

Transcript of “The Case for Cover Crops in Potato Production” presented by Scott Gillespie.
Part of Spud Smart’s round table discussion “Are Cover Crops Worth the Work?”
Online September 9, 2021.

Slides and links to the full round table discussion at www.plantsdigsoil.com/media

0:00 Title

Thank you for the introduction, Ashley, and thank for the invitation to speak today. Making cover crops and regenerative agriculture practices work in potato production is a passion of mine. I’ve been thinking about how to make this work for many years and am excited to present a case for using cover crops in potato production.

0:20 Outline

I’m going to start my talk with a list of good reasons to grow a cover crop. From there, I’ll go over what I think are better reasons to grow a cover crop. Next, I’ll spend some time looking at how to think of them in Return on Investment, or ROI, thinking. For the remainder of the talk, I’ll go through an example applying this thinking to how to go about integrating cover crops into your operation. I’ll end with some resources that you can follow up on later.

1:00 Good Reason to Grow a Cover Crop

So let us start with some good reasons to grow a cover crop. The first one is that the public is demanding regenerative agriculture practices. Regenerative agriculture has many aspects to it but of course the most common practice associated with it is cover crops. Following from that, the second reason for growing a cover crop is that it seems that there are many people growing them with great results.

Prior to the pandemic closing conferences and travel there was a lively speaker circuit of what I call celebrity farmers and researchers talking about many of successes they have had. Many were already on YouTube, but the pandemic only accelerated the number of videos that could be found there.

This is a good way to get inspired to change your operation, but it doesn’t tell you how to actually implement it. Every geographical area is different, and every farm has its own strengths and weaknesses. Most systems excluded potatoes as an option because of the focus on minimizing or eliminating tillage. It makes it hard to try when you are told that tillage destroys all the work you are trying to accomplish.

The third reason to grow cover crops that I have come up with is to gain some points on the latest survey. In the potato industry we’ve seen many of these surveys over the years. Perhaps you have seen some show up in the other crops you grow. Cover crops are widely seen as a good practice by those that develop the surveys so it may be good reason to start. Closely related to this is reason number four: Get more contract in the future. Potato end users are starting to expect this, and it may be the way that they decide who gets the contract.

Finally, you may have heard of growers that are making money from selling carbon credits. Cover crops grown in the off season are the key to making their systems work. While this can seem straight forward the science is not clear on this yet and the markets are volatile. The worth of the carbon may be mostly dependent on government policy now and in the future.

3:00 Better Reasons to Grow a Cover Crop

I'd like to shift now to what I call better reason to grow a cover crop. I have them sorted into three groups of reasons. The first set of reasons is to hold the soil in place and to hold onto nutrients. To me, this is something that will always pay. Losing soil costs you money. You may be able to compensate for it by adding more fertilizer, but you lose much, much more than that.

A few years ago, while out soil sampling I saw some soil that had been blown into a ditch. There had been a wind event that had moved soil from a newly harvested potato field. I probed a bunch of spots in it and put in one of my bags. I had the lab determine the soil texture so that I had a scientific basis for classifying it. It was basically beach sand: Right on the line between a sandy loam and a loamy sand. It was 78% sand, 10% clay, and 12% silt.

In Southern Alberta we farm in a semi-arid area near the Rocky Mountains that gets very little rain. Our soils are called the brown soils because historically, and I'm talking thousands of years, they don't produce a lot. Two percent organic matter is considered good in this area. I don't know what the native prairie would have been, but I know some grassland that had never been farmed and only had been grazed with cattle was 2.8% organic matter when I tested it. This blown beach-sand soil was 2.4% organic matter.

There wasn't much nitrogen in it, but that is to be expected as nitrogen gases off or leaches very easily. What was surprising was that the phosphorus was 164ppm or just over 300 lb/ac for every 6" of depth. Phosphorus is typically very low in our soils without a lot of manure or fertilizer over the years. We have naturally high potassium levels in our soils but even this was high at 820 ppm or over 1600 lb/ac. I won't go through the micronutrients but even all of them were above the critical numbers. Some were even in the moderate to high range.

When you hold onto soil you hold onto nutrients. We don't tend to be at excess moisture levels even with all the irrigation we use but if you regularly have water flowing through the profile you can also lose the mobile nutrients, such as nitrogen. To me, this is the best reason to grow a cover crop. Holding onto soil and nutrients. With current fertilizer prices this pays even more now.

The next set of reasons to grow a cover crop is to increase water infiltration, increase nutrient availability, and to lower pest pressures.

