Joe Scrimger: …it's hard, sometimes because people say, "Well, I still I got good organic matter yet. I'm only down to 3%," where they were 5% or 6%.

And I'm sayin', "But you're decreasing." And the key is a 3% organic matter that's decreasing doesn't function the same way as a 3% organic matter that's increasing. Functions totally differently. And that is not explained on any soil test for organic matter. You have to know history…it's really important to have the soil on a building mode."

Cooley Ludtke: That was longtime Michigan farmer and farm consultant Joe Scrimger. We were fortunate to have a number of wide-ranging discussions with Joe. And it seems to me, Cliff, like what he's saying is: You're either building soil, or you're not.

Cliff Scholz: It's a core concept of regenerative agriculture**,** and it turns out that nitrogen plays a central role. It impacts everything. And of course, all this shows up on your bottom line.

Cooley Ludtke: Yeah, this information is going to be really useful to a lot of people. Thanks for listening to the Farms for Tomorrow podcast. I'm Cooley Ludtke.

Cliff Scholz: And I'm Cliff Scholz

Cooley Ludtke: Let's get into it.

[1:09]

Part 7: Better Crop Health with Reduced Fertilizer Inputs I Length: 13:09

Cliff Scholz: Joe, thanks for spending some time with us. So, to start off, what's the number one thing farmers are doing that they can do differently right now to improve their operations and their bottom line?

Joe Scrimger: It's hard to narrow it right down, but putting on too much nitrogen at one time, and that really comes around to corn. Corn has been the biggest nitrogen requirement.

Which comes from the idea that we're just gonna buy our nitrogen, too. And that's how they got to the point of doin' too much. But they didn't realize that over the years their nitrogen system in the soil was slowing up as they put on more, to the point that it's not functioning.

And at the point where it gets, say, close to not functioning, other pieces of that soil microbiome quit functioning, also. It's sorta the key to that process to workin' the soil to get your recycling.

Cliff Scholz: And by recycling you mean the ability of the soil to digest crop residues. So, adding too much nitrogen affects that.

Joe Scrimger: The important thing is to see that they need to put on less nitrogen, and may have different sources. Or at first just split the application. Some are doing that. But the bulk of agriculture is not.

Cliff Scholz: Are you basically sayin' that when we apply nitrogen, we're actively shutting down the soil's native capacity to deliver nitrogen to our crops? Is that one of the things that I heard you just say?

Joe Scrimger: If we're applying soluble nitrogen. The most common form that gardeners would use and farmers would use would be urea, which is 44% nitrogen. But as soon as it gets with water, it's soluble. It releases.

Some people consider it almost an organic fertilizer in chemical composition, like urine. But it's not, because it releases too much too fast. Where, if you compared that to feather meal, which is a, quote, "certified organic" product, which is 13% nitrogen, but that 13% nitrogen, because it releases slow, all the microbial processes can go on right along beside it. And the soil never senses that it has too much nitrogen. So it keeps producing nitrogen.

Organically, we also have Chilean nitrate, which comes from Chile. And it's like a bat guano byproduct. It's, like, 20% nitrogen. But that's soluble. If you put on too much of that, you're gonna slow your system down. In the same way poultry litter, which is only 3-5% soluble, but most farmers understand that poultry litter is hot, especially if they ever had chickens. 'Cause you could go out and spread that in an area of field, and if you didn't adjust how your manure spreader was set, if you were doin' cow manure the day before and then you have 'em load up the same spreader with poultry manure and took it out to spread it, and if you didn't lower that rate, that spot would show right up the following year.

And it might be to the point that it would burn the crop. Where the cow manure didn't burn the crop at all.

So poultry, even though it's only got a number of 3-5%, it's got all these bacteria that produce nitrogen. And it's got volatile ammonia, which you can smell in the manure, or you can smell in the poultry building, or you can

smell in the compost windrow until you get the compost set right.

Farmers, if they're large farmers, pretty big odds they're using anhydrous ammonia. And they've been in and outta that use. But right now, because economics were pretty tight a few years ago — they're not right now, the price of corn's up, but the price of fertilizer's way up — that makes it tight. But a few years ago, the price of corn was so low some of them had switched from using better sources than anhydrous, but they went back because of the cost factor.

But if you can picture gassing the soil with ammonia. You know, if you wanna clean the kitchen counter, you can use an ammonia-based cleaner, and it kills organisms. Well, the anhydrous ammonia does the same thing in the soil.

In the short term, those organisms turn into plant food, so it makes the anhydrous look pretty well as it burns up organic matter over time. So that's a big factor.

The second in use now by conventional agriculture would be 28% nitrogen. 28% is made up of urea and ammonium nitrate.

Cliff Scholz: Now, for our listeners when you say 28%, that's a product. That's a liquid fertilizer, correct?

Joe Scrimger: Yes. Because all the big planters now, if you consider when it used to be four- and six-row planters, where now it's 12- to 36-row planters, they're so big, so they switched them to liquid fertilizer for handling.

It wasn't that the liquid fertilizer's better. It's just that this planter's so big, if you were to load it with dry fertilizer all the time, it's just so much bulk and weight they can't handle it out on the wings. So they put their big tank in the middle for liquid and then they put the lines out to the wings to dribble it on.

So it's a handle-able thing. It has nothing to do with the workings of the soil. So 28% is used really big, and anhydrous ammonia. Urea's still used as a spreadable, dry product. But one's a gas: anhydrous ammonia. 28%'s a liquid.

Cliff Scholz: Is any one of these preferable to the others from a biological perspective?

Joe Scrimger: 28% is fairly friendly to biological agriculture, 'cause it's

very versatile. We can add additives like carbon or molasses to that, to slow it down. They do add additives to anhydrous ammonia to slow it down, but what they are is bacteriostats.

They try to kill the bacteria off temporarily, so the ammonia doesn't convert. In consequence, that slows the process down, but you're killing or holding up the bacterial process, which doesn't help the soil microbiome at all.

