



# Fertility management in organic strawberries

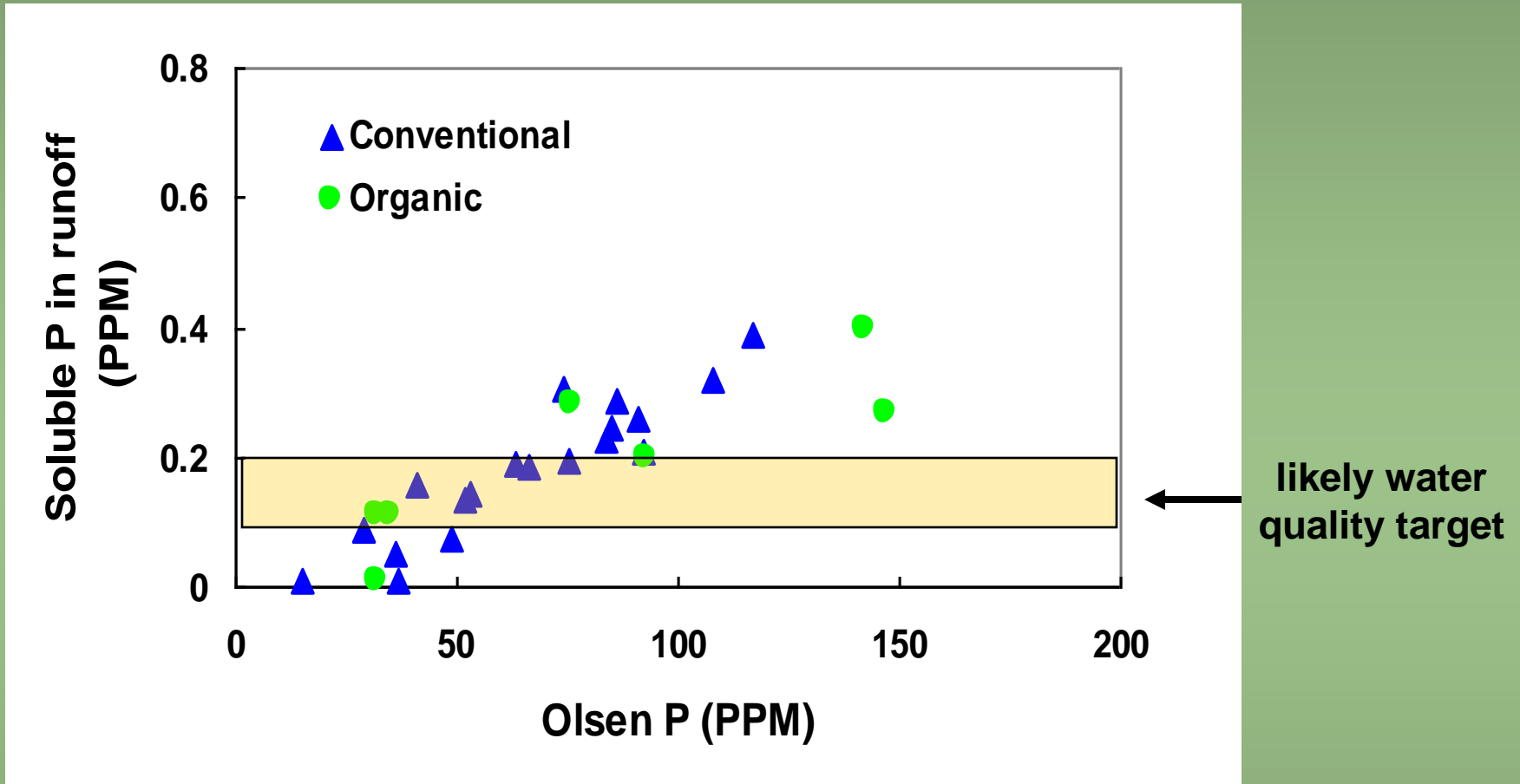


# Organic P management :

- P in composted manure is at least 70% as available as synthetic P fertilizer
- Using composted manure for N availability often results in excess P
  - 5 dry tons/acre of poultry manure compost with 2% P = 200 lb P / acre
  - ≈ the equivalent of 325 lb of chemical  $P_2O_5$  / acre
  - ≈ 8 times the seasonal crop uptake

