Nutrient Management for Grazers
Webinar #1

Kirsten Workman
Sr. Extension Associate
Nutrient Mgt. & Environmental Sust. Specialist
Nutrient Management for Pastures

Why is it important?

• Maximize productivity, reduce losses
• Nutrients are required for forage quality (not just quantity)
• Required for Organic certification, local/state rules, etc.
• Soil health requires managing fertility...we shouldn’t be mining our soil’s resources
• Low yielding systems are ‘leaky’
• Profitability is required for sustainability
• Good grazing management is also good nutrient management
Nutrient Management for Pastures
Nutrient Management for Pastures
The 4Rs promote best management practices (BMPs) to achieve cropping system goals while minimizing field nutrient loss and maximizing crop uptake.

4R Principles of Nutrient Stewardship

RIGHT SOURCE
Matches fertilizer type to crop needs.

RIGHT RATE
Matches amount of fertilizer to crop needs.

RIGHT TIME
Makes nutrients available when crops need them.

RIGHT PLACE
Keeps nutrients where crops can use them.
RIGHT TIME
Makes nutrients available when crops need them.
RIGHT PLACE
Keep nutrients where crops can use them.
Soil Fertility - Lime! Lime! Lime!

- pH management helps with nutrient management
- To know when to apply lime, soil test
Soil Fertility - Nitrogen

Nitrogen

• 50% legume = no additional N (but need to manage other factors)
• Split applications (50-75)
• Only fertilize what you can harvest/graze...don’t get ahead of yourself and waste it.
• Can impact quality – not just quantity
• Maximize your manure nitrogen!
# Soil Fertility – Soil Testing, P & K Fertilization

Table 2.10.1 from 2022 Cornell Guide for Integrated Field Crop Management

<table>
<thead>
<tr>
<th>Soil Management Group</th>
<th>Phosphorus Soil Test Value</th>
<th>Potassium Soil Test Value</th>
<th>Magnesium Soil Test Value</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Very Low</td>
<td>Low Medium High High</td>
<td>Very Low Low Medium High High</td>
</tr>
<tr>
<td>I</td>
<td>&lt;1 1-3</td>
<td>4-8 9-39 40+</td>
<td>&lt;35 35-64 65-94 95-149 150+</td>
</tr>
<tr>
<td>II</td>
<td>&lt;1 1-3</td>
<td>4-8 9-39 40+</td>
<td>&lt;40 40-89 70-99 100-164 165+</td>
</tr>
<tr>
<td>III</td>
<td>&lt;1 1-3</td>
<td>4-8 9-39 40+</td>
<td>&lt;45 45-79 80-119 120-199 200+</td>
</tr>
<tr>
<td>IV</td>
<td>&lt;1 1-3</td>
<td>4-8 9-39 40+</td>
<td>&lt;55 55-99 100-149 150-239 240+</td>
</tr>
<tr>
<td>V</td>
<td>&lt;1 1-3</td>
<td>4-8 9-39 40+</td>
<td>&lt;60 60-114 115-164 165-269 270+</td>
</tr>
</tbody>
</table>

1. Values are in pounds per acre of soil test extractable nutrient using the Cornell Morgan soil test. Using a different test will add uncertainty to the interpretations and recommendations.

2. Soil test phosphorus values differ for winter grains. High is 9-20 lbs P/acre and Very High is 20+ lbs P/acre.

3. Magnesium levels shown are for all field crops except birdsfoot trefoil and soybeans. For these two crops, double the values shown above.
A word about yield

Maximizing pasture (and hay field) yields is an important strategy for...

• Minimizing feed imports
• Increasing efficiency
• Minimizing your carbon footprint
• Reducing environmental losses
• Maximizing profitability

Rich Taber / CCE Chenango
Maximizing Home Grown Nutrients

- Maximize Yield
- Minimize undigestible fiber
- Optimize energy
- For stored forages and pastures!

Figure 4. Pasture Yield by Grazing System
Maximizing Pasture Yields

Timing is everything

Pastures

• Timing of grazing AND timing of rest/recovery
• Don’t start too early
• Don’t go too late

Timing of forage harvest

• Maturity
• Field conditions

Dynamic harvest schedules
Maximizing Pasture Yield & Quality

Anti-Quality Factors
• Species (wrong species or right species, wrong situation)
• Reduced intake (over mature, thorns, etc.)
• Make animals ill/death (toxicity)
• Palatability vs. preference

DON’T LOSE IT IN THE BUNK/BALE

Manage stored feeds to minimize shrink and maximize quality
• Good fermentation or drying
• Good storage conditions
• Good feedout management
Managing Nutrient Applications

Soil Fertility

• Manure – let’s manage it well
Managing Nutrient Applications

Grazing Management is also Crop & Nutrient Management

Continuous Grazing

Conventional Rotational Grazing

Mgt. Intensive Grazing
Records/Information needed for Nutrient Management

✓ Basic info
  • Maps, acres, soil types, environmental concerns
  • Soil tests, manure tests, animal information

