Interview

DR. MATT RUARK,

Professor and Extension Soil Scientist, University of Wisconsin (UW)-Madison Department of Soil and Environmental Sciences

By Joe Kertzman, managing editor, *Badger Common'Tater*

NAME: Dr. Matt Ruark

POSITION: Professor and Extension Soil Scientist

UNIVERSITY & DEPARTMENT: UW-Madison Department of Soil and Environmental Sciences

LOCATION: Madison, WI

HOMETOWN: Sun Prairie, WI

YEARS IN PRESENT POSITION: Seventeen

PREVIOUS EMPLOYMENT: Post-Doctoral Research Associate at California-Davis, working on rice production

SCHOOLING: Bachelor of Science in Environmental Science (1999) and Master of Science in Soil Science (2002), both from the University of Minnesota, and Ph.D. in Agronomy (2006) from Purdue University

ACTIVITIES/ORGANIZATIONS: Wisconsin Potato & Vegetable Growers Association (WPVGA) base-funded researcher, and faculty advisor to the Wisconsin Agri-Business Association (WABA), Dairy Innovation Hub, and UW Discovery Farms

AWARDS/HONORS: WPVGA Researcher of the Year, WABA Award, and inaugural recipient of WPVGA BCS Chair at the UW-Madison College of Agricultural & Life Sciences (CALS)

FAMILY: Wife, Jenny, daughter, Ainsley (15), and son, Leo (13)

HOBBIES: "Driving my kids to their youth sports activities, being in as many fantasy football leagues as possible, sampling the finest beers Wisconsin has to offer, and thinking about the nitrogen cycle."

Having researched nitrogen and phosphorus, and carbon cycling and losses from agricultural systems, Dr. Matt Ruark committed to the University of Wisconsin (UW)-Madison as an Extension Soil Scientist and (at that time) Assistant Professor of Nutrient Management, in 2008.

Seventeen years later, Dr. Ruark is a familiar face in the Wisconsin potato and vegetable industry, and in 2023, was named the inaugural recipient of the Wisconsin Potato & Vegetable Growers Association (WPVGA) BCS Chair at the UW-Madison College of Agricultural & Life Sciences (CALS).

Dr. Ruark also led a $10 million U.S. Department of Agriculture grant addressing climate change mitigation and adaptation in the Great Lakes region, and most recently, was named faculty director of the Dairy Innovation Hub, which the state of Wisconsin is supporting to the tune of $7.8 million per year.

The Dairy Hub harnesses research and development at the UW-Madison, Platteville and River Falls campuses to keep the state's $52.8 billion dairy community at the global forefront in producing products in an economically, environmentally and socially sustainable manner.

"As it relates to potatoes, I've been

Above: Dr. Matt Ruark (right), UW-Madison Professor and Extension Soil Scientist, holds up an in-situ column, or capsule, used to capture ammonium and nitrates as Clare Doss (second from right), an agroecology graduate student who works in the Ruark Lab, explains a soil study being conducted at the Hancock Agricultural Research Station. Larissa Correia (left) is a post-doctoral student in the Ruark Lab who set up the research trial. The study is looking at how nitrates move in the soil and are taken up by plants under several scenarios, from which crops are grown in a rotation to how the previous crop decomposes, if it matters whether nitrogen is applied pre-plant, at hilling or post-hilling, the soil itself providing nitrogen to plants, and such things as using polymer-coated urea or if residual nitrogen is being applied through irrigation.

Left: **Matt Ruark was named faculty director of the Dairy Innovation Hub, which the state of Wisconsin is supporting to the tune of $7.8 million per year to drive research and development and ensure the state's $45.6 billion dairy industry remains a global pacesetter.**

Right: **Identifying optimum N rates for nodulating and non-nodulating snap beans has been a big part of Dr. Matt Ruark's research program.**

able to be a lot more focused on understanding not only how potato responds to nutrients," Ruark says, "but also nitrogen uptake and patterning, how the crop grows, and what the optimal times are for nitrogen application."

How has your role and career progressed at UW-Madison over the past 17 years? Over the span of my career, I've had the chance to conduct research focused on a variety of subjects such as fertility and water quality, often with support from national grants and state-level programs.

Now I've moved into some small administrative roles in organizations such as the Dairy Innovation Hub.

What gains can you specifically point to in nitrogen management, particularly as it relates to potatoes, over that period? That's a tough one. Potato is a high-value crop, and from an agronomic perspective, there's not a lot of incentive to decrease nitrogen application like there is for other crops for which there are economic losses when it is overapplied.

With potatoes, it comes down to application timing, and we've had some success with controlled-release fertilizers. It's about getting more evidence out there and trying to really assess what the true agronomic value is in optimizing nitrogen application rates. It's been tough.

