

# The Importance of Our Soil

Deborah Garcia, a well-known documentary film producer, interviews Dr. Mercola regarding the importance of sustaining healthy soils. Actual interview can be seen on YouTube <http://www.muzikkitabi.com/Video/VIDEOIDM1XWE2zY5Fs/Dr-Mercola-interviews-Deborah-Garcia-on-the-importance-of-Soil>

## The Big Picture

Today's chemical agriculture is destroying our planet's soils at a disturbing pace—soils that took hundreds, *even thousands* of years to develop. A food system based on [monoculture](#), genetically engineered foods, and toxic agrichemicals is decimating the soil, which is a living, breathing ecosystem.

Despite what industry purports, biotechnology is not the answer to world hunger, nor is it sustainable. The rate at which we are using up fuel, water, and soil does not bode well for the longevity of our species, especially in light of the latest world population estimates.

New predictions, based on revised algorithms described to be far more accurate, predict the world population will reach 11 billion by the end of the 21st Century.<sup>2,3</sup> Feeding this many people requires a VASTLY different approach than the present system.

The rate at which soils are disappearing from our globe is alarming. If you visit [Worldometers](#),<sup>4</sup> you can view a real-time clock that tracks the area of land lost to soil erosion, along with other environmental statistics. As of my last check, the area of land lost to soil erosion so far this year amounted to 4,987,477 hectares—and of course, the year isn't over yet.

The focus of our food system should not be on growing food, but rather on developing [healthy soil](#), which should be a priority if we want to survive as a species.

## One Tablespoon of Healthy Soil Contains 50 Billion Busy Microbes

Most of the planet consists of solid rock, upon which most plants can't grow. Approximately 75 percent of soils are transported soils (such as from windblown sediment, or loess), with only 25 percent forming in place. Soils are incredibly diverse, and different plant communities adapt to different soils.

Soil starts with a mineral source—weathered rock, glacial silt, river sediments, lava flows, sand, etc.—but it isn't *soil* until organic matter is added. Organic sources can be living or non-living. Old leaves, dead animals, and tiny living things all enrich the soil with its necessary carbon.

Healthy soil is about 50 percent solids and 50 percent air and water, simply teeming with life—mites, nematodes, protozoa, and a whole menagerie of other organisms, most of them smaller than the head of a pin.

Soil microorganisms are so abundant that 70 to 80 percent have yet to be identified. It's estimated one tablespoon of soil contains about 50 billion microbes.<sup>5</sup> More than 90 percent of land plants are nourished by [mycorrhizae](#), a symbiotic form of fungi that help move nutrients from the soil into the plants' roots.

But there are also thousands of other microbes playing their parts in this microbial symphony in the soil. According to North Carolina University Cooperative Extension:<sup>6</sup>

*“As soil life forms move through the soil, they create channels that improve aeration and drainage. Nematodes and protozoa swim in the film of water around soil particles and feed on bacteria. Mites eat fungi; fungi decompose soil organic matter.*

*The microorganisms' primary role is to break down organic matter to obtain energy. They help release essential nutrients and carbon dioxide, perform key roles in nitrogen fixation, the nitrogen and phosphorus cycles, denitrification, immobilization and mineralization.*

*Microbes must have a constant supply of organic matter or their numbers will decline. Conditions that favor soil life also promote plant growth.”*

## **Soil Has Its Own Life Cycle**

The full life cycle of soil, in all of its stages, can be seen across the Hawaiian Islands in soils that are several hundred to several million years old, with lava as their substrate. On the new island like the Big Island of Hawaii, you will find soils as young as 300 years to extraordinarily rich 20,000-year-old soils in which just about anything can grow, to 350,000-year-old soils whose nutrients have been washed out by eons of rainfall.

Extremely old Hawaiian soils, like Kauai, reaching four million years, are almost completely devoid of nutrients. These ancient soils are highly compressed and essentially just clay.

Unfortunately, agriculture the way it's typically done today greatly accelerates this soil aging process. Soils that would have remained viable for millions of years in nature are rendered dead and lifeless by monoculture in a few short years. Tragically, these soils will take hundreds to thousands of years to recover fully in nature—and not until all agricultural assaults are ceased.

Chemical farming results in waterlogged soil that's easily compacted by heavy machinery, rendered impermeable and susceptible to erosion. One-third of the world's arable land has already been lost to soil erosion.

## **Chemical Farming Pollutes the Planet, Kills Bees, and Injures Babies**

Only a few hundred of the 80,000 chemicals in use in the United States have been tested for safety. The majority ends up in our soil and waterways, destroying soil's beneficial organisms while allowing pathogens to flourish. Not only are these chemicals decimating our soils, but they're also killing off [bees](#), [butterflies](#), and other flora and fauna. According to this documentary, 60 percent of the world's ecological systems are nearing collapse, yet industry continues to turn a blind eye to the destruction.

Not only are agrichemicals making our soils sick, but their long-term effects on humans have yet to be determined. Residues of glyphosate, the active ingredient in Monsanto's herbicide Roundup, are found in most commonly consumed foods in the Western diet, courtesy of genetically engineered (GE) sugar, corn, soy, and conventionally grown wheat that has been desiccated. [Atrazine](#) and nitrates form a deadly combination, as nitrates shut off your body's defenses against these chemicals.