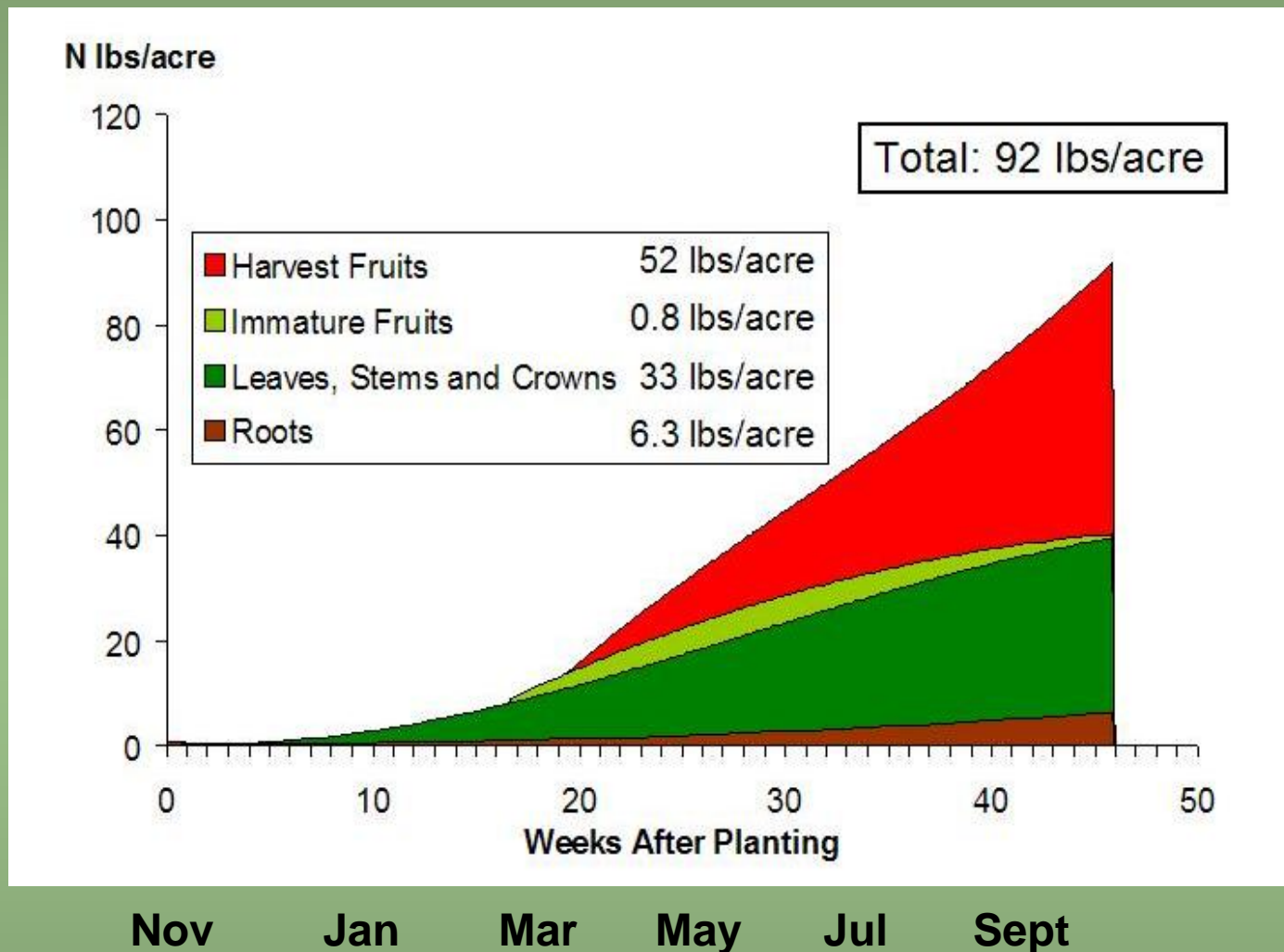


# Organically managed soils can be an environmental threat :



2002-04 laboratory study of coastal soils

# How much N does a strawberry crop need, and when does it need it ?



Salinas area organic strawberries, 4 year ave., 38,000 lb marketable fruit/acre data from J. Muramoto



**In organic production plant-available N comes from :**

- ✓ **Soil organic matter**
- ✓ **Cover crops or other crop residue**
- ✓ **Compost**
- ✓ **Organic fertilizers**