For example, polymer-coated urea fertilizer has been successful in reducing nitrate leaching, but the consistency of a benefit year-to-year is still in question.

But perhaps the biggest gain is just building the dataset of nitrogen response trials to provide a data-based approach to develop nutrient guidelines for potato.

How has it been working and communicating with potato and vegetable growers regarding their best practices? One of my favorite parts of the job and why I like working with potato growers is that it's a strong community. There are big audiences attending the annual Grower Education Conference & Industry Show.

continued on pg. 10

continued from pg. 9

Left: **Growth rates of potatoes are evaluated early in the season by Dr. Matt Ruark's Nutrient Cycling and Agroecosystems Lab.**

Right: **Matt Ruark discusses The Potato Soil Health Project during the National Potato Council's 2019 Summer Meeting at the Chula Vista Resort, in Wisconsin Dells.**

I always felt like I've received great support for my research and a ton of interest in this kind of work. I can have conversations with growers and debate specific points or topics. What we need to do next is figure out how to do more on-farm research together. That's probably the biggest hurdle right now.

We have some potential opportunities. There's the NOPP, which is DATCP's nitrogen optimization pilot program, through which farmers can apply for grants individually to conduct their own on-farm trials in collaboration with the university.

I can help them set up a few funded potato projects. Even though no growers applied for the program this round, we should try to work through funding together. We've done some trials on corn, and I can budget for grower compensation to cover some yield loss, but it's more expensive for potatoes.

There may also be opportunities through other funding mechanisms to do on-farm field trials. We'll see what happens.

When this photo was taken, Matt Ruark says, "It was a beautiful day to harvest and grade potatoes."

In 2023, you were named the inaugural recipient of the WPVGA BCS Chair at CALS. How has that bolstered your research program?

It's been great. We used the funding to hire a post-doc last year, and we were finally able to publish some data we collected through funding from the WPVGA on nitrogen and water quality, in which we measured nitrogen leaching on a famer's field.

We're also working to build a relationship with the University of Minnesota to share nitrogen response data and build out bigger datasets. I hired a second post-doc to start new research on nitrogen timing

and have been working through and organizing older WPVGA-funded projects.

There's value in discovering new data and continuing to build out our dataset. I have someone working full time in the lab on nitrogen in potato now, so through the BCS Chair funding, we're getting a lot done. The ability to set up new field trials working off old data that has already been collected is fantastic.

"One of my favorite parts of the job and why I like working with potato growers is that it's a strong community."

– Dr. Matt Ruark

Growers focus on increasing yields and return on investment. What can you do to help them reach those goals? It comes down to figuring out what their economic return is for the nitrogen applied in the field, especially if they're applying rates above those recommended.

The datasets we are developing can be used to answer such questions as "What's the economic gain on reds for nitrogen applied?" Or, if farmers are in the Central Sands and under pressure to improve water quality, "How can we use the datasets we have to help them reduce nitrate leaching?"

You also led a $10 million U.S. Department of Agriculture grant addressing climate change mitigation and adaptation in the Great Lakes region. What did you learn that can you pass on to specialty crop growers? In the dairy system, there are many sources of greenhouse gases such as methane released from cows and nitrous oxide and methane emissions from manure. Thus, there are opportunities to reduce emissions.

For potato growers, there's less opportunity to reduce emissions. It comes down to the amount of nitrogen they're applying and any sort of reduction in application rates that can be achieved.

continued on pg. 12

Interview. . .

continued from pg. 11

Left: Triticale is harvested at the Hancock Agricultural Research Station (HARS) as part of a cover crop and winter silage study.

Right: Mack Naber and Nick Bero take deep soil cores at HARS.

You need nitrogen out there to maximize yields in potato crops, but not so much that it's leaching into the groundwater through rainfall. This is where the sandy soils are working against us. There's nitrogen movement from rain, and in season, it's all about timing, rate, and source to reduce losses.

How can you help growers achieve sustainability goals or retailer sustainability requirements? When it comes to growers being under pressure from the supply chain and retailers setting sustainability standards, it's about reducing fertilizer application rates and losses from nitrate leaching.

Growers must also maintain productivity, and the data suggests it's about being comfortable with not overapplying nitrogen and other nutrients.

Growers must find a comfort level at which they achieve the yields and return on investment (ROI) that they seek, but in doing so, become more efficient. If you apply that last 50 pounds of nitrogen late in the season, what if you don't have that option in the future? Are you comfortable reducing your application rate?

A field crew samples plants as part of a sweet corn nitrogen rate trial conducted by the Ruark Lab.

