



## NUTRIENT CYCLING & NUTRIENT DENSE CROPS

Featuring Joy Youwakim

Farmer & Agroecology Scientist at Biome Makers

### DJ May 00:01

Welcome to the Decode 6 Podcast where we take your questions about carbon and ecosystem services and match them to the experts with the answers. I'm your host, DJ May. Today we're talking about nutrient cycling in nutrient dense foods. There's a connection between what's in the soil what farmers apply and what ends up in the final plant. It's a complex dance in the perfect question for today's guest, Joy Youwakim. Joy is a soil scientist with a specialization in soil chemistry and soil microbiology. She currently works as an agroecology scientist with Biome Makers. Joy's been farming for eight years and has led research projects ranging from examining the drought resistant properties of sorghum to testing the feasibility of farming atop closed landfills due to potential heavy metal contamination. Joy, welcome to the show.

### Joy Youwakim 00:52

Thank you for having me.

### DJ May 00:54

Yeah, it's great to have you on. So we're gonna start right at the beginning. What is nutrient cycling?

### Joy Youwakim 01:00

What is nutrient cycling, so nutrient cycling refers typically farmers think of nitrogen, phosphorus, potassium, perhaps carbon also, but also their nutrient cycle, we have nutrient cycles for all nutrients, sulfur, your micronutrients, manganese, magnesium, calcium, for example, initiated cycling refers to the Sun really funny, but the cycling of those nutrients. So we have gain and loss pathways and soil biology, we have microbes that are able to fix carbon. And then we have microbes that are involved in processes like aerobic respiration or fermentation, where we have carbon loss, the same for nitrogen, phosphorus, and potassium, we have phosphorus and potassium solubilizes. And we have microbes that need phosphorus and potassium for their own processes. So there's competition. And that would contribute to loss. So nutrient cycling refers to this activity between these microbes, and often we're interested in the net of the cycle. So are we net positive or net negative? What can we do to increased nutrient cycling? And particularly with solubilization? Or fixation?

### DJ May 02:14

Okay, okay. So I feel like we're taken away back to like elementary school science, when you're looking at like, your cute little drawing with like the plant and the decomposers and everything, and then that you end up with some in the atmosphere. When we're thinking about this in terms of like, management, how, yeah, how does it all like tie in with what a farmer is doing? Because obviously, there's some that's happening, you know, all by itself. And then you have inputs coming into the system, too, from management?

### Joy Youwakim 02:43

Yeah, that's a great question. Farmers are really used to their chemical fertility tests, they send in their soil sample, they get data back that says, you know, you're low on nitrogen, phosphorus, or potassium. I mean, this is how you could add more, when we're talking about soil biology and nutrient cycling, we are making sure that even if you are adding more nitrogen, phosphorus and potassium that you have the microbial communities that can consume that addition. Because if you're adding and you don't have the biology there to work with it, then you're adding, you know, and it's not going anywhere. So that's the number one reason it's really important. The more that we know about nutrient cycling, and so biology, the better management decisions we

can make the more informed management decisions we can make. So that we're not buying products that we don't need to be we're not over applying. And that's, that would be the top reason I could go on about that for a while, though.

**DJ May 03:37**

Yeah, no, I mean, I think that's a great connection. Can you dig in a little bit more, you mentioned, you know, obviously, microbes, I feel like, we're very used to the idea of like, okay, soil test inputs. And maybe that concept in the middle of like microbes are sort of the engine that are making all of that change from just a raw input to something the plant can use, can you break down the role of microbes with nutrient management and cycling.

