

**Developing practical fertility monitoring tools
for tomatoes**

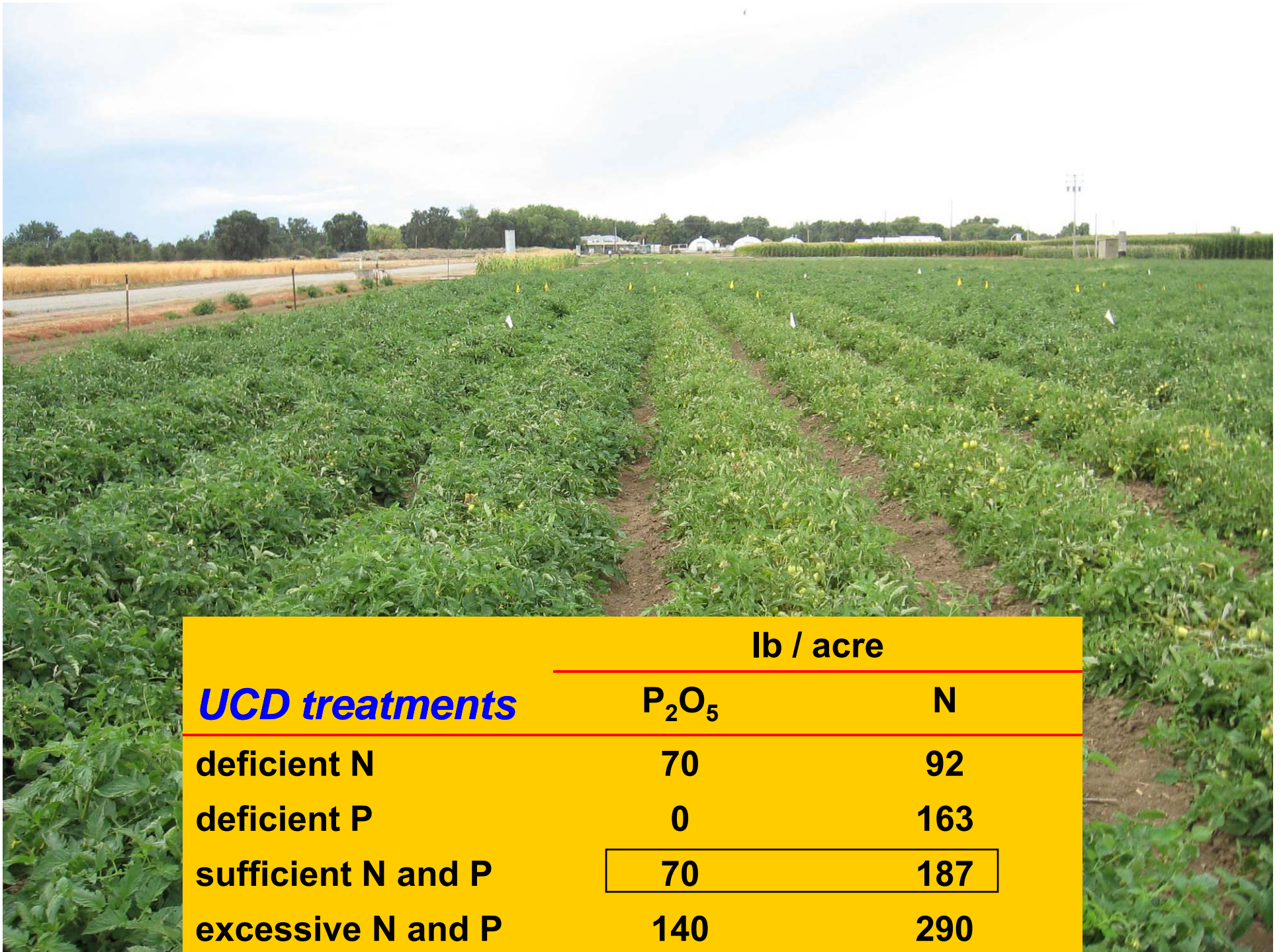


2007-08 processing tomato monitoring:

- ✓ **Fertigation experiments at UC Davis in both years**
- ✓ **Monitoring of 6 drip-irrigated commercial fields**
 - **3 in the Sacramento Valley**
 - **3 in the San Joaquin Valley**

Objectives:

- 1) confirm nutrient uptake requirements for high-yield tomatoes**
- 2) develop fertigation guidelines**



<i>UCD treatments</i>	lb / acre	
	P₂O₅	N
deficient N	70	92
deficient P	0	163
sufficient N and P	70	187
excessive N and P	140	290

Commercial fields :