Research suggests [glyphosate](#) may “enhance the damaging effects of other food-borne chemical residues and toxins in the environment to disrupt normal body functions (including gut bacteria) and promote disease.” Glyphosate also appears to stimulate hormone-dependent cancers even at extremely low concentrations. Studies show that even tiny exposures to common lawn chemicals can induce abortions and resorption of fetuses. In fact, the greatest effects appear to be from the lowest doses. Very small exposures can alter developmental trajectories, resulting in birth defects, irregularities in genitalia, and learning impairments. Babies conceived during the months of highest lawn chemical use are known to have greater risks for these birth defects and developmental abnormalities.

## Nitrogen Depletion and Nitrogen Pollution—Two Sides of the Same Coin

Nitrogen is extremely important for plants, but 70 percent of it is in the air, in an unusable form. Soil bacteria transform this atmospheric nitrogen into a form plants can use. Typically, this is done through nitrogen fixing bacteria like the types that are present on many legumes. However, if soil bacteria are absent, plants require some other source of nitrogen. In conventional commercial agriculture, synthetic fertilizer is typically used—in massive quantities.

Synthetic fertilizers increase plant biomass, so farmers enjoy higher crop yields in the short run. However, a large amount of this nitrogen ends up going to the wrong places. Plants can only use a limited amount of nitrogen, so the excess gets released into the air as a potent greenhouse gas, and into waterways and ultimately oceans, resulting in dead zones.

On average, only half of the added fertilizer is taken up by the plants—the other half is lost immediately to runoff and evaporation. This is even worse with vegetable crops, which can lose up to 80 percent of added nitrogen. However, in spite of all this excess nitrogen, the soil itself becomes *depleted* in nitrogen, since most of the nitrogen-fixing bacteria have been killed off.

Nitrogen pollution reduces oxygen levels in seawater, which causes plankton and other organisms to die off. The Gulf of Mexico dead zone covers 7,000 square miles—an area the size of New Jersey—largely the result of nitrogen leakage down the Mississippi River from massive corn growing operations.

But it's a completely different story with organic farming. There is minimum leakage of nitrogen because it's released slowly and taken up again by living organisms, and there is much less water runoff. Small amounts of nitrogen are continuously brought into the system by nitrogen-fixing bacteria. Also, cover crops such as vetches, oats, peas, and other legumes and manure continuously release nitrogen into the soil.

Synthetic nitrogen fertilizers are extremely costly in terms of energy. Fertilizers account for 50 percent of the energy use in conventional agriculture. Studies show that using cover crops (crop rotation) when growing corn or soy can reduce nitrogen leaching by 70 percent, as well as beginning to rebuild the soil in just two to three years.

## Soil Health Can Be Enhanced by Grazing Animals

Soil erosion is made worse by careless overgrazing. In the US, there are 100 million head of cattle, seven million sheep and four million horses grazing the land. The vast majority of these livestock operations do not incorporate soil regeneration practices—they just continuously take from the soil without putting anything back. When soil is spent, they move on to “greener pastures.”

Additionally, livestock are given parasiticides, which pass through in their feces and end up killing many of the dung beetles responsible for breaking down cow patties. Dung beetles carry their little “dung balls” up to four feet away from the dung pile, spreading those nutrients into neighboring areas. Without dung beetles, this natural fertilization process doesn't occur. Some suggest the answer to overgrazing is to stop using animals for food. However, [properly managed grazing](#) combined with organic farming actually *builds the soil*, as opposed to killing it, resulting in higher crop yields and fewer weed and pest problems.

## Irrigation Is Draining the World's Water Supply

Our fresh [water resources](#) are being drawn down at an unsustainable rate through irrigation—70 percent of all fresh water is used for crops. According to a UN study, the world's need for fresh water is projected to double over the next 50 years.<sup>7 8</sup> In China, 80 percent of grain is dependent on irrigation. Chemical farming requires

FAR more water than organic farming. In arid regions that irrigate, soil losses due to salinization equal those of soil erosion, accounting for a loss of 25 million acres of land each year across the globe. Plants grown in healthy soil have only *five to 10 percent* of the water requirement of plants trying to grow in sickly soil.

If soil is unhealthy, and compacted from the lack of a cover crop or mulch, water can't penetrate the soil layer and instead becomes runoff, so it doesn't replenish the aquifers. Severe droughts will continue to plague our food supply, like the one currently parching the American Southwest. California is in the death-grip of a record-breaking drought, with ravages easily seen in a series of before-and-after images posted on Vox.<sup>9</sup> Here are a few things you can do to keep your soil healthy and reduce your water requirements:

- Grow organically; at Rodale Institute, organic farming outperformed chemical farming by 70 percent under drought conditions
- Use drip lines for irrigation, which use water more efficiently
- Avoid plowing and tilling, and cover your home garden with a mulch like hay or wood chips
- Plant cover crops, such as legumes and oats, during the off season
- If you live in a rainy area, harvest rainwater in rain barrels to use during the dry season.<sup>10</sup> Using mulches like hay or wood chips will also dramatically reduce the need for watering

Plowing and tilling are inadvisable as they disturb the soil's delicate ecosystem, once established. A better approach is direct seeding and topcoating the soil with amendments. There is no need to remove all of the dead plant matter, as it naturally decomposes and nourishes the soil. Even "weeds" can be helpful to the overall system—what you might consider a weed may actually be a plant that's making a valuable contribution. In fact, some weedy areas have actually been shown to produce higher crop yields than weeded areas.

