Precision Variable Rate Irrigation transforming university studies

Washington State University / University of Nebraska / University of Delaware / University of Missouri

In one of the most prolific potato-growing areas of the country, Growsmart by Lindsay’s Precision Variable Rate Irrigation (VRI) is making an impact on the future of French fries. Based on recommendations from the Washington State Potato Commission, three Zimmatic® by Lindsay pivots with VRI were installed at Washington State University’s research center in Othello, Wash.

“In 2012, we had a lateral move irrigation system that crashed and we were going to put in another linear move system. We went to the commission and said we needed their help,” said Mark Pavek, associate professor and potato agronomist.

In addition, the university had been laying out hand lines for special trials, which required a significant amount of manual labor in the spring and fall.

The commission suggested center pivot irrigation and VRI because the university could water a greater area with the same number of spans, and provide a lot more options.

“Precision VRI has enabled us to grow different maturing varieties and trials under the same pivot.”
– Mark Pavek, Associate Professor and Potato Agronomist – WSU
“The potato commission actually convinced us that the pivots were the way to go and donated the systems. The commission has very good insight and is supported by potato growers. Without them, we wouldn’t have been able to do this,” Pavek said.

**ENDLESS POSSIBILITIES**

The university conducts about 40 research trials a year ranging from early- to late-harvest varieties. The problem with that is the varieties require different amounts of water, at different times of the year.

“VRI has enabled us to grow all of these different maturing varieties and trials under the same pivot. Before, we would have to put them into zones or different areas so that we could control the water on a group of different trials. Now we can put them into their own location, and if we need to adjust irrigation on them during the season, we can go into the VRI and program it just for that research trial. We can treat each trial harvest differently, rather than being in a zone,” Pavek explained.

The university is able to apply water in straight-lined grids rather than half circles, as well as adjust irrigation outside of the research trials on the non-crop areas as well. Pavek said, “If we need to grow peas as a cover crop, we give it less water. If there is nothing planted there, we can shut off the water in that area or keep it lightly watered so there’s no erosion. Without a doubt, we’re using less water and it’s going where it needs to go.”

**THE RESEARCH**

Since VRI is a new technology for the university, researchers are learning how to use its many capabilities. Currently, they’re conducting “deficit irrigation by potato variety” research trials, studying how new varieties might grow better with less water, or which grow with less water than standard varieties.
“We can research how numerous different irrigation management practices and water application strategies affect crop production at the field level. Without VRI, this type of research would not be feasible.”

Tim Shaver, Nutrient Management Specialist – UNL

“We look at everything from yield, quality, economics, tuber number, tuber size, and post-harvest quality. Anytime you stress a potato, it seems like stress causes sugar development in the tubers, which can lead to darker French fries or products like that,” Pavek said.

“We’re becoming more specific for each variety and each region. Maybe the south part of our state requires a different potato than the north part of our state. We’re beginning to get precise enough to figure that out. And then on those new varieties, what’s the best way to grow those new varieties? We’re defining that.”

“With VRI, we’re just learning all of the things we can do. Research possibilities are endless,” Pavek said.

UNIVERSITY OF NEBRASKA

In the Midwest, the University of Nebraska-Lincoln is focusing on gaining a better understanding of how VRI and variable rate nitrogen (N) management interact.

Research work is being done on continuous no-till corn among a variety of soil types, from sandy loam to clay loam. The university is also using variable rate nitrogen injection pumps for variable rate fertigation, remote sensing equipment to determine plant N and water requirements, soil moisture monitoring equipment, and will soon incorporate drones into data collection processes.

Results to date show that the N/water interaction is very complicated. Generally, N and water requirements are directly correlated with soil productivity potential, however, determining where soil variability exists and then managing the variability for optimum N and water use efficiency on a field scale is very difficult.

Nutrient Management Specialist Tim Shaver said, “Precision VRI allows us to modify (on an individual drop basis) how much water is applied. We can research how numerous different irrigation management practices and water application strategies affect crop production at the field level. Without VRI, this type of research would not be feasible.”

UNIVERSITY OF DELAWARE

CARVEL EDUCATION & RESEARCH CENTER

SUSSEX COUNTY COOPERATIVE EXTENSION

The University of Delaware has been using VRI as an irrigation management tool for applied work, and provides irrigation recommendations to local growers. Since upgrading to Growsmart® by Lindsay’s Precision VRI in 2012, the university has experienced significant benefits including reduced labor.

“VRI is the ideal tool to rectify variable topography and adjust irrigation rates across a range of soils while improving overall water use efficiency. It has advanced our research capabilities through improved application accuracy and system reliability, and has given us the ability to replicate research plots across different soil types.”

James Adkins, Associate Scientist, Bioresources Engineering

UNIVERSITY OF MISSOURI

FISHER DELTA RESEARCH CENTER

At the University of Missouri’s Fisher Delta Research Center, adjunct professor and USDA-ARS engineer Earl Vories is making the most of VRI’s advantages. “We have extremely variable soil where the pivot is sitting. It’s very common for our location. If we were farmers, we would be trying to match the prescription for the variable rate to the soil. In our case, because we’re doing experiments, we’re trying to match our experimental plan. We’re able to put different amounts of water on different areas. We’ve had different crops under there at the same time. At other times, it’s been different water treatment and irrigation treatment for the same crop. Two crops might be an early-planted soybean and a late-planted soybean. It just gives us a lot more flexibility in the kinds of research that we can do compared to other VRI systems.”

Earl Vories, Adjunct Professor, USDA-ARS engineer
WHY PRECISION VRI?

Rather than applying a uniform rate across an entire field, Precision VRI allows researcher to apply different water treatments over any shape of plots. Also, “avoid areas” can be defined to keep field roads and walkways dry.

Precision VRI provides the capability to customize exactly the right amount of water or chemicals to a specific treatment area for full control over every square inch – minimizing the area needed for research trials.

Efficiently utilizing the earth’s fresh water supply is critical for sustainable food production in the future. The key will be to understanding how the plant-water interaction affects every aspect of crop production in both the irrigated and rainfed production areas. Many states are currently developing management plans for water use and in some locations, limits are already in place for agricultural irrigation. By optimizing water application, the use of VRI can potentially save millions of gallons of irrigation water while increasing both crop yield and quality.¹

Unlike basic VRI programs, Precision VRI’s highly flexible capabilities feature infinite custom shapes to accommodate demanding research protocols. Other VRI systems use inflexible grids/sectors that limit the layout possibilities for water treatments.

¹http://www.clemson.edu/extension/rowcrops/precision_agriculture.html

To learn more about Growsmart by Lindsay Precision VRI, visit www.growsmart.com or talk to your Lindsay dealer.

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