Cliff Scholz: Oh, so this is useful information to make the distinction between soluble and insoluble, and to make the distinction between the organic forms that can behave like a soluble or hit the soil like a soluble…

Joe Scrimger: The 28% is the one that's fairly handle-able biologically. It's fairly good in its original form, plus we can improve upon it. I've had to be able to go onto most any farm and work with what I have. I mean, whatever we're complemented with, and we work to change, but sometime they can't afford change. So anhydrous ammonia, if that's what they're set up for, I would convert it to aqua ammonia. You run it through a water bath and you end up with a product like 28%.

So what I'm sayin', for the farm side of it, if there's those people listening, I have to show myself as bein' flexible to be able to work with them.

But really, you know, again, back in the '80s, anhydrous ammonia use was going down. And they knew it was killing the earthworms, and things beyond that, you know? But somehow, it just creeped right back in.

Cliff Scholz: Are there any upsides to anhydrous, besides cost?

Joe Scrimger: The only thing good about an anhydrous applicator is when they side dress with that, so they're goin' into corn that's ten inches high. Put a little bit of nitrogen on when they're planting. That's a good deal 'cause the plant only needs a little bit of nitrogen.

And then they come in and side dress. Well, the side dress applicator knifes the anhydrous down seven inches or so. And they do that between every row. Well, that takes out all the planter tracks. And it alleviates a lotta compaction.

That part's really good. And if they'd slow their product down, you could use a little bit of that every once in a while. The soil can probably buffer it. But a guy gets raising corn and becomes a, quote, "corn farmer," and then he wants to do corn after corn, and using anhydrous ammonia every year, he can't buffer that.

And then he'll take and inject it before his wheat crop and then plant the wheat after so it's there to release for the wheat, too. So now you're gettin' multiple years of it. You know, part of the thing we're tryin' to get agriculture back to and understand the diversity of the longer rotation and how those other pieces complement the system and complement the biology.

And beyond the biology, we're talkin' hormone, enzymes, and mineral release and whatever that that diversity brings. So you don't end up havin' to buy all the nitrogen from anhydrous, and buy more. And they're caught in that right now because the price is ten times higher than it was back in 1970. But the price of corn is not ten times higher. The price of corn is only two and a half or three times higher.

Cliff Scholz: So, nitrogen management, if it affects soil both chemically and biologically, it'll also affect soil structure and issues like compaction.

Joe Scrimger: And that's the thing that I'd say we probably figured out more recently because, even some organic farmers were havin' problems with compaction. And some of 'em were doin' well, and not much in the way of compaction, like the Spray Brothers from Ohio. And the number one problem in North American agriculture is soil compaction. That beats all other issues.

But these new organic growers that I've worked with, when they started their transition, I worked up in Michigan in the Saginaw Valley area with the first farms that were organic up there. And then that spread. Currently, it's the largest block of continuous organic acres in the Midwest, up there.

Cliff Scholz: In Michigan's Thumb?

Joe Scrimger: Well, it's not the Thumb, it's Saginaw Bay. It's just at the edge of the Thumb. The guys in the Thumb are pretty well spread out. But the guys up by the Caro area fought the initial farm. But then when these guys started makin' money, one by one, all those guys around them started transitioning, 'cause they could see it. And they could see that these guys' crops were as good or better than theirs were. So they started transitioning.

So now we have that group. But they tend to focus on corn, soybeans, and wheat or spelt. So they've got three things. And they might do a little clover in with the wheat or the spelt. A farmer in transition have two issues: where does he get nitrogen, and how does he do weed control? And actually those two things are related. If we're talking about nitrogen, the bacterial part of that microbiome is where you're supposed to get your nitrogen. But,

part of that is in the cycle of building and recycling organic matter so that the bacteria can release nitrogen. And bacteria also work on the residues and decay them back down to recharge the nitrogen.

But if you keep your system too bacterial, even in an organic system, the bacteria keep working on that organic matter, and you don't get your phosphorous to work properly.

And you don't get enough organic matter to really aerate the soil. And that's a piece that I will really give Gabe Brown credit for.

Cliff Scholz: Yeah, he describes incredible rates of water infiltration into his soil during big rain events. And like you he's big advocate of diverse crop rotation.

Joe Scrimger: And most people think, "Well, they do have a rotation. They've got soybeans in there."

And I'm sayin', you have to think about it. On their corn, they were focused on poultry manure to raise enough nitrogen for that: bacterial dominated. On their wheat or their spelt, they were doin' the same thing, focusing on poultry manure, and focusing on clover, which puts more nitrogen back into the system, and more bacteria.

Then the soybean is a legume, which puts nitrogen back into the system. And it also puts more bacteria into the system. Consequently, you end up with a soil that's too bacterial-dominated.

Cliff Scholz: And not balanced with the fungal component, you mean. But we do want to raise the bacteria counts in our transition to organic.

Joe Scrimger: And most organic farmers have, but they didn't keep their education goin'.

Meaning they raised two good crops with poultry manure, so now they just dump poultry manure on, even on the beans. And I'm sayin', for weed and disease pressure, you don't wanna do that. But they saw more yield.

Cliff Scholz: But you're saying they also saw more problems, right? More pests and disease?

Joe Scrimger: And then they, "Well, we can buy a cheap, organic fungicide. We're not gonna worry about that." But that's just USDA organics, that is "organic by substitution".

And it really has not much to do with the, I'm for short of words, for real organic.

[14:18]

Part 8: Evolving Perspectives on Microbes | Length: 4:57

Cliff Scholz: Joe, I've heard you say that the best way to prevent fungal disease is having beneficial fungi in the environment. I'm guessing some farmers may think that all fungi are bad.

Joe Scrimger: But that perception existed in respect to bacteria, too, back in the '70s. Again, because most of those guys in the '50s all came off of dairy farms, and somewhere between the '50s and the '70s they got rid of the dairy. But they'd all been told that the bacteria was bad in the milk cows, you know, by the milk inspector. They had never been told about good bacteria.

Back in the late '70s I had a consultant introduce me to soil microbiology in the old-style movie video deal that he showed at my neighbors'. He was from Canada. He was my first introduction to soil microbiology. And I'd had a lotta soil classes from the university by that time. But I had nothin' on biology. And when he introduced that, and then with other things that we were doin', this Reams system was about the same time, then things started to click.

