover crops can help, too," Beale says, "If the seed is smothered it has a hard time emerging."

Bob Kratochvil reports on dryland double crop timing and manure

University of Maryland Extension Specialist Bob Kratochvil reported on two projects and proposed a third at the Maryland Soybean Board research meeting in March:

Report: Assessing maturity and planting date for dryland double crop soybeans

University of Maryland Extension recommends not planting double crop soybeans after July 15, yet in 2013 some farmers planted in early August and harvested economic yields. Kratochvil looked at late-planted double-crop beans in four locations, using early MG3-5 in 2014 and Early MG3-Late 4 in 2015.

Kratochvil looked at stand counts, growth and development and yield and found that in 2014 there was a big difference, but in 2015 the difference was not as outstanding at Poplar Hill. For the most part, the later maturing varieties gave better performance. There was a dry period in 2014 that may have affected those yields at Poplar Hill. At the Wye, he also saw later maturity groups doing better. Only in Beltsville did they see earlier maturing varieties do well, he said.

His immediate thoughts? You need to consider when the plant will reach Stage R6, or full bean fill, and when the anticipated first frost may be.

Conclusions: Plant double-crop beans ASAP after barley and wheat; mid- to late MG4 varieties appear to be best suited, especially when planted no later than first week of July.

Kratochvil continues to recommend planting by no later than July 15 for best performance, profitability and reducing risk of yield loss, but if planting after that date, he recommends farmers use early MG4 varieties.

Report: Response of full season irrigated soybean to poultry manure – Shore farmers have reported success with manure on full season irrigated beans, leading Kratochvil to wonder what nutrient or nutrients may be causing the yield bump.

At two locations, Kratochvil had the unenviable task of applying manure by hand on small test plots. He added NPK and sulfur at planting and at R2 (full flower).

At the Caroline County farm test plot, beans were a little leggy but yielded no statistical difference; at Wye the yields were lower but again, not statistically different.

Conclusion: "There is no yield response associated with a 1 to 1.5 ton per acre rate – and no negative effect either," Kratochvil says. "It doesn't hurt, it may help, and it gets it down there for the next crop."

He'll look at the idea again during Summer 2016 with $11,656 in soybean checkoff funds, this time adding a nitrate test after soybean harvest.

Kratochvil Proposal: Improve double crop soybean with earlier wheat harvest

The United Soybean Board (USB) has a goal to increase soybean yields 36 percent or 15 bushels per acre by 2025. Improvements in double crop yield are a major focus.

To that end, USB is supporting regional initiatives designed to boost double crop yields. Kratochvil is signed on to the Mid-Atlantic Double Crop Initiative, which engages researchers from North Carolina, Virginia, Maryland, Delaware, Pennsylvania and New Jersey.

In Maryland, getting wheat out of fields earlier is key, since getting beans planted earlier is known to produce higher yields. At Poplar Hill, the Wye and Beltsville, Kratochvil plans on looking at four to five wheat harvest dates, followed by two different MG soybeans.

"Perdue is changing its buying standards to higher test weight wheat," he says, "That is something to consider. You need the wheat grain to get to maturity and after that if it rains it will swell but will never shrink again, affecting test weight. So start thinking about harvesting wheat as soon as it reaches 18-20 percent moisture."

The Maryland Soybean Board is supporting this work with $11,656 in checkoff funds.

Harvesting Nutrients from the Chesapeake Bay

Patrick Kangas and Dr. J. Li had an interesting idea: **Could they use nutrient-rich waters from the Bay to grow algae on land, simultaneously providing a fish feed while cleaning up the Bay's water?**

With $5,000 in "seed" funding and some pointers for more help from the Soy Aquaculture Alliance, the Maryland Soybean Board voted to support "Mixing Soybeans and Algae for Fish Food."

"This is a conceptual model for utilizing algae production," Kangas told the board. "We can take the nutrients out of the Bay but then we need to use them."

The pair have been cultivating and harvesting algae, using macroalgae (seaweed) grown on submerged ropes and microalgae. The growing season is limited since the algae grows slower in winter. The process involves pumping water onto shallow pools with screens, using the nutrients to grow the seaweed, and returning the clean water to the Bay. The activity recently was approved by the Environmental Protection Agency as a Best Management Practice for Bay restoration.

