



If not for WHIN...

Digital Agriculture

These are innovations, networks, and initiatives that exist now in the Wabash Heartland Region that did not exist before WHIN.

▼ INNOVATIONS

These are the ideas and products that exist now in the Wabash Heartland that did not exist before WHIN.

Patents



Dr. Somali Chaterji and Dr. Mohit Verma

Dr. Somali Chaterji filed two patents on scalable databases for IoT workloads using leading-edge noSQL databases, currently in process with Purdue’s Office of Technology & Commercialization (OTC). Dr. Mohit Verma has a filed a provisional application with OTC on a biosensor that detects bovine respiratory disease.

Facilities

Purdue Department of Agriculture and Biological Engineering (ABE)



The new ABE building (partially WHIN funded) includes IoT laboratories in the five-story expansion and total remodel of the previous building.

Purdue’s Department of Agriculture and Biological Engineering (ABE) is a point of exceptional pride for the University. Purdue’s ABE Department has been ranked #1 in undergraduate schools for nine consecutive years and its graduate program has resided in the #1 or #2 spot for the past twelve years.

Remarkably, this achievement has been accomplished with limited space and resources. Due to space constraints in the ABE Building, the ABE faculty have been spread throughout ten different buildings across campus. Due in part to a very generous contribution from WHIN, these space constraints will soon be a distant memory.

A massive new wing, five-stories plus a basement, opened the second week of December 2020 on ABE’s centennial anniversary. The 160,000-square-foot space (see artist rendering below) is designed to be very welcoming to the community.

Ivy Tech’s Ag Teaching Laboratory

The Purdue Birck Nanotechnology team has been a valuable partner on the installation of a series of temperature and moisture sensors in the Ivy Tech Ag Teaching Laboratory, a 65-acre farm field on the Ivy Tech Lafayette campus property. In addition, there have been RealmFive sensors installed to monitor soil conditions subsurface, as well as a new weather station which serves as a LoRaWAN gateway to collect data. As these sensors have been collecting data for over a one-year time period, the students in the Agriculture and the IT schools have been utilizing these data sets in their course work to inform them on the decision-making processes which can be gleaned from these insights. This innovation won a 2020 Award for Excellence from the Indiana Department of Education (see top photo below as the WHIN team accepts their award.)



 WHIN team accepting the 2020 Award for Excellence.

 Nithin Raghunathan speaking to students.



Nithin Raghunathan (orange shirt in the bottom photo) spoke to 20 students in Ivy Tech's Introduction to Crop Production class about the sensors installed at the Ivy Tech farm. He also talked to them about the data being collected, how it can be used for on-farm decision making, and what the process will be for accessing the data to use in their course work.

WHIN's Living Lab

The purpose of WHIN's Living Lab is to vet innovative IoT products and subsidize initial costs for accelerated adoption. The WHIN Digital Ag Tech Partners are given access to progressive customers and research collaborations. To date, these tech partners include: 1) Solinftec (sensored ag equipment), 2) Intelinair/Ag MRI (drone imaging), 3) Rogo Ag (soil sampling), and 4) Telesense (IoT monitoring solutions).

Research Partnerships



"We will be collecting additional weather data and conducting data analysis as part of the project we have defined with WHIN-Purdue on dry matter intake and feed optimization at dairy farms. We have also defined new value propositions that are enhanced by weather metrics and have been able to expand in this area much earlier in our development than we would have without the assistance of the WHIN-Purdue Alliance."

– Elaine Thorndike, *IYOTAH Solutions, Inc.*

▼ NETWORKS

These are the discussion groups, alliances, and portals that exist now in the Wabash Heartland that did not exist before WHIN.

WHIN Extension Educators



John Scott teaches residents of the WHIN region how to fly Unmanned

Digital Agriculture Extension specialist, John Scott, has cultivated relationships among the 20 WHIN region ANR and 4-H Purdue Extension Educators by meeting regularly to provide them with a specialized trainings, a forum to discuss issues specific to their field, and a network they can call upon for support. Because of this effort, Extension Educators are quickly finding ways to help farmers and land and business owners gather more precise data and translate it into efficient, profitable and long-term success.