Cliff Scholz: The takeaway here seems to be that farmers need to focus more on soil biology.

Joe Scrimger: And then it's just a matter of whether it's bacteria or fungal. You have to build them. It's just that there's a point where you have to balance them, too. Initially, you just talk about building them. But as soon as you get the numbers coming and into the ballpark that you need to be, then you work on balancing them.

Cliff Scholz: So when you mean numbers, you mean, like, just, like the actual number of organisms per unit soil…

Joe Scrimger: Yeah. They can be measured. And that's where the Soil Food Web and others come in, now. The Soil Food Web's a company that does a test just focused on biology and how to balance them. And it does everything from bacterial, fungal, and nematodes — good and bad nematodes.

And all that equation, meaning, you can get pretty in-depth, but it really comes back to having more biology, understanding that you have to balance it, or work towards balance it in the longer term. And that's what I'm sayin' the guys up in the Thumb missed out on.

They're gonna talk about that a little bit next month at the MOFFA program, one of those growers. Because he's read Gabe Brown's book, and something clicked.

But the growth that we've been doin' with just nitrogen — and I really have to say that basic farming has been growing most of the crop with nitrogen and potassium — that's why the quality has decreased. Their phosphorous system really doesn't work. And in most cases in Michigan, the phosphorous just builds up in the soil. It looks like you got too much, but you don't have too much working. So if you focus too much on nitrogen, you'll never get your phosphorous system workin' properly.

In the '70s it was the same way with calcium. They might have a decent pH, but they didn't hardly have enough biology, basic bacteria — 'they,' meaning conventional agriculture, in the majority of the cases, not all — to get their calcium to be soluble. And that's just basic nutrition. Calcium is needed more by plants and animals than any other nutrient. But they just had a ridiculously low level of soluble calcium…

Cliff Scholz: I see.

Joe Scrimger: …all back in the '70s. Where most of 'em have got beyond that because, you know, the potato growers and the sugar beet growers have all picked up on the fact that there was a problem there: That crop won't store, you know?

And they finally figured out, and even the fruit growers understood that they had a problem with calcium. Blossom end rot with tomatoes. You used to get them all the time in your salad at the grocery store. You know, I didn't want to eat one of them if I saw that, 'cause I knew there wasn't any nutrition.

You've gotta have the calcium workin' to get the rest of the nutrition. But a lotta people took them. Now we take these greenhouse-grown things, which, certain times of the year, you can grow a pretty good tomato in a hoophouse, extending over the season. But to grow a tomato in the hoop house in the middle of winter, it's really hard to get the nutrition.

They might be redder than they used to be, but they're still not as nutritious

as they should be. So we're missin' a major point.

Cliff Scholz: Yeah. So how does soil biology relate to crop quality and plant health?

Joe Scrimger: Whenever you increase biology, you have a tendency to decrease unbeneficial biology. And whenever you decrease overall biology, you have a tendency to increase the percentage of unbeneficial.

Cliff Scholz: And by 'unbeneficial biology' you mean: disease organisms.

Joe Scrimger: So our goal is to increase the biology, whether it's bacterial or fungal, but then understand at a point that those bacterial organisms are aggressive and work more in the short term, where the fungal are more long-haul.

But they gotta have that organic matter. Both have to have it. It's just that bacteria get first choice, and you gotta slow them down in order to get your fungal goin'.

[19:15]

Part 9: Soil Life and Soil Structure | Length: 13:10

Cliff Scholz: So going back to the problem of soil compaction, your biology will affect your soil structure and water management, is that right?

Joe Scrimger: In the Thumb area of Michigan, and most of the state, we do tile drainage to take away the excess water.

And in the Maumee River area, meanin' that Ohio watershed that's a factor to Lake Erie, they do a lotta drainage there. The Buckeye Tile Machine, originally built down there, then they ended up comin' up to my neighborhood back in the '50s and '60s.

But they were originally used in Ohio. And there's nothin' wrong with tile, but phosphate can escape through the tile. It doesn't tend to move much, but when we put on liquid fertilizer phosphate it'll move with the water sometimes and get in the tile that way, or the big thing is with surface erosion.

So you don't have to have the soil perfect. But you have to be gettin' it to the point that it'll take a three-inch rain per hour, versus a half inch, where most of conventional agriculture is. And at that point, usually you have enough biology to start to hold the soil together and resist wind erosion and

water erosion because you're managing the water into the soil, versus makin' it run off. When that biology starts to work, in order to get it to work, you have to have more air in the soil.

And you're starting to build organic matter versus lose organic matter. So you got these different states of the organic matter. It's hard, sometimes because people say, "Well, I got good organic matter yet. I'm only down to 3%," where they were 5% or 6%.

And I'm sayin', "But you're decreasing." And the key is a 3% organic matter that's decreasing doesn't function the same way as a 3% organic matter that's increasing. Functions totally differently. And that is not explained on any soil test for organic matter. You have to know history.

Cliff Scholz: Whoa! I don't think I've ever heard anyone else talk about organic matter not as a percentage but as a direction the soil is moving.

Joe Scrimger: It's really important to have the soil on a building mode. And then if you've got that basic biology, you can see it in the wind erosion in the spring in the ag community. And you know, no-till tends to stop that, but not totally.

But the water from the tile, if you're not biologically active enough, the no-till doesn't stop that movement of the nitrogen, in some cases movement of the phosphorous with it, because they put 'em on together.

And no-till guys don't use as much anhydrous ammonia. I'll give that to 'em because they don't wanna till the soil that deep. And anhydrous ammonia has to be injected. So they tend to use 28%. And they use a product called polyphosphate, which is 10-34-0 liquid. And if they put them together in a starter and the nitrogen leaches, you're gonna move some phosphorous with it because they're in the mix.

In the natural environment of the soil, the phosphorous will sorta start to be held. But if there's cracks in the soil, which in the spring sometimes those cracks develop in heavy soil, and you've got products that you're putting on, that liquid will move through those cracks, especially if the soil's not biologically active.

