
Managing fertility in drip-irrigated processing tomatoes

How are drip-irrigated tomatoes different ?

✓ Higher yield expectations = higher nutrient removal

each ton of fruit contains about:

3 lb N

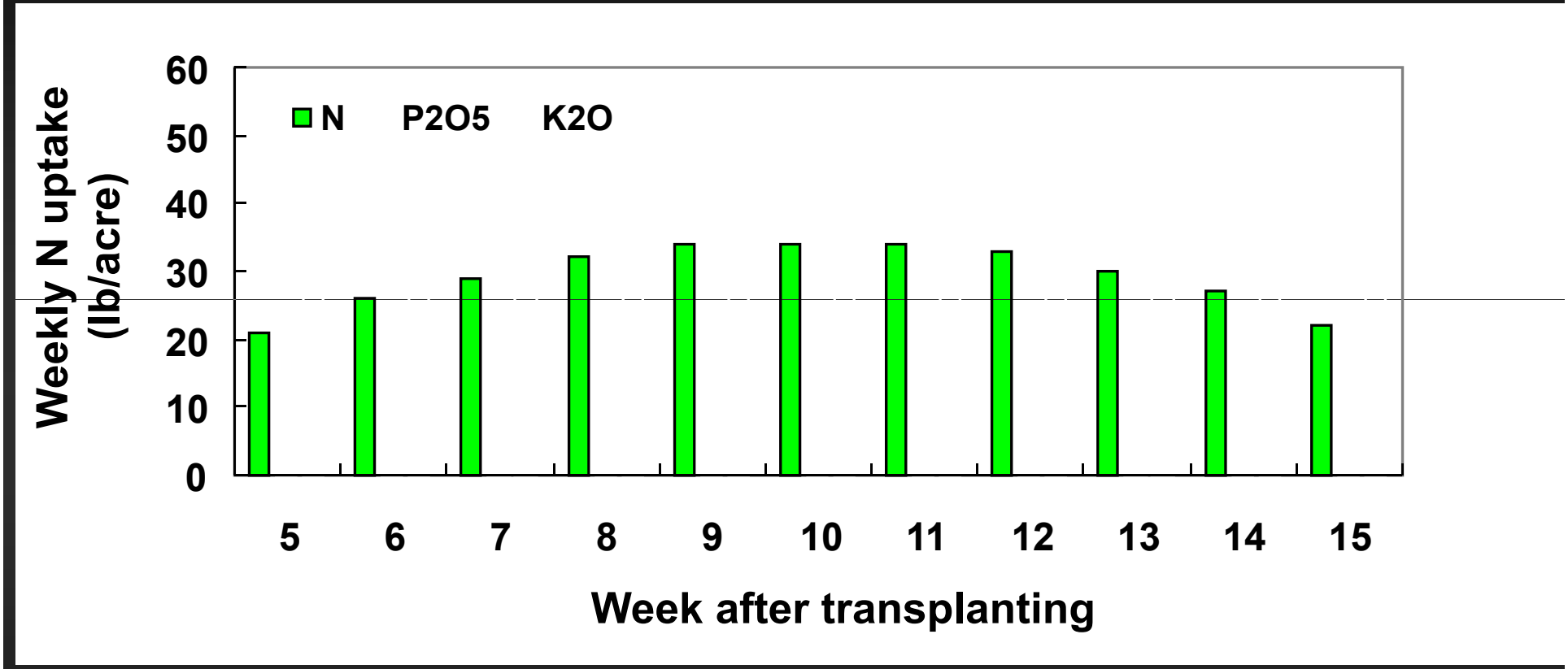