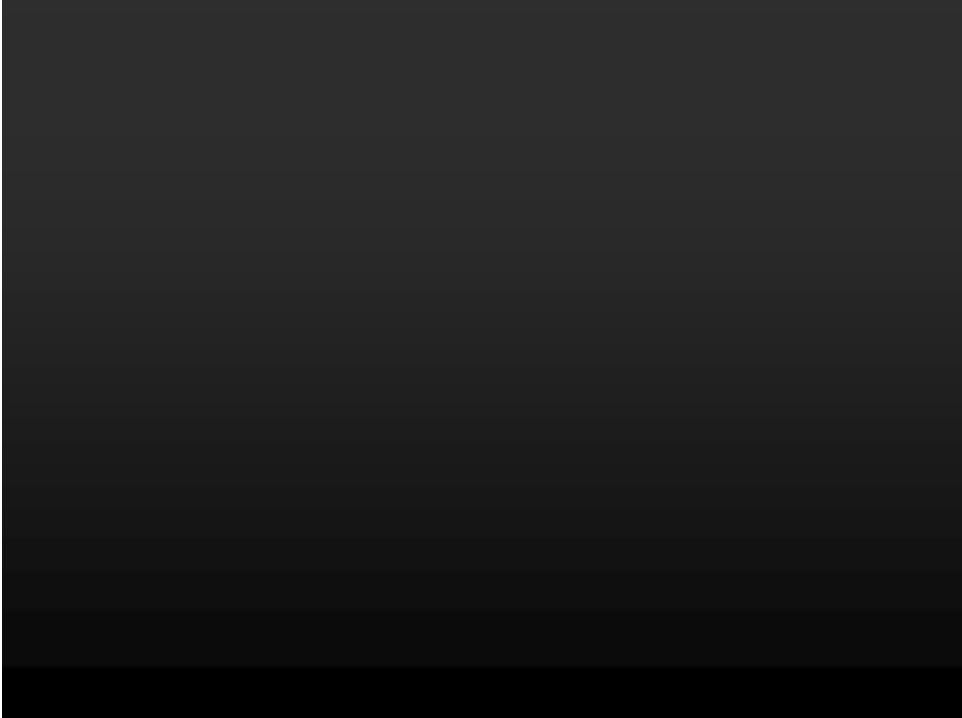


Field	Texture	Exchange	Olsen P	Variety	lb / acre applied		
		K (PPM)	PPM		N	P ₂ O ₅	K ₂ O
1	loam	114	4	H 2601	169	14	24
2	clay loam	138	16	AB 5	181	14	18
3	clay loam	110	11	AB 2	186	90	33
4	clay loam	231	6	AB 2	166	32	0
5	clay loam	182	6	H 2401	196	67	0
6	clay loam	439	29	H 8004	214	53	0



Every 2 weeks (UCD) or every 3 weeks (commercial fields) :

- whole plant sampling for growth and total nutrient uptake
- soil, leaf and petiole analysis for nutrient status



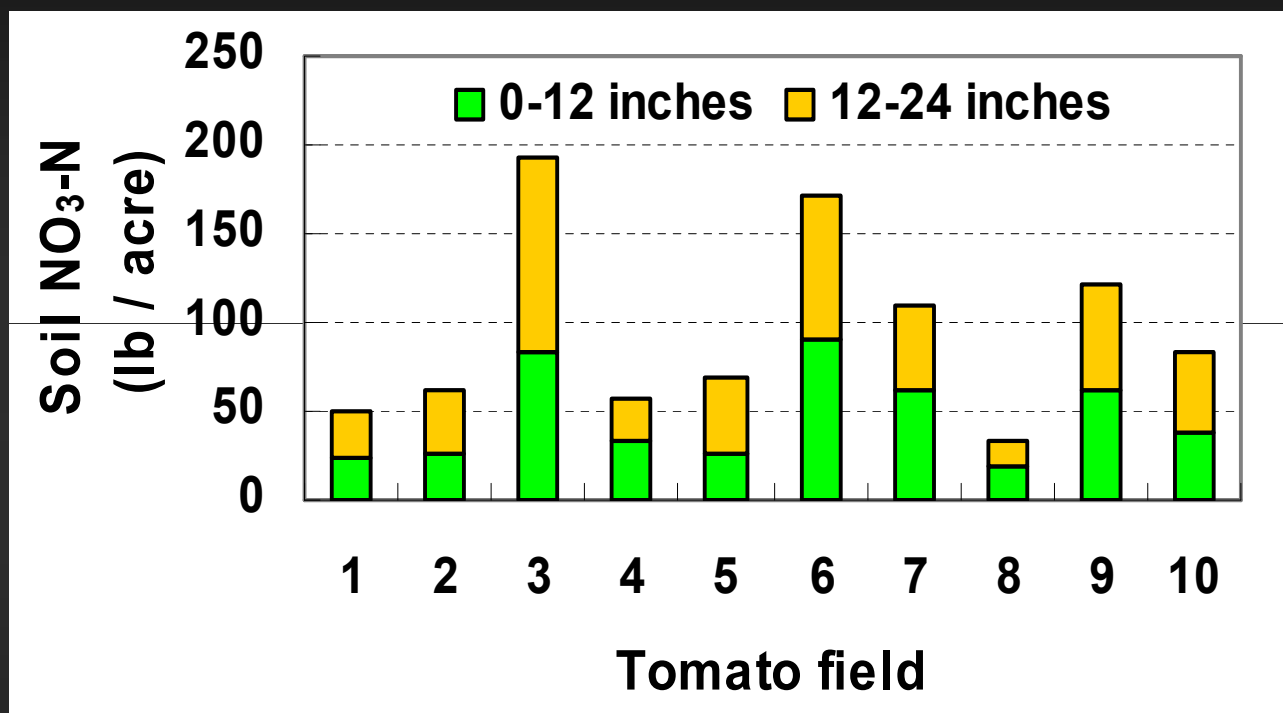
Nitrogen dynamics :

