

Soil Fertility Recommendation Worksheet (February 2013 *version 2.2*)

Prepared by Derek Christianson, Brix Bounty Farm

This worksheet is intended for assisting with development of fertility recommendations from a Logan Labs Soil Test (AEA Base+). A history of field amendments applied (past 3 years) is often used when developing recommendations. Saturated Paste Test Analysis, Water Analysis, & Tissue Analysis are ideal to create a comprehensive fertility plan.

The AEA Base+ test focuses on chemistry (and to a degree the physical conditions in a soil). The Logan Labs test is a Mehlich-3 extraction (about as strong as "vinegar"). On Calcareous or recently limed soil the Mehlich-3 test may dissolve free lime, therefore it will overestimate TEC. The Saturated Paste test will provide additional insight into the chemical, physical, and biological conditions of your soil. We generally recommend biological inoculants and compost for soils which are in a "build-up" phase which will assist with nutrient availability.

Key Resources

The Art of Balancing Soil Nutrients by Bill McKibben - <http://www.acresusa.com/books/closeup.asp?prodid=2108&catid=6&pcid=2>

Bionutrient Food Association Website - <http://bionutrient.org/>

Brix Bounty Farm Website - www.brixbounty.com

Hands-On Agronomy by Neil Kinsey - <http://www.kinseyag.com/Publ.htm>

The Intelligent Gardener: Growing Nutrient Dense Food by Steve Solomon w/ Erica Reinheimer

<http://www.newsociety.com/Books//The-Intelligent-Gardener> and their **OrganiCalc Worksheet** <http://growabundant.com/organicalc/>

Kempf Better Farming Systems (Advancing Eco Ag newsletters) Website - <http://www.kempfbfs.com/latest-news>

The Ideal Soil: A Handbook for the New Agriculture by Michael Astera - <http://www.soilminerals.com/>

Nourishment Home Grown by A.F. Beddoe (Carey Reams) - http://www.advancedideals.org/016_book_ordering.html#rbtifarm

The Soil Probe, Logan Labs Newsletter - <http://www.loganlabs.com/>

Notes

Converting from PPM to Lbs/Acre and Vice Versa: The average acre of soil (~top 6", an acre furrowslice) weighs 2,000,000 pounds. To convert from parts per million to pounds per acre multiply by 2. To convert from pounds per acre to parts per million divide by 2.

Foliar Applications of Trace Minerals: Foliar applications of Copper, Manganese, Zinc (etc.) are often the least expensive method for improving crop tissue levels, but don't directly address underlying deficiencies. We recommend using foliar applications for specific nutrients as your budget allows you to build up your soil levels of these nutrients.

Humic Substances: Humic Substances are often used to buffer mineral excesses and help to chelate nutrients; making mineral applications less volatile and improving crop availability. Their use is valuable when applying highly leachable minerals like Boron.

Maximum Yearly Applications: The maximum yearly applications for amendments listed below are based on a biological approach focusing on balancing soil minerals slowly, so as not to disrupt soil biology and cause nutrient tie-ups.

Nitrogen: The Soil Fertility Recommendation Worksheet does not include test results for Nitrogen. Fertility Recommendations for Nitrogen inputs are farm and crop specific and are calculated by considering "organic matter" credits, compost or manure use, field history, cover crop cycles, biological activity, and expected yields.

Sampling Depth: Fields are usually sampled at 6" depth if tillage is used; or 4" if the field is in hay or pasture.

Target Levels: Target levels below are generalizations for "high value" vegetable crops.

Timing of Applications: We often suggest fall applications of amendments intended to address nutrient imbalances, while reserving pre-plant applications for "available forms of nutrients" and specialized fertilizers.

Timing of Soil Samples: Soil tests are a tool used to make informed management decisions; we often recommend taking tests in the early fall so that you may make amendment decisions in the fall (before incorporating crops and seeding a cover crop). Saturated Paste Analysis is used in-season to assess nutrient availability.

Trace Minerals (including those not tested): A broad spectrum trace mineral amendment is often used to supply trace minerals not tested (i.e. chromium, nickel, vanadium, etc.)

