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Environmental Issues on Use of Sludge on Pastures

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The solid materials remaining after domestic sewage treatment are referred to variously as biosolids, domestic wastewater residuals or sewage sludge. In 1995, 66% of the biosolids and liquid sludge from Florida's population were land-applied, 17% land-filled, and 8% incinerated. Many livestock producers in Florida apply residuals to their pasture to reduce cost of fertilizer and lime, but land owners and the public are justifiably concerned about potential negative effects of applying such waste to the land. Concerns are potential spread of pathogens, accumulation of heavy metals on agricultural land, excessive loading of plant nutrients with a potential for non-point source of pollution, and odor to the neighborhood

The U.S. Environmental Protection Agency (USEPA) 1993 rules are reinforced by Florida DEP State Administrative Code (62-640) to provide guidelines on pathogen and odor reduction procedures, limits on specific heavy metal concentrations in sewage and loading in the soil, nutrient application rates, minimum setbacks from surface and groundwater bodies, and waiting intervals after application before crop utilization by humans and livestock. There is also renewed pressure on the USEPA to review current risk-assessment standards for pathogen elimination in sludge and expand coverage from coliform bacteria to enteric viruses, protozoa and helminths which appear to persist in class B limed sludge. Other contaminants that may be regulated soon include dioxin-like compounds, brominated flame retardants, and alkylphenol ethoxylates widely used in household detergents, paints and pesticides.

We completed a four-year sludge application study on bahiagrass production and nutritive value, pathogen levels in different forms of sludge, and groundwater and soil plant nutrient and heavy metal levels. We observed a reduction in coil bacteria counts from more than 33,000 coliform units (CFU)/g in aerobically-digested liquid sludge to 148 CFU/g in lime-stabilized (class B) liquid sludge. However, the CFU/g increased to 177,500 in the lime-stabilized cake biosolid during the drying process.

Groundwater data showed 2.9 ppm of phosphorus in shallow 2ft-wells above the soil hardpan, but only 0.22 ppm in deep 4ft-wells below the hardpan, regardless of whether the bahiagrass plot was fertilized or not. This was attributed to the rich source of P in our native soils and the high sorption of P in the hardpan which prevents P-leachates from reaching deep well water. Mean groundwater nitrate-N (NO₃-N) concentration in shallow wells was lower than 0.5 ppm except for the first few months of grass establishment in 1997 when we observed more than 10 ppm NO₃-N for plots fertilized with ammonium nitrate and up to 4 ppm for the sludges. The highest NO₃-N concentration recorded in deep wells during grass establishment was 1.4 ppm and a mean of 0.2 ppm in subsequent years.

The mean barium groundwater concentration was 0.04 ppm in deep wells and 0.02 ppm in the shallow wells, irrespective of fertilizer treatment. Means for groundwater concentration of other trace metals which were not affected by depth of wells or fertilizer treatment were copper 0.01 ppm, nickel 0.003 ppm, and molybdenum 0.001 ppm. The soil plant nutrients and trace metal status in that study were even less sensitive to sludge application than those of groundwater in our study.

There are no easy solutions to the sludge disposal problem in Florida. Florida's human population grew from 4 million in 1955 to 16 million in 2000, the highest growth rate in the nation. Prohibition of waste dumping in streams and oceans, diminishing landfill space, skyrocketing landfill costs, and concerns over air pollution from incineration of waste suggest we find alternative environmentally-sound solutions to waste disposal. Although the combination of federal and state regulatory requirements is significant in forming the initial base of sewage sludge management decisions, local ordinances also play an increasing part in seeking to protect the health, safety, and welfare of citizens. Issues addressed may include human health risks, risks to animal health (both livestock and wild animals), water and soil quality, nuisance issues such as odor, liability and uncertainty, monitoring, and enforcement.

The local law may impose restrictions on the type, amount, quality, or source of sludge. Some specify management practices, notification requirements, and additional monitoring beyond that required by federal or state rules. As a result of concern over the inability of state and federal agencies to provide consistent enforcement of rules due to staffing shortages, local ordinances frequently supply enforcement provisions which at a minimum would allow local enforcement of state requirements. Local ordinances may also include fees to cover municipal costs.

Our data shows that sludge use on bahiagrass pasture is beneficial and safe if wastewater residuals are properly treated, applied and managed.