



2015 ANNUAL REPORT





"NCSRP PROGRAMS COMPLEMENT AND EXTEND STATE, NATIONAL AND COMMERCIAL EFFORTS TO IMPROVE AND PROTECT SOYBEAN YIELD AND QUALITY. BY UTILIZING SOYBEAN CHECKOFF MONEY TO ADDRESS HIGH PRIORITY CHALLENGES, RESEARCHERS ARE ABLE TO GENERATE AND COMMUNICATE **MEANINGFUL RESULTS."**

- Ed Anderson, Ph. D., Executive Director, NCSRP

(NCSRP) 2015 annual report. On behalf of the soybean farmers and the research staff who represent

our 12 member states, I encourage you to take time to read this report. The NCSRP strives to invest soybean checkoff dollars into interdisciplinary and multi-institutional soybean research and outreach projects that soybean farmers across the Midwest.

In this report, you will find comments and testimonials from our president, farmers, soybean association staff and university researchers. You will read about a number of research highlights and learn how you can find out even more about NCSRP and the results of the short- and long-term research supported with soybean checkoff funding.

Increasingly, our NCSRP farmers and state staff see opportunities to drive efficiency and a greater return on checkoff investments through collaborative and coordinated university, agency and company partnerships. By utilizing soybean checkoff money to address high priority challenges, researchers are able to generate and communicate meaningful results that help farmers better understand and manage soybean yield and quality opportunities to mitigate disease, insect and other yield and profit-robbing pests and problems.

In some cases, soybean checkoff dollars serve to generate preliminary We are especially excited about a number of NCSRP-funded collaborative

results that will make university research teams more competitive for agency and company funding. NCSRP farmers and staff strongly support and promote public-private partnerships to enhance the entire soybean industry. programs that will garner additional agency and company funding support for accelerating the rate of soybean genetic gain and yield potential, novel approaches to managing soybean cyst nematode, and more holistic approaches to understanding and addressing the threats of various insect pests, seedling diseases and soybean sudden death syndrome.

NCSRP programs complement and extend state, national and commercial efforts to improve and protect soybean yield and quality. Once you've read about these basic and applied studies in this report, I encourage you to learn more by visiting our NCSRP-sponsored website, the Soybean Research & Information Initiative, at www.soybeanresearchinfo.com. You can also contact me, our farmer board members, staff members and the numerous funded university researchers and Extension staff who are dedicated to developing and delivering meaningful results and information to benefit soybean farmers and the industry that supports them.

ED ANDERSON, PH.D. Executive Director, NCSRP

elcome to the North Central **VV** Soybean Research Program



are aimed at improving the productivity, profitability and sustainability of



"THE DETERMINATION OF THE NCSRP BOARD MEMBERS TO INVEST FOR THE GREATEST GOOD OF THE SOYBEAN FARMER IS TRULY WHAT MAKES THIS BOARD WORK SO WELL."

- Trevor Glick, NCSRP President 2015







ello, it was my honor to serve as North Central Soybean Research Program (NCSRP) president in 2015. I would like thank all 12 states that make up NCSRP and the soybean farmers they represent for this honor. This past year was my last year on the NCSRP board and being a director has always been very meaningful to me. As an NCSRP director, I have

always found the board to be on the leading edge when it came to funding meaningful production research. This did not change in 2015. I would like to report that the NCSRP board and Ed Anderson, Ph.D., have made great strides in creating stronger working relationships with private industry partners, the United Soybean Board and state institutions to strengthen our research programs. As all soybean farmers are facing tighter margins it is important to see research checkoff dollars work in such an efficient and effective manner.

The NCSRP summer meeting was hosted by my home state, Indiana this year. It was a pleasure to host the directors and staff on my last year as a director. Jianxin Ma, Ph.D., and Kiersten Wise, Ph.D., of Purdue University, were able to highlight some of their research that is being funded by NCSRP. We were also able to tour the Glass Barn at the Indiana state fair grounds which is used for soybean education for producers and the general public.

