

NUTRIENT FORM AND FATE THROUGH MANURE PROCESSING

Rebecca A. Larson¹ and Horacio Aguirre-Villegas²

Manure processing is generally incorporated into livestock systems to change the characteristics of manure in order to gain a higher value end product, reduce operational burdens, or reduce risks associated with the land application of manure. Some common manure processing systems include composting, sand separation (SS), solid liquid separation (SLS), and anaerobic digestion (AD). For many processing systems, the processed manure or at least a fraction of the processed manure is still land applied, therefore understanding the impacts to the manure characteristics is critical for increasing nutrient use efficiency following land application. Processing technologies aside from composting are rarely found at facilities with less than 1,000 animal units, or the number of animals requiring a Wisconsin Pollutant Discharge Elimination System (WPDES) permit. For those permitted facilities SS is the most common processing technology reported from those that were surveyed with AD and SLS also being incorporated by many farms.

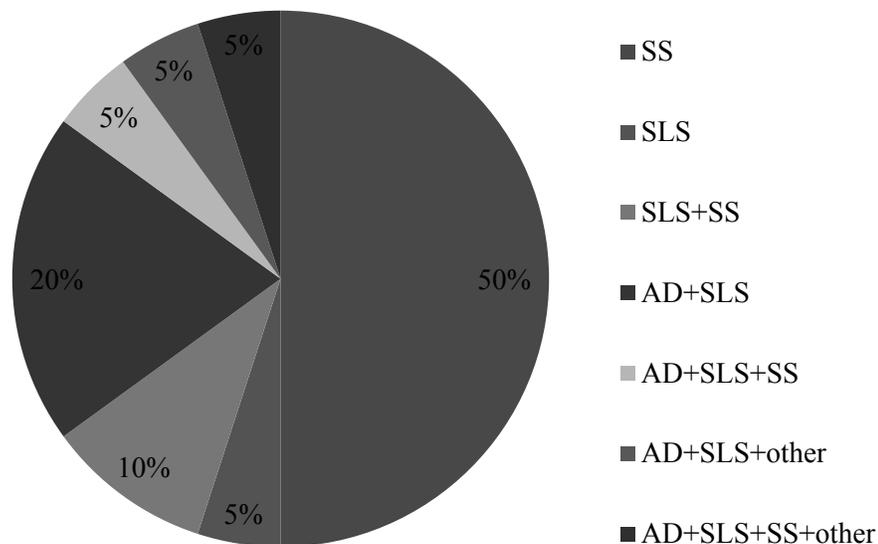


Figure 1. Processing technologies at permitted Wisconsin facilities surveyed (Aguirre-Villegas and Larson, 2017)

¹Associate Professor and Extension Specialist, Biological Systems Engineering, University of Wisconsin-Madison.

²Assistant Scientist, Biological Systems Engineering, University of Wisconsin-Madison.

A study was conducted on nine dairy facilities in Wisconsin to understand the form and fate of nutrient and pathogens through manure processing systems. This included manure sampling throughout the manure system for a year from farms with an AD and SLS systems. The nutrient forms and fate (as well as numerous pathogens/microbes (Burch et al., 2018)) were tracked through the system. The data shows that manure processing system selection and operation are important for estimating the impact to nutrients. Overall, centrifuge separation systems had greater separation efficiencies than those of screw press separation systems for all solids and nutrients, but these systems come at a much greater cost. Digesters can result in mineralization of a significant amount of nitrogen which must be managed to reduce losses in the form of ammonia after digestion. Understanding the forms of nutrients throughout the processing systems can aid in the land application of manure to improve yields and reduce losses.

References

Aguirre-Villegas, H., and R.A. Larson. 2017. Evaluating greenhouse gas emissions from dairy manure management practices using survey data and lifecycle tools. *Journal of Cleaner Production* 143:169-179.

Burch, T.R., S.K. Spencer, S.S. Borchardt, R.A. Larson, and M.A. Borchardt. 2018. Fate of manure-borne pathogens during anaerobic digestion and solids separation. *Journal of Environmental Quality* 47:336-344.