

Plants Dig Soil | Season 4 | Episode 2 | 026 Cover Crops in a Drought | April 4, 2022

Hello! This is Scott Gillespie and welcome to the fourth season of Plants Dig Soil. In this podcast, you will learn how to think critically about regenerative agriculture claims so that you can apply proven and profitable practices that benefit your farm now and in the future.

[TRANSITION MUSIC]

I've spent the past five years thinking about how cover crops fit into an area that doesn't get much rain. I live in what is called a semi-arid area. It's not quite desert, but it can be close at times. Over the past few years, it has been much closer to desert than vegetated area.

In the spring of 2021, there was a slight greening of the landscape, but it didn't ever get above the brown stems and leaves leftover from 2020. As the heat dome settled upon us in June the plants decided to cut their loses and pack it in for the summer. There might have been a greening in the late summer when some rains came, but as far as I saw they just decided to wait until this year.

Unless we get a long, soaking rain, when the ground thaws, they are likely to be disappointed again. Snow does not melt into the ground when it is already frozen. Besides, our strong, warm, Chinook winds have dried up the snow multiple times this winter; most often leaving a dry and barren landscape.

My area is in the traditional area of the Blackfoot people, in what we now call Southern Alberta, Canada, just north of the Montana, United States border. Of course, before a line was arbitrarily cut across the landscape, this was all one area. There really is not much difference between Alberta and Montana in what is now a borderland. In the past, it was the heartland of a region.

One of the early colonial explorers has his name permanently attached this area. He described it as a place not suitable for settlement. In doing some research it seems there's no exact area attached to the area, but it roughly corresponds to what we call the Brown soils of Western Canada. If you imagine a line starting east of Lethbridge and running up to Red Deer then slowly falling southeast through Regina and then tapering off in the southeast border of Saskatchewan you would have a pretty good idea of Palliser's Triangle.

Captain John Palliser came through in the middle of the 19th century in what turned out to be one of the drier times. As settlers moved in later in the century it seemed he was wrong: There was ample rain to grow a crop. There was a theory that the rain followed the plow, and that good agricultural land would follow wherever the land was broken. This proved to be wrong when the dust bowl of the 1930's set in.

A strategy to cope with the lack of rainfall was to use fallow cropping. A cash crop was only grown every other year. In the interim year, the land was left without plants with the idea of conserving moisture. Tillage was initially used as a way to kill the weeds. As herbicides were developed last century, they were increasingly used to control the weeds in the fallow year. This system worked, but it was burning up the organic matter in the soil. The benefit to the farmer was that nutrients were released each fallow year for the coming cash crop, but this was at the expense of carbon as well from the soil.

Fallow has been discouraged for decades and instead a system of no-till, synthetic input additions, and continuous cropping has been developed. As the cover crop craze has moved its way north the idea has been to just "copy & paste" what has been done in other areas. When the cash crop is harvested you plant a cover crop. The problem has been that the land is usually dry, and the weather is still very hot

then. Hardly anything will germinate at that time. If it does germinate when the fall rains come it hardly has a chance to grow before the frost, freezing temperatures, and snow settle in.

It's on this history that I came upon a very interesting study. I first heard of it a year or so ago and have been thinking about it ever since. The idea is to bring back the idea of fallow, but instead of thinking of it as a brown period, think of ways to bring some green into it. Instead of mining the soil's organic matter for nutrients, use the plants to add organic matter and nutrients.

The first objection to this is likely going to be that it will use the moisture you are trying to capture. To that I respond: You will never capture all of the moisture that comes. A portion of it is evaporated off. If you use a lot of tillage, it is probable that the majority of your moisture is lost. Losing moisture to evaporation contributes to another problem that semi-arid farmers deal with: Salinization.

When moisture is wicked through the soil it comes with salts. When the water evaporates, it leaves the salt behind. Salt patches don't show up in one year. They take decades to form. They appear seemingly out of nowhere when the point is reached that it starts to affect plant growth, or you see the white powder sitting on the surface.

