Dr. Kathleen Delate 00:15
Welcome to the innovations and organic ag Podcast. I'm Kathleen Delate, Professor of organic agriculture at Iowa State University. In this podcast, we want to highlight some of the many innovative organic farmers and scientists who work with organic farmers for the purpose of sharing their information and starting a dialogue on the value of these innovations. Contrary to many people's beliefs, organic farmers keep up with the latest technology and weigh its particular value and their operations before recommending it to others. To start off, we're talking with Seth Barbic. Who farms organically with his father and Sycamore, Illinois, which is one hour east of Chicago, in the fertile prairie soils of Central Illinois. Seth and his father have utilized a smartphone and computer based app to collect, store and analyze their individual fields data to help them make better decisions about their farm. Seth, welcome to the show.

Sam Barbic 01:16
Hey, thanks for having me.

Dr. Kathleen Delate 01:17
Sure. Can you tell us a little bit more about yourself your life that I was doing and your plans post graduation, please?

Sam Barbic 01:25
Yeah. So I came to Iowa State, see three and a half years ago now. And I came for agricultural biochemistry. And I'm also minoring in agronomy. I've learned a lot and it's been a lot of fun. It kind of went different directions than I might have planned at the start. But I have, I think, a pretty good foundation now in biology and chemistry, and microbiology and plant science. So it's been fun and I've learned a lot. I'm also just really excited to return to the farm in May and to be an organic farmer with my dad. So I'm looking forward to it.
Dr. Kathleen Delate 01:54
Excellent. Well, can you tell us a little bit about your farm? How many acres were crops you grow and how long you've been certified organic?

Sam Barbic 02:01
Yeah, so we farm about 2000 acres rotation between corn and soybeans and oats. And we did wheat during our transitional period, too. We first started transitioning in 2018. So almost six years now, I think this will be our sixth growing season this spring. And at this point, everything's certified, we kind of did it in chunks, but we're completely certified now. It's been a lot of learning, but a lot of good things to so.

Dr. Kathleen Delate 02:28
That's a lot of acres to manage. What tools have you used to help me manage all those acres? Can you name some of those?

Sam Barbic 02:35
Couple things we've done is we use field view, that's kind of the main app that we store a lot of our yield information and field information. And then we do a lot of like data analysis with Excel and Google Sheets and then record stuff in Google Docs too.

Dr. Kathleen Delate 02:49
Can you walk us through how Fieldview actually works you do buy the program, do you download it, and what are the parameters you enter and anything else you can think of to help an outsider understand that program.

Sam Barbic 03:00
So basically, it's a subscription that you purchase. And then it's an app that you download, you can download it on computers or your phone, and so like, I'll have it on my iPhone, there's a lot of different aspects to it that can help us in the field, you know, I might just get into it, a couple of things that it does is it stores our actual field boundaries, and therefore it can calculate acres of your field. And it also has a lot of places where you can record data. So we connect it to our planter and our combine. And so it'll record what hybrids we plant in different spots very accurately. So we have a picture where different colors match up with a different hybrid. And you can see oh, this is exactly what I find to this hybrid this where it planted this hybrid. And then similarly, it will calculate yield by connecting to the combine. And so in the fall, we'll plug it into the combine, and then it'll upload our yield data. And it's kind of like this big rainbow of
like red to green, you know, or green is obviously high yield and red flow yield. And so you can see on your field map where you had different yields and stuff, those are like two really helpful things. But a lot of other things too.

Dr. Kathleen Delate 04:07
Sounds really neat. We'll graph some of the data too for you, if you asked it for a graphical representation.

Sam Barbic 04:15
Yeah, so that's something where we'll use Google Sheets or something like that, or Excel, I actually don't know if it can or not, again, maybe what we've used it for, we haven't gotten to that spot. Honestly, the best part about it, or maybe a couple more things that are good is that it calculates rainfall for each field. So if there's a significant rain event, or even insignificant data, a 10th of an inch, it'll tell you what field got how many inches of rain, and then we can upload that into like a Google sheet or Excel or we can like have all that data in a spot that okay, let's make a graph that says yield compared to our significant rain dates. Maybe even another cool thing too that we used is you can pin location pins on the map. So let's say that, you know, we're, maybe we're hand weeding our fields, you know, in August, and we get to a giant section of cocklebur. And it's like, oh, my gosh, this is a problem, you know, I can I can get on my phone, pin it and text my dad, hey, there's the pain of this spot, we're gonna have to come back and get it or what happened here, you know, something like that.

Dr. Kathleen Delate 05:20
Interesting so where's it the rainfall data from do you have to input that yourself?

Sam Barbic 05:25
No. So it's called Climate field view. And so I think that's kind of one of the main perks to this subscription is that it calculates rainfall on its own and puts it automatically. So that's like a serious draw, I think that it has maybe an upper hand in some other programs. And I think that's the reason my dad initially went for it was because, oh, we want to know, when we're getting rain, and how much and where.

Dr. Kathleen Delate 05:48
So, by any chance, doesn't do anything with soils.

Sam Barbic 05:53
Yeah, that was kind of the next thing I was thinking about. So it also has soil types for all your fields. It has soil types for everywhere. And then you know, your field has a little chunk out of it that's different soil types.
their big map. And so then you can say, Oh, look at here's this soil type, here's a soil type, and it has elevation too. And it can even sort like, if you're looking at yield in the fall, you know, well, I want to see yield compared to this soil type, this soil type, this soil type or this elevation, you know, and so it has the ability to sort data to, which is pretty complex, and honestly, something that we haven't used a ton just because that data is pretty, I would say complex.

Dr. Kathleen Delate 06:33
Something to do in the winter. Oh, what is one? Look at it now. That's what I was going to ask you. Do you think the program has helped you manage the farm better? And in what way?

Sam Barbic 06:42
Yeah, I definitely think it has. I think that pin thing is the most useful, just like practical thing. Maybe another example would be let's say, I'm rotary hoeing in the spring, and I'm like, Oh, I think I was a little hard on our beans here. It looks like a dig them a little bit. I don't know, though, it's gonna be hard to tell. Well, let's pin it. I will write a note, I was going a little aggressive here. I want to see what it looks like in a month or a week, and then I pin it, then we can come back in a month or a week. And we can be like, okay, they turned around, they're fine. Let's do it again, let's kill these weeds. Or it's like, I think we might have hurt them a little bit. Let's maybe back off on our aggression a little bit. And you know, you can do that for any field work, really? Spring tillage, fall tillage, row cultivating robbery hauling. It's pretty applicable, I would say sure.

Dr. Kathleen Delate 07:26
That sounds wonderful. Do you know if there are any other programs out there doing similar things?

Sam Barbic 07:32
Yeah, I know, there definitely are. I'm not super familiar with the other ones. Because, you know, I haven't necessarily been involved with them. But I know like ag world and conserve us are two big ones. I really just know the names. I don't like know a lot about them. I know John Deere has like an operation center. It's called like when you have a John Deere tractor. Now it automatically uploads data. And so that's another one that I think a lot of people use, because you can map your boundaries and that pretty similarly to Fieldview you can input notes and work dates and all that.

Dr. Kathleen Delate 08:01
I didn't ask about this earlier and if you don't know the answer, no worries. But would you know approximately how much it would cost in a subscription to this?
Sam Barbic 08:09
I actually don't, I should look that up. But I did not.

Dr. Kathleen Delate 08:12
because your father pays for it right?

Sam Barbic 08:15
But you could look it up? I bet they're not trying to hide it.

Dr. Kathleen Delate 08:18
Exactly. Yeah, we can do that too. Alright. Thank you so much for all this information. Is there anything else you want to add about this app?

Sam Barbic 08:26
I think the only thing I would add is that it's pretty unique. And I think you can do a lot of different things with it depending on you know, even just your personality, like what you want to learn about. And so I think it's gonna be different for each person. That's how we've used it. And maybe someone else would be like, what I've never used that or, you know, I've done all these other cool things. So I think, yeah, it comes down to your operation and what you want to do what you want to learn,

Dr. Kathleen Delate 08:49
Right, yeah. Thanks for joining us today and innovations organic ag podcast. Next, let's tackle weed management innovations. Today, we're talking with Levi Lyle farms organically with his father and Keota, Iowa in southeast Iowa, about an hour south of Iowa City. Levi has been experimenting with organic no till and weeds zapping for about five years. And we're excited to talk to him today. Levi, welcome to the show.

Levi Lyle 09:16
Good to see you, Kathleen. Thanks for having me.

