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Mike: From the Center for Occupational Research and Development, welcome to *Preparing Technicians for the Future of Work.* I'm your host Mike Lesiecki. In each podcast we'll reach out to people who are actually on the front line of the future of work and hear what they have to say. That means interviews with industry, interviews with working technicians, forward thinkers in the field. We'll do some background research, and we'll curate that research to make sure you have the most up to date and relevant information. And in every episode, we'll suggest action that you can take. We want to inspire you to take that action.

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Our guest today is Drew Garretson. Drew, it's fascinating to talk to you today our topic is *Digital Agriculture*. But first, tell us a bit about yourself and the place where you work.

Drew: Thanks, Mike. I appreciate the opportunity to be here today to discuss a topic that's close and passionate to me. I'm the Director of Digital Experience for Ceres Solutions. Ceres is a large regional cooperative serving farmers in western, northern Indiana and western Michigan. I'm the Director of Digital Experience, which basically means I'm in charge of our digital strategy, which includes all e-business, Ag-technology, digital marketing, communications, conservation, stewardship, all things that touch digital fall under my strategic direction.

Mike: What about your own background, Drew? Is it in Ag? Or is it engineering? What is it?

Drew: Actually, in Ag. I'm a Purdue grad-Purdue College of Ag, and actually an Ag Education major. I did spend a couple of years in the classroom teaching students specifically in Ag. A few years working for Ceres helping farmers, as I was early in my career, helping make those digital and agronomic decisions. I then left Ceres and went to work for Land O'Lakes, which is a national cooperative. And while I was implementing digital strategies at a retail cooperative level, recently had left Land O'Lakes to come back to Ceres to lead the digital effort here.

Mike: Drew, let me ask you this. People are just beginning to be familiar with the term "digital agriculture." If you were to define the scope of that, what would it be? What's the scope of digital agriculture?

Drew: Yeah, that's a very interesting question, Mike. I hope it "bookends" itself. When something that on one end is, kind of crazy, right? Like robotics and completely autonomous farms-whether it be in the field, or maybe even in a vertical farm or a controlled environment situation. That can be like the most advanced way to describe it.

And the other bookend means it's simple as one digital piece of data that describes a piece of the earth, a particular GPS point, or a soil type, or whatever it might be. That would be digital Ag in kind of its "basic form." And then to its most "advanced form"- being kind of like robots, right?

Mike: Right. On our project, Drew, we are focusing on technician skills. What do they need to work in emerging technologies? So, obviously, this is changing pretty fast in the Ag sector. What have you seen? What gaps exist out there for the people that are working in this fast-changing sector? What do they need to know? What don't they have? What gaps are you seeing in that workforce out there, Drew?

Drew: It's interesting because I think right now we have, especially in digital agriculture, we kind of have two buckets of people. Like we have the technical IT-minded. They have a lot of IT type of experience. Kind of being blended in then with the people that have this subject matter experts around the cultivation of crops in agriculture, right? And those two are really being melded together.

I can tell you from experience, I worked in the department of IT at Land O'Lakes. And we had a great mix of talent. Some of them had a just ground-level understanding of how food is produced. And then we had these really strong technical people that understood how to make things work. So, to me, that's a really fun and energizing work environment.

But you constantly have this tug and pull-or almost this layer of education that exists-between those two buckets of people, right? You got people that understand how food is grown teaching people that have these really strong technical skills, the value of agriculture and kind of how it works. And then you have those people saying, "Well yeah, you can't just add a button in there! It doesn't work like that. Like, it has to be coded, and it has to be scoped, and all these things." Kind of fun to see that.

When I think about the gap, understanding the food value chain, understanding the system, and what farmers actually do on a day-to-day basis. If I'm a technical person, I got to have a base understanding of what that is, so I'm solving the right problem. I think that's what it comes down to. I hope that answers your question, Mike.

