

Intelligent Sprayer Technology

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SPEAKERS

Speaker 3, Liv Meyer, Christa Hartsook, Joe Hannan

C Christa Hartsook 00:15

Hello, and welcome to the Small Farms Podcast, a production of the Small Farms Program at Iowa State University Extension and Outreach. Our podcast covers the opportunities and challenges associated with rural life.

J Joe Hannan 00:29

I am Joe Hannan, Commercial Horticulture Field Specialist with Iowa State University Extension and Outreach, and welcome to the Small Farm Sustainability Podcast. With me today is Liv Meyer with Dr. Gleason's lab in Plant Pathology and Microbiology at ISU. Welcome, Liv. How you doing today?

L Liv Meyer 00:48

Pretty good, Joe, thanks for having me on. I really appreciate this.

J Joe Hannan 00:51

No, I appreciate you coming on. This has been about eight weeks of me trying to get my ducks in a row to get you scheduled. So appreciate your patience and coming on today.

L Liv Meyer 01:00

Oh, yeah, my pleasure.

J Joe Hannan 01:02

So this is your first time on the podcast, and honestly the first time we've really gotten a chance to work together. How about we just take a step back and tell me and the audience a little bit about who are you and what do you do at at ISU?

L Liv Meyer 01:17

Absolutely. Yeah, so I am a first year Master's student. And again, I'm working under Dr. Gleason. We're currently looking at the effects of this new sprayer technology in combination with existing IPM strategies on controlling apple diseases. So it's pretty exciting. You know, this is actually my second graduate degree. My first graduate degree was in Kinesiology. So I'm a little bit out of my field, but everybody here has been really patient and really, really good with me. So I'm excited for it.

J Joe Hannan 01:52

Cool. Well, we are glad to have you here. I was just looking through some of the notes online and stuff and looks like you're working with Deal's Orchard and Center Grove Orchard, as well as at the hort station on this project. Right?

L Liv Meyer 02:04

We are. Yeah, that's right. They're participating in our on-farm trials for the project as well so we can get even more data. Really, really, generous to them.

J Joe Hannan 02:12

Yeah. So today, I think I kind of want to just focus in on the hardware side of things. We'll talk about the models and kind of pull this all together on another podcast. So I guess, Liv, tell us a little bit about what are you doing with your airblast sprayers to make them more efficient out in the fields?

L Liv Meyer 02:31

So yeah, this new technology that we're talking about it uses LIDAR technology. And LIDAR stands for light detection and ranging. And essentially, it's this kit that you can retrofit on your existing airblast sprayer and the kit allows the sprayer to basically "see" the analogy that we like to use or the phrase essentially, is it can see what it's spraying. And so the analogy that I like to use, you know, when I talk about this, because it's you know, it's pretty innovative technology, and it took Brandon Carpenter here at the farm and I a bit you know, to try to figure it out. But once you get it going it's really just a almost magical piece of equipment because I like a bat that, you know, it makes noises or clicks with his mouth, and it sends out sound waves and those sound waves ping off of objects and return to the bat, the bat can figure out you know, where in the environment, its food is, how to navigate through the environment, if it has obstacles in its way. The LIDAR technology with the sprayer essentially does the same thing where instead of sound waves, it emits light waves in the form of lasers. So it sends out these

lasers, and they'll ping off of the tree or whatever your target crop is. And return back to the sprayer, and the sprayer can actually get an idea of the characteristics of your target crop. So in the case of our research, it's apple trees, and so you know, it can tell the density of the tree, the height, the width, it can, you know, separate the trees with spacing, using trunks, etc, etc. So again, instead of you know, the standard airblast sprayer that you set a rate and it just spits out that rate, this intelligence sprayer, you know, actually take those tree characteristics into consideration, and it will only spray what it sees. So if you've got like a gap in the road, it's actually going to shut itself off and it won't spray that gap.