Dr. Kathleen Delate 09:18
Thank you. Dave, can you start us off? Please tell us a little bit about your farm, how many acres total? How many organic acres, what organic crops you grow and how long you've been certified.
Levi Lyle 09:31
I farm here in Keota, Iowa with my father. I have about 250 acres, and he farms nearly the same. Together, we have 60 acres of organic certified ground. And that is a collaboration between my father and I it's been an opportunity for me to hold his hand as we embark on some of these really valuable farming that I'm excited about. I returned to the farm about 11 years ago and so he has helped me get and get my bearings into the way the farm operation works. And I've helped him to get into this organic side of things.

Dr. Kathleen Delate 10:07
So what crops do broadley buy? That are certified. How long have you been certifying?

Levi Lyle 10:10
the well, for 12 years I've been growing organic, certified aronia berries. That's a whole separate podcast, we might do that sometimes. But for five years, I have been organic. So when you include the transition in that, which will come up today, because some of the things we're talking about work so well in transition, I was an organic inspector for a couple years. So that was kind of segway to beginning to transition the row crops into organic soy, corn, soybeans, and small grain are the focus of my row crop production.

Dr. Kathleen Delate 10:42
Right. So Levi, you've been an innovator when it comes to equipment, and soil conservation on your farm? Can you tell us a little bit about the weed zapper? How does it work? And how did you come to know about it?

Levi Lyle 10:54
When I was doing organic inspections, it was really interesting, because I would hear whispers about using electricity. And I didn't see a weed zapping machine in action. But I would sometimes come across fields that the farmer would say, oh, you know, I manage this with electricity. And it was fascinating to me to think that was even possible. With a little bit of research, I found out the technology to use electricity, high voltage in weed management has been around for longer than I've been alive. So you know, more than 40 years. And the thing is, is electricity, of course, has to be used with caution. And it wasn't until here in the last 10 years that a company called Old School Manufacturing. And there are some other companies out there promoting these products too. But Old School Manufacturing has purchased this technology and developed many, many safety features. And that gives a lot of confidence. And this technology breaking into the mainstream. So we'll talk about some of the safety aspects today. But I was able to rent a machine to use on my farm. And a year later, in 2018, I purchased a machine and started doing custom work in the area. And that was great segway to
help pay for the implement, of course. But now we use it more and more local all the time. Each year, I’ll do a little bit of custom work for some people. But at this time, I’m mostly using machine on my own farm.

Dr. Kathleen Delate 12:21
So because I don’t understand at all, can you give a little more detail about how it works, there’s a generator on the machine and turn it on and out the electricity flows.

Levi Lyle 12:32
Yeah, so the PTO generator on the back of the tractor is a generator that you might see going down the road when you drive past the farm. Because these generators are about the size that it takes to run a farm. Often it’s a hog farm around here. And so you’ve got the generator component, which is a 480 volt generation system and you’ve got a transformer back there that can output 20,000 volts. So the power that is used then travels through a copper wire up to the front of the tractor where you have the copper bar, which is across horizontally, and you have hydraulics and it’s best when you have hydraulics in the front of the tractor to be able to lower and raise that bar because when you’re going through a field what you want to do is keep that copper bar as close to the canopy as possible without touching your crops but where weeds are stretching up above your crop

Dr. Kathleen Delate 13:31
and is it instant zapping do you actually see the plants wilt as you go by or does take hours to take effect.

Levi Lyle 13:38
It is it is absolutely instant when you touch the plants, they’re immediately drooped over. You’re basically boiling the cells inside of those plants. And for that reason, it’s the succulent plants like ragweed or mares tail cockleburs. It really works on anything, but the more succulent the plant, the better. And so we’ll go through the field and when we come back through the field, five minutes later, you can see where you have gone, those weeds are just completely drooped over and then in the days that follow those plants to dry out.

Dr. Kathleen Delate 14:14
Excellent. So that was my next question at what stage of growth is it in the plant and primarily your only use on soybeans so far?

Levi Lyle 14:25
I recommend it with soybeans. You can use wheat zappers in lots of settings I’ve heard about from people using it in wheat fields as well. It’s a really interesting technology that could change things.
Dr. Kathleen Delate  15:07

When you when you're going through the soybean field, you're not doing it when they're six inches high. At what stage? Are you zapping the weeds in soybeans? For example?

Levi Lyle  15:16

Exactly, good question. So it's really a wait for the weeds to stretch up above the canopy. If I'm doing custom work, then a farmer doesn't want me to come into their field too early, because more weeds will just come if things haven't reached up above the canopy. So waiting until mid July, is sometimes the best situation for going into another farmer's field, or my field, I can come in early July and start to get those weeds that are just poking up. And then I can make a second pass or a third pass, and it's only my own costs in time. But I like to wait until mid to late July. And then even into August, that works really well. When you get into late August, any of the weeds are going to start to turn more cellulosic and so something that weeds out really great like ragweed all summer long, will be harder to kill in late August, because it is just more stemy and cellulosic and so you just have to go slower and get greater contact time on weeds when it comes to that point.

Dr. Kathleen Delate  16:22

I appreciate you sharing all these tips with us. I imagine it does take a couple of times or years actually to learn how to operate it most proficiently. What about safety concerns? You mentioned that Old School Manufacturer has really stepped up his game on that. But are there any other safety concerns you want to put out there to the audience?

Levi Lyle  16:42

Well, there's explicit signs on the implement that say to stay 50 feet back that, you know, when you're dealing with high voltage electricity, there's just that necessity. But also, there's motion sensors on the implement, and then speed sensors. So you have to be going one and a half miles per hour for the implement to kick on before you can put power to it. So I get a rolling start into the row because you have to, you know, be moving, then you hit your on button and the power starts. And then if you're going too fast, say I believe it's like five mile an hour, the computer will shut off the power. So there's just that range that you have to be going in. And so that's the safety mechanism. And then you've got a grounding colter on the outside of the implement, which actually completes the circuit. If you think of that electricity coming in contact with the weeds, then the charge goes to the soil, and it has to come over to the ground and Coulter to complete the circuit. Some of the complicated situations I've observed are if
you're in a field where a farmer has coltered recently, or there's just a lot of dirt clots in it that Colter on the outside might be bouncing along and cause that circuit to be broken, and then the computer kicks off. And so there's little things like that, that are just, it just takes some experience to figure out like, okay, how am I gonna get past this little obstacle that is being a nuisance, but it's like any piece of equipment, it's a tool that works really well. But there's always problem solving for situations where it's just not quite exactly what you need. Also, I'll just mention because there's all these little details. In any given field, the farmer might have 36 inch rows, or 38. And so then, you know, having a tractor that has the tires that are spaced is one thing, but also your colters on the outside of the implement, which is your grounding colter, it may need to be moved. So you loosen some poles, you slide it in or out, and then your setup for that particular field. But soybeans is really the crop that works ideal with my setup.

Dr. Kathleen Delate 18:52  
Dr. Craig Chase here and Iowa State did an economic analysis using a custom zapping rate of $40 an acre and found that it definitely paid off when you have a moderate or greater than moderate level of weeds. How does this correspond with what you found on your farm or other farms economics wise?

Levi Lyle 19:11  
That sounds about right. If I could accomplish 10 acres per hour, then I have been willing to do custom work for $50 per acre. So that's been kind of the sweet spot. You get into a field with heavy pressure, then the machine slows down significantly. You end up going two miles an hour. And then it takes more time. And if you're doing five acres per hour instead of 10 Then it's the economics are completely different.

Dr. Kathleen Delate 19:40  
Right. What about on your own farm? Have you analyzed it economically? I.E. have you compared where your weeds adverse non was up for economics?

Levi Lyle 19:51  
Well, the person that I did, that was really crunching the numbers was with you Kathleen on the Iowa State organic no till test plot. So we saw that there was significant improvement in yield where we ran the wheat zapper. On the rest of my fields on the greater 60 acres of my organic field. It's been very apparent that the wheat zapping has helped manage the weeds. I also use high residue row cultivation on that field because I have had foxtail issues. Foxtail is tricky because it doesn't reach up above canopy but that's the complimentary implement that also goes along with my operation to keep my soybeans clean.

Dr. Kathleen Delate 20:38  
So you'd be using that high residue cultivator couple of weeks ahead of wheat zapping or how does it fit into the schedule?
Levi Lyle  20:44
Yeah, definitely a couple of weeks before I would be able to get in there with the weed zapper. And so this last year, we ended up in a drought because we didn't get rain. Once we got to mid July. If you recall, we had field day on the test plot that we were working on together. And my soybeans looked excellent at that point in time, about a foot tall, little early for weed zapping but I hit already high residue real cultivated them. A month and a half later, my soybeans were the same size. It was such a disappointment to see the way the rain had affected soybeans. And while I had roller crimped rye, on the entire 60 acres of my organic soybeans that had helped lock in moisture, which did my soybeans, a lot of good. But still the elements of weather are difficult to deal with.