You know, it's hard to explain that, other than that, again in the '70s they were blamin' the earthworms for the nitrate pollution in Iowa and in Michigan. And I'm sayin', "Have you guys ever studied that earthworm hole?" Just because it's a hole in the soil…

And so the university studied a hole. They made a hole, studied it in dead soil, and water will percolate down that hole. A earthworm hole, mathematical impossibility. The water goes down and it goes into the soil, out. It goes down and out. You can't get it to run in a earthworm hole.

The earthworm designed that hole differently than putting a hole in the soil. So it's a totally different deal in a living system. And as the soil gets dead, it works like that. So you get these cracks that open up, and nitrogen moves. In a living soil, you also get cracks that'll open up 'cause that's part of the aeration system of the soil. And it has to happen. Some people irrigate too much, and you lose that cracking factor, then the soil doesn't get aerated, then the yields, even where they irrigate, start to go down.

And that was proven at Kellogg Biological Center back in the '80s. More water won't solve the problem. So: more tile won't solve the problem. More irrigation won't solve the problem. More nitrogen won't solve the problem. But the university goes along with that in a lotta cases.

Let me tell you here, the commodity system says, "Everything is great. We're still getting the bushels." And I'm sayin', but they've got so much more investment in tile and irrigation just to make it work, where good soils will function without tile and irrigation.

Cliff Scholz: Which cost.

Joe Scrimger: And which cost. End cost...

Cliff Scholz: …to the farmer. So one would think that if they could get that work done by the soil biology, which is presumably a lower cost piece of infrastructure than the tile, that it would make economic sense to go with the biological.

So I think that helps us to understand how the soil biology connects with the health of our lakes and rivers. One of the things that I'm looking at here too is, this limit of total nitrogen per year, and different approaches.

And you mentioned it briefly early in our discussion today about split nitrogen applications as one way for farmers who have crops that do need some additional nitrogen at this stage of their operations.

Joe Scrimger: Yes. And 70 pounds per application is about the limit of what the soil can handle and still function biologically. In sand soils, it's less. So the soils that we have in Southwest Michigan, it's less than that. Might only be 50.

In the clay soils of the Thumb, and I'm not talkin' so much clay loam, I'm talkin' clay, which they have the thing of blue clay up there. And they have some of that in Northern Michigan, too, they have extreme clay and extreme sand, in Northern Michigan.

So the clay soils will hold a little more. And part of that's expressed in a quote, "cation exchange capacity," which is not about nitrogen, but it's just their holding capacity. But the total nitrogen, you know, corn was at one time advocating, university-wise, you know, a pound and a quarter, I think, per bushel.

So if you were goin' for 150-bushel corn, you were goin' for 200 pounds of nitrogen, put on. And some of 'em were putting that on in one application. And then they started splitting. The guys I know in the region that split, they split three 70-pound applications. That's still 200 pounds of nitrogen. And they have gotten response from that.

The idea is to first: Split. And then second: Do things to slow it down. So at 28%, you add molasses or other carbon sources like humates. And that gives the nitrogen in that product something to attach to, because the soil a lotta times doesn't have really active organic matter on some of the farms.

And a lotta the conventional dealers have got onto doing that now. So that's a step. But they're treating the product with some good things, meaning the fertilizer. They're not necessarily treating the soil. They're tryin' to make their fertilizer work better. And it does work. And it's somethin' again that we used back in the '80s.

So you split it. Then you start to slow it down. Then you try to come in with other sources. We would say get your nitrogen from at least three sources.

Some might be comin' from a legume in the rotation. I mean, if you add soybeans in the rotation, they'll get you some nitrogen for the following year. If you had clover in the rotation with the wheat, it'll get you more than the soybeans will.

If you had alfalfa in the rotation for multiple years, meaning, three years, and harvested and sold hay, it'll get you nitrogen for three years after that in much higher rates than the soy or the one or two years' use of alfalfa.

We wanna see the farms use some poultry manure, we just don't wanna overuse poultry manure. I've been on a lotta farms that, because they had poultry, they overused poultry manure.

And I'll tell you, it really takes a long time to get that soil back into working order again. I mean, it's a challenge. And you wouldn't think it was to add all this, quote, "organic fertilizer" called poultry manure. But it doesn't work well. It just doesn't work well.

The soil remembers that it had too much poultry manure. It takes a while to get it back on track. Where cattle manure, it just doesn't cause the same problems.

So if you get some nitrogen from cattle manure, if you had poultry manure two years ago in the rotation, you'll still have bacteria left in the soil that are producing nitrogen. If you put on some 28% two times a year, a little bit with the starter and a little bit side dress, you can easily only have purchased 80, 90 pounds of nitrogen. But you have 200 pounds there.

Cliff Scholz: So you mean for the total? So you might be… you might be able to cut your nitrogen costs…

Joe Scrimger: You start maybe cuttin' it by a quarter. And then, as that works, then you cut it by 50%. As that works, then you cut it by three quarters, you see? And if you're doin' it right, those biology will start to fill in, too.

But first, you get your multiple sources of different releases in your diversity of your mix. And it's really pretty easy to do.

Now, there is a problem right now. A lotta people wanna do it with compost. There isn't enough compost for all this acreage. You know, there just isn't enough people making compost. I mean, it covers a lotta acres, but there's not enough for all of agriculture, and so cover crops are a big thing, too. But I'm sayin' byproducts like feather meal, and even blood meal is a lot better fertilizer than it is a feed supplement.

And then bone meal can have some nitrogen with it. You know, if you wanna raise good quality roses with vibrant color, one of the basic fertilizers that's always been used is bone meal, 'cause it works really well.

Now, you listen to this one because this one's real key: When the soil gets goofed up, the phosphorous system doesn't work. The industry says it's got a lot of phosphorous. You don't need to put any on 'cause the soil tests said that. Doesn't measure whether it's soluble or not.

But then the cows are taking all this supplement phosphorous to be healthy. So consequently, the bone meal, which is supposed to go to the soil, goes

directly as a feed supplement to keep the health of the animal on track.

But very rarely do people supplement with bone meal. And they have low phosphorous, too. Shows up in bone structure. And it shows up in their ability to think.