J Joe Hannan 04:26

Yeah, that was actually... ha, so many questions. That was actually when I was first thinking it was just it turns off and on when if you have a gap in the in the row, but it sounds like it also can adjust the rate based on the canopy or density of the canopy? Is that correct?

L Liv Meyer 04:42

Yeah, so and that's where it kind of gets a little bit confusing, but I'll try to break it down as best as I can. So you can actually choose the rate and that's what we're experimenting with as well. So last year, we chose a high flow rate and a low flow rate. Last year our high flow rate was .135 fluid ounces per cubic foot, and our low rate was .09 fluid ounces per cubic foot. Essentially, you know, say for example, I want that .09 flow rate, I can just, you know, manually just that it comes with kind of a tablet, that's Bluetooth to the software that's been retrofitted on the airblast sprayer. So on that tablet, it has a screen, and you can choose all of these options you can choose, you know how far you want the laser to read. So let's say, you know, my row is 14 feet, I can adjust how far I want the left side to see for the right side. And yeah, with the rate, essentially, it's a set rate and so you choose that on the tablet, and you can just go and it will apply, you know, no matter how high the tree is, how wide it is, how dense it is, even foliage characteristics, you know, if you're in the beginning of the season, and you don't have much, or if it's later in the season, you've got a bunch, you know, it will keep that consistent rate, and you could go as fast as you want, fast or slow, and it will keep that rate throughout the entire canopy.

J Joe Hannan 06:05

So this takes your tree room value and density calculations, and basically does it in the computer for you.

L Liv Meyer 06:12

Exactly. Yeah, basically this sensor gets an image of you know, what the trees look like and it will just spray what it sees in that image.

J Joe Hannan 06:21

Okay, so I guess I want to ask you just a hair too. So did I hear that this is a bit? So this is

Okay, so I guess I want to back up just a hair too. So did I hear that this is a kit? So this is actually stuff that's readily available to purchase and install? You didn't have to like custom build and design and hack this all together on your spare?

L Liv Meyer 06:36

So there's a member on our project team that we're collaborating with. His name is Dr. Heping Zhu, and he works for the USDA Ag Research Service. Him and one of his technicians and an USDA-ARS group of engineers essentially had developed this prototype for this LIDAR sprayer. Then this company, Smart Guided Systems, had taken up the prototype, and what they had done, and took it a step further by actually creating this kit. Essentially where you can call in and just give them the type of sprayer that you have, and they have different kits for different sprayers, and they should just be able to send you the kit. Then if you're having difficulty installing it yourself and setting up a software, they had told us in a meeting that supposedly there's a rep that actually can come out and help you with it. So in our situation, it was a little bit different because we had an older sprayer, and it was starting to get difficult to find parts for it. So we actually have manufacturers of our new sprayer, send it over to Smart Guided Systems, where they had set it up and we sent a couple of guys out there. But yeah, essentially, they should have a kit that they can just send to the grower, and you should be able to just hook it up yourself.

J Joe Hannan 07:45

Okay, yeah, that's huge. Not having to custom build something yourself, being able to get a kit and install is huge on BML to actually implement this. So that that's awesome. So I guess, ballpark, give or take what is the kit's cost to put this on your sprayer?

L Liv Meyer 08:02

Right, that's a good question. So what we had paid essentially was around \$15,000 for the kit and the assembly. But with the savings that you can get, and we could talk about this later, but you know, with the savings that you get the return on investment, it should be pretty quick. Out here at the work farm, we're only operating, well before the derecho it was around 6-8 acres, but after after the derecho we dropped down to about five acres of apple and pear trees essentially. And you know, we're still seeing huge chunks of savings, which is just it's phenomenal for us, it's phenomenal for the environment, you know, labor costs, stuff like that, so.

J Joe Hannan 08:42

And pesticides aren't getting cheaper by any means.

L Liv Meyer 08:45

Oh, no, Lord, no. Yeah.

J Joe Hannan 08:48
They're, they're pricey.

L Liv Meyer 08:50
Yeah, and so every little bit helps. So this, this machine is really phenomenal. This equipment, this system, it's just remarkable. And everybody here is happy with it so far.

