Nutrient Dense Soil

Transcript – Module 3

Hey, welcome to module three of the soil certification workshop. I'm Tom Bartels from GrowFoodWell.com and today I'll be talking about the basics of soil amendments and that may raise the question about amendments in general. Why bother adding stuff to the soil? Why don't we just skip it and start planting? Good question and the answer boils down to this. Plants need an assortment of minerals and nutrients to grow properly. Here's the list of all of them. Now, you might recognize the first three: NPK or nitrogen, phosphorus and potassium. That's because you see them on most bags of fertilizer or the NPK levels are represented as a percentage of each mineral contained in that material by weight. NPK are the three biggies or macronutrients plants use to grow. Without them, plants just simply don't do well. So, these macronutrients are needed in higher levels than the remaining minerals on the list also called trace minerals, since they're only needed in smaller quantities, but they are needed by the plants for full growth and that's a key distinction. Many of our soils have been demineralized over time through weathering, erosion or overuse. Those soils no longer have the full spectrum of minerals needed for robust plant growth. And the thing about demineralized soil is that your plants and your microorganisms can no longer work at full capacity. So, no matter how active your soil organisms might be or how attentive you are to your garden, your plants are working at a disadvantage. That's why you amend your soil. As you know, soils in industrial ag sectors are not treated so well and plants there are typically fed a liquid diet of NPK fertilizer. Since the soil isn't amended each year to replace nutrients, it becomes a weaker each year. In most cases, the soil isn't being amended at all.

The soil microorganisms are absent, and the plants are basically being fed the liquid diet, much like a hospital patient on an IV drip, technically alive, but not really living. Instead, it's best to feed the soil a full array of the mineral and organic matter that it needs. And we'll be talking about that in just a second. That then feeds the microorganisms in the soil that breaks down that solid material that consequently feeds the plants. That's how nature does it and that's one of the basic tenants of organic gardening, feeding the soil a solid amendment that then feeds the plants on its own versus feeding a liquid diet to the plants themselves. Now the best way to find out which minerals are deficient in your soil is to look at your soil test results, but if you didn't take a soil test, you can generalize just a bit here because most of our soils are demineralized to some extent, unless you live in a very lucky area.

And even if we're growing in organic gardens, if you think of it this way, each successive year that you harvest all these nutrient rich and mineral rich vegetables and eat them, the soil creates and has all that mineral and micronutrient content that comes from the soil. So that gets into your vegetables. You take it away year after year, and you're actually mining that out of the soil. So, at some point you need to replace that mineral and nutrient load back into the soil. And many people will resort to the liquid fertilizers, NPK varieties that only have a certain very small spectrum of minerals in them that then give a shot of quick energy to plants. That's a fast-acting energy release that happens. That typically drains very quickly through the soil profile, does a little bit to supercharge that plant briefly, but it does very little to the soil enhancement as a whole.

And that's why I support the solid amendments that you can put on the soil that last four months or in some cases years with a slow release of minerals and nutrients that then feeds the soil profile and the microorganisms that then feed your plants. Now, as far as organic gardening goes there are only three basic amendments that I would recommend in general. Worm castings being the fourth, but the three are rock phosphate or rock flour, green sand and organic compost. And we'll talk about the benefits of each of them individually. Now remember, individual results may vary so

your soil may need some adjustments due to high or low pH or varied mineral content, but the point is you can't hurt a garden too much when using these three amendments. They're slow moving natural additions that the soil can utilize to help microorganisms and plants grow for the long haul.

You only need to use rock flours every five years or so or when starting a new bed. The compost is the only seasonal addition. Let's go through each of the three to see how they help soil. Rock phosphate is basically crushed rock. It comes in a powdered or pelleted form and adds phosphorus and calcium to the soil. It also contains 11 of the trace minerals that your plants need in small quantities. Green sand is crushed marine fossils and sediment material from ancient oceanic organisms. It adds potassium, silica, iron oxide, magnesium, phosphoric acid, and about 30 other trace minerals to soil. Organic compost is really the magic elixir. It adds other micronutrients dependent on the source materials that you're using. It adds nitrogen and general organic matter, which can supercharge your soil in many ways and it's really hard to overstate how important organic matter is for healthy plants.

Let's look at what soil organic matter can do for your garden beds. It increases Cation Exchange, which we'll explain in a minute. It increases plant available nutrients while supporting slow releases of them. It helps aeration, reduces erosion, increases water infiltration while also retaining more water. It increases microorganism activities and beneficial nematodes. It improves drainage and water holding capacity simultaneously, which improves soil tilth and structure. And that's it. That's all I've used in my gardens with the addition of some worm castings for the past 18 years and my gardens grow like this and like this. So instead of resorting to grabbing the flashy label of liquid jet fuel for your plants or fish emulsion or some other expensive additive, I would recommend going for the slow-release solid forms of amendments for organic gardens. Now we're going to talk about the pH of your soil for a few minutes here.