1 lb P_2O_5 equivalent

5 lb K_2O equivalent

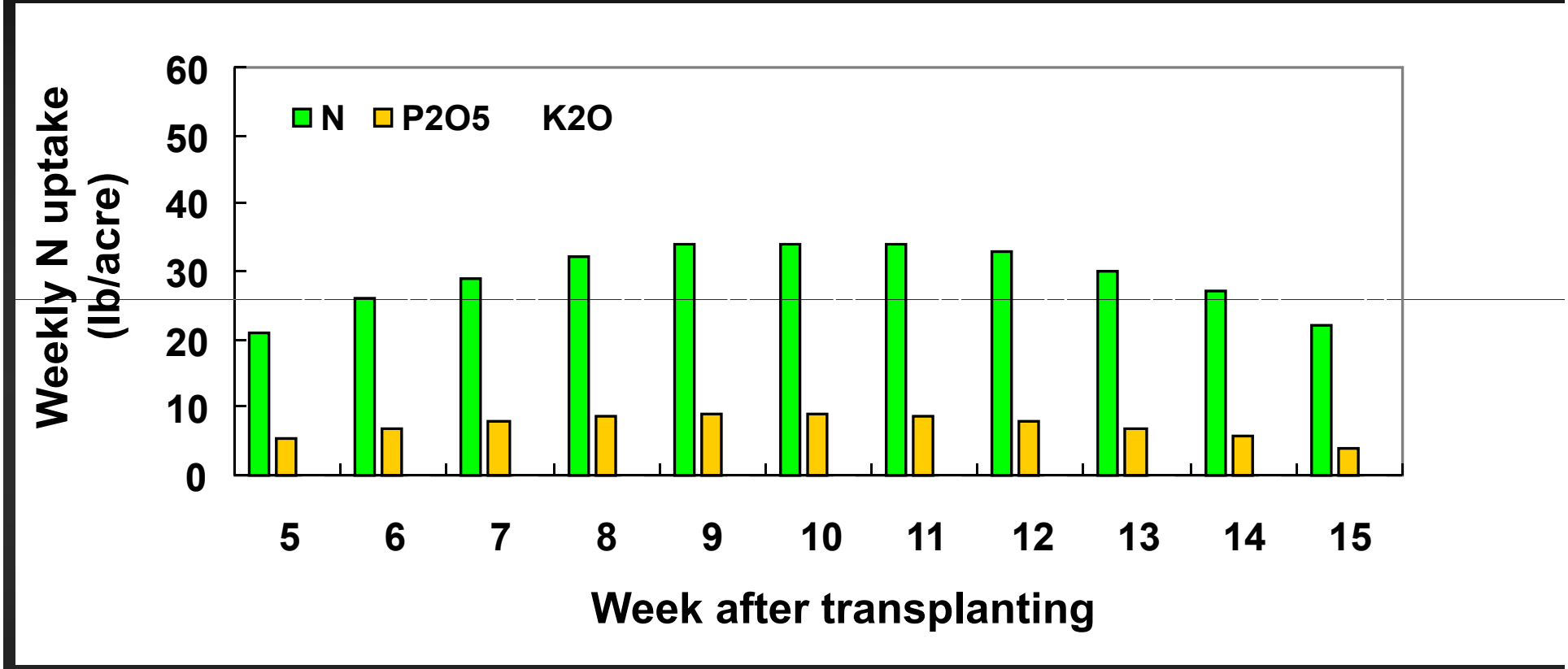
How are drip-irrigated tomatoes different ?

- ✓ Roots feed in a limited zone of soil

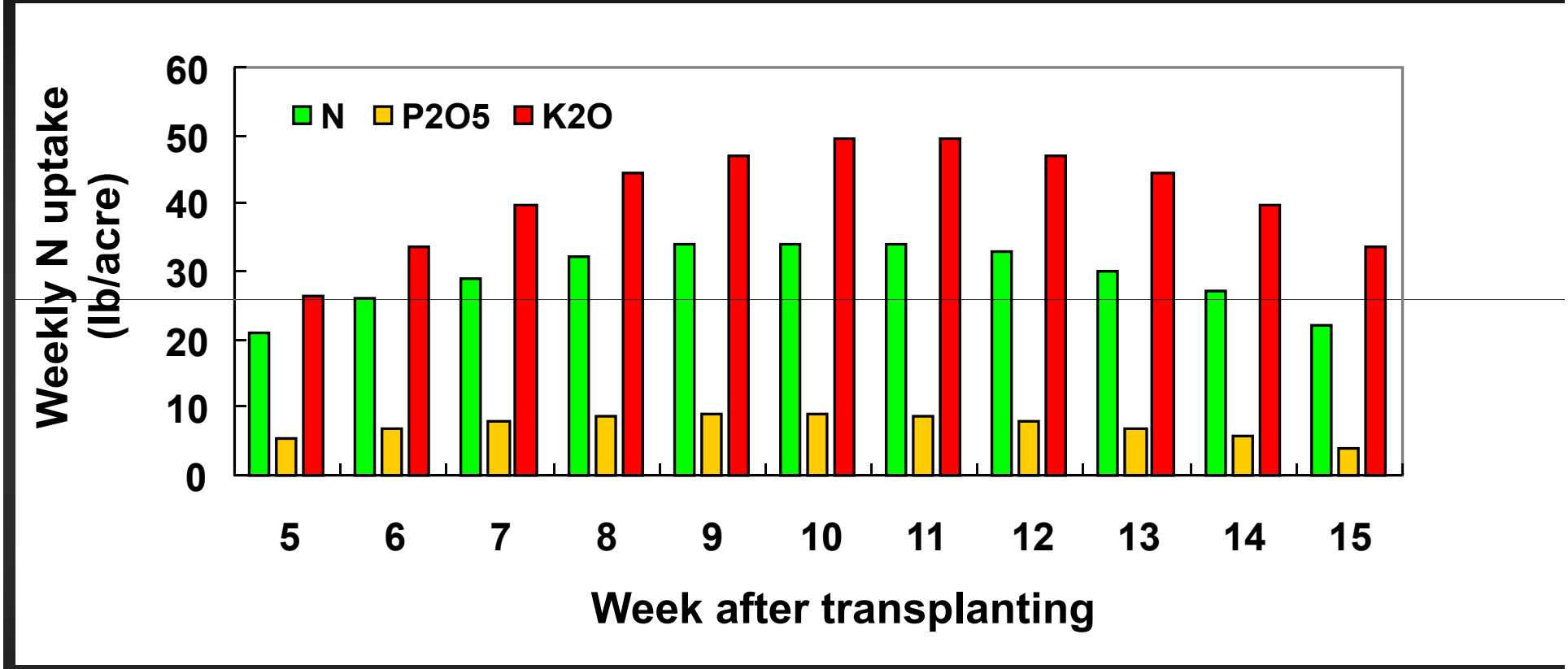
Nutrient uptake is predictable :



