

539 N2O emissions, disease control with composts, and using tillage responsibly

#RealisticRegenAg | In this month's regenerative agriculture news, I have six stories. I'll start with some new research that shows that cover crops may not be a net benefit to the nitrogen loss equation. While they can prevent leaching, they may contribute more to nitrous oxide emissions. On the topic of nitrous oxide emissions, work in the Prairies is continuing to show that inhibitors work to reduce emissions. However, the yield impacts for producers are not worth the cost of using them. On the disease front, promising work shows how a specific combination of compost inputs may tackle one of our toughest potato diseases. This dovetails well into another story about biodiversity. It's not about putting everything into the system and looking for resilience; it's more about finding the right combinations that lead to the desired outcomes. This principle has been used by a farmer in Ontario who has gone back to tillage. As I've talked about before, it's not about no-till or reducing tillage; it's about using it properly. Finally, I'll point you to an article that discusses future forecasting and the problem of assumptions.

Welcome to Plants Dig Soil, a podcast about #RealisticRegenAg. I'm your host, Scott Gillespie, and I'm an agronomist from the western Canadian prairies specializing in climate-smart agriculture. I discuss scientifically proven practices that benefit the planet and, just as importantly, farmers' economic sustainability. Be sure to visit my website, www.plantsdigsoil.com, for resources and information about the services I offer.

Transcript is available:

<https://www.plantsdigsoil.com/podcast/n20-cover-crops-manure-tillage>

Articles mentioned in the podcast:

<https://access.onlinelibrary.wiley.com/doi/10.1002/ael2.20103>

<https://canadianagronomist.ca/reduced-emissions-with-eef-fertilizer-but-little-agronomic-benefit>

<https://www.potatoesincanada.com/poultry-manure-and-potato-early-die>

<https://csanr.wsu.edu/whats-so-good-about-biodiversity-in-crop-production>

<https://organicalberta.org/article/well-chosen-tillage-part-of-organic-familys-innovative-crop-system>

<https://tdaynard.com/2023/10/26/serious-flaws-in-new-ontario-report-on-climate-change-and-ontario-agriculture-and-food>

My consulting packages:

<https://www.plantsdigsoil.com/pricing/#consulting>

My funding service offerings:

<https://www.plantsdigsoil.com/pricing/#paperwork>

SCAP overview: <https://youtu.be/OicitHJR2Ik>

SCAP program details <https://www.alberta.ca/sustainable-cap.aspx>

My course: Profitable From the Start: Cover Crops for the Prairies:

<https://plantsdigsoil.thinkific.com/courses/cover-crops-prairies>

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<https://www.linkedin.com/newsletters/6944029544697802752>

Email: scott@plantsdigsoil.com

X (aka Twitter) (Scott): <https://twitter.com/scottcgillespie>

X (aka Twitter) (Company): <https://twitter.com/PlantsDigSoil>

LinkedIn (Scott): <https://www.linkedin.com/in/scottcgillespie/>

LinkedIn (Company): <https://www.linkedin.com/company/plants-dig-soil>

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So let's start with cover crops and nitrogen losses. The most popular cover crop by far is cereal rye, known as fall rye in Canada. It is used more in areas with milder winters and in areas that tend to deal with excess moisture. Farmers have been using it because it provides tangible benefits. While many may have started using it because of financial incentives, they continue to use it because they see their farms working better.

The main benefits I've seen are that it uses excess water and captures nitrogen that would otherwise be lost to leaching deep in the soil. This is a crucial benefit as it helps society by keeping nitrates out of the groundwater. When this groundwater is used as drinking water, high nitrate levels can be poisonous, especially to infants.

It doesn't seem like there could be any drawbacks, but it appears there could be some. I was surprised when I first read this and had to read it a few times to really grasp it. New research is showing there is a tradeoff. While leaching was reduced, emissions increased. Nitrous oxide is one of the more potent greenhouse gases, so this isn't just a loss of fertilizer; it's fixing one problem and contributing to another.

This research just covered this issue, and I did see some criticisms online of the amount of fertilizer used in the study. Perhaps if less were used, emissions would be lower. Also, if inhibitors were used, there might be fewer losses as well. This leads right into the next story I have about research on nitrogen inhibitors.

