

# Soil Quality = *Ability*

- Plants only take up nutrients dissolved in water.
- Water can flow in or out
- **BUT: soil can accept, hold, & release water & nutrients**
- Soil acts as a reservoir of nutrients and water, and buffers against change

# Benefits of Compost

- **Buffers** soil pH, water, nutrients, temperature
- Better tilth
- Supplies slow-release nutrients
- Worms & microbes
- More soil aggregates
- Less weeds and nematodes
- Mixed effect on insects and diseases
- May immobilize heavy metals
- Recycle waste

# Downside of Organic Matter

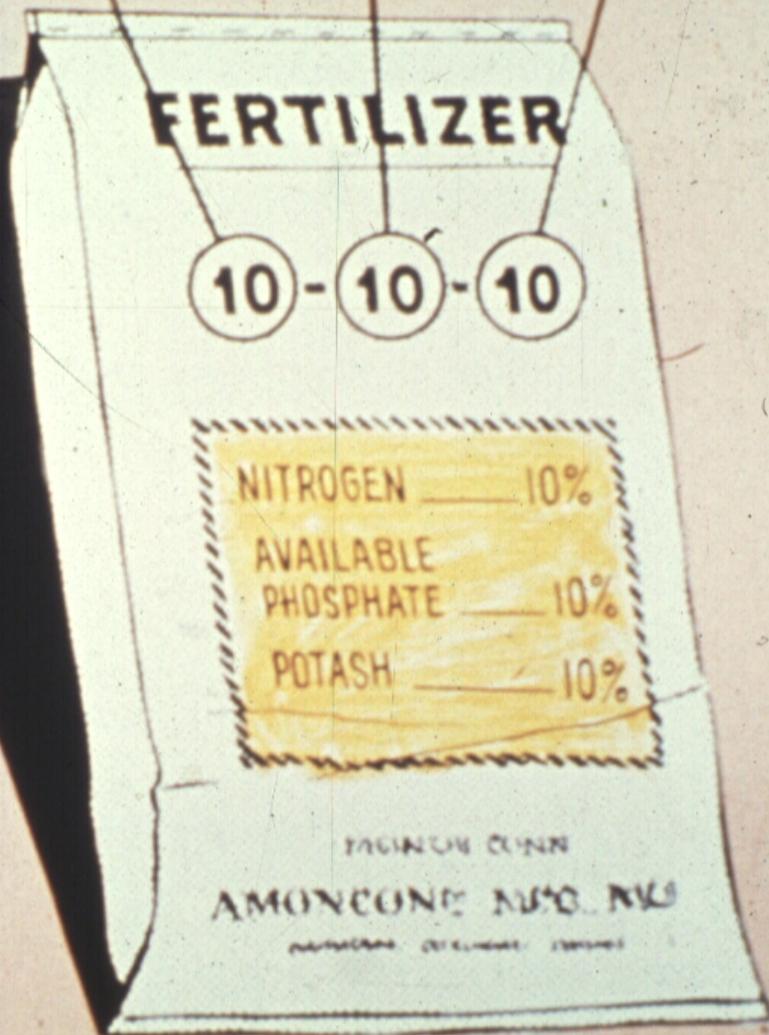
- Slow release of nutrients
- Moisture retention
- May increase diseases and insects
- Heavy metals, e.g. sludge.
- If not well composted: tie up N, add pests

# WHAT'S IN THE BAG ?

Nitrogen  
(N)