**Joy Youwakim 04:05**

So within nutrient cycling, microbes are responsible for the gain, loss, and then some indirect benefits as well. The best example to think about is like you're mentioning, let's say we have a cover crop field, we have planted everything, it's time to harvest before we plant our cash crop. And everything sitting in the field decomposing, the microbes are gonna be really helpful in consuming that plant material, and then releasing, helping facilitate the release of organic matter and sort of increasing that content in soil. So that's something we really look for. We have an easy example that we love to see that is inarguably beneficial. They can help with a lot of other functions as well, when we're looking at overall phosphorus cycling, overall potassium cycling, and we also with monitoring the communities that are maybe contributing to loss and we ways that we can look at management as well. So that would be like, if we have with nitrogen, and we want to see microbes that are helping with inorganic nitrogen release. And then conversely looking at microbes that if we have a population of microbes that are competing for nitrogen, and that's too high, how we can manage that as well.

**DJ May 05:18**

Okay, okay. No, that's perfect. So just to kind of tie everything together. How much of this is kind of top of mind when you're thinking about management, as far as microbes for most people?

**Joy Youwakim 05:30**

I know, for a lot of people that it's the first time that they're doing testing, they say, I've been, I need to do something new. My chemical fertility routine isn't working, I'm not sure why I want to see what's happening on a biological level. And then we can show them paired with the looking at their chemistry data and our biology data, what's missing, and why things aren't lining up. For some people, it's top of mind. For some people they are they've been in the region x base for a long time, and they're working with biostimulants. And they're monitoring those really carefully, year after year, and seeing how the biostimulants that they're applying are affecting their microbial populations. So it really depends on the farmer, their management techniques and where they're at in their soil health journey.

**DJ May 06:15**

Yeah, okay. No, that's perfect. And then, you know, the last thing that we kind of talked about was like, you do all of this to figure out your management, you've sort of nailed down what's going on with your microbes. How does that all translate into more nutrient dense food at the end of this?

**Joy Youwakim 06:30**

Great question. So when we're talking, you know, soil is the foundation for our health, when talking about nutrient cycling, and nutrients that are present in soil, that directly translates to nutrients that are in food, and then that we can retain in our bodies. So there are a lot of steps. First, they have to be present in soil, then

they have to, you have to have the microbial communities that can uptake them, produce them, help collate them, bring them into produce. And then there's the whole cycle of you know, when you get your produce and how long that takes. So the connection between nutrient cycling and nutrient dense foods is that when you have a microbial population that is cycling well, and where you have your net gain, and you know they have enough food to consume and do that, you're increasing the likelihood that with, you know, everything else going well. But as farmers, we know, there's weather, and all sorts of things that can happen. But everything else equal, you have your producing produce that is high and taking as much as they can from the soil. So as we're replenishing our soils that have been depleted. For years, we are hoping that as we regenerate them that we can also create the produce can uptake everything as well. And then that translates to our own health and well being. So that's the connection between them.

**DJ May** 07:49

Yeah, yeah, no, I mean, maybe this is a silly question, Joy. But I'm sitting here and you know, this is maybe one of those things where it's like, well, I can't see it. So is it really happening? Because you assume like, all producers are created equal? Like if I get an apple, it's going to be the same as some other apple? So as as a farmer, how do you know that? Maybe you're like optimizing the produce that you're producing, for lack of a better way to say that?

**Joy Youwakim** 08:14

Oh, absolutely. Yeah, if you looked at like a green bell pepper against another green bell pepper you, you wouldn't know the difference. As a consumer, or maybe even as a farmer, the best way to do it would be to participate in testing to test your fields at the beginning before you plant anything, and then looking at the end. And that's what many farmers do already with their management practices, they're looking at what the crop took. So crops you know, that's another thing is, when as we grow crops they are taking from the soil, and we have to find ways to put it back so that they're ready for the next crop. So when we talk about soil depletion, that can be from a variety of factors, whether we're planting the same crop in the same field over and over again, and then we're not replenishing what it's taking for for it to be produced, you know, it's taking these nutrients, just like us how we need them to grow for itself to grow. So ensuring that the soil is ready for the next season in that way. And then making sure that we're feeding back what's there, so it has the highest chance of success. So it definitely comes to soil testing and knowing your numbers so that you can ensure that everything's present. Awesome.

