Transcript of Episode 009 of the Plants Dig Soil podcast – "Beyond Cover Crops"

Hello! This is Scott Gillespie and welcome to the second season of Plants Dig Soil. In this podcast, you will learn ways to transition from conventional to regenerative practices in agricultural, horticultural, and home gardening systems.

[Transition Music]

When I talk to farmers, I find that cover crops are sometimes not very well understood. It's just seen as something you put out to cover the soil. Usually, the goal is to do it for the lowest cost. There's not a lot of value seen in it. They are sometimes seen in a negative light. The common reaction is that they tried them once but they didn't see the benefit. The cost of the seed was greater than what they got back. Or perhaps the crop grew but then they had a hard time managing it in the spring.

I can understand this. I had that experience last spring with my own garden. I was so happy to see the cereal rye growing through the snow as it melted. I had lots of green! But then when I went to plant my vegetables the root masses were so thick it took a lot of work just to get them out of the way and I ended up with lumpy and dried out soil.[1]

Let's start out with what a cover crop is. A cover crop is something that is growing while the cash crop is not growing with the main purpose of protecting the soil. It may provide some other benefits but the main purpose is to protect the soil from erosion. Protecting the soil is very important, don't get me wrong on this, but if your only purpose is to hold the soil in place you are just sustaining the system.

To move to the next level, you need to be planting a soil crop. To me, a soil crop is something that is grown to regenerate the soil. It needs to go beyond a standard cover crop that is there to protect the soil. Have you heard of a soil crop before? I haven't found anyone refer to it but I think it better captures what we are trying to do. Let me know – scott@plantsdigsoil.com or catch me on Twitter on LinkedIn by going to the links on my site: www.plantsdigsoil.com.

Most soil crops stay in place and are killed by chemical or mechanical means prior to planting, if they don't die over the winter. They do their job by having a living plant on the ground sending carbon down to the roots and keeping the microbiology working.

A special type of soil crop is a green manure. Green manures are different than most crops in that they require the above-ground biomass to be tilled into the soil. This is a bit of a bio-hacking technique – it's not the roots of the crop that are doing the job. It's the tissue going into the soil that does the job. In the case of mustard-based biofumigants, it's the by-product of chopping and incorporating the crop into the soil ahead of a potato crop that does the work.[2]

Before we go too far, let's define a cash crop. These are the crops that we intend to harvest. As a home gardener, they would simply be a crop because you intend to eat it, but for everyone else, including market gardeners and farmers, it's a cash crop. Most of the time the crop is edible but it can be for other purposes such as cotton or tobacco. An edible crop may also be used for

purposes other than human consumption. Corn is commonly grown for animal feed and it can also be used to make fuel in the form of ethanol.

In most cases, there's just one part of the plant that we are using but there are some cases where many parts are used. Hemp has the potential to provide food from the seeds, fibre for textiles from the stalks, and medicine in the form of CBD from the stalks. Its cousin, marijuana, is a very different plant and only has one desired product – THC.

Ranchers grow crops for feeding their livestock but the line can get blurred very quickly on whether it is a cash crop, a cover crop, or a soil crop. If all of the above-ground biomass is harvested and taken for animal feed, I'd consider it to be a cash crop. If it's used on-farm it may not be thought of as a cash crop because no sale takes place, similar to the home gardener taking vegetables from their garden and eating or feeding to their family. It's still a cash crop – something has been harvested and exported from the field.

Ranchers may also grow perennial crops that are grazed by animals. If the intention is to graze for maximum animal gain, I'd still call it a cash crop. If you need to add fertilizer to replace what is taken so that the next crop grows well, it's a cash crop. If the intention is to only graze what the system can sustain and let it feed the soil it could be considered a dual-purpose crop – both cash crop and soil crop. For an excellent discussion on this topic and some numbers to back up nutrient and carbon flows, please check an article by Andy McGuire called "How does regenerative agriculture reduce inputs?"[3]

I often hear of ranchers grazing their cover crops. In the Cover Crop Economics report[4] by SARE (Sustainable Agriculture Research & Extention) they give this as an example of a way you can help make cover crops pay quicker. The caution I'd give is that if you take more than it gives back you're no further ahead. If you plant a mixture of plants and take it off as annual forage, it's really a cash crop.

