Thanks again for coming for those of you who joined us last time we were together on the 1st of October for a session about yield impacts at Vesh Led. You're here today for session, 2 talking about cover crops and water, and we will have another Webinar on the 18th of December, it is a Wednesday at 10 Am. Central time, and this webinar is a part of a collaborative agreement that my research team and I have with NRCS and University to support conservation delivery, and I want to just give an opportunity to Carlos and Nathan to share a few things about our series as we get started

Carlos Villarreal (he/him), USDA-NRCS

00:45

Hey? Thanks, Andrea, for those of y'all that don't know me. My name is Carlos Villarreal. I'm a State soil scientist here in Lincoln for NRCS and for our NRCS staff.

Well, Rob couldn't be here today. He will be on the next one. But he couldn't be here today, so he just wanted me to emphasize 2 points. one just encouraging you to participate. Thanking you for being involved in this like Andrea said, this is a made possible through an agreement, and we want you to.

You know. Be confident that we're using our agreement wisely. And this is one of the extremely valuable great things to come out of this agreement, the opportunity to empower our employees with having conversations with producers and customers about cover crops.

To me. That's 1 of the greatest investments we can make in ourselves. So, I just encourage you to be engaged the last half of this webinar is going to be breakout sessions. So please even if you feel like you're in the wrong webinar, you're in the wrong place or don't deal with cover crops. It's still valuable to have you on, and just give your perspective. So, encourage you to participate. And then also, I wanted to thank Q. And L. And our extension educators are online.

Also, we also want our staff to be familiar with you who you are, what your program looks like and encourage some conversations after the Webinar series. If there's any field days, or any ways that we could collaborate and be more involved with each other's programs, I think, is, is a really great asset for us to have, as we work on that front line of our customer service, working directly with private lands and producers. So, it's exciting to me to be a part of this. So, thank you all for joining, and I believe Nathan had a couple of things he wanted to add also, so, thanks, y'all.

Nathan Mueller (NRCS)

02:41

Thanks, Carlos and Andrea. Yeah, thanks for joining us again for some repeat. Webinar attendees.

I just wanted to let everybody know within NRCS. That the cover crop Webinar series back in October is on the soils, on our SharePoint, on soils and under soils is Fy 25 cover crop Webinar series. And so, you can find the recording the Transcript and a Pdf version of the PowerPoint from October. There and then, within about a week from now we'll get the same thing loaded for the webinar today. that's all I had. Thank you.

Andrea Basche

03:18

Great. Thank you, guys. So, what do we want to do to start as we did last time. So when we get into our breakout rooms, and I'll tell you more about our agenda here in just a minute. But Vesh is going to launch a poll now, and we just want you to select what part of Nebraska you are primarily focused on with your work. So, this will help us gauge the number of people and the number of breakout rooms, and how we set that up

And we can play this by year a little bit, too, depending on, you know, if more people come, or if we have to combine breakout rooms. So, we have. Let's see right now on the Webinar. We've got 29 folks, so we should get close to that many responses.

So, we've got 1819 definitely got some representation from around. So maybe a few people have not answered but Vesh, I think maybe what we'll do is combine a few rooms and maybe in northeast have maybe 2, but we'll tell you the numbers and how it works out.

So, what we'll do when I get to the end of my presentation is we will open up the breakout rooms. We will. We've got a great slate of extension educators. We're so glad to have everyone here who will be our main facilitators and will figure out what the numbers where we land. So, Vesh, I'll let you work on that in the back end as I get presenting, so probably you could close the poll. Now, I think there's probably a few people who did not answer. But I think that is okay.

So, I did want to remind you. My colleague, Katya Cole or Cole. If you want to share, I'll share with you who we've got here, if you want to see where the numbers have shaken out. So, we will let you know where we want to try to have maybe about 5 or so people in all the rooms just to have nice discussion. If we end up getting a few more folks joining, we'll figure out from there.

So okay. yeah. So, my colleague, Katya Kohler Cole, last session. She is not able to join us today. Just wanted us to remind the NRCS folks that we have a directory for finding extension educators. That was a really important point that we wanted to have with this Webinar series, to have an opportunity, even virtually to for educators and NRCS field staff, to get to know each other. So, if you are NRCS field staff, and you're not sure who some of your water cropping systems or livestock systems extension educators might be. This is a source for you to search.