	Fruit yield (tons/acre)	Nitrogen (lb/acre)		
		applied	total uptake	removed with fruit
Field 6	71	214	341	231
UCD 08	70	183	271	179
UCD 07	61	190	224	171
Field 3	59	186	245	179
Field 2	51	181	243	171
Field 4	51	166	183	131
Field 5	49	196	229	162
Field 1	45	169	191	136
average	57	186	241	170

Sources of non-fertilizer N :

✓ Soil residual $\text{NO}_3\text{-N}$:

Post-thinning soil $\text{NO}_3\text{-N}$ in Valley tomato fields :



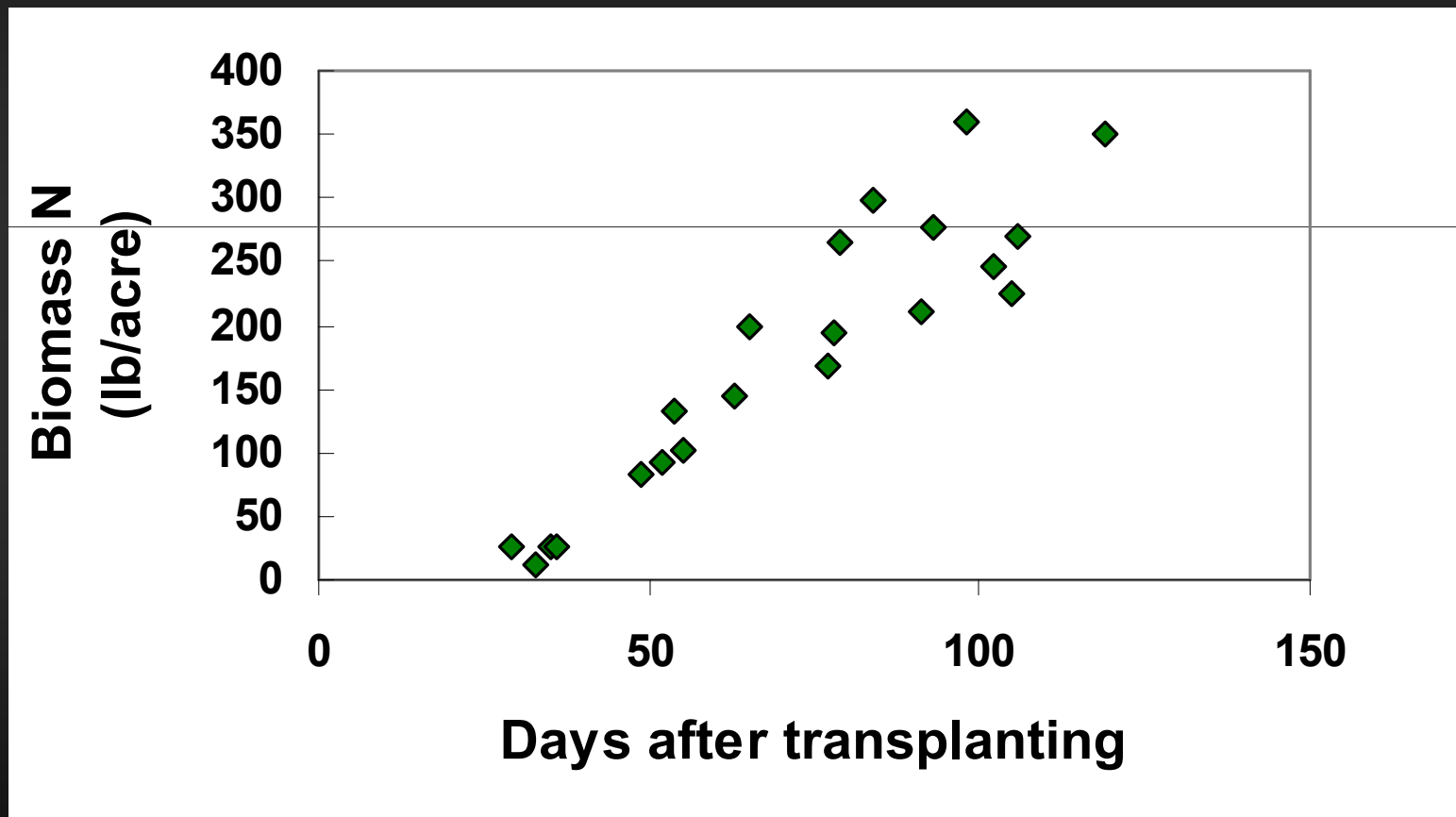
✓ Soil organic N mineralization :