Dr. Kathleen Delate  21:37
I know I don't know if this will make you feel better or not. But at the medicines conference last weekend, I was hanging out with some friends from Montana. And their drought was so bad that they harvested less grain than what they actually sewed. So I thought we had it bad but I think you probably harvested more soybeans

Levi Lyle  22:01
so you know we can talk about weed zapping as one of my primary tools but in general, the organic no till has been a great system on my farm because partially the roller crimping which I realize isn't our main topic today. But the roller crimping in transition allowed me to maintain my regular soybean yields during transition. You know we have other GMO fields. I'm a parallel organic farmers so we have GMO field across the road. And we usually yield about 50 bushels an acre for soybeans, and then transition to also still get 50 bushels an acre because of roller crimping rye before planting soybeans was just a wonderful way to transition and and then that was before I owned the weed zapper. And I had really clean beans after transition. The roller crimping was a great system to keep the fields clean initially. But then as the weeds started to percolate into my field, the weed zapper became a tool that was a perfect fit to start to address that.

Dr. Kathleen Delate  23:01
Well, you segue right into our next topic of organic no till. And as you know, we had I would say have been experimenting with organic no till since 2005. I can say we're still perfecting our ratio of successful years to less than successful is about 60-40. But I have observed excellent responses to our vantage on certain forms, including yours and 2020. You walk us through how you do organic no till you're covered problem when it's planted. Which roller you use when you roll or when you plant.

Levi Lyle  23:35
Well, in answering that question. It's interesting because I've realized that it's easy to just jump ahead and start talking about my method of when I see the rice and when we will or cramping when we plant the soybeans. But I think it's really important to back up and look at what that system has been. My father was a no tiller for almost 30 years on the field where we are organic. And so he has always been known I mean, since I was in grade school he was doing no till. So that increases the soil organic matter and Harris for the soil in a way that I think perfectly prepares to transition into organic. Then we had gotten in on all the energy in around here in Washington County and Keokuk County, there is a lot of cover cropping. And about 10 years ago, there was a bunch of energy and excitement in this area about no tilling and farmers were very aggressive in this area to get in there and do some cover cropping. So we cover crops for a couple years on this field that we then began transitioning to organic. So doing cover crops prior to transitioning really starts to get the biology going in that soil. And this is backed up by a lot of research also the cover crops and especially multi species cover crops. And if there's livestock in the system, you know, now you've got this healthy soil that you have is your starting point in organics. And from there, you can go into organic no till and have better success. So I didn't realize all that was going on when I started transitioning to no till I was kind of fortunate just to stumble into this because my dad had already been no tilling, and then we had done some cover cropping. So I had that going for us in the start of this operation. So Kathleen, back in 2005, I was just a couple years out of college and learned about you and what you're doing at Iowa State, I met you for the first time and saw that you guys had access to a roller crimper. And I was so excited at that time to learn about roller crimping. So that was the beginning of the journey. For me, it was another 10 years before I was back on the farm and ready to transition to organic. So a lot happened in between that time, including being an organic inspector, which helped me deepen my knowledge of organics. So then, when I started doing organic no till I had a lot of confidence in the system that I was undertaking. So seeding the rye as early as possible in September, or early October is very important, because you want that rye to get a good establishment. Two and a Half bushels per acre on the seeding is what we use, we would use three, if we could push it out of the air seeder that we use. But two and a half bushels an acre is sufficient farmers use one and have success if they can get it out and establish because then that rival tiller. It's not often said in the recommendations to short your amount of rye because in an organic system, this is your primary weed management tool. So you don't want to mess around, you want to make sure you have the right population out there to make sure you're gonna have a good standard. So once we have a good standard for rye then in the spring, we can come in and roller crimp. First I'm going to mention my one pass roller crimping approach because we have had a lot of success in that. And it's really an exciting successful method, we started out with the roller crimping by having the roller crimper upfront on the front hitch on the tractor. And then we would have our 15 and a half foot drill on the back of the tractor. And we would plant soybeans and roller crimpe rye at the same time. And this has been a wonderful way to plan our crop because we go out there one time we get it all done. And then there's no more work to do out in the field. As I mentioned, in more recent years, I have the weed zapper, I have the high residue row cultivation. And so these are very relevant tools now. But in transition, my beans were so clean, it didn't matter. It was just crazy to go out there at one time, plant roll, and then that was it until harvest. But I've learned with some experience that that's not always going to be practical. So there's the one past approach. That would mean roller crimping in early June, most likely. But really what you're looking for is for your right to enter anthesis which is the pollen shed stage and at least 50% of your rye needs to be in that stage. Otherwise, it will both pop right back up when you roll it down and it won't be dead. And then you'll have rye growing in your beans. And that could affect your yield and you won't have that map laid down like a carpet, which inhibits the sunlight from touching the soil. Suppressing weeds, you have all those elements that are reasons that you want to get the roller crimping right in the first time. Now, there's another approach that we have had
success in and Kathleen and you observe this this last year. And our plot that we did together. This was going in and planting the soybeans in mid May, May 12, I think was my planting date. So three weeks went by, and my soybeans were up growing beneath that, rye and the rye was still standing because there I was, in an early enough stage when we planted our soybeans that there it didn't even go down. It was just growing, you know, like tender grass at that point. May 12 planted the soybeans three weeks later, it was just entering that third trifoliate which is about when the soybeans stop being so brutal. So at that point, we were able to come in and roller crimp the whole field and those soybeans that were coming underneath, were just underneath there and they then wound their way up through that rye grass that was rolled down. And we had great success with that. And because of that month and a half of no rain and mid summer. It turned out to be a real blessing that we were able to get our soybeans out there early and growing because there was a neighbor who did not plant early. He did the same time which is the usually recommended approach for a roller crimping and planting. And his soybeans were smaller and less developed when that drought came. So it did him more so than it did hurt me. So those are just some really interesting components. And it has worked well also to do that early planting of soybeans and later rolling.

Dr. Kathleen Delate  30:22

So it seems like it's very site dependent year dependent. If you had to speculate what you think your greatest success is correlated with. For me, I would say weather number one, but I don't know what your thinking is on that.

Levi Lyle  30:39

Yeah, it's definitely weather. And also, there's a few things I've realized that just work better. So number one this last year, I shouldn't have waited so long to roller crimp. I thought my beans are growing underneath. I want them to get to the third trifoliate. So the anthesis came in when the first week in June. And I thought, you know, what's the hurry? This is all working so well. I'll get in there in the next week or 10 days and do my roller crimping? Well, we should have just roller crimped, when we usually roller crimp because I waited just a little bit too long. And that rye had developed enough that I had volunteer rye that still formed even though it was laid down, formed. So when the Columbine came through to pick up soybeans, it picked up some of that rye seed that was developed. And so I had an unusual amount of rye seed as a foreign matter in my organic soybeans. So I had to clean them before I took them to my buyer. So you know, that's an obstacle that was mainly just a nuisance, but it was something I hadn't experienced before because I hadn't ever held off on rolling that long, I just had confidence that it would all work so well. And it did, but ended up with the volunteer rye. And when I say volunteer, I guess I don't mean volunteer, it was like the rye, it was laid down. And it had entered into the milk stage at that point. And those pods were swollen up, developed seed laying there on the ground. That was one element that I've learned. And another little trick, I guess I've learned is instead of, you know when you when you seed you're ryet and and then you come in and you plant soybeans along that same direction. Sometimes you might be on top of a row of rye all the way through the field, and then your soybeans don't get put in the ground as well in some random row. So I've learned to seed my cover crop at like three degrees the whole way through the field, which makes it a little you know, more detailed when you're out there planting cover crop. But then when you come in with your soybean drill, you can go the way you want to go just north and south or east and west, whichever, and know that
you're not going to end up on a row where you had seeded rye all the way through the field. If you follow me, it's been a little trick, I guess that definitely does help the system. And then when you roll, when you roll down, rye. If you're just rolling in the direction that you see that the rye again, sometimes that ride doesn't stay down as well, because it's just all pushing into each other as you're rolling down the road. But if you rye seated at a slight angle, now you're rolling it, and it's coming down sideways, and it's almost like it, it makes a little weave pattern and all holds each other down. I've never heard anybody talk about this, but it's very apparent that it helps to have that little bit of angle going on when you roll down rye.

