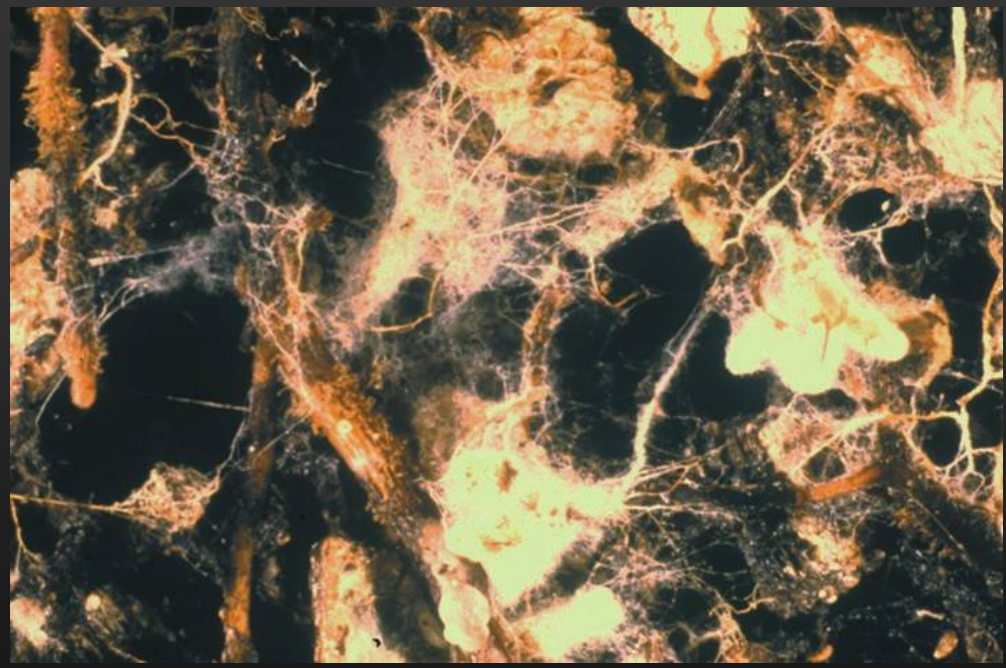
Is P fertility inherently different in organic production ?