While they do work well in wet areas with greater loss mechanisms, they do not provide much benefit in the arid Prairies of western Canada, where I work. They still provide nitrous oxide emission benefits when we have a wetter year. However, overall, there is no economic benefit to the farmer.

This is a tough problem to solve as there is an external effect that farmers should be trying to mitigate, but it's an unseen benefit. When nitrogen leaches into groundwater, it can be measured, and the effects on the local community are real. When some of it gases off and ends up in the air that circulates all over the world, it's impossible to feel the effect.

Let's move on to something that has a real impact for farmers. Early die is a significant problem in potatoes. The first year a field is used for potatoes, it almost never shows up. With every subsequent crop of potatoes, it gets worse. Growing at least 3 years of non-potato crops between potato years can

slow it down, but it always seems to increase. As long as I've been working in potatoes, it's been the one thing that people are trying to solve.

New research out of Michigan is looking at a possible solution to this problem. There is a specific compost blend from a company that seems to help. It doesn't lower the disease-causing organism, *Verticillium dahliae*, but it seems to shift the microbiome to make it less favorable for the disease to take root. Poultry manure seems to be the key ingredient in the mix, but the researchers caution that this does not mean we just need to apply poultry manure. The story was mostly about the new grant they have received and what they are planning to do with it. There is something there, but they want to understand what is doing the work.

As I said in the introduction, this dovetails well into an article about biodiversity. In agriculture, it's not about getting the most things out there and expecting the system to adapt to our needs. It's about finding the right combination that works for our goals.

In the case of the poultry manure, some could say it's all the organisms it brings. Or, they could say that if we mix it with many species of manures, we'll get the best one for the job. The evidence so far is that poultry manure sets back a nematode that helps accelerate a fungus that causes early die. Skewing the manure to have hurt the nematode helps us. If we had a diverse range of manures and one promoted the nematode, it would hurt our goals of growing more potatoes.

The next story I have is about tillage. Organic growers still use a lot of tillage as they don't have the chemical controls that conventional or regenerative growers have. Over the past few decades, there has been a lot of research trying to make no-till work in organic systems. The primary way was to use a roller-crimper that kills fall rye and leaves a mat of mulch on the ground. While this can work well in warmer areas, farmers in cooler climates struggle to make this work as the ideal time to kill it is much later in the season than crops are usually planted.

A farmer in Ontario found that taking the rye as silage allowed a more timely planting of the soybeans. There is some regrowth of the rye, but since it's lost nearly all of its above-ground growth, it is seriously impeded. A quick discing sets it back and controls any weeds that have escaped the cutting. He's also wondering if the stressed-out rye is still producing the chemicals that impede the germination of many weeds. These allelopathic chemicals have little to no effect on soybeans, so the crop is favored, and the weeds are not.

Finally, I want to leave you with an article about trying to forecast the future. We can see many reports that paint a dire picture of the future. The problem with any report is the data used and the timescale of prediction. The report is 505 pages long, and I have no intention of reading it. It's specific to Ontario agriculture, and Terry Daynard has already read it and has done his analysis of it. New data was available that the authors of the report did not use. Instead, they favored the worst-case scenario.

They also seemed to miss context. Even in the worst-case scenario, parts of Ontario will be similar to present-day climates in Illinois and Missouri, where the same crops - corn, soybeans, and wheat - grow very well. The report authors are also extrapolating to the next century. Take a look at agriculture in the 1940s and compare it to the present day. There has been a lot of innovation and adaptation.

Thanks for joining me in this monthly roundup of regenerative agriculture news. The links for all of the articles will be in the description. I encourage you to read them yourselves. Let me know what you think. You can comment on whatever platform you are reading, listening, or watching this on, or you can come to my website and send me an email. While you're there, if you aren't already signed up, check out my monthly newsletter and sign up. A new one will be coming out next week.

On the agronomy business front, the snow has come, and while the ground isn't yet frozen, it will be soon. Things slow down a lot for me now, and I will be concentrating on some client work and reading the books that have been patiently sitting all summer, waiting to be read.