The 2015 Annual Report for NCSRP illustrates the continued work that this board does for all soybean farmers. I would like to thank all current and past board members for their dedication and time spent with NCSRP. The determination of the NCSRP board members to invest for the greatest good of the soybean farmer is truly what makes this board work so well. I have enjoyed all my years on NCSRP and will miss being involved.

TREVOR GLICK NCSRP President 2015





























VISION

TO SUPPORT THE ACCOMPLISHMENT AND COMMUNICATION OF SOYBEAN RESEARCH THAT WILL ENHANCE GROWER PRODUCTIVITY, PROFITABILITY AND ENVIRONMENTAL STEWARDSHIP ACROSS THE NORTH CENTRAL REGION; INCLUDING ILLINOIS, INDIANA, IOWA, KANSAS, MICHIGAN, MINNESOTA, MISSOURI, NEBRASKA, NORTH DAKOTA, OHIO, SOUTH DAKOTA AND WISCONSIN.



NORTH CENTRAL SOYBEAN RESEARCH **PROGRAM (NCSRP) STRATEGY**

MISSION

NCSRP will serve as a bridge between state and national soybean organizations and will be the recognized leader in funding and communicating basic and applied soybean research programs that are highly collaborative and uniquely appropriate in addressing soybean production, profitability and environmental sustainability for growers across the North Central Region.

NCSRP GUIDING STATEMENTS

- NCSRP Executive Board will review overall program impact and success, and establish specific research priorities of regional importance on a five year cycle (e.g. key diseases, insects, production practices, etc.).
- 2. NCSRP funded programs and projects will not be redundant with current state (QSSB) or nationally (USB) funded programs, but may complement and extend state or nationally funded projects when addressing the common interests and needs of North Central Region soybean growers.
 - NCSRP will maintain communication and collaborative connectivity with state QSSB's and with the USB in order to maintain awareness of state and national soybean research priorities and funding.
 - Regional researchers submitting proposals for NCSRP funding must provide clear statements of research being funded by a QSSB or the USB.
- 3. Multi-year research project or program proposals will be accepted for funding consideration, but annual renewal will be predicated on successful generation and communication of meaningful annual results.

COLLABORATIVE SOYBEAN **RESEARCH OBJECTIVES** AND PRIORITIES

- 1. Soybean yield enhancement through genetic improvement and biotic and abiotic stress mitigation for the soybean maturity groups 0 - IV.
 - Classical and molecular soybean breeding efforts that will enhance yield potential and yield stability clearly focused to the North Central Region.
 - Research that addresses the control of insects and diseases (defensive traits) of consistent and economically significant impact across the North Central Region.
 - Research that addresses weed resistance to herbicides for species of common occurrence and threat across the North Central Region.
 - Research that address soybean • response to water, nutrient, soil and environmental conditions unique to the North Central Region.
- 2. Soybean production practices that will increase yield, profitability and environmental stewardship issues specific to the North Central Region.
 - Corn/soybean rotations
 - Plant populations, row spacing and input management
 - Water quality and watershed planning
 - Cover crops
 - Soybean production sustainability and life cycle assessment (e.g. STAARS)



"SINCE PRODUCTION CHALLENGES DON'T CHANGE AT STATE BORDERS, WE FEEL THAT IT IS WISE TO CONTRIBUTE TO AND BENEFIT FROM THE VAST RESEARCH CAPABILITIES ACROSS THE NORTH CENTRAL REGION"

- Mark Seamon, Michigan Soybean Promotion Committee





NCSRP STATE STAFF COMMENTS

WHAT IS THE BIGGEST IMPACT NCSRP HAS MADE IN YOUR STATE?



TOM FONTANA Ohio Soybean Council

"The Ohio Soybean Council is pleased to be a partner with 11 other states in the North Central Soybean Research Program. Using the collaborative talents of researchers throughout the region leads to cost effective projects with results that are valuable to soybean farmers. It makes sense to leverage resources to maximize farmer return on investment."