And we also have the statewide maps that show some of the different programs. And again, more contacts that way. So, we hope you can use this opportunity to connect.

Okay, now on to the main event, getting for me to talk about one of my favorite topics, which is cover crops and water. So, I want to present to you evidence. I want to present to you some information from Nebraska that can empower you to better answer questions or just support your producers and folks within our CCs contracts. So, what I want to do first, st actually, the teacher in me wants to make sure we revisit some of the topics that Vesh, in the presentation in October, talked about with respect to what we know about cover crop yield effects I'm just going to spend. Probably I don't know, maybe about 10 or so minutes talking about that revisiting that. Then I will just give us a refresh of water cycle. I want to give us a healthy dose of evidence that we have from the research about cover crop water impacts. I'll try to tie that all together, and then we'll get into our breakout rooms.

I hope to do all that by about 2, 40 or so 1 40 mountain time, and then get you into the breakout rooms that way. So, let's again start with what we know. What are some of the processes and evidence for how cover crops can impact yields. Because, of course, we know that is a major concern. Potential barrier is a

cover crop going to negatively impact my cash crop. So, this is a diagram that Vesh showed in the last presentation about just some of the processes. What are some of the pathways that cover crops could be again, positively or negatively impacting cash crops, right?

So, improving soil health, suppressing weeds, pest and disease management, especially that last one pest and disease management. There are incidents where cover crops could increase negative pest pressure. Right? We know with nutrients they are taking up nutrients. They are using water. Okay? So, we know that there could be some negative potential effects like those are some of the major pathways that I think about. Why might a cover crop be impacting cash crops here?

We're talking all about water, but there are other pathways that could be contributing, and I do think that water is an important one, and I do think, as you'll see in some of the evidence, that in Nebraska water is really a concern, and can lead to some yield decline. So, these are some of the pathways. But what I want to show you next is evidence from a few different scales. So, we've got some evidence from small-scale research from farm reported data and from farm research. That really point to similar trends which I'm just giving you the punchline right now, and I might start to sound like a broken record. But largely when we look across in the aggregate, we see that cover crops can have mostly neutral effects, sometimes a little positive, sometimes a little negative, but largely neutral effects on cash crop yield.

So, the 1st evidence I'm showing you is from a paper actually, 2 of my colleagues who I had the chance to visit this week, as I've been at the Tri Societies Conference, Fernando Magazz and Guillermo Marcillo, who were my major advisor and a lab mate colleague of mine worked on a meta-analysis about corn yield of cash cover, crops, follow before corn. And so, this is something that best showed. He went into a little bit of detail about it. And I'm going to try to like get through this without, you know, too much emphasis. But what this kind of experiment, or what this kind of paper does is, it synthesizes experiments. I find these to be really powerful ways for us to look at effects across a range of studies. Okay? So, they looked at all the publications where cover crops had been grown before corn. And then what were those yield effects? So, you, in a really systematic way, organize that information, and they found that, as you can see here on the left graph for grasses. So, they sorted the cover crops by species grasses, and this yield effect of a 0 means no difference from a control to no cover crop. If you're to the right of this bar, the 0 bar that means the cover crops were increasing yields, you could see for corn if you had a mixture, or if you had a legume, that again, for all the global studies looking at these effects cover crops were increasing, yields in mixture and following mixture and legume cover crops, but with a neutral effect on grasses, and that effect did not change. Whether that was a no-till or conventional till system. That's a graph on the right. So, I think that's really powerful. It's not just like one year, one study. It's hundreds of studies compiled in one synthesis to say that you know, a corn following a grass can be neutral. Other species can be positive.

Okay? So again, in aggregate, a lot of the different scales of research point to similar trends. So, this is just a snippet from a news report that was written about long-term on-farm replicated trials, like many of you, work with farmers and with our extension colleagues where corn and soybean were grown for a number of years. And this is Iowa farms. Okay? And what they found was that just for corn yields that in the 1st 2 years of the experiments that farmers did. There were 3 out of 10 site years. So basically, one place one year where there was a negative effect of the cover crop on corn and 7, where there was positive or no change. and then, later the latter years, there were no yield reductions, some yield improvements, but mostly neutral. So that's for corn and for soybean there were yield improvements even in the beginning, and continued, and then one site year, where there was a decline in the latter year. So, I think that this is a

really interesting finding, because it, in my opinion, does substantiate what we just see from small scale studies, but that in time there was less negative, more positive yield effects, and maybe even more positive here with Soybean.

