

## Building Fires with Fertility

**MINERALS IN SYNERGY  
WITHIN HEALTHY PLANT ECOSYSTEMS**

DEREK CHRISTIANSON – BRIX BOUNTY FARM  
[WWW.BRIXBOUNTY.COM](http://WWW.BRIXBOUNTY.COM)  
DEREKCHRISTIANSON@GMAIL.COM

**SOIL & NUTRITION: AN EDUCATION & COALITION  
BUILDING CONFERENCE**

**NOFA MASS & REAL FOOD CAMPAIGN**

FEB 10, 2012

Soil & Nutrition – Feb. 10, 2012

Complete set of slides available  
(.pdf) format on our website:

[www.brixbounty.com/event](http://www.brixbounty.com/event)

Spinach... oxalic acid, nitrates and nutrition... the  
case for locally grown nutrient dense crops



Brix Bounty Farm, Dartmouth, MA

## Growing Food with Respect for the Earth & Future Generations

Founded in 2008

Fresh Vegetables & Community Education  
A Catalyst

### Labor & Resources

#### Building Fires or Fighting Fires

- EROEI – Energy Returned on Energy Invested
- Fixed Costs within Agriculture
- In order to ensure financially viable farming operations, we need to “maximize” our return on labor while improving our natural resource base for the future.

### Capturing Moisture with Carbon

Morning Fog - June 2010

Glandular Trichomes (“hairs”)



### Receiving Earth's Energy

- Plants and Soils – Capturing Energy
- Enhancing our Environment
- Carbon
- What % of optimal are we functioning at?

### Every Day...



### Ask the Right Questions

- What are the Farm's Limiting Factors?
  - Fertility
  - Labor
  - Markets
  - Weed Pressure
  - Etc.
- How are We Building a Foundation or "Endowment" for Future Generations?
- Caring, Honoring, and Dignifying our Biological Systems

### What is the Proper Amount of \$ to Invest in Health?

- A Question for Our Community
  - What are we spending by not investing in soil and plant vitality?
- Importance of Agriculture in Raw Material "Economic Productivity"
- Multiple Benefits
  - Improved Yields
  - Improved Disease & Pest Resistance
  - Environmental Impact
  - Humification > Building Soil

### Sharing our Costs with Customers

- Deep Nutrition Share at Brix Bounty Farm
- **"Wintertime Vegetable CSA Share Price** – Our prices reflect our deep commitment to growing top quality produce using sustainable practices which emphasize care for the earth. We are striving to take the necessary actions to make accelerated steps toward improved nutritional quality in our production. To this end we are inviting our CSA members to make a voluntary investment in our Capital Fertility Plan, dubbed the **Deep Nutrition Share** (\$100 investment for wintertime shares, \$200 investment for summertime shares). See our Wintertime CSA Share Information for complete information about the new **Deep Nutrition Share Investment Option.**"
- "Asking for Support" (with a story)

### Results of Our Inaugural Offering

- 2011-2012 Wintertime CSA:
  - 6 Distributions \$250 – November – January
- Small Wintertime CSA - currently ~35 Members
  - 34 Members @ \$250 = \$8,500.00
  - 12 Deep Nutrition Shares @ \$100, 2 @ \$50 = \$1,300.00
  - ~41% of Wintertime Members Contributed
  - ~15% Additional Dollars from Deep Nutrition Share
  - +20 yds of EarthCare Farm Compost for Hoophouse & Garlic Beds, additional soil testing and microbial inoculants.

### Tomatoes – June 27<sup>th</sup>, 2010



### Our Soils as a Foundation of Health and Wealth

- Soils are far too important to be neglected
- Aim should be to create and maintain soils which grow healthy crops and therefore can avoid expensive use of pesticides and herbicides. Who profits in this scenario? Ideally the farmer if we focus on soils...
- Human health and future financial implications (diabetes, etc.)
- Raw material or primary wealth production
- Soils are far too important to be neglected

### Folks Who Provide Insight Into Fertility

- William Albrecht – Soil Scientist at U. of Missouri, focused on the basic cation saturation ratio (BCSR)
  - Neal Kinsey – follows Albrecht methods
- Eliot Coleman – “The New Organic Grower”
- Sir Albert Howard – “An Agricultural Testament”
- Carey Reams – Reams Biological Theory of Ionization
  - Arden Andersen, Dan Skow – building on Reams’s work
- Rudolf Steiner – Lectures formed foundation of Biodynamic Agriculture
- **And... a growing network of growers, labs, and scientists**

