

IMPACTS OF ANAEROBIC DIGESTION AND SOLID/LIQUID SEPARATION ON NUTRIENT AVAILABILITY IN MANURE

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Managing manure as a fertilizer source is an important factor to maintain a profitable and sustainable food production system. The greater management incorporated into understanding the nutrient cycling throughout the entire system can greatly increase crop yields, reduce chemical fertilizer needs, reduce manure handling and processing costs, and limit the environmental impacts. Many manure management processes can impact the availability of nutrients and should be factored into manure management plans to realize the potential benefits. Anaerobic digestion and solid/liquid separation (including bedding recovery units) are increasing in on-farm use around the United States as a component of manure management systems. Anaerobic digestion is a proven waste to energy technology which produces biogas and digestate from anaerobic microbial degradation of organic sources. Nearly all on-farm systems in the United States have a mechanical solid/liquid separation system following digestion which fractions the digestate into a solid and a liquid product. Solid/liquid separators known as bedding recovery units use aerobic processes to degrade organic material also resulting in a similar solid and a liquid portion following processing. Processing of manure using digestion and/or a solid/liquid separation process can impact the nutrient and pathogen content of each stream. Digestion results in mineralization of nutrients and pathogen reductions based on system design of temperature and retention time. Separation (including bedding recovery units) can result in fractioning of nutrients as well as moisture, resulting in increased control of nutrient streams for increased management of manure. The liquid fraction following separation has increased content of soluble nutrients and is commonly land applied as a fertilizer source. The solid fraction is commonly used on-farm as a bedding source, but as it contains concentrated organic nutrients can also be sold as a value added product. However, the lack of data for real world performance has limited the use of these end products and has reduced revenues and resulted in operational problems for many dairies in Wisconsin.

In order to assess real world performance of digesters and solid/liquid separation systems, an assessment of 9 on-farm systems is being conducted over the course of one year. The study design includes sampling every other week pre and post digestion (if a digester is on-farm) and the solid and liquid portion after separation. This allows for assessment of the digestion process and the separation system. Samples are evaluated for nutrients, solids, pathogens (particularly those associated with herd health) and pathogen indicators. The results can be used to assess if digesters and separators are performing as designed. Additionally, these data can provide performance data on the various digester designs and separator equipment. The fractioning of nutrients is critical for assessing nutrient management practices and investigating the impact of recycling manure through the system on nutrient content in both streams. Results of the nutrient portion of this study will be presented for the first 5 months of sampling. These results are critical to developing more profitable nutrient management strategies with reduced environmental impact.

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