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

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

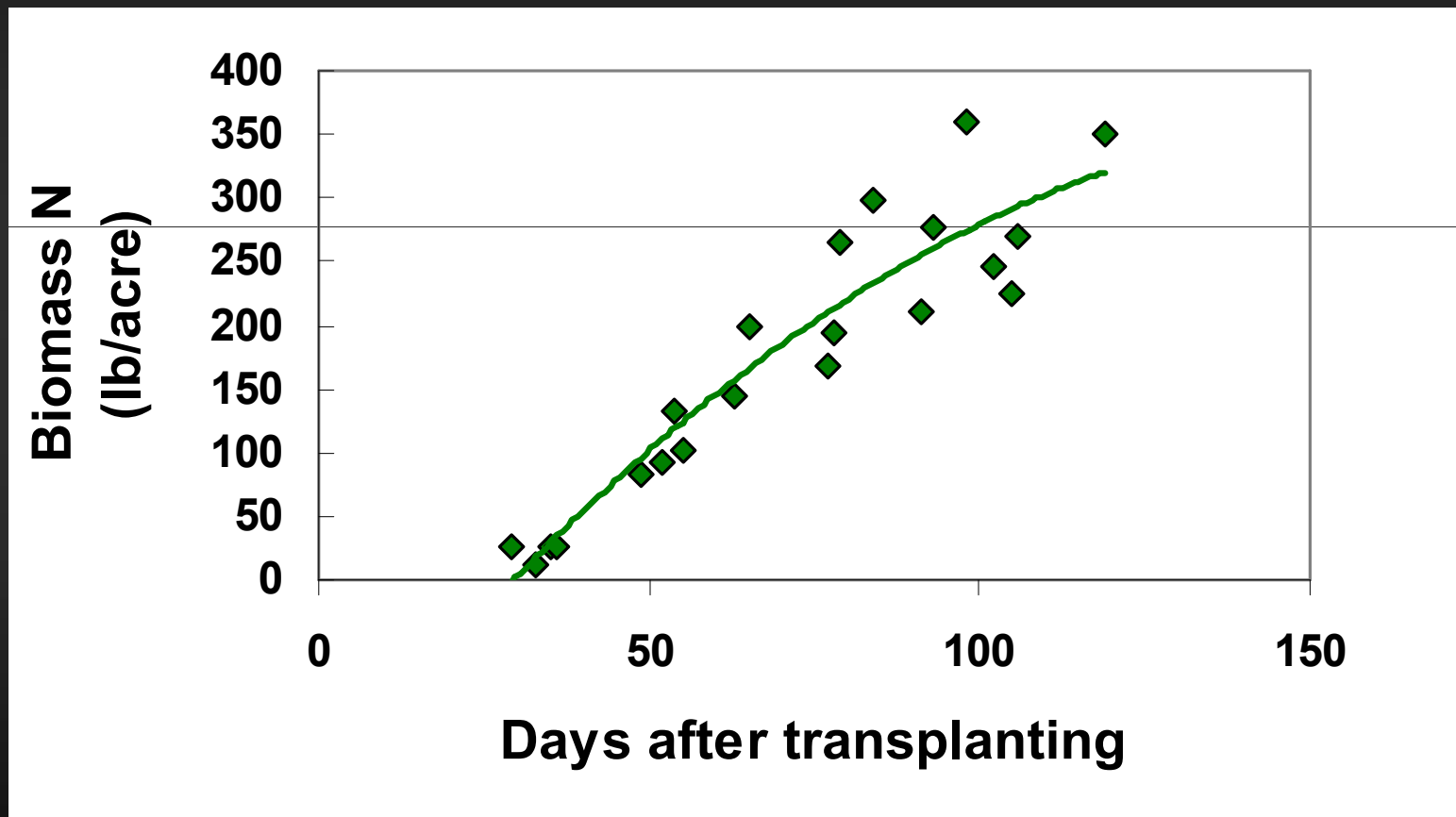
Efficient N fertigation management

N uptake of the 4 highest yielding fields :

