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## Soil Education Course Chapter 2 FAQ

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### Session #7: The Natural Nutrient Cycle

**1. Q: What is the source of the company name Earthfort?**

A: The original name of Earthfort is Earth fortification Supplies Company. The Earthfort logo was created by a graphic design student at the University of Oregon whose husband worked for us. They created this earthfort logo and we went “Oh, awesome!” and then we shortened the name. A few years ago, we officially changed the name to Earthfort LLC.

**2. Q: About that PH chart you showed earlier, do the bars represent total or available nutrients?**

A: They represent total nutrients. They’re not taking into consideration any of the forms, whether they’re available or not, it is the total.

**3. Q: Adding a salt-based fertilizer. I understand that the macronutrients are a problem. But what if you have a deficiency of a micronutrient (let’s just say, manganese) and you have a bag of manganese sulfate and instead of using 5lbs of macronutrients, you use 1-2 ounces. Is it a problem adding it in a sulfate form?**

A: It’s all about volume. Small micro doses of those things are fine. And one of the tips that we’ll talk about in the when we get into the practical side of things as we get into the more doing of stuff one of the things that we recommend you do is you take your compost and you mix that mineral component into some organic matter and let the biology work on that, and then apply it to the soil. And it can be a lot less. Basically, let the compost buffer and absorb it before you apply it. So that’s another way to approach dealing with that. 5lbs of a product on a thousand square feet is going to just be devastating, but a couple ounces will probably be fine.

**4. Q: About irrigation... There are more and more water restrictions added all the time in California. We’re depleting water sources. Could you expand on the water holding capacity within the soil?**

A: When the biology is not working correctly, you have to irrigate more because it loses its ability to hold onto the water. The sponge-like quality of the soil is directly related to organic

matter content, but more importantly, building biology. Fungi specifically creates that network: that sponge. It's part of the reason why no-till is actually such a great idea, because it doesn't disrupt that characteristic of the soil that can hold in the water. Even if you can't irrigate, we've worked with a lot of dry land, farms, and stuff. And it's just a different yield. Dry land barley versus irrigated barley might as well just be 2 different plants because of the production and the way that you manage them. The yields are radically different. It's not necessarily that you have to have irrigation, but the growth of production worldwide is directly tied to the ability to irrigate and to get water to those plants. It's all about yield, but not necessarily about quality. We have a lot of fun with the almond growers down in California and their water system.

**5. Q: Where does humic acid come in? Does it break down?**

A: I suggest you go to the Humic Substances Society Web page. Basically, it'll be frustrating because everybody has different opinions about it. There are stable forms of organic matter that become humus, that's the stable form. But even humus gets cycled and utilized. It's still a mineral component of biology. They say that the biology has broken it down, but it's still habitat, and it's still fairly volatile. Humic acid is an extractable component of humus. Soil or organic matter coming out of mineralized forms, eventually it does become mineralized. A lot of organic matter over time becomes coal. In a particular stage of that coal, you can extract humic acid pretty efficiently. That's where most of the humic acid products come from. The real answer is that yeah, there is that stable component but it's not as stable as people think.

Humic acid in that form is not really doing the same kind of a job as applying humic acid directly to the soil. Again, the conditions of the soil vary greatly. Basically it won't do anything in a healthy region here in the northwest US for a healthy system. It's a pointless activity. But, in an unhealthy system, or in a system that needs a lot of help to rebuild itself, it can be really valuable.

**6. Q: Regarding fertilizer challenges chart, with the almost 100 units drop in fertilizer consumption over several years around 1990, why were cereal production and yield levels seeming to not be affected?**

A: There are a few ideas about what may have happened to create this view.

1. The biology was able to recover just enough to do its job without those inputs.
2. There was excess fertilizer in the ground that was utilized to help maintain productivity.
3. This is a global perspective, and the US and Russia were the two largest users of the fertilizers, but much smaller in overall production, so the rest of the world held steady or improved because they did not use that much to begin with, and the averages, globally, were only slightly impacted.

If we saw the individual countries I think the graph would look different depending on the nature of the agricultural system. It is an interesting graph, here is a link to some much more detailed information: <https://ourworldindata.org/fertilizers#all-charts-preview> I have not

looked through it all and I do not know how far back it goes, but it may provide some deeper insights.

