Protecting environmental quality - use of organic soil amendments

Air, water and land resources

Organic soil amendments

Contaminants that can impact water quality

- Nutrients- Phosphorus, Nitrogen
- Pathogens
- Organic matter
- Heavy metals
Nutrient story first

- Soil organic amendments nutrients mostly in organic form
- Need to be broken into inorganic form to be available to plants
- Can be an advantage under high leaching conditions- reduced nutrient losses from soil

Organic soil amendments

- Once organic nutrients are converted to inorganic forms in the soil- no longer any distinction between sources of supply
- Long-term excessive or inappropriate application of organic fertilisers can be just as harmful to the environment as the unsound use of manufactured fertilisers.

Source: NSW dpi website- What scum is that? Green algae
Blue- Green algae bloom- Western District Lake. Effects of nutrients entering water bodies.

Compost v’s Manures

- Effective composting converts raw products into humus- relatively stable nutrient rich, chemically active organic fraction.

- Humus- no free ammonia, soluble nitrate-nitrogen tied up in biological components

- Other nutrients stabilized in compost as well. Most pathogens destroyed, but not all!
Best practices - to reduce nutrient losses

• Good soil management!

• Soil testing - monitoring nutrient levels, not exceeding adequate levels

• Nutrient budgeting - know how much is coming in and what’s going out

• Avoiding compaction - soil structure - good infiltration, functioning soil biology converting nutrients into different forms, plant roots utilising nutrients
Ground cover management
• Maintain Ground cover- year round – especially Winter & Summer!

Planning is key!- Storage & Application considerations
• Farm map- showing drainage lines, location of dams
• Storage- choose carefully!, examine potential for run-off, odour, groundwater reserves, movement of windborne particles
• Access- trucks, spreaders, loaders
• Hard working base- without waterlogging
Identify high risk areas

Avoiding these areas when spreading, buffer zones
Managing wet areas differently- land classing
Grass buffer around dams- filter sediment

Mobility of nutrients

• P losses often attached to soil particles- erosion.
• Phosphorus (P)- low mobility, reacts with soil, forming insoluble compounds. Although high risk of losses in dissolved form _if heavy rain immediately follows application of nutrients._
• High risk- losses in dissolved form if excessive P levels in top-soil (Olsen P > 20 mg/kg)
Mobility of nutrients

• P not normally leached to groundwater or drainage water – unless very sandy, non calcareous soils


Mobility of nutrients

• Nitrogen- interacts with soil components changes form in the soil.

• Very mobile in soils

• Readily leached to groundwater and drainage waters, easily dissolved in run-off.

• Losses to the atmosphere!
Nitrogen cycle

Source: http://www.windows2universe.org/earth/climate

Nitrogen losses- Organic soil amendments

• Effective use of manure and compost- can result in improved nitrogen use efficiency- soil biology have a role in cycling nitrogen, improving this cycling- reduces need for inputs.

• Potential for reducing N₂O emissions through composting animal manures (from intensive animal industries). Compared to stockpiling and ageing of manures. Current research in progress!
Minimising nitrogen losses

In general similar principles apply as mineral fertilisers;
• timing applications to coincide with plant needs
• placing fertilisers near roots
• incorporating fertilisers at rooting depth
• storing and handling fertilisers to minimise losses.
• Avoiding waterlogged conditions, applying when risk of run-off is low (weather forecast!)

- See also Target-10 Soils and Fertiliser Manual- Chapter 12 Nitrogen Fertilisers

Other potential contaminates

• Pathogens (microbes) capable of causing disease in other organisms. Includes *Ecoli*, *Salmonella*, *Giardia sp.*, *Cryptosporidium sp.* Can contaminate water bodies.

• Organic matter- can become a harmful pollutant in the aquatic environment. Consumes oxygen degrades water quality.
Surface water flow - the key

- Pathogens and Organic matter are unlikely to be transported in sufficient quantities to nearby surface waters unless;
  - Direct discharge from manure storage, livestock housing-into surface water drain
  - Significant rainfall shortly after surface application of manure

Pathogens

- Half lives- some pathogens are short lived (1-3 wks)
- Many have reliance on host
- Withholding periods (eg. 3 wks before grazing)- destroyed by UV light
- Many destroyed during composting process, not all!
- Changed in the soil – active soil biology
- Precautionary approach required- due to risks involved. OH&S precautions required!
Application to land

- Importance of timing, using weather forecasting (7 day forecast)
- Calibration of spreaders- even spreading
- Rates- matching soil and plant requirements
- Withholding periods- 3 weeks before grazing
- Regular testing to avoid imbalances

Heavy metals

- Can accumulate through composting process
- Can accumulate in soil over time
- Need to monitor loads applied (application rate * concentration)
- Copper, Zinc- monitor if using chicken manure
- Arsenic, Mercury also monitor, particularly repeated application to same areas over time
Summary

- Know what you are storing/applying (risks associated)
- Appropriate siting, drainage management
- 7 day weather forecast! Essential tool! Delay for a day - could make a big difference!
- Soil testing! Otherwise flying blind!