Soil Fertility Recommendation - Worksheet

Recommendation Completed By: _____ Recommendation Date: _____

Farm Name: _____ Sample Date: _____

Sample Location: _____ Sample ID: _____

Sample Depth in Inches: _____

Total Exchange Capacity (M.E.): _____

p.H. of Soil Sample _____

Organic Matter, Percent _____

Nitrogen **Recommendation:** _____

Anions

Sulfur: Target – 25-50-75 ppm _____ ppm _____ lbs/acre

Recommendation: _____

Mehlich-3 Phosphorous: Target - 75ppm + _____ ppm _____ lbs/acre

Recommendation: _____

Exchangeable Cations

Ideal Amounts for Ca, Mg, & K are determined by your Total Exchange Capacity (TEC)

Calcium (ppm): Desired Value _____ ppm _____ lbs/acre

Value Found _____ ppm _____ lbs/acre

Deficit _____ ppm _____ lbs/acre

Recommendation: _____

Magnesium (ppm): Desired Value _____ ppm _____ lbs/acre

Value Found _____ ppm _____ lbs/acre

Deficit _____ ppm _____ lbs/acre

Recommendation: _____

Potassium (ppm): Desired Value _____ ppm _____ lbs/acre

Value Found _____ ppm _____ lbs/acre

Deficit _____ ppm _____ lbs/acre

Recommendation: _____

Sodium (ppm): _____ ppm

Base Saturation

Calcium (60 to 70%) _____ %

Magnesium (10 to 20%) _____ %

Potassium (2 to 5%) _____ %

Sodium (.5 to 3%) _____ %

Other Bases (Variable) _____ %

Exchangeable Hydrogen (10 to 15%) _____ %

Trace Elements

Boron (ppm): Target: 1-3 ppm _____ ppm _____ lbs/acre

Recommendation:

Note: Max. Yearly (split applications) – 3lbs/acre actual B - 15 lbs/acre Solubor (22% B) or 30 lbs/acre Borax (~10% B)

Iron (ppm): _____ ppm

Note:

Manganese (ppm): Target: 25-50-90 ppm _____ ppm _____ lbs/acre

Recommendation:

Note: Max Yearly – 20 lbs/acre Manganese Sulfate (32%)

Copper (ppm): Target: 4-8 ppm _____ ppm _____ lbs/acre

Recommendation:

Note: Max Yearly – 10 lbs/acre Copper Sulfate (25% Cu)

Zinc (ppm): Target: 6-12 ppm _____ ppm _____ lbs/acre

Recommendation:

Note: Max Yearly Application – 10 lbs/acre Zinc Sulfate (36% Zn)

Aluminum (ppm): _____ ppm

Note:

Other Traces Recommendations:

Cobalt (2 ppm): _____ ppm _____ lbs/acre

Molybdenum (1 ppm): _____ ppm _____ lbs/acre

Selenium (.5 ppm): _____ ppm _____ lbs/acre

Silicon (50 ppm): _____ ppm _____ lbs/acre

EC: _____

Recommendations:

Addressing Deficiencies with Common Mineral Amendments:

Minerals listed below with "common" analysis, confirm mineral analysis from your supplier.

These are just a few of the commonly applied mineral amendments; other sources are available

Nitrogen

Sulfur	Elemental Sulfur (90% S)	Sulfate Forms of other nutrients	Sul-Po-Mag (~20% Sulfur)
Phosphorous	Bone Char or Bone Meal	Rock Phosphates	Soft Rock Phosphate (9% P-3%avail Phos.)
Calcium	Gypsum (23% Ca, 17% S)	High Calcium Lime (25-40% Ca)	Rock Phosphates (~20% Ca)
Magnesium	Dolomitic Limestone (~10%Mg)	Magnesium Sulfate (16% Mg)	Sul-Po-Mag (~11% Mg)
Potassium	Greensand (~7% Potash)	Potassium Sulfate(50% Potash)	Sul-Po-Mag (~22 % Potash)
Sodium	Sea Salt (35% Na)		

