

**Beginning Women's Farming Conference
Amherst, MA, - March 22 & 23, 2012**

"Nutrient Dense Grazing" – Handout

After completing a course in 2011 on Nutrient Dense Farming (www.realfoodcampaign.org), Lisa was inspired to use this new-found information and apply it to her pastures and gardens. Taking a close look at her soil tests, she gained a deeper understanding of the soil's excesses and deficiencies, and came up with a strategy to increase the biological activity in her soil, the health of her plants and, the nutritional quality in the pastures and gardens. This presentation will take you through the process of what has been done on Earthwise Farm and Forest, the economics behind it, some observations from the 2011 growing season, and thoughts and plans for 2012.

Introduction: Earthwise Farm and Forest consists of 158 acres of which 125 acres are actively managed forest and 8 acres is currently open and used for pasture and vegetable crops. An additional 16 acres is leased and used for pasture. Livestock managed on these acres in 2011 were: 2 sows and 6 feeder pigs; 2 draft horses; 2 milk cows & a bred heifer and 3 yearling steers; 50 heritage turkeys; 25 meat birds; 30 laying hens.

Much of the leased land has come under our management over the past 4-8 years and prior to that had been over grazed or neglected. We have been making improvements on these pieces by employing Management Intensive Grazing, and providing water in the paddocks for more efficient grazing and more control over where the manure is deposited. We also drag the pastures in the spring and clip pastures at least once a year, when necessary.

It was clear from the animal productivity, plant species, and total dry matter harvested each season that our grazing management was making a difference, but there was a lot of room for improvement. We know that if our land is more productive, that we would be able to harvest some of the surplus feed for winter feeding. I knew that we could make incredible strides if we were to take some soil tests and address some of the acute deficiencies and imbalances.

In 2011, I enrolled in the Nutrient Dense Farming Class, offered by the Real Food Campaign (www.realfoodcampaign.org) and taught by Dan Kittredge. This course helped me develop a deeper understanding of what it means to have healthy balanced soils and how that impacts: 1) feed and food quality; 2) disease resistance; 3) pest resistance; and 4) the volume of the feed and food produced. I used the knowledge gleaned from this class in addressing deficiencies in our pastures and gardens and would like to share with you some of our activities and plans for the future.

Reading and understanding the soil test was the first step. By reading the soil test I could identify the deficiencies and imbalances in our pastures and gardens, and then determine which organically approved fertilizers I wanted to apply to address those deficiencies. Then I would need to calculate the volume (lbs/acre) of each amendment that would be needed to bring the soil to perfect balance.

Finances: With limited cash reserves, we needed to look at what was needed, calculate the costs, determine what we *could* afford, and then cut the amendments to a volume that was practical within our budget. We also created a wish list of additional amendments that we would add *if time and resources became available*.

Logistics: Knowing what to add was actually the easiest part to this project. Finding out where to get the amendments, getting a reasonable price, and determining how it was going to be delivered and applied was almost more challenging.

Our farm is relatively small and almost all of the fields needing attention do not have easy access, nor do we have a good location for amendments to be dropped off (volume loads) and then spread. Our methods of application were: 1) lime spreader, pulled by our horses, 2) back pack sprayer (liquid application), 3) spreading by hand (micro nutrients).

Monitoring and Evaluating: For 2011, we have been keeping track of the pounds of dry matter harvested per acre over the growing season on each of our fields. One of the record keeping forms we used was HMI's Grazing Planning and Control Chart. We also took forage samples in August and plan to continue monitoring plant regrowth and quality year after year – taking note of the particular growing season (hot/wet/dry/cold...), do determine impact of management, applications and the growing season in general.

Grazing Management System: In order to plan our grazing season we need to write down a number of factors including:

- 1) Animal groups grazing on our farm: Draft Horses(2), Dairy Cow & calves (3), Steers (5), Turkeys (50), Meat Birds (50), Layers (30), Layer Replacements (15), Sows and piglets (6-8)
- 2) Identifying which animals can move large distances and which ones stick to a particular piece of ground. We also will start our pigs in a different location each year.
- 3) How often we plan to move various groups. A new paddock is given every 12-48 hours (depending upon the animal group)
- 4) Planning for clipping, reseeding, dragging, possible hay harvest for 2012
- 5) Making sure that there is water in each paddock
- 6) Time to do some biological monitoring over the grazing season: Making note of pre and post grazing height, palatability, milk production, plant species, plant density, regrowth time, etc.

Further Learning: Taking the Nutrient Dense Farming Course, I became more appreciative of a broad spectrum of nutrients (beyond the NPK), and their importance in producing food that is more nutritious and resistant to disease and pest infestations. I have enjoyed using the soil testing services provided by Logan Laboratories, as they provide clear information on many of the macro and micro nutrients, and provide ideal and actual readings so that I can identify deficiencies and excesses and use this information in my fertilizer amendment plans.

In my presentation, I will go over the soil test results for a couple of my fields and will explain what I added to our pastures and why, as well as report on the \$/acre that was invested in our fields. I will also go over our Grazing Planning Chart, showing how I kept track of our grazing rotations and feed harvested, and why I hope to see additional some improvements this year in the form of yield, plant species, and feed quality.

