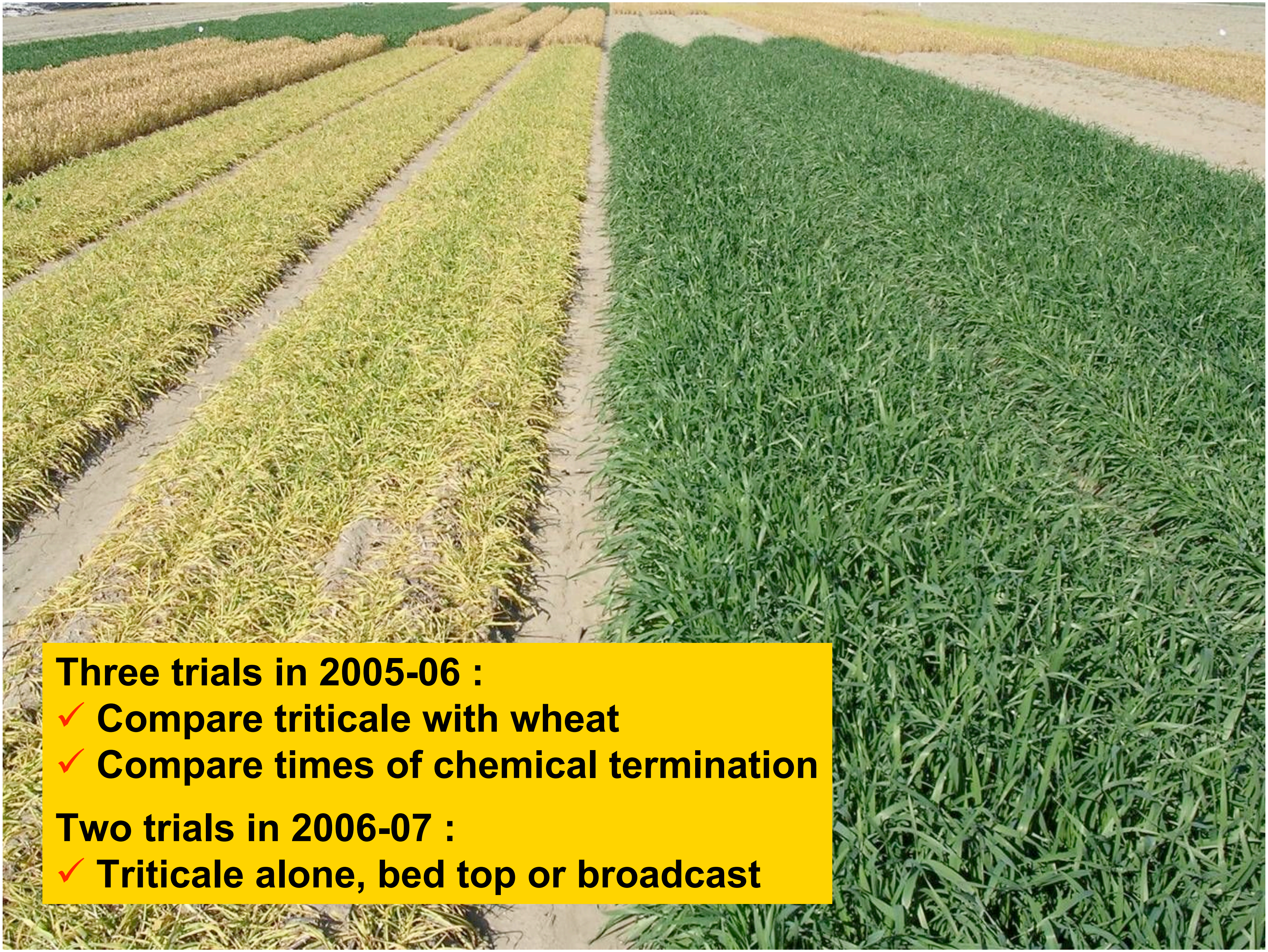

Low biomass cover crops for tomato production


Three trials in 2005-06 :
✓ Compare triticale with wheat
✓ Compare times of chemical termination
Two trials in 2006-07 :
✓ Triticale alone, bed top or broadcast


Approach :
✓ Seed late October - early November
✓ Roundup application mid February - early March