✓ Yields???
  • Amount of forage harvested...by cows and people
  • How do you estimate (grazing records, pasture stick, others)

✓ Manure volume & nutrient applications
  • Accounting for grazing manure (animal groups as ‘spreaders’)
  • Calibrating spreaders (manure or otherwise)

✓ Grazing Charts
  • Using them as record keeping tools too!
## Basic Info

<table>
<thead>
<tr>
<th>Information</th>
<th>Where? How?</th>
<th>How often?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maps/soil types/environmental concerns</td>
<td>NRCS SWCD Extension Online</td>
<td>Initial Whenever landbase changes</td>
</tr>
<tr>
<td>Soil tests</td>
<td>You SWCD</td>
<td>Every 3 years (or more frequent if tracking something or rotating crops)</td>
</tr>
<tr>
<td>Manure tests</td>
<td>YOU</td>
<td>Annually – or whenever you spread</td>
</tr>
<tr>
<td>Fertilizer Analysis</td>
<td>Supplier</td>
<td>Whenever purchasing</td>
</tr>
<tr>
<td>Animal Info (#s, weights, groupings)</td>
<td>YOU</td>
<td>ongoing</td>
</tr>
<tr>
<td>Imported Feeds + analysis</td>
<td>Supplier or you</td>
<td>Whenever purchasing</td>
</tr>
</tbody>
</table>
## Basic Info

<table>
<thead>
<tr>
<th>Information</th>
<th>Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil tests</td>
<td>Use your Landgrant recommended soil analysis and send to a certified lab.</td>
</tr>
<tr>
<td>Animal Info (#s, weights, groupings)</td>
<td>Your records, weight tapes, scales, estimates</td>
</tr>
<tr>
<td>Imported Feeds + analysis</td>
<td>Your records, invoices, analysis from source</td>
</tr>
</tbody>
</table>
Yields

How to measure yields

Harvested Crops
- Yield checks
- Weigh bales/loads

Pastures
- Clipping
- Falling Plate
- Pasture Stick
- Calculating based on DMI 3%

https://ohioline.osu.edu/factsheet/11-HCS-868
Yields

Pastures – Clipping

- Sample a known area by clipping (at typical grazing height). Usually 1 – 2 square feet
- Dry it down (microwave will work)
- Weigh the dried sample and then convert to pounds DM/acre

\[
0.05 \text{ lbs DM/sq ft} \times 43,560 = 2,178 \text{ lbs DM/acre}
\]

- Can be time consuming, but a good way to start and to calibrate other methods
- *Should* do multiple samples/paddock
Yields

Pastures - Pasture Stick

- Measure height
- Measure stand density to get estimate of pounds per inch
- Multiply pounds/inch x # grazing inches available

200 lbs DM/inch x 12 inches available = 2,400 lbs DM/acre

- *Should* do multiple samples/paddock

https://extension.sdstate.edu/using-grazing-stick-assess-pasture-forage

https://youtu.be/bSYflqjP6B0
Yields

Pastures - Calculating based on DMI

- Animal Wgt x # animals in group x percent intake = Pounds forage/day

15 yearlings x 850 lbs x .03 = 383 lbs DM/day
- They grazed that 0.5 acre paddock for 3 days (and did not run out of forage and we left a good residual)

3 x 383 = 1,149 lbs DM / 0.5 acres = 2,300 lbs DM/ac

For groups with multiple animal types/sizes, calculate for each ‘type’ and add together

This is also imperative for PLANNING your grazing as well...how much is out there and how long should a group of animals be out there?
Manure Inventory & Nutrient Applications

Manure Volumes
- Amount stored during winter
- Amount ‘spread’ on pastures by grazing animals

Nutrient Applications
- Amount spread/day/grazing unit
- Calibrate manure spreader?

Tools
- grazing ‘unit’ manure estimations - UMass
- Vermont Manure Screening Tool
- How to calibrate a manure spreader
Manure Inventory

Manure Volumes

Amount stored during winter

Number of Animals x Average Weight of Animal (lb) ÷ 1000 (animal unit) x Daily Manure Prod. x Manure Collection Period (days) + Estimated Percent of Bedding in Manure.

