

# How to Interpret Your Soil Reports

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## SUMMARY KEYWORDS

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## SPEAKERS

Speaker 3, Christa Hartsook, Joe Hannan, Olivia Hanlon



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.



Olivia Hanlon 00:29

In this episode, I interview Joe Hannan, Commercial Horticulture Specialist for Iowa State University Extension and Outreach, and talk about how to interpret your soil reports. I'm Olivia Hanlon, Farm Food and Enterprise Development Extension Education Specialist. And welcome to the Small Farms Podcast. Last week, we talked a little bit about collecting soil samples, and this week we are talking about interpreting those soil samples. So Joe, welcome back this week.



Joe Hannan 00:56

Yeah, hi, Olivia. I'm kinda glad to get a little bit of a series going here and back on track with our weekly talks.



Olivia Hanlon 01:04

Absolutely keeping people on track. So the soil sample report says I need to add 50

pounds of potassium. Is that correct?

**J** Joe Hannan 01:14

Yeah, so that's a good question. So as we look at our soil reports, the labs will do a great job of looking at the soil and telling you what's actually there. What they don't do is a very good job necessarily telling you what to do with that information or making good recommendations, especially when we're talking about specialty crops. Now, a couple of them that I mentioned on our last podcast, they do a pretty good job for specialty crops, but not all the labs do. So yeah, sample soil report comes back and says we need fifty pounds potassium, is that right? Or is that really what you need? Probably not, probably you need to look at that a little bit closer, or you need to go back and tell them when you're putting in your soil tests or asking for a soil test, make sure that they interpret those the results for specialty crops, or garden, or grapes, or apples or whatever you're wanting the information for. So is that soil report, that 50 pounds? It's probably not.

**O** Olivia Hanlon 02:20

Okay, so when we're looking at those reports, what we do with that information is probably going to depend on whether we're growing fruits or vegetables correct?

**J** Joe Hannan 02:29

Yeah, so vegetable world is a lot easier to deal with when we're talking, adding nutrients to the soil, as opposed to fruit crops. And it's because with annual crops, we're tilling the ground, we can work the ground, we can add the nutrients and till those nutrients right into the soil. But when we're growing annual crops, grapes, apples, juneberry, and strawberries, we can't really go in and till those nutrients into place. So we're really limited when it comes to fruit crops, what we can do.

**O** Olivia Hanlon 03:03

Okay, so why is it so important to till in our nutrients?

**J** Joe Hannan 03:07

Yeah, so our phosphorus or potassium and our pH adjustment material, so sulfur or limestone, those are primarily what we're going to be adding or needing to correct within our soil. Phosphorus, potassium, limestone, sulfur, those are not water soluble, meaning they won't leak down into the root zone if you just apply them on the surface. So if you

apply nitrogen to the surface of the soil, and then we get rain, the rain will move that nitrogen down into the root zone, and then we'll get to the plants, but phosphorus, potassium, sulfur, and limestone, again, not water soluble, soluble. So rain is not really going to move those down into the root zone. So you have to physically put them into the soil. And so typically, we do that with tillage.

**O** Olivia Hanlon 03:59

Okay, that's good to know. So say we're looking at growing vegetables, what am I going to do with the information that comes back from the lab?

**J** Joe Hannan 04:08

In order to make decisions for annual crops with for vegetables from our soil report, we're really going to look in and focus on three values. We're going to focus on our phosphorus, our potassium, and our soil pH. Those are the three that we're really going to look at. For determining how much to apply, you have to look at what do you need to have in the soil for growing vegetables versus what you already have in your soil from your soil test. So with phosphorus, we're looking at about 80 pounds per acre of P that we want, actually in the ground from growing vegetables. So if we want to have 80, and our soil test comes back and says we have about 60. Well then simple subtraction says 80 minus 60, we need to apply about 20 pounds of P. For potassium, that would be we want to have about 350 pounds per acre. So let's say we had 300 pounds of potassium, K, already in the soil, then we would just need to apply an additional 50 pounds to bring it up to what we call optimum, where additional P or additional K, you're at optimum, really don't provide any additional yield output. So, of course, fertilizer is not sold as P and K, it's sold as p205. And k20, and it's often a mix of multiple nutrients all in one or when you're looking at compost or manure, again, those have N, P and K in there. And the ratios can vary a lot. Suffice it to say, going through math in a podcast would be really, really boring. But we have a couple of really good articles that work through and how to go through that math that are available. And Olivia, I think you can put those in the show notes if you would,

**O** Olivia Hanlon 05:52

Absolutely.