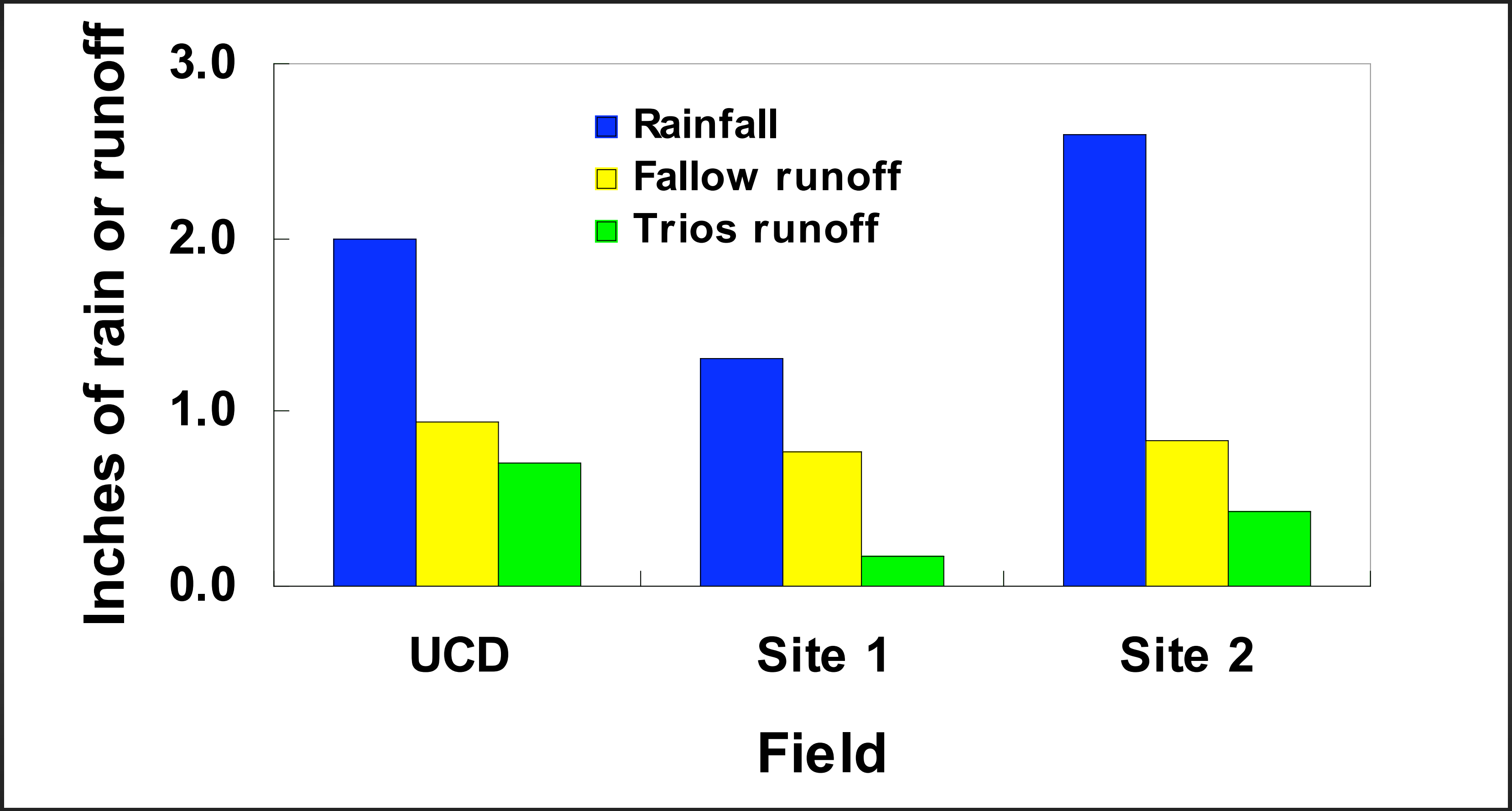
How much biomass is produced ?

≈ 1 dry ton/acre

2 - 4 dry tons/acre

Environmental benefits realized ?

