

511 Building Disease Suppressive Soils (Agronomy Focus Mar 2023) – Plants Dig Soil Consulting Ltd.

#RealisticRegenAg | Disease suppressive soils are ones that would fend off diseases before they even had a chance to get into your crop plants. I think this is a worthwhile goal to work towards in regenerative agriculture. But of course, it's not going to be simple and it's not going to cover everything. In this episode, I'm going to go over all of the different ideas that I have seen come up over the years and talk about the plausibility of them. Stay tuned. I will cover this all in this episode

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Hi, my name is Scott Gillespie of Plants Dig Soil, the name of the podcast and the consulting company. We're an independent agronomy company. We do not sell products. We provide advice only. We focus on #RealisticRegenAg which has to be proven and profitable. We work in person or remote or a combination of the two. Our pricing is set to be affordable to anyone from a Q&A package to full farm planning. There's no long-term commitments, you can retain our services, do it yourself or hire others. Of course we always love to work with people over the long term.

Let's start out with cover crops. I hear often the phrase get the biology working for you. And it's used in the context of many things. Most of the time it's in with nutrients where if you get the biology working for you, they'll just take care of all the nutrients for you. It can also be applied into disease suppression in the general sense, it would be analogous to being in a crowded street versus an empty street. If you have a bunch of people around, it is safer than being in an empty street where you're not sure what's going on or someone could attack you. I think this is the idea of a general disease defense. You have more biology working in your soil and the theory is you'll have less chance for getting into your crop. This does have potential but it is not a guarantee. And I think it's also something that will build in a system over time as you build up the organisms that work best for you. But as a caution, it one time is

not going to just take care of all the disease in fact, it could make some diseases worse, which I have heard some anecdotal evidence of this happening in a farm system. Now cover crops could be used for specific things and I will cover this further in the next slide. But it's in this context, a cover crop could be one, it's usually one species or a few species that target one particular thing. So the problem is it's finding which ones are going to work and getting them to work ahead of the crops that you are planting. And as a caution, like I don't doubt that this could work and could really help us out but the research is only just getting going on this and it needs to be locally adapted because I have seen a presentation I saw once where a cover crop in Europe was found to be decreasing a disease it was brought to Canada and the researchers actually increased the disease in the context. So something about the climate and probably with the particular organisms or the mix of organisms had the opposite effect. So just because something works in one area doesn't mean you should just bring it over and expect it to do the same thing. It needs local research to validate.

The one system that I have seen that has been very thoroughly tested and very is being implemented by farmers is out of Washington and it's using mustard that's high in glucosinolates. Which, as far as I understand, these are the chemicals that make it strong to us and when they're very high. They are tough on our bodies and are not good for us to eat. But when they are used in the context of bio fumigation, they can have a great effect. So this is where I have heard people talk about putting in cover crops with mustard in it or with brassicas in it which is the larger family and they think they're gonna get a bio fumigation effect, but it only works under very specific circumstances or at least the circumstances have to be just right for it to do what they're looking for. So this is in the context of potatoes it takes care of some of the potato diseases. There research and the experience is that it has to get to huge biomass. So in Washington, this can be done under after a winter crop. So after a regular cash crop, you can grow this in the summer and fall and get this effect in my area. In Alberta. There wouldn't be enough time to grow this. You would have to take an entire year out of production to do this. That being said if it gives you more benefit from your potatoes in the following year than you would have got from a cash crop and then by all means it's a great thing to do. So the specifics are it must be first of all the variety that is high in glucosinolates. So there's very specific varieties that work best. It has to grow to one to two meters high. So you have to get large biomass. It has to be an early flower not too far along but just at its flowering stage. You have to mow it and chop it and it's very specific. It has to be disced in within an hour or really within minutes if the disc is following the chopper because you're actually doing kind of a bio hack year. You're fumigating the the soil with a chemical which is very similar to the commercial, synthetic chemicals in the soil so it needs to get in the glucosinolates need to be released and they change forms within the in the soil rapidly. And for some reason it seems to kill more of the harmful organisms and less of the beneficial ones. So potatoes tend to grow better after it and have less disease.

So that is a very intensive system doing the green manure, biofuels again or or trying to grow cover crops in, in a system or try to add them in for general or specific impacts. Of course, everyone wants to know is there just something I can put in the soil that bypasses all of this and it's generally referred to as bugs in a jug. And it's because there's it's every biological seems to have something in it and it's, it's referred to it as this. So again, there's general and specific, there's one set have many different things in there and the hope is that something there is going to help your soil or fend off the disease. There are specific ones that are being developed. As far as I have seen, there's nothing commercially successful on this, but if you know of it, please let me know. And as far as I've seen, there's a few different or there's two different ways that it could be formulated that could be living organisms, which of course make it was much tougher to make it work because you have to follow you have to keep them alive and get them into the soil. dead ones are ones where there could be the chemicals that they produce that is