## Soil organic matter :

Each 1% O.M. = 20,000 lb/acre in 6" of soil

≈ about 12,000 lb C

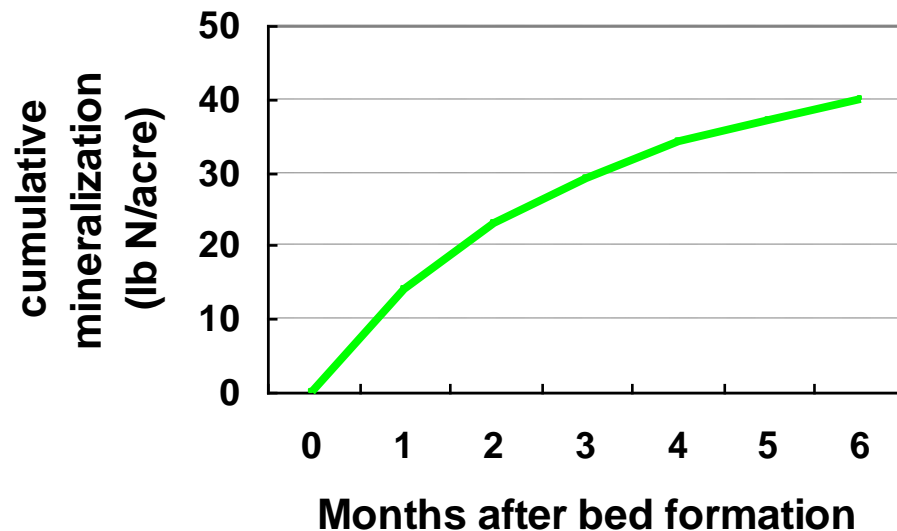
≈ about 1,300 lb organic N

During the growth season (March - August) at least 2 - 4 % of organic N should mineralize (become plant-available)

