



# Organic Soil Amendments in Yards and Gardens: How Much is Enough?

WASHINGTON STATE UNIVERSITY EXTENSION FACT SHEET • FS123E

Gardeners apply organic soil amendments to improve soil and raise healthy plants. While **organic soil amendments** benefit most garden soils, over-application can waste money, increase the risk of harm to water quality, and in some cases, harm plants.

The focus of this fact sheet is organic soil amendments, which gardeners often apply at high rates to build garden and landscape soils. Organic soil amendments include composts and similar materials, which are rich in organic matter, but contain modest amounts of nutrients. Many organic soil amendments are made from local, recycled materials. In this fact sheet, “organic” means materials of biological origin, not just certified organic products.

## Types and Characteristics of Organic Soil Amendments

Compost is the most common organic soil amendment. Composting transforms fresh organic materials (known as feedstocks) into stable forms that release nutrients slowly. Examples of compost feedstocks include yard debris, food waste, animal manure, wastewater **biosolids**, and woody materials (Figures 1 and 2).



Figure 1. Fine-screened compost made from yard debris. Photo by Andy Bary.

Biosolids-blends are another type of organic soil amendment. These are not compost, but act in a similar way. Biosolids are first heated to reduce **pathogens**, and are then combined with aged woody materials, and sometimes sand, to make biosolids-blends (Figure 3). For more information on biosolids use in home gardens, refer to WSU Extension Publication FS123E, *Using Biosolids in Gardens and Landscapes*.

Compost is not simply organic matter; it also includes inorganic materials in plant tissue and other feedstocks, and any soil that is present in the feedstocks. Therefore, when you add compost to soil, you are adding a mixture of organic and mineral materials. The organic matter in compost typically ranges from 30 to 70 percent by weight. Backyard (homemade) compost and other compost containing lots of soil (such as feedlot manure) are at the low end of the organic matter range. For more information on compost, see *Soil Fertility in Organic Systems: A Guide for Gardeners and Small Acreage Farmers* (Collins et al. 2013).

## Benefits of Organic Soil Amendments

Applying organic soil amendments to the garden or landscape



Figure 2. Dairy manure solids undergoing composting. Photo by Liz Whitefield.





**Figure 3. A biosolids-wood product blend applied to the surface of an urban garden. Photo by Craig Cogger.**

can loosen soil, improve water infiltration, and increase long-term nutrient supply. When added to sandy soils, organic soil amendments can also improve water-holding capacity.

Soils that benefit the most from organic soil amendments are those lacking in organic matter. These often include urban soils that have been disturbed during construction, landscaping, and utility work. Research conducted on agricultural soils showed that the benefits of organic matter increased with application rates (Cogger 2005). The highest application rate tested was about three inches of amendment.

Adding compost and biosolids amendments increases the quantity of soil organic matter in the soil, which is a form of **carbon sequestration** (or carbon storage). Research in Washington State showed 20 percent or more of amendment carbon was retained in the soil 5 to 15 years after the last amendment application (Cogger et al. 2013; Brown et al. 2011). However, the amount of organic matter retained may be lower in soils that are tilled, and higher in soils that are depleted in organic matter.

Using compost and biosolids products also recycles material from local waste streams, which benefits soils, the local economy, and the environment.

## How Much Amendment to Use

For new garden or landscape plantings, add 1 to 3 inches of organic soil amendment to the soil and incorporate to a depth of at least 6 to 8 inches. If your soil lacks organic matter (typically light colored with poor physical properties, Figure 4) add 2 or 3 inches of amendment. If your soil has adequate organic matter, or if salts are a concern, add less (or none at all). If a laboratory soil test shows excessive levels of phosphorus (P) in your soil, consider reducing or eliminating amendment applications.



**Figure 4. Soil with a low level of organic matter. It is light colored when moist, and does not have evidence of good structure. Photo by Andy Bary.**

If you are establishing landscape plants, amend the entire bed, and not just the planting holes. Permanent landscape beds don't need organic soil amendments after the initial application. Decomposition of leaf litter and organic surface mulches will help maintain organic matter, creating an environment similar to soil found in forests. Established gardens and landscapes require less organic soil amendments—typically about ½ inch per year (Figure 5).

Another option for gardeners is to grow cover crops to maintain sufficient organic matter in the soil. For more information on cover crops, see *Methods for Successful Cover Crop Management in Your Home Garden* (Benedict et al. 2014).

If you are gardening in raised beds you will need to add enough organic soil amendment or soil mix to maintain the initial soil depth in the beds. Volume loss in raised beds is inevitable—a result of the soil mix settling in the bed, and decomposition of the amendments.