actually getting put into the soil or used on the crop to to have a similar effective disease control as a synthetic chemical, except that in this case, it's come from a biological source. Now my perspective on this is that the soil is so vast, and it's going to be so hard to change things in the soil with just a small amount. Usually these are applied at milliliters per acre, or liters per acre or grams per acre. Very rarely more than that and when you consider that in soil in the top six inches or 15 centimeters, has a million kilograms of soil and you're putting in grams or kilograms it's it's a huge dilution factor and the the native biology in there is going to quickly overwhelm it. So where I see a lot of these working, or where I see the potential of it is in seed treatments because it's a very, very tiny amount needed and what you're putting into the soil and it can quickly inoculate and proceed as it's growing. If it is one that is going to help it it could go in furrow so it doesn't have to go on the seed but just right, sprayed in or or dropped into the soil right near the seed. I think those ones have the potential compost teas. I'm still skeptical of them. I think they can work in very specific circumstances. But the caution that I have heard is that you have to be really careful of what you're putting into that what you're spraying onto your plants or onto your soil. You might have brewed up a pathogen or in the case of food safety, if you have used manure in your system or in your compost and there's E coli in there, you might be spraying your vegetables with E coli, which is going to cause problems when the humans go to eat it. So nobody wants that. And so in my perspective, I think there's potential in this but for right now, until I see something that has good testing data, or has been locally tried in field scale trials, I'm gonna hold off on it but again, I'm always I'm always on the lookout for something that has potential

Now let's talk about amendments. Now this could be manure compost or a newer one is called digestate, which comes from bio reactors. It's what's leftover after the microbes break it down and produce the the bio energy there could even be sewage sludge is also put into this category. As amendments that comes with its own issues with potential of high metals and pharmaceuticals that come from the from the human sewer systems. But adding these is actually adding organic matter because we're not talking about grams per acre. or kilograms per acre. We're talking about tons per acre, usually that are applied of these. Now, there is an idea or there's it's put out like they do, they do bring their own biology into the system. But from what I can understand, again, it's very quickly overtaken by the native biology. So if you think about it, there are going to be specific organisms that come with compost or come with manure, but their purpose or their niche was growing in that particular environment. So they might help to break it. Down. But once it's broken down into its smaller components or into small particles, then what is in the soil is going to take over, but it can have a big effect in in in making your soil more resilient by bringing this back into the system. It's bringing carbon it's bringing nutrients, it's bringing micronutrients. And overall if you're not bringing a pathogen in, you can highly benefit your soil. Now there are some pathogens that can make it in in potatoes powdery scab can come through manure, so you have to be cautious in what you bring in. In a potato rotation. It's definitely going to be the highest risk if it's brought in right before the potatoes but even then these pathogens they have very resilient resting resting structures so they can sit around for a while. So again, it's it's not a it's not something that is just automatically a good fit for the system. You need to think about it before doing it. Now why I am a big fan of amendments is what I have seen is that in fields that are now or that were once small divisions when they were when they were first set up or when they were when they were created now people have taken down fences and made them larger for large equipment. I can see the old the old feed or the not really the feedlot but the the area where the animals would have spent their winter or where their manure was wherever it was closest to the yard or the areas that were closer to the yard those little divisions always got more manure. And I see this effect for 5, 10, or sometimes 20 years later, when I look at satellite images of fields, and I can I have went out and I have soil sampled these separate areas. And they don't show a huge difference in nutrients. Sometimes they'll show higher phosphorus so that means they had excessive amounts, but in general

they don't have anything very easy to figure out what is going on. There is something with the manure or with the animals that does help with these fields. So in my perspective, if you're looking for a disease suppressive soil, stick to the basics or stick to the tried and true which is manure compost if you can get it out there. Cover crops if you can get it out there. The biochar biologicals and the newer stuff. I think we need to evaluate them, but they aren't. They aren't something that is going to be a miracle cure.

This brings me to my last point, which is proper crop rotations. I've been told if you have if your crop rotation is just two crops, it's not a rotation. It's just a flip flop. If you're going between corn and soybeans or say in the prairies going between canola and wheat, and you're just going back and forth between the two money making crops, you're going to get disease build up and there's not a lot you can do about that. Again, if you put pulses pulse crops such as the peas, beans, lentils, even soybeans are in the same family. They're technically not a pulse because we don't eat them directly. But any of those type of ones they seem to build up disease faster. So having them out at least to a four year maybe even longer. Rotation is really going to be the best thing and I know that this is a challenge because local markets may only take certain crops or it maybe it is very tough to grow. Put in the diversity of rotations but I think you need to look at what you can do and see what can build your soils over the long term. Now this is where I think cover crops could fit in. But again, as I said the research is just just getting going on this. It could be a way to break up these shorter crop rotations by putting a different plant in there that could have a similar effect as having a long or a full season crop in there. But again, it's in its infancy and but I see the potential it seems like cereals before and after anything works. So if you can at least break your cereal crops up with one year then they seem to be fine in a shorter rotation but then that allows you to put canola or peas or some other type of pulse in there. On a four year rotation or even longer. Now I know this is challenging to get into grazing or put a green manure year in. But the evidence coming is that it really does help. If you could break up say a four year rotation with one year of green manure grazing or add a perennial phase into your rotation where you can put say two to three years of a perennial. That's going to be one of the greatest ways to break up your disease cycle. But again, the economics make it tough for this to work. So there's, again this is what we come up against in agronomy consulting is that there's the best way to do it but then the economics sometimes push against it. This shows up in our human health as well. We probably know what the best foods to eat are and the best exercise to do or movement to do. But it may be economics it may be cost but also maybe motivation to do to do what is the best thing rather than what's the easiest to think. So there's no easy answers to it. But putting all of these practices together we should be able to come up with with a disease suppressive soil and work over the long term to make it economically viable for the farm. So I'd welcome any comments or any any stuff that you've seen work or things that you are seeing promising so please get a hold of me there's links in the show description. If you can't see that it's scott@plantsdigsoil.com Or just go to the website or search out plants dig soil in a browser and you'll find my website. So I will talk to you next time.