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From Sludge to Fertilizer?

Biosolids can cut costs of growing hay

By Kathleen Hatt

For the past two growing seasons, fields and pastures at Meadow Farm in Northwood, N.H., have been nourished by Class A biosolids, also known as processed sewage sludge. The sometimes controversial soil amendment is an inexpensive fertilizer Doug and Janet Briggs apply in prescribed amounts to hay fields and pastures surrounding their 1760s home and bed and breakfast.



An Oldenburg mare and her foal in a pasture adjacent to Doug and Janet Briggs' Meadow Farm B&B.

Photos by Kathleen Hatt

What are biosolids?

Biosolids are treated and processed domestic sewage, the products of the wastewater treatment process. Primarily from human and animal excreta and food waste, the untreated solids (known as sludge) may contain a variety of bacterial, viral and parasitic enteric pathogens along with soil-enriching nutrients. The residue collected at local wastewater treatment facilities

as sludge is dewatered and stabilized through physical, chemical and biological processes. It may be treated with lime or wood ash to raise the pH level and help eliminate objectionable odors. Following initial treatment, it is taken to a regional facility for further processing to reduce pathogenic microorganisms. After processing, biosolids may be buried, incinerated or applied to fields as fertilizer.

Class A biosolids are more highly processed than Class B biosolids. Class A biosolids contain no detectable levels of pathogens. Class B biosolids have been treated, but still contain detectable levels of pathogens. Both classes must fall within the same metal contents requirements as defined by federal regulations (CFR, Title 40, Part 503, also known as the Part 503 Rule). There are buffer requirements, public access and crop harvesting restrictions for virtually all forms of Class B biosolids.

Exceptional Quality (EQ) biosolids have the same pathogen levels as Class A, but have lower metals concentrations than either Class A or Class B. This highest EQ grade is the biosolid type applied to land at Meadow Farm.



Designed to dispense individual diets to animals housed in a group, the Calan Broadbent Feeding System developed by Doug Briggs is used in agricultural research facilities worldwide.

From biosolids to hay

In 2008, the Briggs began a program to improve 12 acres of hay fields and pasture at their 50-acre Meadow Farm. On each acre, 11.5 cubic yards of Class A biosolids and 3.75 cubic yards of wood ash were spread and plowed under. Two plots were seeded in mid-May of 2008 using a Brillion Seeder: a 2.5-acre pasture in endophyte-free ryegrass and red clover; and a 2.5-acre hay field in 70 percent alfalfa, 20 percent timothy and 10 percent red clover together with a nurse crop of oats.

The ryegrass and red clover pasture was ready for grazing by late June and supported two to four horses throughout the 2008 season. "The pasture continues to produce abundantly, currently supporting an Oldenburg mare and her foal," says Briggs.

In 2008, the alfalfa/timothy/red clover field with oat nurse crop yielded one cutting of oat hay. What Briggs describes as "a wonderful second cutting" of alfalfa/timothy/clover yielded approximately 1.5 tons per acre. In 2009, two cuttings yielded approximately 3 tons per acre.

In 2009, a second 2.5 acres was planted in the alfalfa/timothy/red clover mixture, but without oats. Biosolids were increased to 12 cubic yards per acre and wood ash to 4 cubic yards. "Again, we had excellent results," says Briggs. Two 2009 cuttings yielded approximately 4 tons per acre.

In 2010, the first cutting of the two 2.5-acre fields produced 150 bales per acre. A dry summer resulted in a drop to 140 bales on the entire 5 acres for the second cutting. However, a third cutting yielded 205 bales (40 pounds each) of "the most beautiful alfalfa anyone could ask for," Briggs says.

Having improved soil pH, fertility and yields to an extent he finds quite remarkable, Briggs plans to continue maintaining Meadow Farm's alfalfa fields with a spring topdressing of 5.5 cubic yards of wood ash per acre and to begin seeding another 4 acres. Since 2008, he calculates total average cost of fertilizer and soil amendments to be \$50.61 per acre.