Dr. Kathleen Delate  33:37
Well neat, thanks for sharing that tip with us. All right, we're coming to the end here. Is there anything else you want to add?

Levi Lyle  33:44
The outcome, improving soil organic matter has far exceeded what I ever imagined. We have found through soil testing that in seven years of transitioning and then being organic, we've increased the soil organic matter by a full percent. That's 18,000 pounds of carbon per acre that we have added to this field. It's interesting to think back to when I was growing up. And you would often hear that it takes hundreds of years to add an inch of soil on the prairie as the Buffalo and the wild areas of the Midwest were there. And I think science is showing that that's just not the case, we can increase soil organic matter very rapidly in the right conditions. So I'm continuing to explore more ways to amp up that system. I've got some ideas that we can talk about in future podcasts that I'm learning from other farmers. And it's very exciting. And it seems like there's still so much more we can do to continue to improve the biology of our soil which will make yields better using less and less inputs, and of course without chemicals and synthetic fertilizers. So when we talk again on this podcast, I hope we can get into some more of that.

Dr. Kathleen Delate  35:00
Well, thank you so much Levi for talking to us today and sharing your innovations. Next, we discuss more precision ag innovations. We're talking to Scott Shriver, he farms organically on 2000 acres in Jefferson, Iowa in central Iowa, about an hour west of Iowa State University. Scott, welcome to the show.

Scott Shriver  35:21
Hi. Glad to be here. Thank you.

Dr. Kathleen Delate  35:23
Thank you for coming. Can you please tell us a little bit about your farm? How many organic acres? Is it all organic or some conventional too, what crops have grown? And how long has the farm been certified organic?
Okay, like you said, We farm about 2000 acres, it's all organic. Our rotation is soybeans, corn, soybeans, corn, and then a small grain. One of those soybean years is a no till application of the soybean or after the small grain we plant the rye and then plant soybeans into the rye the next year.

We started converting those acres in 1998. It took us till I think 2008 And we were 100% Organic at that point.

Slowly, yep.

So with all organic farmers, precision and planting and weed management is the key to success. I was wondering if you could explain to the audience about your real time kinematic system RTK exactly what it is, as he used for planning weed management and harvest. How does it work? Talk to me like I'm a third grader and explaining it please.

Okay, I'll try feel free to stop me and ask for explanation. But we have an Ag Leader system is called a geo steer. And that is kind of the brains behind the steering and you know, taking in the satellite information and everything is displayed on a monitor. And kind of these are the things you'd have to buy to, you know, to add this to a tractor you'd have to have a monitor, basically your box or your brain that is that system. And then you have to have an antenna on top of your tractor that's receiving this signals from everything. The very basic system of guidance is called WAAS, which is Wide Area Augmentation System. And that's where your system just communicates with satellites. And there's just tons of satellites up in the sky.
There's ones that the United States has put out, there's ones the Russians have put out in certain systems will take both. But that kind of guidance will give you what they expect. They'll call it plus or minus four inches accuracy. But it's so pass to pass accuracy as opposed to continuous accuracy where they like the next day you might come out and your wall system that you were running the day before, you might be a couple of feet off, which a lot of times it's okay. But for what we're doing, we feel we need the RTK the real time kinematic. So our system still receives everything that the WAAS systems gives for free this, you know all that satellite stuff is just accessible to anybody's equipment. So we're adding the RTK real time kinematic. And that accuracy is considered to be I think it's plus or minus an inch. But it's year to year. I mean, you get that same accuracy every year. And so our system allows us to store our guidance patterns. I think 15 years ago or more, I started and set up our guidance pattern. Like if our rows are planted east and west, we'll have one guidance pattern for the East West rows and one for each field. And it's something you go out to your field and you say your first pass through, you set an A B line. And when you start you hit a when you go to the other end of the field, you hit B and that's your A B line and a B line we've been using for 15 years. But it's the same thing every year with the RTK gives us that kind of accuracy. But we've got a guidance pattern. So if we're planting east west, that means we've got end rows on the north sides. So we've set up those AV lines, we try to do everything in straight lines, we've got a couple of patterns that you can do curves, you can do identical curve, I mean, there's lots of different things you can do. But we try to keep everything straight just because I think that works better with the organics and the cultivators and things like that. So we've got guidance patterns for each field that are the same things every year and this RTK system.

Dr. Kathleen Delate 39:25

So walk us through when you're planting is it physically moving your planter then when it receives a signal and how does that work

Scott Shriver 39:33

this system steers the tractor and we've gone to a three point mounted planter. So the tractor and the planter are pretty well hitch together and that wherever the tractor goes, the planter goes. If you do have a hitch mounted planter with a say even a long tongue, that planter will wander around a little bit on you. You know it'll drift downhill if you're on a side hill, and that's why we've gone away from it because obviously all of our cultivators and everything are also a three point mounted and you know you have a little bit of sway in your three point hitch and we've done some things to tighten them up. But I think you could say that your three point hitch is going to do the same thing with a planter as it does with a cultivator. So even if it drifts downhill a half an inch, if the planter drifts downhill, the cultivators are probably going to be drifted downhill also.

Dr. Kathleen Delate 40:20

So can you see it actually making the corrections as you're going down?

Scott Shriver 40:24
You know, not really, it's pretty seamless, if you will just hit just drive straight. And if you think you could drive straight, you can't until you realize what you've got with this RTK system, it's really phenomenal. And you don't want to feel those corrections. I mean, because it's correcting as it gets half an inch off or even less than that. If you're feeling those corrections, then that means your tractor or your cultivator is moving side to side when you want that to be a perfectly straight line. So we plant with the RTK. And I think that gives us the benefit of having a straight row. So even if you weren't cultivating with RTK, if you were doing that, say manually by you know, your eyesight, at least you have a straight row to follow. So that was you know, an initial benefit. And now I mean, we cultivate with RTK. So we'll set it up, it isn't just push a button and never look at it again. But these RTK systems will have a nudge button. So if you set it up and you go and you feel like well, I'm, we still keep a row marker. And we use that as kind of a secondary, you know, when you turn your corners, we'll use that row marker to set up, you know, to get close. And usually even to start out a little bit. If your tractors not going the right safe, it's just got a heading that's slightly off of where you want to be and you hit your engage button on your guidance. It'll jerk it pretty hard to get you on and you don't want to be cultivating while it jerks you. So you'd want to be heading kind of on line and in straight where you want to go engage your guidance, that'll get you online, and we keep our nudge buttons set on a half an inch, so we can nudge right or nudge left a half an inch at a time. And it's funny when you asked me if you feel it move the tractor, you can feel it that half an inch when you hit the nudge button, you just feel it a little bit. So the fact that you don't feel it when you're not nudging just tells you that tractor, it just stays on line. It's always staying on line and not moving. But we use that nudge button and I'd say we're either nudging I mean it's either right on or we're nudging maybe a half inch one way and maybe up to an inch, you know, one way or the other. But I think that has, it's not so much to do with the accuracy of the system. But it's changing from tractor, to tractor we have four tractors, they all have guidance, you know, the cultivators, you know, seven or eight different cultivators, Rotary hose and tank weeders that, you know, they might just all act a little different. So I think the nudge helps make up for those differences in tractors and equipment that we have to allow all of the runs straight.

Dr. Kathleen Delate  43:01

Very interesting. So I would imagine then you wouldn't need it for harvesting because you're

Scott Shriver  43:05

you really don't need it. We have it on the combine. I feel like it keeps us on especially the corn rows, I don't know the whole guidance thing. It just, it's almost like you don't know what you do without it anymore. Without it for years and years and years, and you kind of thought well, what do we need this for? But it's just really nice to have and a lot of intangible benefits.

