Fertility management for drip-irrigated tomatoes

How are drip-irrigated tomatoes different ?

- roots feed in a limited zone of soil
- the top few inches of soil too dry for root activity

How are drip-irrigated tomatoes different ?

✓ Higher yield expectations = higher nutrient removal

each ton of fruit contains about:

3 lb N

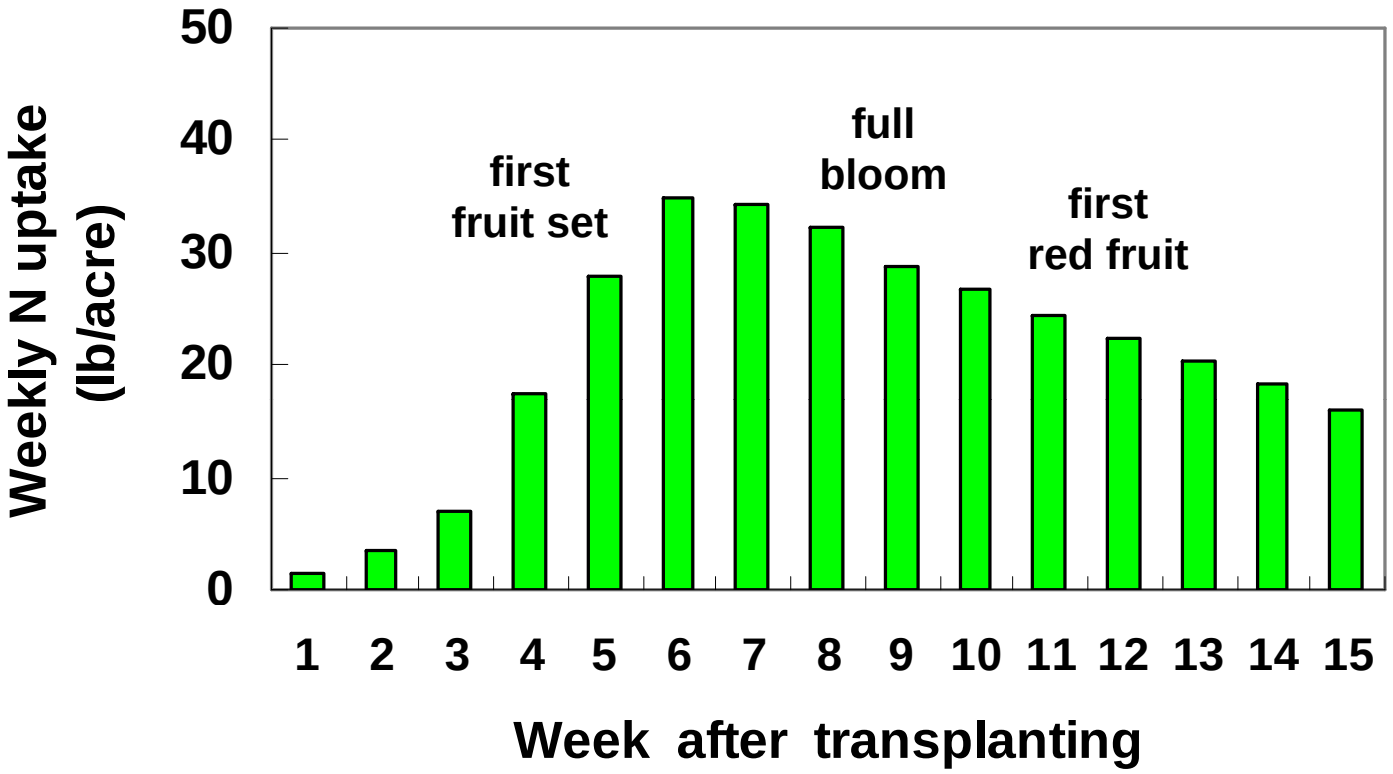
1 lb P_2O_5 equivalent

5-6 lb K_2O equivalent

Bottom line :

P and K fertilization requirements likely to increase with drip irrigation, and N requirement may increase as well

Crop nutrient uptake in high yield tomatoes :