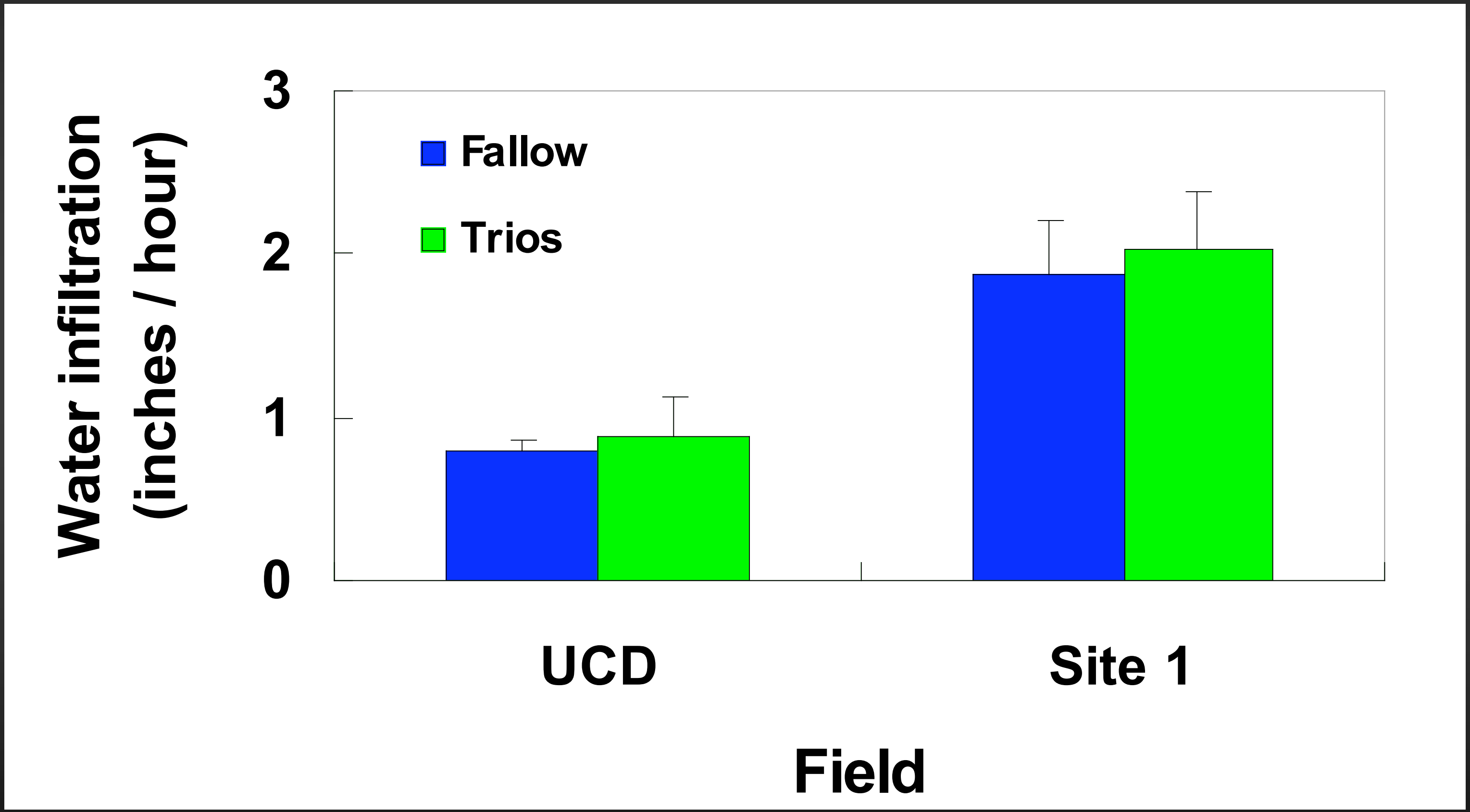
Runoff reduced substantially …

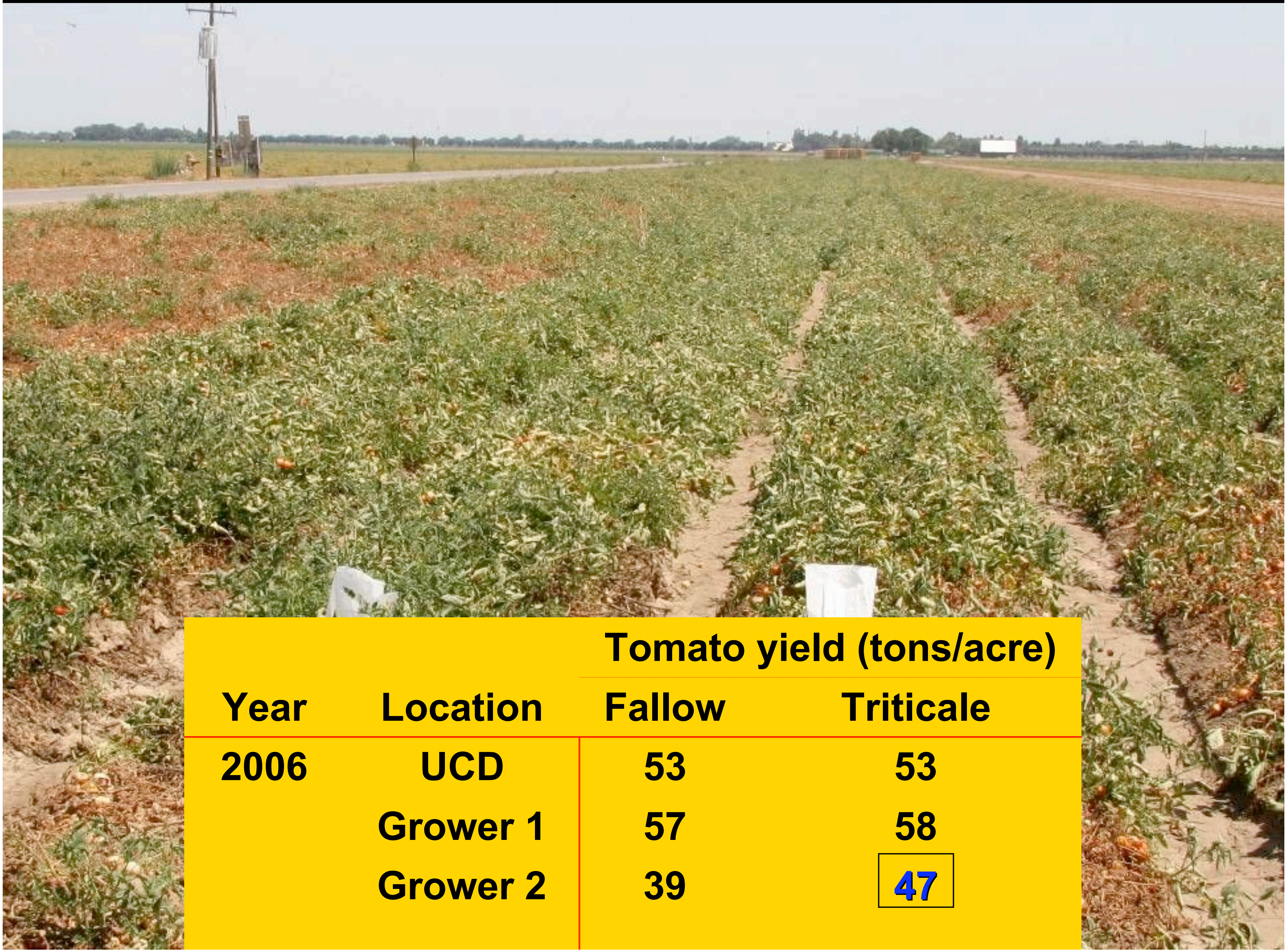