### Fertility Budget Primers

- Resources
  - Laurie Drinkwater (Cornell) – A Closer Look at Nutrient Budgeting
    - ✦ <http://www.smallfarms.cornell.edu/tag/nutrients/>
  - Organic Farming Research Foundation Project Report (Drinkwater)
    - ✦ [http://ofrf.org/funded/reports/drinkwater\\_03s16.pdf](http://ofrf.org/funded/reports/drinkwater_03s16.pdf)
  - Nutrient Cycling and Maintaining Soil Fertility... (U of Minn.)
    - ✦ <http://www.extension.umn.edu/distribution/horticulture/m1193.html>
  - Using Manure and Compost as Nutrient Sources... (U of Minn.)
    - ✦ <http://www.extension.umn.edu/distribution/horticulture/M1192.html>
  - Nutrient Budget Basics for Organic Farming Systems (eXtension.org)
    - ✦ <http://www.extension.org/pages/18794/nutrient-budget-basics-for-organic-farming-systems>

### Developing a Fertility Budget

- Biology, Chemistry, and Physics
  - But Don't Forget (Cultivation, Efficient Labor, Marketing, Water)
- Start With Proper Information
  - Soil Testing
  - Crop Value and Market Demand
- Assessing Existing Fertility
- Assessing Farm Generated Fertility
- Financial Budget Will Often Dictate Choices

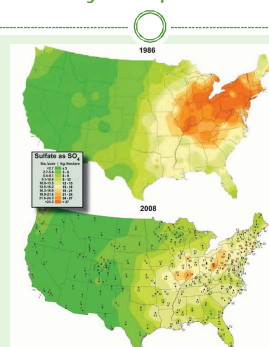
### Fertility Recommendations

- Climatic Impact on Soils (Albrecht)
  - Mosaic Co. Back-to-Basics - <http://back-to-basics.net/>
- Based on Soil Analysis
- Past Amendment Application
- Field History
- Organic Matter and Cover Crop Nutrient Credits
- Current and Future Crops

### Fertility Costs

- Inputs
- Equipment
- Supplies
- Labor
- "Savings"

### Sulfur Deposition by Precipitation '86-08 (mosaic)



[www.back-to-basics.net/balanced\\_nutrition/Changes%20Create%20Need%20for%20Sulfur.pdf](http://www.back-to-basics.net/balanced_nutrition/Changes%20Create%20Need%20for%20Sulfur.pdf)

## Natural Fertility and Climatic Impact on Soils

- The Big 3
  - Glaciers
  - Volcanoes
  - Siltation
- Weathering of parent material and climate impact on soils
- Soils in the Northeast > Acidic overtime (cation leaching)
  - Lower pH - fungally dominant soils vs. bacterially dominant soils (higher pH)
- **Agricultural Management of our Soils > Future Impact**
  - Management Systems Impact Nutrient Losses... More N then...\_\_\_\_\_.

## The Difference a Year Makes...

Summer Squash – June 21<sup>st</sup>, 2009

Summer Squash – June 4<sup>th</sup>, 2010



## June 27<sup>th</sup>, 2010 (management & weather)



## Biology, Chemistry, & Physics

- Agriculture's Triple Bottom Line...
- Soil health is a function and result of interrelated processes including biological, chemical, and physical characteristics.
- Chemistry influences Biology and Physics
  - Ca vs. Mg and soil flocculation
- Physics influences Chemistry and Biology
  - Oxygen necessary for aerobic soil biology
- Biology influences Chemistry and Physics
  - Mycorrhizal fungi producing Glomalin and improving P availability

### Raven & Cashflow Zucchini - June 27th, 2010



### Soil Testing (and Availability)

- Gather Information to Assess Needs and Inform Decisions
- Different Tests Yield Different Results
- Avoid "Shooting Blind"... (the expenses of)
- Provide Another Tool for Learning the Land

### Diversity

- Diversity is a key to resiliency within biological systems.
- Calciums
- How do we counteract (or offset) our tendency toward monocultures?