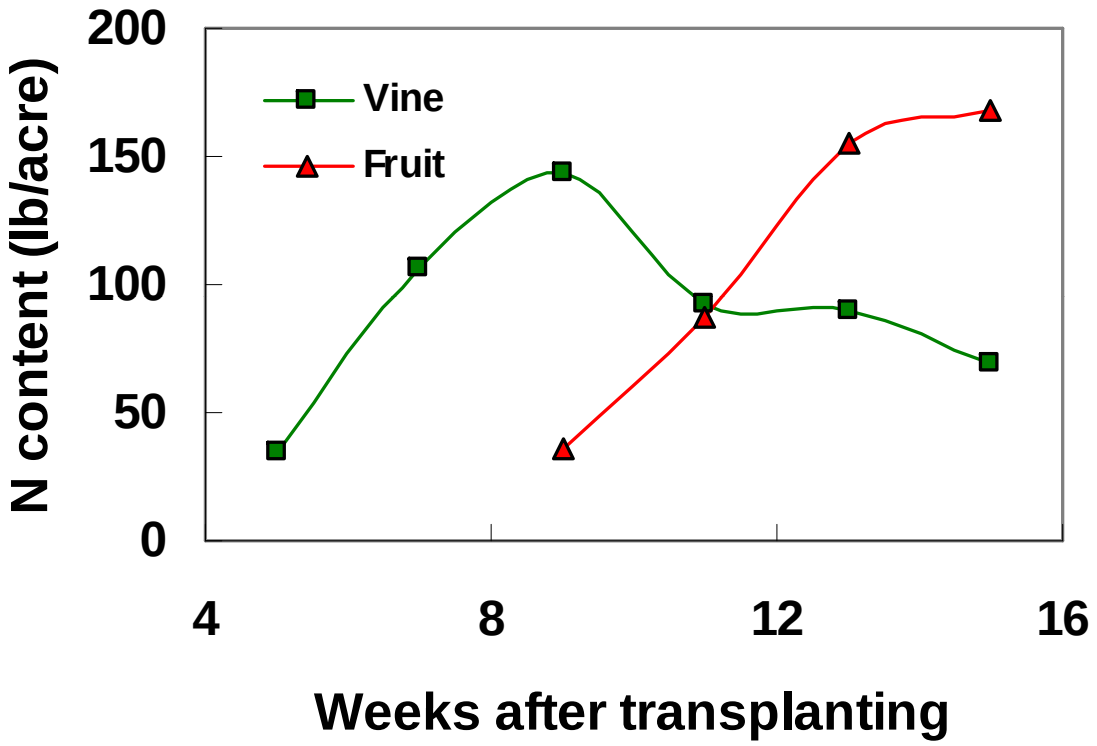


Total uptake :
250-300 lb N/acre

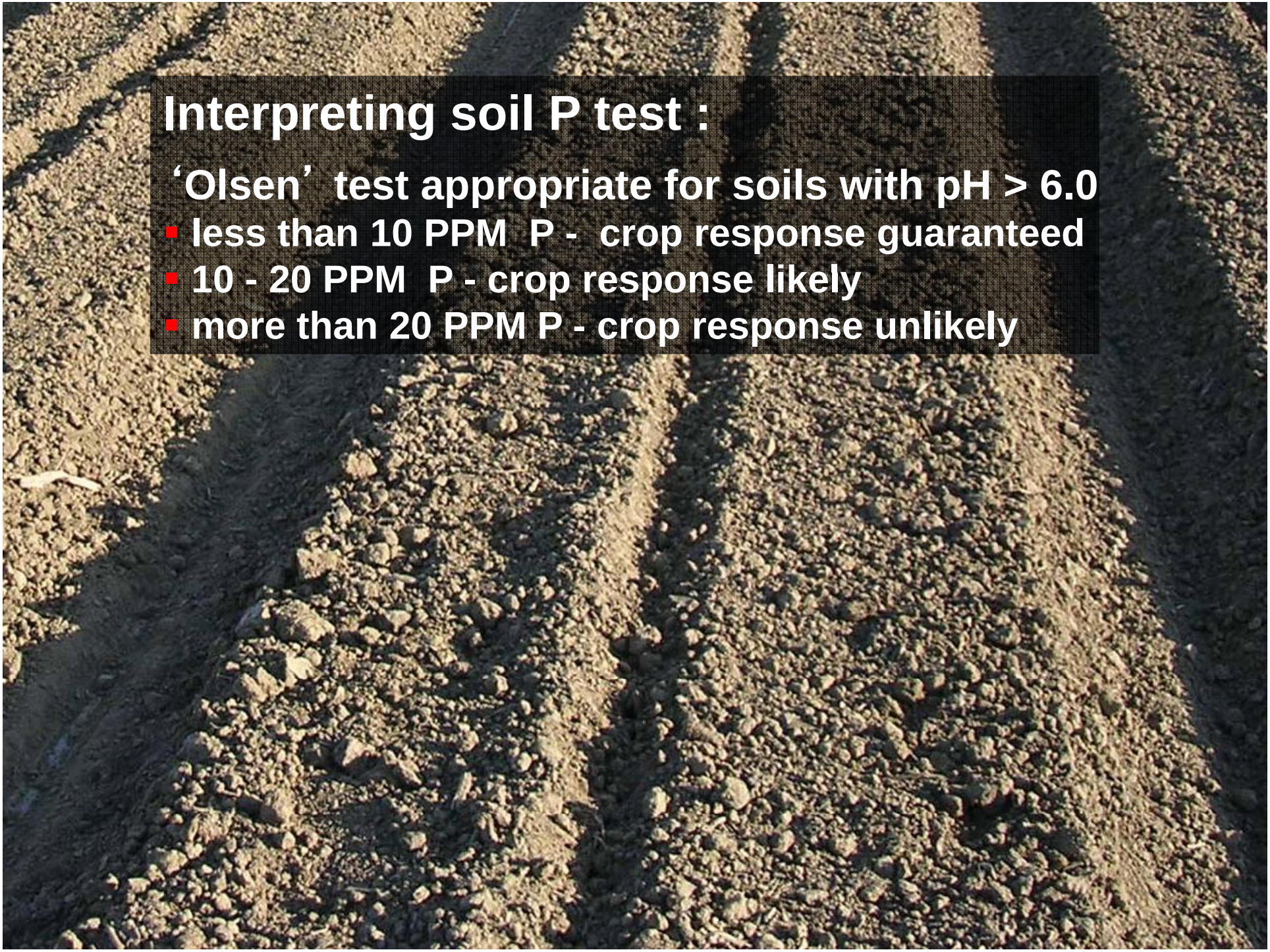
P and K uptake pattern similar, but different amounts:

- **35 - 40 lb P / acre**
- **250 - 400 lb K / acre**

Pattern of nutrient partitioning :