Runoff from storm of Feb 27, 2006

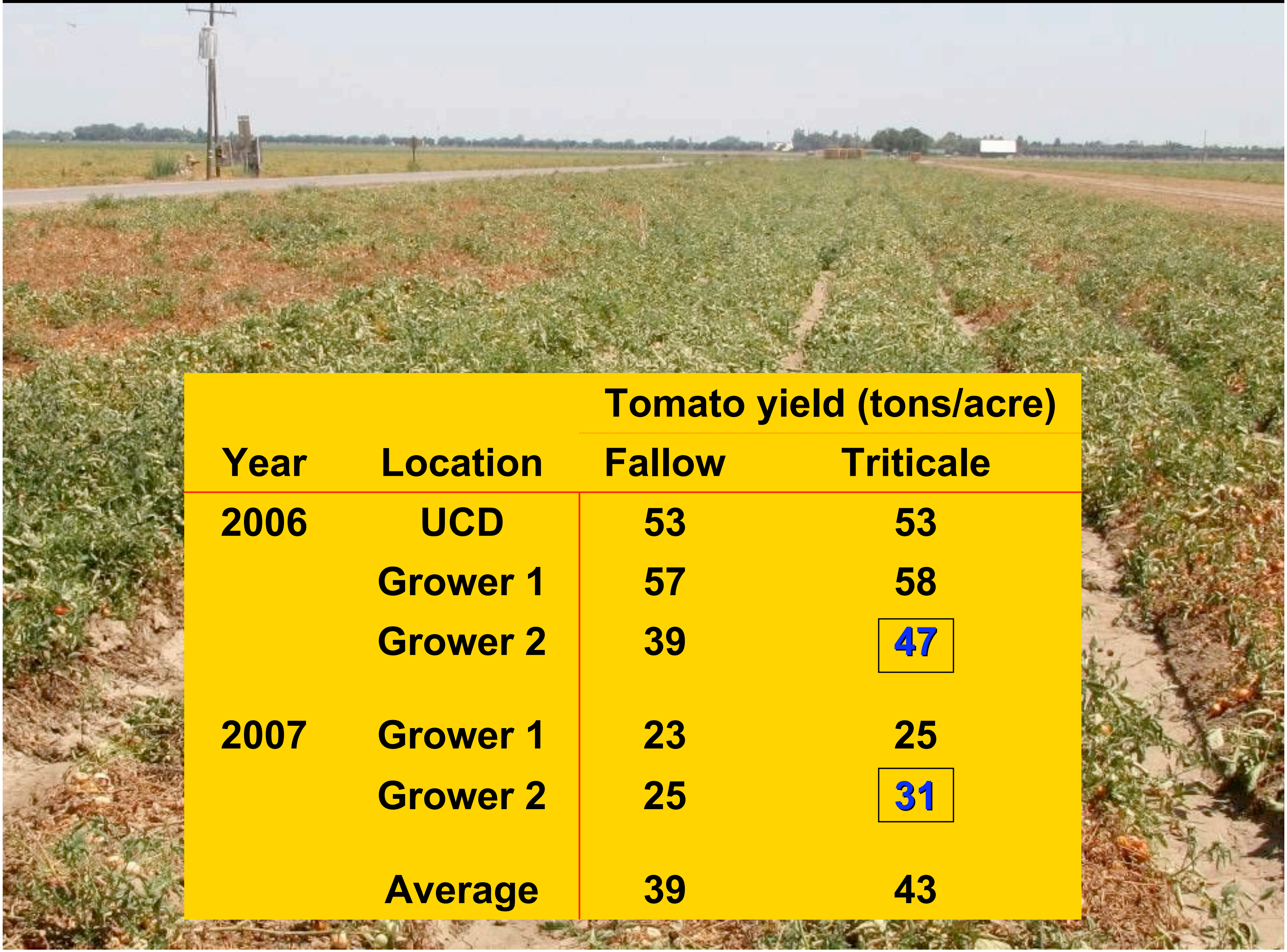
Tomato production benefits realized ?