Congratulations on being recently named faculty director of the Dairy Innovation Hub. How can the two segments of agriculture—dairy and specialty crops—help or learn from each other? There are a lot of similarities. Potato growers, for example, are getting together and forming producer-led groups, writing their own grants, and implementing best practices.

That's similar to what the Dairy Innovation Hub is about, but in a more formal structure with a program that's running through the university to hire faculty and fund researchers. But potato growers have been doing that for a long time.

The parallel between the dairy groups and WPVGA is in caring about research and placing value on the ROI that they're getting through funded studies, as well as through learning from each other.

What are one or two takeaways in evaluating fertilizer, manure and cover crop management on overall crop production, water quality or soil health? Thinking about the kind of work being done in the Central Sands, there are soil health benefits from

growing cover crops or in stimulating microbial activity, but we don't have data showing the overall long-term benefits to the potato crop.

We're finding that soil health is very much about disease management and suppression. So, this has forced the soil fertility and plant pathology folks to work together.

We can change microbial activity relatively quickly and to a noticeable degree, especially in the springtime, but that doesn't necessarily translate to crop benefits at the end of year. Diseases, on the other hand, have a big effect on crop yields at the end of the year.

As a professor and extension specialist, do you teach classes? I taught for a short period, but the university changed its rules regarding extension specialists teaching courses.

I did teach a UW soil biology class, and it was fun sharing research and findings with the students. It was an overall good experience getting undergrads active in science, and some of the more enjoyable lectures were when I shared data with them.

We're in a good position in Soil and Environmental Sciences with new faculty and staff, so we have plenty of new folks to teach classes right now.

Do you have ongoing projects at any of the Wisconsin Ag Research Stations? Yes, I'm conducting trials on cover crops, manure application timing and nitrogen management at the Arlington and Hancock Agricultural Research Stations, and I have a large, ongoing potato soil health project.

Above: Matt Ruark addresses potato soil health during the 2023 HARS Field Day. ***Image courtesy of Troy Fishler***

We've established long-term potato plots on an annual crop rotation to study the continued effects of fumigation and cover cropping, and we have conducted quite a few nitrogen trials at HARS (the Hancock Agricultural Research Station).

What do you see as the biggest hurdle today and in the future for potato growers? I think it's how we can conduct on-farm testing better. We can easily set up simple trials for corn farmers on silt loam soils to learn about the value they are getting from their fertilizer. How can we do that with potatoes?

That's what we've got to figure out. How do we work with this high-value crop on very small areas of land to test and evaluate techniques to reduce inputs without breaking the bank?

We've been limited to HARS, and we need to account for residual nitrogen applied through the pivot, so it's tough to work under those conditions.

The data we have is valuable, but we need more. There have been some

continued on pg. 14

Interview. . .

continued from pg. 13

successes in pinpointing optimum application rates and justifications for university recommendations, yet there are still challenges in doing on-farm nitrogen optimization work with potatoes.

Wallendal Farms and Coloma Farms have been great collaborators, but if they already have a lot of nitrogen in their pivots, it's difficult to account for it in optimization trials. It's easier to do with other crops. I could do 10 nitrogen trials on corn for the same cost of one nitrogen optimization trial on potatoes.

So how can they overcome that hurdle? Growers need to figure out how much of their land they'd be willing to devote to research and test plots. It also entails time and labor to take measurements and dig potatoes by hand, all of which is also dependent on the type of equipment they use.

We probably need to reengage on that front, and unlike dairy farmers or corn and bean growers where there's been a lot of opportunities for engagement, it's way more challenging for potatoes.

Cover crops are sampled at the Hancock ARS.

You've spent a large portion of your career working with growers on soil and nutrient management issues. You must enjoy it. I love doing applied research that people can use. I find that extremely rewarding. I like being involved with Extension where I get to travel all over the state and meet a lot of people. Generally, the people who I get to meet are interested in learning more about field trials and coming to field days, and conferences.

Also, I hate to admit it, but I really enjoy working and collaborating with all the other Extension Specialists who work on potato production.

Do you get to have one-on-one time with growers? I suppose I don't as much as I used to, being pulled now in different directions, but I'm always happy to take someone's phone call and talk through things.

Usually, by the time the question gets to me, it means it's a tough one. But those are always fun to work through with the farmer or consultant.

I talk to a lot of people during field days each year and am always happy to engage in conversations at the Grower Education Conference.

What do you hope for the future of your position, Matt, and nutrient management or soil health?
I certainly see myself in this role for a long time. I really enjoy it. Honestly, I hope that I can continue to complete the work I'm doing and evolve it into what's next.

I really hope there are opportunities for federal research dollars because it would be great to bring in big funds and bigtime research for potato growers. BC'T