Mike: It's funny, Drew. In our project, we're seeing this in other areas. Let's just use manufacturing as an example. There's these cross skills: IT, electromechanical stuff, electronics-they're just crossing. And people really do need these cross disciplinary skills. And I think digital Ag is pretty much the same, in that sense.

But let me ask you one little detail question: Cybersecurity. Does someone working in the digital Ag sector need to know about cybersecurity?

Drew: Yeah, that's one of those growing trends and topics within digital ag that are getting more and more attention today. It's something that we as an IT team talk about more often than we did.

Let me give you an example. A lot of farmers today, especially sophisticated operations, are running FMIS platforms: *Farm Management Information Systems*. They run these platforms across their organization. That really accounts for every single action that happens on that farm. And even in that field, on that acre, within that field. Everything's accounted for, including all the financial information, land rent, equipment costs, input costs,

profitability. So, there's some pretty sensitive information that exists inside of those FMIS platforms that farmers are more regularly adopting.

So, to me, there's always a layer of security that needs to be thought about, as it relates to transactional information and business intel inside of those systems that needs to be protected. I absolutely think it's a growing need.

Mike: That's funny. So, now suppose I'm an educator, right? Preparing students in this sector. So, now I'm thinking, "Oh, darn. Now they have to learn everything from GPS to horticulture to agronomy to data sciences... And I've got to somehow cram that into a two-year program!" Isn't that funny?

Drew: [laughing]

Mike: It's not easy, I know, and it's one of the struggles that people have today. But speaking about technologies, are there a number of things that strike you as the dominant technologies for this field? Obviously, automation and robotics is probably one. Are there others? Can you elaborate a bit on what you see as the dominant influencers?

Drew: GPS has just been a game changer in agriculture. The basic understanding of that is foundational, because everything that we do from a data and analytics perspective, in agriculture relates back to some location on the planet. And so, that becomes a critical part of understanding how this works. So, I think that's one of the critical pieces.

And I think (if there's another one that I just think it's kind of "You got to have it," I mean), when you start to think about operations of a lot of these things, you have these telematics.

And then you have ground-controlled application equipment that's driven off of GPS. So, going back to that, is kind of like, "Oh, this is how this piece of equipment needs to operate based off of this specific thought." It's kind of triangulating all that information.

So, there's this cross reference back to a shapefile as being an application file. When I'm here, I do this, I think that's some of the foundational information that is critical. Really, at the beginning, understanding how those things work.

Mike: Does a technician working in this area have to know about autonomous vehicles? This sounds funny: Are there people inside of tractors anymore? Or do they run themselves? What do they have to know?

Drew: Well, there's a combination of a lot of things. I mean, you still have tractors that are fully controlled by the person in the operator seat at a 100% level, all the way to a one-road robot that doesn't have anybody in the seat.

So, I think a majority of our farmers have implemented the technology that we call "autosteer," which was widely adopted very quickly across the industry, because it solved a real fundamental problem for farmers, right? They were growing tired from doing the work of driving the tractor, and then a percentage of their work was overlapped. And they were doing it again because of human error. So, now with autosteer technology, you can set your AB lines in the field, and then put in your sides of your implement, and then the tractor does all the steering for you. Even on the ends, if you choose for that to happen, almost all the time there's somebody in the tractor that can override, or is operating the tractor.

Mike: Sure.

Drew: So, that's a form of autonomy that exists today in conjunction with a human. That would be a very widely adopted example of autonomy that exists today in the market.

Mike: Let me ask you about another topic. And I'm afraid I'm not very knowledgeable here, Drew. So, I hope you'll help me- put up with my naivete. But "controlled environment agriculture," or "vertical farms." I'm hearing more and more about that. What are these places? What are the people do inside of them? What is it like?

Drew: Well, let's first define what "controlled environment ag" (or CEA is kind of the in-vogue acronym for it). But really, what it is, Mike, it's growing crops in a controlled experience with the absence of Mother Nature. So, that can look like a lot of different experiences.

