SLUDGE AS A FERTILIZER AMMENDMENT

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For the last five years, I have been working on projects, mainly in Franklin County, applying sludge to agricultural land. This sludge has been applied mainly to corn land at rates to supply enough nitrogen (up to 200 lbs per acre) for a 20 ton corn crop. On one field in Colrain, this growing season is the fifth consecutive year that we have applied sludge.

The nutrient content of sludge varies considerably from each treatment plant as does the moisture content and the heavy metals that may be present such as: N, P_2O_5, K_2O, Cd, Cu, Ni, Pb, Zn, Cr and Hg. EPA, Mass. DEQE and the Extension Service have all set guidelines for the yearly amounts of each of these heavy metals that can be safely applied to land for corn production. To date, the different sludges that I have been working with are relatively low in these metals; therefore, our application rates have not had to be decreased.

If sludge is to be applied to agricultural land, below are a few guidelines that I feel should be followed:

1. Soil pH should be 6.5 or above as this high pH immobilizes many of the heavy metals.
2. Soil should be tested for N, P, K and CEC (Cation Exchange Capacity).
3. Sludge should not be applied to land subject to flooding.
4. Sludge should be incorporated into the soil as soon as possible after spreading.
5. Soils should be moderate to well-drained, loamy types have good depth to hardpan or bedrock.
6. Metals posing a most serious hazard are cadmium, copper, molybdenum, nickel and zinc. Less serious are manganese, iron, aluminum, chromium, arsenic, selenium, antimony, lead and mercury.
7. Sludge should be tested for the above serioud metals plus N, P and K to determine the rates permissible to apply on an acre basis.
8. Sludge should not be applied on land used to produce vegetables that can be eaten raw unless sludge is free of pathogenic organisms or three years have elapsed since application.

At the present time, Mass. DEQE is writing up regulations and guidelines for the safe use of sludge on agricultural land. Hopefully, within a year or so there will be a legal, official program.

The real benefits realized from applying sludge to agricultural land is in eliminating the expensive cost to the town, of disposing in a land-fill dump or incineration - thus holding or decreasing taxes. Farmers can realize a savings of $20-40 per acre for the nitrogen and phosphorus that the sludge supplies, usually they are very low in potash. The soil can benefit from the addition of organic matter, most of the heavy metals are bound to soil particles and are not absorbed by the plant as long as pH remains above 6.5. Most pathogenic organisms that could be present in sludge will not survive when incorporated into the soil.

SILAGE CORN YIELD FROM SLUDGE FERTILIZATION

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In 1979 an experiment designed to examine the potential for land application of municipal sludge was conducted on land at the Haverhill Water Pollution Abatement Facility. Corn for silage was chosen as the test crop since the area grown of this crop shows the greatest possibility for use of sludge in New England commercial agriculture. Data collected has included parameters of environmental concern; for example, the buildup of heavy metals in the soil, the uptake of these by the corn crop, and groundwater movement of applied elements. These experiments have continued to be expanded in 1980. The preliminary yield results for 1979 show similar silage corn yields for sludge and commercial fertilizer when sludge was applied at twice the rate of equivalent nitrogen as the commercial fertilizer (Table 1). When applied at the same equivalent of nitrogen as the commercial fertilizer treatment, the sludge had a lower yield. Some carryover of nitrogen in later years would be expected from the first year's application.

Table 1. Silage corn yield (ton per acre) from Haverhill sludge and commercial fertilizer.

Nitrogen source and rate	Silage (70% moist)
Fertilizer nitrogen (150 lb per acre)	24.5
Sludge (150 lb N equivalent)	19.7
Sludge (300 lb N equivalent)	22.8
Least significant difference	3.8