Dr. Kathleen Delate  43:31

Well, you sold me on it. But how expensive is it in general,
it's relatively expensive, a person would need to you know, go to somebody that markets these things and price it because it's going to have a different costs for different tractors, older tractors are probably gonna be a little more expensive, because they weren't made, you know, in a timeframe that they came autosteer ready. If they're, you know, 25-30 years old, I would say about 20 years ago, then they started integrating some of the steering valves and things that was needed for the auto steer into the new tractors and that progress probably over time where I'd say anything built in the last 10 years, I'm sure is you know guidance ready. So a little bit depends on your tractor. And then once your guidance ready, then a lost system is probably about 10 to $12,000. And that would get you your monitor your brain box, like in our case, it's the Geo steer from Ag Leader. We were on Integra monitors from Ag Leader. And they're not the I mean, they're they're out of date, really. They've had the new what do they call it the in command for years and years. And I've talked to the people that are my suppliers of this system and they're like, the newer monitors are nice. They can do different things. You can have split screens and more cameras and things like that. But from a standpoint of guidance, the system we have now is not any better with the new equipment. It's not any more accurate. It doesn't steer the tractor any better. are so, you know, I've kept with it, and it's done good. So I, you know, it's kind of expensive. But I think the system I've have now has been in the tractors for 10 or 15 years. So you know, last a long time to get to RTK is probably about another $4,000, there's a little bit more quit, you know, you got the modem, but sometimes it's just an unlock that you have to have. And the unlock costs money, it seems a little ridiculous that when you buy your monitor, if all you want is loss, your monitor is cheaper. But if you want to unlock your monitor to use RTK, there's an unlock fee can be $1,000 $2,000. The systems haven't that they're about the same price as they were probably 10 or 15 years ago, which in one hand you can say, well, with inflation, you can say it's almost the prices come down. But I think you know, technology has gotten cheaper over over that timeframe and everything but at least you know, it hasn't gotten more expensive.

Dr. Kathleen Delate 45:55

trip. Well, I don't know if you can answer my last question. How do you determine if it pays to have it and maybe talk a little bit about farm size too, because the average size organic farm in Iowa is about 300 acres. So starting from there, do you think if you have a 300 acre farm it would be worth it?

Scott Shriver 46:14

I think so it's just tons of intangibles. But I believe that having the system and if you're a farmer 300 acres, you probably can do it all with one tractor. So you just you're not talking about putting it on four tractors, you put it on one tractor, and we can set our cultivators closer to the row to do a better job with weed control. We can cultivate faster even as we're cultivating closer to the row, our speeds are increased, we have a lot less cultivator blight. And even though we're nudging once in a while, it's maybe once maybe twice on a pass, but the rest of the time you can turn around and look at what that cultivator is doing and not worry that you're going to wipe out your crop. So I think that allows you to do a better job cultivating adjusting your cultivator there, maybe your third lane, you know, just to see what's going on back there, you can do a better job. So it doesn't take long, you know, in better weed control, doing a better job cultivating with organic prices to make up for that. It's all a little bit intangible and hard to actually, you know, put a number by it, but I think it's worth.
Well, thank you for sharing all this information with us. Is there anything else you want to add?

I can't think of anything unless you can think of any questions.

No, I actually understood it for change. So thank you for explaining it in those details. So well. Thank you so much, Scott. We appreciate you sharing this information. Next, we move to innovative ways to preserve cover on the land while growing organic crops. Today we're talking with Mike O'Donnell, who wears several hats working with living prairie family farms and Walcott Indiana a 4000 acre organic farm in Northwest Indiana. And now he's a crop specialist with Grain Millers in Marion, Indiana. Michael, welcome to the show.

Thank you, Kathleen,

can you start by telling us a little bit more about yourself what you've been doing these last five years and what you're doing now?

Sure, yeah, then on a bit of a journey the last few years. But if we step back about five years, working as an organic agriculture specialist with a Purdue Extension, that was a statewide extension position where I was tasked generally with supporting the organic farming community in the organic industry within Indiana, which is a really diverse established part of agriculture in Indiana, we have a number of Amish communities. And that's where kind of what I considered the heart of organics in Indiana is based in those communities and where some of the original certified organic operations were in the state, and where some of the additional organic activity started to grow from. So a lot of organic poultry and laying operations and dairies in those communities that then started creating demand for organic grain. So in my role with Purdue Extension in that organic specialist role, I made the decision to kind of focus in on supporting organic field crop production. There's obviously a lot of things in organics that I could have supported, but as a single person with limited resources and where the demand and a lot of the questions were coming from, I just kind of made the decision like this is where I'm going to focus and where I think I can have the most impact with my program. And so that was, you know, traditional extension programs, farmer meetings, conferences, field days, and then
trying to lay the groundwork for more collaborative on farm research with farmers again, on that field crop row crop space. Yeah, and towards the end of 2020 into early 21. I made the decision to step away from my role with extension and take on a unique opportunity with a farm as you mentioned, Living Prairie Family Farm in Walcott Northwest Indiana about halfway between Indianapolis and Chicago just a little bit off Interstate 65. The farm was still in early days of transitioning some acres into organic I think when I was getting to know Jason better the farm owner, he had maybe 160 or so acres certified organic, that is first certified organic acres, which he took on already certified organic acres that he took on a lease, I think, in 2016. And then the next year started transitioning acres into organic himself with their home farm and then another one after that. But I came on he wanted somebody to help him get more organized, with the organic certification stuff, all the record keeping. And as you can imagine, within with an operation across 4000 acres, 35 Fields, you know, you gotta be organized to maintain those records and communicate well with your certifier and think through the crop planning, and the markets, and how all that big jigsaw puzzle is all going to fit together year to year. And so Jason invited me to join his operation I came in kind of worked with him hand in hand on thinking through crop planning, grain marketing, handling all the organic certification, I put record keeping systems in place, and then also help with operations. In addition to the farm, he's got an equipment business called Living Prairie Equipment. So as he was retooling his operation from conventional corn and soybean into diversified organic cropping. He was asked by a lot of these equipment manufacturers Oh, you want to be a dealer, we don't have anybody in your area. And so he just sort of took on being a dealer with several equipment manufacturers and has this this business Living Prairie Equipment. So I also helped with equipment sales and parts ordering and all that kind of stuff with some of his equipment customers. So I continue to work for Jason still handling his organic certification stuff, working with him on crop planning and thinking about market opportunities. But for some family reasons, I had to step back from being involved full time and being available for farm operations, because the farm is a bit of a distance from where I live. So as I stepped away from that, I now find myself in a position with Grain Millers. And one of their facilities is in Marion, Indiana. It's a dry corn mill, where they process organic, non GMO and conventional corn into things like corn, grits, different sizes and specs, corn meals and corn flowers. So in this position, I'm kind of a field agronomist. The title is crop specialists. And so I'm supporting our suppliers of corn and oats corns coming into Marion, and oats going out to St. Ansgar, Iowa. So we'll be there.

Dr. Kathleen Delate  52:44
Sounds like you're busy while the organic farmers are really lucky to have you around like that, with all your expertise and willingness to share and help people succeed. We really appreciate that. Can you talk a little about the crop rotations on Living Prairie Farm? How are the crops decided? And what are the markets available for these diverse crops in rotation?

Mike O'Donnell  53:05
Yeah, so that Living Prairie Family Farms, a big one is organic popcorn. That's been kind of a mainstay for Jason for several years now. Soybeans, mostly feed grade, a lot of different options where we can go with that. We've gotten into sunflower both oil seeds, sunflower and had one field of a con oil, sunflower last year, the kernel is used for like a snack food. And that's a cross between a confectionery and an oil steed. What else a lot of small grains soy, raise
winter wheat, soft red winter wheat, winter barley, winter rye, oats, yeah, all those and then tried some acres of a seed, pumpkin, and that's for a snack food company, Top Fox, have some more acres in that crop again this year. And lots of different cover crops. I think that covers all the cash crops, and various cover crops and rotation. So in terms of the rotation, I often joke or I don't know, if it's a joke, it's just where the farm is at right now. There's not necessarily a set define rotation that we stick to I know a number of organic farms, they have a set rotation, they will never deviate in the past. You know, you'll hear some of them talk about the times that I've deviated from my rotation. It always hurt me. Right. But I think right now, you know, coming into this space with a lot of acres getting settled now the whole farm less. Let's see this year all but 12 acres will be certified organic, but you know, just coming in with a lot of acres over the last few years and trying to piece together where the markets to support the diverse rotation that we want to see. It's challenging. But I think also with this idea of having an adaptive what I call an adaptive cropping system. And we want to be somewhat responsive to the market opportunities, the things that we're seeing in terms of weed pressures or disease pressure or whatever it might be nutrient cycling, you know, trying to fit this together being responsive and observant of what we're seeing in the fields and matching that with market opportunities that might emerge. So rather than saying, okay, a third of our acres are in small grain. Third is in soybean, a third is in corn popcorn. It's not quite that but if you do look at the rotation, the last couple of years, I would say about approximately a quarter of the acres are in various small grains. So again, that's oats winter, wheat winter barley, winter rye. A half ish is in summer row crops, maybe more. Last year was more, so that's popcorns, soybean, and the sunflowers and then the remainder is in some of these other crops and cover crops.