- **at harvest fruit contain about 70% on total plant N / P / K**

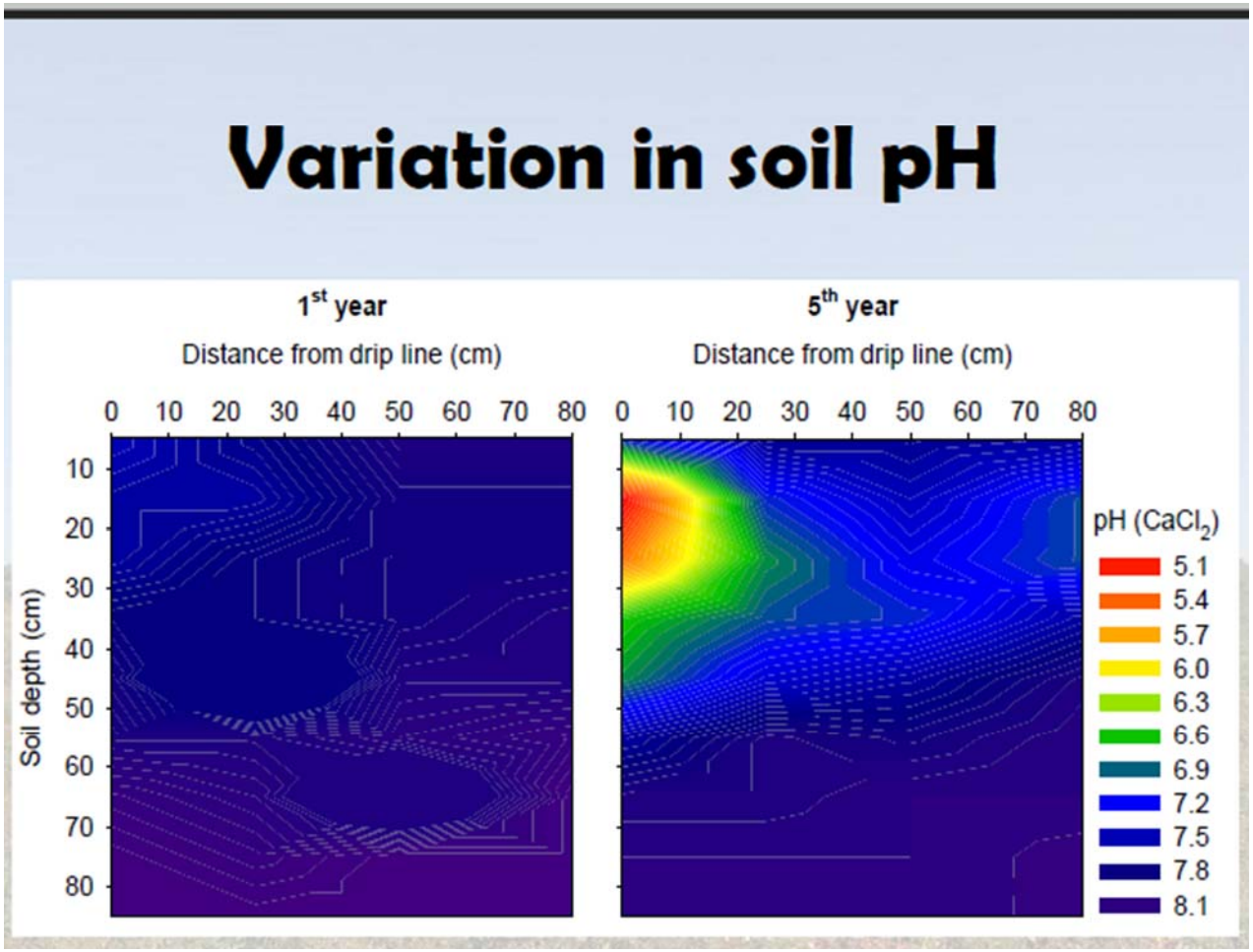


Interpreting soil P test :

'Olsen' test appropriate for soils with pH > 6.0

- less than 10 PPM P - crop response guaranteed
- 10 - 20 PPM P - crop response likely
- more than 20 PPM P - crop response unlikely

Collect soil sample from the concentrated root zone, because soil properties in that zone change over time …



Australian data from drip-irrigated tomato field

P fertilization:

When:

with appropriate preplant or at-transplant application,
in-season fertigation is not usually necessary

How:

get at least some P close to the transplant to support
early growth

How much:

