

Biosolids are a Natural Fertilizer

For many individuals sewage sludge (biosolids) induce a major emotional response. This response is understandable when you realize that ever since infancy, parents teach children that human waste is dirty and is to be avoided and flushed down the toilet. Compare this with the life-long experience of most persons familiar with animal wastes as a material to be managed and used.

Like animal waste, biosolids are a part of the natural cycle of life (Figure 1). They contain inorganic and organic compounds removed during wastewater treatment. An important perspective on biosolids -- the natural fertilizer -- can be gained from the following closer look:



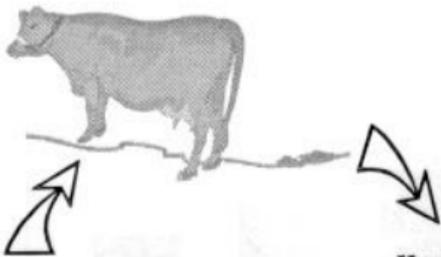
Sun and rain cause crops to make carbon rich foods and provides energy for uptake of nutrients such as nitrogen, potassium, phosphorous, zinc, and molybdenum



"Crops that supply our food and animal feed are grown in the soil. To grow, the crops need fertilizer and water. Essential soil fertilizer nutrients include carbon, hydrogen, oxygen, phosphorus, potassium, nitrogen, sulphur, calcium, iron, magnesium, molybdenum, boron, copper and zinc. Plants take up these essential soil-borne nutrients that are necessary for their normal growth. Using these nutrients and sunlight, plants manufacture organic carbon-rich foodstuffs such as carbohydrates, fats, and proteins.

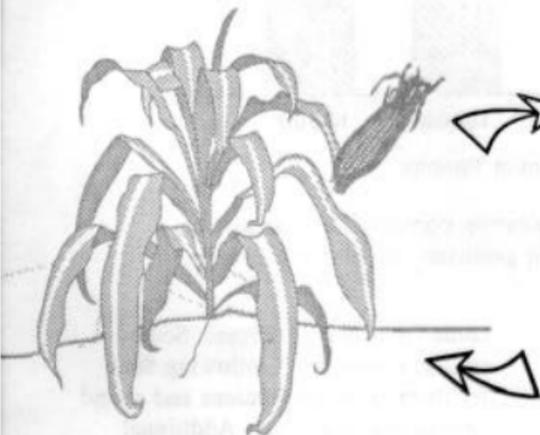
The same nutrients that are essential for plant growth also are essential for the growth of humans and other animals. We gain many of these essential nutrients, along with carbohydrates, fats, and proteins, by eating plants. Wastes are excreted from humans and contain these same essential nutrient elements that are in the





Farm animals eat plants to obtain the same nutrients and carbon rich foods for growth

Humans eat animal and plant foods to obtain nutrients and carbon rich foods for growth



Plant residues and fecal matter and wastes from farm animals and humans are returned to the soil to support plant growth

Figure 1. Natural Cycling of Nutrients

foods we consume. These wastes go into the municipal sewer system along with other household wastes. Municipalities also collect and treat wastewater from industrial and commercial sources. The residual solids generated during wastewater treatment were previously called sewage sludge. Sewage sludges that can be used are now being called

biosolids to emphasize the beneficial nature of this valuable recyclable resource. Properly prepared biosolids provide a rich source of the essential fertilizer elements needed by plants to produce food. It seems only natural to return this rich source of nutrients and organic matter back to the soil to perpetuate the cycle of life."

Declining Cadmium (mg/kg) in Biosolids at the
Hyperion Wastewater Treatment Facility