Dr. Kathleen Delate  55:56
Can you talk a little about which cover crops are in the rotation? And how are they used or do for our seed to plant inter seed? Or what's your schedule on that

Mike O'Donnell  56:06

two primary sort of places or approaches to cover cropping, so almost all of the acres coming out of popcorn, immediately after those fields are harvested, we will put CRI winter rye out, just because how flexible of a cover crop is you know, if some of that popcorn is coming off late, we can still put something out there and know that we're going to get rye growth. So have a Valmar air cedar, so we can zip across fields and blow cover crop out. I think it's a 60 foot boom, onto the popcorn stocks. And then we'll just quickly zip over those fields with a Lemken Heliodor. It's a speed disk, and knock down ridges if we have ridges from cultivating the popcorn and incorporate that dry. So it's a real quick efficient way to get that right out there and get ridges, knocked down at the same time. And generally those acres will be going to soybeans the following year, or in some cases sunflower. But we're still kind of seeing how sunflower fits and where that makes sense in the rotation and cropping sequence. The other would be frost seeding Clover alfalfa, or mixes there of into the winter small grains, the barley, rye and wheat this winter, which we really haven't had much of a winner, we never really put a frost into the ground. We've been getting a lot of rain in the last few weeks. You know, last week, I think we had two and a half inch rainfall, then it's about 60 degrees here today, we haven't gotten anything frost seeded, because it's been wet, it's gonna be interesting to see when and how we get that out there. So with frost seeding, I mean, we don't need the ground to be you know, frozen solid, we just need it to be firm. Because what we use is a different
Valmar air boom, it's a pull behind our 246 and just pull it with a pickup truck. So we can get out there. And just as up across the field, it's got just a basic GPS kind of color bar thing that keeps you in your swath. And we just dropped the cover crop out there and in the winter, small grains, and sometimes it'll be straight alfalfa or straight red clover, but we've been playing with some mixes of different types of clover, and alfalfa and even a little bit of very small amount of some grasses because we're curious about some of the carbon and nitrogen ratio on some of these cover crops. But with oats will basically seed those mixes at the same time as the oats. So those are two primary places where we get cover crops incorporated, we do also have some years with a full year of cover crop. So if there's a field where we just feel it needs to be a full year, or we call region or soil build year, that might be a sort of a sequence of different cover crops just depending on what that field is coming out of and what it's going to.

Dr. Kathleen Delate 58:59

That's really smart I think more farmers should look into that because it probably can help with weed management too if you have some issues there. So just switching topics a little bit as organic farmers edge now we're all striving for less tillage in our fields. And I attended your lecture at Practical Farmers of Iowa conference and I remember in your experiences with organic strip till that you and Andy Klemp in Wheatfield Indiana discussed and I was wondering if you could explain to the audience first of your system and maybe a little bit about Andy's because I know it's a little bit different. How that strip till system is set up when you're going into cover crops or alfalfa or commercial crops to use strip till for and when you plant cover crops when commercial crops everything there is to know about strip tillage.

Mike O'Donnell 59:45

Sure, sure. Yeah, and I definitely won't take credit for developing the ideas around this system. This comes from the mind of Jason Federer. The farm owner just has a mind for equipment and operations and row crops. He comes up with some really unique ideas about how to manage these systems. And it sort of grew out of just, again, observation, I think observation of what's really taking time to see what's going on on fields and how can we adapt and change from year to year. So a field that was coming out of two years of alfalfa and into a first year organic back in 2020, just did a couple passes with a Lemken and it's kind of a heavier speed disc to try to terminate that alfalfa going to popcorn, first year organic popcorn, and great seed bed planted popcorn, good, stand, but then alfalfa started coming. Right? So the passes with the Lemken Rubin didn't fully terminate that standard alfalfa, but it was it was okay. Right, could manage it had good weed control, I mean, coming up two years of alfalfa, not a ton of weed pressure. And Jason was able to, you know, manage that crop and get a good crop of organic popcorn, but, you know, there was alfalfa in the row competing with that popcorn. It did make cultivation a little bit tricky. And I think it did put some stress on that crop. I think the end row competition with the alfalfa was a little bit more than we would have liked. So based on that, Jason came up with the idea like I like having this alfalfa between the rows, but can we get rid of what's in the row so that that popcorn has more space right there in the end row that's getting established. So what he did was try this strip till system so on some fields the following year coming out of alfalfa and clover, we flail shred, so let, let that alfalfa or clover, whatever is there, get some good growth in the spring. Use a flail mower to shred it all the way down. Then make strips with a Hiniker cultivator. So just running the Hiniker cultivator like an inch or two deep I forget the exact depth that we run that I think we're using 19 inch sweep. And so essentially severing
those alfalfa crowns are Clover within the strip where that popcorn row was going to be, then, on most fields, still then made a pass with the Lemken Rubin that speed disc kind of at an angle to the strips that were made with the Hiniker. So we kind of knocked back the alfalfa between the rows, but we're not terminating it, in some places just laid the strips and didn't make the pass. But then yeah, just planting the popcorn right over those strips. So it's got, you know, RTK and able to stay right on those strips with the planter. So then we've got a clean strip popcorns emerging between the rows that alfalfa continues to come on. So even though we knock it back with the speed disk, that we hit at an angle to the strips, it doesn't terminate it so that alfalfa is coming back we have popcorn emerging alfalfa coming on. It's just depending on the field and what the growth is like. If the alfalfa is coming on strong, we can run over it with the flail shredder again. And you know, it's not going to hurt these tiny little like the one popcorn plants. So just a way to keep that alfalfa suppressed between the rows. And then another tool we use is a Lister cultivator. And that kind of tears up and beats up and suppresses the alfalfa a little bit. So the idea is, is just, we're allowing that green cover to continue between the rows of popcorn trying to keep it somewhat suppressed until that popcorn becomes the more dominant plant out there. So that window of time from planting and until that popcorn plant is more dominant, you know, it's important to manage to try to figure out how to manage that alfalfa or Clover to keep it from not taking over. So in 2021, it went really well. You know, I think the weather, the moisture, the temperature, everything seemed to favor the popcorn, and had a great experience with a good yields, clean fields. 2022 kind of a mixed bag of results. And I think, you know, we're still thinking through what it is that we observed on some of these fields and struggled. We had a really big rainfall event June 3 Around June 3 Last year, like a five inch rainfall event when a lot of the stuff was planted, I think the third into the fourth week of May, in terms of popcorn, and then had this big rainfall event when a lot of this stuff was like D1-D2. And you know you've got this perennial Clover or alfalfa that has well established root system and it was just thriving. But the popcorn tiny little plant, you know root system is established. We have this big rainfall event, soils go anaerobic, you know, potentially limited root development early from high soil moisture, saturated soils. And so the, you know, the alfalfa and clover really became dominant. And a lot of these in some cases, I mean, it was like it was almost canopy over the popcorn. And we're delayed and be able to get out there and do field operations to get this alfalfa and clover suppressed between the strips. But we're able to do it. Some of the fields struggled, some of them did fantastic. And I think it was all probably related to timing when it was planted relative to this rainfall event.

Dr. Kathleen Delate  1:05:30
Yeah, weather impacts everything we've found. Could you talk a little bit more about was there post planting tillage than or weed management in those strips

Mike O'Donnell  1:05:40
in the strips? No.

Dr. Kathleen Delate  1:05:42
Okay. And how, how's the weed pressure then, at the end of the season?
Mike O'Donnell  1:05:46
Acceptable? I guess one thing I forgot to that I failed to mention the last pass. So I talked about like, you know, we can mow over the crop when it's really small. If we want to mow down that alfalfa and clover in the strips, we can hit it with the Willesden which we might do multiple times to kind of rip it up, beat it up, suppress it. And then last pass, we'll go through with the Hiniker and undercut those strips. So we're getting some flow of soil into the row. So if there's some weeds in there with the with the popcorn can try to get some of those buried,

Dr. Kathleen Delate  1:06:18
Note any differences between alfalfa versus Clover as far as

Mike O'Donnell  1:06:22
Yeah, that's one thing that we're discussing. And given that it's really just been two years, you know, had that one year of like minimal tillage alfalfa, where it was growing across the whole field and have the strips then now two years of strips, into some monoculture alfalfa into some monoculture clover, this year, we're going to have some mixes. So don't have a good like control variable to say, like, in in one year, you know, we had great weather, you know, following, you know, at planting and following planting another year with this massive rainfall event. So it's hard to say, you know, was it Clover was it the alfalfa, we seem to currently be thinking that planting into a monoculture of alfalfa and this system does better as compared to Clover, but not sure, we're going to keep playing with it.

Dr. Kathleen Delate  1:07:12
We appreciate that you keep experimenting and sharing your results.