**J** Joe Hannan 05:53

Perfect. So I mean, that's that's what you're using, or how you're making those base decisions for annual crops. And then with the pH you're going to look at, ideally, you're

wanting your pH to be within 6.0 to 7.0, and even 6.0 to 6.8, preferably. And so then you're going to be looking at where are you with your pH? Are you above that range? Or are you below that range, if you're lower than 6.0, you're going to be adding limestone to bring the pH up. If you're above 7.0, you're going to be adding sulfur to bring the pH down. And then when you have those values, there's some really easy charts again, and one of the links that Olivia will include there that walk you through looking at the chart and making a determination for how much sulfur and how much lime you need to put on to bring the pH down or up depending on your need. Again, math on podcast, probably not so fun, but nice fancy little chart for their for pH adjustment work pretty well.

 Olivia Hanlon 06:52

Perfect, those are much easier to see than they are to hear.

 Joe Hannan 06:57

Yeah, and of course with again, with that P and K, any soil pH adjustments again, you're going to be applying those to the surface and then you're going to be incorporating them with disk or tiller or some other tillage type operation to get it down into the root zone.

 Olivia Hanlon 07:13

Perfect. So we covered vegetables a little bit, I would imagine that perennial crops such as apples and grapes are much more difficult to deal with if you can't till things in?

 Joe Hannan 07:23

Yeah, because we can't till things in we're really limited on what we can do. That goes back to harping on people to get their pH their PNK correct before they ever put a apple or grape or strawberry in the ground. However, nobody ever listens to me. So now we got to figure out how to deal with it when the plants are already in the ground and established in again, because it can't till our options are are limited. And then it further gets complicated, because cultivars will have a tremendous variability on how well they actually take up nutrients. So things like Honey Crisp, and Marquette are the ones that I always use for examples for apples and grapes. They don't do a great job of taking up nutrients when the pH is off. So you can have adequate potassium and adequate micronutrients and phosphorus in the ground, but you may not necessarily have adequate amounts of those nutrients being taken up by the plant and actually physically in the plant.

O Olivia Hanlon 08:26  
Could you give us an example of that, Joe?

J Joe Hannan 08:30  
I can. Oddly enough, I had one of these cross my desk just last week. So I have a solo report come back for grapes that was showing adequate potassium, adequate phosphorus, and adequate micronutrients, particularly boron and iron for one cultivar and then the other cultivar was just barely showing marginal. So you know, just looking at that information alone, you're like, Oh, this is gonna be pretty easy. We just need a little bit of potassium, we'll just surface apply that each year over the next couple of years and let it slowly kind of move down because it will move down. It's just really, really slow process. And then we'll just spray a little bit of soluble water onto the plants or boron onto the plants and easy peasy out of a problem.

O Olivia Hanlon 09:20  
Do you have a but to follow that sentence Joe?

J Joe Hannan 09:23  
I do have a but. So when you look at when I looked at the soil pH value, I can see this pretty high. The pH was about 7.3 or so. And then you go and you look at the location and this is up in Northeast Iowa, up in the Decorah area. And if you know your soils, you know that northeast Iowa down along the Mississippi River and then across up over in western Iowa along the Missouri River you know that those hills are limestone based, and so I saw that 7.3 there and like hmm, that 7.3 may not be accurate it could be coming false reading if they had put some previous sulfur on to kind of pull that pH down. But yeah, I was definitely concerned when I saw that pH was high. So I sent a note over to the farmer and just said, Hey, do you have full year samples that I can look at your soil report is telling me one thing, but I think there's more to the story. And yeah, I got petiole samples back the fullier samples back. And unfortunately, it wasn't just that I needed a little K or I need a little bit of boron, it was actually both cultivars were showing deficient in potassium and boron, I think even iron themselves even though the soil tests are showing that as I should've been okay. I definitely had deficiencies actually within those plants.

O Olivia Hanlon 10:46  
So in this case, you needed more than just the soil sample to tell what's really going on

with the fruit crop, then?