KENDALL NICHOLS North Dakota Soybean Council

"The biggest impact NCSRP has made in North Dakota is the research conducted on the control of diseases and SCN. As we have continued to increase soybean acres and soybeans have become a part of almost all farmers' rotation, the importance of control of diseases becomes increasingly important. NCSRP research provides insight to dealing with diseases and other production issues that North Dakota farmers have not previously had to deal with."



LINDA KULL

Illinois Soybean Association

"For Illinois, being able to leverage the diverse NCSRP research investments for production concerns allows us to focus our checkoff on state-specific events and needs and receive the benefit of the NCSRP research. Many of today's soybean production challenges cannot be solved by any single state or university, and nearly all the technologies reaching our farmers come through private industry. NCSRP is well-positioned to facilitate public-private research partnerships, build on previous research endeavors, and bring relevance to the checkoff investment."



MARK SEAMON

Michigan Soybean **Promotion Committee**

"States such as Michigan with smaller soybean acreages benefit greatly from the collective expertise and capacity that are accessed through the use of combined resources. Michigan researchers continue to contribute as well as receive input into cutting edge research projects. Since production challenges don't change at state borders, we feel that it is wise to contribute to and benefit from the vast research capabilities across the North Central Region."







"THERE WERE ALSO SEVERAL DATA SOURCES THAT SUGGESTED 15 INCH SOYBEANS ARE MORE PROFITABLE AND WE WANTED TO EXPAND THE **RESEARCH AND COMPARE MULTI-STATE DATA."**

- Nathan Paul, Iowa Soybean Association, operations manager and NCSRP liaison



MULTI-STATE ON-FARM PARTNERSHIP: FACING THE GROWING CHALLENGE IN SOYBEANS

ver the past 40 years, soybean yields have increased about 0.44 bushels per acre, per year – far below the yield gains in corn - andfarmers are taking notice.

To address this growing challenge, the North Central Soybean Research Program (NCSRP) developed the Multi-State On-Farm Partnership, a coordinated research effort between 14 university, commodity group, and non-governmental organizations (NGOs) to advance U.S. agriculture in a meaningful way.

"There are a number of opportunities where collaborating across state lines on similar and robust protocols allow us to take data and aggregate it further to broaden the benefit to farmers," said Ed Anderson, Ph.D., NCSRP executive director.

Combining both new and existing on-farm programs, the Multi-State On-Farm partnership began in the spring of 2014 to serve as a framework for facilitating regional and national projects. In 2015, the Partnership conducted its first in-field trials comparing the soybean yields of 15and 30-inch row spacing.

"We were looking for a relatively easy management trial to get the partnership up and running," said Nathan Paul, NCSRP liaison and Iowa Soybean Association On-Farm Network® operations manager. "There were also several data sources that suggested 15-inch soybeans are more profitable and we wanted to expand the research and compare multi-state data."

Paul works closely with the

partnership to coordinate trials and facilitate data collection.

"Overall the data collection has been very successful and people have bought into it," said Paul. "It's a topic of interest and we've found some great farmer participants and partnerships."

Nine partner states including Illinois (2), Iowa (3), Kansas (3), Michigan, Missouri, Nebraska, Ohio, South Dakota (2) and Wisconsin conducted 15 successful trials in 2015 despite challenges from Mother Nature. Heavy rainfall caused planting delays in some locations.

While all data has yet to be analyzed, early indications suggest a slight yield advantage to 15-inch rows especially in lower yielding territories Final results will be posted publicly on www.unitedsoybean.org.

"It's good to look into improved practices outside the seed itself," said Paul. "Management techniques, such as row spacing, are simple changes that could lead to higher profitability and larger gains in yield over time."

Paul believes the data can benefit farmers in many ways including equipment upgrade decisions. Farmers looking for variation like 15-inch rows can look into interplant planters as opposed to traditional 30inch rows for corn and soybeans.

THE YEAR AHEAD

While the Multi-State On-Farm Partnership experienced moderate success in their first year, the group plans to broaden research in 2016. "This past year helped establish

the system for coordination and collaboration and help folks see the potential," said Mike Dunn, director of environmental programs and production research for the Indiana Soybean Alliance. Dunn serves as the project coordinator for the Multi-State Partnership.