Overwintering, survival and colonization of kudzu bug in Maryland

Experts know how it spends its summer: Munching on kudzu vines and a small range of other hosts, which, sad to say, include soybeans. How the bug survives its winter is what they want to find out.

First discovered in Georgia in 2009, the kudzu bug has expanded its range to include Maryland, where it was discovered in 2013.

It has been identified in Maryland fields each year since, but the bug has not expanded its range northward from the Free State, leading University of Maryland researcher Jessica Grant to question just how cold it needs to get to kill off the resident population.

Grant has raised the bugs in a "nursery" under four temperature regimens, looking at days to hatching, percent which survive, days to adulthood, average age per female and longevity. It turns out, to find out how to kill a bug, you need to know how to keep it alive.

Grant also looked at which point the bugs will actually freeze and die, and then looked to correlate that to the actual temperatures that the bugs experience in the field.

The bugs overwinter in leaf litter and there are not as many swings in the temperature thanks to their insulated microhabitats, Grant says.

Kudzu bugs have piercing sucking mouthparts that cause damage that interferes with photosynthesis in plants. Untreated fields can experience up to 47 percent loss in yield from kudzu bug compared with an average loss of 18 percent in treated fields.

This year, Grant will continue work on degree-day development and overwintering in microhabitats, validate a model of phenology based on observations and share with growers and media, thanks to a soybean checkoff grant of $5,276.

Simon Zebelo of the University of Maryland Eastern Shore is interested in kudzu bug, too. His approach is to focus on the development of alternative management practices for kudzu bug, with $7,500 in soybean checkoff support.

His project takes a behavioral approach. The first generation of kudzu bug may appear in early planted soybeans in spring, with a second generation appearing during summer, Zebelo says.

Unlike other stink bugs, kudzu bug shows a low tendency to move from a suitable host. With limited mobility and "social" tendencies, they aggregate and colonize on field margins. Once there they don't want to move.

The goal? Practices that reduce pesticide use, potentially reduce human health risks and minimize adverse impact on non-target insect populations.

Potential practices include parasitoids or predators; cultural control (early planted soybeans are highly susceptible, and infestations are typically greater at the field edges); and trap crops.

For more information about kudzu bug, see the link on

www.mdsoy.com

Sulfur effect on soybean yield and protein quality to be evaluated

Between 1985 and 2008 there was a large reduction in sulfur coming from fertilizers, fungicides and, quite frankly, pollution in the Eastern United States, says University of Maryland soil scientist Dr. Ray Weil.

And since legumes need sulfur to make protein, Weil wants to take a look at the extent of sulfur deficiency in Maryland beans and how treatments may improve protein quality.

To do so, he's taking a three-pronged approach, with $22,420 in funds from the Maryland Soybean Board:

1. Surveying commercial soybean fields to identify sulfur deficiencies

2. Developing a rapid, in-field method to measure sulfur, using portable X-ray fluorescence

3. Measure the soybean response to sulfur applied to the soil and foliage

Besides protein quality, sulfur may have an impact on yield. On sulfur-deficient soils, yield increases in corn and wheat attributed to added sulfur ranged from five percent to 25 percent.

Yield responses in soybeans are particularly likely because sulfur plays a significant role in nitrogen fixation and photosynthesis, both of which impact protein synthesis, Weil says. In Argentina, ten to 20 percent yield responses in soybeans have been recorded.

Sulfur is a relatively low cost amendment which can be applied as mined gypsum or as other sulfate materials such as potassium sulfate, which is more water soluble. "Even old gypsum wallboard material and gypsum created by air pollution scrubbers in power plants may be useful," Weil says. "Once an S limitation in the soil is recognized, it can be corrected with limited investment."

Stinky feet. Coffee grinders. And 34 cents ...

Continued from Page 1 ...