You can't solve this problem with cover crops, but they can help to prevent it. Deep rooted perennials that slowly creep into the area to lower the water table and rains to flush the salts deeper is the only real solution to salinity. By having a plant growing and using the water that would normally be evaporating off you help to prevent this problem from happening.

That's the theory, the practice is so much harder. You'll need to learn to judge situations each year. Some years you'll kill too early and miss some extra weeks when it could grow. Some years you'll kill too late and not leave enough moisture for the cash crop the following year. Some years it won't matter what you do because you'll get a Prairie thunderstorm pop up and dump 3" in one afternoon.

On that point, in time, you will find that you can handle that thunderstorm better. You'll also find you can get by with less moisture as the system is more efficient in capturing and holding onto the rains that come. The residue left on the surface contributes to the soil armor that not only slows down the impact of raindrops, it also prevents evaporation of the captured moisture when the sun returns.

Unlike our neighbours to the south and to the east, we can't expect this to happen in a matter of years. We must think in decades or in generations. The study that I was talking about earlier, and will be linked in the show notes and transcript¹ for you to take a look at yourself, states it best: "This research provides a strong cautionary statement about producer expectations in soil improvement with cover crops in this low rainfall, semi-arid region."

The next objection that I'm sure will come up is cost. You will have to buy seed and you will have to plant it. Broadcasting and tilling in with an existing tillage operation may work, but I have found this not to be a reliable method in this area. Drilling it into the soil will give the most reliable stand and allows you to use the lower seeding rate. You will need to kill the cover crop at some point but if you were already practising a chemically based fallow system (chem fallow) you were already going across the field anyway.

A way to cut costs is to pick the cheapest seed you can find that will do what you want to do. Pick the best species for the job. I advocate this against mixes because mixes can dilute the effects of all species

present and mean less is accomplished, not more. The study focused on uses of mixes, and they found no advantage to them.

There may be other benefits you see in the long term, but I doubt the biomass you attain will be enough to achieve this. Cover crops can help to crowd out weeds and they can contribute nitrogen to the soil. If you plant a legume that is inoculated, and it grows long enough to produce significant biomass you may be able to capture enough nitrogen from the air to equal the cost in planting it.

A caution about legumes: They don't always add more nitrogen. They are scavengers and will take any available nitrogen first and then make more. It is possible if you are starting out with moderate to high nitrate levels you only manage to lock up what is there. As they breakdown fast if killed before seed is set it should be all available to your cash crop the following year.

Another caution: They, and any other cover crop out there, won't mine phosphorus for you². Yes, there can be a small amount of phosphorus mined by the microbes from the soil particles. However, you must have extremely low levels of phosphorus for it to be worth the plants spending its carbon energy to pay these microbes to do it.

The advantage to legumes is their water use efficiency. Cereal and grass cover crops make big biomass, but they also suck the soil dry. Legumes don't make big biomass, but they give more nutrient credits, and they don't take as much moisture.

To finish off this episode I want to tie back the historic way this land was managed. The Indigenous tribes would help steer the buffalo across the landscape with controlled burns in timescales of generations. What could be done further north or further east in the Prairies in a few years could take decades here.

Dr. Edward Bork of the University of Alberta has done extensive work on grazing systems for the Prairies that sequester carbon. The Brown soils are listed as having a low potential of sequestration³. Keep in mind this is under conditions similar to how the buffalo grazed for millennia and using a system that has minimal exports of nutrients. Grazing leaves almost everything behind as the main export is meat.

Annual cropping systems export grain that contains carbon and nutrients that will not be returned to the land; that is, until we find a way to bring back all the manure and sewage from the animals and humans that eat our grains in far off places.

In a drought, I think this is best way we can think of integrating cover crops. Taking a cue from the land, there may be years when the best solution is to not plant a cover crop on fallow ground. It might be time for the plants to take a year off. We don't need to worry about the microbes in dry soil. They are adapted to survive. When the soil is wet and there are no plants pumping new carbon into the soil then we need to worry about what to do. Perhaps if we get rains through the summer and we have some prime cover crop growing time we look at warm season adapted ones to quickly capture some of that summer sunshine.