10 sheep x 200 lbs /1000 = 2 AUE
2 x 40 lbs/day x 100 days in barn = 8,000 lbs manure collected
8,000 x 1.05 (5% bedding) = 8,400 lbs/2000 = 4.2 tons

Amount ‘spread’ on pastures by grazing animals

10 sheep x 200 lbs /1000 = 2 AUE
2 x 40 lbs/day x 1 grazing day = 80 lbs/day
80 x 260 days ‘out’ = 20,800 lbs/2000 = 10.5 tons

<table>
<thead>
<tr>
<th>Animal Type</th>
<th>Daily Production</th>
<th>Analysis Units</th>
<th>N</th>
<th>P₂O₅</th>
<th>K₂O</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dairy cow: lactating (liquid)</td>
<td>13 gal</td>
<td>lb/1000gal</td>
<td>28</td>
<td>13</td>
<td>25</td>
</tr>
<tr>
<td>Dairy cow: lactating (solid)</td>
<td>106 lb</td>
<td>lb/ton</td>
<td>10</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Dairy cow: dry</td>
<td>82 lb</td>
<td>lb/ton</td>
<td>9</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Dairy cow: calf and heifer</td>
<td>87 lb</td>
<td>lb/ton</td>
<td>7</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Beef cattle: cow and calf</td>
<td>60 lb</td>
<td>lb/ton</td>
<td>11</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>Beef cattle: steer</td>
<td>75 lb</td>
<td>lb/ton</td>
<td>14</td>
<td>5</td>
<td>8</td>
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<tr>
<td>Beef cattle: veal</td>
<td>5 gal</td>
<td>lb/1000gal</td>
<td>36</td>
<td>27</td>
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<tr>
<td>Swine: gestation</td>
<td>4 gal</td>
<td>lb/1000gal</td>
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<tr>
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<td>40 lb</td>
<td>lb/ton</td>
<td>23</td>
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*Adapted from: The agronomic guide 2002. College of Agricultural Sciences, Penn State University.

Nutrients in stored manure

4.2 x 23 = 97 lbs N
4.2 x 8 = 34 lbs P₂O₅
4.2 x 20 = 84 lbs K₂O

Nutrients in grazing manure

10.5 x 23 = 242 lbs N
10.5 x 8 = 84 lbs P₂O₅
10.5 x 20 = 210 lbs K₂O
Manure Applications

Estimating Manure application

Amount ‘spread’ on pastures by grazing animals per day

10 sheep x 200 lbs /1000 = 2 AUE
2 x 40 lbs/day x 1 grazing day = 80 lbs/day
80/2000 = .04 tons/day

.04 x 23 = 1 lbs N
.04 x 8 = 0.3 lbs P2O5
.04 x 20 = 0.8 lbs K2O

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<th>ANIMAL TYPE</th>
<th>DAILY PRODUCTION</th>
<th>ANALYSIS UNITS</th>
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Estimating Manure application

Calibrating spreaders

- weight loaded - weight empty = load size
- Load size (lbs) ÷ Area covered by load (sq. feet) = (lbs/sq feet x 43,650) ÷ 2000 = tons/acre
- Or count number of loads, multiply by load size and divide by total field acres

23,850 lbs – 11,150 lbs = 12,700 lbs
36’ x 515’ = 18,540 sq feet
(12,700/18,540) x 43,560 ÷ 2000 = 14.9 tons/acre
12,700 lbs = 6.35 tons
6.35 x 35 loads = 35*6.35 = 222.25 tons/15 acres = 14.8 tons/acre

Calibrating manure spreaders is FUN!!
Estimating Manure application

Farm: Farmstead
Crop Year: 2021
Manure Type: dairy-solid

Calibration Date: 11/9/2020

Spreader model: H & S 310

23,850 lbs – 11,150 lbs = 12,700 lbs
36’ x 515’ = 18,540 sq feet
(12,700/18,540) x 43,560 ÷ 2000 = 14.9 tons/acre

*Manure samples were collected at the time of calibration
Grazing Charts as Record Keeping Tools
<table>
<thead>
<tr>
<th>PADDOCKS</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
</tr>
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<tbody>
<tr>
<td>Size</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number/Name</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

RAINFALL/in
SNOW/in

Daily Temps
Write the name of each grazing unit and its size

- Pasture
- Paddock
- However you manage/rotate
For each grazing group...pick a color
- Fill in the box for each day that group is in that paddock

Record other events (using different colors/symbols)
- Manure applications
- Crop harvests
- Irrigation
<table>
<thead>
<tr>
<th>YEAR</th>
<th>GRAZING PLAN</th>
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</thead>
<tbody>
<tr>
<td></td>
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</table>

Record weather
- Rainfall
- Snow
- Temperatures
- other

RAINFALL/ in  
SNOW/ in  
Daily Temps
### Record other monthly events

- Notes
- Comments
- Observations
Breakout – Resources for NM Records

• Grazing Chart – contact Troy Bishopp (the Grass Whisperer) or your local SWCD/Extension office.


• Land grant university fertility guidance (refer to your local LGU)

• Using a grazing stick:
  https://youtu.be/bSYflqjP6B0;
  https://extension.sdstate.edu/using-grazing-stick-assess-pasture-forage

• Measuring pasture dry matter yields:
  https://ohioline.osu.edu/factsheet/11-HCS-868

• Calculating manure production:
  https://ag.umass.edu/crops-dairy-livestock-equine/fact-sheets/manure-inventory

• Calibrating manure spreaders:
  https://www.uvm.edu/sites/default/files/Agriculture/CVCROPS/ManureCalibration.pdf;