And so, what this article talks about, too, is the importance of management, and that once farmers were able to get through a learning curve and not have issues with termination, they were able to see positive yield effects.

So that's small scale on-farm research. And actually, Katya and myself and Laura Thompson and Jenny Reese from extension, worked on another synthesis paper where we just categorized all the experiments from our on-farm research network and from the published literature about cover crops in Nebraska. So, we looked at how much biomass was grown. We looked at where studies were done, we looked at yield effects. And so, the graphs that we're showing you on the right are the yield effects. And each one of those points are one site experiment year. And so, I like to show graphs like this because it basically rather than just showing you an average, it shows a distribution because averages can be deceiving. We know that in agriculture really some of those very good or very bad years have become the most important, right? So, we looked at again on farm research. So, we called those farmer led. And then Researcher led were the smaller scale studies. And basically, what we found is that if you took the average of all of these, even though I'm showing you the distribution, there were some that were negative. There were many positive and the same in the farmer led studies that there was actually no significant difference from 0, so yields with and without cover. Crops were basically statistically the same. Right? So again, similar evidence pointing to the same thing, I'd like to point out here to this panel F in the graph on the left, just showing that we really have as a research group. And even with the farmers we've worked with focused on a lot of studies in Eastern Nebraska, and so work that Vesh and I have been doing through this agreement, and we want to continue to share more about that, with all of you, has tried to expand some of our knowledge about cover crops into Western Nebraska. So, we know how important that is so again. So, this is comparing. Farmer led and researcher led at on farm and smaller scale experiments. And then I also wanted to share this with you.

And again, this was in Vesh slides from October. that from the SARE CTIC farmer survey. So, it's a survey that gets done every year. Hundreds of farmers fill it out. They reported the data last year, broken out by state. And so, what we see here is that when farmers report, what are. Your average yields with cover crops and without cover crops. So, this is for corn. They show a 14% increase in yields with cover crops and across the responses for Soybean. The yields were also reported as higher. So again, this is not the same kind of replicated, controlled study, but to me, pointing to evidence of how once people are confident with management that they are able to see a yield improvement.

So, I know that this is a slide that has a lot of words on it, but I did want to kind of go through just real quickly. We'll put this together in a summary document for everyone. This is just all the slides.

Vesh had some really nice slides and really detailed information of experiments that were specific to Nebraska. So, I've got a bullet point for all of those things that he had, and I'll just kind of hit the highlights of them for you here. So, he showed several studies specific to Nebraska. So not synthesis studies like I've been showing you. One was a project that was a recently finished PhD. Student on my team, Tawana Almeida did, where we looked at corn planted green with termination time earlier and later termination, timings of cereal, rye, and Hairy Vetch at ENREC. So East Central Nebraska, and we did find that our late terminated treatments in cereal rye did decrease corn yields, especially in 2022, when we were drier.

Another study that was done over dry land and irrigated experiments with earlier and later planting. On average when you look across all of those site experiment years did not see any differences, but there were a few places where there were some cornel declines, some cornel increases, too. So, I think you're kind of getting the pattern here. But some interesting trends, I think, come out when we look at what's going on in some of the Nebraska studies. So, a study that was done by former graduate student, Trey. Stevens looked at planting green with soybean over 2 years, and found one year of a decline, one year of increase and the decline associated with drier conditions.

Another study that Katia and colleagues led over several years, 4 years and 3 sites with soybean, mostly neutral effects one year with lower yield one year with higher yield. Okay, corn and soybean. these dry years can have a potential negative effect. And then a couple of studies that I will talk about when we get into the water section of the presentation that had to do with wheat so hitting corn, soybean and wheat. In all of these studies but paper worked on by Nielsen and colleagues, published in 2016 found, and this was specific to Sydney. 2 years of data. They also had a site in Colorado, and did find that cover crops were reducing crop yields both under this is for wheat under irrigated and dry land conditions.