Here are some key conversion tables that I found to be helpful:

Percentages of Nutrients in various mined minerals (allowed for organic use):

Magnesium Sulfate (epsom salts) = 20% Mg, 30% S

Gypsum = 23% Ca, 19% S

Sul-Po-Mag = 22%S, 22% K, 11% Mg

Soft Rock Phosphate = 22% P, 20% Ca

Hi Cal Lime = 38-40% Ca

Dolomitic Lime = 30% Ca, 10% Mg

P2O5: 75 ppm P x 4.6 = 350 #/acre P2O5

trace elements:

Solubor = 20% Boron
Borax = 11% Boron
Cobalt Sulfate = 27% copper
Manganese Sulfate = 32% Manganese

Important Conversion Values:

PPM – Parts per million
PPA = Pounds per Acre
PPA = 2(PPM)

There are 2 million lbs of soil in the top 6 inches of soil

500 lbs per acre = 11.5 lbs per 1000 sq feet
100 lbs per acre = 2.3 lbs per 1000 sq feet
20 lbs per acre = .46 lbs per 1000 sq feet
5 lbs per acre = 2 ounces per 1000 sq feet

Macro and Micro Nutrients: What they have to offer

Potassium: Ideal balance = 3-5% base saturation ($780 \text{ CEC} \times \% \text{ saturation} \div 200 = \text{ppm}$), **Ca:K ratio 10:1**

Best Sources: Potassium sulfate, Bio-cal

Note: Excessive levels of potassium can crowd out calcium and magnesium, resulting in deficiencies of these cations. In dairy cattle low Mg and Ca and high K can lead to 'grass tetany' (hypomagnesemia) and milk fever (hypocalcemia).

Benefits:

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|---------------------------------------|---|
| 1) stalk strength, lodging resistance | 5) Carbohydrate production; sugar translocation |
| 2) Improves winter hardiness | 6) Enzyme function |
| 3) Disease resistance | 7) Cell division |
| 4) Protein production | |

Magnesium: Ideal balance = 12-15% saturation ($240 \text{ CEC} \times \% \text{ saturation} \div 200 = \text{ppm}$), **Ca:Mg ratio 5:1**

Best Sources: Magnesium sulfate, Sul-Po-Mag

Benefits:

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|-------------------------------|-------------------------------|
| 1) Key element in chlorophyll | 5) Aids in phosphorous uptake |
| 2) Protein production | 6) Oil formation |
| 3) Enzyme functions | 7) Starch translocation |
| 4) Energy release in cells | |

Calcium: Ideal balance = 70-80% saturation ($400 \text{ CEC} \times \% \text{ saturation} \div 200 = \text{ppm}$), **Ca:K ratio 10:1, Ca:Mg ratio 5:1**

Best sources = Bio-Cal, Calcium Sulfate (gypsum), High Calcium Lime (low Mg), Ida-Phos

Benefits:

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|--|-------------------------------------|
| 1) improves soil structure | 6) Cell division |
| 2) stimulates soil microbes and earthworms | 7) Builds cell walls |
| 3) mobilizes nutrients into plant | 8) Enzyme functions |
| 4) Increases Nitrogen utilization, protein content | 9) Increases sugar content of plant |
| 5) Root & leaf growth | 10) Promotes overall plant health |
| | 11) High quality grain or fruit |

Phosphorous: Ideal Balance = P1 (available): 25-50 ppm, P2 (reserve): 50-100 ppm

Best sources: Monoammonium phosphate, Idaho phosphate (Ida-phos), N.Carolina phosphate

Benefits:

- 1) fast & vigorous growth
- 2) Good & early root growth
- 3) Grain development and quality
- 4) Hastens maturity
- 5) Increased N uptake
- 6) Increased mineral content
- 7) Higher sugar in plant
- 8) Energy release in cells
- 9) Cell division & enlargement
- 10) Photosynthesis
- 11) Contained in cells' DNA

Sulfur: Ideal Balance = 50 ppm or 100 #/acre

Best sources: Bio-Cal, Annomium sulfate, calcium sulfate (gypsum), potassium sulfate

Benefits:

- 1) more useable protein (High quality, complete)
- 2) Makes soil nitrogen more available
- 3) Loosens, aerates soil
- 4) Reduces excess soil magnesium
- 5) Lowers soil pH
- 6) Energy release in cells
- 7) Part of vitamin B1 and biotin

Zinc: Ideal balance = 5+ ppm or 10#/are

Best sources: zinc sulfate

Benefits:

- 1) contributes to test weight
- 2) Increases ear size of corn
- 3) Promotes silking in corn
- 4) Hastens maturity
- 5) Chlorophyll formation
- 6) Enzyme functions
- 7) Regulates plant growth

Manganese: Ideal balance = 20 ppm or 40#/acre – Mn/Fe ratio should be 1:1

Best sources: Manganese sulfate, 28%

Benefits:

- 1) Normal growth and photosynthesis
- 2) Oil production
- 3) Energy release in cells
- 4) Enzyme function

Iron: Ideal Balance = 20 ppm or 40#/acre

High iron ties up phosphorous

Benefits:

- 1) chlorophyll production
- 2) energy release in cells
- 3) needed by nitrogen-fixing bacteria

Copper: Ideal Balance = 2+ ppm or 4#/acre

Best sources = copper sulfate, 25%

Benefits:

- 1) controls mold and fungi
- 2) photosynthesis
- 3) releases energy in cells
- 4) enzyme functions
- 5) normal leaf growth
- 6) increases stalk strength
- 7) animal health

Boron: Ideal Balance = 2+ ppm or 4#/acre

Best sources = calcium borate

Benefits:

- 1) Promotes flowering & pollen (silk & tassel in corn)
- 2) Seed development
- 3) Root and leaf growth

- 4) Cell wall formation
- 5) Protein production
- 6) Sugar translocation

- 7) Energy release in cells
- 8) Improves quality
- 9) Increases calcium uptake