Nutrient uptake is predictable :



Nutrient uptake is predictable :



Nutrient uptake by processing tomato :

	lb / acre	
Nutrient	total	in fruit
N	240 - 280	160 - 200
P_2O_5	80 - 100	50 - 70
K_2O	300 - 450	250 - 350

Nutrient budget for processing tomato :

	lb / acre	
Nutrient	total	in fruit
N	220 - 280	160 - 200
P_2O_5	80 - 100	50 - 70
K_2O	300 - 450	250 - 350

Lower fertilizer rates = soil ‘mining’

What is a reasonable N fertigation template ?

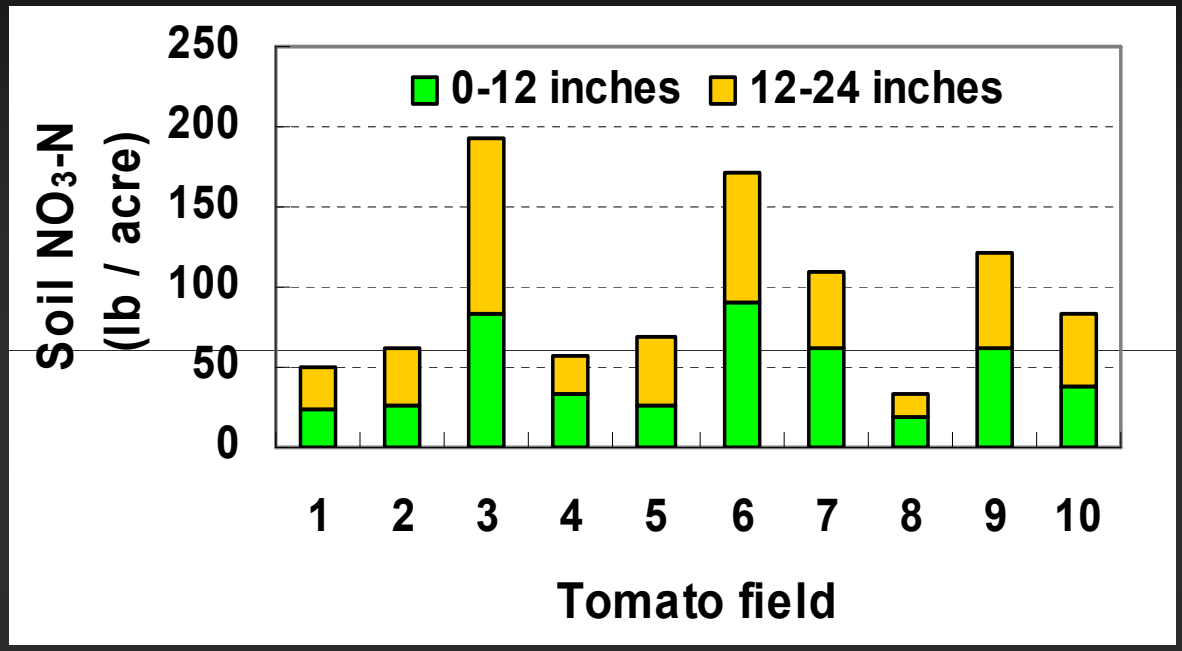
Growth stage	Duration (weeks)	N fertigation rate *no more than* * (lb/acre/week)
2 weeks post-transplant - early fruit set	2-3	10
early fruit set - full bloom	3-4	30-35
full bloom - early red fruit	2-3	20-25
early red fruit - harvest	4-5	not usually necessary

