

## Human Health and the Use of Animal Manure in Crop Production

**A**nimal manure is a good source of essential plant nutrients when properly used. It can improve soil fertility and enhance biological and physical properties. However, manure has several disadvantages when compared to commercially produced fertilizers, including being bulky, heavy, and having a low nutrient content, making it expensive to transport very far from the animal source. Manure continues to release nutrients during periods when crops aren't actively growing to take them up. This can result in an increased risk of the unused nutrients being washed into surface water through erosion and runoff or leached into groundwater. Careful timing and placement of manure application can help offset these concerns. Because the nutrient content of manure will vary with animal species and management, it is critical to analyze its nutrient composition and factor that into nutrient management planning.

**The ratios and forms of nutrients in manure pose management challenges.** The nutrient content of manure directly reflects the animal diet and the nutrients are not always well matched with plant nutrient requirements. For example, long-term manure applications can lead to excessive buildup of phosphorus (P) in soils because manure is relatively rich in P and crops require relatively small amounts of P, compared with nitrogen (N) and potassium (K). When manure is applied to the soil in quantities necessary to meet crop need for N, soil P frequently accumulates to excessive concentrations, leading to water quality problems. Fresh manure is susceptible to ammonia loss to the air. Ammonia can react to form microscopic airborne particles that contribute to atmospheric haze, respiratory problems, and can drift off site to areas where it may be detrimental.

**Animal manure may carry pathogens that present dangers to human health.** Fresh manure is associated with foodborne illness because it contains bacteria that are a natural part of the animal digestive tract. Food crops, especially vegetables, may become contaminated if they are grown where manure has been recently applied or it splashes onto the vegetation during rainfall or irrigation.

**The U.S. Environmental Protection Agency has cited pathogenic bacteria as a leading cause of water quality impairment in streams, rivers, and estuaries.** There are more than 150 organisms that can spread infection from animals to humans. Many of those can be found in animal feces and urine. They include bacteria—such as *E. coli*, *Salmonella*, and *Campylobacter*—viruses, and protozoa. The U.S. Centers for



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Disease Control (CDC) estimates there are more than 50,000 cases of infection in humans each year from *E. coli* alone. Food-borne illnesses are considered the most serious food safety problem in the U.S. The application of raw manure is one way pathogens are spread in the environment. Manure should never be applied directly to crops intended for direct human consumption. However when manure is properly composted, the generated heat kills the harmful pathogens, thereby reducing the human disease risks. Composting also reduces the volume of manure, making it more practical to transport.

**Animal manure can be a useful resource.** Careful manure management is an important issue since there is such a large volume to deal with (The U.S. Department of Agriculture estimates that farms with confined livestock and poultry animals generate about 500 million tons of manure each year). Manure guidelines recommend that a waiting period of 120 days occur between manure application and harvesting crops intended for human food. Untreated manure should never be used to fertilize leafy green vegetables. Properly composted animal manure can be an excellent nutrient source without a waiting period. **With proper management, manure can be an excellent plant nutrient source.**

### FOR FURTHER READING:

- USDA Agricultural Research Service. FY 2009 Annual Report National Program 206—Manure and Byproduct Utilization. (Accessed [on-line](#) 9 Nov. 2012).
- Land Application of Manure Nutrients. (Accessed [on-line](#) 9 Nov. 2012).
- SERA-17; Organization to Minimize Phosphorus Losses from Agriculture. (Accessed [on-line](#) 9 Nov. 2012).
- Edwards, D.R. and T.C. Daniel. 1992. Bioresource Technology. 41:9-33.