### Questions from Session #8: Bacteria

- 1. Q: A question from a textbook from the suggested reading. There is a chapter on bacteria and archaea... for our purposes, do we care that there is this other domain of similarly shaped/sized biology?**

A: It's interesting to the scientists who are studying it. The archaea tends to be those extremophiles. For the most part, they're the ones living. Snottites would be considered archaea and not necessarily bacteria. But for our purposes, it really doesn't matter. So when we're doing bacterial counts under the microscope, there's no way to tell the difference between the bacteria and archaea. So, don't worry about it too much. It's like fungi.

You have to remember, scientists love creating work for themselves. The more species there are, then that means the more specialization there is. If there's a million species of bacteria, that means there's a million PhDs (or more) studying that organism. Then it becomes exponential when you actually start looking at it from a perspective of how that bacteria interrelates to its environment, to different plant systems, to other organisms, and now we have billions and billions of years of research history. I think the archaea is just an easier way for them to differentiate between general bacteria and these extremophiles.

### Questions from Session #9: General Fungi

- 1. Q: If one wanted to increase the diversity of fungi could you go to an old growth forest and get a couple of wheelbarrows of the litter on top and spread it around your garden, or is there a better tactic?**

A: I don't encourage that because you won't know what you're getting. A lot of those organisms that live in that soil will probably wipe out your vegetable patch. They're not meant to be growing outside of the forest... necessarily. What's beneficial in the forest could become quite harmful in the garden. With that said, I also don't encourage people to go in and harvest natural materials, unless you have permission to do so, and it's not from a national park, etc. There're liability issues with stealing somebody's soil. That's just the caveat. We know the best thing to do is just good compost, and maybe even a variety of composts.

Diversity is all about supporting your habitat. A lot of these organisms will come along, even in an urban setting, they're just waiting for the opportunity, so your best bet is to just have a good compost. If you do go collect some forest soil or something like that, put it into the compost process, don't just put it directly into your garden. So, actually just incorporate it at the beginning of your compost, feed it to your worms, put it into the composting & thermal compost process. That way if there are any diseases or other weird things going on in the compost, it will integrate more completely into that mixture. You can also diversify your food resources to encourage diversity. So don't always need to use ReVive to feed your fungi.

## **2. Q: Does higher lignin increase the fungal content?**

A: Think about other components like increasing the lignin content, and focus more on just the general carbon. Higher carbon tends to be higher fungal and we will talk about that when we get to the compost for sure because we'll talk about inputs and everything. So higher lignin, higher carbon content will definitely increase the fungal diversity and quantity.

## **3. Q: Size increasing lignin, carbon, fungal, what other conditions are helpful?**

A: Time is important with fungi. When you look at the life cycles (and again, we'll talk about this in probably another month or so) Bacteria are fast growing. Fungi are a little slower but they need more time. If you're making thermal compost, mixing it up a lot in the early stages, and you gotta let it rest. Having a high carbon food source. Also, looking at things like oats, and making sure the moisture is not too wet, not too dry. Cooler temperatures also favor fungi. That's why most of the fungal content in a compost comes after it reaches ambient temperature and cools down.

## **4. Q: Are some carbons better than others?**

A: Oh, yeah. There's always a differentiation. When you're looking at woody material, the one thing to avoid is aromatics. This means eucalyptus, pine, cedar, any of those types. Those plants have antimicrobial, protective compounds in those plants. The reason why cedar is a great thing to put in a closet is that it not only discourages moths, but it also discourages fungi and bacteria growing. Plus, it takes forever for cedar to break down. So yes, some carbons are definitely better than others.

The kind that breaks down quicker are things that have already been processed. This includes paper, cardboard, sawdust. Those types of woods tend to be quicker, wood chips are a slower process. Personally, I like alder and maple. Cherry can be good. Apple too, but just be aware it's a dense wood, so it takes a little longer to break down. Apple is great if you're doing static piles for a year, but again, we'll talk more about that when we talk about composting. The other thing to look for is shells. A lot of people really like using hazelnut, walnut, and pecan shells. Just be aware that those are really dense, and they make great walkways through the garden... but they may take a long time to break down in a composting process.

## **Emailed Questions**

## **5. Q: Are there commercially available sources, other than Revive, to add fungal diversity? And, how much is enough?**

A: Adding diversity is different than encouraging diversity, you can only grow what is there. Revive is a food, other foods could be fish hydrolysate, kelp, humic acid, any protein based organic fertilizer could also be good (soymeal and alfalfa meal), also grains flours such as oats. How much to use is difficult to determine; how well it stimulates your biology, the conditions in the soil are all factors to consider. Typically small quantities frequently applied are preferred over a single large dose.