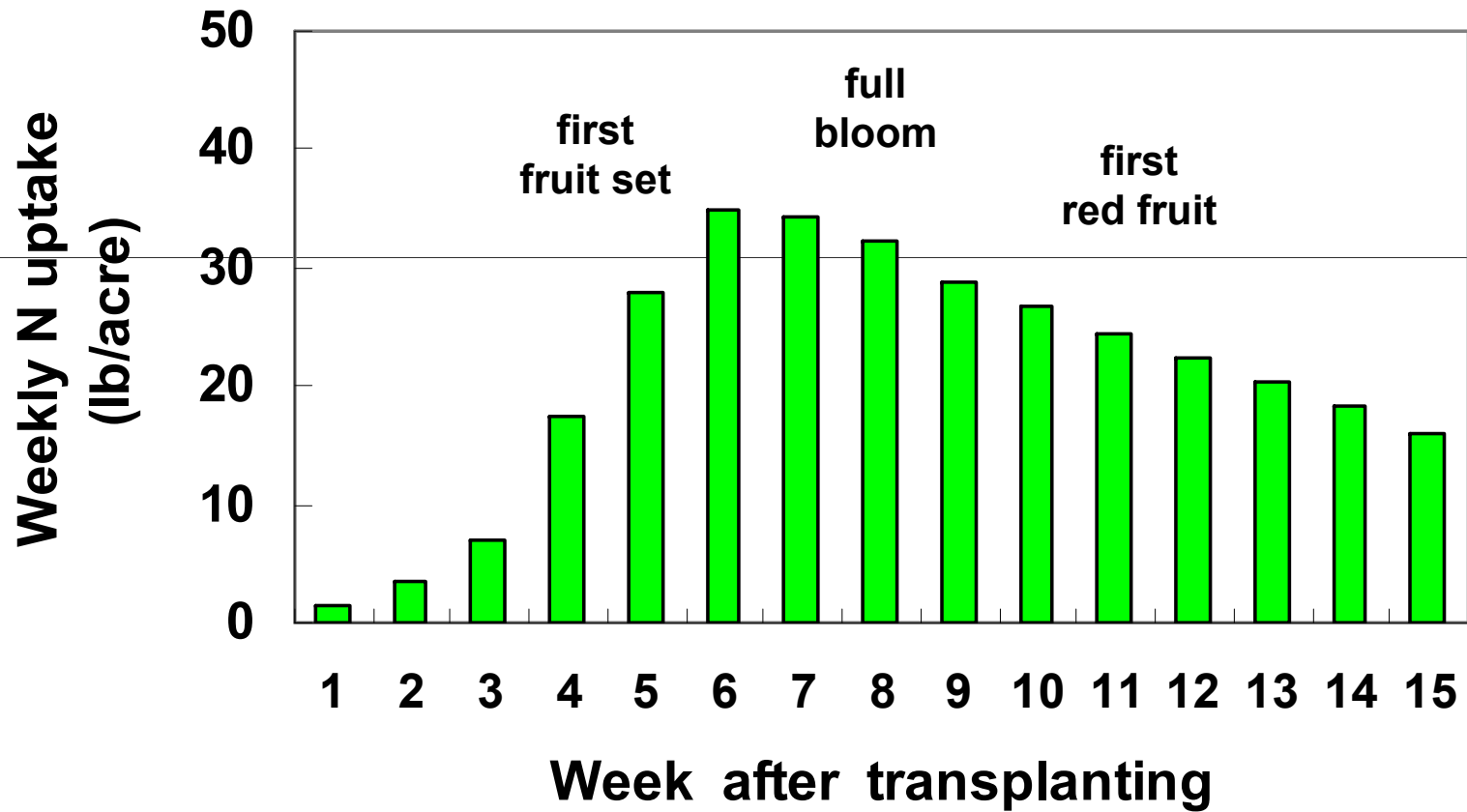


Efficient N fertigation management

N uptake of the 4 highest yielding fields :



Crop N uptake rate :



What is a reasonable N fertigation template ?