And then Alex Rosa was a former graduate student, who is now working with Bayer in Gothenburg. If you've run across Alex, he's a great contact for many of us 2 site years in his research at Grant and North Platte, and did see when they had corn before or after a cover crop following wheat. Most of those species did have some slight decline on corn yield, except for spring oats, so I'm going to try to tie that all together. So again, lots of words. We'll put this together for you. But like, what does this all mean when we look at what's been found in Nebraska, and what has been found on some other synthesis projects. So, these studies, again, across smaller scale, across, on farm research, across the farmer survey data, all generally point to neutral effects of cover crops on cash crops in the aggregate. Of course there's some caveats here, but that is the really general pattern that we see across a number of different scales.

And then you know, what are some more specifics here? So, one of those slides that I shared is that meta-analysis found for corn, legumes, and mixtures could lead to higher yields and as we see across a number of studies, those the late termination, especially in drier years could lead to yield declines, and I would say, just kind of trying to tie this all together for us. I think that these same principles could generally apply for wheat, but I would say this has been studied a bit less than for corn.

I would say we have a little bit less information from research about soybean yields, but probably lesser effects of soybean. I think that the competition of the cover crop is a bit is a bit less something that soybeans as a plant, it's able to grow out of a little bit easier. But I would say again I studied a bit less, but still, I would say, neutral to potentially positive effects. And this is really our sense is that once farmers and researchers, we have to count ourselves as farmers who can make mistakes or struggle with the complexities of cover crop management. Once the folks get past that learning curve typically with termination, that negative yield effects are generally pretty limited.

And we'll let you have a little bit of discussion about water, and how we can manage for that, especially knowing that drier years can be a challenge. So that is what I wanted to share, just revisiting from last time. Again, we'll make all of that available and put together kind of a reference list of some of these papers If it is of interest.

I want to next move into the water cycle, because this is generally when people how I would answer. When people ask me about cover crop impacts on water. I think it's important. We think about the entire

water cycle together. So, I want to give you just a high, level. Look ahead and reminder refresh of the water cycle and all the ways that a cover crop could be impacting. Right. So essentially, what is the water cycle? Right? This is the continuous movement of water molecules through the earth system.

And so, what are some of the important processes. When we think about ag systems, right? We might think about precipitation, how much water is falling from the atmosphere. We can think about what's happening with respect to water, table, groundwater, flow, stream, flow.

How we manage our all of those things! When we think about irrigation, we would think about evapotranspiration. So that's the water that plants use in transpiration and evaporation. The water we lose from the soil surface. and I like to think a lot about infiltration. That's probably one of my favorite processes. If we had to pick one. Maybe that could be your icebreaker question, what's your favorite part of the water cycle? So, infiltration is the water that is moving into the soil rather than over the soil as runoff or soil moisture. What's staying in the soil?

So, soil, moisture? What's staying infiltration? What's getting in that active process? Surface runoff? What is running off? So those are some of the obvious elements of the water cycle that are important when we think about agriculture, and when we think about cover crops. So, the other way that I like to think about this, too, is if we think about what we're doing in agriculture is really managing a water balance, right?

So, what we're trying to do is maximize how much water is entering our system so that plants have water to be able to grow, to transpire, and we also want to try to prevent losses from things like evaporation and runoff. And what I like to think about is the soil surface. As this balance is really where the action is happening and where

All of these processes are really coming to bear. So, this is what we're trying to do. We are trying to think about the soil profiles the way I think about it. It's where the action is happening. When it comes to the water cycle, it's really the central component that regulates the in and out flows of the water cycle, so

I don't probably have to tell you at NRCS the nice diagrams and quantifications that have tried to be done about how much water can healthier soil hold, and we see some nice evidence of that as I'm going to share with you, because research has been able to quantify this. But this is really where the action is happening right? And I think it’s important that we remember

That soils are a matrix not like, you know the matrix, but they are a not like the Keanu rouge matrix, right? But if we think about soil as a mixture of particles, different types of soil have different. And I like to think about this as bricks and the way they lay together.

You know, we want to make sure that our healthy soil has enough air to facilitate movement of water and gases through it, and in the matrix of the soil we have organic matter which is what remains the decay of plant material. Again, I probably don't need to refresh too many folks at NRCS about this, but we obviously want to make sure that that orientation of the building blocks and the mineral components of the soil is such that we can facilitate movement of air, so that has to do with properties like porosity as well as organic matter in the soil. But we're going to think about infiltration and soil hydrologic properties here and show you what the research shows.