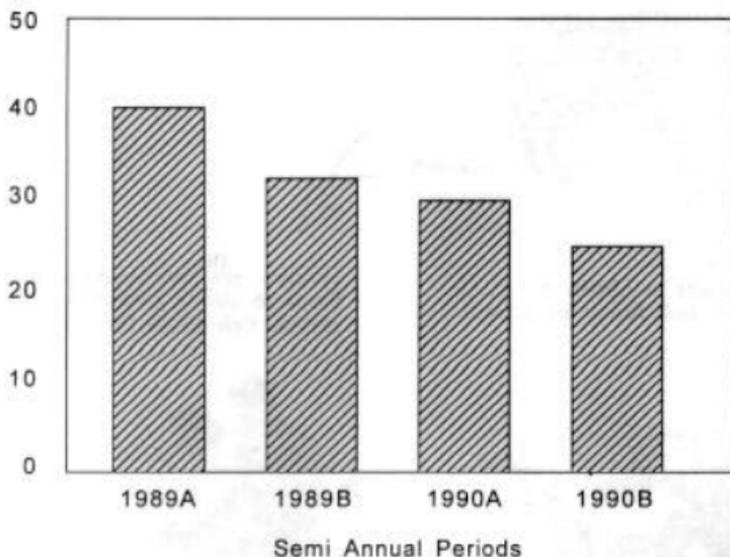


Figure 2. Pretreatment and source control have been very successful in reducing pollutant levels in biosolids.

Appropriate control is needed for the safe agricultural use of all fertilizers and soil conditioners -- whether in the form of biosolids, other organic amendments, or chemically-based fertilizers -- to insure that the proper amount of essential elements are provided. Controls also are needed with all fertilizers and soil conditioners to avoid contamination of groundwater with leachable excess nitrogen. Controls are needed with biosolids and animal wastes, because, depending upon the level of treatment, disease-causing organisms (pathogens) may be present and vectors such as flies and rodents can be attracted that may transmit disease. These controls

come from many sources. Some control comes from following State fertilizer recommendations and sound agricultural practices. Additional control is obtained by required wastewater treatment to reduce pathogens to levels that are not harmful. Pretreatment by industry, mandated by law, is another primary control that prevents excessive levels of unwanted pollutants in wastewater and the resultant biosolids. Figure 2 shows that pretreatment and source control have been very successful in reducing the levels of pollutants in biosolids. And finally, compliance with the new Federal as well as existing State regulations requires the



careful implementation of management practices and the use of biosolids application rates based on crop needs.

Agricultural Use of Biosolids

EPA's policy that promotes the beneficial use of municipal biosolids is based on years of extensive study and experience. Hundreds of studies have been conducted as a basis for the safe use of biosolids. Moreover, thousands of publicly owned treatment works (POTWs) are currently using their biosolids as an organic fertilizer and soil conditioner on land throughout the United States. For example, over

55% and 90%, respectively, of all biosolids produced in Ohio and Maryland are used on land.

Examples of communities recycling their biosolids include Hannibal, MO (19,000 population), Madison, WI (250,000 population), and Seattle, WA (1.1 million population). Each of these municipal authorities have been winners in EPA's National Beneficial Use of Biosolids Awards Program. Hannibal, MO and Madison, WI charge farmers for using their biosolids. Hannibal recovers 100% of the costs of hauling and spreading biosolids from its sales to farmers,



This corn crop benefitted from the use of biosolids as a fertilizer.

Table 1. Value of 5 to 10 Dry Tons per Acre of a Typical Anaerobically Digested Dewatered Biosolids Applied to Farmland

Nutrient	lbs/Acre Applied	Value/Acre
Nitrogen	150	\$ 30.00
Phosphorus (P ₂ O ₅)	150	\$ 30.00
Potassium (K ₂ O)	10	\$ 1.00
Copper (Cu)	7	\$ 14.00
Zinc (Zn)	10	\$ 12.50
Sulfur	20	\$ 10.00
Lime	1 ton	\$ 28.00
Spreading		\$ 15.00
Total Value*		\$140.00

* Value of organic matter is in addition to this total

Madison receives \$12 per acre for applying their biosolids. Madison fertilizes 3,000 to 4,000 acres of farmland with biosolids each year and has farmers waiting with a total of 22,000 acres of farmland available for application. Seattle applies biosolids to forest as well as agricultural land.

Since 1974, all the biosolids from metropolitan Washington, DC (3 million population) have been used on land. In 1993 about 75% (87,000 dry tons) of the dewatered biosolids produced was used on agricultural land in Maryland (4,000 acres) and Virginia (4,000 acres). The remaining 25% was composted for use by

landscapers, horticulturalists, and the general public. The dewatered biosolids were applied to private farmland by private contractors at no charge to the farmers. The farmers received \$100 to \$140 worth of needed nitrogen, phosphorus, trace nutrients, lime, and organic matter per acre from each 5 to 10 dry ton per acre application of biosolids (Table 1).

An additional benefit of biosolids is its suppression of pathogenic soil organisms such as nematodes that damage plant roots as well as specific plant root diseases that otherwise cause damage to commercially grown potted plants.

