Nutrient Management for Low Cost Production.

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Critical Soil Test Levels.

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Nutrient / Fertilizer

- Plant nutrient – a mineral needed by plants for life, growth, and reproduction
  - (N, P\textsubscript{2}O\textsubscript{5}, K\textsubscript{2}O)

- Fertilizer – a mineral or organic source of plant nutrients
Fertilizers

- Urea (46-0-0)
- Triple Super Phosphate (0-46-0)
- DAP (18-46-0)
- Potassium Chloride (0-0-60)
- Blends (19-19-19)
Potash Sources

- potassium chloride (0-0-60)
- potassium sulfate (0-0-53)
- sulfate of potashmagnesia (0-0-26)
Critical value

- Soil test index number for a nutrient indicating the minimum level of that nutrient that allows maximum crop production without addition of more nutrient.
<table>
<thead>
<tr>
<th>Soil Test Description</th>
<th>Plant Nutrient Status</th>
<th>Soil Test Index Range</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>P</td>
</tr>
<tr>
<td>Low</td>
<td>Deficient</td>
<td>0-25</td>
</tr>
<tr>
<td>Medium</td>
<td>Some response</td>
<td>25-50</td>
</tr>
<tr>
<td>High</td>
<td>Sufficient</td>
<td>50-80</td>
</tr>
<tr>
<td>Very High</td>
<td>Excessive</td>
<td>80+</td>
</tr>
</tbody>
</table>
Forage Yield Response to Soil Test P.
Forage Yield Response to Soil Test K.
Soil pH Affects Legume Yield.

![Graph showing the effect of Soil pH on Relative Yield for alfalfa, trefoil, and clover.]
<table>
<thead>
<tr>
<th>Soil Test Description</th>
<th>Recommended Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>apply fertilizer</td>
</tr>
<tr>
<td>Medium</td>
<td>apply maintenance fertilizer</td>
</tr>
<tr>
<td>High</td>
<td>no fertilizer or maintenance fertilizer</td>
</tr>
<tr>
<td>Very High</td>
<td>no fertilizer needed</td>
</tr>
</tbody>
</table>
Apply nutrients based on crop nutrient removal.

- 1 ton of hay removes 10-12 lbs $\text{P}_2\text{O}_5$ and 40-50 lbs of $\text{K}_2\text{O}$
- Where needed apply only $\text{N}$ in the spring
- Late summer apply replacement $\text{P}$ and $\text{K}$ based on hay yield (0-11-45 or 0-10-40)
Fertilizer P Affect on Forage Yield When Soils Test Low in P.
Fertilizer P Affect on Forage Yield When Soils Test Medium to High in P.
Fertilizer K Affect on Forage Yield When Soils Test Low in K.
Fertilizer K Affect on Forage Yield When Soils Test Medium to High in K.
Yield Response to N Rate

![Graph showing the relationship between N rate and yield in tons per acre.](image)
Use Legumes to Replace Purchased N

- Clover-grass mix provides hay yield equivalent to 150 lbs of N on grass
- Clover-grass mix provides animal gain per acre equivalent to 200 lbs of N on grass
- Clover needs pH above 6.0
- Alfalfa needs pH above 6.5
- Legumes need P and K in the high range
16% Legume
32% Legume
54% Legume
Yield Response to Legume Percentage

Red Clover and Birdsfoot Treefoil-Grass Yield

Site 1
Site 2
Effect of Height at Harvest and Stubble Height on Orchardgrass-Ladino Clover Yield (10 Year Average)
February 2008 Fertilizer Prices

- Urea (46-0-0) $630/ton
- DAP (18-46-0) $770/ton
- KCl (0-0-60) $495/ton
Price per pound plant nutrient.

Urea, 46-0-0

0.46 N / lb fert. x 2000 = 920 lb N / ton

$630 / 920 = $0.68 / lb N
February 2008 Fertilizer Prices

- N from urea $0.68 / lb
- P$_2$O$_5$ from DAP $0.84
- P$_2$O$_5$ from DAP discounted for value of N $0.82
- K$_2$O from KCl $0.41
## Nutritive Value of Hay

<table>
<thead>
<tr>
<th>Feed</th>
<th>Pounds/Ton at 90% Dry Matter</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
</tr>
<tr>
<td>Hay, grass</td>
<td>30</td>
</tr>
<tr>
<td>Hay, mm grass</td>
<td>35</td>
</tr>
<tr>
<td>Hay, mm legume</td>
<td>48</td>
</tr>
<tr>
<td>Hay, legume</td>
<td>56</td>
</tr>
<tr>
<td>Hay, small grain</td>
<td>26</td>
</tr>
<tr>
<td>Straw</td>
<td>17</td>
</tr>
<tr>
<td>Corn stalks</td>
<td>6</td>
</tr>
<tr>
<td>SD</td>
<td>9</td>
</tr>
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</table>
Manage the Manure

• Hay fields
  – $45-$70 of N, P, and K in a ton of hay

• Pastures
  – mineral feeding provides $300 worth of fertilizer per ton of mineral.

• Crop land
  – Collect/protect confinement feeding manure

• It is too expensive to feed in the woods
Return Manure to Field Where Feed Was Produced

• Fed hay back on hay meadows
  – Returns nutrients to where it came from
  – Need to reseed behind hay without seeds
  – Does not work well on deep or wet soils
  – Some bad weeds may take over

• Collect/protect manure and return to fields
Spring after winter feeding
First cut hay 1-year after feeding
Aftermath growth 1-year after feeding