Example: soil with 1.5% organic matter

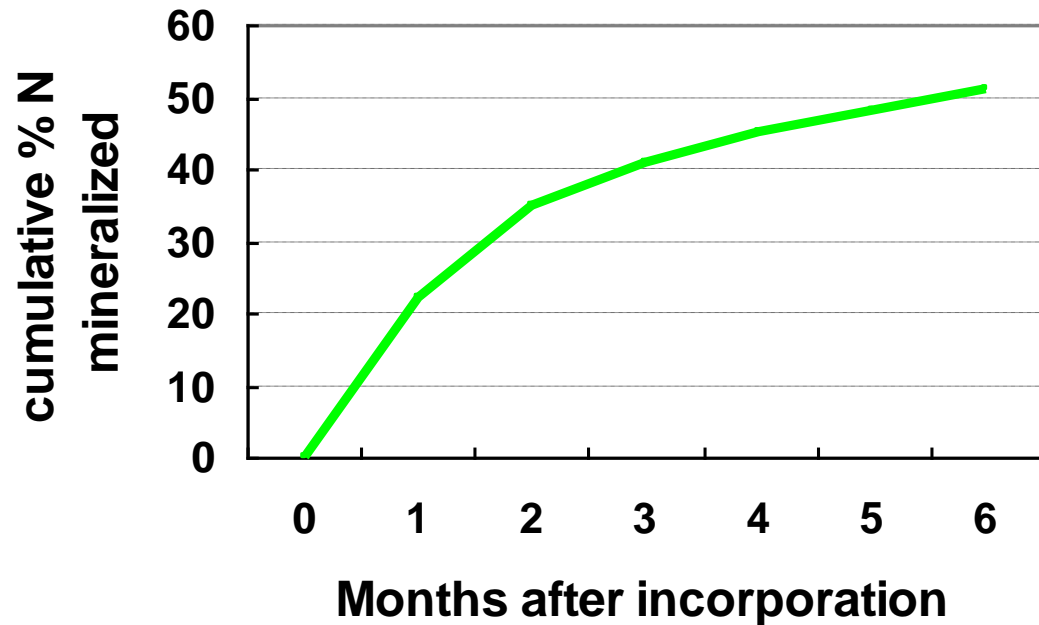
≈ 2,000 lb organic N in top 6 inches

if 2% mineralized = 40 lb N/acre from soil organic matter



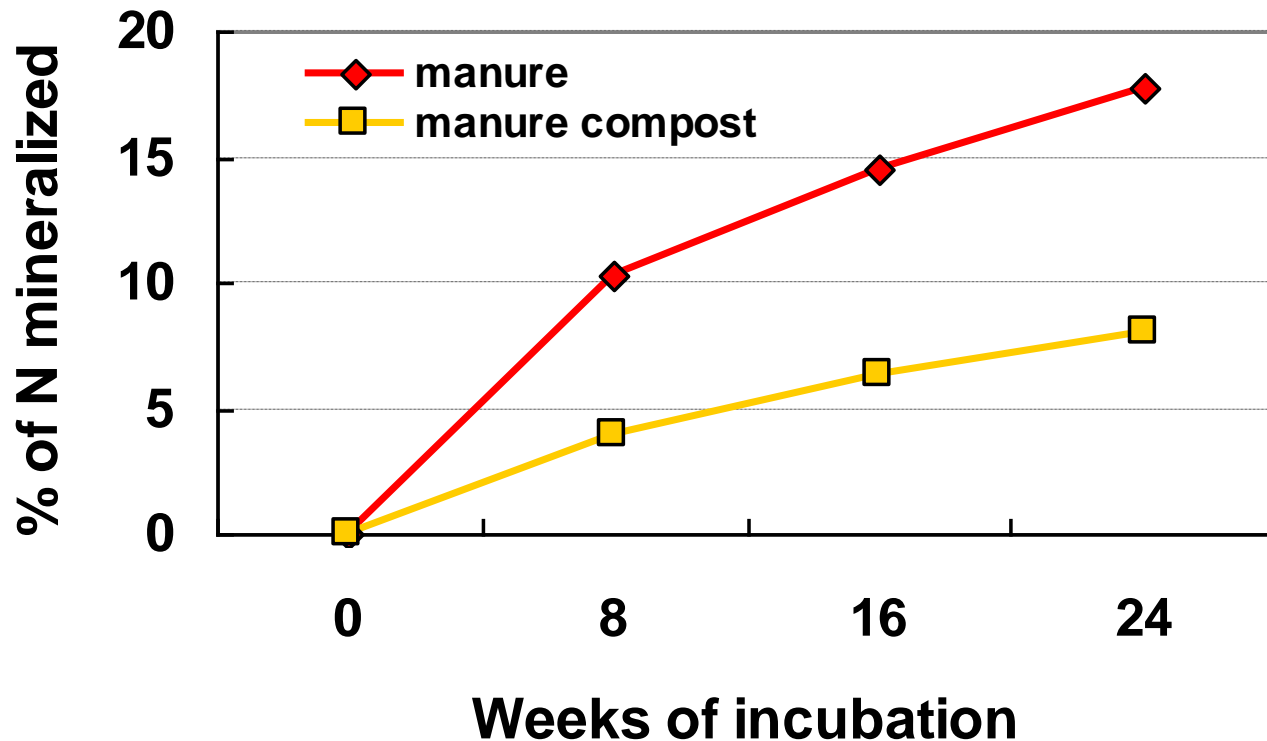
## Cover crops :

- ❖ If residue  $> 3\% \text{ N}$  :  
30 - 70% of N mineralized
- ❖ If residue  $< 2.5\% \text{ N}$  :  
???



# Composts and manures :

- ❖ Nitrogen mineralization rates vary based on N content
  - higher % N or lower C:N ratio increases N mineralization rate