So the most expensive mineral supplement tends to be phosphorous. And so the guy might be savin' it on his fertilizer, and then he's spendin' it in a barn, if he's still doin' cattle.

And you know, there was a time when farmers could connect soil health to animal health because they had the soil and they had the animals. Now, we have these cash crop people that don't know anything about raisin' animals. And they raise a crop. And then the guy with animals has to deal with that. And it takes a lot of phosphorous supplement. And actually, it takes a lot of protein supplement, too, because the crops that are bein' raised are higher in volume but lower in protein.

So bringin' that back to nitrogen, nitrogen is the first thing that really got overdone in that recipe. And it caused other problems, specifically with phosphorous, and organic matter, and water movement. And, you know, we're pretty blessed with water, but most of the Midwest and most of where our vegetable comes from, which is California, were blessed with water, they thought. But they've abused it. And it's mismanagement. We can design a much better system.

I'd rather just talk about how we can make the system work and the harmony of making the system work. It's sorta like directing a symphony when the system biologically works on the farm and everything works together to complement everything, you can walk away and have a coffee or a beer, whatever, and it just goes on without you. That's the fun part. And that's approachable with agriculture and food. We don't need to pollute our lakes. We don't have to have farmers havin' so much cost that they're so yield-focused that they forgot about nutritional quality. The ability and the science is there to have a system running in harmony with nature.

[32:25]

Part 10: Benefits of Compost and Compost Tea | Length: 3:56

Cliff Scholz: So to boost that soil biology, one of the things farms go to is compost. But there isn’t enough of it. What other strategies can farmers use?

Joe Scrimger: So, it's always been understood that you can do sheet composting in the soil. You can put your ingredients in and manage that residue, versus, you know, what was happening back in the '60s with just “burying the trash”. Meanin' they plowed the field, inverted the soil, and put the trash down ten inches deep.

That's not managing the residue. That was what we call “burying the trash”. And that was a goal. And it really caused some problems so, by the time we got to the '70s, people were figurin' out we had to manage the residue.

If you can keep that residue on the surface, and you're managing biology in the soil, you're basically feeding living organisms: microbes. But you can use such things as compost teas to stretch it.

And some of 'em are made from compost, and some of 'em are made from other things. But some people don't want animal manure in their process, so they make the compost teas from things that aren't animal manure-based.

Animal manure is a natural part of the system. The system's set up to handle that quite well. And it does work as a really good inoculant. But there's a lotta different ways to make the compost. So if your residue’s on the surface, and then spray a tea there that's encouraging those microbes to digest that residue. And the key is, you don't want 'em to digest it too fast. You wanna get it back in the system, but you want some of that residue there to stop wind erosion and surface erosion 'cause it's part of the structure for that.

But the important part of that wind and water erosion is when you got enough microbes living and dying that protoplasmic decay is the glue that holds the system together. So when you get their numbers up, and that's measurable, you gotta get it up to four or five ton per acre before that system becomes dynamic.

And then it's not just the crop residue that keeps it from eroding. The no-till farmers are sayin' it's the crop residue. I'll give you examples where that's not the case. The biology are much more dynamic than the crop residue. But if you can get the residue and the biology to work together, you're even more dynamic.

So if we take that back to the compost, some people are getting good at brewin' beer now. I mean, there was more bad batches back in the '70s. But they're gettin' better at that now.

Well, a lotta people are gettin' better at brewing compost tea now. We can do a nutrient drench from the compost tea.

And that's just basic tea that we put on the soil for nutrients. Anybody can do that in a drum, whatever. And you can even goof up a little bit and you get nutrients and you get biology. But if you want a foliar spray, you've gotta have a pretty good blend goin' into your tea. And you gotta understand it.

Then if you want disease resistance, you better be an experienced compost tea guy, you know? An amateur could randomly get it, he just can't repeat the process. An experienced compost tea guy, once he gets onto the biological principles of how that tea processes, he can do it most every time and get you disease-resistant.

But the key is not having to reach for the compost tea, just like guys were reachin' for fungicide. The key is, you use a compost tea to help suppress disease and re-culture that plant or tree environment while you're re-culturing the soil. And as you re-culture the soil, the soil keeps the plant in proper culture to resist disease. And it works, and you don't need any compost or compost tea. And the testing will show you when you get there.

[36:21]

Part 11: Crop Rotation and Cover Cropping | Length: 16:05

Cliff Scholz: You've also talked about crop rotation and cover cropping as ways for farmers to economically build up their soils.

Joe Scrimger: Rotation is a tool, and can be used for a couple different things. It can be used to sidestep your problem for a while. You know, so the problem more exists with soybeans. So you rotate to another crop, or even put a different type of bean in there, like navy beans, that may not be quite as susceptible.

So you can rotate to get around some of your problems. And then you can rotate to bring different things back to your soil. So, I think we've touched on the buckwheat thing. And the buckwheat, being a broadleaf, doesn't respond much to nitrogen, will work in poor soil, is a nice quick cover.

And the only thing is, you don't wanna let it go to seed because it can be a weed. But you can harvest it and sell it as a crop. You always have to watch your rotation, so that some of that seed that you harvested, or the small seeds that would get through the screen of the combine, that would still

germinate, don't become a weed.

Following buckwheat, you sort of have to cover-crop the buckwheat out of the system. Or you've got to be using Roundup to spray it, which we don't advocate in the long term. But most farmers will just cover-crop a little extra and get it out of the system. So, buckwheat is just key because it doesn't really respond to fertilizer. And it yields more in poorer soil. It's pretty neat. Good soil raises a lot of growth, and it looks pretty. But it won't yield much unless you trick it into yielding. And you can do that with, quote, "foliar spraying."

So buckwheat's really neat. It's not a legume. It's not a grass. It's a broadleaf. It's one of those things we need in the system.

And a lot of other broadleaves, all the way down to dandelion, that you can use in the pasture, that have this root that functions differently. But buckwheat also brings up trace minerals. I like to talk about buckwheat because, get people understanding that buckwheat tastes different if you use it as food.