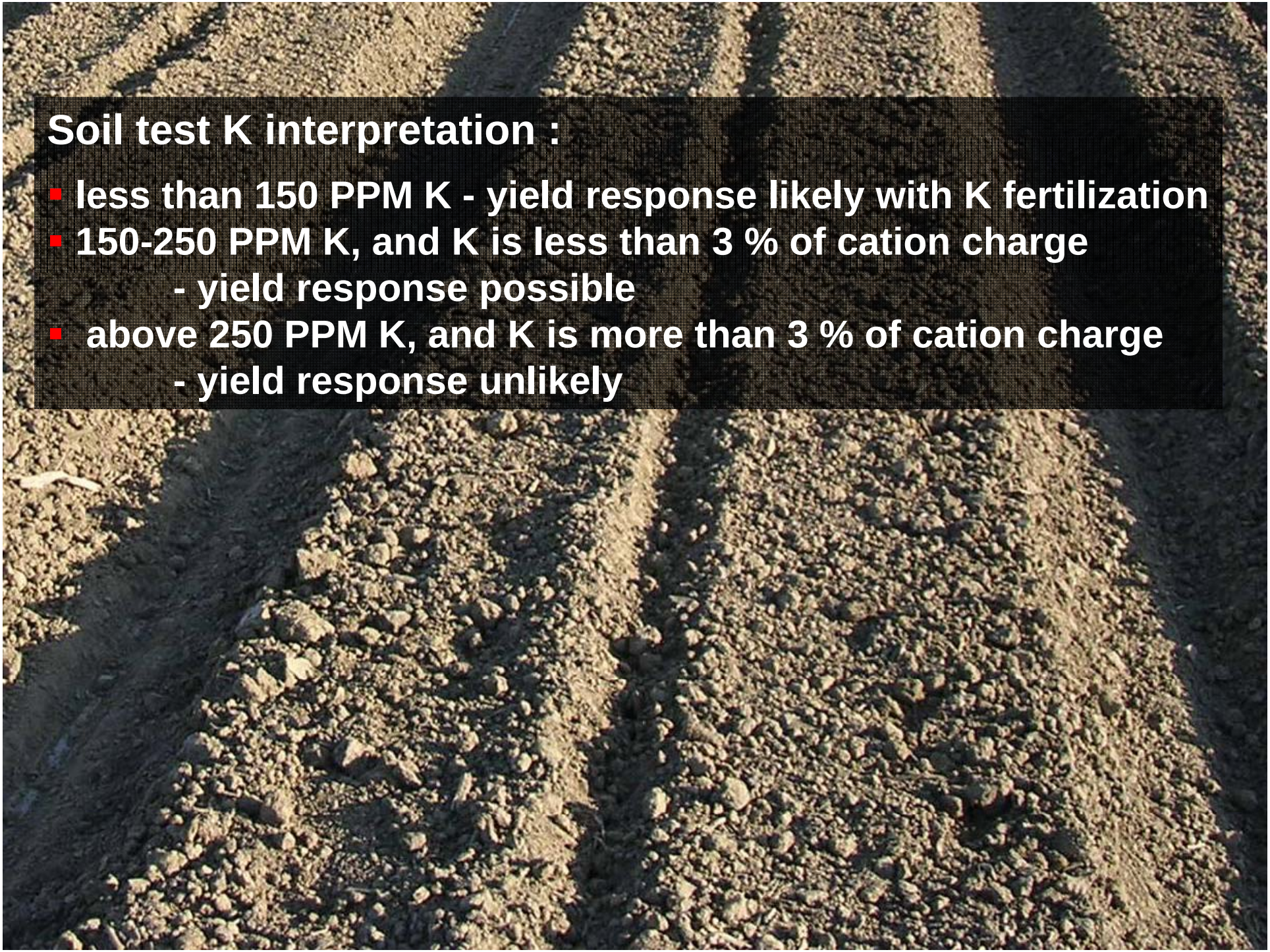
soil test between 10-20 PPM - fruit removal rate (60-70 lb P_2O_5/acre)
soil test < 10 PPM - more than fruit removal rate

Soil factors governing plant K availability :

- absolute amount (PPM exchangeable K)
- amount relative to other base cations (Ca, Mg, Na)

$$\% K = \frac{\text{milliequivalents of K}}{\text{sum of milliequivalents (K + Ca + Mg + Na)}}$$

- rooting volume and density



Soil test K interpretation :

- less than 150 PPM K - yield response likely with K fertilization
- 150-250 PPM K, and K is less than 3 % of cation charge
  - yield response possible
- above 250 PPM K, and K is more than 3 % of cation charge
  - yield response unlikely

K fertilization :

When: during fruit set

How much: first 100 lb K_2O /acre will be the most effective *

*** anything less than what is removed with fruit (250-350 lb K_2O/acre) reduces long-term soil K supply**

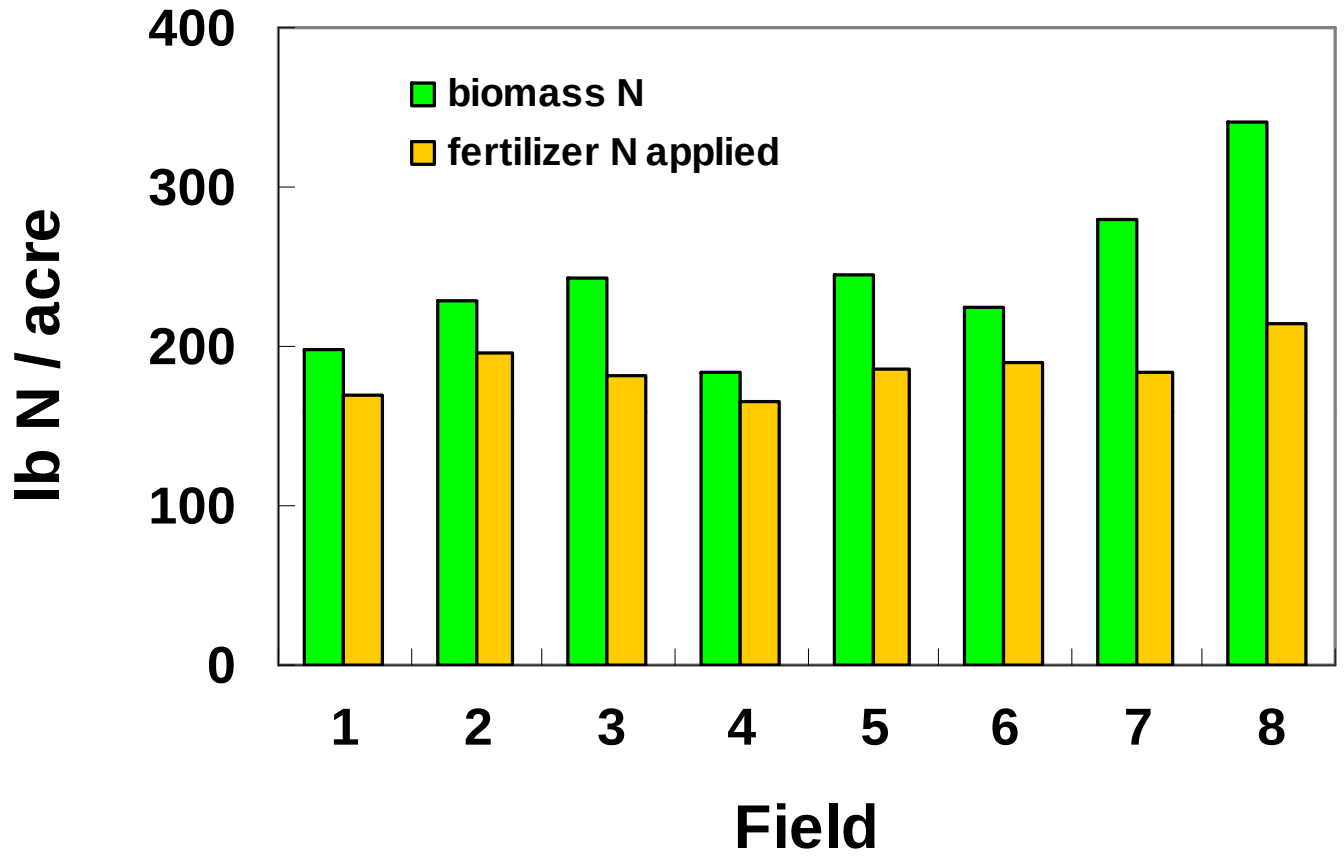
At economically feasible rates, K fertigation :