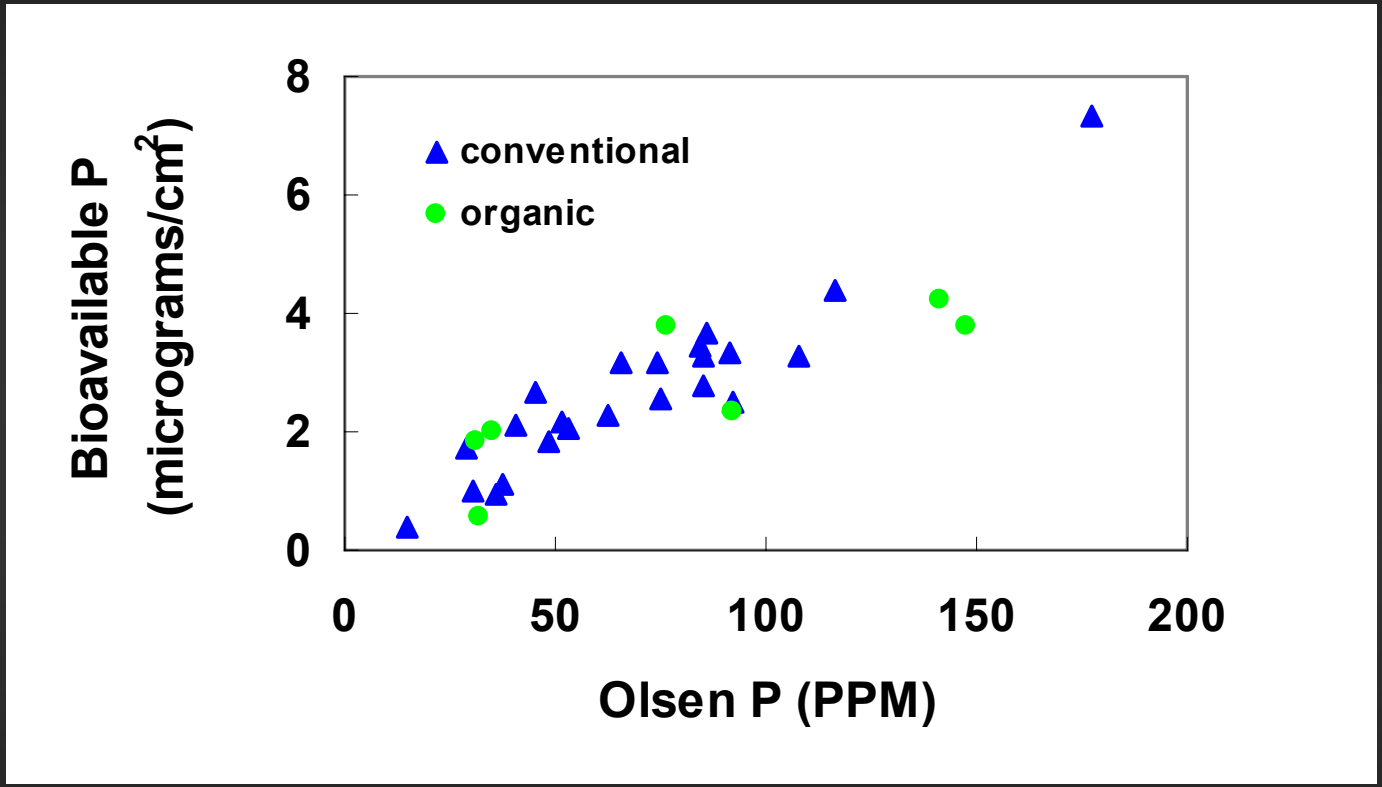
Differences generally minor

- arbuscular mycorrhizal fungi may increase soil P availability



Does the normal soil test work for organic soils ?

2002-04 study of soils in vegetable rotations :



Soil test threshold for agronomic response is 20-25 PPM Olsen P

Organic P sources :

- ✓ Rock phosphate
- ✓ Bone meal
- ✓ Manures or composts

How available is P in manures and composts ?

Source	% Organic P	% Inorganic P
Feedlot manure	25	75
Composted manure	16	84
Dairy manure	25	75
Poultry litter	10	90
Swine manure	9	91