And it tastes different because of its mineral content. So minerals imply taste and flavor to the food, where we wanna get it with a steak sauce, or all the seasonings. And there's nothing wrong with a little seasoning. But we shouldn't be having to use the seasoning, whether it's poultry, meat, or some of the vegetables. And grains, should have more flavor. And they've lost the flavor. So we've come up with the deal of seasoning them.

So buckwheat's key to understand. And it’s not a new crop to me. I’d never qualify that as a new crop, but I guess it's a new crop to a lot of people, now.

Deep-rooting legumes. We really like sweet clover. Sweet clover grows almost wild in some cases. So a sweet clover / red clover combination is cheaper seed than alfalfa. And sometimes we use that in the start and transition. The root has a way of conditioning the soil down deep. And so you usually need that in a system with a farm if they don't have good biology, or microbiome in their system, or if they're applying too much nitrogen. You need that deep-rooting legume.

But things like buckwheat and even dandelion will bring other nutrients up too, even though they're not a legume. So the deep-rooting legumes, whether it's sweet clover, clover, or alfalfa: alfalfa is pretty expensive seed for the most part, unless you're harvesting your own. And I've done a lot of

that over the years. That's how you get your seed cost under control. And you put it in as a crop, and harvest it. But then you show that your alfalfa has better mineral balance than the others. But you'll never get high phosphorous in the alfalfa.

It's gonna be high calcium. But you show that. And you show that it's got better quality protein. And you get a premium for that, whether it's organic or not. You make it so the cows milk better on it to the farm that you sell. And you guarantee it.

But grass hay is actually better than alfalfa hay. And most people don't know that. But grass hay takes really good soil to produce. Alfalfa doesn't. Alfalfa will grow in poor soil. And we've made that transition to alfalfa in recent years, partially because, like I said, it yields more, but it will yield in poorer soil.

Where grasses, which we used to use back in the '30s and '40s and before, the meadow was typically grass and broadleaf mix, maybe even some legumes, but not many, and it produced great for us. But as the soil degraded and lost its nitrogen ability, we switched more to legumes.

Then I go to oats. We always mention this in farm meetings, "Okay, guys. You're looking at maybe supplying a market versus just a commodity market. And the price of corn's pretty low. Have you ever raised oats?" And most of ’em haven't.

And, well, oats don't take as much fertilizer. You can do a little double cropping after oats, 'cause they're harvested early. They're planted in the spring. They take cold weather well.

But ask your doctor, "What's the best breakfast, cornflakes or oatmeal?" And we find that most doctors, will say oats: "Oatmeal's the best breakfast." As far as of those two things. I mean, there's other things we can have for breakfast.

And so I tell the farmers well, "You don't raise oats, you're missing one whole meal that you could supply for. And anybody that's onto the true marketing of oats, it's an expanding market. Now they have even oat milk, you know, that's being done.

But oats function differently than wheat or spelt, because they will function better in cold weather in the spring. Wheat or spelt will turn yellow in cold weather. Oats will just stay green, relatively. And we can use them to build up phosphorous. We can build up a little bit of phosphorous with

buckwheat. But buckwheat will more charge the trace minerals. But it will charge some phosphorous. But oats will bring tied-up soil phosphorous back into the system and get it back so it can be used in the crops in the rotation.

And it does something beyond that to the soil that most of the old farmers knew. And so, the horse being fed oats, there was the old terminology that'd say, that that animal is "feeling its oats," meaning it has a certain vitality from eating the oats.

And oats give that vitality back to the soil, if you have it in the rotation, using it as a cover crop, or a crop. It's pretty interesting stuff. And the thing is, most farmers treat oats like corn. And they can't get 'em to yield well. You have to go back and treat it as a different crop.

It's a grass. But it's a different crop because of how it functions in cold weather. And you take that all the way back to Sweden and talk to the Swedes, who are some of the best at raising oats. And you find out they fertilize it differently. And then they find out if they do do tillage, they till differently, too.

You don't do deep tillage for oats. You just do shallow tillage in the spring. And the yield goes up, not down. With corn, the deeper we tilled, the more yield we got, 'cause it's really sensitive to compaction. Oats don't want compaction, either. But they will take firm soil.

So we learned, as we got more horsepower in the '70s at our farm, we were raising a lot of oats, that if we used that horsepower and tilled deep, our oat yield went down. If we put a bigger implement behind, and raised it up and worked the ground shallower we could get more acres done. And the oats yield would go up. Less cost. But there's nutrients in respect to phosphorous. It provides a quick cover in cold weather. It doesn't like freezing. But it'll take a frost. And it's good food.

Cliff Scholz: Have you heard the old saying that the English feed oats to their horses, and the Scots feed oats to their men, and that's why the English are known for their horses, and the Scots are known for their men?

Joe Scrimger: No. I haven't. We'll think about that one. But you're onto it, though. Yeah. You're onto it.

So on the list then we'd say: barley. Barley has been around since the dawn of time. And what does it get used for? It got used more at malting. But I went out to this ACRES Conference last year. And I missed that this

year, because I went to the vegetable show in Michigan here. And they happen at the same time.

A friend of mine went to the ACRES. We talked about it here. But two years ago, they had a woman at the ACRES Conference that was baking bread with barley, almost a dark black loaf. Barley and rye were the typical older flours. But rye you can plant really late. Can't plant wheat that late. Rye is hardier than wheat. And barley can be planted in the spring. And there is fall varieties.

But barley's like buckwheat. It'll do well in poor soil. The biodynamic farmers understand that. So when they're building their soil, they'll start with buckwheat and barley, because those things will function in a low-nutrient-cycle system. And then you cover crop 'em a little bit while you're taking some for your food. And they build the soil, so you can raise a more diversity crop.

But these breads — and I'm really into wholegrain bread, and the sourdoughs — I'm into the taste and flavor of the bread. I don't wanna have to put jam on it. That doesn't make much sense to me. But I grew up doing that. I want the bread to have taste and flavor. I wanna put butter on it and enjoy it. I wanna know that I've got minerals in the bread that are basically fat-soluble minerals in my system.