* Not all plant N uptake comes from fertilizer

Sources of non-fertilizer N :

✓ Soil residual NO_3-N :

Post-thinning soil NO_3-N in Valley tomato fields :



✓ Soil organic N mineralization :

≈ 1-2 % of soil organic N is mineralized during a summer season

≈ 30-60 lb N/acre in soil with 1% organic matter

Bottom line :

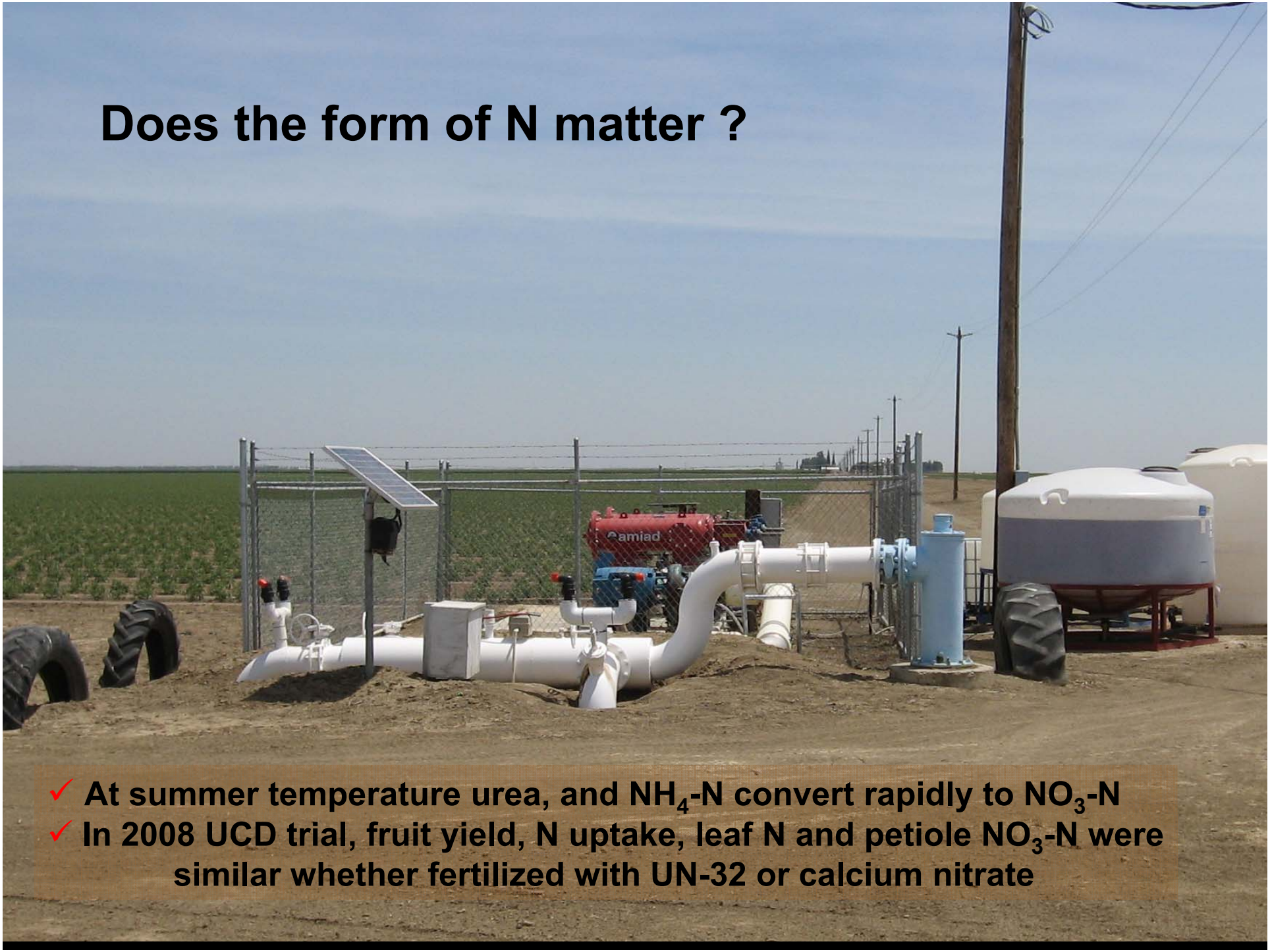
seasonal N application of 160 – 200 lb N/acre should be sufficient

What is the problem with overfertilization ?