The partnership plans to duplicate the row spacing trials from 2015 only on a portion of the fields as well as expand the research to cover additional topics. The group has considered research on starter fertilizer, seed treatments and even tying into a sustainability study, but no decision has been made.

Additional funds from the United Soybean Board have made resources available for 30 field trials in the coming year, up from 18 in 2015. Dunn, Paul and others leading the partnership hope to increase the number of states participating as well.

"That's really what this project is about - getting as many states as possible working together on some of these on-farm projects," said Dunn. "We're doing research on farmers' fields across a large geography and aggregating that data for more meaningful results."

"We're trying to be responsive in coordinating the best and brightest researchers across the country to address, with a sense of urgency, the needs of farmers and to help the soybean industry," stated Anderson. "We focus on farmer interest in driving efficiency, reducing redundancy and guaranteeing a greater return-on-investment of their check-off dollars."

nderstanding the cause of U nderstanding the cause of Sudden Death Syndrome (SDS), one of the newest and fastest spreading diseases across the North Central region and a cause of yield loss for thousands of the region's farmers, and communicating it is the focus of a recent study funded by the North Central Soybean Research Program (NCSRP).

The team of researchers, led by Daren Mueller, Ph.D., Iowa State University (ISU), involves seven universities from five states and a Canadian territory. The purpose of the "Developing an Integrated Management and Communication Plan for Soybean Sudden Death Syndrome" study was to look into management options that will improve the efficacy of current resistant cultivators available to farmers by evaluating root health and analyzing shifts in production practices to determine what helps reduce SDS. The team then plans

to communicate the research to farmers, agribusinesses and other stakeholders.

"SDS has been one of the primary soybean diseases across many of the states in the North Central region, so getting a better understanding of cultural practices that can affect it should be extremely beneficial," Mueller said. "None of the resistant varieties are going to provide 100 percent control of SDS, so knowing when to use which management strategies is important. They all cost money, they all have other consequences; our research allows farmers to make wiser and more informed decisions around managing a very destructive disease."

- At the end of the second year of funding, there are several findings that are ready to be shared.
- A multi-lab analysis of the performance of six genes under a variety of research conditions

was published. In addition, a more effective diagnosis and quantification protocol was determined to improve the efficiency of future SDS research.

A study was conducted to evaluate the effectiveness of planting dates and seed treatments on controlling SDS. While the planting date data were inconclusive, it was found that the seed treatment ILeVO® effectively reduced disease severity and increased yields. Contributors to this project

include Leonor Leandro, Ph.D., Iowa State University, Carl Bradley, Ph.D., University of Kentucky, Glen Hartman, Ph.D., University of Illinois, Martin Chilvers, Ph.D., Michigan State University, Dean Malvick, Ph.D., University of Minnesota, Kiersten Wise, Ph.D., Purdue University, Ahmad Fakhoury, Ph.D., Southern Illinois University-Carbondale and Albert Tenuta of the University of Guelph in Ontario, Canada.

There are several projects within this study, including work to summarize data about the interaction between herbicides and seed treatments on SDS and field experiments looking at how an increase in soybean cyst nematode (SCN) resistance affects SDS resistance.

Like all NCSRP-funded research, this project places a heavy emphasis on communicating the results. One of the objectives of this project was to make sure farmers can come up with an integrated management plan.

"Our goal was to give farmers information to help them develop a management plan that incorporates more than one tactic, which should give farmers a more effective plan," Mueller said. "It was included because the project is led by a bunch of extension specialists that know the importance of communicating results back to farmers."

The full results of the study have been and will continue to be communicated through professional meetings, seminars, media interviews, statelevel newsletters, extension publications, news releases and www.soybeanresearchinfo.com. Additionally, the researchers plan to continue to publish results in peerreviewed journals once data analysis is complete.

Among the biggest benefits farmers will see from this project are an SDS fact sheet and a scouting card. The fact sheet will be a quick way for farmers to find out what products or practices are effective in managing SDS. The scouting card will be a convenient piece for farmers to take into their fields when disease scouting to assist in determining if the disease they're looking at is SDS or a different disease, and how they should respond.