Growth stage	Duration (weeks)	N fertigation rate <i>no more than</i> * (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

*** Not all plant N uptake comes from fertilizer**

Phosphorus dynamics :

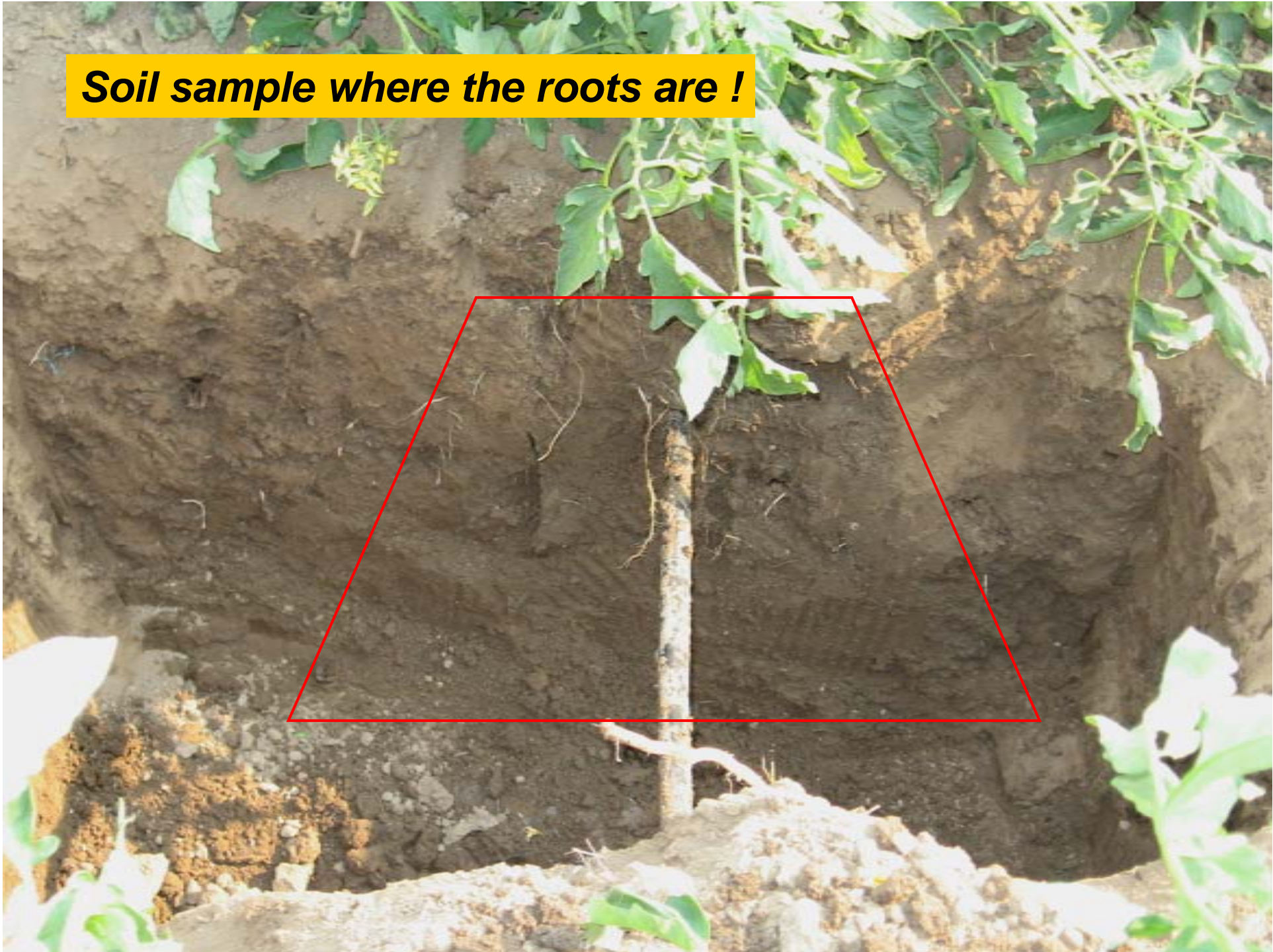
	Fruit yield (tons/acre)	Phosphorus (lb P ₂ O ₅ equivalent/acre)		
		applied	total uptake	removed with fruit
Field 6	71	53	107	81
UCD 08	70	70	98	72
UCD 07	61	70	84	67
Field 3	59	90	79	60
Field 2	51	14	63	42
Field 4	51	32	81	60
Field 5	49	67	70	53
Field 1	45	14	58	42
average	57	51	80	60



P management :

- ✓ yield response threshold \approx 20 PPM Olsen P
- ✓ for buried drip fields soil test the major root zone