So that was my quick revisit in a few minutes of the water cycle a number of ways that a growing cover crop and a decomposing cover crop could be contributing to all of those processes. And I want to kind of try to talk you through all of that here. And so, here's what I'm going to do.

So, I've kind of combined in my presentation here.

Studies that have been done more synthetic studies like I've already shown you so studies that have synthesized experiments from around the world. And I also want to talk about some studies from Iowa and Nebraska the Iowa one. The reason I get that in is because I did it, and I get to talk about it. This is one of my favorite research papers that I worked on, but close enough in the region I feel. So, I want to talk about some global studies. And then I also want to talk about again, some things from our region.

And what these experiments from around the world that synthesize lots of different experiments, what do they show they show that cover crops are consistently increasing infiltration rates. I'm going through my water balance components that improve soil hydrology, so adding some quantification to those numbers at NRCS. I love those diagrams. I use them a lot about healthy soil and water

Cover crops can reduce drainage that has been seen in synthesis of studies, as I'm going to show you in a minute. The cover crops do reduce evapotranspiration and can increase water storage and overall water use efficiency. So those things that I just shared I'm going to go into a little bit more detail here because they've been again found from these synthesis of studies from all over.

And we've seen some of these things on Nebraska farms, too, that they've increased infiltration that they've had limited impact on soil water content that they can increase soil water storage in wetter and drier years. And they can also, we see the evidence of water use that they have had negative impacts on crop yields in drier years.

Okay, so let me get into it. So, the 1st study I want to show you I'm showing you a diagram of this, I've got the citation. Here. On the bottom was a synthesis of again global studies. They looked at 117 studies that fit their criteria. So, you always like, determine what should an experiment have done for me to be able to include it in a systematic way in an analysis like this, and they looked at 117 studies that reported soil moisture with and without cover crops, and they did some calculations from those numbers on things like water use efficiency which they calculate by the yield divided by evapotranspiration.

And what they found is evidence of the cover crop using water. That it was reducing evapotranspiration as well as water in the soil during the fallow period, but that the cover crops were able to increase water, use efficiency overall so more yield per unit of evapotranspiration. So again, I'm starting with this one because I liked how they were creatively able to combine several components of the water cycle. That does kind of help us understand that. You know the cover crop is using water, but overall, it is able to contribute to water use efficiency through reducing evapotranspiration. Really, they attribute that to the reducing of loss from the soil surface or reducing evaporation. So that's good. It's a way we could eliminate loss, as we might expect from residue cover from our cover crop.

So that's a global study. So here, I want to talk about global and also or global synthesis. I should say I want to talk about Nebraska studies and some global studies. Global synthesis studies that I've been a part of. So, Fernando Krupek, who was a former graduate student in our department, worked with me. We had another collaborative agreement we've presented to NRCS a few times about that. If you've heard us talk about it. So, this was a project that a collaboration with Nebraska extension and on farm research. So, we

looked at this particular study. 4 replicated trials on farms that had cover and no cover over a few years. So, we took these measurements after just a few years that cover crops had been in place. and what we found was that in 3 of those 4 farms cover crops did increase in filtration. And I really like to make this point that that was happening quickly, that we'd like to talk a lot about how some soil properties and processes are insensitive to management and do not change quickly. But my experience is that infiltration is something that can change very quickly. Okay. So, when I say that the bullet point here, this is substantiated by other meta-analyses, a project that I worked on, and another synthesis study where they looked at impact of cover crops and a number of different soil properties. They found that even within one year infiltration was something that cover crops could have a positive impact on. And that makes a lot of sense. When we think about the roots in the soil, the potential contribution to more labile portions of carbon infiltration. Again, it is something sensitive to management, so not only have we seen this on Nebraska farms.

We also do see this in lots of other studies as well. And so, I did want to mention here, too, when I say, results of water storage infiltration effects will definitely differ, based on our soil texture, right? So, a sandier soil, lower water holding capacity. we might expect more water percolating through the root zone, and the opportunity to refill more quickly as well after the cover crop has been terminated. Compared to maybe a coarser or a more finely textured soil. Right? So, I say this without being all the things that I'm sharing are not very specific to soil type, but we know that you know, base principles of holding capacity, soil texture will come in these effects. But what was interesting about actually, the global synthesis that I worked on did not actually see an effect that was consistent across soil type. So, to me, this is a fairly robust finding in terms of the benefit of cover crops with respect to infiltration. and I did want to make mention a great NRCS article. I love to share this when we think about infiltration when we think about rainfall variability. One of the farmers who did see a positive effect of infiltration from the cover crop talked about the flooding in 2019, which I'm sure is very resonant for many of you.