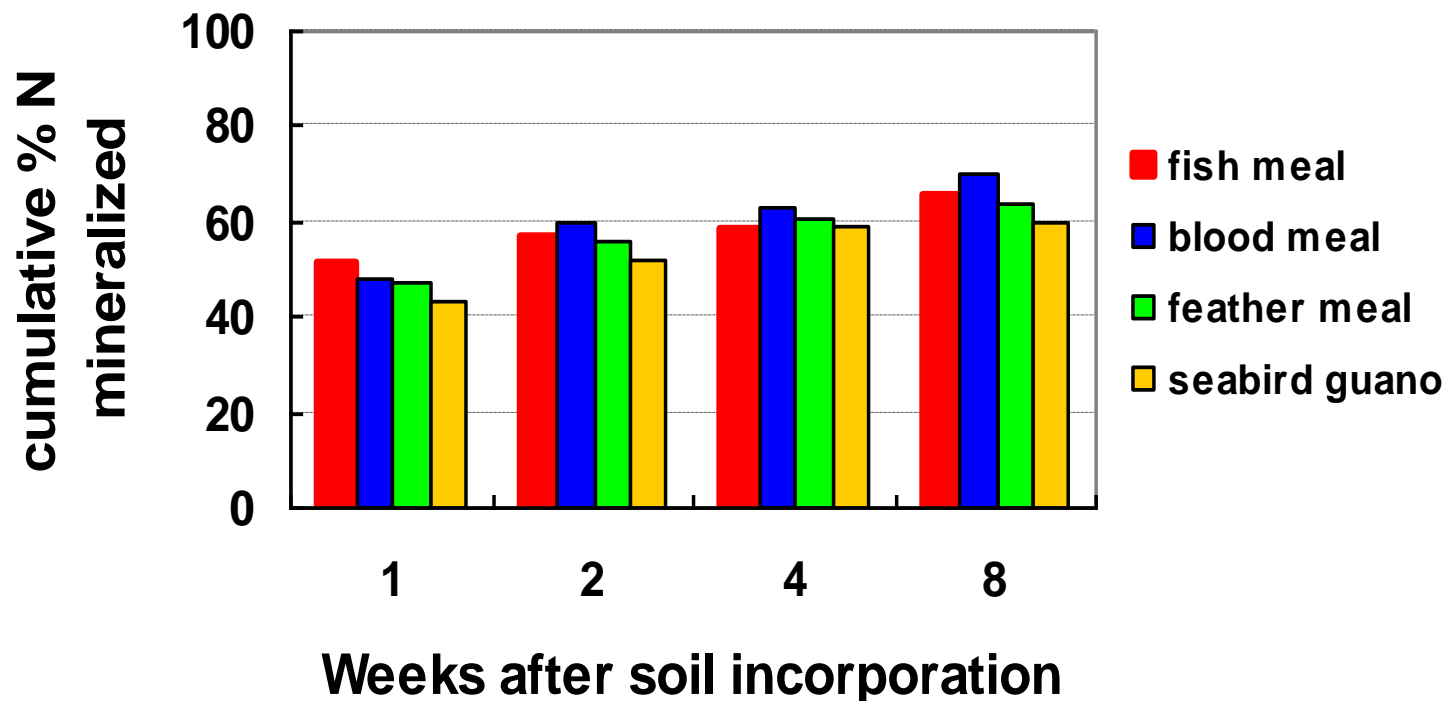


Mean of 4 materials of each type, all poultry-based  
% N = 2.5 - 3.5% , C/N ratio = 7 - 10



## Organic fertilizers :

- ❖ High N waste products have rapid mineralization



Materials 11 - 16% N, C:N ratio < 4

Incubation at 68 °F in coastal organic field soil

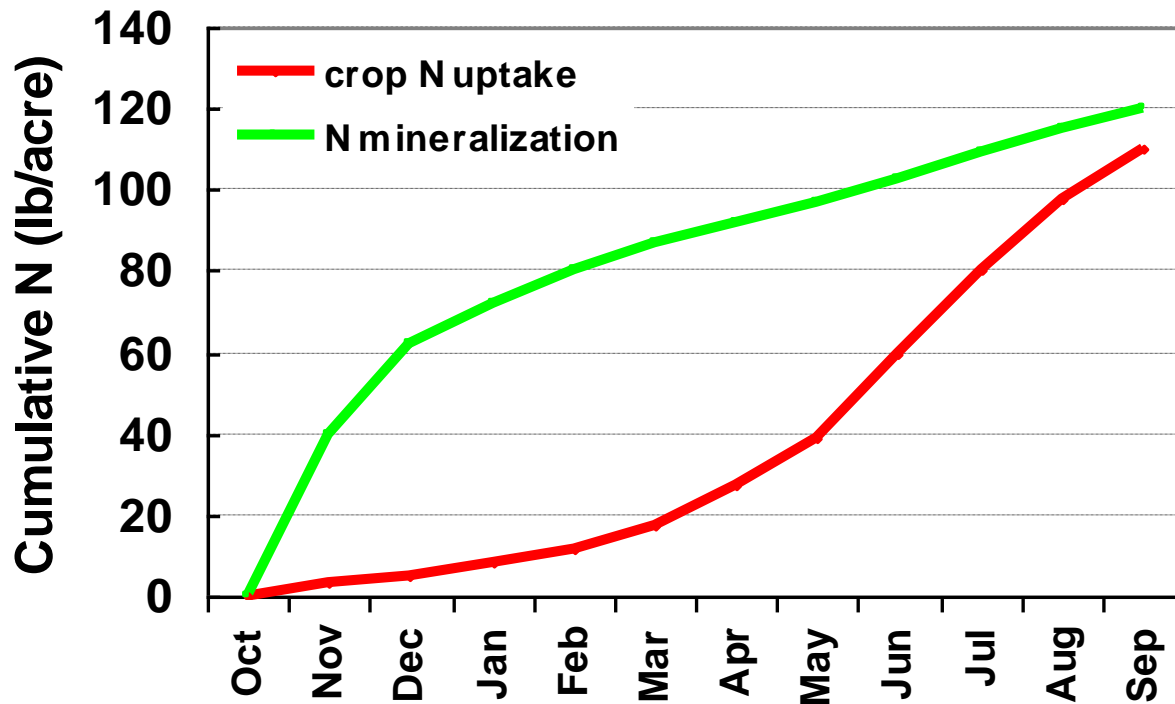
# How do preplant inputs match up with crop need ?

