As an effort to understand more about what's under the ground we stand on, I took a three day course in microbiology. It's a fascinating subject. The professor dispelled many myths and inspired a desire to learn more. I have a long way to go.

Soils have lots of nutrients, but they are in a form that is unavailable to plants. A soil test tells us what's available, and gives recommendations for how much fertilizer to add. The water soluble fertilizer helps t he plants to grow, but it destroys the soils microorganisms. Once we learn their role, we don't want to hurt them. There are a thousand times more unavailable nutrients in the soil than available ones, and microbes can make them available.

In a teaspoon of good soil, 600 million bacteria live. In poor soil only 1 million are present. Around plant root in a live humus soil, you will find 10 to 100 billion bacteria in a teaspoon of soil. That's a big difference. So what do they do?

All plants exude (give off) stuff as they grow. Scratch you arm and stuff comes out of you, too. This stuff is food for microbes, bacteria and fungi live on it. In exchange for this food, they help the plant to grow. Protozoa and nematodes eat the bacteria and fungi. Bugs eat them. Bigger bugs eat the smaller bugs, and on and on.

With all this eating going on, there is a lot of excreting going on, too. This is fall of nutrients that the plants can use. So when your soil test says you need 200 pounds of nitrogen, because you only have 20 pounds available, don't worry. Nitrogen fixing microbes will supply the rest of the nitrogen your crop needs. The same is true for potassium and phosphorus, and the other nutrients plants require.

But the microbes have to be there, and this is the problem. They are destroyed by herbicides, insecticides, fungicides and other pesticides. And they are destroyed by fertilizers.

When we apply fertilizer, the ground water becomes full of the nutrients our crop needs. That sounds like a good idea. But the problem is that it kills the microbes that feed the plants these nutrients, so when the water soluble fertilizer is used up or leaches out, the plant no longer has microbes to feed and protect roots. So you have to come to the plant's rescue with materials that further destroy microbes.

We can alleviate the situation by making and apply compost. This is where we grow microbes. By mixing up manures, green stuff, garden refuse, soil, leaves, rotten wood chips and other organic matter, and wetting it down, microbes are propagated. We can enliven the soil with them and they will again feed and protect our crops.

Farmers used to do this. Cover crops are turned under farm animals graze pastures, compost is made, manure is cared for carefully, and tillage of the soil slower and done with lighter tractors or horses. We can't go back to those days, but we can use what those farmers knew along with these new insights that microbiology has to offer. Once we get the biology corrected, the crops thrive.

One bacteria, if it had the food, can propaqate so fast that in three dasy the total weight of it's offspring would weigh more than the earth. With life in the soil, nutrients are held, water is retained, diseases can't grow and insect eggs are eaten before they hatch. If the soil needs life, the insect egg hatches, and plants are destroyed in order to give life to the soil. Since microbes are easy to grow, it makes sense to grow them ands not let the insects do the job of giving life to the soil.

Different microbes grow around different plants. We want a large diversity of plants so we have a large diversity of microbes. Growing crops with microbiology is the way it's always been done. We have temporarily dropped their populations with chemicals and composition to the point where crops require fertilizers and pesticides. With compost to the rescue, live humus soils are

built which can again grow crops naturally. That’s my understanding.