- **will improve but not cure fruit color disorders**
- **will not increase fruit soluble solids concentration**

What is a reasonable N fertigation template ?

Growth stage	Duration (weeks)	N fertigation rate *no more than* (lb/acre/week)
2 weeks post-transplant - early fruit set	2-3	10
early fruit set - full bloom	3-4	30-35
full bloom - early red fruit	2-3	20-25
early red fruit - harvest	4-5	usually not necessary

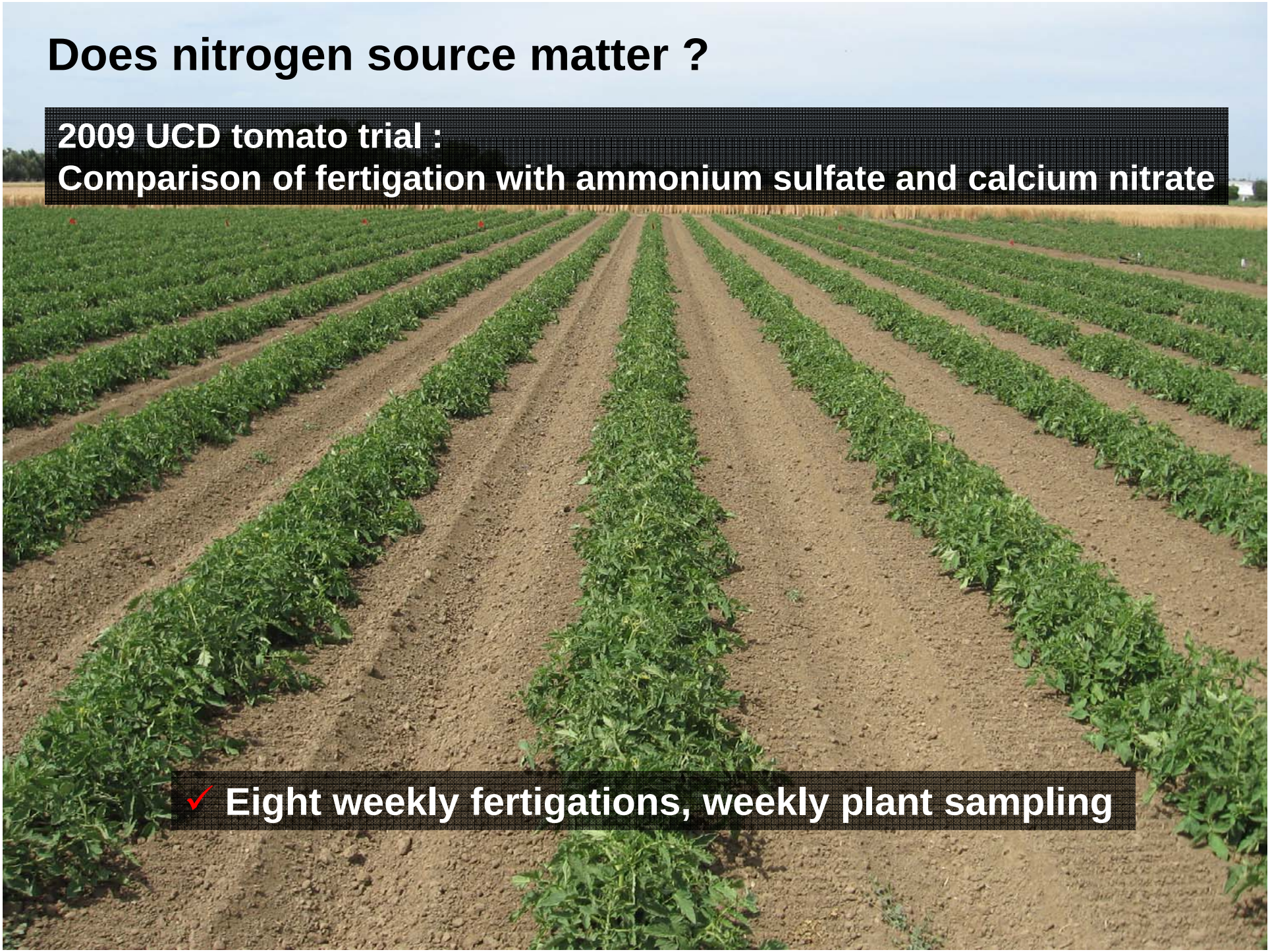
A seasonal total of no more than 200 lb N/acre should be needed



