

Livestock waste treatment systems of the future: A challenge to environmental quality, food safety and sustainability

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Abstract

The aim of the study was to focus on the current state of scientific information on the treatment of animal waste, with the intent to apply this information strategically towards enhancing livestock systems for both the sustainable use and protection of natural resources and sustainable production. Currently, the potential impact of manure on the environment represents one of the world agriculture's major challenges. Once dominated by many small operations as part of traditional crop– livestock farms, livestock production has become highly concentrated in large operations. This development has separated animal production from crop production. Thus, the amount of manure produced often exceeds local demand for use as fertilizer. When properly managed, manure can be used as a nutrient source for crops and to improve soil properties through accretion of soil organic matter. On the other hand, improperly managed manure can pose a threat to soil, water and air quality, and human and animal health. Treatment technologies can play an important role in the management of livestock manure by providing a more flexible approach to land application and acreage limitations, and by solving specific problems such as odors, pathogens, water pollution, ammonia emissions, greenhouse gases emissions, and phosphorus and heavy metal contamination of soils. Treatment can be enhanced with the use of biological, chemical, and physical methodologies, especially in combination as part of holistic systems that: (1) are integrated with the needs of the land and other agri-food activities, and (2) maximize the value of manure through energy production, nutrient concentration and recycling, GHG reductions and environmental credits, and other beneficial by-products. The challenge for many countries is how to implement such technologies both on a wider scale and economically.

Keywords: Livestock manure; water pollution; ammonia; greenhouse gases emissions; environmental credits.