Biosolids Facts

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Q. How do biosolids help soils and crops?

A. Biosolids enrich the soil with essential nutrients and add needed organic matter to the soil.

The agricultural benefits of biosolids have been documented for many decades by numerous scientific studies and through the practical experience of thousands of farmers.

Plants need a complex mixture of nutrients, soil, air and water. Biosolids contain some of all the essential plant nutrients, including the primary macronutrients nitrogen, phosphorus, and, to a lesser extent, potassium; the secondary macronutrients magnesium, calcium and sulfur; and such micronutrients as copper, zinc, iron, manganese, molybdenum and boron. Humans also need many of these elements, which are contained in multi-vitamins.

Organic matter in biosolids improves soil tilth, reduces compaction, increases water-holding capacity, and provides an energy source for necessary microbial activity. This results in decreased water runoff and soil erosion, increased water conservation and more resistance to drought. Biosolids that have been lime-stabilized help neutralize acidity in soils, just as is done by agricultural limestone, which helps maintain the proper soil pH for crop growth.

Chemically, biosolids increase the soil's *cation exchange capacity* (CEC), which is a measure of how well a soil retains certain plant nutrients. The organic matter in biosolids acts like a magnet and attracts plant nutrients. It helps hold plant nutrients in the root zone and prevents them from leaching.

Solid or "cake" biosolids are applied to farmland using box spreaders, which are also used to apply other manure fertilizers, like poultry manures. Liquid biosolids can also be applied. The application rate is set to meet the needs of the crops being grown on specific soils, based on a nutrient management plan. Biosolids rates vary with the soil and the crop, but typical application rates are about 20 wet tons an acre. At a cake solids content of 15-25 percent, this results in an application rate of approximately 3-5 dry tons per acre. All land application permits and nutrient management plans must be approved by the Pennsylvania Department of Environmental Protection.

Experience & Research

Here are some brief examples of the experience and the research documenting the agricultural benefits of biosolids:

- Yields of corn and hay more than doubled on multiple sites in Cumberland County, Virginia after the application of biosolids, according to farmer Joe Hazelgrove. He added that these crops were much more drought resistant than crops that did not receive biosolids. Farmers across Virginia report similar results. *Statement by Joe Hazelgrove, 2005.*

- Since biosolids are applied free to farmland in Pennsylvania, farmers can save from $150 to $250 per acre of biosolids applied land, compared to the cost of commercial fertilizer.

- Crop yields on biosolids-improved farmland in Yuma, Arizona, were 10 to 85 percent higher than crop yields on soils receiving commercial fertilizers. In addition, no significant increase in metal concentrations in plant tissues was observed. *Water Environment Research Foundation, 1993.*

- **"**Studies by the University of Washington in the Northwest, and the U.S. Forest Service in the Southeast, on the use of biosolids as a fertilizer in silviculture have shown as much as a three-fold increase in tree growth compared to controls for certain tree species." *U.S. Environmental Protection Agency, 1994.*

- Spectacular growth increases in Douglas fir trees have been demonstrated on low productivity sites fertilized with biosolids. *Michael Van Ham, PhD, and J. P. Kimmins: "Recycling Biosolids and Other Organic Wastes as Slow Release Fertilizers," Final Report to Science Council of British Columbia, 1994.*

- Land application of biosolids in established loblolly pine plantations in Berkeley County, SC increased wood volume growth by 37-38 percent and value by $555 to $595 per acre seven years after application. *"Effect of a One-Time Biosolids Application in and Old-Field Loblolly Pine Plantation on Diameter Distributions, Volume per Acre, and Value per Acre," E. David Dickens, In: Gen. Tech. Rep. SRS–48. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. pg. 15-19, 2002.*

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