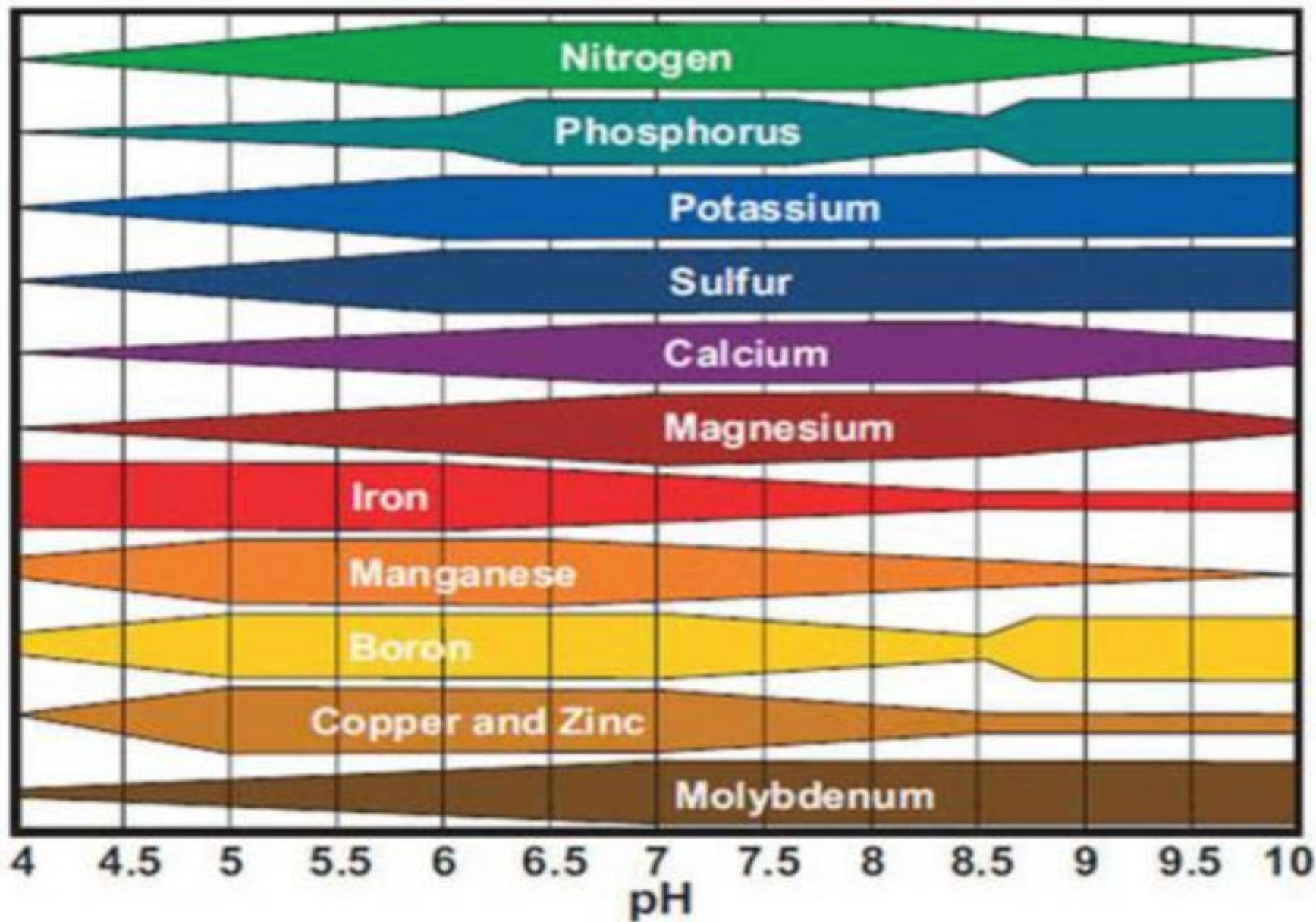
Available  
Phosphate  
( $P_2O_5$ )

Potash  
( $K_2O$ )



# What's on the Bag?

- amounts of phosphate ( $P_2O_5$ ) and potash ( $K_2O$ ) in forms that are available to plants.
- Nitrogen listed as total nitrogen
- **NOT**: *plant-available nitrogen (PAN)*
- *PAN* = mineral forms ammonium ( $NH_4^+$ ) or nitrate ( $NO_3^-$ ).
- C:N ratio is the key to PAN