In most fields 50-100 lb N/acre will come from non-fertilizer sources

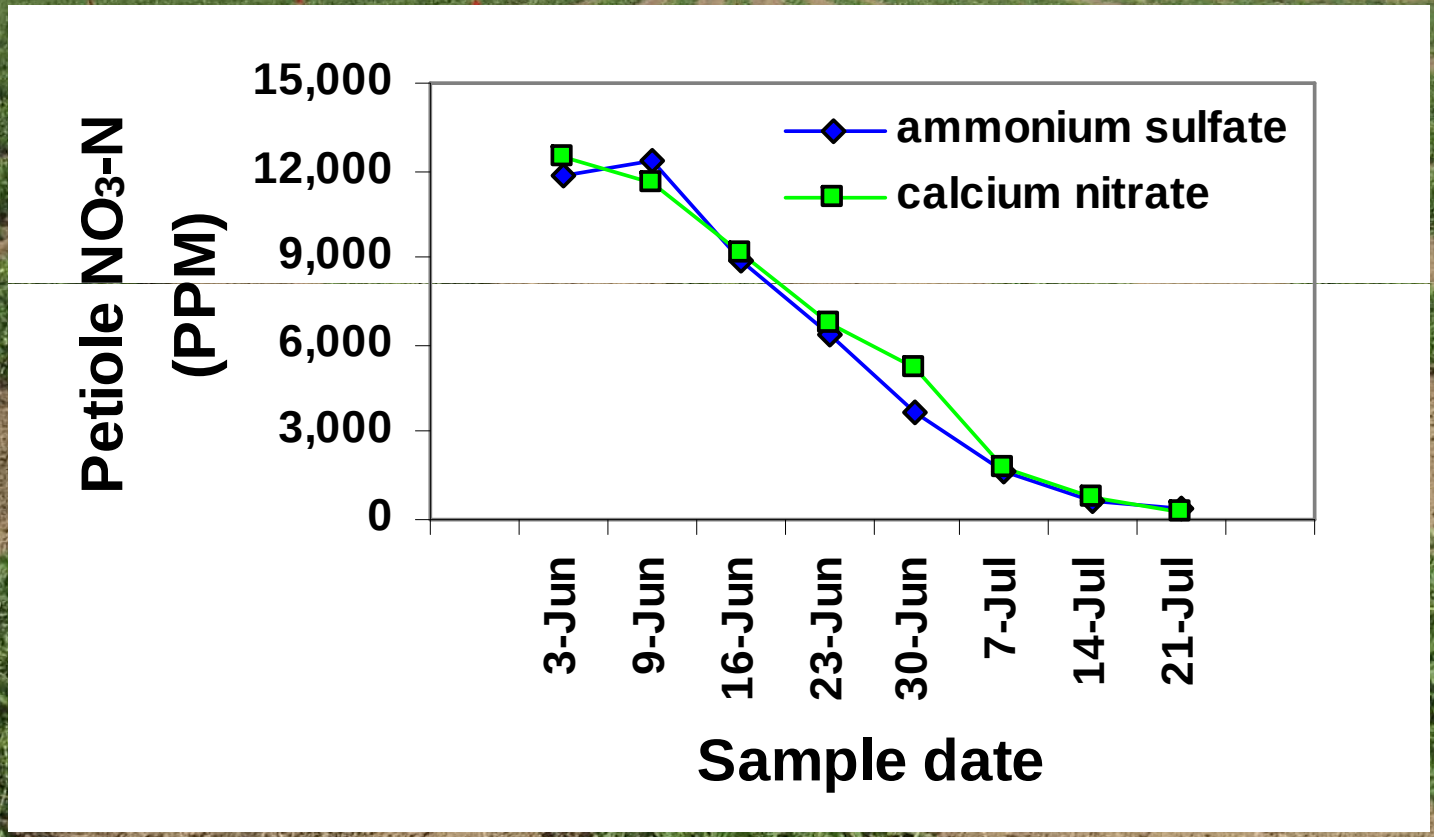
Does nitrogen source matter ?

