

# AGRICULTURAL LAND APPLICATION OF BIOSOLIDS

## Factsheet

### BIOSOLIDS

The term 'biosolids' refers to the organic materials produced during the wastewater treatment process. As Canadian municipalities continue to construct wastewater treatment facilities, greater quantities of biosolids will be produced, creating a need for management options that are environmentally sound and economically feasible. Throughout Canada and internationally, biosolids have been applied to agricultural land for more than 40 years. The success of a land application program is highly dependent on quality-control.



Figure 1 – Comparing crops applied with sludge/biosolids and fertilizer (source: [www.unep.org.jp](http://www.unep.org.jp))

*Before commencing land application, biosolids must satisfy the criteria outlined in the Nova Scotia Department of Environment and Labour's Guidelines for the Land Application of Biosolids.*

### BENEFITS

Recycling biosolids through land application serves several purposes. Land application provides valuable nutrients to help organically enrich soils and restore the necessary conditions for improved plant growth. It provides a means of diverting thousands of tons of waste from landfills and incinerators, saving the cost of disposal while preserving valuable landfill space and eliminating the potential for harmful emissions to pollute the air we breathe. Land application of biosolids is often an attractive option for producers, as biosolids tend to:

- Provide essential plant nutrients (N, P, K, Ca, Cu, Fe, Mg, Mn, S and Zn).;
- Reduce production costs (cost of fertilizer);
- Replenish soil organic matter that has been depleted over time;
- Improve soil structure, increasing the ability to absorb and store moisture, thus increasing vegetative drought tolerance; and
- Provide a source of nutrients that are slow-release, enabling the crop to absorb the nutrients as it grows. This efficiency lessens the likelihoods of groundwater pollution of N and P. At the same time, biosolids may not release N fast enough for maximum plant growth.

### CHALLENGES

Similar to dairy, beef or poultry manure, biosolids are a source of valuable plant nutrients. As with animal manures, the beneficial value of biosolids is dependent on their origin and the method in which they have been treated.

**If land application is not conducted in an agronomically and environmentally sound manner, human and animal health, soil quality, plant growth and water quality can be adversely affected.**

Common challenges with land application include:

- Dependency on weather; biosolids should not be applied to fields that are frozen or wet;
- Required storage capacity;
- Potential for odour if the process is not properly managed.
- Potential for public opposition; and
- Presence of organic chemicals, pathogens or trace elements.

Table 1 identifies the maximum acceptable metal concentrations for Nova Scotian soils. Biosolids cannot be land applied if metals in the soil exceed these concentrations. If background metal concentrations in soil exceed the criteria listed in Table 1, land application will be evaluated on a case-by-case basis.

**Table 1 – Maximum Acceptable Metal Concentrations for Nova Scotian Soils.**

<b>Metal</b>	<b>Max. Acceptable Concentrations in Soils (mg/kg dry weight)</b>
Arsenic	12
Cadmium	1.4
Chromium	64
Cobalt	20
Copper	63
Mercury	0.5
Molybdenum	4.0
Nickel	32
Lead	60
Selenium	1.6
Zinc	200

## COMPOSITION

Since the influent materials entering a sewage treatment plant may vary considerably, chemical, biological and physical analyses of the resulting biosolids is required to determine the nutrient and trace element content. The properties will determine the application method and rate, as well as the degree of regulatory control required. Biosolids typically contain 0.1% - 0.3% total nitrogen.

## LAND APPLICATION

Selection of the application method depends on the land type and the consistency of the biosolids. Two of the most commonly used land application methods include:

**Injection** of liquid biosolids (94-97% water) using self-propelled or drag hose systems can greatly reduce the chance of run-off, odours and loss of N.

**Surface spreading/broadcasting** using a tank lowered by a truck or other vehicle and is an application method primarily used in forested or reclamation sites.

It is often economical to reduce the volume of biosolids prior to transportation or storage. The amount of water in biosolids can be reduced through mechanical processes such as draining, pressing, or centrifuging, resulting in a material composed of up to 30% dry solids, which should have the consistency of damp soil. Dewatered biosolids do not require any specialized equipment and can be applied with conventional agricultural equipment, such as manure spreaders pulled by tractors.

To minimize soil compaction, biosolids should be spread when the soil is dry; spreading on wet soil may result in rutted fields and reduced crop productivity. Another point to consider is that the nitrogen in biosolids is used most effectively when the material is spread in the spring, either by injection or surface spreading with incorporation into the soil within 24-48 hours.

Delaying incorporation will result in N loss to the atmosphere. In these cases, supplemental fertilizer rates must be adjusted to compensate for N loss.

With the exception of flood risk areas, Class A biosolids may be land applied by surface spreading as a top dressing or through incorporation, or by injection below the surface of the soil.

Class B biosolids may be surface spread followed by incorporation, or may be injected below the surface of the soil. Regardless of the method employed, Class B biosolids must be incorporated into the soil within 24 hours of spreading.

## APPROVAL FOR LAND APPLICATION

In Nova Scotia, those wishing to land apply biosolids are required to obtain an approval from the provincial Department of Environment and Labour. The Guidelines for Land Application and Storage of Biosolids in Nova Scotia require that the approval holder:

- Identify the source of the material;
- Identify specific parcels of land where material would be applied;
- Identify specific separation distances from water courses, other buildings, etc; and
- Meet testing requirements for nutrients, metals, pH, stabilization and pathogens.

Land on which Class B biosolids have been applied must adhere to the waiting periods identified in Table 2. Class A and Class B biosolids are not permitted for use on residential lawns and gardens.

**Table 2 – Land application waiting periods established by the NS Department of Environment and Labour.**

<b>Land Use</b>	<b>Waiting Period</b>
Pasture	Not in the same calendar year
Forage	2 months before harvest
Livestock feed	2 months before harvest
Food crops (edible parts below the soil surface)	38 months before harvest
Food crops (edible parts above the soil surface)	18 months before harvest
Commercial sod	12 months before harvest

The land application of biosolids to agricultural land is to follow a Nutrient Management Plan (NMP). The NMP is prepared by a nutrient management planner and is used to determine the biosolids application rate based on the agronomic rate (biosolids must be applied at a rate that is equal to or less than the agronomic rate). For more information on Nutrient Management plans, see: [www.gov.ns.ca/nsaf/prm/programs/schedule\\_a.shtml](http://www.gov.ns.ca/nsaf/prm/programs/schedule_a.shtml).

**For more information on land applying biosolids, please contact:  
AgraPoint Ag Info Centre at 1-866-606-4636.**