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**Managing Dairy Wastewater
Using an Innovative Treatment and Disposal System**

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Wastewater from dairies has become a controversial topic in recent years. Dealing with dairy wastewater has been identified as an area of significant opportunity on Michigan's smaller dairy farms for improving water quality. Typical dairy wastewater comes as a combination of runoff from feedlot areas, silage pads, holding areas, and milking center wastewater. Milking center wastewater is simply wastewater from a milking facility containing a low concentration of manure, milk residue, and food grade cleansers.

Because dairy wastewater is generally low in nutrient content it has little value as a fertilizer, but with current regulatory conditions Michigan's only standardized method of handling dairy wastewater is retention in a designed manure storage structure for eventual application to agricultural fields. There are a number of drawbacks to this type of system. First there is the cost of hauling the wastewater to fields for disposal, second there is the environmental risk involved if the wastewater is not applied properly. Many of the smaller dairies in the state are being faced with this problem. In Lenawee County, near the town of Hudson, a unique project is being developed that changes the paradigm of dealing with dairy wastewater. In this project, collected wastewater from the dairy is being used to increase crop yields by being a source of water and nutrients through a subirrigation system. This is truly a multi-disciplinary and multi-agency project. The major players in this project are the Lenawee Soil Conservation District, the state NRCS, Michigan DEQ, and Michigan State University. Much of the funding for the project comes from Michigan DEQ, Michigan NRCS, Michigan Soybean Promotion Committee, and the Corn Marketing Program of Michigan.

The innovative portion of this study is that the stored wastewater from the dairy milking house water and runoff from the adjoining 2 acre farmland and silage pad area produced throughout the year is being collected and then fed into a constructed wetland system and then after some treatment will be used to meet the evapotranspiration demand of crops on a 20 acre field through a subirrigation system. The system is a closed system where none of the wastewater can be released to surface water; it can only be recycled between the wetland, the field drainage system, and the storage basin. The idea of a wetland/subirrigation system is not entirely new. Researchers with Ohio State University and the Agriculture Research Service have constructed a system like this in Ohio to recycle tile drainage water. Our project is unique in that it is providing wastewater from a dairy as the subirrigation supply.

A constructed wetland will be used as an initial treatment system to remove residual solids that weren't settled previously and to take the "edge" off of the wastewater. While the dairy wastewater has little nutrient content, it can have high levels of pathogenic bacteria and BOD (a measure of the strength of wastewater) from the manure. Research has shown that the competitive wetland ecosystem is extremely effective at removing pathogens and breaking down BOD. The wetland is roughly 3/4 of an acre in size and relatively shallow at 3 feet deep. It is subdivided into three stages where the first stage of the wetland treatment system consists of an open pond that receives the wastewater from the storage basin. The open pond configuration will act as one last settling basin to help settle any remaining solids in the wastewater. The

wastewater will then pass through a vegetative pea gravel area that will add additionally filtering and provide some microbial treatment of the wastewater. The final stage is another shallow pond where the treated wastewater can be pumped into the subirrigation system. All in all, the wastewater will have a residence time of approximately 10 days within the wetland before it is pumped into the subirrigation system.

The subirrigation system, design by former BE faculty, Dr. Harold "Bud" Belcher is designed to operate in zones, thereby allowing water to be applied anywhere between 8 and 20 acres in 2.5 acre increments. Having the subirrigation system separated into different zones allows for enhanced management of the wastewater stream. In dry years, the wastewater can be applied to fewer zones to make the wastewater last through the irrigation season. In wetter years, more zones can be incorporated to have enough area to be able to use up all of the wastewater over the course of the growing season. Based on typical water demands of a corn crop for Lenawee County, the average evapotranspiration across the growing season equals 0.18 inches per day. Spread out over the subirrigation system, this amounts to anywhere between about 40,000 to 100,000 gallons per day depending on the number of zones that are being used. By applying the wastewater in daily doses that meet the evaporative demand of the crop, there is little chance for the wastewater to seep to a nearby stream or deeper groundwater. Currently, about 20 groundwater monitor wells have been installed in the field to monitor groundwater quality. As more funding becomes available, there will be water quality testing along the different steps of the treatment process. Yield data will also be collected within the subirrigated field to help establish an economic return on the treatment system. In the short term, the wetland/subirrigation system will be showcased at a field day sponsored by the Center of Excellence and the Lenawee County Conservation District is planned for August 25th, 2004. For more information on this project please contact [William Northcott](#) at 517-432-7702 or Mr. Tom Van Wagner, District Conservationist, Lenawee County Conservation District at 517-263-7400 (ext 3).