Water infiltration apparently not enhanced …



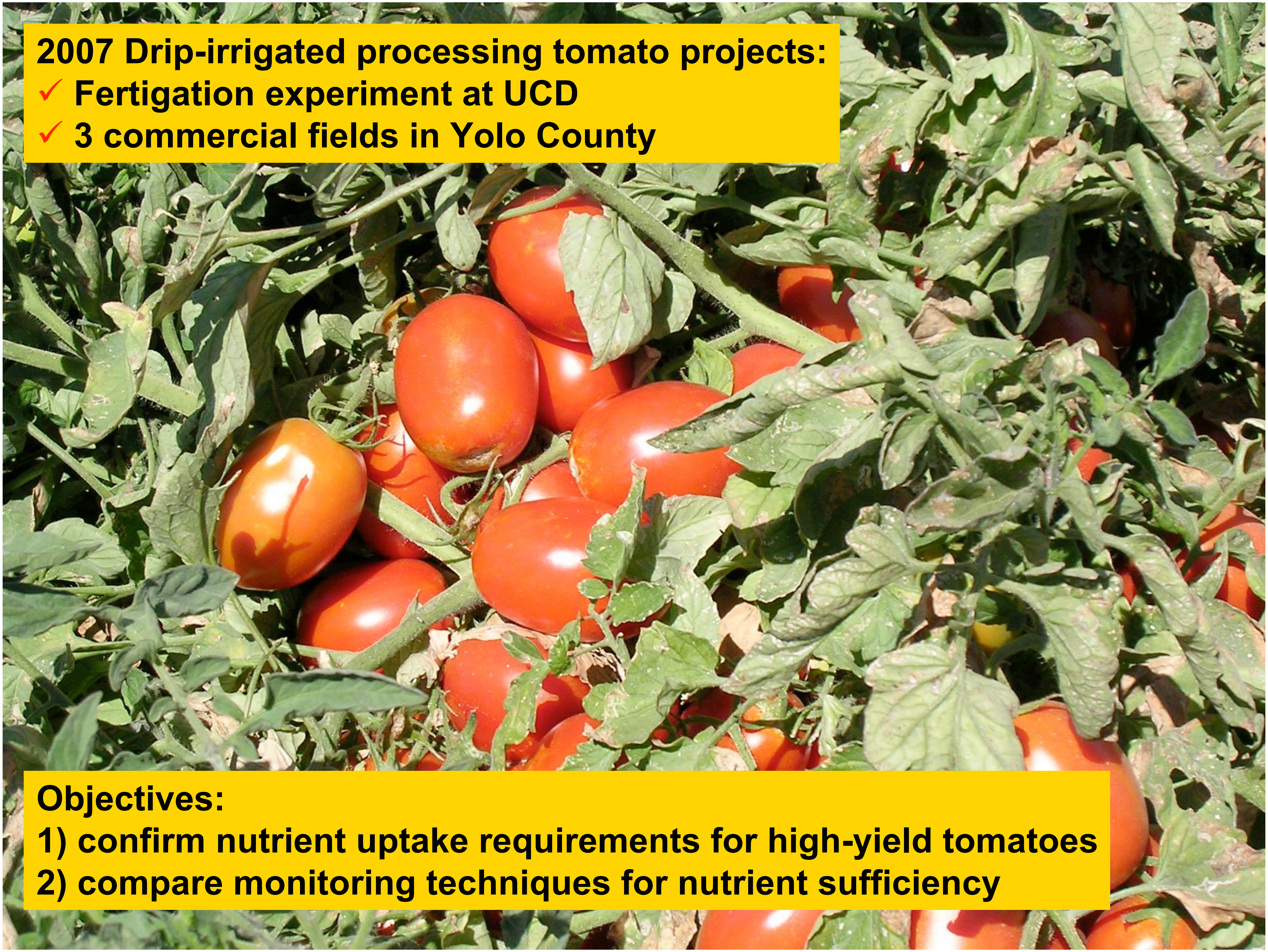



Year	Location	Tomato yield (tons/acre) Fallow	Triticale
2006	UCD	53	53
	Grower 1	57	58
	Grower 2	39	47



Year	Location	Tomato yield (tons/acre) Fallow	Triticale
2006	UCD	53	53
	Grower 1	57	58
	Grower 2	39	47
2007	Grower 1	23	25
	Grower 2	25	31
	Average	39	43