How often to fertigate ?

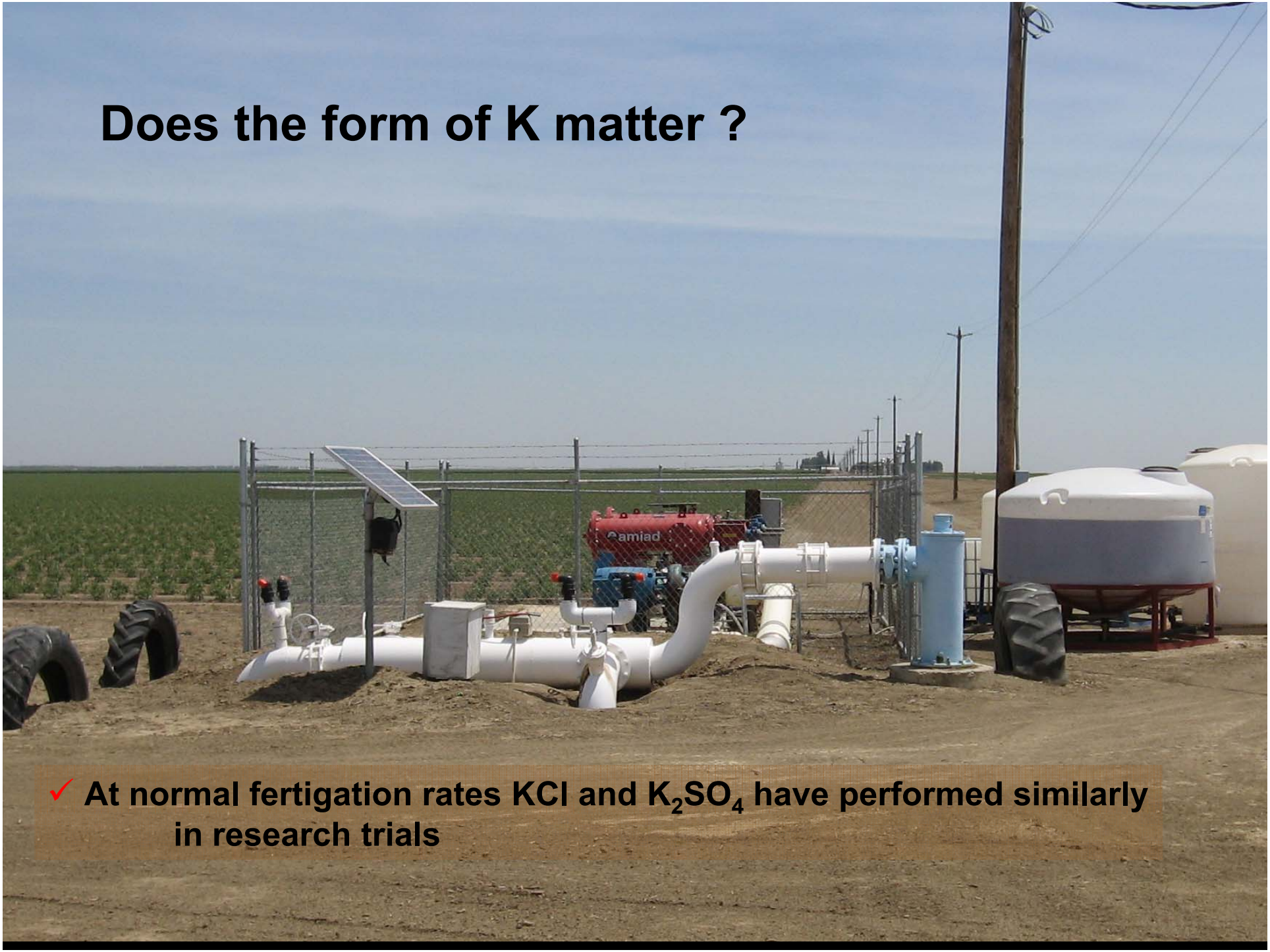
✓ no more than weekly should be required

Does the form of N matter ?