There's a few basic concepts you should understand about the pH level or the acidity or alkalinity of your soils. I'm out west and the Rocky Mountains have a typically more alkaline soil, so it's going to be a higher pH. Mine came out I think originally at about a 7.5 or higher, so it's a pretty high alkaline soil. And you may be in Florida or somewhere to the south or somewhere where it's rainy and you might have a much more acidic soil. And pH, the amount of acidity or alkalinity in your soil, can contribute or detract from the success of your garden and growing vegetables in a couple different ways. If you have a really extreme pH, a super acidic or super alkaline, it will reduce your plant's ability to access the minerals in the soil.

And since we're on the subject of minerals in the soil, I want to quickly go over a term you might find on your soil report called the Cation Exchange Capacity or CEC, which measures your soil's ability to retain certain positively charged nutrients including calcium, magnesium, potassium and nitrogen. Those nutrients all have a positive electrical charge and require a negatively charged surface to attach to. When that happens, your soil can retain those nutrients and they're less apt to be washed away and will be available for your plants. Clay soils and humus can help hold those Cations in higher numbers since they have more surface area with a negative charge. Silty and sandy soils have a harder time and a lower Cation Exchange Capacity. The CEC value can directly relate to how much amendments need to be added to the soil. In general, if there's a higher Cation Exchange Capacity and the soil is holding more nutrients than the plants can use in one season, than less amendment is necessary.

If, on the other hand you have a really sandy or silty soil with low Cation Exchange Capacity, then the nutrients need to be added more often to compensate. But at certain times you can be wasting amendments if you have a Cation Exchange rate is too low and it doesn't have the attractant electrical charge to hold onto those nutrients. So, if you have a CEC value on your soil test results, that's what is referring to and is part of how they decide on recommended amendments. The pH of your soil can also affect the CEC, which can be a bit confusing. So, I use an analogy to explain it.

I like to think of it like a radio dial when you're trying to tune in a radio station and if it's not quite tuned in, you get all this static and you have a hard time accessing the content of what's being said on that radio station. That's sorta like a low, really low pH or a really high pH. The plant can't quite access the minerals and nutrients in that soil, but if you dial it

in, if you get that pH closer to the 6.5 to 7.0 window, that's like tuning in a radio station, you get full access to that clean signal and you get all that content readily and that's the plan; getting access to those minerals and nutrients that they need. If you have a really tweaked pH that's super low or super high, you can adjust it to get it balanced or closer to the center pH of 6.5 to 7.0 by adding one of two things. For the acidic soil, you add lime. For the alkaline soil, you add sulfur in powdered form on both counts and what your soil test results will give you is information about application rates of either the lime or the sulfur. It's important to pay attention to the quantity of those applications, so you don't put too much or too little. You don't want to be really messing around and being sloppy with adjusting your pH, so pay attention to those if you're going to do that. And you want to incorporate the lime or sulfur completely in your soil. Don't leave pockets of it in different places because that'll burn your plants. Now, I don't have a lot of students that I suggest lime and sulfur for their soils because most of them are a half point off, either high or low.

And frankly, it gets a little tricky trying to balance your pH with sulfur and lime. It takes sometimes, a lot of time to do it right and you've got to keep testing the soil to make sure you're closer or if anything's happening at all. For instance, if you check your pH in the spring, it can be up to a half point of difference then if you check it in the fall without adjusting anything. So that pH fluctuates a little bit during the year depending on what season it is. And even though, for instance, I have alkaline soil that is over 7.5 on the pH scale, I've been able to buffer it for over 19 years by using compost and compost has the ability to quote unquote buffer pH by just allowing those plants to have such robust root growth that they can accommodate and pull up enough minerals even though the pH is not perfect, it's not totally balanced. I'm high on the alkaline scale. So, that's really good for fruit trees but not so good for vegetables. So again, if you have a fruit tree there and some vegetables here, you don't want to have to go micromanaging all these different soil areas. I tend to generalize and buffer the pH with compost. So, keep that in mind. The pH of the soil is important for accessing the minerals with the CEC or the Cation Exchange Capacity. And it's really important for getting certain types of vegetables that like that sweet spot between 6.5 and 7.0 and if you're growing in a 4.0, a really super acidic soil, it's not going to grow very well. The same for the consequence on a high pH or an alkaline soil. So, you want to kind of swing it in the middle a little bit, test your soil.

You can generalize a little bit if you know the soils around you happen to be around 7.4, to you know, 6.5, somewhere in that scale, you're going to be okay if you just keep adding compost and that'll help you buffer it. But for those of you in extreme situations, best case scenario for you is to get a soil test. You know exactly, close enough, what that pH is going to be, and you know which direction you're going to have to move to get that more balanced pH for garden vegetables. So, by amending the soil with rock flour and green sand every five years or so, or for every new bed and adding compost each season we give the microorganisms in the soil, all the minerals and nutrients they need to feed the plants. And this plant feeding system that's driven by microorganisms in the soil is called the soil food web. It's how a forest feeds itself on its own and when you feed the soil food web in your garden, magic happens. Once you understand how it works, it'll transform the way you grow. We'll be covering the soil food web in module four. So, go ahead and take the quiz for module three and we'll see you in the next session.