Grazing systems, whether perennial or annual based, can have a net gain to the soil over systems where a crop is left ungrazed. Some plants do more for the soil when they have some of their above-ground biomass eaten. This can be simulated by mowing the soil crops as well. At flowering, the crop is putting its energy into seed production and giving it a reset will stimulate more root growth. Just like grazing, if too much is taken off the plant and it spends too many resources replacing its solar panels, the leaves, it won't do as much for the soil. Grazing or mowing can also be a management option to prevent seed set. A soil crop that becomes a weed when trying to grow your cash crop is a problem.

[Transition Music]

Are you still with me? It can get confusing but the basic concept is to look at crops as cash crops that we use, cover crops that sustain the soil, and soil crops that regenerate the soil. Think of the intent and it will help you to classify it.

Just while we're taking a bit of break have you signed up for my newsletter? I'll remind you at the end of the show again but it's a great way to keep up with the latest episodes and some articles to get you thinking. I only send it out once a month so you won't hear from me often. If

you're subscribed to the podcast already – thank-you! If you haven't, please make sure to hit the subscribe button on your favourite app. Just like the newsletter, you'll see a new episode only once a month.

Now, back to the show!

[Transition Music]

Let's move on to ways that can be used to fine-tune the system.

Intercrops have been gaining popularity in the Canadian Prairies for a few years now.[5] The most common one is dry pea and canola. It's sometimes referred to as peola. Dry peas are the ones that you buy in the store as split peas – they are not the fresh ones harvested from the garden. Dry peas can also be used for animal feed.

In the case of a pea/canola intercrop, the canola can provide a scaffolding for the peas to climb up. This keeps them further away from the ground and can help prevent disease. It can also help harvest because the combine header picks up more of the crop and may not have to cut so close to the ground. One of the barriers to intercrops in the past was the machinery to harvest two crops at once and the ability to separate it for storage but innovative farmers have mostly solved this.[6]

Even though canola is not known to form mycorrhizal associations there appears to be some exchange of nutrients between the two plants. It could also be that each of the plants can use parts of the soil that the other can't. Rooting depth is a factor as well. Canola can go deep for nutrients and water whereas peas stay more shallow in the soil.

One unexpected benefit is insect control. Farmers and agronomists observe that there is usually less pest pressure in intercrops. They have even seen lines in the field where insects are at much higher levels in a monoculture check strip. I have not found any studies on this but it appears that it has caught the attention of researchers and may be studied in the future.[7]

We may think this is a new idea but it has been around for thousands of years. The classic example is of Indigenous plantings of corn, squash, and beans together. The corn gives a trellis for the beans, the squash spreads out to suppress weeds, and the beans may give some nitrogen to the other crops. A book that I have on my reading list and have not gotten to is "Buffalo Bird Woman's Garden".[8] When I've read that I should be able to provide some more insight on how intercropping may work.

I've changed my own garden to try to take advantage of this. Instead of having blocks of certain crops that I rotate around, I scatter the rows around the garden. A row of carrots may have tomatoes to one side and lettuce to the other. Sometimes I try to grow crops that spread, like pumpkins, near early harvest ones, like garlic so that they take up the space vacated by the early crop. Each row could have a mixture of crops in it but I learned last year that competition and different harvest times complicate this unnecessarily.

Another practice to fine-tune the system is companion cropping. It may look similar to intercropping but there is a difference. In companion cropping, at least one of the crops is not

intended to be harvested. A companion crop is something that is planted for the benefit of the cash crop. It might have some soil building properties but the main purpose is for it to be a benefit to the cash crop.

Brendon Rockey is a potato farmer in Colorado who has been adding companion crops to his potatoes for years.[9] The main goal is to give a food source to beneficial species so that they are established in the crop and ready to eat pests when they arrive. Added benefits may include nitrogen from legumes, keeping the soil more mellow for harvest, and using up excess moisture after the potato crop dies down if a large rain event happens. All of these benefit the crop in that they make it more likely that he will harvest a high quality crop and a high tonnage crop from his land.

A practice that I have seen develop over the past decade is to grow a fall rye crop, crimp it with a roller in spring at pollen shed, and then plant a soybean crop into it.[10] The rye is killed but acts as a barrier for weed growth along with holding in soil moisture and giving protection to the soil from erosion. It is generally referred to as cover crop no-till but I think it should be referred to as a companion crop. It is there to provide a benefit for the crop, not necessarily the soil. It will still help the soil, but the primary function is to benefit the crop.

Relay cropping is gaining popularity and is something that I am doing in my own garden. Relay cropping involves planting the next crop among the existing crop. I use it to establish the soil crop in my cash crop. Once my vegetables have been established and are growing I plant my soil crop between the rows. It sits there not doing much because the vegetables have the head start on nutrients, moisture, and sunlight. But as they mature the soil crop is right there ready to take over. Once I've harvested what I need they can take over and get working on my soil.