J

Joe Hannan 10:52

Yeah, and honestly, it's, anytime you're looking at a fruit crop, you should be looking at your historical fullier samples or petiole samples, whether it's apples, grapes, strawberries, because there's always more to the picture than just what you're seeing with with your soil samples. So really at the end of the day, I have very different recommendations for this vineyard because of the information that was showing up in that broader picture. And so when I looked at the actual recommendations, it was Yeah, we're gonna apply a little bit of sulfur to the soil just broadcast on the surface, again, because we can't till it in. And we're going to apply a little bit of potassium to the surface of the soil. Again, we can't till it in. So we're probably going to do that over each of the next several years in hopes that some of that will start to slowly move down. It is not a great solution. But it's kind of one of those things, that's as best as we can do on that end. So then we look at the micronutrients and micronutrient availability, micronutrient uptake in the plant is very much dependent on soil pH, but we're not going to get soil pH down anytime soon. So that means we now need to start thinking about foliar applying our micronutrients. So in this case, boron and iron, and those are two that we pretty much just assume we're going to have to apply when we're on a high pH soil here in Iowa. So my recommendation, then, in addition to the sulfur and the potassium applied to the ground was to come back in and start applying boron in your tank mix in the springtime, one week, then the next week, applying some iron chelate, and then the following week, don't apply anything and then got to go on a rotational cycle of boron on one week, iron one week, nothing. In order to kind of make up, feed those additional nutrients that the plant needs, but isn't necessarily getting from from the ground. So we know that potassium is low in the ground, or potassium isn't low on the ground, but it's not getting into the plant. So we can also add a potassium application in that full year, your tank feeding while we're spraying our insecticides and fungicides in the spring as well. So if you go and add boron into the tank mix one day, iron into the tank mix the next week, and then we can put some potassium into the tank mix the following week. We're not going to probably get all the potassium that we need from that foliar applications. But it should help a little bit. But potassium uptake via plant, again, that can vary a lot from cultivars to cultivar and even what type of product you're actually spraying on to the plant. So it should help, but it's not a great solution, either. But in this case, something needs to be done. So we need to attack it from multiple aspects.

O

Olivia Hanlon 13:45

So that gets a little bit complicated. Joe, if you could summarize that in a take home

message for us. What would it be?

J

Joe Hannan 13:52

Make sure that you've fixed your nutrient levels before you plant. I guess that's a smart answer for it. I guess the take home here is you know I get perennial plants on high pH and a little bit of potassium deficiency we need to probably be thinking about surface plane sulfur and potassium on an annual basis until things start to normalize and get down to where they want to be. And then also start doing foliar applications of boron, iron, and potassium, possibly zinc, foliar petiole samples will tell you that as well. So that's from the fruit crop, whether it's apples, grapes, strawberries. On the vegetable side of things, we can really take care of most potassium and pH issues during the offseason by applying and incorporating it into the soil. But on those high value crops, so really on those tomatoes, you should still be taking foliar samples during the season just to make sure we got things where they need to be because we can inject some additional micronutrients or some additional potassium in through an irrigation system to kind of help offset that a little bit more if we didn't quite get it perfect where we needed to be, especially when we're in a high tunnel or something where you're getting a lot more plant growth and just out out in the field. I'm not sure that was any shorter.

O

Olivia Hanlon 15:16

That was a great summary, Joe, thank you. Is there anything that we didn't get covered today that you wanted to add on?

J

Joe Hannan 15:23

We covered a lot, I realize it's complicated. But if you're growing vegetables, Ajay, Patrick O'Malley and myself, we're all happy to work with you during the offseason to look at those soil reports and even historical leaf sample, tissue samples if you want to help you kind of build up a fertilizer program and on the fruit crop side of things I'm very much willing to sit down with you in the offseason and kind of work on a program and try to figure things out for your specific location because things are so variable and it takes a little bit art a little bit of experience to kind of to get our soil nutrients where they need to be for our plants.

O

Olivia Hanlon 16:05

Alright, Joe, so for anyone who doesn't know where would they be able to find your contact information or contact information for Ajay and Patrick as well?

- J** Joe Hannan 16:14  
The show notes below might be a good spot.
- O** Olivia Hanlon 16:16  
That sounds great.
- J** Joe Hannan 16:17  
That's a great place for our contact info. Otherwise, we can be found on the extension Ag and Natural Resources webpage, but it's a little harder to find us there.
- O** Olivia Hanlon 16:27  
Absolutely. We'll make it easy for everyone and put you right below.
- J** Joe Hannan 16:31  
Awesome Olivia, much appreciated.
- O** Olivia Hanlon 16:34  
Alright Joe, thanks for being on today.
- J** Joe Hannan 16:36  
Yeah, thanks for having me. Sorry, this maybe got a little bit winded and we'll see you next week.
- O** Olivia Hanlon 16:41  
Bye Joe.
- S** Speaker 3 16:42  
The resources mentioned in this episode can be found at:  
<https://www.extension.iastate.edu/smallfarms/interpreting-soil-reports>  
<https://www.extension.iastate.edu/smallfarms/managing-soil-ph-horticultural-crops> The contacts mentioned in this episode are: Joe Hannan | [jmhannan@iastate.edu](mailto:jmhannan@iastate.edu) | 515-993-

4281 Ajay Nair | [nairajay@iastate.edu](mailto:nairajay@iastate.edu) | 515-294-7080 Patrick O'Malley | [omall@iastate.edu](mailto:omall@iastate.edu)  
| 319-337-2145



Joe Hannan 16:42

Bye.



Speaker 3 16:45

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