J Joe Hannan 09:02
So fairly easy to use? Any major problems, challenges that you've been dealing with once you've got it up and going?

L Liv Meyer 09:10
The only thing that I can really think about again, as I said earlier, it comes with the software that you would want a tablet for essentially, and you can have that tablet inside your cab, and the kit is on the back of the sprayer outside of the cab, and there's some hookups and things like that. I think the most difficult part might be just playing around with the system on the tablet, the software, and just trying to figure out what you can do with it. But the manual that they send out is super user-friendly. They break down everything in that kit for you to be able to understand what's going on, you know how to use it, and they're constantly updating the software too. It's just the things that it can do is remarkable. And again, Brandon and I haven't even scratched the surface, but so far once you get the hang of it, it makes your life a whole lot easier and just you know the amount of time that you spend in the beginning, trying to figure it out, makes it well worth it in the long run with what you see and what it can do and how much you can save.

J Joe Hannan 10:09
Cool. At some point we'll have to go out and actually take a look at it in the field here sometime.

L Liv Meyer 10:14
Oh, we would love for you to come out. Yeah, it's just so fun. It's really, really neat.

J Joe Hannan 10:19
Yeah, it's on my to do list. So at \$15,000, you know, spread out over 10 years on 30-40 acres is not going to be too bad.

L Liv Meyer 10:30

No, no. And with our research, we've got an economics professor and he and his graduate student are trying to work through an economic analyses essentially in the future as well. So we can give growers a better idea, but you know, what that return on investment would look like with how much that they've got.

J Joe Hannan 10:47

Yeah, and I understand you're only starting your second year on that can't necessarily ask you for that too much yet.

L Liv Meyer 10:55

Right. Yep, yep, yep. And with and with the season last year, you know, it was particularly dry, we had the derecho,

J Joe Hannan 11:03

Yeah.

L Liv Meyer 11:03

So this project is a three year project. So hopefully, after three years, we've got some substantial information for growers that they can use.

J Joe Hannan 11:11

Yeah. And so looking through some of the notes and stuff that you sent me last week in preparation here, it sounds like you've got some preliminary results, and you've got some things that you're going to change going into the 2020 season, do you want to talk about what you have seen so far? And keep in mind, everybody that's listening, this is results after one year, so things could change a little bit. But yeah.

L Liv Meyer 11:36

So fortunately, we got a lot of this information before the derecho, so is a bit more applicable. But with the intelligent sprayer technology itself. So essentially, we were trying to look at, you know, how much spray volume can we save using the intelligent sprayer and different rates versus the standard mode on the airblast sprayer. So with the standard mode, we had used 100 gallons per acre, essentially as our flow rate. And with the LIDAR sprayer, our high rate, again, was 0.135 fluid ounces per cubic foot and the low rate was .09 fluid ounces per cubic foot. And

with that low rate, compared to the standard airblast sprayer mode, we had actually seen a 30% over 30% savings in spray volume, with that high rate we saw about 5%. So now essentially, it's playing a game of okay, how low can we go with that rate, while still maintaining adequate pest control. So this year, we're dropping the rates to the high rate is now .09 since we saw such dramatic savings, and then the low rate is .06 fluid ounces per cubic foot.

J Joe Hannan 12:47

Okay. That that's huge, because you're talking product, but you're also talking water, and if nothing else, water is time that it takes to refill the tank. So that's that's huge being able to drop your gallon age per acre.

L Liv Meyer 13:01

Exactly, yeah. You know cost of pesticide, spray volume that you're putting on, could potentially help reduce the amount of drift, you know, if that standard sprayer is spraying through the gaps in the trees and things like that. And yeah, just labor. I mean, you know, it is a pain in the butt that have to go back and refill every time. It just it takes time, you know, to remix some of those chemicals and things like that.

J Joe Hannan 13:24

Let's be honest, not not all farms have a water tower like you guys have at the station.

L Liv Meyer 13:31

Yeah, that's true. That's true. So this could again, even more so help.

