

FERTILIZERS AND SOIL BUILDING 101 FOR COMMUNITY GARDENERS

Is organic better?

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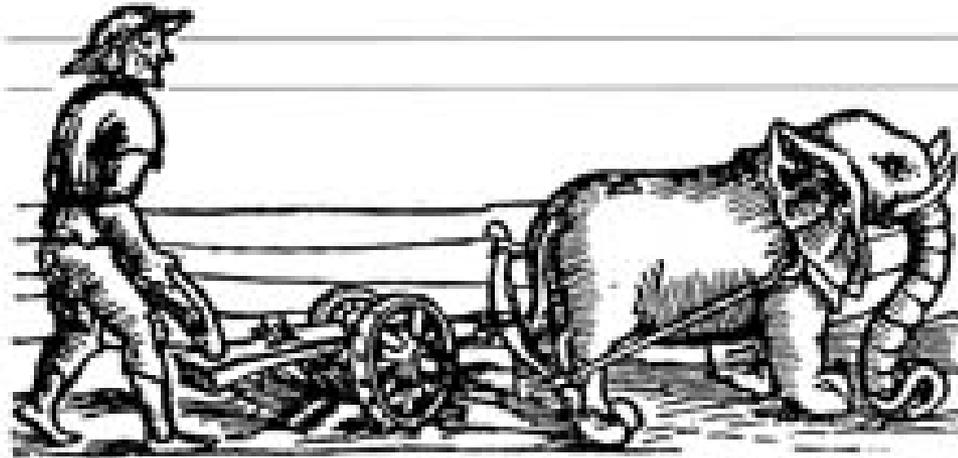
Session goals

- To enable you and your community garden to...
 - Keep your soil fertile
 - Cost-effective
 - Practical and sensible
 - Friendly to Mother Earth
 - Clarify the basics
 - What are fertilizers?
 - How do they work?
 - In the plant
 - In the soil



Check in

- *Your name*
- *Where you are from and where you garden*
- *Your biggest fertilizer question (1 sentence)*



Why bother to fertilizer?

- Vegetables are (mostly) fast growing “first succession” plants ecologically – they want to grow fast, with ample resources
- We remove nutrients when we harvest and eat the plants – we need to return those nutrients or the soil keeps getting poorer
- Fertilizers, organic or synthetic, are cost effective for community gardeners



What do plants do when they're hungry?*

- Plants get their “food” from photosynthesis, from light energy and elements in air and water (hydrogen, oxygen and carbon aka H, O, and C)
- However, they also need some 13 other nutrients, which they take up from the soil solution. That's why we add fertilizer.
- Soils make a difference – a rich soil is naturally full of these nutrients.
- Fertilizing is human manipulation of this natural system
- (*They eat at C. HOPKNS café)

The biggies: N P K

- 3 nutrients, the “macros”, are so important they get special treatment – they are those three numbers on the fertilizer bag
- **N (nitrogen)**
 - It is a fundamental building block of life (needed to make protein and chlorophyll, vital for vigorous growth and ‘greening’ plants)
- **P (phosphorus).**
 - Stimulates early growth, root growth, seed formation.
- **K (potassium)**
 - Increases vigor, strong stalks, sugar production, quality of crop.

The rest – Ca, Mg, S, Fe, Mn, Zn, Co, Mo, B, Ni, Co...

- *These ‘secondary’ and ‘micro’ nutrients are just as essential for plant health*
- *“The law of the minimum”*
- *Calcium is very important for cell walls – lack contributes to blossom end rot in tomatoes. Magnesium is a key element in chlorophyll. Sulfur is needed to build protein...The list includes zinc, iron, manganese, copper, molybdenum, boron, nickel (and some species need cobalt...the list grows...)*



Plants have needs

- Plants need all these nutrients (not just 3)
- in balanced amounts
- in the correct form
- at the correct time

Different environments and soils are naturally different in fertility

- EXAMPLES
- Rich prairie soils
- Forest soils
- Desert soils
- Jungle soils (nutrients are in the plants)



It all happens in the (living) soil

- *In natural ecosystems, nutrients recycle between the soil, plants and animals.*
- *Plants adapt to different environments*
- *Decomposed material (organic matter) in the soil “holds on” to nutrients so they aren’t lost from the ecosystem*
- *Many nutrients are held in the “living fraction” – the soil microbes and soil life, roots and living plants and animals. **SOIL LIVES!***



What's “organic”?