As SDS continues to spread across the North Central region, research, and subsequent communication of the research will become increasingly important in the management of this yieldrobbing disease.



"OUR GOAL WAS TO GIVE FARMERS INFORMATION TO HELP THEM DEVELOP A MANAGEMENT PLAN THAT INCORPORATES MORE THAN ONE TACTIC, WHICH SHOULD GIVE FARMERS A MORE **EFFECTIVE PLAN.**"

- Daren Mueller, Ph.D., Iowa State University

NCSRP STUDY GROUP FOCUSES ON NEW AND EMERGING SOYBEAN DISEASES



C tudy groups aren't just for cramming for finals anymore. Researchers with the North Central Soybean Research Program (NCSRP) are using a similar approach to advance timely knowledge of soybean diseases for farmers in the North Central region.

"The purpose of this project is to provide Extension materials on some soybean diseases where information is lacking or outdated and we know we have more current identification information," said Kiersten Wise, associate professor of botany and plant pathology and Extension specialist at Purdue University. "We have been charged with providing accessible information in print and electronic formats along with video resources to help farmers identify and better manage these soybean diseases."

The project is in its second year - with funding for the year at \$74,000 - and has developed twofull-length publications on stem canker, pod and stem blight and two scouting cards on common soybean diseases. More than 40,000 of these

publications have been distributed to the North Central states.

Other areas of progress include the revision of past NCSRP-funded publications, specifically those on charcoal rot and white mold. in order to create a uniform and up-to-date Soybean Diseases Management Series through NCSRP. Based on the assessments of this project, research needs for soybean vein necrosis virus (SVNV), stem canker and pod and stem blight were summarized by the group, resulting in six grant proposals submitted to either UDSA-NIFA (National Institute of Food and Agriculture) or the United Soybean Board, designed to further understand the biology and management of SVNV and the causal agent of stem canker.

"For the second year, we have revised and started three new publications," Wise said. "For the last year of the project, we'll create more publications, but will also plan to do a showcase for all these research publications at the 2016 Commodity Classic. By showcasing these publications, it will help farmers make the connection between the projects. We will also try to continue to create high quality Extension resources for these various diseases."

Full-length and scouting card publications have been distributed to local soybean boards and are available electronically on the SRII website (soybeanresearchinfo. com) and on local state Extension websites.

This model improves stakeholder awareness of diseases and creates a template for information that is easily recognized by soybean farmers as an output funded and created by Extension. For 2016, the group will develop a full length publication and scouting card, and an updated research factsheet on managing sudden death syndrome. Scouting cards on stem diseases will also be available in 2016.

Wise says the biggest farmer benefit to this project is the ability to quickly get new and updated information.

"In a typical research situation, we identify a problem, conduct research and then after a couple years we think about creating an Extension publication," Wise said. "This project bypasses that gap in farmer and industry awareness, which normally prevents stakeholders from obtaining the most current information about emerging issues. We can also easily update and manage already existing publications for farmers so they are always getting the most up-to-date information."

According to Wise the project improves awareness and stakeholder knowledge of emerging diseases using older methods like fact sheets and bulletins while also utilizing new technologies like web-based videos and online content that is downloadable and viewable through smartphones and tablet devices.

Additional project contributors include: Daren Mueller, Ph.D., Iowa State University; Loren Giesler, Ph.D., University of Nebraska; Carl Bradley, Ph.D., University of Kentucky; Martin Chilvers, Ph.D., Michigan State University; Damon Smith, Ph.D. University of Wisconsin; and Albert Tenuta, OMAFRA.

SCN PROJECT REPORTS **PROMISING FINDINGS**

Progress is being made to control a billion-dollar pest, according to a research project funded by the North Central Soybean Research Program (NCSRP).

Soybean researchers from several land grant universities, led by Harold Trick, Ph.D., of Kansas State University, are in the third year of a study to increase engineered resistance to soybean cyst nematode (SCN) via induced gene silencing. The third-year budget is nearly \$169,000.

