Iowa State University
Iowa Soybean Research Center
In Collaboration with the Iowa Soybean Association

2019 Stakeholder Report

Photo: Joseph L. Murphy, Iowa Soybean Association
About the ISRC

The Iowa Soybean Research Center works in partnership with the Iowa Soybean Association, industry leaders, farmers and researchers at Iowa State University. The goal of this collaborative effort is to identify and fund research in the areas of soybean production and protection. Soybeans play a big part in Iowa’s economy and research serves to aid the farmer by improving soybean yields.

The center involves and helps coordinate research, teaching and extension activities of faculty and staff who work in the areas of soybean biology, breeding, economics, precision agriculture, production and pest management at Iowa State and the Iowa Soybean Association.

Funding

Funding for the ISRC comes from Iowa State University’s College of Agriculture and Life Sciences, the Iowa Soybean Association and industry partners. Our goal is to seek widespread input and support from individuals representing key segments of the soybean production and protection system. Partners from select non-governmental organizations with expertise on policy, social and environmental issues also are desired.

Research Focus

The ISRC-funded research includes traditional and multidisciplinary problem-solving approaches, which sometimes includes machine learning and artificial intelligence tools to accelerate and enhance research efforts. Specific research areas for the ISRC are identified by the center’s Industry Advisory Council.

Industry Advisory Council

The center is a formal collaboration of industry partners, the Iowa Soybean Association and Iowa State University. Together, they make up the ISRC’s Industry Advisory Council. Industry partners currently represented on the council include BASF, Bayer, Cornelius Seed, Corteva Agriscience, FMC, GDM and Syngenta.
ISRC Management Team

Funding decisions are made by the center’s management team based on feedback from the Industry Advisory Council.

The management team consists of:

ISU College of Agriculture and Life Sciences Dean Daniel Robison
ISU Department Chairs Thomas Baum, Kendall Lamkey and Steve Mickelson
ISA Senior Director of Research Ed Anderson (ex officio)
ISU ISRC Director and Professor of Plant Pathology and Microbiology Greg Tylka

Industry Partners (2019)
ISRC Research Projects Overview

Get more information on each project at www.iowasoybeancenter.org/research.html.

Past Projects

Iowa Pest Resistance Management Plan

Summary: The Iowa Pest Resistance Management Program (IPRMP) is an Iowa-specific effort to address pests (including weeds, insects and diseases) that can adapt and become resistant to chemical, genetic and agronomic control practices causing yield loss, increasing the cost of production and limiting farmers’ future pest management options. The IPRMP promotes approaches for effective, community-based management solutions that will be sustainable in controlling mobile pests. By fostering methods to detect resistance and proactively implementing diverse pest management techniques, resistance can be delayed, or even prevented, and the spread of resistant pests across farming communities can be limited. More at www.ipm.iastate.edu/protectiowacrops.

2-year project, 2016-2017, $60,000

Dr. Steven Bradbury, Iowa State University

RNA-based Approaches for Resistance to Nematode and Fungal Pathogens of Soybean

Summary: Over the past few years, researchers have demonstrated that novel, exciting and practical strategies to manage diseases caused by pathogens of plants can be developed through the application of small RNA-based technologies. These RNA-based approaches involve engineering the plant to produce small RNA molecules that specifically inactivate plant or pathogen genes. This action can make plants more resistant or directly kill or inactivate the pathogen.

1-year project, 2016, $64,000

Dr. Thomas Baum, Iowa State University
**Cropping Systems Modeling Tools to Improve Soybean Management and Yield in Iowa**

*Summary:* Choosing soybean variety maturities and when to plant them are two critical decisions that farmers make each year. The goal of the project was to improve soybean yields in Iowa using science-based simulation models. The support tool helps farmers better understand planting date by maturity by location interactions on soybean yield and crop staging. Users can select a soybean maturity (12 options) and a planting date (24 options) and visualize graphic the impact of those decisions on yield and crop staging as well as learn the optimum date of planting and maturity group selection for maximum yields. More at agron.iastate.edu/CroppingSystemsTools/soybean-decisions.html.