# Nutrient Management Plan

- **Crop need**: N, P, K, etc
- What's there: PAN, cover crops, residue
- **App rate** = Crop need – Soil supply
- Leaching and runoff
- Reference: Nutrient Management Plan (590) for Organic Systems

**Table 1. Nitrogen requirement of vegetable crops based on seasonal nitrogen uptake**

<b>Low Total N Need &lt;120 lb/acre</b>	<b>Medium Total N Need &lt;120-200 lb/acre</b>	<b>High Total N Need &gt;200 lb/acre</b>
<b>Baby greens</b>	<b>Carrot</b>	<b>Broccoli</b>
<b>Beans</b>	<b>Corn, Sweet</b>	<b>Cabbage</b>
<b>Cucumbers</b>	<b>Garlic</b>	<b>Cauliflower</b>
<b>Radish</b>	<b>Lettuce</b>	<b>Celery</b>
<b>Spinach</b>	<b>Melons</b>	<b>Potato</b>
<b>Squashes</b>	<b>Onion</b>	
	<b>Peppers</b>	
	<b>Tomatoes</b>	

— *Gaskell et al. 2006, Soil Fertility Management for Organic Crops*

<http://smallfarms.oregonstate.edu/organic-fertilizers-calculator>

EM 8936-E • SEPTEMBER

## USER GUIDE

---

# ORGANIC FERTILIZER CALCULATOR

**A tool for comparing the cost, nutrient value,  
and nitrogen availability of organic materials**

*N. Andrews and J. Foster*

# Organic Nutrient Considerations

- Cost
- Nutrient content
  - Generally several nutrients
- Nitrogen Availability
  - Measure, online tools

# When P is in Excess

- P inputs to surface waters promote eutrophication and degrade water quality

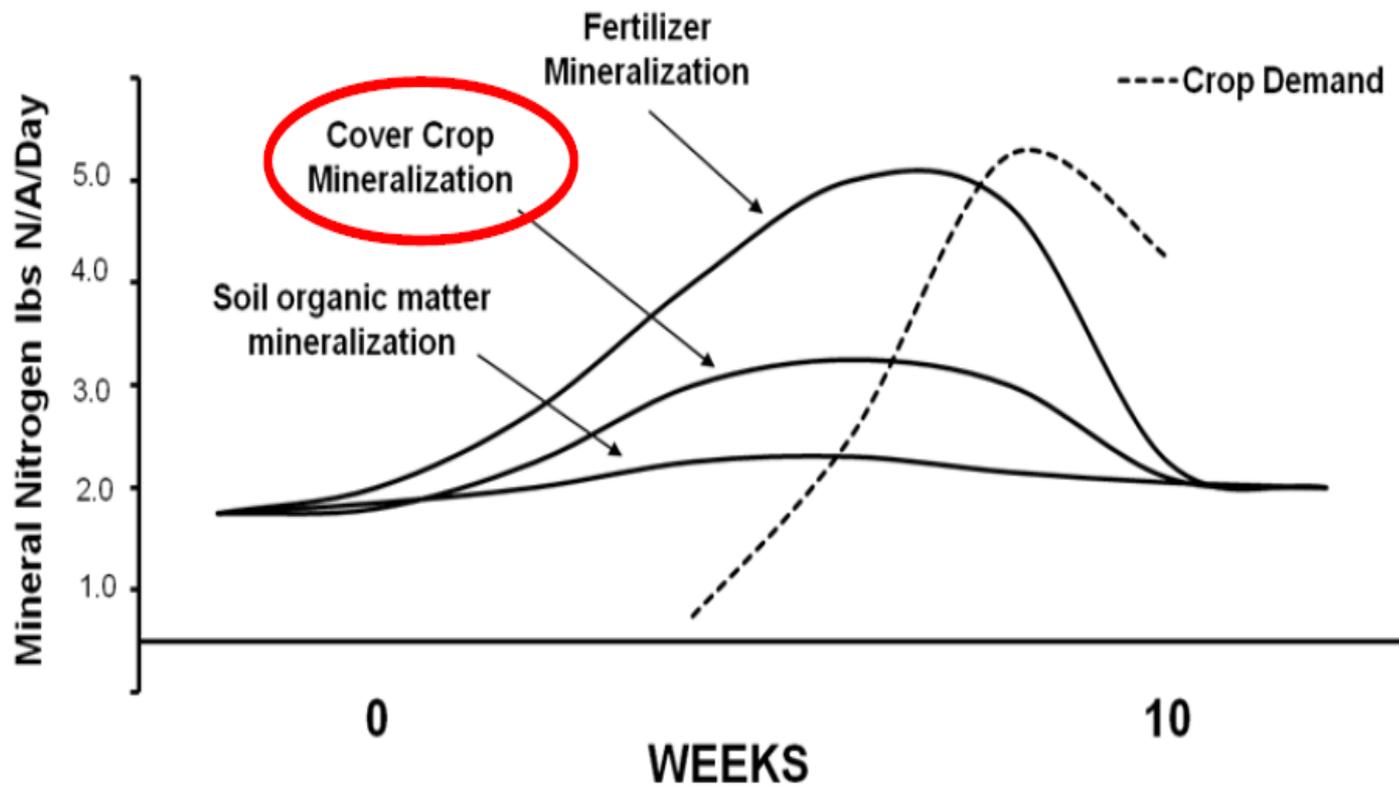
- Manure P is source of many regulations in several high-rainfall states