Water infiltration may be increased within weeks of the cover crop being established but it's more likely something that will gain over multiple cycles. Water infiltration is not the total amount that the soil can hold. This refers to how fast the water can move into the soil. When you have good infiltration, you can take in rainstorms quickly and have less run off. When irrigating you can put more water on at a time.

If you can grow a legume cover crop and incorporate or leave all of it in place you have a chance to increase the nitrogen content of the soil. For this to work it needs to grow long enough to grow significant biomass and it must have actively producing nodules. Phosphorus can't be easily mined from a soil, no matter what the celebrity farmers say. Microbial mining of soil particles is a fact. However, the rate that it occurs at gives a fraction of what we export in crop off the land each year.

What we can tap into, and I think the "no fertilizer added" people are actually using, is the legacy phosphorus. Phosphorus fertilizer gets tied up quickly in the soil and is slowly released over the years

and decades that follow. If a cover crop does the work to liberate this instead of your cash crop, and its decomposition coincides with your cash crop growth, you may be able to access this before it again gets tied up.

The final reason, in this middle section of better reasons to grow a cover crop, is to lower pest pressure. Herbicide tolerant weeds are a common reason that most farmers in the United States get into cover crops, and it is where they have the most success. By covering the land with the best species for the job they crowd out the undesirable species. It's not 100% control but it may allow them to use the herbicides that they do have more effectively.

Insect and disease suppression is where I get the most excited in the potential of cover crops. In my example later in this presentation I'll be going over one system that seems to be working well. In the next presentation of this webinar Dr. Judith Nyiraneza will be presenting some of her work on this and I'm excited to learn more on this. Many times I hear that just putting out cover crops, especially cocktail mixes of 10-15 species, is enough to get the biology working for you, but I think it's not quite that easy. Targeted species for specific pests is what you need.

In the final block of better reasons to grow a cover crop I have increasing the organic matter of the soil and increasing the water holding capacity. These are long term plays that you will not likely see a change in for decades. They may only benefit the next generation coming up on the farm. Organic matter can appear to be building quickly on a soil but the stable form of it takes many years and takes many cycles of growth and decay. This in turn will help the total amount of water and nutrients you can hold in your soil. This won't pay back you directly but if you get payback on the short and medium term benefits you will build a long-term foundation.

9:00 Return on Investment

This leads into the next section of my talk – Return on Investment. To illustrate the concept, I want you to think about something that all potato growers use: Fungicides. Even if you are organic, I'm sure you've used an organic approved product.

The first application will usually give you the greatest return. Think about the week before canopy closure. Early blight may or may not be appearing but as soon as the canopy closes it has the ideal environment. The humidity will be higher, and the spores will be coming from the soil. Good coverage slows or stops this initial infection and makes the whole rest of the season easier. If you only sprayed once, this one would give you the most money back.

Throughout the season the subsequent sprays should continue to give you more money back than you spend on the product and the application costs. Scouting, spore traps, weather, irrigation, and many other factors will play into how many sprays, what products, and how often they are sprayed. The best time to stop is just before the cost is greater than the return.

Shifting back to cover crops if you can solve an immediate problem then you should get payback within the growing season. Holding onto soil and/or nutrients pays back right away. Solving a short-term problem should still payback more than the money spent. It can be tougher to see the payback immediately on this as it could take until the next potato year to see the difference. This is why it's so important to use the right species for the job.

If you focus on immediate and short term returns the organic matter that was produced by the cover crop stays in the system and contributes to the long term stable organic matter. Unlike a fungicide, with a cover crop the short-term benefits will feed into the long-term benefits. Once the season is over all the fungicide that was sprayed is slowly dissipated and broken down in the soil. It may even be contributing to more problems in the future as organisms develop resistance. There may even be long term effects on the soil microbial community that are causing hidden harms to your soil.

I'm not saying you don't use a fungicide. You still get the benefits from it. Even if it is causing some long-term problems the short-term benefits, that is, a high yielding crops, outweigh the costs. The switch in thinking is that with a cover crop the short-term benefits pay you back as well as contribute to the long-term benefits.

12:00 Erosion Control & Nutrient Scavenging – Good/Better

Let us work through an example now. A good solution to erosion control and nutrient scavenging is to spread the cheapest cereal seed you can get a hold of. I am choosing cereal because they are one of the fastest growing cover crops we have and most of us will have experience growing them as cash crops. We know how they behave, and we know how to kill them in subsequent crops. You can spread them with a spin spreader or drill them in with existing equipment. If you are setup to spread ahead of harvest or have aerial options, you be able to do that and then have the harvesting process plant them.