Arguably, there's no bigger obstacle to soybean yield and profitability than SCN – a small plant-parasitic roundworm that attacks the roots of soybeans, robbing nutrients and yields.

"There are estimates that SCN costs U.S. soybean producers over a billion dollars per year," the project report said. "Midwest soybean producers, especially those whose fields are infected by SCN, will benefit from this research by reducing yield loss due to soybean cysts."

The primary goal of this research project is to establish a new set of biotech traits that have durable resistance to SCN. Soybean breeders in the early 1990s laid the ground work to develop existing resistant varieties, but they are not as effective as in the past.

Yield loss in fields with SCN is typically 5 to 20 percent, experts say.

Scientists contend turning off genes by a process known as RNA interference has tremendous potential as a new strategy to

increase nematode resistance. The project is targeting specific SCN genes for down-regulation or silencing by producing small RNA molecules in soybeans. Subsequently, the RNAs will be ingested by soybean cyst nematodes.

"The target genes within the nematodes will be silenced and thus either kill or prevent the nematodes from reproducing," the report said.

Scientists have completed the first objective of the study - produce a stable of transgenic soybean plants with traits that can silence specific nematode genes – and performed several tests to confirm the effectiveness of SCN resistance of these lines. Based on an initial screening of 45 transgenic lines representing six different target nematode genes, 18 transgenic lines were selected for further analysis.

An initial RNA sequencing dataset on a few of these lines has demonstrated that at least two lines of one gene and one line of a second gene show promise in reducing SCN populations. Some by more than 55 percent.

"The end result of this research could potentially provide effective resistance against all populations of SCN and even to multiple species," the report said.

Additional testing of transgenic events will continue as part of the project. These lines will undergo molecular analysis to determine the populations and quality of the small RNAs generated and correlate this data to the effectiveness of nematode control.





GETTING TO THE ROOT OF THE PROBLEM

n ongoing project is looking at the genetics of Iron Deficiency Chlorosis (IDC) thanks to funding from the North Central Soybean Research Program (NCSRP).

The uptake of iron is essential to healthy soybean growth, but conditions aren't always ideal and soybean plants - especially those grown in the North Central region- can become deficient.

Research has shown that many genes work together to make proper iron uptake and utilization possible.

The research project, "Iron Deficiency Chlorosis: Getting to the Root of the Problem" is led by Phillip McClean, Ph.D., Department of Plant Sciences at North Dakota State University (NDSU); Robert Stupar, Ph.D., Department of Agronomy and Plant Genetics, University of Minnesota; James Orf, Ph.D., Department of Agronomy and Plant Genetic, University of Minnesota; and Ted Helms, Ph.D., Department of Plant Sciences of NDSU are co-investigators on the project. The study seeks to find and analyze genes related to IDC. The project's initiatives for 2015 included three stages focused on molecular marker discovery and deletion analysis as described in their recent annual project report.

STAGE 1: MARKER DISCOVERY

The research team initially planned to evaluate 200 molecular markers, but were fortunately able to switch to five times that many for the project. The 1,000 genomic-based markers were overlaid onto 284 breeding lines from 30 public and private programs with a focus on Great Plains varieties. The research revealed nine markers were associated with IDC tolerance. Eight of the markers were located near Gm03 - a gene involved in iron metabolism.

Moving forward, the team assessed

the value of the markers by evaluating them on an additional 711 lines from breeding programs in North Dakota. Results showed three of the original nine markers were associated with IDC performance in these varieties. Further analysis determined which marker was found in the most IDC tolerant lines.

The next step was to determine the marker performance in active breeding projects through the help of NDSU's breeding program. The Gm19 locus, a genomic region previously associated with plant growth and maturity, was demonstrated to be one component of IDC tolerance. Additional data is still being analyzed and results will be shared in future NCSRP reports.

STAGE 2: ADDITIONAL MARKER DISCOVERY

In the second stage of the project the team used genotype-by-sequencing (GBS) technology to collect data from 34,428 SNP markers. The use of the GBS technology allowed for a large number of markers to be studied at once, ultimately determining 10 new molecular markers to target for breeding IDC tolerance. These markers will be validated and made available for broader use.