- Means many things
- As philosophy...
- Learn from and use natural ecological patterns as the starting point
- Look at the whole system
- Feed the soil, not the plant
- Use compost to create a rich living soil
- Avoid synthetics



Compost is key

- *Compost (and composted manures) add organic matter and life to the soil, duplicating the dynamics of natural systems*
- *“Compost” is a (simple enough) process for converting garden wastes and other materials into a stable and safe soil amendment*
- *Composts are bulky products that may either be incorporated into the soil or used on top as a mulch or a topdressing*
- *You can make your own close to where you grow your garden*





You can easily make your own compost, right in the garden where you need it, from garden wastes.

***caution:
sewage sludge
isn't compost...**

•Compost is rich in soil life – helps suppress diseases – has balanced nutrients, time-released as plants need them – even helps chemical fertilizer perform better – hangs on to nutrients... a long list of benefits...

Compost recommendation



- 10cm (3-4 inches) spread over garden when first preparing, dig in deep (30 cm/12 in)
- 1 -3 cm ($\frac{1}{2}$ -1 inch) spread annually on top, hoed in
- Add lime and P materials if you need them when you do the initial preparation.

Organic gardeners use other materials to supplement compost

- Bone meal 4-10-0 for P, N
- Feathermeal 12-0-0 for N
- Rock phosphate 0-4-0 for P
- Wood ashes (varies, 0-0-2) for K
- New development are mixed products like Espoma Plant-tone 5-3-3 (and a bunch of other 'tones') and Scott's 'Naturals'
- These are easy to use and apply, and contain all 16 nutrients not just 3, and in an organic form, not as salts



What's with the numbers?

- Each number stands for the percentage of the nutrient:
- Espoma Plant-Tone is 5-3-3: in 100 kilos of the fertilizer, there are 5 kilos of nitrogen, 3 kilos of phosphorus* and 3 kilos of potassium* (*in the US, we use equivalency formulas for P and K, not actual percentages – little practical significance for community gardens)
- Synthetic fertilizers (10-10-10) are usually only the nutrients shown, often in the form of a salt. Plant-tone and similar organic products may have many other nutrients. Read the label.



ESPOMA Garden-tone

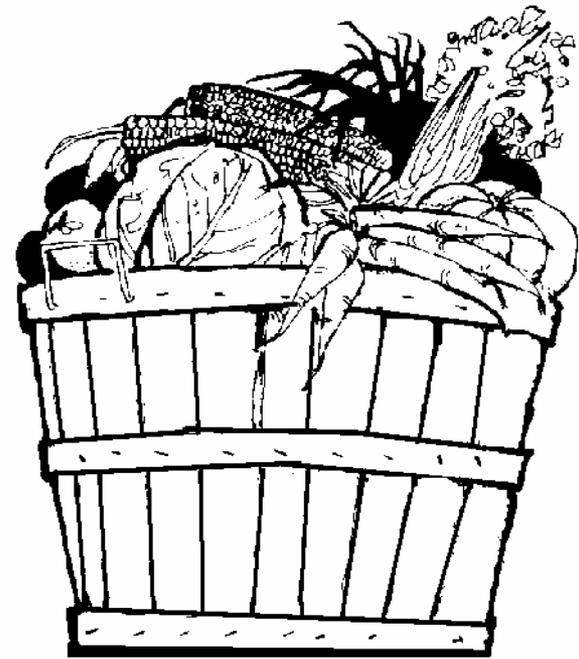
Statement of Guaranteed Analysis 4-6-6

Total Nitrogen (N).....	4.0%	Boron (B).....	0.02%
2.8%.....Water Soluble Nitrogen		Chlorine (Cl).....	0.1%
1.2%.....Water Insoluble Nitrogen		Cobalt (Co).....	0.0005%
Available Phosphate (P ₂ O ₅).....	6.0%	Copper (Cu).....	0.05%
Soluble Potash (K ₂ O).....	6.0%	Iron (Fe).....	1.0%
Calcium (Ca).....	3.0%	Total Manganese (Mn).....	0.05%
Total Magnesium (Mg).....	0.5%	0.01%..Water Soluble Manganese (Mn)	
0.3%..Water Soluble Magnesium (Mg)		Molybdenum (Mo).....	0.0005%
Sulfur (S).....	5.0%	Sodium (Na).....	0.1%
5.0%.....Combined Sulfur (S)		Zinc (Zn).....	0.05%