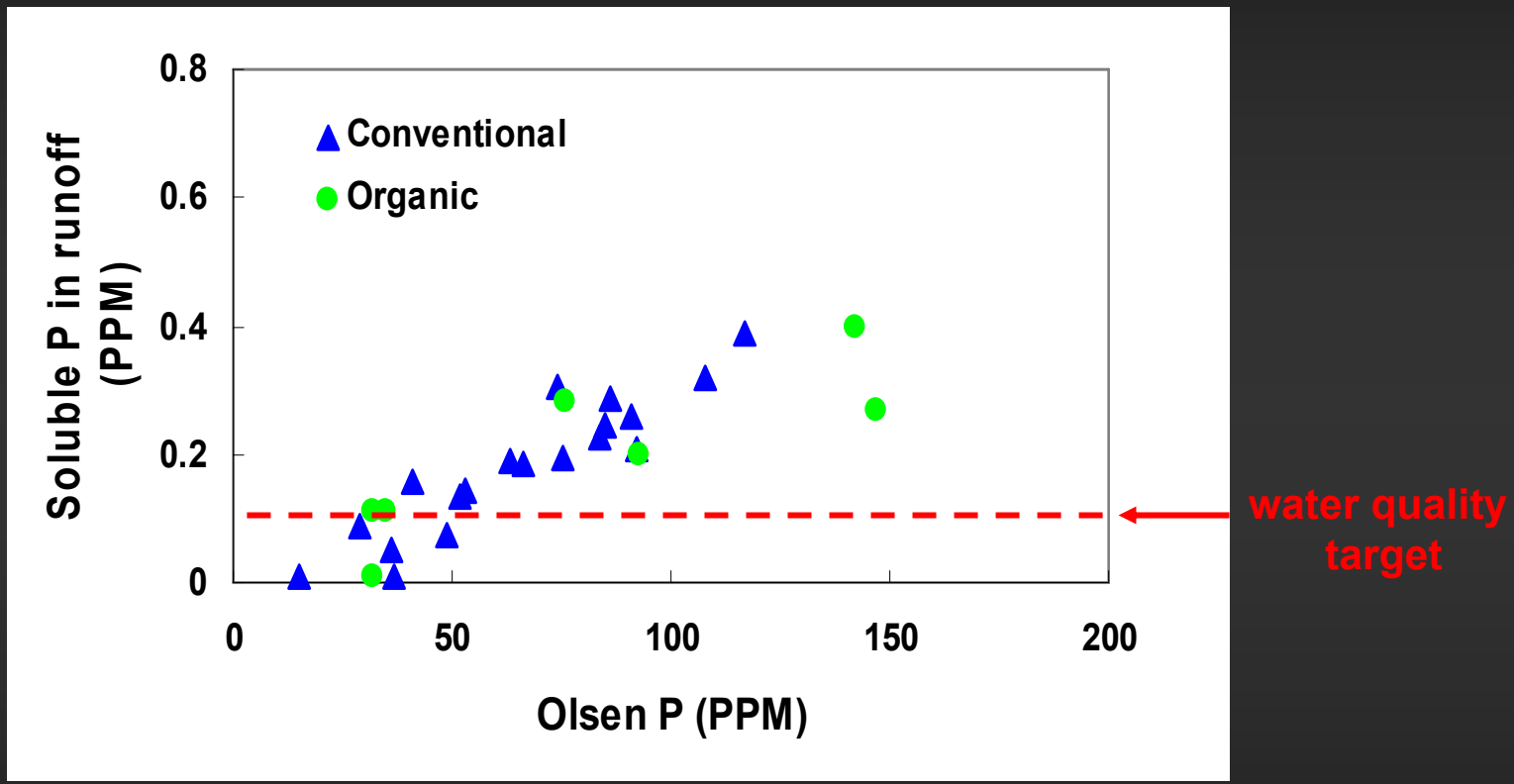
Studies show that manure or compost P can substitute nearly 1:1 for synthetic fertilizer; the limitation is that it cannot be banded

Organic P management can have environmental consequences :

Reliance on manures or composts for N availability often results in excess P

- 4 dry tons/acre of compost with 2% P ≈ 370 lb P_2O_5 equivalent

Organically managed soils can be an environmental threat :



2002-04 laboratory study of soils in vegetable rotations

Is K fertility inherently different in organic production ?