And the butter and the minerals work dynamically in my gut to improve my digestion. And then the minerals work to enhance my brain. And that's not the way our system's working on the white bread model. It just doesn't happen.

And so barley is just a really nice crop. Some people do it. We've worked with all the malting varieties. But we've worked with it as a food crop. Not that alcohol is not a food, and not that I don't enjoy alcohol. Too many people get hooked on the sugar factor to alcohol.

And there's a reason for that, 'cause in plants, sugars and minerals are tied together. The body doesn't understand, that we separate the sugars. And sometimes as straight sugar: it’s pure carbohydrate, and quote, "white flour,” and we eat those things. But the body still wants more sugar, because it wants more minerals.

And it knows in plants those two things are tied. But we separate 'em. And so you have to raise the plant with that in mind. You can raise more vegetative growth. Or you can raise more seed potential. But you can put

minerals in or choose not to put as many minerals in. That's all in the hands of the farmer, sometimes in varieties, too. But the minerals are needed in warm-blooded mammals, to get them to function properly.

Cliff Scholz: And these minerals come from the soil. How do we get the soil to deliver those minerals?

Joe Scrimger: Some people are using a dozen different varieties in their cover crop now. I only named four or five things.

And I used to get a kick out of cover-cropping corn. That would really get my neighbors all wondering what I was doing. 'Cause I'd be drilling the corn, and doing a little weeding in it with a machine called a weeder.

It was just broadcast corn, actually, and worked in. I'd do that after I get everything else done on the farm, and pick a field to cover crop. Let the corn get up chest high. And it'd be just dark green. Then go disk it down. And this was in the '80s. And the neighbors would say, "You're doing what?"

But that's part of that green charge back to the system. So you can use corn, soy beans, whatever in that recipe. Or you can use all the way to a new crop, teff, which you can do it for hay or grain. But it's an African crop. Personally, I think we could do Timothy, because that's a Michigan crop, you know? Can we do teff? It's got a heck of a market. And it's…

Cliff Scholz: Isn't that like a… Ethiopian?

Joe Scrimger: You got it. I got farmers in Northern Michigan that are doing that. It's not something I recommended because this is not Africa. And I don't think we've taken advantage of Timothy and the grasses that grow naturally here. We've gotten rid of most of 'em. We don't grow grasses. We grow alfalfa and corn. That's what we grow. We don't grow grasses. We've got to relearn how to grow grasses in agriculture. We don't grow oats, in general, you know, where we used to. Oats was a huge crop coming out of the Thumb of Michigan.

So, we have these guys that are in the cover-crop seed business. And they're pretty good on seed. And I usually refer people to them if they really want diversity.

But I'm saying, sometimes you take what you're blessed with. Because some of these cover-crop seeds are fairly expensive per acre. What I do is I figure 'em out, plant 'em, and then figure out how to harvest the seed, so I

don't have to buy it over again. I have no problem buying things once. I just don't like to continue to have to buy it.

Most farmers don't know how to do seed. They know how to do commodity production. You have to reteach them that.

But there's so many seeds, brome grasses, Timothy, brome, and then the other yielding grasses like oats, that grow well here. We're striking off, doing seed from Africa, when we haven't even done the seeds that are native to Michigan yet. Does that make any sense to you?

Cliff Scholz: Well if you can find a specific market, that will allow you to grow out a crop and sell it, it makes sense. But it also makes sense to find the things that are native that are already adapted to this environment. And if you can find a way to do it economically, then, sure, absolutely.

Joe Scrimger: I mean, the whole system has caught onto niche crops. And, you know, the whole system was calling, "Wow. The organic farmers are dealing with that niche market." And right now our market is the fastest growing market of the food system.

It's not a niche market. It's the fastest growing segment of the food system. Now I'm not against doing niche markets. But what I'm talking about is not niche markets. I'm talking about redoing the food system. And it not having to be organic, but it has to be nutritionally dense. And it has to make people healthy. A friend of mine recently told another friend that, "Well he wasn't selling pesticides anymore. He's selling seed now: Soybeans."

It's just he's selling seed that are genetically modified, that have to have pesticides applied to them. I say he's still selling pesticides.

Cliff Scholz: How about bio controls? I recall Gabe Brown in his book saying that he left some areas of his farm in a natural state to provide a habitat for the species that are doing this work in his fields.

Joe Scrimger: I'm very much in favor of biocontrols, which is using one insect to control another. That's part of nature's design. That's why ladybugs are out there, and many others.

That's why there's parasitic wasps. Parasitic wasps come into the oat crop, if you're doing your farm properly, and take care of the cereal leaf beetle. We learned that back in the '70s, when everybody had been sold on the idea that they had to put pesticide on their oats.

And there was a lot of oats grown, coming out of the '60s, going into the '70s. By the time we got into the '80s, people couldn't get a big enough yield, putting fungicide on their oats, 'cause most of it goes to the soil. And it affects that system in respect to phosphorous. And oats need the phosphorous to function properly. So they quit raising 'em, because of the cereal leaf beetle.

One old organic farmer from Kalamazoo area, close to where I live now, Mr. Mundt. They did the research on his farm in respect to the parasitic wasp. That was in the '70s. Why are they just bringing that to farmers today on a more mass scale? We really need to speed this process up a little bit.

[52:26]

Part 12: Growing in a Healthy Direction | Length: 9:01

Cliff Scholz: What's holding conventional farmers back from trying these transition strategies?

Joe Scrimger: There's definitely peer pressure. Well, in the short term, we gotta keep the cash flowing. But in the long term, if you do this right, you'll make more money.

But, you know, the goal maybe shouldn't just be around money, 'cause that's partially what got 'em into the problem, not respecting the soil, while having cheap fertilizer, and just being able to put on more fertilizer and get more corn yield. Got 'em into a problem with soil. And that's pretty well recognized. But I think of all the meetings I've went to and just sat and listened. The problem, it's a mental thing that we've got to get through. And once the guy breaks through that, he's gonna get there no matter what I say. And so we see that, because organic farming, especially if a guy goes cold turkey, takes a certain commitment, once those organic farmers get into it a while, they usually are on track.