Nutrient management for drip-irrigated tomato production

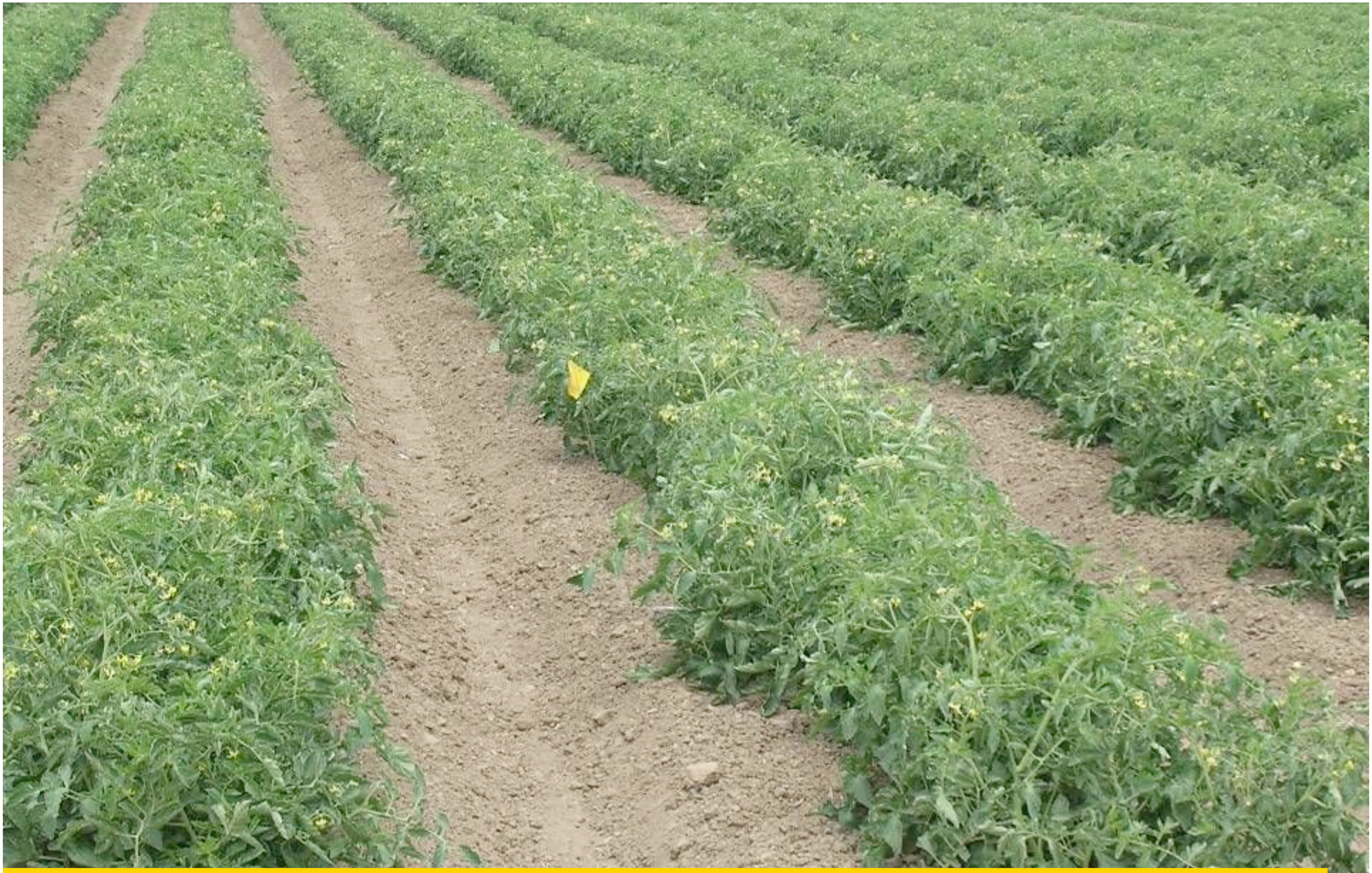

2007 Drip-irrigated processing tomato projects:
✓ Fertigation experiment at UCD
✓ 3 commercial fields in Yolo County
Objectives:
1) confirm nutrient uptake requirements for high-yield tomatoes
2) compare monitoring techniques for nutrient sufficiency


Treatments at UCD:
➢ deficient N
➢ deficient P
➢ sufficient N and P
➢ excessive N and P
AB 2 and Heinz 9780
3 replications per treatment

	lb/acre		
	Preplant P_2O_5	Preplant N	Fertigated N
deficient N	70	23	57
deficient P	0	0	167
sufficient N and P	70	23	167
excessive N and P	140	46	247

Commercial fields :

- **All low soil P (< 15 PPM) and low soil K (< 140 PPM)**
- **Conservative in-season fertigation of 160-175 lb N, < 30 lb K**



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

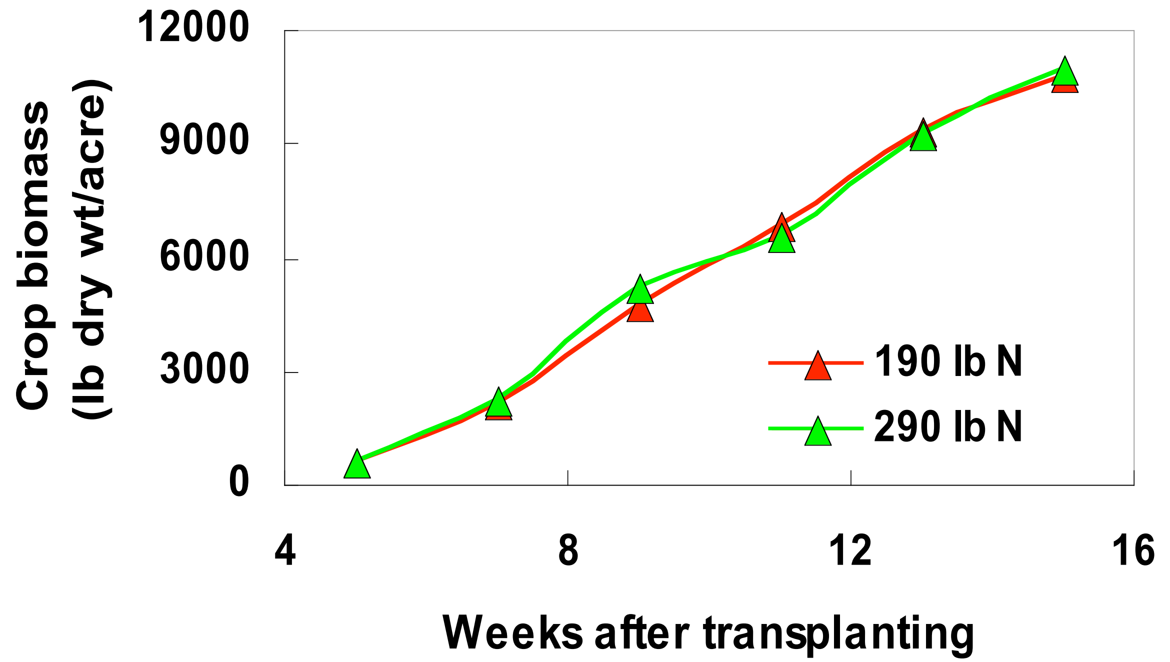
- **whole plant sampling for growth and total nutrient uptake**
- **leaf and petiole analysis**

	Fruit yield (tons/acre)	Crop nutrient uptake (lb/acre)		
		N	P	K
UCD sufficient N & P	58			
Field 1	45			
Field 2	51			
Field 3	59			