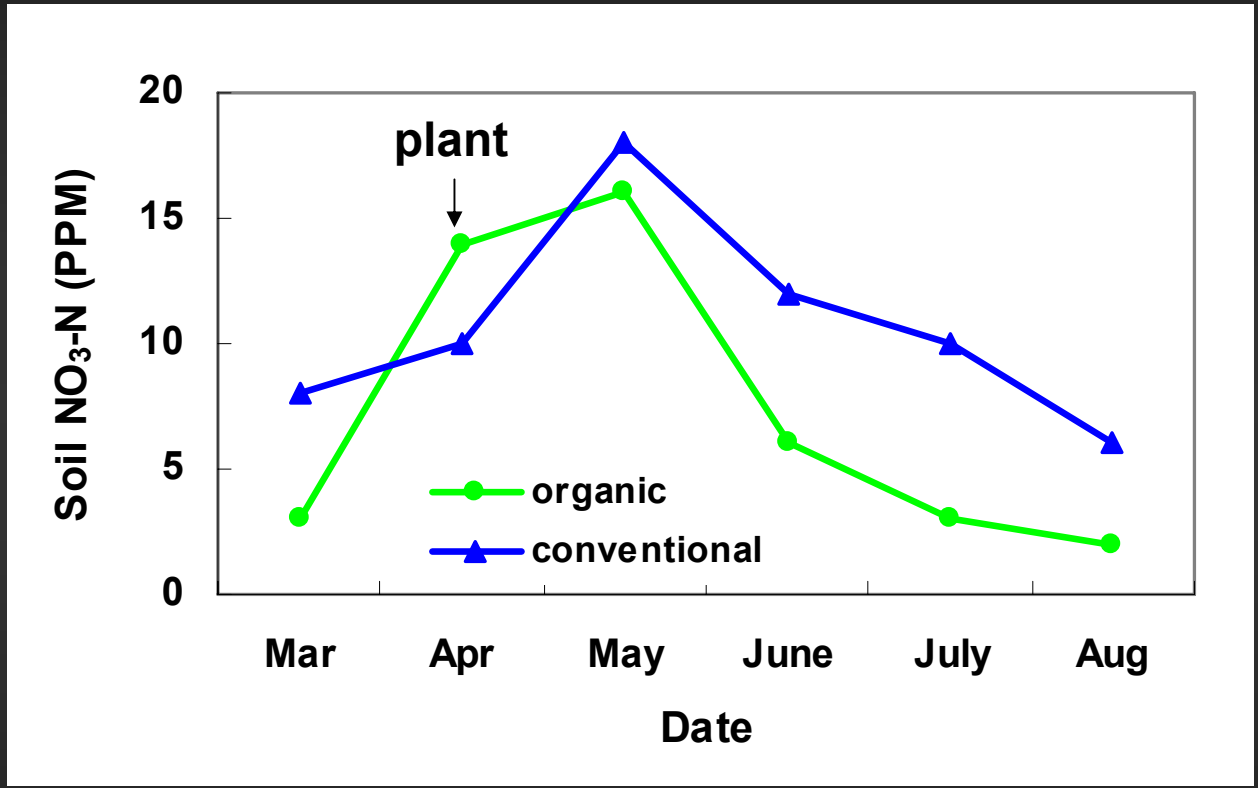
- ✓ Soil K availability can be improved by soil building practices
- ✓ Better soil tilth may improve root density, K uptake
- ✓ K application useful if soil test is :
  - < 150 PPM
  - < 2-3% of base cations
  - Mg/K ratio > 10-12

Organic sources of K :

- ✓ Compost
- ✓ K_2SO_4
- ✓ K-Mag (K_2SO_4 – $2MgSO_4$) – Langbeinite

In-season nutrient monitoring :

Is soil NO_3-N analysis useful ?



In-season nutrient monitoring :

Is soil NO_3-N analysis useful ?

Soil test interpretation :

- ✓ > 10 PPM NO_3-N = adequate for current growth
- ✓ < 10 PPM = ?

In-season nutrient monitoring :

Is petiole NO_3-N testing useful ?

Petiole NO_3-N concentration at early bloom, SAFS project :

	Petiole NO_3-N (PPM)		Organic system
Year	Organic	Conventional	N deficient ?
1994	4,300	14,300	yes
1995	1,000	7,900	yes
1996	7,900	12,400	no
1997	10,900	8,400	no
1998	15,200	10,000	no

Sufficiency threshold:

> 6,000 PPM at early bloom ?

2000 Yolo organic sidedress trial :

- No sidedress vs. 120 lb/acre N with high-N organic fertilizer

Treatment	Petiole NO_3-N (PPM)		Yield
	First flower	Full bloom	(tons/acre)
No sidedress N	3,400	100	20
Seabird guano	6,200	4,400	36
Blood meal	5,500	3,400	34
Fish powder	5,900	4,200	35
Sufficiency minimum	6,000 ?	2,500	

In-season nutrient monitoring :

Is whole leaf testing useful ?

	Sufficiency range	
Nutrient	First flower	Full bloom
N	4.6* - 5.2	3.5 - 4.5
P	0.32 - 0.49	0.25 - 0.41
K	2.2 - 3.5	1.6 - 3.1

* Caution: this range may be higher than necessary for N

Interpretation of organic whole leaf samples :