We've had greenhouses for a very long time. Now we're taking some of that, where we're growing crops indoors, or whether it be horticultural crops, fruits, or vegetables, or whatever it may be. They're typically crops that are

used for some sort of consumption in some degree. So, they can be a greenhouse experience.

Or it can be a vertical farm, where you're actually using artificial light in that instance, to move air and light and water through a system of growing crops. Typically, your leafy greens, like lettuce, spinach-those kinds of things are easily grown in that type of environment. And they're becoming more and more close to large metropolitan areas, which they can quickly get to market. So, you don't have the transportation factor.

Like you said, there are all these environmental factors that you can NOT control if you're a farmer-with rain, and storms, and soil, and drought, and all these things. So, that takes some of that risk out by being able to bring it indoors. So, a lot of it is automation in that process.

You got to have a basic understanding of the cultivation of the crop, but there's so much technology that enable those CEA experiences to work. There's countless types of roles that people can do when you're working for some of these CEA locations.

Mike: Drew, what's your sense of people that work, as you mentioned, either for a CEA type of facility, or perhaps on a larger farm, or whatever it might be. How do they upskill themselves? This technology is changing fast. How do they gain knowledge? Is their vendor training from the equipment folks? Do they go back to community college? Do they learn online? Do you have any sense of that?

Drew: Yeah, so there's a lot of different opportunities for folks. For one, educate yourself! There's so many resources online to be able to dig into these things.

But there's also value in having human connectivity. So, in a digitalized space, there are a couple conferences that kind of "set the bar" to help people understand what's the newest and latest and greatest in the technology space.

All the way from these established technology companies in digital ag, to the new Ag Tech startups, or even research that's being conducted. So, you have a couple of those that are out in the market. InfoAg has been around for a while that will be doing that. Tech Hub Live is a new experience that's been getting really good reviews out there. But these are in-person experiences to be able to learn about what's happening in the digital ag space.

There's a lot of online "thought leaders" that I follow, both on social media. And then there's some newsletters that I think that are worth signing up for. Whether you're a farmer, or you are in ag business, or you're an educator—if you're trying to learn about this particular space, there's a lot of good online resources. People to follow online, as well.

Mike: Good. Good. That's good advice. And thanks for that.

Okay, so Drew, now it's time to get out your crystal ball. And I bet you don't mind doing this. Take a look out there in the future. I don't know if it's three years or 40 years out there. But give us a sense of what you see as the "emerging things." The things that are going to come in the future. Especially from a technological sense. What would you see if you looked into that crystal ball?

Drew: Now, this is my favorite thing. Thank you, Mike, for asking that question. I had the opportunity to speak on this a couple different times. And I really enjoy like, "What does farming look like in 20 years from now?" A bit like predicting the weather, right? Like, "I don't know." But it's fun to think about.

Okay, let's extrapolate out some of the trends that are happening now and just think about them making an impact. And we've done that in reverse, right? And be able to see, "Okay, how has hydraulics made an impression into agriculture?" So, let's think about this. And a couple different things come to mind for me.

One is I think there's going to be continued mounting pressure on the environment for farmers. And so, they're going to continue to leverage technology to solve some of the conservation and stewardship practices that get enabled on the farm. So, I think you'll see the continued adoption of crop diversity, minimizing tillage, and minimizing the pesticide applications that happen across the field, as we start to leverage technology to help us do those things: crop rotations, intercropping, maybe even some greater sustainability practices that regenerate agriculture and include livestock into some operations. So, that's an exciting thing—the consumer will continue to demand those things to happen.

I think, in the same vein, we can say that crop diversity will come back to the farm. If you just close your eyes and think, "What did a farmer look like in 1950?" Right? You

probably have this really romantic vision of grandma and grandpa, standing on the front porch with a few children, and you have the cows, and the chickens, and that picture of agriculture did this at one point. And these are subsistence farmers that sold the extras out of their garden, or their extra crops or livestock, to open markets. And really, over time, we've increased the size of equipment, and increased the size of farms, and made them VERY efficient.