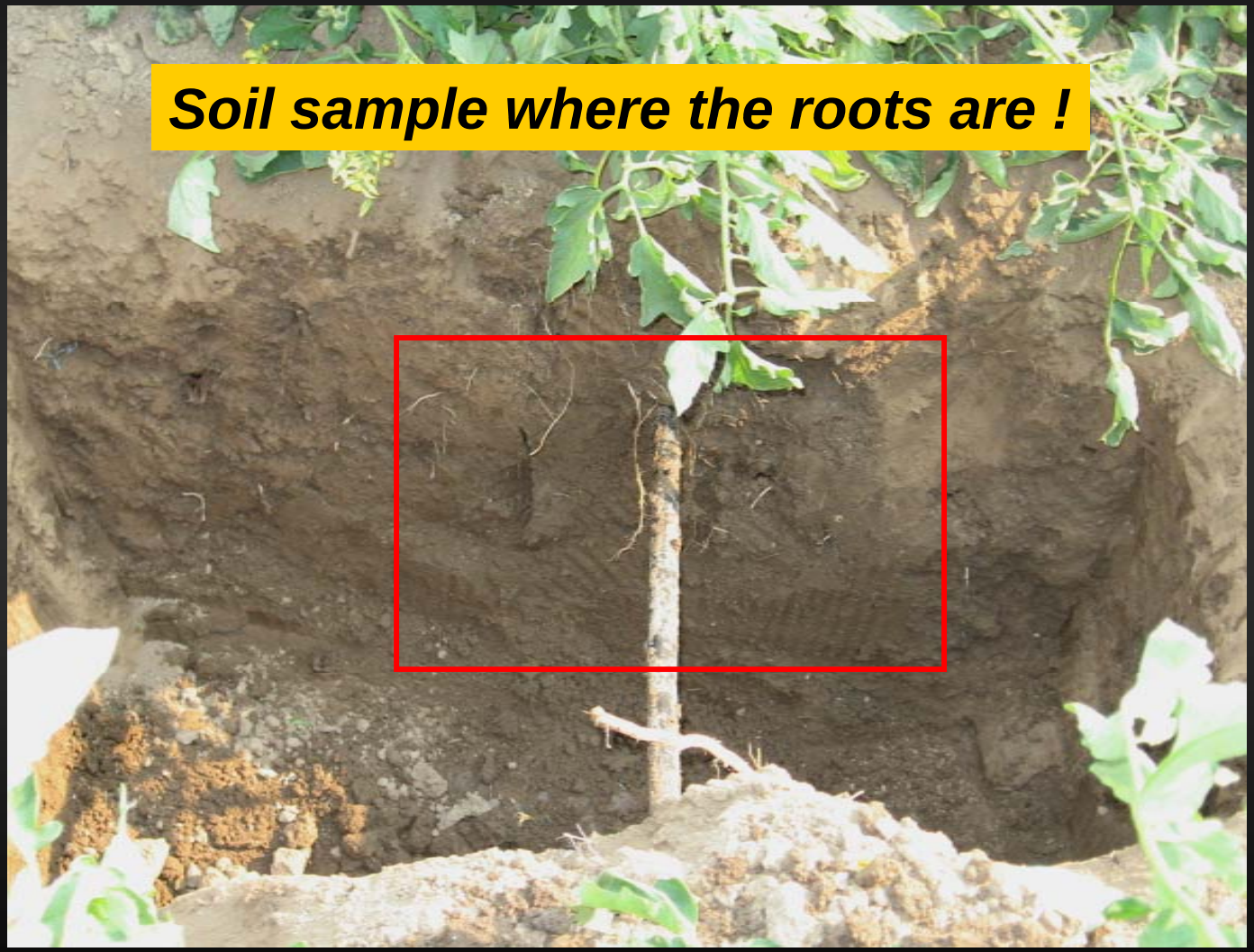
- ✓ At summer temperature urea, and NH_4-N convert rapidly to NO_3-N
- ✓ In 2008 UCD trial, fruit yield, N uptake, leaf N and petiole NO_3-N were similar whether fertilized with UN-32 or calcium nitrate

Does the form of K matter ?