Mike O'Donnell  1:07:16
One other thing I'll mention is, that's interesting about this as we have some of these fields that were in strip till popcorn, in 21, we had a lot of alfalfa and clover still there, the following spring of 22. And those fields then went to sunflower, so we got, you know, a second year benefit out of that cover crop to feed that sunflower crop,

Dr. Kathleen Delate  1:07:40
that probably made a difference. And I don't know if you've compared yields, with or without cover crops.

Mike O'Donnell  1:07:46
Yeah, good question. yields, a lot of fields a lot of data and not enough time to make sense of it
Yeah, good question. Yields, a lot of fields a lot of data and not enough time to make sense of it all.

Dr. Kathleen Delate  1:07:54
That's what the winters for Oh, no winters over time is running.

Mike O'Donnell  1:07:56
Yeah. Yeah. Yeah. And I'll mention that's one thing to be, I guess, careful of is 2020, where we had that minimum tillage alfalfa field that went to popcorn. After that we see a rye and went to a no till soybean crop in 21 You know, is great, let the rye get up tall, planted into a green roller crimp the rye later. Soybeans are coming through but then what else started to come through alfalfa? That's coming up right through the rye. And it was pretty wet under the mat of rye. We've gotten rain event it was real wet, couldn't get out there. Eventually, we're able to get out there but the alfalfa was literally starting to like canopy the soybeans, but we're able to get through there with high residue, cultivator, Hiniker out of front cultivator that can slice through that right and then the sweeps underneath, we're able to undercut most of that alfalfa between the rows and ended up with a decent crop. But I think this is one of the things we need to think about is what I call compounding in our cropping systems. And those can either be positive compounding or negative compounding. And some of these things we're playing with reduced tillage, no till, strip tillage, we've got to think about how those things carry over from year to year, and really extend our thinking for subsequent years, multiple years of how these things might play out.

Dr. Kathleen Delate  1:09:19
Yeah, we talked to Levi Lyle last week about his organic no till. And yeah, it's still, oh, it's a little more than 50/50. I'd say 60/40 for us for success is still working on perfecting it. But the good news is no matter what you're putting more recently ground, you're putting more carbon in the ground, you're leading to less erosion. So no matter what happens with those cover crops are benefiting your system. So I know we talked a little bit about Andy Klemp because he was on the same docket with me with PFI. Can you talk just for a little bit about how his differs with his strip till system?

Mike O'Donnell  1:09:55
Yeah, and I'm not as obviously not as intimate with Andy Klemp system, Klemp Organic Farms up in Wheatfield, Indiana. It's about an hour north of Jason federers operation in Wolcott and Jason's operation is mostly on loam soils, you know, good organic matter high CEC. But we do struggle sometimes in the spring with water, you know, the soils holding on the water and not draining. And so getting back into fields can be our challenge whereas Andy, he's up closer to Chicago, in an area that's all drained out right former kind of wetland area, you know, way back and very sandy soils, lower organic matter lower CEC. So for him, he can get into fields quickly, but holding on nutrients can be challenging, right, and he can get drought the, if it turns hot and dry and it's on a dryland field without irrigation, you know, stuff can burn up. So Andy's cropping is much more intensive in terms of crop rotation, not as many small grains, a lot more
corn bean overall on the balance of rotation, but very intensive on cover crop management. And he worked on trying to play with organic no till corn and soybeans and still had some success with organic no till beans, we've kind of moved on from trying to make organic no till corn work and start developing strip tillage systems both with corn and soybeans. But in his case, he's not using alfalfa or clover, he's using more annual cover crops, not perennial type. So on soybeans, he's using rye and then on corn using things like thatch, crimson clover, annual ryegrass and he will make strips with an orphan strip till bar. He also uses a lot of different types of manure as a custom manure management business. There's a lot of livestock up in his area, poultry, dairy hog, his family has a hog operation. And so he's grown a business out of that opportunity in that area. So he'll use all these different types of manure and he'll actually inject dairy or hog manure under the strips, refreshing the strip, and plant corn on it. And then he's rigged up some equipment like he uses pots and big clear time leader that he rigged up to be able to where the tines are just on the strip, so he can pull up the tines between the strips. So if he's not in a full tillage situation, you can just time weed that strip. And try to think at some point of cultivation if he takes out the strip with a row cultivator I can't recall. But yeah, the specifics of his system. I don't know all the specifics. But again, rather than going into perennial alfalfa and clovers, he's going into annual cover crops, much more intensive management, using the strip till bar, laying down manure under the strip and managing for weed control, right in that strip, intensive management. But on his light soils, being able to have that cover, I think is pretty important for nutrient management and erosion and keeping the soil covered.

Dr. Kathleen Delate  1:13:07
That sounds really innovative. In general, is he happy with the system? Or has he tweaked?

Mike O'Donnell  1:13:12
Keeping it Going.

Dr. Kathleen Delate  1:13:13
Yeah, that's what we'd like to hear? Well, you've covered a lot we've covered how to do it, what the challenges are, what the successes are, was there anything else you want to add to the audience to know more about organic strip till.

Mike O'Donnell  1:13:26
I don't want to give the impression that we're not tied to this, right, we're going to continue to play with this strip till system, try to make it work. But in some scenarios, if you know, if we come out in the spring, with a stand of Clover alfalfa, whatever it might be, and that stand doesn't look good. For one reason or another, we will go to full width tillage. So we're not going to stick to this. Like it's a, you know, we're not dogmatic about it. Right. If we have the good stand, and conditions are right, we're going to go for it. But if things don't look good for success for that season, we're going to go to plan B, and we're going to green manure that whole field
and do you know full of tillage and cultivation. So I think being adaptable and flexible, observing what you have there, and being willing to change how you're going to manage a given field in a given year, I think is really important.

Dr. Kathleen Delate  1:14:19
Good advice. So let's have the weather helps us get our frost seeding done because we're in the same boat here, although we're supposed to have snow tomorrow night. So I think we're still in winter here more than you are there. So good luck with the season and we really appreciate you sharing all your knowledge and information and wishing you the best.

Mike O'Donnell  1:14:42
Thank you. Appreciate the opportunity.

Dr. Kathleen Delate  1:14:44
Thank you. Finally, we move to organic livestock innovations with Brad Heins who's a professor of Animal Science at the University of Minnesota, assigned to work on organic dairy research, teaching an extension. Brad comes from a Dairy family and has been working at UNM since 2010. He's made tremendous connections with organic dairy folks across the nation nearly across the world. And he does an excellent job of keeping up with the latest technologies that may be useful for organic operations. He also has his own podcast called news room for people that want to tune into I think he has 50 episodes hosted now, Brad, welcome to the show.

Brad Heins  1:15:28
Thanks for having me, Kathleen.

Dr. Kathleen Delate  1:15:29
Sure. Can you tell the audience a little bit more about your job, who you serve? How many organic research projects you have going and the focus of your research?

Brad Heins  1:15:40
Well, I'm a professor of organic dairy production at the University of Minnesota, there are not many of us working in organic livestock, let alone organic dairy production in the U.S. So I've been very fortunate to work here. Actually, at the University of Minnesota, we have a 300 cow organic dairy at the West Central Research Center where I'm located in the western part of the state. So I have access to an organic dairy herd for research. And it's really helped me answer a lot of the questions that farmers have been asking me. I guess for our projects, we have so many projects going on, they're quite variable. One is raising calves in an organic situation. So can we raise calves on cows in an organic dairy herd? We're also looking at pain mitigation
strategies for dehorning organic calves. We're also trying to increase legumes in pasture dairy herds, can we increase legumes and how well does that bode for soil fertility and increased milk production. We're also looking at genetics for organic dairy herds, looking at alternative breeds, some breeds from Europe, also trying to look at the fatty acid profiles of the milk and how we can make a more high quality milk for consumers have also sort of ventured into new realms. So one is grazing under solar panels. So we've been grazing our organic dairy herd and under solar energy to try and offset some of our energy usage in our organic dairy herd. So we can graze cows and produce some solar energy. And I have about five graduate students now all working on organic dairy projects. And, you know, working on all of the projects that I just talked about, they're all doing well and really enjoy working in the organic industry, it gives them something new and something of a challenge to work at. So it's not, you know, kind of the same old projects that people have worked on. So it's been really good to expose graduate students and undergraduate students to organic research.

Dr. Kathleen Delate 1:17:58
Excellent. You're a busy man Brad. I don't know when you sleep. Thank you for doing this podcast. We've had a couple of podcasts on precision farming and organic Ag. And today, we'd like to turn to precision animal agriculture. And I have three innovations in mind, Brad, but if we have time, maybe you can talk about all those. Let's start with biosensors. Can you talk to us about exactly what they are? How they work, what they measure or monitor? And why would one use them?