Conventional agriculture, because some of 'em have made money, and some of 'em have been able to cash flow getting larger, it's sort of worked for them. They have a new house, and a new pinstripe John Deere tractor. But that's sort of the wrong priority. It's one of the components.

Health issues got my attention back in the '70s. Those health issues really haven't stopped. I mean, they're still there.

So health is a factor. And some people it's economics.

And there's definitely a point once you get a farmer into the transition, you can say, "Okay. Now it's time to sit down at the desk and figure out the economics here. And you tell me which way you wanna go."

And they usually go ahead to the organic market, once they get a grasp on it. But that initial transition, that's where the bigger part of agriculture is at, that we gotta change. And again, we don't need to change 'em all to organic.

We just need to get 'em managing nitrogen better, having more respect for organic matter.

Back to that transition: nitrogen is the key, nutrients are, weed control.

Tillage can be bad, if you use too much. But a little tillage along with that is not bad. And you do have respect for the biology when you're doing it.

If the soil's low in organic matter, you get a faster building thing if you can mix some of that organic matter in, versus letting it, some of it, dissipate off in the air, if you leave it all on top. And the grazers are onto that. They use a close spacing on their fence, crowd those cattle so they have enough trampling effect on the residue to get it in contact with the soil. So you can use the cow. Or you can use the tillage machine to do that. It's just: Don't over-till. And don't spend too much money on your tillage.

And that's… sometimes my wife would say I'm getting too old. I have a hard time keeping up with guys spending a half-million dollars for a combine, and a half-million dollars for a tractor, and $150,000 for a disk. And I understand when you're working 500 acres a day, and harvesting many thousands of acres, you need some of that capacity. But the Europeans have taught us how to deal with appropriate-size equipment. And they tend to have smaller equipment, designed for the size of the farm.

And we don't even bother to look at that anymore. Just like we don't bother to look at small dairy processing equipment. We look at huge, humongous stuff.

So in that transition, I think the key is still back to: Getting the farmer to think some about health, getting the farmer to understand how we can make local food better for health, getting the farmer and the consumer to understand how we can trigger our immune system more with local foods. And we're not telling the public that we can change this.

Cliff Scholz: Yeah, people don’t know that local makes a difference, not

just for our local farmers, but for our own health. And doesn't it also connect with the health of our lakes and rivers?

Joe Scrimger: The governor of Ohio just this week put together a program to pay those farmers more to cut more phosphorous out of their system. Didn't say anything about nitrogen. Although I gotta look at that a little bit more. That's a new thing. They were paying 'em some. They decided that it could pay to pay 'em more.

I don't care if it's Iowa, Michigan, or Ontario. I was at three different research seminars. And the Canadian one was expressed in, you know, metric. And it took me a while to convert that. But they all come to the same conclusion, that about 70 pounds of nitrogen was really all the soil can hold. Why are we still putting on more than that? We have the science. I mean, that was in the '80s, guys. We're not looking at the science. We're still selling that farmer on things that he really doesn't need, and a system he doesn't need.

And that won't make him money, and won't make his family and his neighbors healthier, physically or economically, in the future.

I mentioned that this is a great time for a young person to get into farming. It's not a get-rich-quick scheme. But he will make his family healthier. And he will make his community healthier. And his community will pay for that. We've already shown that. That doesn't need to be checked out.

Base your system on raising good quality food, because we missed that base. And we missed that base back in the '60s and '70s, and even before.

A lot of those old-time farmers, and people in the community understood what was going on in the '50s or '60s. But we kept going.

It's not just the farmer. The consumer's been sold the same bill of goods, by a pretty high-tech media system.

Take medicine all the way back to the start: your food will be your medicine. Your medicine will be your food. And that's what supposedly the medical system started with, with Hippocrates way back when. But it become hypocritical to make that statement, because we were moving to relying on drugs. And we're not relying on food. And people just take it for granted, you know?

So it's the farmer's fault. But it's also the consumers educated in just about the same way. A lot more consumers. So if we can change them, and get

them to request more, just complementing the organic demand, and complementing certain specialty crop demand, complementing the demand for whole grains in the marketplace, that's a plus to people's health.

And most of the wheat out there is raised with yield in mind, not nutrition.

Cliff Scholz: Yeah. The consumer education piece is a component of the overall transition. Because it will drive the market demand that will then further incentivize farmers.

Joe Scrimger: That demand is a vote. When the people buy food, that's voting. And they just need to shift how they do their vote. And that'll change things almost faster than the farm can.

If we get farmers doing a majority local food again, or approaching that, we get consumers more focused on that, the system corrects itself. And I wouldn't spend this time with you, if I didn't have that figured out.

So I know there's some pieces in the transition that are challenges. But I know if we go to a more of a local/regional food base, and meaning just majority, 51%, that the system corrects itself.

I want that soil quote "symphony" — and farm, it's the whole farm symphony — to work. And I wanna help that process. And the key thing is that the value system in the local food helps to straighten up the phosphorous pollution in Lake Erie.

Cliff Scholz: So if we keep nutrients on the farm rather than running downriver to ruin the lakes, everybody benefits. But how do we get there?

Joe Scrimger: You don't wait for perfect. We need to change this. And, and we hope that consumers can catch it the same, and more farmers.

Direction, in the end, is the important deal. It's not being perfect tomorrow. In fact it… whether we ever get perfect, and whether we wanna ever think we're perfect, we always need to be improving.

Eliot Coleman, one of the times we had him in to speak at the university, and that was in the late '70s, early '80s, he says, "The science is there, even at Michigan State." He says, "You can go to the library and pick up anything that we're really talking about today." It's just a matter of how you piece it together, you know?

So, we are using more science, and more current science, and more biological science, and more dynamic science. I'm pretty proud of the people I deal with. I'm proud of the farmers. I'm proud of the researchers. I'm proud of the consumers.

[1:01:27]

Cooley Ludtke: That was Joe Scrimger. To hear more content like this from Joe and other farmers and farm advocates, check out our website at FarmsForTomorrow.org. Follow us on Instagram, Facebook and Apple Podcasts. Thanks for listening, and spread the word!

END OF TRANSCRIPT