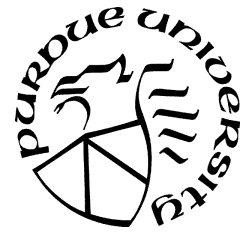


ANIMAL ISSUES



Briefing

Total Farm Nutrient Management - Manure Utilization

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Situation

Increased public concern, proposed legislation, and the potential of greater environmental regulations have created a major threat to the viability of the Indiana livestock and poultry farms. Livestock and poultry producers have been forced to expand the size of their operations to remain economically competitive, while at the same time many rural areas have been experiencing tremendous increases in population densities.

The USEPA and USDA have identified livestock production as a major contributor to water pollution. Over application of manure nutrients can increase nitrogen (N) and phosphorus (P) levels in water sources resulting in increased nitrate concentrations in drinking water, alga blooms, fish kills, and hypoxia. For many operations, the quantity of nutrients being purchased and brought onto the farm is greater than the nutrients remove, which in the long term, will not be sustainable. The following is a summary about what we know, what we don't know and what is being done concerning total farm nutrient management and proper manure utilization.

What We Know

- Most liquid and solid animal manure is utilized through application to crop fields. This recycles nutrients back to where the nutrients came from and allows producers to enhance their bottom line by reducing purchases of commercial fertilizers. Manure application, if managed properly, can improve soil quality (physical, chemical, and biological properties) over time.
- Phosphorus (P), copper (Cu), and zinc (Zn), which are essential plant nutrients, are sometimes added to animal diets at levels that markedly increase their concentrations in manure. Excessive accumulation of these nutrients could potentially affect water quality (P) and plant growth (Cu and Zn) if not managed properly. While manure applications have increased the level of these nutrients in some soils, decreased crop production from these manure nutrients have not been reported in Indiana.
- Long-term application of manure, even at rates not exceeding the N needs of crops, can result in soil buildup of P and potassium (K). Runoff and erosion losses of soil P to surface waters can cause alga blooms and contribute to fish kills. With continued high P applications, some soluble P can begin to move to lower depths in the soil profile and eventually reach field tile drainage systems and surface waters. Excessive soil K levels can lead to grass tetany problems in pastures.

- Use of phytase in pig diets can reduce P excretion from 20 to 40 percent and enhance the availability of dietary minerals. Development of genetically engineered low phytic phosphorus corn, alfalfa, and soybeans may also aid in reducing the excretion of P in manure.
- Losses of manure N and P in field runoff are related to rate, timing, and method of application; soil characteristics, such as slope and texture; crop management practices; residue or crop cover; and weather during and after application. The greatest contamination occurs in runoff when manure is surface applied to sloping frozen soil, when a heavy rain occurs shortly after application and when applied near a water body.
- Manure incorporation, such as direct injection or by field cultivation methods, decrease runoff potential, greatly eliminate odors and conserve N for crop use. More than half the odor complaints associated with livestock production are caused by surface land application procedures, so rapid incorporation of manure into soil avoids most of these complaints.
- Loss of soluble P in runoff from surface manure application can be minimized by proper selection of manure application rate and consideration of the location and condition of fields on which manure is applied. An effective method of controlling nutrient and sediment runoff is through the use of residue cover, cover crops, and vegetative buffer strips in the drainage way.

What We Don't Know

- Due to the organic nature of manure, enhanced microbial activity occurs in the soil after manure application. However, we presently have little control over the rate or timing of mineralization of nutrients from the breakdown of the organic matter in the manure, making it difficult to synchronize crop demands for nutrients with their release from manure.

- The nutrient content of manure varies greatly from load to load and even within a load. Methods for determining the levels of most of the nutrients in manure prior to application, or even as it is applied, are very inexact.
- We have not verified soil test P threshold limits for different soil types that will limit field P losses from runoff or erosion, and minimize P losses to tile drains at the field scale.

What We Are Doing

- Additional study of the soil microbial, physical, and chemical interactions in the soil is proceeding, along with the development of materials to control the fate of certain nutrients, especially N.
- We are improving the nutrient use efficiency of livestock to reduce excessive nutrient excretion in manure at the source. We are improving nutrient uptake through diet manipulation including the use of enzymes, synthetic amino acids, and new experimental crop varieties with traits specifically designed to increase nutrient availability and provide more balanced diets. We are matching the available nutrients in the diets with the requirements of different genetic lines of growing (lean tissue development) and egg and milk producing animals.
- The genetic capability of certain crops to increase nutrient uptake at high soil test levels is being explored. We may be able to develop cropping programs to maximize nutrient uptake when the land base for manure application is limited.
- New on-farm methods to improve our ability to adjust manure application rates and incorporate "prescription agriculture techniques" to increase manure nutrient use efficiency by plants is being studied.
- Computer software is being developed to assist producers in developing comprehensive nutrient management plans for their farm. This program will determine if there are nutrient imbalances for the total farm, including commercial fertilizer use and feed ingredients brought onto the farm.