2009 UCD tomato trial :
Comparison of fertigation with ammonium sulfate and calcium nitrate



✓ **Eight weekly fertigations, weekly plant sampling**

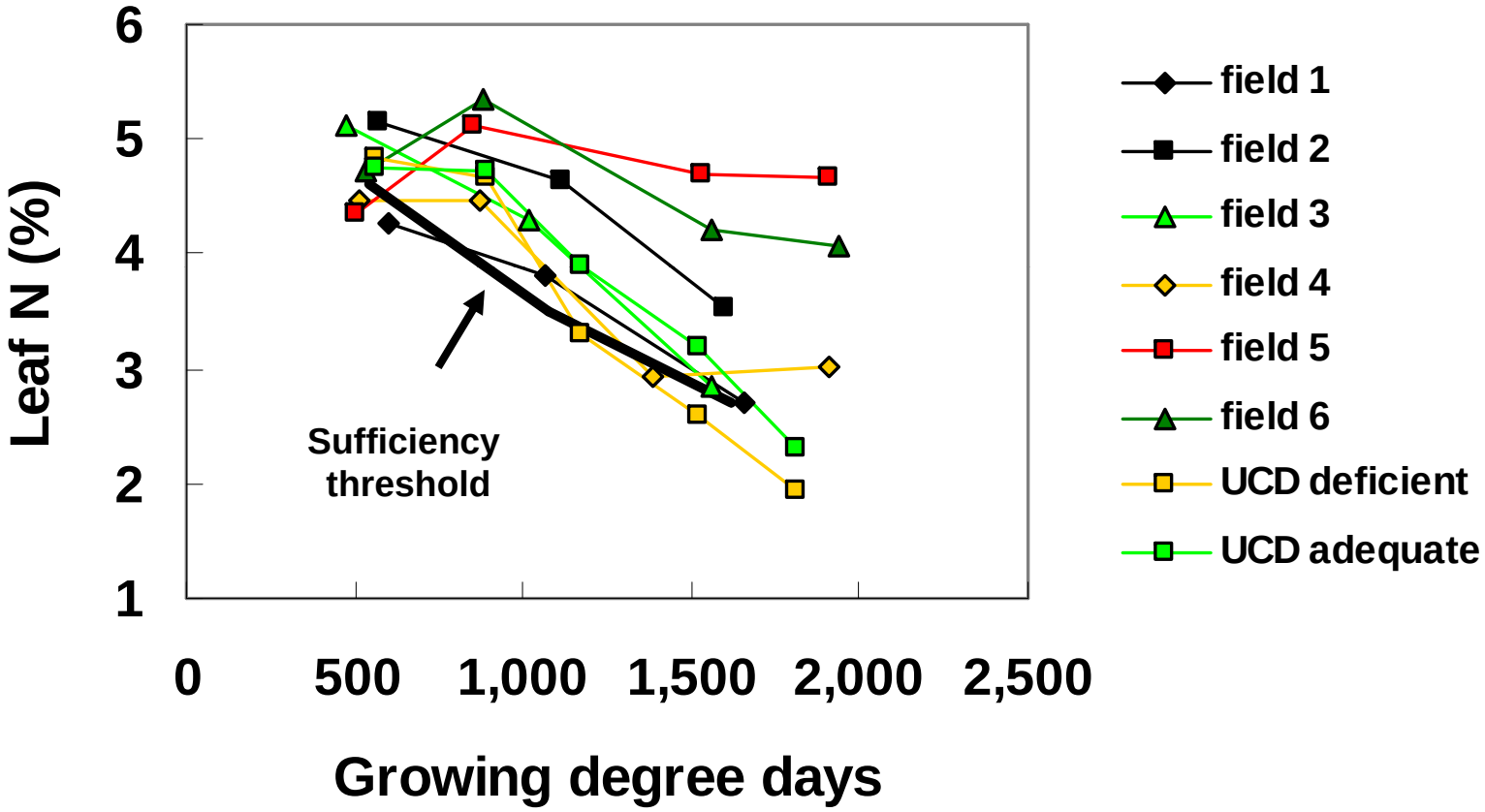
2009 UCD tomato trial :



No treatment difference in crop N uptake, fruit yield or quality

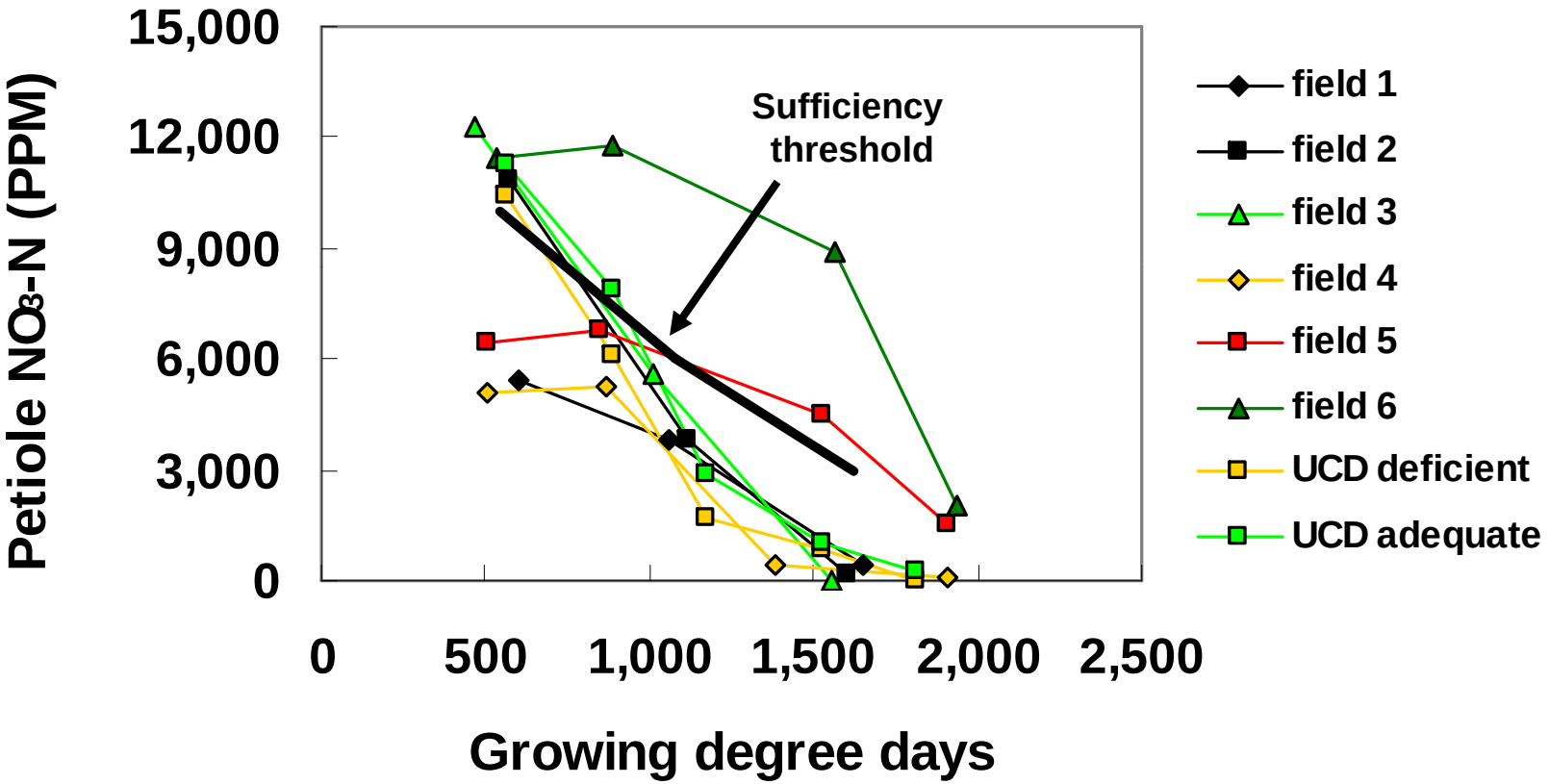
Tissue sampling :