1-year project, 2016, $80,000

*Dr. Sotirios Archontoulis, Iowa State University*

---

**Integrated Research and Education Program for Use of Remote Sensing and UAVs for Enhanced Soybean Production**

*Summary:* This project launched an integrated research and educational program focused on the uses of remote sensing imagery in agriculture. It established two dedicated soybean remote sensing research and development sites for the continuous development of remote sensing tools and educational aides for Iowa soybean farmers. Commercial imagery from unmanned aerial vehicles (UAVs), manned flights and satellites were collected throughout the growing season to quantify issues with image capture. The educational program focused on web content and concise videos to share key decision support tools related to when and how to best use imagery in soybean production.

1-year project, 2016, $37,000

*Dr. Matt Darr, Iowa State University*
ISRC Research Projects Overview (Continued)

Current Projects

Root and Microbiome Traits to Tailor the Next-Gen Soybean Cultivars

**Summary:** The research scans hundreds of diverse genetic soybean accessions using both “shovelomics” and creative non-invasive phenotyping systems to explore useful root genetic diversity, and then uses genome-wide approaches integrated with computer vision to determine optimal root traits (e.g., specific root architecture). The phenotyping platform and computer vision will be used to attempt to relate below- and above-ground traits seamlessly leading to better integration of more useful root diversity in the soybean genetic base used for breeding. This research will also generate the first high-resolution spatial and temporal maps of a soybean root microbiome, thus advancing beyond the current state-of-the-field in which root microbiomes are mixed and averaged across entire root systems despite potentially highly localized functions.

3-year project, 2017-2019, $400,000

**Dr. Gwyn Beattie and Dr. Danny Singh, Iowa State University**

ISOFAST – Mastering Agronomic Decisions Through Interactive On-line Summaries of On-farm Replicated Strip Trials

**Summary:** A web-based resource (analytics.iasoybeans.com/cool-apps/ISOFAST) that is an easy-to-use portal where producers can find the results of hundreds of on-farm research trials conducted by the ISA’s On-Farm Network. The Interactive Summaries of On-Farm Strip Trials, or ISOFAST, makes data mining easy for farmers, researchers and others interested in accessing detailed information from the organization’s independent tests of products and practices. The tool provides results of research on plant nutrition, disease management, weed and pest control products and crop management practices, such as plant population tillage or row spacing. It also allows interactive economic analyses using cost and price inputs provided by users.

1-year project, 2018, $46,000

**Dr. Fernando Miguez, Iowa State University and Dr. Peter Kyveryga, Iowa Soybean Association**
Machine Learning Framework To Identify and Quantify Multiple Biotic and Abiotic Stresses in Soybean

Summary: Phenotyping is integral to crop scouting for farmers and specialists and researchers who study traits relevant to crop production and breeding. This work will fill a huge gap in on-going research and tool development for disease scouting and farmer’s decision making. This work will enhance the applicability of customizable farming and will lead to huge savings as farmers can control site-specific stress in a timely and strategic manner. The output of this research will assist farmers in disease scouting using drones (either on their own or through a contract) and will enable screening for different stresses in an accurate, precise and speedy manner. A long-term goal is to make smartphone apps to assist in scouting, enabling the farmer to use their smartphone to determine the presence and severity of specific diseases in order to make strategic decisions on disease and stress control.

1-year project, 2019, $80,000

Dr. Arti Singh, Iowa State University

USDA Funding

Two Iowa State University researchers were recently awarded USDA National Institute of Food and Agriculture (NIFA) grants for projects related to research funded by the ISRC.

Mechanistic Drivers Shaping Root Microbiomes and Microbiome Drivers of Fitness Benefits in Drought-stressed Plants

$750,000 over 3 years, 2019-2022

Dr. Gwyn Beattie

A Scalable Cyber Ecosystem for Acquisition, Curation, and Analysis of Multispectral UAV Image Data

$500,000 over 3 years, 2019-2022

Dr. Arti Singh
Most of Iowa State’s soybean pest researchers are housed in the new Advanced Teaching and Research Building (ATRB) pictured above.