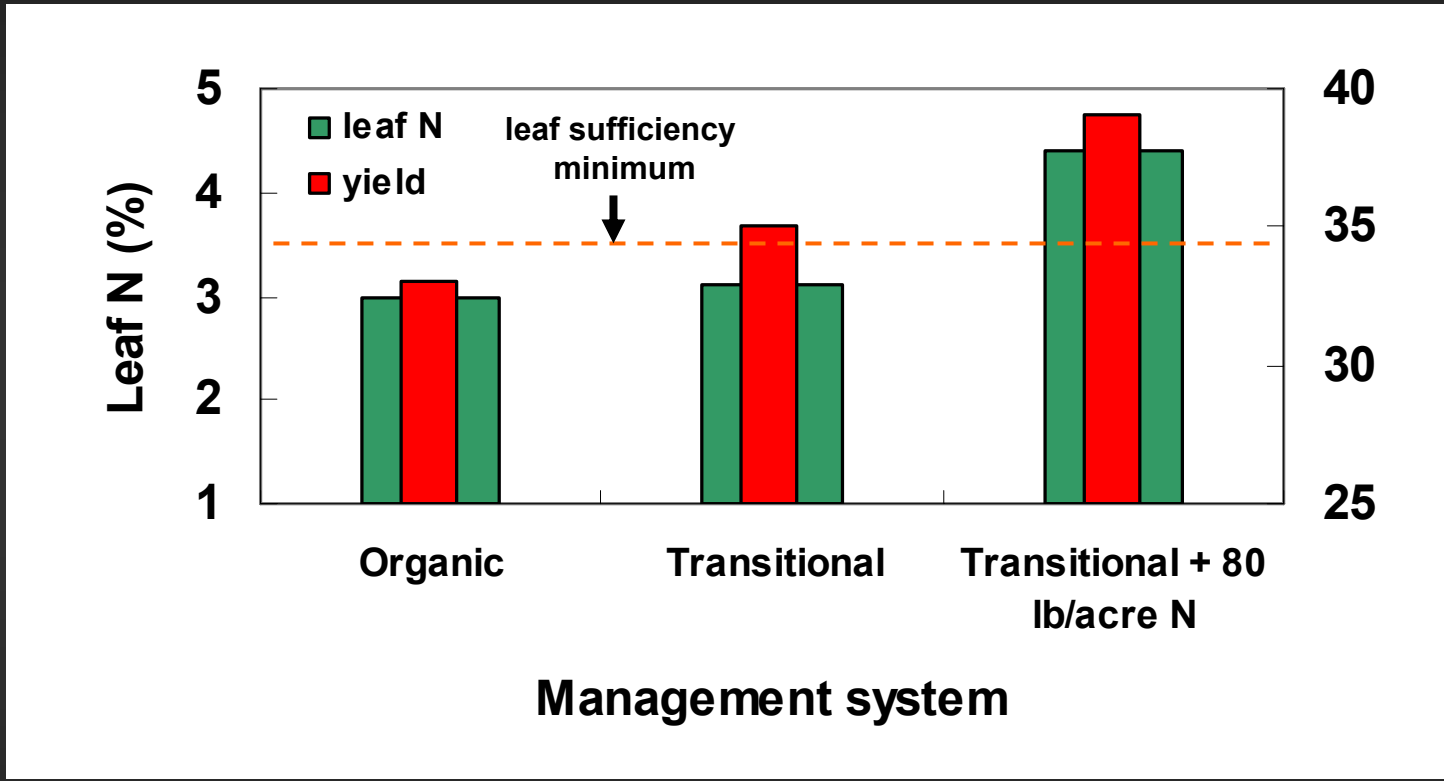
- ✓ if organic meet these standards, nutrient sufficiency presumed
- ✓ if organic substantially < these standards, deficiency likely

2000 Yolo organic sidedress trial :

- No sidedress vs. 120 lb/acre N with high-N organic fertilizer

Treatment	Leaf N (%)		Yield
	First flower	Full bloom	(tons/acre)
No sidedress N	3.9	2.8	20
Seabird guano	4.3	4.2	36
Blood meal	4.1	4.1	34
Fish powder	4.2	4.3	35
Sufficiency minimum	4.6 ?	3.5	