I think with the consumer's demand to have more transparency to their food and more traceability and connection to their food, you will see diversity come back to the farm. We will see more farms that look like what I described the 1950s romantic version. You'll kind of see that come back in 20 years from now.

And what's going to enable that is autonomy, and the robots that will actually enable it. Because-guess why those farms don't exist today? Because we had labor shortages, and labor issues, and higher wage jobs that were created by factories and manufacturing that took people away from the farm.

I believe that diversity will come back to the farm. That they'll raise things other than your commodity crops like wheat, and corn, and soybeans. They'll have a diversity of fruits, and vegetables, and honey, and livestock, that'll actually exist on that farm. Last night, I was looking at a poultry farm. And they're raising eggs. And I can go to their website. I can put in the lot number that's on the box of eggs. I can see the farm that they came from. I can see an example of how these chickens were raised. And the pasture that they were feeding on. Those things will become more and more present in the marketplace.

So, those are the big things I think we'll see as the big trends. There'll be some AI. And modeling will become more readily adopted, right? If we can project out the weather better, we can tell you when to make certain applications, or what yields might look like, and when you should sell your crop, or when you should buy your crop, and those kinds of things. I think those things are easy to solve for. I think the market- and the consumer-driven pieces are the ones that I really am excited about. That I think will really change how people view agriculture and the farmer today.

Mike: Drew, that's a very exciting picture that you painted there. It's different than it is today. And yet, there's a lot of things that we can all relate to. This whole thing of "sourcing," of knowing the source of what we eat. It's an important thing. And I can see that as part of this future picture. Cool.

Drew: Absolutely.

Mike: Drew, thank you very much. Today several things struck me. I hadn't really thought about an electrical mechanical technician having to understand the food value chain to work in this area. So, there's a cross disciplinary thing that just didn't strike me until we had a chance of talking today.

And you painted a interesting picture of this "controlled environment ag"-what that might mean. And what working in a place that has an entire system of heating and cooling and environmental controls and all of that. So, all of those things are important, I think, at the technician level, of people that support those systems. So, thank you for that.

And I think the message here is, "Digitize that farm!" I think that's a cool little thing to end up with today.

Drew, in the Show Notes, I'm gonna put a couple of links there for people-for more information. And I just wanted to thank you again for being part of today's discussion.

Drew: Thanks, Mike. I appreciate the time. Enjoyed the conversation.

Mike: Alright! Goodbye then!

Drew: Bye!

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Mike: Folks, today we heard Drew talk about the future of digital agriculture. And what's happening right now: people using GPS, autonomous vehicles, robots, data management, logistics-everything that's making the digital farm system.

I was particularly interested when he discussed "controlled environment agriculture." Essentially a combination of systems that uses computer-controlled greenhouses. And plant management. And data management. And systems like water, heating, cooling. All of those things coming together in a very controlled environment. A lot of digital and technological applications there.

And many opportunities for us to use this system as an example of applications of what our own students are studying. Whether it's IT, cybersecurity, manufacturing, electromechanical systems, mechatronics-you know what I'm talking about.

So, your task today is to get yourself more up to speed with this whole digital agriculture industry segment. I'll put a link to one of Drew's presentations, where he talks about Industry 4.0 and how it's being applied to the industry sector. That'll really help you by taking a look at that video.

So, today I want to acknowledge that our audio production is done by John Chamberlain at CORD. Thank you, John, for all of your excellent work. And our project is led by Principal Investigator Ann Claire Anderson, also at CORD. Thank you, Ann Claire.

Now folks, today don't forget: in the Show Notes, on the website, there's a link that says "Feedback Survey." Take a moment. Fill it out. That'll help us improve these productions as we go forward.

By the way, you can find this recording, and all of our previous podcasts, on "preparingtechnicians" (all one word) dot "org." Or individually access podcasts through Google Play or Apple Podcast. And a rating/review are always appreciated. And thank you, our listeners, for ***Preparing Technicians for the Future of Work!***

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