Established lawns seldom need organic matter supplements because of the dense, fibrous root systems that build organic matter in the soil as the roots grow, die, and decompose. However, new lawns may benefit from organ-



**Figure 5. Apply about 1/2 inch of organic soil amendment to an established garden bed. Photo by Mary Cogger.**



ic soil amendments when the amendments are incorporated into the soil before planting. This is especially true where the topsoil was removed or the soil contains little organic matter. Amendment rates for new lawns are lower than those for new gardens, typically 15 to 20 percent by volume, or 1 inch of compost incorporated to a depth of 5 to 6 inches.

If an established lawn is growing in soil that is low in organic matter, the easiest way to amend the soil is to spread a thin layer of compost, no more than ½ inch deep, over the grass. Next, aerate the lawn several times with a hollow-tine aerator to remove soil cores and incorporate the compost into the holes. Applying a thick layer of compost to turf without incorporating it into the soil may create a barrier that restricts water movement and rooting into the soil.

## The Drawbacks of Over-Amending Soil

If adding organic matter is good, will adding more make it better? It is possible to grow plants in straight compost, as long as the compost's porosity is suitable and salts aren't a problem. Nonetheless, repeated heavy applications of organic soil amendments do have drawbacks such as:

- Too much phosphorus. Phosphorus is an essential plant nutrient, but most organic soil amendments contain more phosphorus (P) than plants need. Repeated applications can create excessive P levels in the soil, which increases the risk of P runoff into lakes and other bodies of water. Excess P in lakes contributes to **eutrophication** (algae blooms that deplete oxygen levels in the water), resulting in damaged ecosystems and a decrease in the lake's recreational value. Phosphorus runoff is a particular risk in urban areas when gardens are located near sidewalks and driveways; this allows for easy movement of garden runoff into storm drains.
- Diminishing returns on organic matter benefits. Soils that were initially the lowest in organic matter will benefit the most from organic amendments. However, as organic matter in the soil increases, incremental benefits decline, and the rate of organic matter decomposition increases. The ability of soils to store additional carbon also decreases as organic matter levels increase.
- Reduced turf usability and quality. When properly maintained, turfgrass is the only living groundcover that can take consistent wear from foot traffic throughout the growing season. If too much compost is mixed in the soil, the root zone can hold too much water, making the area unsuitable for foot traffic during wet periods (particularly in areas of west of the Cascades). Thick layers of compost applied on the surface of turfgrass (top-dressing) also holds excess water, and can make the area unsuitable for foot traffic.
- Salt accumulation in arid regions. Excess salts harm plants by reducing their ability to take up water.

Manure-based soil amendments have a relatively high concentration of salts, which can accumulate in soil. This can be a problem in arid regions where there is not enough rainfall to naturally leach the salts from the soil. This may limit application rates of organic soil amendments (particularly manure-based) in arid areas—unless the salts can be leached from the soil. For more information on salts and salt management in arid regions, refer to the *Home Gardeners Guide to Soils and Fertilizers* (Cogger 2014).

- Cost. If you purchase organic soil amendments, you will get little additional productivity, aesthetic, or environmental return on your investment by amending soil that already has high amounts of organic matter.

## Summary

High rates of organic soil amendments improve soils that are depleted in organic matter, but do not benefit soils that already have adequate organic matter. Gardeners should use smaller amounts of amendments and grow cover crops in annual gardens that already have enough organic matter. Established landscapes and turf seldom need organic amendments.

## Glossary of Terms

**Biosolids** are a product of municipal wastewater treatment that contain nutrients, organic matter, and inorganic constituents. Class A biosolids have been treated to remove pathogens and are suitable for use in gardens and landscapes.

**Carbon sequestration** occurs when plants remove carbon dioxide from the atmosphere, and the carbon is stored in plants and soils. Carbon sequestration is one tool to reduce atmospheric carbon dioxide levels and mitigate climate change.

**Eutrophication** occurs when bodies of water receive excess nutrients (typically phosphorus in fresh water) resulting in excess algae growth and subsequent loss of oxygen when the algae die and decay.

**Organic soil amendments** contain lower concentrations of nutrients than organic fertilizers and release those nutrients more slowly. Organic soil amendments are applied at higher rates than fertilizers to increase soil organic matter. Examples include most types of compost, biosolids blends, and horse manure that includes bedding material (straw or wood shavings).

**Pathogens** are microorganisms that cause disease. Examples of pathogens that affect humans include *Salmonella* and *E. coli* O157:H7.

## References and Further Reading

Benedict, C., C. Cogger, and N. Andrews. 2014. Methods for successful cover crop management in your home

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By **Craig Cogger**, Extension Soil Specialist, WSU Puyallup Research and Extension Center; and **Gwen Stahnke**, Agriculture Chemistry/Turf Management Instructor, Walla Walla Community College.

Use pesticides with care. Apply them only to plants, animals, or sites as listed on the label. When mixing and applying pesticides, follow all label precautions to protect yourself and others around you. It is a violation of the law to disregard label directions. If pesticides are spilled on skin or clothing, remove clothing and wash skin thoroughly. Store pesticides in their original containers and keep them out of the reach of children, pets, and livestock.

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