Boron	Borax (~10% B)	Calcium Borate (10%B)	Solubor (21% B)
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Copper	Copper Sulfate (25% Cu, 12%S)		
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Iron	Greensand (~9% Fe)	Iron Sulfate (30% Fe, 18% S)	
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Manganese	Manganese Sulfate (32% Mn, 19% S)		
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Zinc	Zinc Sulfate (36% Zn, 17%S)		
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Micro Traces	Cobalt Sulfate (27% Co)	Sodium Molybdate (5-39% Mo)	Sodium Selenate (6-41% Se)
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Silicon	Diatomaceous Earth	Equisetum (Horsetail)	Soft Rock Phosphate
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Animal/Plant	Compost	Kelp	Manure
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Broad Spectrum	Azomite	Carbonatite	Planters II
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Sea Minerals	Sea Water	Sea-90	SeaCrop
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Sugars	Dextrose	Kelp	Molasses
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Biological Inoculants

Amendment Sources (a few of the folks who source mineral amendments, bio-inoculants, & fertilizers)

- Conklin Limestone (RI) - http://www.conklinlimestone.com/About_Us/about_us.html - local source of hi-cal lime
- Crop Services International (MI) - <http://www.cropservicesintl.com/> - array of biological inoculants and more
- Fedco Organic Growers Supply (ME) - <http://www.fedcoseeds.com/ogs.htm> - also available through the NOFA Bulk Order
- Kreher Enterprises, LLC – Composted Chicken Manure (NY) for commercial growers – Duwayne Grabenstatter – 716-759-6802
- Josephine Porter Institute (VA) - <http://www.jpibiodynamics.org/> - source for biodynamic preparations
- Lancaster Ag Products (PA) - <http://www.lancasterag.com> - good source of custom blended inputs for farm scale applications
- NOFA Mass Bulk Order (available Jan. 1st, deadline is Feb. 1st) - <http://www.nofamass.org/programs/bulkorder/index.php>
- Nutrient Density Supply Co. (MA) http://www.ndsupply.com/Nutrient_Density_Supply_Co./NDSC.html
- Organic Gem (New Bedford, MA) - <http://www.organicgem.com/> - is a good source of fish; folks on the North Shore often use Neptune's Harvest (www.neptunesharvest.com).
- Rock Dust Local sourcing regional rock dusts - <http://www.rockdustlocal.com/>
- Snow Pond Farm Supplies (Abington, MA) - <http://www.snow-pond.com/index.shtml> - North County Organics distributor.

Additional Recommendations and/or Notes (page 5)

Soil Balancing Costs

- Total from page 2&3 Cost = \$_____ / ac.

General Recommendations:

- These recommendations are focused on addressing mineral deficiencies and will not supply necessary nutrients for annual crop removal. We suggest addressing annual crop removal w/ fertilizer inputs (i.e. blended fertilizers). Cost = \$250-500/ac.

(Careful: Compost applications used repeatedly to address Nitrogen needs often oversupply P & K)

- Biological inoculants are suggested for maximizing nutrient availability and yield. Cost = \$10-60/ac. +/-
- Nutrient Drenches at transplanting time and/or throughout the season will promote strong root growth and healthier crops. Cost = \$20-120/ac +/-
- Foliar Sprays are useful to achieve the highest quality production. Cost = \$20-80/ac. +/-
- Fall Digestion Sprays are useful for capturing nutrients within your farm system. Cost = \$20-60/ac. +/-

Recommendations Addressing Long-Term Fertility Needs

- If Soil P & K levels are low, Compost applications are suitable to raise P & K Cost = varies by farm
- Consider 1000# Soft Rock Phosphate Application to increase Phosphorous levels. Cost = \$200/ac +/-
- Consider 500-1000# Greensand Application (or Zeolite or similar amendment) to build exchange capacity, moisture holding capacity, & long term Potassium Reserve. Cost = \$150-300/ac.
- Adding 8-10 tons of Rock Dust per acre is one strategy to improve soil energy levels and to supply minerals for future fertility needs. Cost = \$100-500/ac.

Other Fertility Costs to Consider:

- Cover Crop Seed – costs depend on selection of varieties and if you use OG seeds Cost = \$100-250/ac.
- Labor Cost = varies by farm
- Required Equipment and/or Supplies Cost = varies by farm
- Potting Soil Cost = varies by farm