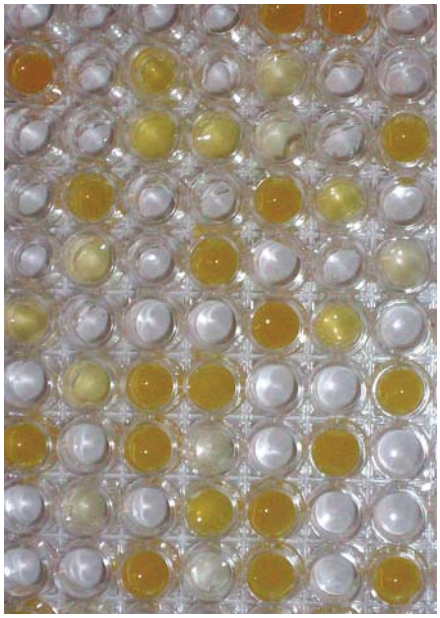
oping non-GMO varieties.

Rhodes has been developing soybeans that express low quantities of the trypsin inhibitor. He's made some crosses and come up with varieties which are headed in the right direction, but using traditional DNA tests to rule out (or in) his progeny have not been accurate. He suspects that is because more than one gene type is involved.

And another problem: It used to cost $85 per one-pound sample to test the genetics of a new line.

So Schillinger developed a new test, at a considerably lower $.34 per sample. Rhodes said they can run 90 prepared samples on just 25 seeds, up to 270 samples per day.

Based on how the protein "cleaves" to a certain element, Rhodes says, the new colormetric test turns out a result. They're looking for yellow.



"The best part is that other than the colormetric analyzer, the process otherwise only uses a coffee grinder. The downside is that it smells like stinky feet."

Schillinger had populations growing in Argentina during winter 2016 to increase ultra-low trypsin lines. He said if they can identify one or more markers for the ultra-low genes, they can accelerate their breeding program.

Until then, it's coffee grinders and stinky feet.

2015 Maryland Soybean Variety Tests released

Maryland soybean variety tests are conducted each year by the Maryland Agricultural Experiment Station, Department of Plant Science and Landscape Architecture, to provide soybean growers with the latest information on agronomic performance of soybean varieties.

Varieties are tested by maturity group as designated by the releasing organization. Varieties of Maturity Groups 3, 4, and 5 are included in the tests because they are best adapted for production in Maryland. Late maturing varieties in Maturity Group 4 (relative maturities of 4.6 to 4.9) were evaluated separately from the earlier maturing varieties in Maturity Group 4.

All entries in the 2015 test are tolerant to Roundup herbicide. Entries with STS in their names also have tolerance to the sulfonylurea herbicides.

The Maryland tests are designed to evaluate varieties at several planting dates and on various soil types within the soybean production areas of the state. Recommended cultural practices were followed in the establishment of each test.

Find the results here:

https://www.psla.umd.edu

Then choose "Extension" and then "MD Crops".

Non-GMO. HO. Lo-Lin. OK?

Billy Rhodes, vice president of research at Schillinger Genetics, says the company has High Oleic beans and Low Linolenic beans, both non-GMO. But they want to create a bean with even more added traits, he told the Maryland Soybean Board.

"The idea," he says, "is to combine these characteristics to make a special meal. … We have markers for the genes we need so we can run tests through the lab to determine if we have been able to pick up all five genes needed. This would create a non-GMO alternative to Vistive Gold and Plenish, with no yield drag and strong defensive traits such as SCN resistance."

Out of 8,000 crosses last year there are 1,500 lines being grown out this year, Rhodes reported. The soybean board voted to support the project with $15,000. The Delaware Soybean Board is also contributing $15,000.

Digging deeper

Weil: Deep soil nutrients represent a 'neglected resource' for growers

"I'm talking about looking to seven feet deep for nutrients. Most tests look no further than three feet," says UMd soil scientist Dr. Ray Weil.

"There's a lot of nutrients out there, it's probably going to pay to go after it. And it probably explains why, after decades of nutrient management, things are not improving as much as we'd like."

Above, Jim Lewis (left), listens to Dr. Ray Weil present his results during the MSB research meeting.

Cover crops, he says, are definitely working on nitrate leaching at 3- to 4-foot deep samples.

"In some cases (cover crops are) doing a great job of taking (nutrients) up but not such a great job of letting them go," Weil says. "We still have a lot to learn about mixtures of cover crops. Packages can be 'designed,' perhaps, to fit the various needs of the site: nitrogen recovery, tilth, etc."