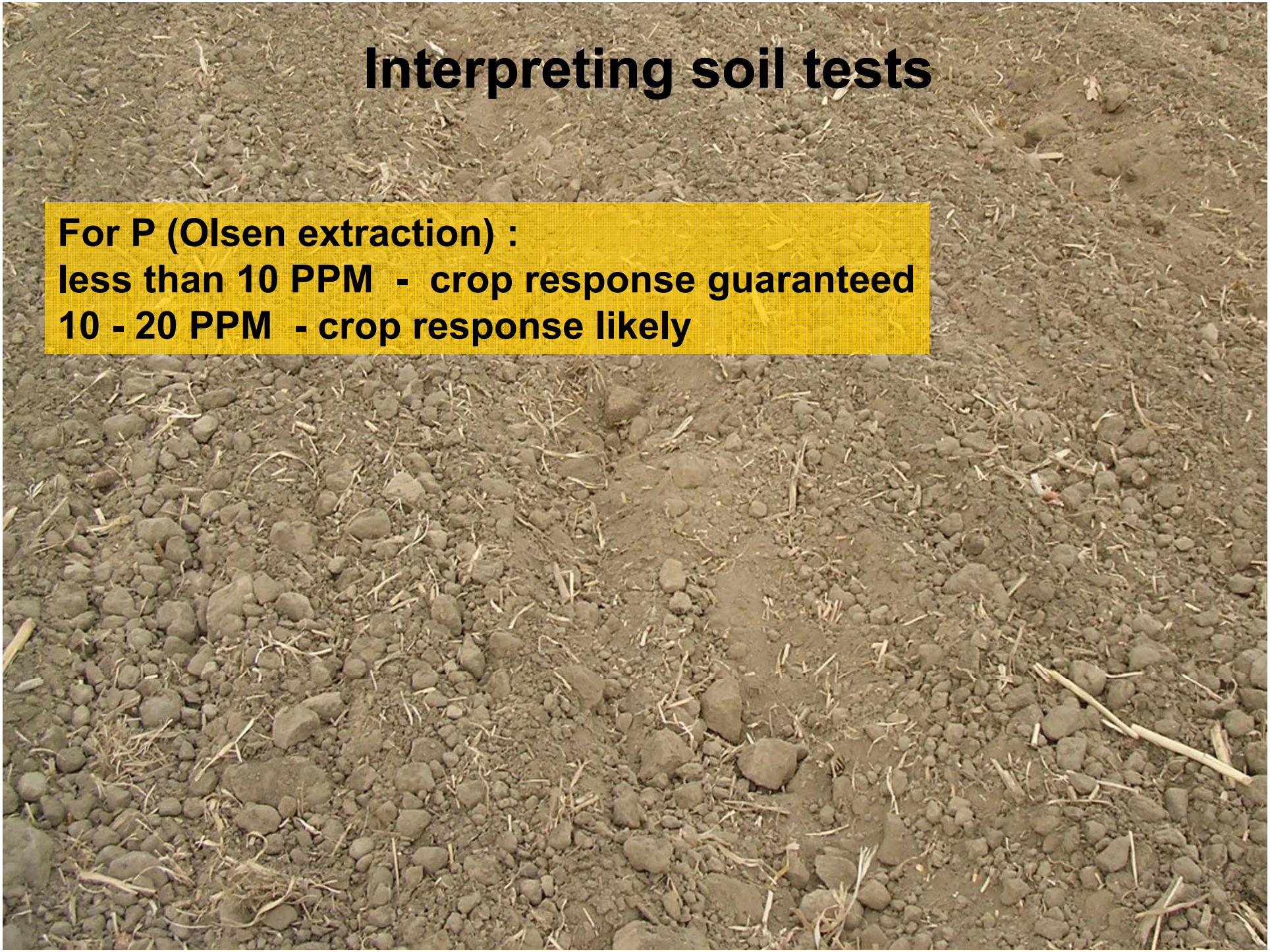


- ✓ At normal fertigation rates KCl and K_2SO_4 have performed similarly in research trials

P and K management :
Soil testing is the foundation, but remember to …



Interpreting soil tests



For P (Olsen extraction) :
less than 10 PPM - crop response guaranteed
10 - 20 PPM - crop response likely

Interpreting soil tests

For P (Olsen extraction) :

- **less than 10 PPM - crop response guaranteed**
- **10 - 20 PPM - crop response likely**

For K (ammonium acetate extraction) :

- **less than 150 PPM - yield response likely**
- **150 - 250 PPM - yield response possible if K is < 2% of cation exchange**

Applying P :

When:

with appropriate preplant management,
in-season application should not be necessary

How:

