SAFETY FIRST

ENVIRONMENTAL QUALITY

Manure Handling and Application

New regulations and public concern about our water resources have changed the way the public views animal manure management. This perceived “waste” is a useful by-product and can be recycled for beneficial purposes. Livestock manure is rich in plant available nutrients which can be valuable assets to crop producers. However, it also can be a source of both ground and surface water contamination if improperly handled. Livestock manure contains significant quantities of nitrogen (N), phosphorus (P), and potassium (K), and small amounts of nutrients such as calcium (Ca), magnesium (Mg), manganese (Mn), zinc (Zn), copper (Cu), and sulfur (S). Manure properly applied to the cropland adds organic matter to the soil, which improves soil structure, infiltration, and tilth. Soil erosion is controlled, and the moisture holding capacity is increased.

Best Management Practices (BMPs) for Manure Utilization

To select manure BMPs that achieve water quality goals and the greatest net returns for your operation, consider:

- Most suitable practice to your site and management constraints.
- Potential leaching hazard of application site.

General BMPs

Analyze manure and soil for nutrient content, and consider crop and yield goal prior to determining application rate.

Use a land area of sufficient size to safely accommodate the amount of manure generated by the feeding operation.
Maintain records of manure and soil analyses used for determining acceptable land application rates for three years. Also, keep records of all manure applications, fertilizer applied, and crop yields.

Manure Application BMPs

Base manure application rates upon a site-specific nutrient management plan.

Credit of all plant available nutrients from manure, irrigation water, crop residues, residual soil nutrients, and soil organic matter should be based upon laboratory analysis of soil, water, and manure.

Use management factors such as handling, application method, tillage, irrigation regime, cropping pattern, along with site factors such as soil texture, slope, and aspect in the site-specific nutrient management plan to modify the prescribed manure application rates.

Incorporate manure as soon as possible after application to prevent surface runoff. Avoid application of manure to lands subject to excessive erosion.

Determine soil type and aquifer contamination potential of the application site. If manure is applied on coarse-textured soils, apply near planting time to minimize nitrate (NO3) leaching. Multiple light applications are better than a single heavy application.

Delay Fall application until soil temperatures are below 50 degrees F. Application of manure to frozen or saturated ground should be limited to lands not subject to excessive surface runoff.

Create a 100 foot buffer area around surface water and wells where no manure is applied to prevent the possibility of water contamination.

Plant grass strips around the perimeter of surface water and erosive fields to catch and filter nutrients and sediments should runoff occur.

Storage BMPs

Locate manure stockpiles a safe distance from all water supply wells. Manure stockpiles should be located on areas not subject to leaching and above the 100-year flood plain, unless adequate flood proofing structures are provided.

Divert runoff from manure storage sites away from surface waters by construction of ditches or terraces.

Avoid mechanical disturbance of the manure-soil or “hard pack” seal when cleaning feedlots.

Scrape feedlots or manure storage areas down to bare earth and revegetate if they are permanently abandoned.

Questions to Ask?

Manure applied to fields represents a potential non-point source of water contamination if improperly managed. Non-point source contamination of surface water may occur if there is excessive runoff or erosion from sloping fields. Groundwater contamination occurs when nutrients from manure leach through the soil profile to the water table.

To determine the potential at your site, the following questions should be considered:

- **Soil texture** – the amount of sand, silt, clay and organic matter influences the binding potential of manure.
- **Soil erosion potential** – nutrients that are bound to soil can move into water.
- **Depth to groundwater** – the closer groundwater is to the soil surface, the greater the potential for contamination.
- **Distance to surface water** – the closer to surface water, the greater the potential for contamination.
- **Amount of precipitation** – greater amounts of precipitation or moisture, increases the potential for leaching and runoff.
- **Temperatures** – higher temperatures increase volatilization of manure nutrients and influence the form of nutrient available (especially N).
- **Wind directions** – direction of the wind influences when and where manure applications should be made.
- **Manure application method** – application influences the amount of odor, degree of volatilization and area to which it is applied.
- **Crops grown** – different crops have varying nutrient needs and rates of nutrient uptake.
- **Location of neighbors** – be aware of nuisance potential, direction of prevailing winds, time of application.
- **Incorporation** – timing and methods of incorporation affect odor, and nutrients available.

Soil, Water and Manure Testing

Proper soil and manure testing are the foundation of a sound nutrient management program. Obtaining representative samples is the key to good soil, lagoon and manure analysis. Obtaining a representative analysis is important to establish a reference point of nutrient composition and to determine proper application rate and reduction in potential crop injury.

When taking soil samples it is best to take at least 1 core sample per 10 acres. Composite samples should be limited to 80 acres. (Example: a 130-acre field should be divided into approximately two 65-acre parcels, and 6-7 core samples should be collected per each parcel.)

To collect samples from lagoons or pits it is best to agitate the water to obtain a uniform mixture of solid and liquid. Solid manure samples should be collected from several locations and placed in doubled plastic bags. Plastic bags or bottles can be obtained from the laboratory of your choice. One pint should be sufficient for most liquid analyses. Remember to keep samples cool, do not dry them. You will obtain the most accurate analysis if you send samples by overnight delivery to the lab.

It is best to contact the lab you intend to use prior to collecting samples to get the most up to date information and specific collection instructions. Quality of laboratory services may vary. Ask the laboratory manager about areas of expertise or seek references. You may also contact your local Cooperative Extension Office for help in sampling techniques.

Rule-of-thumb estimates of available nutrient in manure

	Nutrients available the first year			
	--------lb/ton----------			
	Moisture (%)	**N**	**P_2O_5**	**K_2O**
Beef (open lot storage)	30	11	16	3
Dairy (manure, no bedding, stored outside)	87	3	2.5	4
Swine	--------- lb/1000 gallons----------			
Liquid pit	96	28	25	22
Lagoon	99	4.4	3	4

Below are samples that can be used for record keeping:

WASTEWATER APPLICATION LOG

Field :_____

Year : _____

Acre inches = Gallons per minute X number of minutes per irrigation event

27,158

Inches/acre per event = Acre inches

Acres

Date	Crop	Gallons/Minute	# of Minutes	# of Acres	Inches/Event

MANURE APPLICATION LOG (On-site)

Field : _____

Date : _____

Date	Person Applying Manure	Amount (Tons/Load)

MANURE REMOVAL LOG (Taken Off-site)

Year : _____

Date	Person Taking Manure	Amount (Tons/Load)