In areas with longer growing seasons, this can be a way to harvest two crops in one year from the same land. One farmer has a system to establish soybeans in his winter wheat so that they are ready to go as soon as the wheat is harvested.[11]

Could something be a companion crop, a relay crop, a cover crop, and a soil crop? Corn farmers have been establishing what they call cover crops in the corn crop after weed control but before it gets over 30-60cm (1-2') tall. I'd call this relay cropping. In this case, it could be also be called a companion crop if it's providing shelter and habitat to the ground beetles and other insects living near or on the soil surface. These insects may be eating weed seeds and the cover over the soil may help to suppress weed growth. When the corn is harvested this inter-seeded crop could be considered a cover crop as it prevents erosion from wind or water. If the shoulder season goes long enough, or if it can overwinter and resume growth in the spring it could be called a soil crop if it provides some extra nitrogen, carbon, and microbial biomass to the soil.

That's enough different crops for now. What have I missed? Is there anything you think I got wrong. Let me know – scott@plantsdigsoil.com or send me a message through LinkedIn or Twitter. Check the episode description for direct links.

As a quick summary, remember to think of the intention when labelling a crop. A cover crop is planted to sustain the soil. A soil crop is planted to regenerate the soil. A companion crop is

planted to benefit the cash crop. An intercrop is two or more cash crops that provide benefits to each other. And a relay crop is one that is established within the growing crop so that it can take over as the current crop matures.

[Transition Music]

Remember to get local advice before acting upon this information. If you don't know who to talk to, get a hold of me and I'll help you find someone. If you're in my local area and are in need of help, contact me. It's always free to chat. If we get to the point that the scope broadens to consulting work we can work out a plan that fits your budget.

Would you like to keep up with me through a free monthly newsletter? Go to www.plantsdigsoil.com/contact and select the newsletter option. If you haven't subscribed to the podcast yet please make sure you do that in your favourite app. New podcasts come out once a month so, just like the newsletter, you won't be overwhelmed with information.

If you're still listening you're probably like me and like to know what the catch is. Why am I putting out this information for free? The reason is that I love to learn and I love to share the information. My knowledge has been built up from experiences in my own garden, advising farmers and agronomists in my consulting business, and from reading the latest books and articles on agronomy and regenerative agriculture.

I have a B.Sc (Agr) with an agronomy focus and M.Sc with a focus on Plant Science. Beyond my formal education, I have attained and maintained my Certified Crop Advisor designation and am a member in good standing with the Alberta Institute of Agrologists.

Nearly everything I talk about is from free resources posted to university and research organization websites. Books that used to be hard to track down are available to buy or borrow for nearly anyone with an ereader. The information is out there – sifting through it all is what takes the time.

I make a living entirely from consulting. I don't sell any products, software, or systems. I strive to be as independent and as unbiased as possible so I can provide the best advice to my clients and help as many people as possible move from conventional to regenerative agriculture.

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[1] Scott Gillespie. 2019. 006 Lessons Learned in 2019.
https://www.plantsdigsoil.com/podcast/006-lessons-learned-in-2019

[2] Andrew McGuire. 2016. Using Green Manures in Potato Cropping Systems.
http://pubs.cahnrs.wsu.edu/publications/wp-content/uploads/sites/2/publications/FS218E.pdf

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[4] Sustainable Agriculture Research & Extention. 2019. Cover Crop Economics.
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[5] Lana Shaw. 2018. Intercropping Pulses and Oilseeds. http://agriarm.ca/wp-content/uploads/2018/01/Intercropping-Pulses-Oilseeds-Lana-Shaw.pdf

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[7] Alexis Kienlen. 2020. Seeding rates and economic thresholds to combat flea beetles. Farming Smarter 2020 P.6 https://www.agcanada.com/digital-edition/farming-smarter_2020-03-09/

[8] Gilbert Livingstone Wilson. 1917. Buffalo Bird Woman's Garden. http://digital.library.upenn.edu/women/buffalo/garden/garden.html

[9] Start at his site then look for videos on YouTube for more information: http://www.brendonrockey.com/rockey-farms.html

[10] Erin Silva. 2018. Organic No-Till Production. https://youtu.be/d1v2hROGVEE

[11] Regenerative Agriculture Podcast. 2020. Relay Cropping Grain with Jason Mauck. http://regenerativeagriculturepodcast.com/relay-cropping-with-jason-mauck