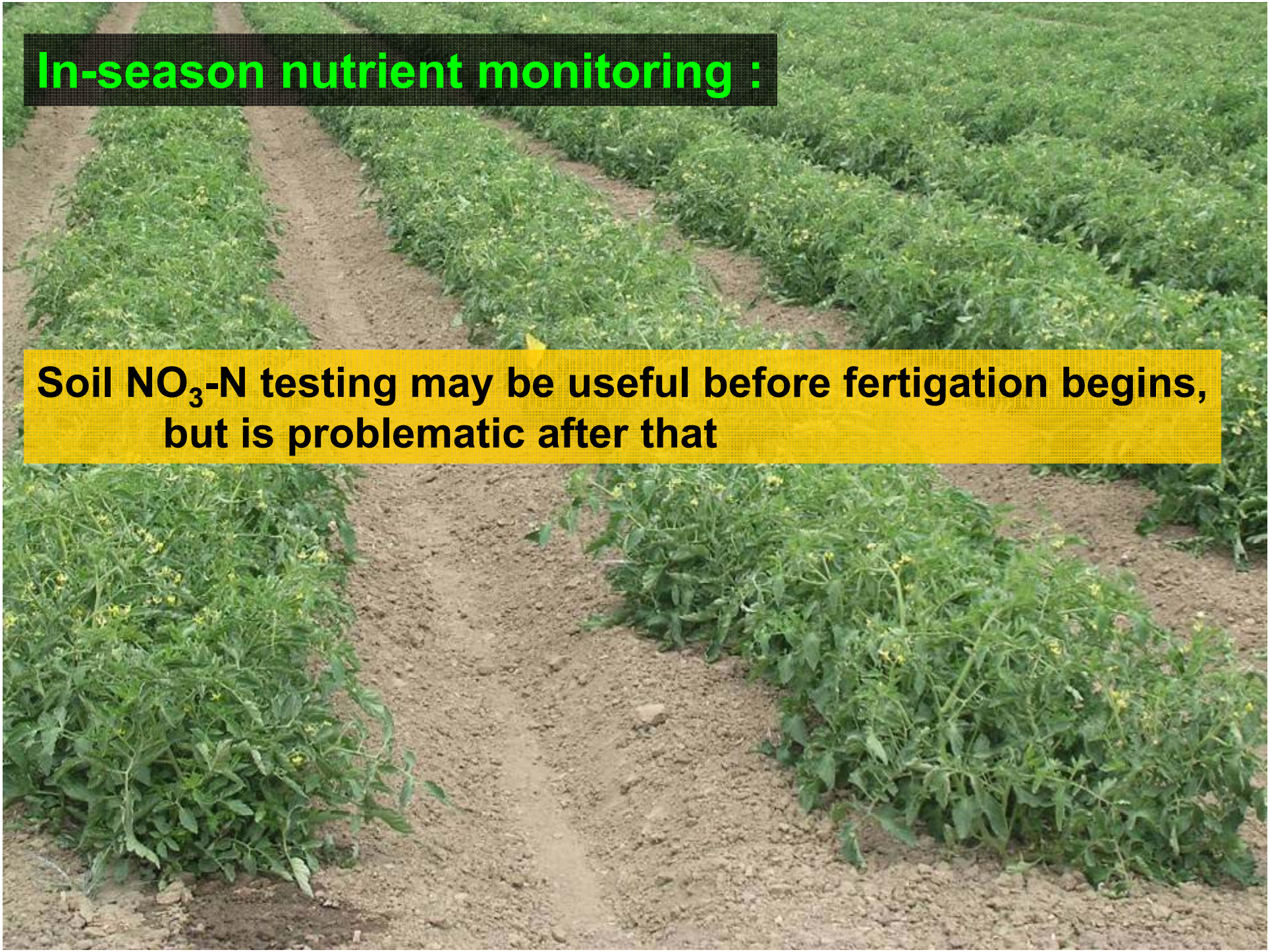
get at least some P close to the transplant to
support early growth

How much:

soil test between 10-20 PPM - crop removal rate (50-70 lb P_2O_5/acre)
soil test < 10 PPM – more than crop removal rate

Applying K :
When: during fruit set
How: fertigation
How much: first 100 lb/acre will be the most effective *

*** Anything less than what is removed with fruit reduces long-term soil K supply**


In-season nutrient monitoring :
Soil NO_3-N testing may be useful before fertigation begins,
but is problematic after that


Soil NO_3-N (PPM)
13
8
20
7
11
16

Tissue testing :

Petiole sampling for NO_3-N, PO_4-P and K :

- ✓ can change rapidly over a few days
- ✓ can be affected by weather conditions
- ✓ useful as a spot check on your fertility plan, but should not drive your program
- ✓ ***not useful after full bloom***

Tissue testing :

Whole leaf sampling for total N, P and K :

- ✓ better measure of overall crop nutrient status
- ✓ changes more slowly than petioles, so projects farther into the future
- ✓ can provide useful information at any crop stage

Tissue sufficiency standards :

		Sufficiency level		
Sample type	Nutrient	Early flower	Full bloom	First red fruit
whole leaf	% N	4.0	3.5	2.7
	% P	0.32	0.25	0.23
	% K	2.2	1.6	0.8
petiole	PPM NO_3-N	8,000	3,000	??
	PPM PO_4-P	2,500	2,000	
	% K	4.5	3.0