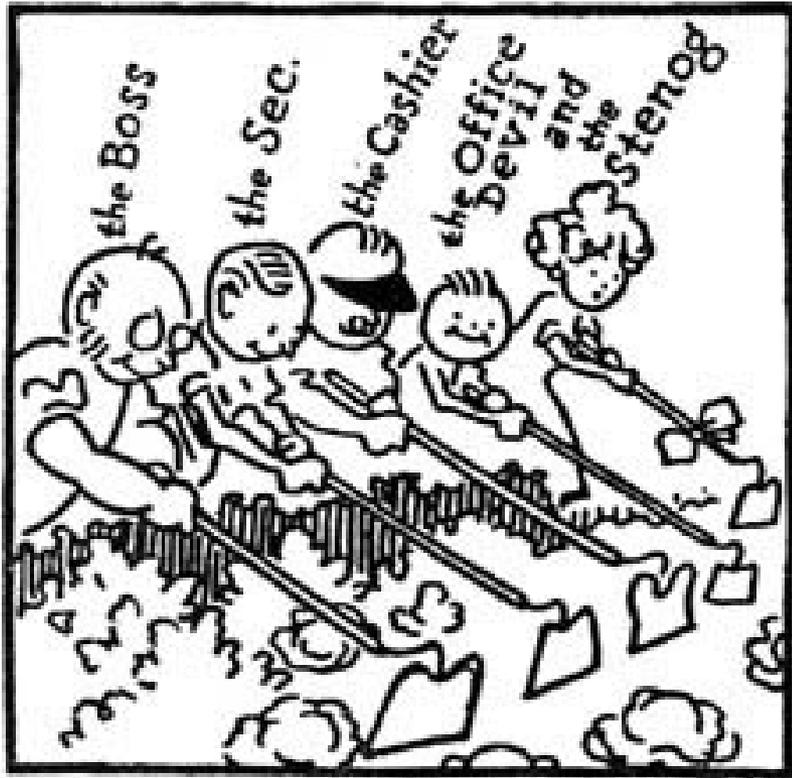
Garden-Tone is a complete plant food. It contains all the essential plant nutrients. The nutrients are derived from: Dehydrated manure, Animal tankage, Crab meal, Cocoa meal, Bone meal, Cottonseed meal, Dried blood, Sunflower meal, Kelp, Greensand, Rock phosphate, Sulfate of Potash, Ammonium sulphate, and Single superphosphate.

What's chemical fertilizer?

- *I say “synthetic” or “industrial”*
- 100 years ago, science figured out basic plant nutrition on plant level
- Industries found they could sell fertilizer (same materials used for munitions)
- Highly concentrated salts, easy to apply using ‘industrial’ farming, convenient, easy to sell, cheap
- Big environmental and sustainability problems...



Organic vs. synthetic



An office type of victory garden

- Not as “simple” to make a decision with fertilizer as with pesticide (ie “Just say NO.”)
- Synthetics used correctly may have a valuable role
- You don’t want to guilt trip Ms. Jones because she likes her Miracle-Gro or 10-10-10
- Organic is my choice, but it is most important to garden ecologically – everyone should use compost...

“fertilizer use efficiency”

- Fertilizer – organic or synthetic – can be used efficiently or wasted
- Wasting fertilizer costs you money and hurts the environment
- Use efficiency depends on
 - **right kind**
 - **right amount**
 - **right place**
 - **right time**
- Organic fertilizers, such as manure and compost, and coated synthetics, release fertilizer at a measured rate into the root zone



Right kind

- **Match the fertilizer carefully to the specific crop's needs (easy on the N with beans and tomatoes)**
- **Look for the most environmentally friendly way, and local sources if you can find them**
- **Use a fertilizer that provides the nutrients your soil lacks and that are what your plant needs (beans and peas make their own N – they need P and K, not much N)**

Right amount

- **DO A SOIL TEST!**
- Follow recommendations exactly – more is not better, and “insurance” can backfire
- Split N applications
- Scale down accurately (acres to beds is a big jump!)