## Wood Chips Are One of the Best Ways to Improve Your Soil Health

I am so grateful to Paul Gautschi, whose video [Back to Eden](#), helped me understand the value of using a protective ground cover mulch like hay or wood chips. The simplicity and low cost were massively appealing for me, and I believe it may be the single best way to optimize soil microbiology with very little effort. Paul replicates what occurs in nature, which doesn't make compost piles, but degrades the ground cover of leaves, twigs, and stems slowly over time. It seems obvious to me that this is precisely the type of environment that soil microbes are adapted to.

The key here is to create stable carbon complexes. Biochar is certainly one way to do that as it will last in the soil for centuries, but you can actually create something similar for far less time and money with wood chips. The chips and leaves gradually break down and are digested and redigested by a wide variety of bacteria, fungi, protozoa, and nematodes in the soil. Once the carbon can't be digested anymore, it forms humates that last in the soil for centuries and provide a host of benefits. The longer you leave the chips on, and the deeper you put on the wood chips, the deeper the topsoil will be. This simple method also cuts down on weeding and irrigation needs, and eliminates the need of fertilizers.

Nearly any biomass can be used for mulch but wood chips are one of the best for a variety of reasons, one being the cost. In many communities, they are merely thrown into landfills and can easily be obtained for next to nothing by calling tree cutting services in your area. Mulches will also normalize whatever soil you have. Paul Gautschi used wood chips for decades and, when a soil test was done, most of his nutrient levels were literally 10 times higher than the great levels, and he never added any fertilizers. Finally, wood chips serve as a great insulation blanket for your soil and moderates the temperatures in the summer and the winter.

## Corn-Based Biofuels are NOT the Solution

Contrary to the claims of the Obama administration, corn-based biofuels are not the answer, for the following reasons:

- A new federal study<sup>11</sup> found that corn biofuels are worse than gasoline in greenhouse gas contributions, at least in the short run; corn-based biofuels release seven percent more greenhouse gases in the early years compared with conventional gasoline
- Corn grown in the US causes more erosion and uses more synthetic fertilizer, insecticides, and herbicides than any other crop
- It takes 40 percent more fossil fuel to produce a gallon of ethanol than a gallon of gasoline, further driving up atmospheric carbon dioxide levels
- More than three tons of carbon dioxide can be sequestered per acre with organic agriculture, whereas chemical agriculture emits carbon dioxide
- 1,700 gallons of water are required to produce just ONE gallon of ethanol

### **Better Living Through Biology**

One of the more insidious aspects to the industrial food system is that, as soil becomes sicker and less able to perform its functions, farmers become increasingly dependent on the chemical technology industry—they become trapped. The use of glyphosate begins a downward spiral, making it necessary for farmers to use more and more herbicides, pesticides, synthetic fertilizers, and GE seeds. Weeds become resistant to glyphosate, so farmers have to use more weed killers. Crops become nutrient-deprived, so they have to increase synthetic fertilizers. Weeds and bugs become superweeds and superbugs... and on and on in a vicious cycle.

The best way to avoid this trap is to refrain from using agrichemicals in the first place. Any organic farmer will tell you that they are growing SOIL, not food—a properly cared for soil will take care of growing your food. As was expressed in the film, all you need to do is “feed your soil compost and seeds.” This is actually a KEY factor I would encourage you to look for when purchasing food. Certainly get non-GMO foods but also seek to only purchase produce from local farmers who are using soil regenerative techniques, such as no till, cocktail cover crops, and livestock integration. The key is to use regenerative soil techniques not factory farming degenerative approaches.

The answer to [world hunger](#) is not genetically engineered foods or fuels, but rather reverting to ecologically rational and sustainable agricultural practices, with an emphasis on supporting [small local farmers](#). In a comprehensive global report entitled “Agriculture at a Crossroads,” IAAST (International Assessment of Agricultural Knowledge, Science and Technology for Development) gave high-tech farming a dismal two thumbs-down.<sup>12 13</sup> Resistance to revamping the food system can be expected from a few mega-corporations whose pockets are lined by the chemical technology and pesticide industries, but as a consumer, you have a great deal of power as you vote every day with your wallet.

### **Take Control of Your Health—Choose Your Foods Wisely**

In a recent interview with to Dr. Stephanie Seneff, a number of frightening revelations concerning GE foods came out during the Beijing conference. Besides the potential hazards associated with GE foods—which includes heightened allergenicity—the issue of glyphosate contamination is a very important one. It appears to play an instrumental role not only in celiac disease, but also in autism, Alzheimer's, and cancer. In fact, Dr. Seneff's work suggests it may play a role in most chronic diseases.