

# SIUE Research Projects Funded by Illinois Innovation Network

by Megan Wieser  
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EDWARDSVILLE – Southern Illinois University Edwardsville researchers are leading and supporting collaborative projects that aim to develop robotic technologies to support the state of Illinois’ specialty crop industry, and quantify perfluorinated compounds (PFCs), so that groundwater testing can be performed.

They are among eight research teams to have received seed funding, totaling \$229,000 from the Illinois Innovation Network’s (IIN) Sustaining Illinois program. The program is designed to increase collaborative research among the state’s public universities, focusing on the economy, health and social well-being, while addressing issues of diversity, equity and inclusion.

“Development of robotic technologies tailored to support the specialty crop production in the state of Illinois” is a funded-project involving SIUE’s Nima Lotfi, PhD, assistant professor of mechanical and mechatronics engineering, SIUE’s Carrie Butts-Wilmsmeyer, PhD, associate professor of biological sciences and director of the Center for Predictive Analytics (C-PAN), and Northern Illinois University’s (NIU) Hasan Ferdowsi, PhD, assistant professor of electrical engineering.

“The ultimate goal of this project is to lay the foundation for further research and development into the integration of tailored robotic technologies in specialty crop production,” Lotfi explained. “The outcomes can ensure the sustainability of specialty crop production and locally sourced food supply and economic well-being of Illinois growers. This project will contribute to Sustaining Illinois through potential advancements to high tech industries such as robotics, data science, and artificial intelligence”

According to Lotfi, Illinois is one of the nation’s leading producers of specialty crops (i. e. horseradish, pumpkins, asparagus, etc.). To ensure a sustainable food supply, a need highlighted by unprecedented pandemic conditions, support for locally sourced produce from specialty crops has grown.

“Contrary to grain commodity cropping systems, specialty crop growers lack access to digital agriculture technologies, which have the potential to help with labor-intensive tasks and management strategies, and consequently, to improve the health, quality and value of their crops,” Lotfi noted. “To fill this gap, we aim to identify exact requirements and constraints for deployment of robots in specialty crop fields. The developed algorithms will be validated through field tests using custom-built ground and aerial robots. The data pipelines provided by these robots, along with machine learning algorithms, will be used to investigate the potential of robots in labor-intensive tasks such as scouting and predictive phenotypic modeling.”

SIUE’s Kevin Tucker, PhD, assistant professor of chemistry, is a researcher on the funded-project, entitled “Forever chemicals: PFAs detection, fate and transport in Illinois.” His collaborators include NIU’s Melissa Lenczewski, PhD, professor of geology and environmental geosciences, and Megan Brown, PhD, assistant professor of geology and environmental geosciences.

Tucker’s role is to develop a robust, rugged method of quantifying PFCs in water and soil. Chemistry student Megan Davis, of Galatia, will lead this work as she finishes her senior year and begins graduate school.

The research supports Illinois' groundwater quality standards, passed in 2020, limiting the levels of several per- and poly-fluoroalkyl substances (PFAs) and perfluorooctanoic acids (PFOA).

"The primary objectives of the project are to develop a method to quantify PFCs and transfer that method to NIU, so that testing for PFCs can be performed at institutions in northern and southern Illinois," Tucker said.

"PFCs are of particular concern, because their "forever chemical" status means that they are a cyclic problem," he explained. "When disposed of in a landfill, they can be incorporated in leachate that ends up in a wastewater treatment plant and then remains in wastewater sludge that is either incinerated, sent to a landfill or used, for example, in agriculture. This cycle of disposal affects 'fence-line communities' that are often made up of marginalized demographics, posing environmental justice issues."

The IIN award builds on the environmental training grant that was received by Tucker and SIUE collaborators in 2019 to train undergraduates in the collection of environmental water samples, preparation for analysis and analysis by similar methods. Davis was part of the first group of trainees. The third group will begin in fall 2021.

IIN is a group of 15 university-based hubs across the state working to boost Illinois' economy through entrepreneurship, research and workforce development. The seed funding was provided by the University of Illinois System and Northern Illinois University.

Southern Illinois University Edwardsville provides students with a high-quality, affordable education that prepares them for successful careers and lives of purpose to shape a changing world. Built on the foundation of a broad-based liberal education, and enhanced by hands-on research and real-world experiences, the academic preparation SIUE students receive equips them to thrive in the global marketplace and make our communities better places to live. Situated on 2,660 acres of beautiful woodland atop the bluffs overlooking the natural beauty of the Mississippi River's rich bottomland and only a short drive from downtown St. Louis, the SIUE campus is home to a diverse student body of nearly 13,000.

Photos: (L-R) Nima Lotfi, PhD, assistant professor of mechanical and mechatronics engineering; Carrie Butts-Wilmsmeyer, PhD, associate professor of biological sciences and director of the Center for Predictive Analytics (C-PAN); and Kevin Tucker, PhD, assistant professor of chemistry.