Right time



- Compost, composted manure, and other ‘bulk’ organics are best incorporated as you dig the garden
 - Synthetics and concentrated organics can be incorporated just before planting, and used during the growth of the plants

Right **place**

- If the plant can't get to the fertilizer, it won't do any good
- Banding puts the fertilizer right beside and/or under the growing plant.
- Beds keeps the fertilizer close to where the plants are.
- Especially P doesn't "move" in the soil, so you want it to be incorporated lower in root zone (top 15 cm)



Feed the soil

- Add compost or composted manure
- Don't leave the soil bare
- The best way to encourage good soil and stop nutrient loss is to grow something (cover crops and 'green manures')
- Some experienced organic growers just say "apply compost and forget the number game"



What about lime?

- *Vegetable plants use fertilizer best if the soil is not too acid or too basic.*
- *In places where the soil is too acid, you can add ground limestone to make the soil less acid*
- *You need to repeat every few years, but it makes a big difference for some crops*
 - *Use a soil test!*

Soil test? Vegetable recommendations? See Cooperative Extension.

- *You can get scientific information in easily understood terms:*
- *Cooperative Extension Service in every state – call your local Extension Agent. If they are good, support them vigorously.*
- *Use online resources, beginning with Extension.*



Why not just a load of “top soil”

- If you really get Farmer Jone’s topsoil great – but it might be subsoil from under a skyscraper foundation.
- If blended, check carefully to find the ingredients (you don’t want sewage sludge or **toxic waste**)
- Even if OK, you’ll probably still want to add compost, do a soil test and follow a fertilizer program

Why not just buy some peat moss?



- Peat moss is very low in nutrients – it is added to improve texture, often in potted soil mixes
 - Vocabulary check:
- peat moss (is not) mulch (is not) “topsoil” (is not) manure (is not)
 - **COMPOST**

Fertilizer and soils 101 pointers

- **Test the soil.** Just do it.
- Apply lime if the soil test suggests it.
- Use a baby scale to weigh fertilizer
- Rotate crops to take advantage of high fertilizer lovers (fall lettuce after tomatoes)
- Grow your own fertilizer, and protect your soil, by growing green manure and cover crops.
- K and especially P benefit from being banded alongside the plants that will use them – 6 in to one side and 6 in deep is a good rule of thumb. You can incorporate these when you add lime and compost when first preparing gardens
- In cool weather (low microbe activity), soluble fertilizers can be useful (Omega 6-6-6 organic; Miracle-Gro 15-30-15 synthetic).

Nitrogen

- Nitrogen takes several forms in the soil, and needs careful management since it can easily leave the garden ecosystem and create environmental problems
- Too much nitrogen causes problems – too little causes weak crops. Follow recommendations!
- Use organic and ‘slow-release’ sources as your routine application, and more soluble types (synthetics like calcium nitrate ($\text{Ca}(\text{NO}_3)_2$; 15-0-0), or “organics” like bloodmeal 12-0-0) for side dressing during growth – N use is most efficient when plants are growing rapidly (though be careful not to burn plants by over-applying).
- Bagged alfalfa is also a useful fertilizer and compost starter if you have a cheap source. Cheap rabbit food also works (3-0-0).

A note on **‘certified organic’**

- For the past couple of years, “organic” has also meant that a farm meets exacting Federal standards
- Certification and record keeping are a real challenge
- Might be worth considering for big market gardens in urban areas where organic produce (including flowers) is in demand

- Applied following ecological guidelines and common sense, an organic approach to fertilizing community gardens makes a lot of sense and gives excellent results



**The bottom
line**

Fertilizer and soils 101

- **Key points to remember**

- TEST THE SOIL

- COMPOST

- FEED THE SOIL

- REMEMBER THE “4 RIGHTS”:

TYPE, AMOUNT, TIMING, PLACEMENT

- GO ORGANIC and ECOLOGICAL

- – MAKE IT REAL, NOT JUST A SLOGAN