Whole leaf total N analysis gives useful information :

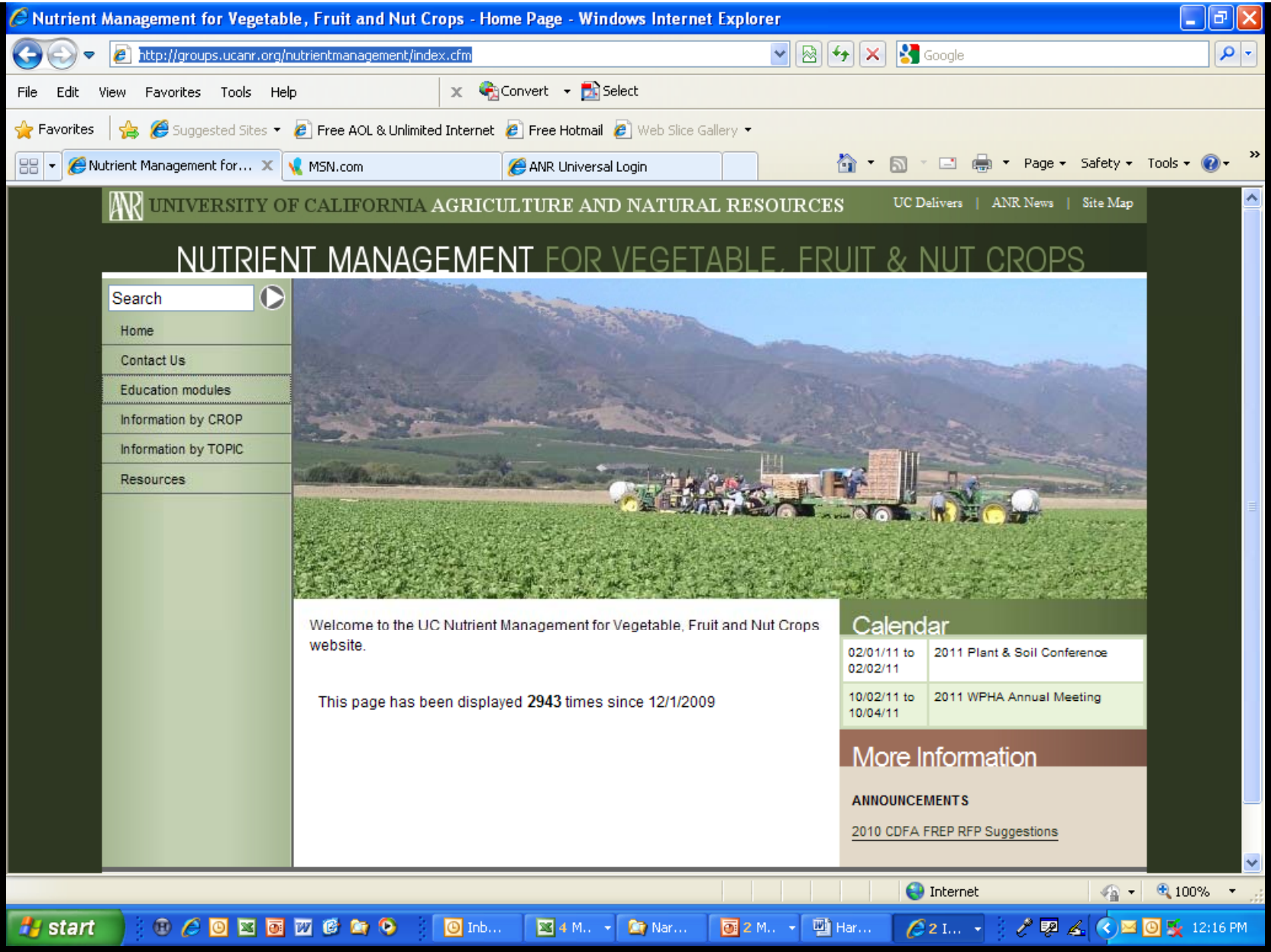


2007-08 processing tomato project

Petiole NO_3-N analysis can be misleading :



2007-08 processing tomato project



http://groups.ucanr.org/nutrientmanagement/index.cfm

http://stream.ucanr.org/vric/tomato_fert/index.html