MANAGING SPRAY IRRIGATION OF NUTRIENTS

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Optimal crop production requires nutrient application. Land application of nutrients is a common practice in Wisconsin and occurs as both animal manure and chemical fertilizers. Conventional practices have involved nutrient application during the spring or fall and at quantities sufficient to ensure adequate supply throughout the growing season. This requires applying additional nutrients to compensate for anticipated losses through both surface and subsurface pathways and/or mineralization in the soil. Mechanisms for these losses can include manure in surface runoff and tiles or nutrients dissolved in stormwater runoff.

Nutrient losses represent a cost to producers as well as the environmental cost from downstream impacts. Nutrients lost from upland areas enter streams, lakes and groundwater resulting in impairment to beneficial use. Oxygen demanding organic matter, bacteria, pathogens and nutrients from manure can pose public health and environmental risks. In addition, it is costly to transport liquid manure from the farm to land application areas. These costs increase with distance along with increased wear on public roads.

One approach to address the aforementioned challenges is to use new technologies to separate manures into solids, concentrated slurries and thin liquids. The rapidly evolving bioproducts industry continues to develop new uses for manure solids in products such as fertilizer, landscape mulch and wall board. The manure solids and concentrated slurries also contain the majority of the phosphorus (P), a nutrient of concern for water quality. These manure solids can be sold or transported to fields and concentrated slurries can be pumped or transported to P deficient fields located at greater distances from the farm at a significantly reduced cost. The thin liquid fraction contains nitrogen and potassium, both essential nutrients for crop growth. Existing spray irrigation technology can be used to apply this fraction to crops throughout the growing season at a rate commensurate with crop growth and uptake (spoon feeding). Nutrient application in this manner decreases the time between application and plant uptake, thus decreasing the surface and subsurface loss risk.

The management goal of manure spray irrigation is to maximize plant nutrient uptake. Essential elements include application rate, timing and volume. The application rate should not exceed 0.25 inches per hour to prevent rapid transport via macropores. Timing should be during periods of active plant growth and total volume should be managed to not exceed the root zone storage capacity and thus prevent deep drainage. Irrigation scheduling and soil moisture monitoring can be used to reduce deep drainage risk. This includes only irrigating to 70% of field capacity to provide a soil water storage buffer for natural rainfall. Discussion will include some of the benefits, challenges and yet unanswered questions of this method of nutrient application.

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