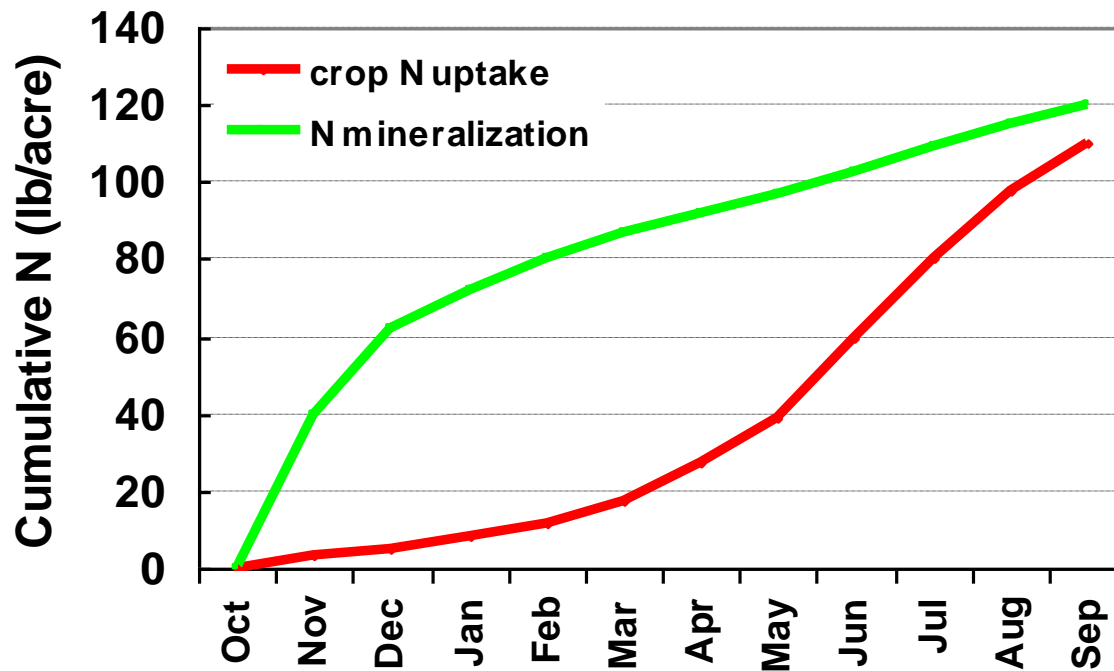
Hypothetical field :

soil with 1.5% organic matter

Preplant input (per acre) :

- 6 tons of poultry manure compost
- 500 lb feather meal





**Fundamental problem:**

**How to keep available N in the root zone until crop uptake ?**

**N can be lost through :**

- ❖ Denitrification – loss is small unless soil is poorly drained clay
- ❖ Leaching from rain - can be significant even with plastic mulch
- ❖ Leaching from irrigation - often a major issue

## 2005-06 Watsonville organic strawberry trial :

	Soil inorganic N (lb/acre)	Crop N uptake (lb/acre)	Apparent N loss (lb/acre)
Nov. 4 (planting)	160		
Dec. 9	125		35
Jan. 30	35	5	85
March 10	15	15	10