J Joe Hannan 13:38

Cool. So is that pretty much what you're going to be changing in this year then? It's just adjusting your gallonage rates down?

L Liv Meyer 13:45

Yeah, yeah. For the for the intelligence sprayer side. And as I'd said before, we're also working with some IPM strategies as well in combination. So we're looking at the effects of the intelligent sprayer in combination with the disease warning system or weather based warning system. And so we kind of want to see how much we can save on spray volume, as well as how many trips that we have to make out there.

J Joe Hannan 14:00

J Joe Hannan 14:09
And that's primarily for flyspeck that you're looking at?

L Liv Meyer 14:13
Yep, this past year was flyspeck and then for this next year and the year after, we're also looking to incorporate the fireblight warning system, maryblyt.

J Joe Hannan 14:22
Perfect. Yeah, we'll have to get you on here really soon. Because Maryblyt and Fireblight is almost upon us.

L Liv Meyer 14:29
Well, it's creeping up very quickly this year. Yep

J Joe Hannan 14:32
Yeah, Liv, anything else you want to talk about on the sprayer system today?

L Liv Meyer 14:38
I think that's the nuts and bolts of it. You know, we can get into a little bit more complex, but you know, even then, like I said before, I'm still learning, Brandon's still learning. We're constantly meeting with Dr. Zhu and Adam, you know, to try to figure out more advancements that they're making on this technology, but again, it's just it's a really phenomenal piece of equipment and even in the year that we've had it Nick, the supervisor out here, and Brandon, the ag specialist, we're just we're pleased as punch with the results.

J Joe Hannan 15:07
Good, and I'm assuming we'll see this at the horticulture field day this summer.

L Liv Meyer 15:11
Oh, yeah. Yep, you can bet on it. So hopefully that'll be a big, big attractor for a lot of growers out in the area. And I say we use it with apples and pears. We use it also in our vineyard as well. So, you know, whatever you're spraying, essentially, you could use this for.

J Joe Hannan 15:28

Perfect, well Liv, I think that's probably a good place to wrap up here then today. I do want to give a big shout out to Christa Hartsook and Olivia Hanlon at ISU Small Farms Sustainability Program for editing and hosting these podcasts. Again, if you're listening to these podcasts, and you want to join me as a co-host someday, I would really love to have have you on. Liv, will be back here hopefully within a couple of weeks to talk about Fireblight modeling. And then we'll talk about flyspeck probably later in the season and talk about that modeling and how that integrates into the system. I guess before we sign off Liv, where can folks find out more information on your research? And where can they find information on this LIDAR system.

L Liv Meyer 16:10

So we've got this phenomenal resource, we have an extension page through Iowa State, and I think they'll include that as a link with this podcast. If people are on Twitter, we've also got a Twitter page. Or if you're on YouTube, we're also trying to put up a bunch of blogs and testimonials and some educational videos for growers as well for resources to kind of learn about what we're doing in the field with this research, the technology, the warning system, all of that good stuff. So we've got we got plenty of resources out there for people to check it out.

J Joe Hannan 16:40

Perfect. Yeah, we'll put the website and link to the videos in the show notes for everybody. Well, I guess that wraps everything up for today. Liv, thank you very much for joining me on a nice day where you should be outside actually doing work. Thanks for taking some time to come in the office and hang out with me for a few minutes.

L Liv Meyer 16:59

Hey, again, my pleasure. Thank you, Joe, for having me on.

J Joe Hannan 17:02

All right. Take care and take care everyone else.

S Speaker 3 17:05

For more information on Liv's research you can visit their website <https://www.smartapplespray.plantpath.iastate.edu/> or their YouTube channel at <https://www.youtube.com/channel/UCAm7rWVca4Ka4HktQ5YPutg>. This program is brought to you by Iowa State University Extension and Outreach. This institution is an equal opportunity provider for the full non-discrimination statement or accommodation inquires, go to www.extension.iastate.edu/diversity/ext.