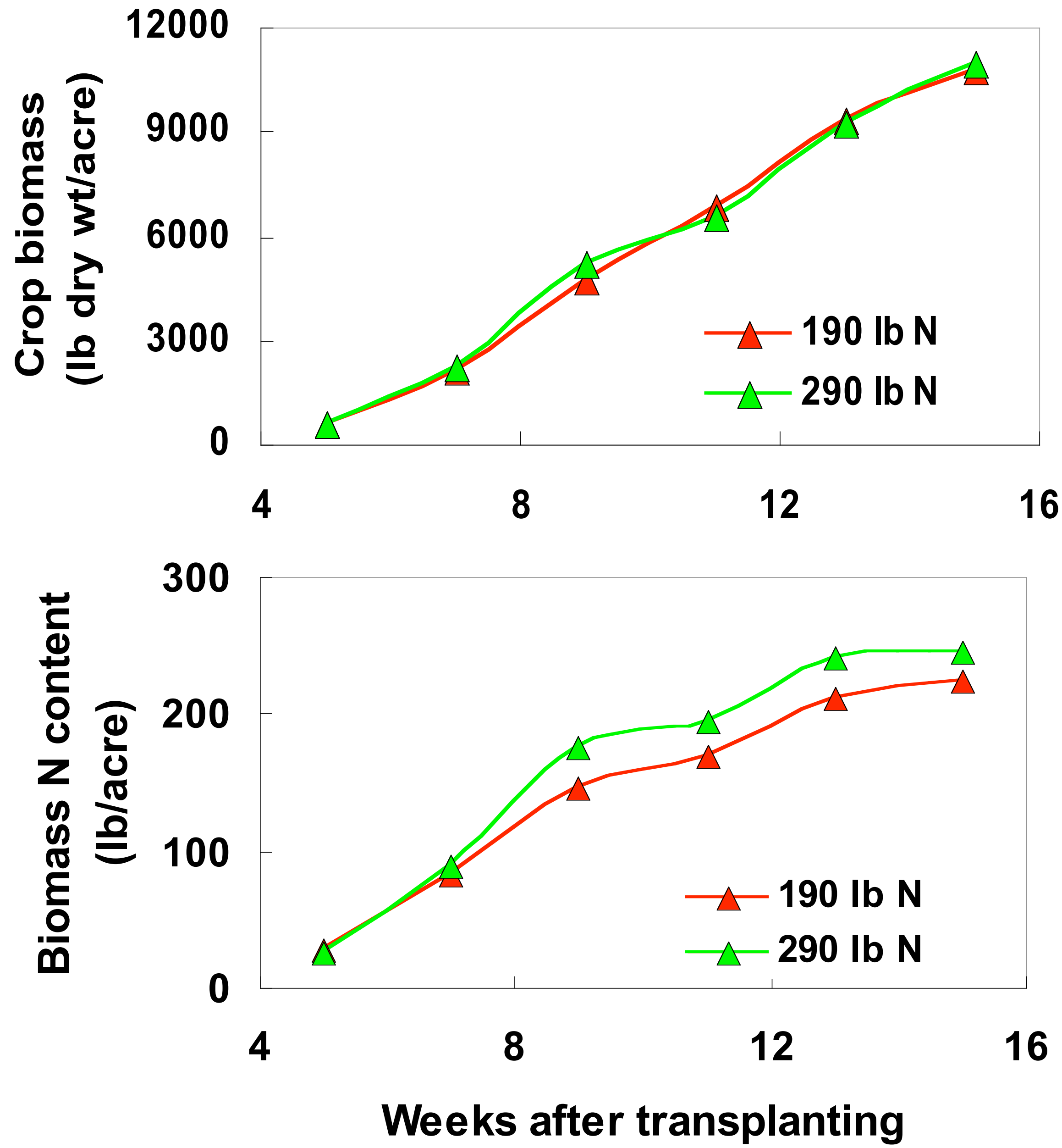
	Fruit yield (tons/acre)	Crop nutrient uptake (lb/acre)		
		N	P	K
UCD sufficient N & P	58	210		
Field 1	45	200		
Field 2	51	240		
Field 3	59	250		

	Fruit yield (tons/acre)	Crop nutrient uptake (lb/acre)		
		N	P	K
UCD sufficient N & P	**58**	**210**	**34**	
Field 1	**45**	**200**	**25**	
Field 2	**51**	**240**	**27**	
Field 3	**59**	**250**	**34**	

	Fruit yield (tons/acre)	Crop nutrient uptake (lb/acre)		
		N	P	K
UCD sufficient N & P	58	210	34	320
Field 1	45	200	25	160
Field 2	51	240	27	190
Field 3	59	250	34	230