### ***Bottom line :***

- ✓ Loss of > 100 lb available N / acre between planting and the beginning of rapid plant growth



## Keys to efficient irrigation :

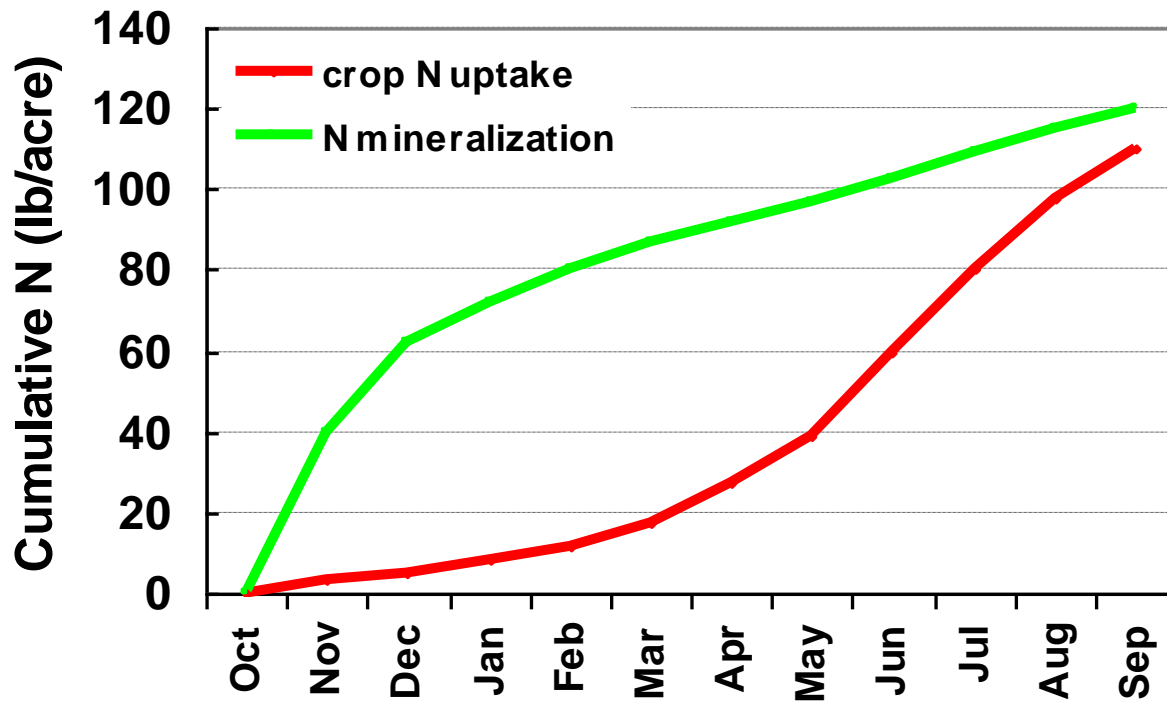
- ✓ Tie irrigation volume to environmental demand  
- use  $ET_0$  and crop coefficients
- ✓ Adjust irrigation frequency to limit leaching





**Limit individual irrigations:**  
**< 0.5 inches for sandy soil**  
**< 0.75 inches for clay soil**





**In-season N fertilization may be necessary :**

**Issues:**

- ✓ N availability
- ✓ Cost
- ✓ Compatibility with drip system

# Liquid organic fertilizers :

**Product A :**

**Guaranteed Analysis**  
**6-2-0.5**

Total Nitrogen(N) .....	6.0%
4.0% Water Soluble Organic Nitrogen	
2.0% Water Insoluble Organic Nitrogen	
Available Phosphoric Acid (P <sub>2</sub> O <sub>5</sub> ).....	2.0%
Soluble Potash (K <sub>2</sub> O).....	0.5%

Derived from feather meal and seabird guano.

**Produce B :**

**GUARANTEED ANALYSIS**

Total Nitrogen (N).....	6.0%
4.0% Ammoniacal Nitrogen	
1.6% Water Soluble Organic Nitrogen	
0.4% Water Insoluble Organic Nitrogen	
Available Phosphoric Acid (P <sub>2</sub> O <sub>5</sub> ).....	2.0%
Soluble Potash (K <sub>2</sub> O).....	0%

PRIMARY PLANT FOOD INGREDIENTS:  
Enzymatically digested meal from ocean going fish. Stabilized with sulfuric acid.



