

Carbon Gardening (Part 3): Sequestering Carbon with Compost

By Will Bakx, Soil Scientist

We used to believe that compost should be turned into the soil, but the application of compost is not that simple anymore. As we shift from soil management to carbon gardening/farming, the emphasis is now on how to maximize the accumulation of carbon in the soil and reap the benefits from improved soil health.

A look at nature

How does nature build organic matter in soil? 1) Plants, animals, insects, birds, and such die and fall on the surface of the soil. As this organic matter decomposes, it makes its way into the soil, moved by earthworms, insects, moles, etc. 2) Plants form carbon through photosynthesis and exude about 40% of it through their roots into the soil. 3) Roots and soil organisms die and decompose, adding organic matter to the soil. Nature's way of tilling is done by organisms that move through and on the soil. We can learn from nature.

To till or not to till

To maximize the accumulation of organic matter in the soil, we must consider the soil's condition. A soil that has been depleted or has had the topsoil removed for construction has low or no organic matter remaining. Therefore, when we disturb this soil to incorporate organic matter and other nutrients into the root zone, such disturbance releases little or no carbon into the atmosphere. In such soils, we recommend incorporating compost into the soil to give both the soil and the plants a boost. Organic matter is placed right where it is needed, next to the plant roots. Fungi in the compost will send out hyphae to aggregate the soil and to allow plants to create larger root balls, which in turn results in more robust plant growth, increasing the soil's potential to sequester carbon through photosynthesis.



Carbon friendly compost system applicable for landscaping companies

Soil health is a function of a symbiotic relationship between the soil and plant roots. The diverse, rich population of microorganisms in compost helps the soil release nutrients to plants and improves soil structure. Compost supplies energy, in the form of carbon, to soil biota, and is a tool in IPM. Compost is also a valuable tool for managing soil moisture, increasing water holding capacity in well-drained soils, and improving drainage in heavy clay soils. Together these improved soil properties promote healthy plants with the maximum potential for photosynthesis. Compost boosts the soil's biological engine to maximize carbon sequestration that would be much slower if the compost was applied only to the soil surface.

On the other hand, if a healthy soil already has stored long-term carbon in the form of humus, tilling compost into the soil will destroy its structure and expose new surface area to air, thereby accelerating the decomposition of the native organic matter. A net loss of organic matter may hinder carbon sequestration. A surface application of compost, perhaps followed by a protective layer of mulch, is preferred in these situations.

Choosing the right compost

As most landscapers know, all composts are not created equal. Robust plants use photosynthesis to sequester carbon from the atmosphere into the soil, so nurturing vigorous plants helps to optimize carbon gardening. Different plants have different needs, and the better these needs can be met, the higher the rate of sequestration.

The compost applied needs to match the requirements of the targeted plant community. Native plants, trees, and shrubs do not tend to like high nitrogen compost, although where soils have been degraded by previous abuse, a high N compost may assist in re-establishing native vegetation. On the other hand, vegetables, flowers, and lawns need nitrogen.

Mature compost no longer contains phytotoxins, weeds, or pathogens and provides nutrients in a form plants can use.

Maximize carbon gardening using both compost and mulch

For new or redesigned landscapes, MWELo requires a minimum of 4 cy/1,000 square feet of permeable soil and a minimum 3" layer of mulch on exposed soil. Besides complying with MWELo, compost and mulch used correctly in the landscape enhance water efficiency, improve soil structure, support a diverse microbial population to enhance IPM, and sequester carbon for climate mitigation.

[Will Bakx](#) is a soil scientist, soil health consultant, and compost expert based in Sonoma County. He is co-owner of [Sonoma Compost Co.](#) and [Renewable Sonoma](#) and is committed to bringing back high-quality, affordable compost to the community. He currently works as general manager for [West Marin Compost](#) in Nicasio, CA.