WHIN Ag Alliance

291

progressive growers have attended four Digital Ag Alliance Summits since WHIN launched its alliances in 2019.

35

Wabash Heartland farmers are members of the WHIN Ag Alliance.

140,000

acres are owned by those 35 farmers.

\$120M

worth of corn and soybean are produced on that land.



 71 progressive growers attended the first WHIN Ag Alliance Summit held at The Trails in West Lafayette on Aug. 27, 2019.

WHIN Digital Agriculture Portals

Purdue Extension's Unmanned Aerial Vehicles website, built by Purdue University's Agriculture Communications and powered by WHIN, features all the ways Purdue Agriculture is leading the way in technology outreach to the WHIN region and beyond: <https://extension.purdue.edu/uav/>. The Purdue Digital Ag Resources Website, launched in January 2020, serves as a resource to the WHIN region and includes a directory of people, information by topic, links to related Purdue programs, calendar of events and glossary: <https://ag.purdue.edu/digital-ag-resources>.

▼ INITIATIVES

These are the projects, trainings, and degree-seeking courses that exist now in the Wabash Heartland that did not exist before WHIN.

Unmanned Aerial Vehicles (UAV) Certificate Program

Purdue Extension developed a 15-hour, introductory UAV certification course that was first launched in the WHIN region in March 2019. This course specifically emphasizes the FAA certification process along with more practical uses of drones. The pilot program began with 18 attendees in Clinton County in March 2019. To date in 2021, the Purdue Extension team has hosted 45 events, including presentations, demonstrations, and programs reaching out to over 850 WHIN region stakeholders, which include high school students, farmers, and agribusinesses.



20 farms selected as testbeds learn about the benefits of drones and related IoT.

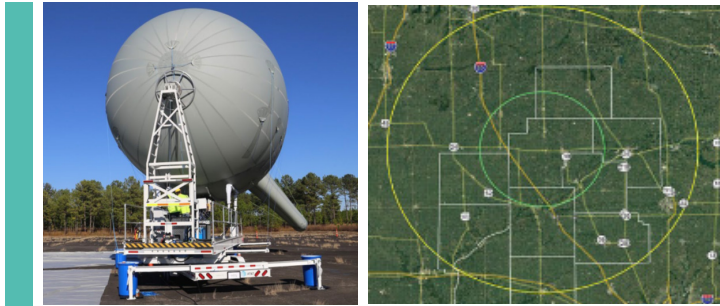
“


This year with WHIN has been a proof of concept. We are limited by the amount of people we have, but drones help us expand our workforce. It also gives us more reliable and more expansive data. This will continue to evolve and grow over time; it is going to open up more doors. Over the next 5-10 years, the related technologies will continue to advance and may be very different. We will be able to use what we are implementing now in currently undiscovered ways and we will have already started a program and partnerships to be able to use that data. This brings us into the 21st century with data collection.”

– Brad Thada, Weaver Popcorn Hybrids, LLC

Aerostat

WHIN's Aerostat (below left: a stationary blimp to be operated by Watch Communications and RTO Wireless) is being installed in White County by summer 2021. The Aerostat will be used for LoRaWAN to empower up to a 50-mile radius, plus CBRS for fixed wireless that will give another 10-15 miles radius expansion.

