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# Sewage Sludge for Land Application

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Department of Agronomy

# Soil Science News & Views



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## Sewage Sludge for Land Application

William O. Thom

Sewage sludge is a product of waste water treatment plants that function as environmentally acceptable pollution control facilities. In past years most of the sludge had been landfilled, dumped at sea or buried. But environmental and economic considerations have resulted in greater interest in its application on cropland.

Sewage sludge consists of the solids remaining after treatment of raw sewage in a properly operated waste water treatment facility. Three types of sewage sludge can be produced: (1) primary sludge consists of the solids that settle out of mechanically processed raw sewage; (2) secondary sludge is primary sludge that has been subjected to aerated microbial digestion and further stabilized by chlorine oxidation, heat treatment, anaerobic digestion or lime; and (3) tertiary sludge which is secondary sludge subjected to additional physical or chemical treatment to reduce the volume. Of these three types, the secondary stabilized sludge is most appropriate to consider for land application. Primary sludge should not be applied to land and tertiary sludge may not be the most appropriate for land application.

The sewage sludge can leave the treatment plant as either a liquid (1% to 10% solids), semi-solid "cake" (20% to 30% solids), or as a semi-dry sludge (30% to 80% solids). With appropriate handling and application equipment either the liquid or semi-solid "cake" can be used for land application.

### Agronomic Value of Sewage Sludge

Agronomically, sewage sludge contains considerable quantities of organic matter and can supply the nitrogen and phosphorus needs of several crops. When applied at high rates, it is effective in reclaiming drastically disturbed lands and in supplying several plant nutrients that such areas almost invariably need. Sewage sludges contain very little potassium for plant growth.

### Considerations in Use of Sewage Sludge

There are a number of potential concerns associated with land application. Heavy metals such as cadmium, copper, chromium, lead, nickel and zinc are introduced into the soil. Copper and zinc are necessary in small quantities for plant growth. Cadmium has

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been associated with a number of human health problems. In excessive quantities, any of the heavy metals can be toxic to plants, animals and humans. Heavy metals are not readily leached from the soil, thus they persist in the soil-plant environment for many years. Another unknown is the possible presence of persistent toxic organic compounds in sludges. The concern of bacterial or viral contamination can be overcome if secondary sludge is stabilized by heat treatment or anaerobic digestion.

#### Regulation of Sewage Sludge Application

Legally, all disposal of sewage sludge in Kentucky is regulated by permit only through the Department of Environmental Protection, Division of Waste Management in Frankfort. The treatment plant, the hauler and spreader, or the farmer will need to have a permit before applying sewage sludge on land in Kentucky.

There are many specific restrictions relative to the site and to the quality of the sludge. Before land application is considered, a recent complete chemical and physical analysis of the sludge as required for the permit process should be available for evaluation. Soil sample results of the proposed land site are needed to determine annual application rates and total amounts that can be applied. Also, the current regulations restrict application timing, crop management and livestock grazing that will influence post application management. Subsurface injection is preferred to surface application in order to reduce odors, reduce potential runoff and conserve nitrogen which requires more expensive equipment.

Risks associated with land application are minimized when the following are considered: (1) Use only low cadmium containing sludge; (2) Use only secondary stabilized sludge for land application; (3) Use composted or heat treated secondary sludge to remove odors and kill seeds; (4) Use annual applications no greater than nitrogen needs of crop; (5) Maintain soil pH at 6.5 or above during and for several years following application; (6) Tobacco should not be grown on any sludge treated land; and (7) Follow current regulations on heavy metal application. At the present time, a conservative approach to land application should be followed until more evidence is gathered to minimize several of these concerns.

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