A better solution is to use the right species for the job. Fall rye, or cereal rye as it's more commonly known as in the United States, can't be beat. It germinates in cold weather, it overwinters in most areas, and it grows very early in the spring. The biggest disadvantage is that it can be too good at its job. You must have a plan to control it in the following spring. You may want to consider using a less aggressive winter cereal such as triticale or wheat, but of course you'll trade off cold season germination and growth. However, if you drill them in and you get a good catch you may just be able to let it grow to maturity and sell as a cash crop.

13:30 Erosion Control & Nutrient Scavenging – Advanced

An advanced solution is to start in the year prior to potatoes. You will do what I call supercharging the system. You will take an entire year out of cash crop production and grow a green manure crop that you chop and immediately disc into the soil. If you are setup to mark rows or form the hills in the fall prior to potato production, you can do that right away.

Decaying plant material will hold the soil in place better than having nothing there. It's not perfect but it will help to give you that bridge. You should plant something on top of the hills or spread a cereal in advance of making the hills to have something growing as the decaying organic matter loses its effect.

Whether or not you mark rows in the fall you'll want to have something that winterkills or is easily killed prior to planting. Current equipment constrains what we can do as most of it is designed to work in tilled soils. Innovation is happening though. Chad Berry in Manitoba has adapted his equipment to work in minimally tilled soils. Between this and manufacturers stepping up, I think we will have many more options in the next 5-10 years.

15:00 Erosion Control & Nutrient Scavenging – Advanced increasing ROI

This could be tough to justify taking an entire year out of production. In the Pacific Northwest of the United States, they can make this work by doing a green manure after winter wheat harvest, but they have a much longer growing season. It's been proven that you need the big biomass to make it work.

To increase the return on investment choosing the right species for the job may give more back in the year of potato production than you lose by not having a cash crop. The green manure work I've been referring to uses mustard to help control disease. Specifically, it is being used to suppress the early die complex of organisms. It is well studied and well used in the Pacific Northwest.

To do it right you need big biomass, you need to chop it at the right time, and you need to immediately (within minutes) get it incorporated into the soil. I've heard from some people that even the variety of mustard is important. Some do a much better job than others at controlling the disease. This may even be dependent on environment and the species that make up the disease complex in your field.

16:30 Erosion Control & Nutrient Scavenging – Super advanced

The super advanced solution is to integrate cover crops for disease and/or insect control, weed suppression, and water infiltration in the years in between potatoes. This should benefit you by not letting pests get to high numbers. Over time this will increase organic matter and the water holding capacity of the soil. It should also give you more stable nutrient cycles.

Of course, the biggest problem is how to justify this on rented land. Or maybe you don't know who will be farming the land in 5-10 years. It can be hard to work on something when you are just farming year to year. This is beyond the scope of what I am presenting on today but perhaps in the Q&A later we can talk on ideas for how to solve this.

17:30 Summary

Time is closing in on me and most likely you've learned as much as you can from me for now. To review what I've talked about I first put forward good reasons to grow cover crops. Public demand, increased contracts, and carbon credits are all good reasons, but they depend on external incentives. If policy changes or markets crash, you have no value.

Better reasons to grow cover crops benefit you directly. Holding onto soil, holding onto nutrients, capturing and storing water efficiently, and lowering pest pressures pay you back now and in the future. Advanced and super advanced practices will help those of you who are in it for the long term or who have an eye on the future caretakers of the land. Look for the return on investment in the short term and this will help you pay for the long term. Unlike inputs such as fungicides the residual benefits of cover crops can accrue over time.

18:30 Further Learning

To get a different perspective on this I suggest you check out the Field Work podcast. It is farmers talking to farmers and there are two episodes that directly relate to this topic. The cotton industry is very far removed from us but the consumer pressures and pressures on farming are similar. The first episode covers the industry side and the second the farmer side. Cover crops helped save a grower from

herbicide tolerant weeds. He also has very clear thinking on seeing return on investment in all that he does.

Dr. Andrew McGuire has helped to research and develop the mustard green manure system in potato production. Start on any of his articles and I'm sure you'll learn something. His thinking has influenced how I go about integrating cover crops into potato production.

And finally, check out my podcast. I love talking about #RealisticRegenAg and put together something about this length every month in the growing season. I look forward to chatting with you after Dr Judith Nyiraneza's presentation.