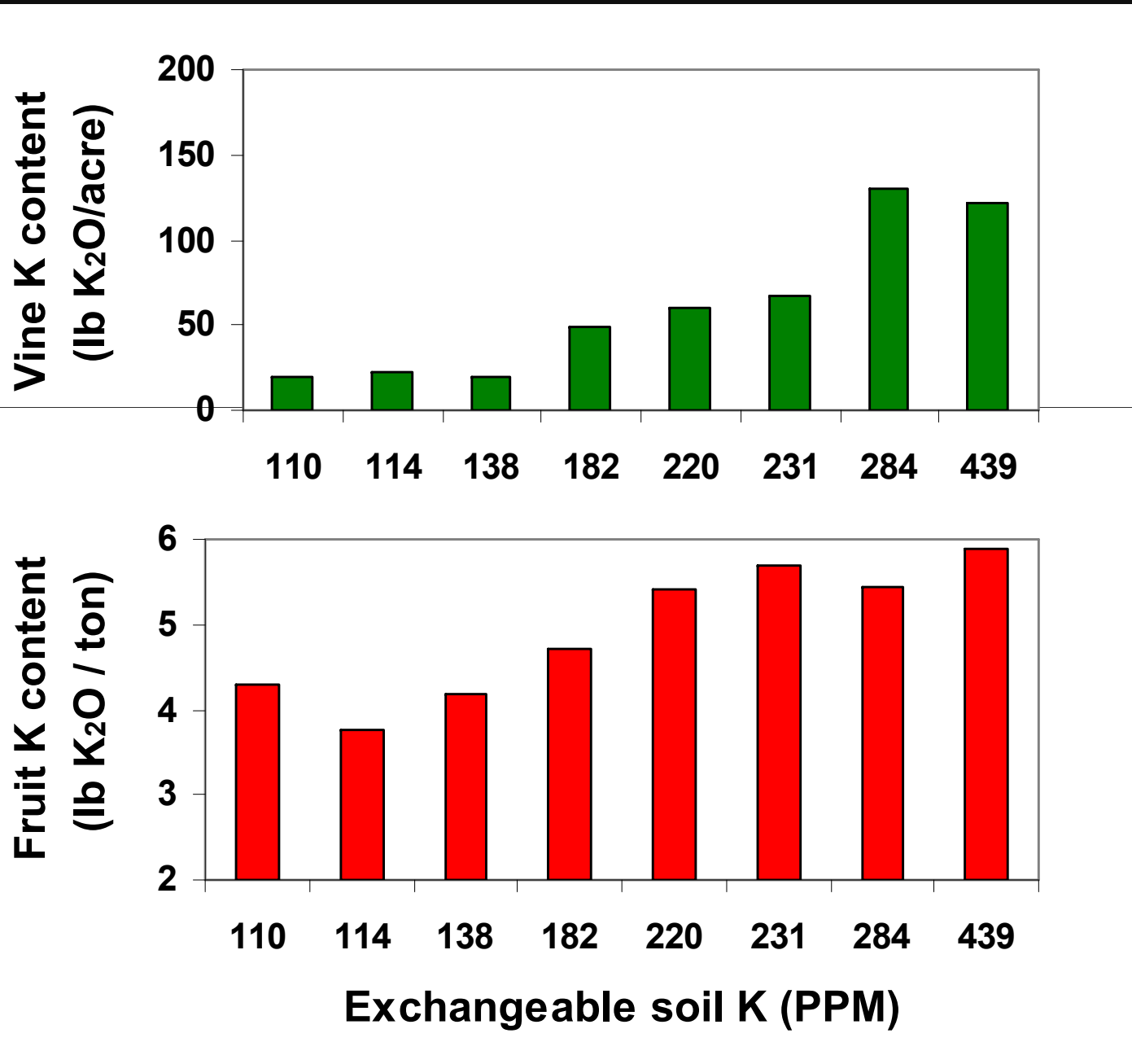
Soil sample where the roots are !



Potassium dynamics :

	Fruit yield (tons/acre)	Potassium (lb K ₂ O equivalent/acre)		
		applied	total uptake	removed with fruit
Field 6	71	0	541	419
UCD 08	70	0	511	381
UCD 07	61	0	418	358
Field 3	59	33	273	253
Field 2	51	18	233	213
Field 4	51	0	357	290
Field 5	49	0	280	231
Field 1	45	24	192	169
average	57	9	351	289

At harvest ...