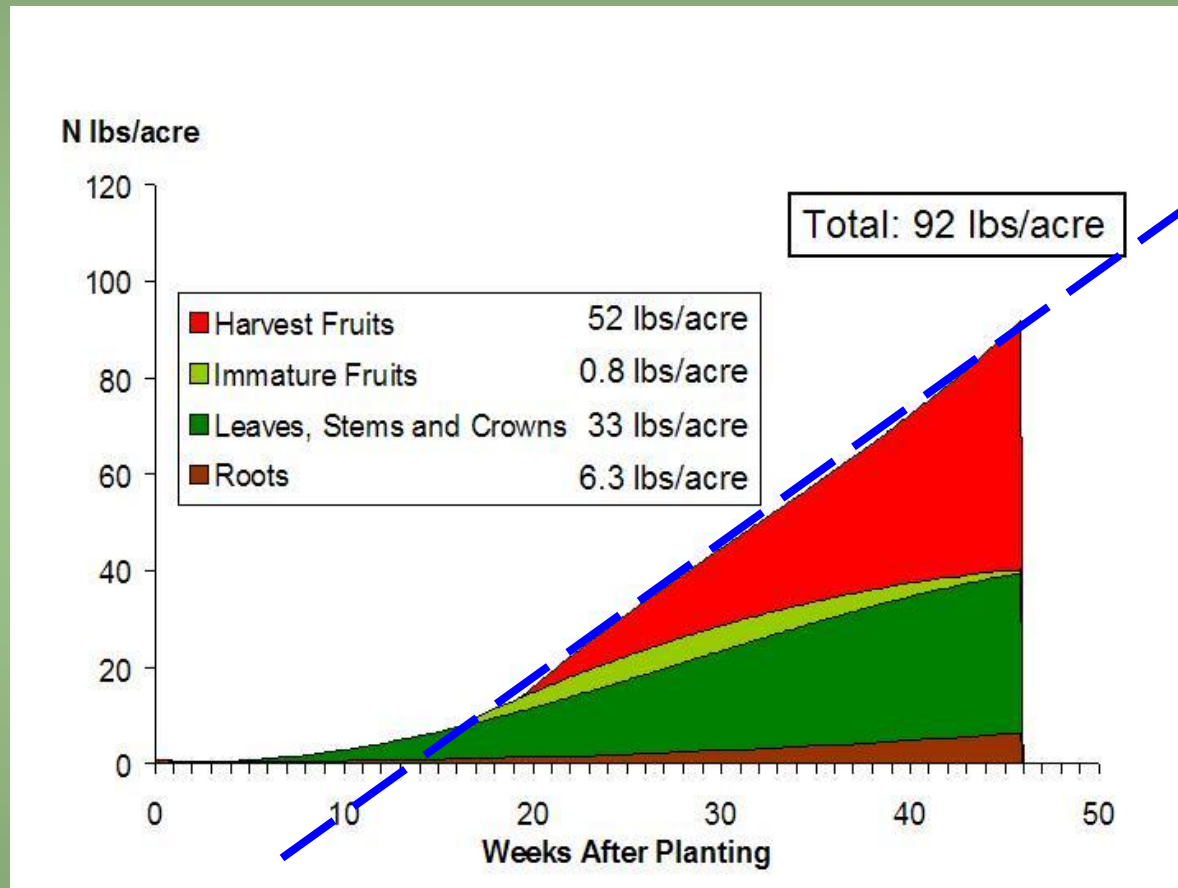


**N availability from high-N liquid fertilizers :**

- mineral N fraction immediately available
- about 50% of organic N available within 2 weeks

# Planning N injections :

- match crop N uptake



From March through summer, crop N uptake  $\approx$  3 - 4 lb N / acre / week

# Planning N injections :

## ➤ Soil NO<sub>3</sub>-N 'quick test'



Procedure available at  
<http://vric.ucdavis.edu/veginfo/topics/fertilizer/nitmanagement.pdf>

# Planning N injections :

- plant tissue analysis ?





## **In summary :**

- ✓ **Limit high-P composted manure use to prevent soil P buildup**
- ✓ **Protect available soil N from loss with irrigation**
- ✓ **In-season application of injectable N fertilizers may be necessary, but requirements should be modest and predictable**