STAGE 3: DELETION ANALYSIS

The relevance of Gm03 was further determined during the final stage of this year's study. According to the report, advanced genotyping methods allowed the observation of susceptibility to IDC to be mapped on Gm03 in three different forms. Additional phenotyping coupled with this data solidified the importance of Gm03 to iron metabolism. In future research the team will attempt to further characterize the nature and function of the gene associated with the Gm03 marker.

North Central Soybean Research Program Annual Report | 17

LOOKING TO 2016: SOYBEAN RESEARCH REJUVENATION

idwest soybean farmers invested nearly a million dollars in the coming year to solve two multi-billion dollar problems.

Yield-robbing soybean cyst nematodes (SCN) annually cost farmers \$1.2 billion or more in lost production, researchers say. Modest soybean yield improvement, especially compared to corn, may be just as costly.

The North Central Soybean Research Program (NCSRP) Board of Directors funded research projects to address both issues.

"Farmers get paid for bushels," said Ed Anderson, Ph.D., NCSRP executive director. "The organization has always been focused on getting

the highest yield and preventing diseases and insects from robbing production."

The board invested a little more than \$593,000 to fund the first year of a proposed three-year study, which began Oct. 1, 2015 to find novel approaches to managing SCN. Iowa State University nematologist Thomas Baum, Ph.D., is leading a team of scientists from several land-grant universities to find "an integrated approach to enhance durability of SCN resistance for longterm, strategic management."

In addition, nearly \$370,000 was approved by the board to fund the first year of a proposed threeyear project to accelerate genetic



yield gain and potential in soybeans. Project leader Aaron Lorenz, Ph.D., an assistant professor in the University of Minnesota Agronomy and Plant Genetics Department, and more than a dozen university researchers from across the Midwest will work to create a genomic selection pipeline for public soybean breeders in the north central region.

Scientists have been working for decades to enhance and protect soybean yields with varying degrees of success and frustration. Understandably, farmers want their research investments to pay off.

Anderson believes a renewed emphasis on collaborative projects will do just that.

"This is our response to the ground swell of emphasis on returnon-investment by trying to bring more coordination and multidisciplinary approaches to these efforts," Anderson said.

YIELD

Soybean yields over the past 40 years have annually increased, on average, about .4 bushels per acre, while corn yields have increased about 1.7 bushels per acre per year, he said.

The new yield enhancement study is aimed at narrowing the gap.

"A project like this is laying the foundation for the methodology that can be used to more quickly increase yield," Lorenz said.

Advances in genomics have made whole-genome genotyping less expensive. Lorenz said scientists will work to develop tools to make the best use of all the genomic data.



In the past, scientists were mainly interested in mapping specific genes that affect yield. The new study will use all the high density DNA marker data and genomic data simultaneously in a single predictive model to make yield predictions.

"The faster and more accurate we can make selections, the quicker we will develop higher yielding cultivators," Lorenz said.

The vision of the project is to further coordinate the number of soybean breeding efforts to fill the commercial pipeline with more diverse and higher yielding soybean germplasm.

Scientists hope that demonstrated success will attract federal agency and private company dollars to help target and prioritize future work.

NCSRP Vice President Gene Stoel, who farms near Lake Wilson, Minn., said corn yields have made great strides over the years and it's time soybeans do the same to stay competitive.

"Anything we can do to enhance yield should mean better profits for soybean farmers," Stoel said.

SCN

SCN is the most damaging pathogen to North American soybean production.

The small plant-parasitic roundworm attacks the roots of soybeans, robbing nutrients and yields. In the late 1980s, SCN decimated fields across the Midwest to the point farmers thought it would threaten the viability of the soybean industry.

Researchers developed SCN resistant soybean varieties, which helped minimize field losses. But continuous use of the same resistance genes in commercial varieties has contributed to the buildup of nematode resistance over time.

"SCN is still the No. 1 challenge," Anderson said. "If we don't figure out ways to stay in front of the evolving populations, we're going to be in trouble."