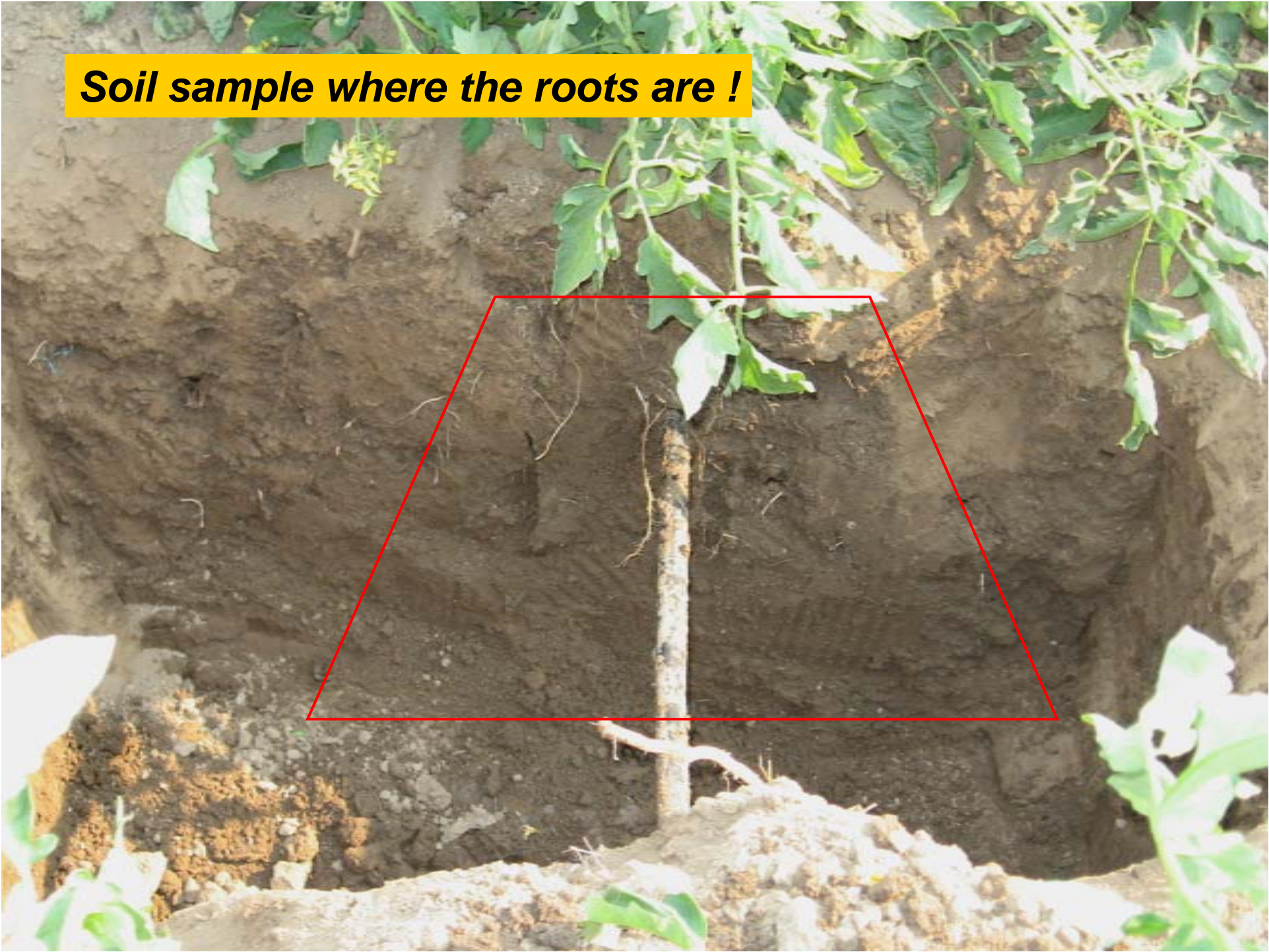




K management :

- ✓ **approximate yield response threshold**
 - **soils < 150 PPM likely to respond to K fertigation**
 - **soils up to 250 PPM potentially responsive**
- ✓ **current practices degrade soil K fertility**

Soil sample where the roots are !



How and when to apply K ?

- ✓ in soil with K fixation capacity, fertigation is best
- ✓ best timing is during fruit set



What about tissue sampling ?

Sample type	Nutrient	Sufficiency level		
		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 NO3-N	8,000	3,000	
	PPM PO4-P	2,500	2,000	??
	% K	4.5	3.0	

Drip Irrigation and Fertigation Management of Processing Tomato

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A. Drip Irrigation Management

Drip system design

The standard approach to drip irrigating tomatoes has been to use a buried system which remains in place for a period of years before field renovation. Drip tape is typically buried 10-12 inches deep, one line per 60-66 inch soil bed. In recent years some growers have used “in-furrow” drip systems in which drip tape is laid in every furrow, or every other furrow, after crop establishment. Many factors affect the choice between buried or surface drip systems: system cost, labor availability, crop rotation pattern, soil type, etc. The general experience has been that buried systems offer higher yield potential, but cost more to install and maintain. The main advantage of surface drip, beyond lower initial cost, is that it is mobile, able to be moved each year as the tomato crop is rotated.

Available at : www.vric.ucdavis.edu