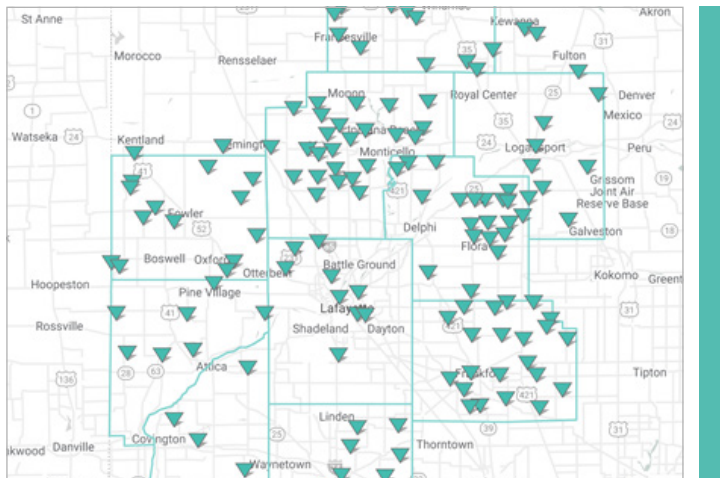


 Yellow circle: 50 mile radius for LoRaWAN IoT connectivity
Green circle: 20 mile radius for CBRS broadband connectivity

Davis Weather Station Network



**WHIN Alliance
installs a Davis
weather station
on one of the
member's farm
property.**



 Map of 160 weather stations across the 10-county region

WHIN has deployed more than 160 weather stations in farms across the 10-county region. All of the weather stations have nearly identical sensor technology, enabling them to capture a complex range of temperature and humidity measurements.

Purdue Digital Agriculture Courses

 **Over 40**

undergraduate courses and over 20 resident graduate courses at Purdue University are now related to digital agriculture.

Certificate in Applications in Data Science

16 credits, many fit into other requirements for majors. Available to all Purdue undergraduate students. Check out purdue.edu/data-science for more information.

Data Driven Agriculture Minor

21 credit requirement, dovetails with Data Science Certificate (see above). One course from each pillar:

- Statistical Methods STAT 30100
- Data Literacy, Management, and Analytics ENTM 24200
- Computation ASM 10500, HORT 53000, or CS 17700
- Data Science for Agriculture AGR 33300
- Data Acquisition, choose from list of six courses
- Data Architecture and Usage, choose from list of ten courses
- Data to Decisions, choose from list of 21 courses

Data and Information Systems

Concentration of Agricultural Systems Management in Ag and Biological Engineering.

Integrating Data Science and Applied Digital Agriculture (AGR 33300)

Contributing departments: Agricultural and Biological Engineering, Agricultural Economics, Agronomy, Animal Sciences, Entomology, Food Science, and Forestry and Natural Resources.

Outcomes

- Source different types of data
- Transform and format data for analyses
- Detect trends in data as part of hypothesis generation
- Communicate findings to different audiences through appropriate graphics and animations, including through web pages
- Write R scripts to accomplish all of the above



All eight of these students below successfully completed the REEU program launch in August 2019.



Graduate Certificate in Spatial Data Science

[Online.purdue.edu/programs/online-certificates](https://online.purdue.edu/programs/online-certificates) was launched in May 2020 and is available fully online. Courses include: GIS Applications, Advanced Spatial Ecology, Remote Sensing of Land Resources, and Environmental Informatics.

Crop Management Drone Flight and Imaging (AGRY 598)

First offered January, 2020. Includes regulations, aviation meteorology, UAV maintenance and performance, flight plans, image uploading map generation, data interpretation, multiple case studies.

Grow App

GROW is an app that automatically caches satellite imagery, field metadata, and relevant historical weather data, enabling an offline experience. Grower-specific data, such as: field name, boundary, plant date, and variety can be stored privately on a personal Google Sheet allowing farmers to access their field data from any device. Purdue software engineer Andrew D. Balmos, Prof. Dennis Buckmaster, Prof. James V. Krogmeier, and the Open Ag Technology and Systems (OATS) Center developed GROW to draw information from public weather datasets merged with field boundaries, planting data, and corn variety information. It stores and computes all per-field insights locally, making it accessible out on the farm even when no Internet is available.



PURDUE
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Center for Regional Development



WHIN

WABASH HEARTLAND
INNOVATION NETWORK

The Purdue Center for Regional Development (PCRD) has been involved in the Wabash Heartland Innovation Network (WHIN) since 2016 as the research/assessment component of the project. PCRD has provided WHIN with grant-writing assistance, a comprehensive data dashboard, regional placemaking surveys, biannual reports, and this midpoint impact analysis.



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