**DJ May** 09:20

Okay. And that's like a perfect lead in because I wanted to ask you for some practical tips. If you're thinking about really, you know, producing the best food that you can. What what are some advice you would give to maybe someone who hasn't thought about this much yet?

**Joy Youwakim** 09:35

Well, there's a lot. There's a lot of really, it depends on your farming style. But yeah, practical tips for improving nutrient density and foods. I would say. The first one is deer chemistry testing Deer Valley testing, see was present look at your communities, see what you're working with. Then there's a host of management choices that you can make after but you can make a much more informed decision once you have that in information. And then whether that is applying, you know, replenishing, maybe you find that you do have depletion and you need to replenish or everything's fine. And you see that your community is also fine and can cycle well, then you go forward and grow. It's really there is nutrient density testing you can do or you can send produce to labs, and they will test and let you know the quantity of the nutrient like nutrition information. So if people were doing an experiment with different soil amendment applications, then they could see which one improved

nutrient density more. And I think that that's something I've read a lot about how it's going to become more important in the future, and farmers can be paid more for producing higher quality produce. So it's not a bad idea to start thinking about those things now and finding products that work well. And even if you don't add anything, let's say soil amendments aside, but management techniques that encourage soil nutrient retention, which can happen, it's different based on your soil type that can be improved through several different methods. So those would be the tips off the top of my mind.

**DJ May** 11:07

Yeah, what, what methods outside of, you know, application? Are you thinking of, or

**Joy Youwakim** 11:12

testing, I mean, cover cropping is great. We know that cover cropping helps to bring in nutrients that if once were those tight crop rotations, we're adding in things and you know, switching up the microbiome a bit. So that's really helpful, leaving the organic matter in the field to decompose and making sure that we are in that, you know, even when not, you don't even have to play out the same cover crop every time, the more diversification or rotation that you have, is really helpful and can help improve. So aggregate stability, reduce soil erosion, and then you have the soil moisture retention as well, again, depending on your soil type, but those are management practices that cover cropping in and of itself and in the rotations as well as intercropping. You know, if people can't cover crop, even intercropping, adding, the more more crop diversity that we can help the microbiome and also helps with replenishing the chemical quantities as well. So that would be my number one recommendation is crop diversification. And those are three different ways that you can do it. Besides that, the minimal disturbance is very helpful with keeping the microbiome strong. So when we're thinking about machinery and passes, minimizing those as much as possible is really helpful. And besides that, those I say, those are my top two.

**DJ May** 12:40

Excellent. Okay. Is there anything I didn't ask you about, in terms of nutrient cycling, nutrient dense foods that you want to plug here at the last little bit?

**Joy Youwakim** 12:50

I would just say that, in the emphasis of, you know, I think most maybe consumers at large, you know, they're shopping for produce, and they don't think like, the maybe they think like, how, when was this harvested? Or how long did it take to get to me, but rarely are people thinking like, this came from soil and you know, what was in the soil that is composing everything that's going into my body now. And I would stress that it is, you know, it's, we talk a lot about the difference between dirt and soil. And this is kind of it when you when you have a soil that is cycling well and able to have this nutrient retention, it's, you know, the difference and it when we think about ourselves and how we're moving forward and regenerative ag and public health, nutrient cycling is the sort of foundation for us. So I would encourage people to focus on it and paired their biology data with their chemistry data.

**DJ May** 13:53

Perfect. Well, thank you so much joy, it was great having you on.

**Joy Youwakim** 13:58

Thank you.

**DJ May** 14:00

And that's our episode for today, you can find more information about nutrient cycling and nutrient dense foods in the show notes. And if you have questions about carbon and ecosystem services that you want experts to answer don't hesitate to reach out to [info@decode6.org](mailto:info@decode6.org). Also, you can always come and learn more with us about carbon ecosystem services and better farming at [decode.six.org](http://decode.six.org). We'll see you there.