Issues in Agricultural Nutrient Management

Carl Majewski
UNH Extension
Feed
Fertilizer
Animals

Harvested feed to animals

Manure to cropland

Milk
Meat
Crops
Manure

Nutrient losses:
Leaching of NO3-
P losses with runoff
Soil Nitrogen Issues

ORGANIC N

Volatilization

Denitrification

INPUTS
Fertilizer, manure, Biosolids, etc.

LEACHING
Stalk $\text{NO}_3^-$ in Cheshire County
Soil Phosphorus Issues

ORGANIC P

SOIL SOLUTION (orthophosphate)

Fe, Ca, Mn, Al COMPOUNDS

INPUTS

ADSORBED TO SOIL SURFACE

LEACHING

RUNOFF & EROSION
Soil Test P

50 ppm – upper end of Optimal range
Soil Test P vs P saturation
How did it get this way?

- Consequence of older recommendations
- Livestock operations have become more concentrated
- Farms are net importers of nutrients
- Manure applications have focused on nitrogen
Addressing Nutrient Management Issues

• Test soils, and follow recommendations

• Consider all sources of nutrients

• Use practices to conserve nutrients
Effect of Starter P on Silage Yields

Response to N on 1st Year Corn

Source: Joe Lawrence, Quirine Ketterings, Karl Czymmek, and Greg Godwin. 2007. Nitrogen savings on first year corn. What’s Cropping Up? Vol 17, No. 1
Nutrient Allocation

- Corn removal
- N-based
- Conserved N-based
- P-based
- Conserved P-based

- 20# excess P per acre
- 6# excess P per acre
- 63# N deficit per acre
- 29# N deficit per acre

Nitrogen
Phosphorus
Calculating rates

<table>
<thead>
<tr>
<th></th>
<th>Corn with manure history, winter cover</th>
<th>Corn with no manure history, low fertility</th>
<th>Corn with high STP, no winter cover</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crop N requirement/acre</td>
<td>160</td>
<td>160</td>
<td>-</td>
</tr>
<tr>
<td>N Credits per acre</td>
<td>108</td>
<td>35</td>
<td>-</td>
</tr>
<tr>
<td>N from biosolids per acre</td>
<td>52</td>
<td>125</td>
<td>-</td>
</tr>
<tr>
<td>Biosolids N (#/wet T)</td>
<td>8.3</td>
<td>8.3</td>
<td>-</td>
</tr>
<tr>
<td>P removal per acre</td>
<td>-</td>
<td>-</td>
<td>130</td>
</tr>
<tr>
<td>Biosolids P(#/wet T)</td>
<td>-</td>
<td>-</td>
<td>56</td>
</tr>
<tr>
<td>Rate per acre (T)</td>
<td>6.3</td>
<td>15</td>
<td>2.3</td>
</tr>
</tbody>
</table>
Best Management Practices

• Avoid sensitive areas – slopes, flooding, frozen...

• Observe setbacks
  – 75-125’ from surface waters
  – 300’ for private wells, 500’ from public wells

• Incorporate or apply prior to rain to conserve nitrogen
Addressing P Transport

- Rotate crops, especially on highly erodible sites
- Provide winter cover
- Avoid winter spreading
- Maintain buffer strips
Questions?
Changes in Nutrient Mass Balance

Source: Melanie Soberon, Sebastian Cela, Quirine Ketterings, Caroline Rasmussen, and Karl Czymmek, Change in nutrient mass balances over time for 54 New York dairy farms. What’s Cropping Up? Blog June 17, 2015