- 6. Q: When commercially available compost lists "forest products" as an ingredient, is that secret code for "sawdust"? If so, is there anything wrong with using that?**

A: It may be that they are referring to sawdust, old bark dust, or any woody material removed from a logging operation. I do not think there is anything wrong with this, so long as the product is properly tested and labeled.

- 7. Q: I've read that adding oats to my AACT (Actively Aerated Compost Tea) will create a fungal tea. If so, can I sprinkle oats in my garden?**

A: Just putting oats into your tea will have little impact, as they must be consumed by the microbes in the compost prior to brewing. This process can take up to two weeks. Certainly you can apply oats directly into the garden, I recommend using whole oats, they have the germ that contains the essential oils.

- 8. Q: Finding non-aromatic wood chips is a challenge (fir bark was applied to my landscaping). I can find small bags of maple, apple, etc. in the Weber section of big box stores. Can I use those for my small garden?**

A: Fir bark makes a great mulch and walkway material. The key to the aromatics is to get aged material; once the phenols gas off, they can be perfectly suitable. Using smoking chips can be just fine, just be sure they have not been treated with any chemicals to "enhance" the smoke flavor, these may be less than desirable inputs into the garden.

## Session #10: Mycorrhizal Fungi

- 1. Q: Which companies produce quality fungi products for application to your plants?**

A: It depends on what you are looking for, and for which crop. For example, trees and pumpkins would have very different needs. Most companies offer 20 common species of Endo-Myco and Ecto-Myco. Nobody offers Ericoid. Most of them are good, as long as there is a good spore count. There are so many companies that I wouldn't know where to begin. I'd make sure to get something that is specific, as there is really no need to apply Endo- and Ecto- simultaneously. You can easily find those Endo/Ecto mixes in general stores and places like that, as the general public doesn't know much better. Most people think applying both is beneficial, but really depending on your plant/crop type, you will need one or the other.

- 2. Q: I work in urban landscapes. Can mycorrhizal fungi be applied to containers or disturbed landscapes? What can you do to grow Ericoid plants in containers (e.g. blueberries)?**

A: Focus on getting the general soil conditions good (or better), and then introduce spores. Especially when buying nursery plants, you'll most likely have that ericoid already present. For containers, say you're trying to grow blueberries from nursery plants, the ericoid will most likely already be there. From seed, you probably won't have that ericoid already there. A good rule of thumb is that if blueberry plants are producing berries, you do have ericoid present. One way I'd recommend getting that inoculant would be to take some of the soil

from around the fruiting blueberry (or from azaleas or some other ericoid plants) and put it on your new plant's soil.

**3. Q: Is it possible for mycorrhizals to do well in rocky clay soil? To benefit turf, for example?**

A: Absolutely, it is all part of establishing a healthy soil. Plants don't care what the soil texture is like, if all of the organisms and nutrients are available to them.

**4. Q: Have you had any experience with the Johnson-Su type bioreactor and producing effective fungal compost with this method?**

A: Yes, I have worked with a few people using that. One thing about compost -- you will NEVER EVER get mycorrhizal with the compost. You'll get fungal components, it is a great source of fungi, but you will not get mycorrhizal fungi.

**5. Q: Is it counterproductive to use mycorrhizal fungi and synthetic fertilizers?**

A: High phosphorus fertilizers can be counterproductive. The plant finds the phosphorus and shuts off the fungi build up and colonization; the plant no longer needs it. What the fertilizer does is it discourages the fungi colonization, so it no longer grows to support the plant because the plant is directly obtaining the nutrients it needs.

This can be compared to a cat needing food, if it hunts its food itself, you won't need to feed it. But if it's an indoor cat, you'll need cat food (i.e. a synthetic fertilizer) to feed it.

**6. Q: If a farm soil has too much Magnesium and not enough Calcium, is just spraying fungal based teas and extracts enough to get a farm started? Or will we need to apply small amounts of Calcium until fungi is established enough to free Calcium up in the system? Are there other applications needed to support the fungi being applied to make sure they establish successfully? Does SOM % matter in deciding this as I assume organic matter is an important source of food for the fungi?**

A: A little bit of calcium can go a long way to help get things balanced. Also, Soil Revive can help feed the fungi and break loose some of the salts. Adding compost in addition to the extract/teas can be helpful in the worst-case scenarios. Of course testing helps to guide these choices.