# Potassium (K)

- Muriate of potash (KCl): not allowed or recommended
- Potassium sulfate ( $K_2SO_4$ ) – allowed if solar evaporated
- **Potassium magnesium sulfate, ( $K_2SO_4-2MgSO_4$ ), Langbeinite, is allowed**
- Kelp meal – expensive
- Potassium nitrate – ok
- Manure: variable, urine has more K

# Effective Synchrony Between Mineralization from the Various Sources and Crop Demand





**Legumes: Fix N from the air and provide a net input of N to the soil**

**Cereals, Mustards, Others:  
Scavenge & recycle residual N from soil**



**Soil Testing for Nutrient Availability**  
**Procedures and Interpretation for California Vegetable Crop Production**

T.K. Hartz  
Extension Vegetable Specialist  
Dept. of Plant Sciences, UC Davis

**Soil sample collection**

Nutrient content of soil can vary greatly by depth. The top 4-6 inches, the zone into which most fertilizer is placed and most crop residue is incorporated, often has much higher levels of organic matter, nitrogen (N), phosphorus (P), potassium (K) and micronutrients than the soil below. To accurately reflect overall nutrient availability a soil sample should be collected with a coring device that collects an equal amount of soil over the entire depth of the sample. In samples collected with a shovel the top few inches are usually over-represented, and the test results will exaggerate the actual fertility of the field. Variability across a field can also be an issue, particularly in fields with a range of soil textures or parent materials. To encompass field variability, a composite sample of at least a dozen soil cores should be gathered, representing all areas of the field. In fields in

## In-season soil nitrate monitoring :

### Soil nitrate 'quick test'



### Soil test interpretation :

- ✓ > 10 PPM  $\text{NO}_3\text{-N}$  = adequate for current growth
- ✓ < 5 PPM = very limited N availability

# References

- **Fert. Calc:** <https://smallfarms.oregonstate.edu/calculator>
- **Well written Nutrient Management Plan:**
  - <https://tilth.org/app/uploads/2015/03/Nutrient-Management-in-Organic-Systems-Western-States-Implementation-Guide.pdf>
- Software to **manage irrigation, fertilizers:** <https://cropmanage.ucanr.edu/>
- [milt@ucr.edu](mailto:milt@ucr.edu) [909-560-0839](tel:909-560-0839)