When we get back to a rainier cycle, we could look at cutting back the fallow. Perhaps one in three years instead of one in two years. Perhaps we take it out and try to extend the season. To me the next logical step is relay interseeding cover crops into the cash crop after the last weed control pass. We get a cash crop and then through the fall we get a soil building cover crop. This system may work in higher rainfall

periods, but we always keep an eye on things that are ready to scale this back in favour of fallow cover crop systems again.

In this way we work with what nature is providing instead of always trying to fit it into our production system. We work out a flexible system that responds to moisture and allow us to do what the native perennial species do all the time: grow big and strong when the rains come and slow down and cut their losses when the rains disappear.

[TRANSITION MUSIC]

If you are interested in diving deeper into cover crops, why not check out the course I have developed? Over the fall I put together an online course that you can work on at your own pace to learn when, and when not, to plant cover crops. It should take you a morning or afternoon to complete; or spread it out over a period of week just taking on a half hour to an hour at a time.

It is called Profitable From the Start: Cover Crops for the Prairies. In a drought, they likely will not pay. However, there will come a time when the moisture returns, and you need to be ready to capitalize on them. When you take the course, you will have a Cover Crops FIRST™ Plan that will help you to discover the fit, the implementation, the return on investment, the species, and the termination you will need to know.

Go to www.plantsdigsoil.com and click on the course or check the show notes for the link. For being a listener of the podcast you can get \$20 off by using the coupon code “podcast” at checkout (<https://plantsdigsoil.thinkific.com/courses/cover-crops-prairies?coupon=podcast>).

[TRANSITION MUSIC]

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If you prefer email, consider going to my website, www.plantsdigsoil.com and click on the newsletter option (<https://mailchi.mp/plantsdigsoil/newsletter>). New subscribers get a \$20 off coupon for my online course. It comes out once a month with new episode listings, events that I will be at, and carefully curated content with commentary so you can keep up on the essential news in regenerative agriculture.

Another great way to help me is to share on your social networks. This could be with something interesting you learned and using the #RealisticRegenAg or sending direct to a person that you know could benefit.

I always like to know how people that give out information for free actually make money. The podcast is free so that you can learn something new and get to know how I work through issues. If you need a little more help than the podcast can provide, I have a self-directed, online course to help you dig a little deeper. Included in the course are office hours that let you have time with me to fine tune your plans. When you need more than that, I provide one-on-one consulting services

My expertise is centred around the Canadian Prairies. I have a B.Sc. (Agr.) with an agronomy focus and a 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.

Closer to my home in Southern Alberta, Canada (just north of Montana, U.S.), I provide scouting services throughout the summer with weekly field checks for crop staging, pest presence, and, under irrigated fields, soil moisture and weekly irrigation plans. I go beyond the standard crops of wheat, barley, canola, and peas to include things like potatoes, quinoa, and hemp. And of course, I love taking on cover crops.

Ecoregions do not respect country boundaries, so if you are in the Northern Great Plains of the United States, I am sure I can help you as well with remote consulting options. Are you further afield than that (pun intended)? Many of the principles and frameworks that I have created adapt to farming anywhere in the world.

I use Anchor (from Spotify) to send this podcast out to the world across many platforms and it tells me I have listeners from every continent. Oddly, it even says I have listeners from Antarctica. If that, is you, I would love to hear from you, or wherever you are in the world. Send me an email or connect on Twitter or LinkedIn. If you go to Anchor you can leave me a voice message.

See you next time.

¹ SARE. 2020. Advancing Cover Crop Knowledge: Assessing the Role of Plant Diversity on Soil Change <https://projects.sare.org/project-reports/gw18-151/>

² Scott Gillespie. May 9, 2021. Plants Dig Soil. "018 Three Pillars Propping Regen Ag" <https://www.plantsdigsoil.com/podcast/018-three-pillars-propping-regen-ag>

³ Manitoba Organic Alliance. Feb 22, 2022. Prairie Organics: Think Whole Farm 2022 Conference. 47:35-47:55 <https://www.youtube.com/watch?v=-YU0AasmxXE&t=2855s>