Brad Heins 1:18:28
Well, we sort of ventured into sensors for cows. almost 10 years ago, we were exploring foreign organic research project, we wanted to look at the behavior of grazing cows, what happens, you know, when they're eating fly behavior, you name it. So we originally got our first sensor, and it was a collar based system. So you put it around the neck of a cow. And it measures their activity level, and their rumination. So basically, eating behavior aspects. Now one of the main reasons that organic farms and we started using these was for activity detection or for breeding purposes. So heat detection, being able to find cows in heat. Because with organics, you can't use hormones or anything like that for cows. So you have to rely on natural heats to do that. And sometimes it can be difficult when cows are out to pasture to really see when cows are in heat when you should breed them. So these sensors have really helped us in our breeding program. We've increased our reproduction in our organic herd here at our research center, just by using the one collar based sensor. And I've seen that in other organic herds as well by using some of these sensors. Now there's a lot more of them we've ventured into other sensors since that time period, I've moved into an ear tag based sensor. And that also looks at activity, rumination eating behavior. Actually one of my graduate students, Glenda Pereira, she actually was the first person to validate one of the sensors on pasture based herds. And this sensor is known all over the world now. And a lot of actually, organic dairy herds have gone to this sensor. And it's working out quite well. It really works well for pasture herds, because there's solar receivers. So we have heifers that are two miles away from our milking parlor, and we can see what's happening in those heifers by solar receivers. So we know their activity, their rumination, you know, we use it for breeding behavior, detection of health issues, you know, lameness, you name it, we can do that. Those are two sensors. Right now, I have four sensors on all of our cows here. Another one that we use is basically a pedometer, and that measures
activity of cows, how many steps they take, some of our cows are taken 60,000 steps per day, I can't imagine taking that many steps ourselves. Another sensor is a rumen bolus. So it goes inside. It's an internal one that measures activity, rumination as well. But it also measures internal body temperature. So we can look at heat stress. And we've used that in a research setting to monitor heat stress of our grazing cows, and how we can alleviate heat stress in cows. All of the sensors that we've used are available for organic producers, it probably just matters, which one you want to use, they all do about the same thing. Some are a little bit different than others and support and interfaces. But I think that for heat detection, that's number one for organic dairies. And that's really a reason why they should be using them.

Dr. Kathleen Delate 1:22:03
Right? Well, How expensive are they, Brad? And then how do you determine if it pays to use them?

Brad Heins 1:22:10
Well, that's a good question. They can be expensive, you know, some of these tags and colors that I think of are $150 per tag. Now they can be reusable, some of them, you can reuse them. So if you cull a cow or one dies on farm, you can reuse that tag. So, you know, we reuse a lot of the tags. So although they might be expensive upfront, I think they pay for themselves in the long run by better fertility. We cull less cows because we get them pregnant based on the activity. So if you asked me in our herd, they have paid for themselves by getting more animals pregnant, and not having to cull so many, you know, now we have so many organic dairy animals, we maybe have generated a few too many here because of our good reproduction from our sensors. So I think they definitely pay for themselves. Just in activity and health detection, we can detect health issues much quicker than what we used to in the past.

Dr. Kathleen Delate 1:23:14
Does sound like they're worthwhile, then. Thanks. If you don't mind, we'll move to the next innovation. I'd like to talk to you about robotic milkers. How exactly do they work? And How available are they in the U.S.?

Brad Heins 1:23:26
So, robotic milkers are kind of an interesting aspect from an organic perspective. And I know quite a few organic herds that have gone to robotics. Usually, you have one robot and it can milk 60 to 75 cows in a pasture based herd. A lot of farms have used those to alleviate labor concerns. You know, labor is a big issue in the dairy industry. So farms have gone to robotics to alleviate labor issues. They do a lot of the same things that they have sensors on them too. So you can tell activity, you can tell rumination, like the sensors that we talked about earlier. They also measure a lot of different aspects. fat, protein, lactose, somatic cell count, they measure a lot of aspects in the milk for those cows. One of the challenges maybe that farms have is trying to figure out how to graze with them. And there's ways that you can do that. A lot of people feed grain in a robotic system to get the cows back to the robot so they can milk and there's
ways that you can set up your paddocks and pasture systems. So cows come and go to the robot a few times a day, you may have to fetch more of the cows from the pasture to come up in milk but they do work quite well in an organic situation.

**Dr. Kathleen Delate 1:24:48**
Can you back up just a bit and actually literally walk me through it. So I don't think you have a man or robotic person out there. So it's just a stand or less that they go into and then the robot takes over. How's that work?

**Brad Heins 1:25:03**
Right? It's kind of a, I don't know, envision like a checkout lane at a grocery store, the cow comes up, it kind of holds her in place, then it has a robotic arm that swings underneath the udder. It washes the cow's teats off for milking and then it uses some lasers to put the milking teat cups on the otter, and it basically milks the cow out with the robot and there's no human interaction whatsoever. It you know, records all of the data, body weights milking time, and it can refuse the cow too. So if the robot thinks that a cow is coming back too many times during the day, it can open the gate up and send her out without milking her. So you there's lots of different ways that a farmer can set up a robot, but it's pretty simple. You know, they can be expensive. They're 150 to $175,000 per, per robot, just for the robot, and you need barn and everything else behind that. So they can be quite expensive, but they save a lot on labor.

**Dr. Kathleen Delate 1:26:10**
Yeah, that's my next question. Similar to biosensors? How do you determine if it pays to use them? I assume everything's connected to scale. So the larger dairies would possibly use more than average or smaller size theories.

**Brad Heins 1:26:28**
Right? Most of the organic dairies that I've been on, have at least two robots, some have been four to five robots. Actually, one organic dairy that I know just has one robot and they milk 65 cows, and that's what they want to do. So I think there's a lot of options for organic herds, whether you want one robot or a lot of robots.

**Dr. Kathleen Delate 1:26:50**
And do the cows have to get adjusted to it? Or do they take to it right away.

**Brad Heins 1:26:55**
It takes some adjustment, it's really different, especially getting cows to, you know, remember to go milk themselves versus somebody coming and taking them to the milking parlor all of the
time. You know, training takes a week or more to do that. I've helped on a few conventional dairies to train their cows in robots. And the first couple of days, it's a lot of work. It's a lot of work to get those cows in. And it's just different because there's no human contact. It's all this, you know, robotic arm doing everything. So it can be a little challenging for some cows, but most of them adjust quite well within a week.

Dr. Kathleen Delate 1:27:31
And then there's a process for filling the tank similar to a regular dairy. It goes from the catchment of the robot to tanks.

Brad Heins 1:27:40
Yep, very similar. All the milk flows through the robot into the bulk tank with no problem.

Dr. Kathleen Delate 1:27:46
Maybe you can demo it on your field days.

Brad Heins 1:27:49
Exactly, exactly.

Dr. Kathleen Delate 1:27:51
Thanks. Okay. Well, last one I have in mind is your really cool cow vac that I saw at your research station, Nan spray method to manage flies and organic dairies. Can you walk us through No pun intended? How the cow vac works, please?

Brad Heins 1:28:08
Sure, you know, we've been using the cow vac for seven or eight years now started out with organic research project to control flies on pasture. So it's pretty simple. Cows kind of walk through a chute kind of a lean, and they walk into the cow vac. And there's kind of some blowers that blow across their stomach to blow the flies off and it sucks them up on the other side. And then as they walk through it, there's some fans that stuck to flies off the top of their back as they walk through. And so the cows like to walk through it, it does control the flies. In our research project, we showed that every time a cow walks through there, it captures 60% of the flies on the cows. It's not perfect, but it captures a lot of flies. So we still use it here at our Research Center. We have two of them. Our cows walk through it twice a day before they go into the milking parlor. It's really helped control the flies. I've worked with other organic dairy herds that have these cow vacuums so that they like it, a lot of them that have utilized them like and there's actually a farmer that I worked with in northeast Iowa that has one and he likes it and uses it quite often for his heard as well.
Dr. Kathleen Delate  1:29:36
Does it run on electricity? I forgot to ask you that.

Brad Heins  1:29:36
It does run on electricity. Yep, there's 110 or 240. Typically, it's pretty easy to install these. Usually they install them near the milking parlor. So when the cows come in for milking, they walk through the system. Except I had one on a research project. I had one at a robotic dairy so every time the cows come up for milking to the robot, they walk through the cow vacuum that cow vacuum is still there on the robotic dairy, they love it for their cows on in their robots.