So, this farmer who's in Central Nebraska said that in that heavy rain event that bomb cyclone, that very unusual event that happened in mid-March of 2019, that one of the fields that had a rye cover crop had 70 out of 75 acres underwater that was underwater for many days. When the water finally receded, the field was still in good condition, and you really couldn't have imagined what that would have looked like without the rye cover crop. So, I do think that there's trade-offs. Everything in agriculture is a trade-off right when we think about the benefits and rainfall variability and soil conservation.

I think we have to think about, you know, getting past that learning curve, and like, what is the trade-off we have maybe, for minor yield declines in the short term. So really positive story here that I was glad that NRCS has shared. Okay, drainage didn't explicitly show that in the water cycle, but something of importance, we think about water moving through the soil profile.

So, this was a synthesis of 28 experiments that they found that compared a bare soil to a cover crop where drainage water was measured, and they defined that as the water that was unavailable to plant roots and likely to recharge groundwater. And they were actually able to calculate an average impact of the cover crop of 27 that drainage water was reduced, which is evidence, and the cover crop is using water. So, 27 just a little over an inch of water, not a huge amount of water use. They do talk about this as a potential disservice and just thinking about the whole water balance. But I would say, yes, potential disservice. But also, I think it's really neat that in a synthesis like this they can actually really calculate

some average number of the water use the difference in water drainage from the cover crop. So again, adding to our balance, we think about what the overall effect of the cover crop on the water cycle is.

So, water storage next component. So, this is some work that I worked on when I was a graduate student at Iowa State University, and there was a really great long-term USDA site where we were collecting data from that had had a cover crop in place since about 2,002, and so at the point that we took a look at the soil, moisture, sensor data from 2,008 to 2,014. That cover crop had been in place, for, you know, 6 to about 12 years. and what we saw when we looked at soil, moisture, sensor data. We only looked at 30 to 45 cm. So, it wasn't very deep.

But we did see again evidence that the cover crop was using water in the spring. This was just cereal rye and a corn soybean rotation. and we did see that evidence of water use, but by the time it was time to plant corn and soybean, even in wetter and drier years, so this includes 2012. It includes some normal years, really a range of seasons, that there was no difference in planting conditions for corn and soybean, so that spring rains were able to replenish soil moisture to the same level compared to bare soil, and we also did some assessment of the soils at that site, and we were able to actually see an increase in field capacity, and when we calculate what that is for plant available water, we saw a significant increase as well, so that was pretty neat, and that led me into next project in my next role to try to look at. Have other studies found this? Have other studies been able to see cover crops, increasing properties of soil, hydrology like field capacity, porosity. Those are the 2 that we looked at in the citation. That's here where we looked at different, continuous living cover practices, and we did find that those were improving field capacity and porosities in a significant way. So, we think about soils as a sponge. Here we have been able to quantify that that is leading to an improvement. Again, it is probably contributing to some of those infiltration increases as well.

Okay. So, I'm going to just have about 2 more slides here of evidence. And these are specific to Nebraska. So, work that was done. Katia Kohler, Cole, and a number of colleagues had some funding from the corn and soybean board years ago that they were able to do on multiple sites. You can see the locations here. So, they had experiments at Bruhl, Mead, Clay Center and Concord. So, in several regions of Nebraska where they looked at a corn soybean rotation, with no cover crop and a mixture of cover crops. They monitored soil moisture over several seasons. As would be expected, there was a range of biomass for their cover crops from 0 to up to about 3 tons per acre. and that in all of those rotation phases and years in different locations. They only found differences in water content between the control and the cover crop in the top 12 inches of the soil in 4 of 12 situations, and that those impacts were pretty minimal. So, there are less than 11 difference of water in total. And so, I just put in italics here their final note of their abstract, which was that.