The new SCN study will bring together the foremost experts in the north central region – breeders, molecular biologists, nematologists, extension specialists, bioinformaticists - to better understand and control the pest.

The goal:

- Diversify the genetic base of SCN resistance in soybeans.
- Identify SCN virulence factors and better understand how the nematode adapts to resistance.
- Translate the results into increased profitability.

The latest NCSRP investment is the next step in a productive partnership between university scientists and soybean farmers. Baum admires the foresight of producers to fund relevant research.

"It's an incredibly complex problem ... an animal infecting a plant," Baum said. "There are no quick fixes. But if we don't do this, there won't be any fixes."

NCSRP funding will help get researchers on the same page and develop a strategy to best combat the problem, Baum added.

Scientists are "optimistic" SCN losses will dissipate with the new holistic approach.

So is Stoel. The microscopic worms have been a thorn in his side for a long time.

"Hopefully we can find something that will knock the nematodes back all the way around," Stoel said.

SOYBEAN Research & Information ΙΔΤ N F

he Soybean Research and Information Initiative (SRII) website marked its first full year of operation in 2015. The initiative launched in the spring of 2014 as an effort to build upon the functionality and success of the Plant Health Initiative (PHI) in developing an easy access onestop shop for soybean research. A project funded by the North Central Soybean Research Program (NCSRP), the site can be found at www.soybeanresearchinfo.com.

In 2015, the SRII site hosted more than 517,415 visits by people who took advantage of the site's content which features research from thirteen universities across the twelve NCSRP member states. In addition to the latest articles and publications being featured on the homepage, the SRII website offers farmers useful information about soybean diseases and pests as well as diagnostic tools and other agronomic issues.

"When we undertook the effort to enhance and expand the PHI website, we wanted to accomplish a couple of key things," said Ed Anderson, Ph.D., NCSRP executive director. "First, we wanted to make the site easier to find. In addition, we wanted to provide a variety of timely and topical research results and information."

The SRII site contains NCSRP-funded soybean research summaries, detailed reports, Extension bulletins, peer-reviewed journal articles, videos, photographs, tips and links to many other soybean information resources.



SOYBEANRESEARCHINFO.COM



SOYBEANRESEARCHDATA.COM

Perhaps one of the most beneficial features of the site is the overview of 24 of the most prolific soybean diseases throughout the region. Each summary includes the disease's life cycle, agronomic impact and how to manage the disease. To help identify the diseases many pictures are included in addition to scouting tips and information about how to distinguish diseases that are commonly mistaken for each other.

Even though NCSRP focuses on the northern part of the Midwest, the SRII website also includes links to the National Soybean Checkoff Research Database; a searchable directory of all the soybean checkoff funded research programs from across the country. This provides farmers with as much information as possible to help with

their operations.

If a farmer would still like more information after looking through SRII, contact information is available for each state's diagnostic clinic. In addition, major soybean production topics are listed alongside the name and email of the lead investigator(s) for NCSRP-funded research in that area.

"We know that NCSRPfunded university researchers and Extension staff value personal interactions with farmers," Anderson said. "Dialogue among researchers and farmers frequently leads to sharing of information and insights that are mutually beneficial, so we encourage farmers to contact NCSRPsupported scientists."

SOYBEANRESEARCHINFO.COM Summary from launch to present (Date Range: 05/01/2014 - 12/31/2015)

TOTAL SESSIONS: 175.424

TOTAL PAGEVIEWS: 517.415

AVERAGE SESSIONS PER DAY: 279.34

AVERAGE PAGEVIEWS PER DAY: 823.91

AVERAGE LENGTH OF SESSION: 03:54







NCSRP BUDGET



2015 BOARD OF DIRECTORS



Rock Port, MO

CLIFF MULDER

Pella, IA

JERED HOOKER Clinton, IL



RON OHLDE Palmer, KS

22 North Central Soybean Research Program Annual Report













NORTH CENTRAL SOYBEAN RESEARCH PROGRAM

1255 SW Prairie Trail Parkway | Ankeny, IA 50023 www.ncsrp.com

Funded by the soybean checkoff.