It's the deeper "well" of nutrients he's looking to tap this year. Last year, Weil "buried" nitrogen to see if rye and radish cover crops could reach it at one and two meters.

"There's a lot of variability but (the buried nutrients appear to be) in the hundreds of pounds, possibly 2-500 pounds. We definitely have data that shows cover crops can get down to at least one meter. We want to look at the samples we've got and the water moving through."

Weil adds that it's important to note there's a lot of mineralization that occurs in spring, and organic nitrogen down there too.

With $24,426 in soybean checkoff funding, Weil and "a small army of students" will look at more field-scale tests of deep-rooted cover crops in both corn and soybeans.

The project also will evaluate the effectiveness of aerial application for early cover crop seeding into standing soy and corn crops as well as document the effect of irrigation on the reliability, speed of establishment and growth of early aerially seeded cover crops. The group also plans on exploring the relationship between late summer soil nitrate tests and growth of early cover crops.

They're in need of farmers who willing to fly on cover crop seed in the fall and perhaps follow with irrigation and farmers who are willing to participate at various levels with the sulfur study shown on Page 5.

Farmers who are interested in collaborating with Weil should reach out to him at rweil@umd.edu or through their local Extension office.

Evaluating double crop soybean maturity under irrigation

"Early - Mid Group 3's are where we need to be," says Jim Lewis, Caroline County Extension ag agent, who has been comparing yields of different full season soybean maturity groups grown under irrigation for the past two years.

However, when planting double crop beans under irrigation, the late 4's are the highest yielding maturity group. The later maturing beans have more time to grow before frost, he says.

For beans planted June 15 through July 15, 2014/2015, the highest yields were recorded from MGs 4.6-4.9, Lewis adds. Lodging was also tracked and was minimal except for some Dectes stem borer issues.

Lewis was awarded $7,043 to continue his study in 2016.

"On the Eastern Shore counties, there are over 20,000 acres of full season irrigated soybeans produced annually," he wrote in his proposal. "They are grown in rotation with field corn and vegetables. Farmers and researchers have not put much effort in increasing full season irrigated soybean yields. Therefore, yields have been stagnant and are similar to what they were 25 years ago.

Lewis says the maturity group is an important decision for growers. "Too long of a maturity group bean under irrigation results in tall lanky plants that lodge and yield less.

"We have plenty of data for dryland maturity groups versus yield, but that is not relevant as conditions are completely different."

MARYLAND SOYBEAN BOARD

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An increase of one pod per plant is equal to two additional bushels per acre, according to the United Soybean Board.

Deb Jaisi: Analysis of Phosphorus Origin in Chesapeake Bay

Phosphorus is a tricky element: We know we have plenty of it in our soils and water. What we don't know is if all of it is problematic. Three major sources of phosphorus (P) have contributed to the degradation of water quality in the Chesapeake Bay: the land, bay sediments and the ocean.

But not all phosphorus is "bio-available," meaning that some of it is of far less concern for water quality, says Deb Jaisi, a University of Delaware researcher. With soybean checkoff support, Jaisi set about tracking P sources and differentiating between available and unavailable "pools" of the nutrient on farms around the Chesapeake Bay.

Jaisi uses a process called isotopic fingerprinting to identify sources and variations in phosphorus.

"Over the past two years we studied a series of soil samples collected from 10 different agricultural farms – a total 31 sites - in Maryland and Delaware," he says. "The sites include fresh land just beginning in agriculture, farms under agriculture for decades, and farms with particular rotation of crops, as well as different P sources, including manure, chemical fertilizer and human waste.

"Our results show that phosphorus bound with iron and aluminum oxide are the most dominant P pools on almost all sites," he says. "Sites with the most plant-available and least plant-available phosphorus were split almost equally."

The test results suggest that a few distinct "signatures" are generated on farms, depending on different variables such as soil type and nutrient application.

"Isotope data and estimated underlying mechanisms along with our existing and past research on the Bay sediments, East Creek watershed and other sites in the region have provided unique insights on the relative roles of agricultural and non-agricultural P sources on water quality issues," Jaisi says. He's seeking publication for his research now.