Biosolid application: how much and where?

Biosolids have long been used as fertilizer. One such product is Milorganite, the treated and bagged biosolids from the municipal facility of the city of Milwaukee, Wis. Milorganite first came to market in 1929. Since then, and with the inception of the Clean Water Act, federal, state and, in some instances, municipal regulations have been promulgated to govern use and disposal of biosolids. Further conditions may be added by the biosolids supplier.



Doug Briggs in one of two 2.5-acre fields seeded with alfalfa and fertilized with EQ biosolids and wood ash. Here the field is seen a day before its third cutting of 2010.

The regional processor and source of the EQ-grade biosolids applied to the Briggs' land is Resource Management, Inc. (RMI) of Ashland, N.H. RMI is the only company in New Hampshire that deals in land-applied biosolids. It requires that landowners supply certain information before biosolids will be delivered, including a statement of their goals for soil and crop management. The Briggses set their goals with the help of John Porter, University of New Hampshire extension professor, emeritus, who evaluated conditions at Meadow Farm and suggested seed varieties and mixtures.

In addition to soil and crop management goals, the Briggses also provided RMI with the required recent and representative soil analysis for each field and an aerial photo or site map for use in determining field sizes and acreage base. (In subsequent years for established customers, RMI provides soil testing and analysis at no charge.) Fields are carefully monitored to avoid overspreading of biosolids at any one farm. Fields treated with wood ash alone are monitored every three years.

With that information, RMI determined the quantity of biosolids that could be applied in order to improve soil fertility and soil pH. The Briggses then signed RMI's agreement to follow best management practices for agricultural application of bulk EQ biosolids (see Sidebar). RMI delivers a minimum of 40 cubic yards of biosolids (the approximate equivalent of 29 tons), which its customers must agree to spread within eight months of delivery. The friable, soil-like biosolids are spread using conventional manure spreading equipment and may be used as a topdressing or as an incorporated fertilizer. According to Carl Bartlett of RMI, the pathogen content of both Class A and Class B biosolids is less than that in existing soil. After further processing, the more highly refined biosolids termed EQ contain even fewer pathogens.

Two sides to the story



Biosolids were tilled in when fields at Meadow Farm were first seeded in alfalfa. Wood ash, seen here, is spread in subsequent years. Owner Doug Briggs finds it less expensive to use biosolids and wood ash than conventional fertilizers and lime. He also finds that wood ash encourages more clover.

While biosolid use at Meadow Farm has been without controversy, use of biosolids has its detractors. Initial concerns are often related to disagreeable odor. Other issues are related to human health and environmental degradation. Detractors cite the possibility that trace or harmful elements could build up in soil treated with biosolids, and that currently available laboratory tests may not be able to detect substances or concentrations of those substances that may be detrimental to human health. There is also what Bartlett calls "the area of repugnance: Human beings are just plain engineered to be repulsed by biosolids," he says.

John Porter supports the use of biosolids and lives across the road from a dairy farm where biosolids are delivered. He describes the smell of biosolids as similar and no less objectionable than cow manure. The Briggses find that the odor of biosolids dissipates within a day or two of tilling in and within one week of topdressing.

At this point, because of the assumed presence of pathogens, there is little support for biosolid use (Class A, EQ or otherwise) on crops for human consumption, especially root crops. While some may view spreading of biosolids as the closing of a biological loop, enriching the land with the byproduct of human civilization, others prefer to see it buried. However, burial is not without the concern that various elements could leach out from buried biosolids into waterways. This is why Porter prefers filtering biosolids through a forage crop, such as those at Meadow Farm.

Considering biosolids?

While federal regulations apply to all 50 states, individual state, local and biosolid supplier rules may vary. States and municipalities may require permits, and some localities have banned biosolid use. "Be prepared to educate and be educated," says Porter. "Many people do not realize the extent to which biosolids are controlled, monitored and tested."

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