In conclusion, the winter cover crops did not have an effect on soil, water content that would impact corn and soybean productions. This is really similar to what we found in my experiment in Iowa, and I think that's very interesting. We look at this greater range of geography here, in these experiments as well.

And then the last experiments that I want to refer to are specific to Western Nebraska and the potential negatives to be looking out for right. So, Alex Rosa, whose work and I've mentioned these 2 already when I talked about the yield effects, because these are 2 specific to Nebraska, where drier years did lead to some negative yield effects. So, Alex's study looked at a couple of locations over a couple of years. Grant and North Platte, and they had later termination. This was again wheat cover, crop, corn. They were looking at the corn yield effects, and they did find that later termination affected corn yields.

And then this study with wheat yields from a few years back was in Sydney, and also, as I mentioned before, in Ohio over a couple of years they did find a pretty robust trend where the cover crops were reducing wheat yield by 10%, and that that effect was worse in drier years.

They did also do a lot of nice calculations. If you're in Western Nebraska, and we will share all of these things, encourage you to look at this some interesting ways. They looked at soil, water and water use efficiency. So, they did find that even though the cover crop treatments were using more water. They were increasing water use efficiency in one of the years of the experiment, and they had dry land and irrigated conditions. So of course, I know that those cash crop yield impacts are really important, but I do think that there's management opportunity to offset some of that.

So let me put this all together for you. I would say, if someone asks you and you're concerned about cover crops water use. Yes, that's the real thing. It's a plant. It needs water to grow. but that cover crops can have an effect on the entire water cycle. But potential for complicated effects on crop yields.

I would again highlight that there is overall positive effects on water cycle, improving elements of soil, hydrology, including things like infiltration and water storage. and I would say that in Nebraska this generally holds true right, that there are minimal or limited yield effects. I've highlighted some of the sorry, more negative ones for you there. But they can contribute to yield effects in drier years.

And those are some of the bigger effects, and with later termination, right? So that experiment that I've already mentioned that we did at Mead. I would have caution recommending planting green for farmers, even though many of them are trying it, but especially in drier years. This careful management is key. So, terminating early is important. I haven't said a lot here yet about Wet Springs, but I think that there could be situations, too, with rainfall variability where more water use is a potential positive.

Okay? Well, that is what I wanted to share for you. And I appreciate your good attention and hope I've given you some evidence around cover crops, water use, and more. So, my contact information is here will be on the PowerPoint slides.

And I think now we'll be ready for the breakout rooms. I'll point us to them in just a second. So again, we're going to try to do these by region based on maybe combining some, so that we get several people in the rooms. And so, these are the questions that we want you to look at. Right? So, are you working with farmers in your area on cover crops? What are their goals for? Cover crops? Are you hearing stories about cover crops and water use? And if it's a concern, what are some of the strategies that you might recommend?

So, we want you to discuss your ideas, since it's about 2 42. We did schedule, you know, a good 90 min. For this. We encourage you to stay and chat as long as you want. If you want to share as an icebreaker your favorite part of the water cycle encourage you to do that. Our facilitators are going to help us take some notes, and they want to just help give everybody an opportunity to share some of their thoughts. So, I think that what we'll do is go ahead and open the rooms now Vesh.

And we can kind of wait in the main room and see if anybody is wanting to come back and visit us and recap a little bit after maybe 20 or 30 min. But if you also want to be dismissed from Webinar after this, and you're welcome to do that, we know at the top of the hour we'll probably lose some folks, anyway. So Vesh! Is there any other instruction you want to give folks about which rooms go ahead.

Vesh Thapa

41:34

So, considering the number of participants, I merged some of the breakout rooms, I merged northwest, north central, and southwest into one, and John will be facilitating that room, I merged Central and South Central into one, and Samantha will be facilitating that room, and considering the higher number of participants from eastern part, I made 2 rooms for the eastern part: participants name that starts from A through M can join Room one for northeast, east central, and southeast, and the name that starts from N through Z may join Room 2 for northeast, east central, and southeast.

Andrea Basche

42:22

Okay. So, the rooms will be open, and you can jump into the one that fits your region, and we will hang out. I will be in the main room if anybody is not sure where to go, and then, if you want to just dismiss yourself from Main Room after you know, 2030 min of discussion. That would be fine. If you want to come back and join the main room and share any thoughts, we'll be here.

Thanks. Everyone. Thanks.