### Growth and Fruiting Energy

Butterhead Lettuce, June 2011

Summer Squash, August 2011





## Mineral Synergies

- Simplicity through Complexity
- Natural Systems – Complexity at Many Levels
- Honoring Complexity with the Entire Spectrum
  - Major, Minor, & Trace Elements and Biology...
- Calcium, Silica, & Boron
  - see notes from NOFA Winter Conference 2012 (online)

## Why Simplify Complex Systems?



## Farao Cabbage, June 2011



## Calcium

- Calcium, Calcium, Calcium... in Every Cell
- Cation
- Availability at Root Tips
- Levels determined in part by your CEC (Cation Exchange Capacity)
- Field Applications
  - High Calcium Limestone – 1000# per acre = \$100 per acre
  - Bone Char, Gypsum, Soft Rock Phosphate, etc.
  - Micronized Calciums/Specialized Products
- Foliar – “special formulations”
- Resulting in... “Better nutrient uptake & mobilization” AND...



## Valley Girl Tomatoes – July 14<sup>th</sup>, 2010



## Sulfur

- Atmospheric Deposition is Changing our Rates of Soil Sulfur.
- Anion
- Flavor
- 50-75 PPM (Logan Labs Test)
- Sulfate form of other minerals, Elemental Sulfur
- Field Applications (examples)
  - Elemental Sulfur (pastille)- not soluble, needs bacteria for oxidation (Thiobacillus)
  - Gypsum – 200 lbs per acre = 34# actual Sulfur = \$50 per acre
  - K-Mag - 200 lbs per acre = 44# actual Sulfur = \$80 per acre
- Resulting in... “protein synthesis (Chaboussou)” AND...

Azotobacter, Earthworms, Chickens, Cows.... Soil Acidity,  
Plant Roots, Transpiration & Sap Pressure: Making Nutrients Available



## Fertile:

*1b* :  
characterized  
by great  
resourcefulness  
of thought or  
imagination:  
inventive : <a  
*fertile* mind>

merriam-webster.com



**Observation and Knowledge is Fertility**

### Blossom Energy and Winter Hardiness Beyond Single Factor...

August 2011

January 6<sup>th</sup>, 2012



### Boron

- Split Applications
- Anion
- What are your Boron levels? What are your Calcium levels?
- Calcium, Silica, & Boron Synergies
  - see NOFAMass Winter Conference Presentation – Jan 2012
- 1-3 PPM (Logan Labs Test) depending on Ca and CEC
- Calcium Borate (10% B) = \$24/ 50 lb, if 20 lbs. = ~\$10/acre
- Solubor (21% B) = \$70/ 50 lb.
- Field and Foliar – if 10 lbs Solubor per acre = \$14 per acre
- Resulting in... "sap pressure, nutrient mobility, & fruit AND...

### Capturing Energy, Mobilizing Nutrients Through Fruit

Sun Cherry, August 2012

Yellow Mini, August 2012



### Manganese (Mn)

- "Fruiting" Energy
- Cation
- Mn and Fe
- At a higher pH less Mn is available... (i.e. soils with high applications of dolomitic lime).
- 50-90 PPM (Logan Labs Test)
- Manganese Sulfate (32% Mn) = \$60/ 50 lb.
- Field and **Foliar** - if 20 lbs per acre = \$24 per acre
- Resulting in... "improved fruit production, better seed quality AND...

## Dynamic Systems

January 6<sup>th</sup> (ds of Tyee 11/10/11)



## Molybdenum

- Anion
- Do you have Molybdenum in your soils?
- Is it available? pH ... more available at higher pH
- Role in Nitrate Reductase Enzyme (S)
- 1PPM ... (Logan Labs Test)
- Sodium Molybdate (39% Mo) = ~\$50/lb
- Field Applications (and foliar) 2-4 oz. (\$6-\$12 per acre)
  - Note about seed treatment in soybean production
- Resulting in... "improved N utilization AND ...

## Building Fires

- Sharing Experience and Knowledge
- Taking Action to Improve Fertility in our Fields
- Hope & Excitement for Future Production Quality
- Our Continued Development

## Honoring our Farms with Full Spectrum Fertility

Powerpoint .pdf of This Presentation  
Available at [www.brixbounty.com](http://www.brixbounty.com)

For more information on this  
presentation contact:

Derek Christianson  
**Brix Bounty Farm**  
858 Tucker Road  
Dartmouth, MA 02747  
508-992-1868  
[derekchristianson@gmail.com](mailto:derekchristianson@gmail.com)