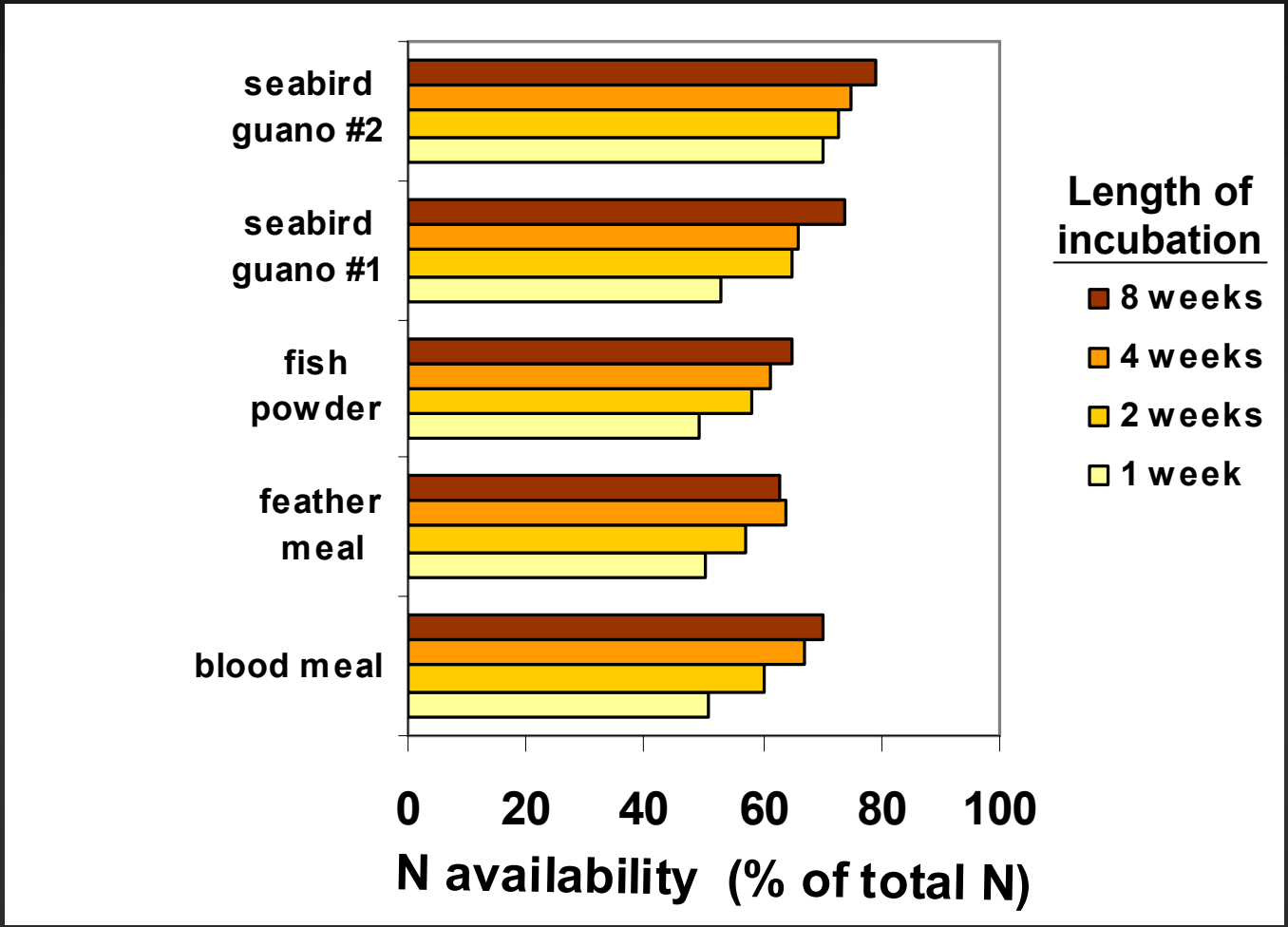
1999 LTRAS trial, sampled at early fruiting :



N availability of in-season fertilizers:

UC incubation trial:

- Five high-N materials (> 10% N, C:N ratio < 4)
  - blood meal
  - feather meal
  - fish powder
  - two types of seabird guano
- Incubated in moist soil at 77 ^{o}F
- Rate of N mineralized determined at 1, 2, 4 and 8 weeks



- ✓ Quick N mineralization
  - animal byproducts have simple organic N forms
- ✓ All high-N, low C:N ratio products behave similarly

N mineralization rate of 30 organic fertilizers :

2005 data from Oregon State University