UCD sufficient and excessive N & P treatments



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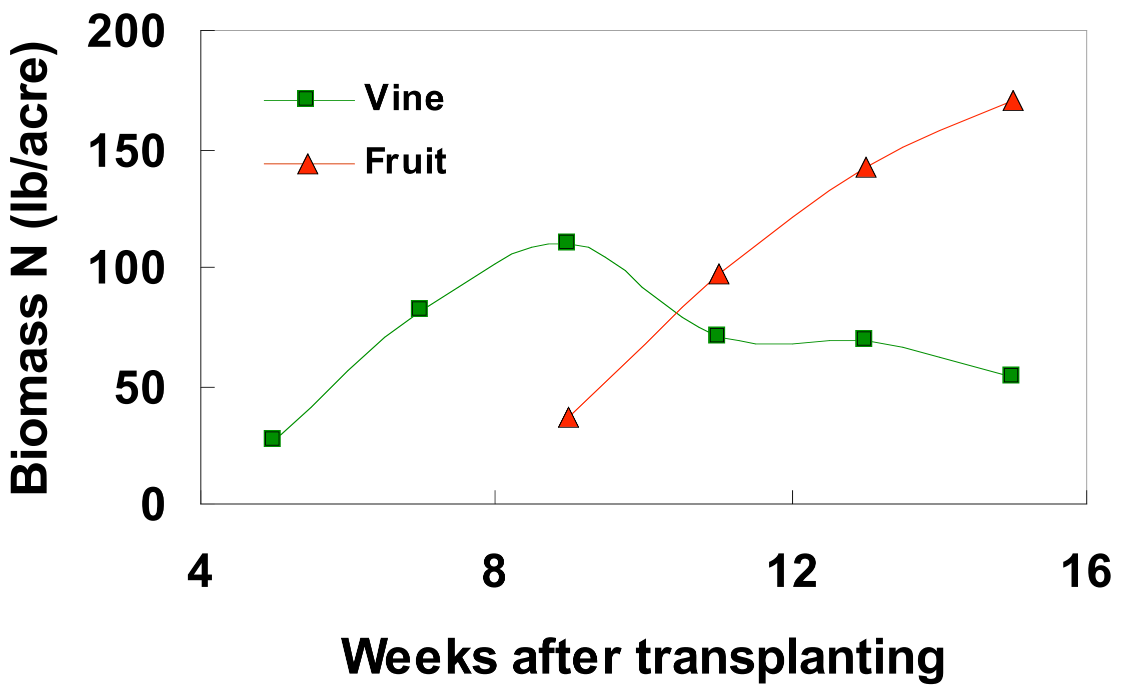

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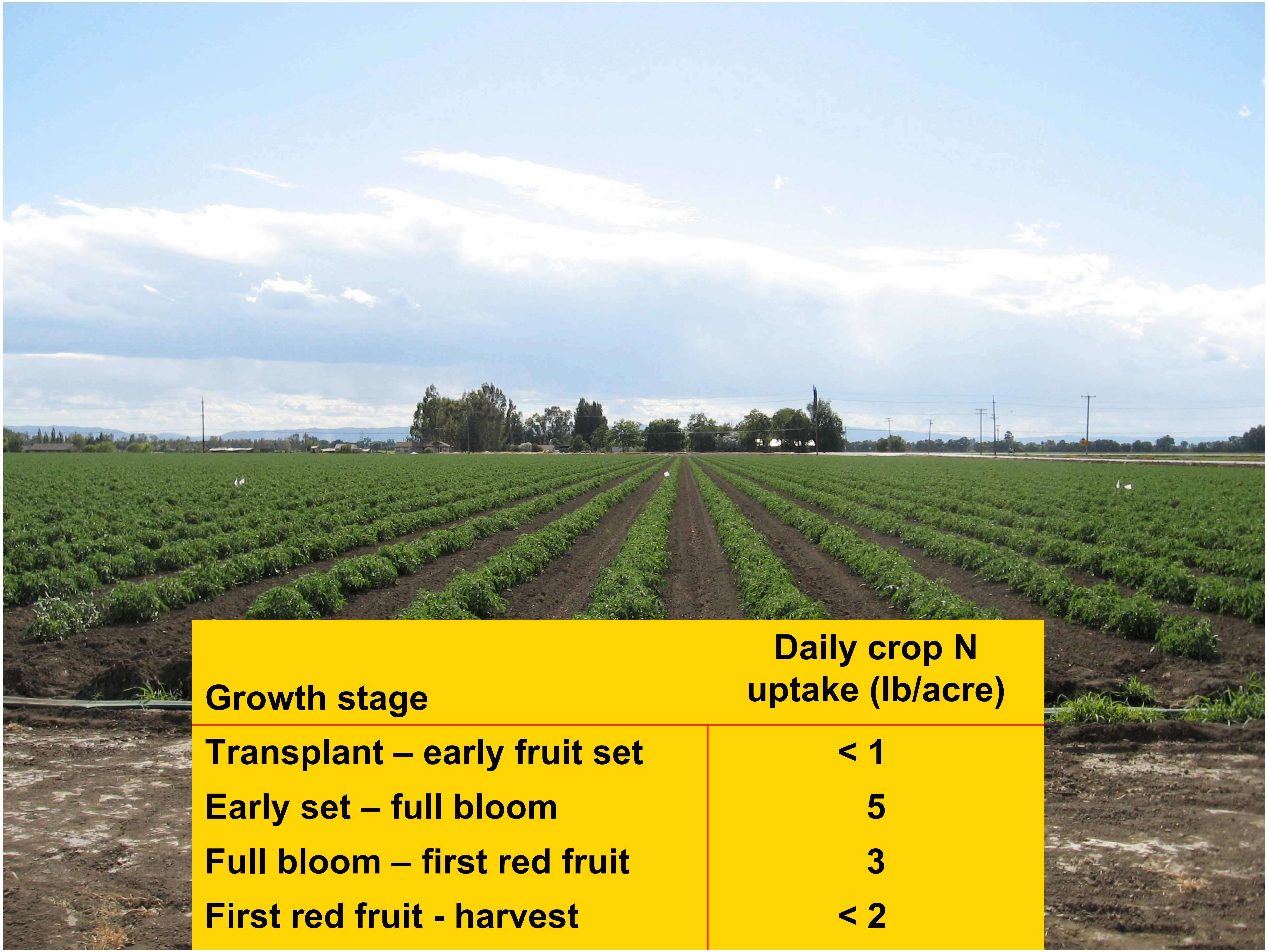
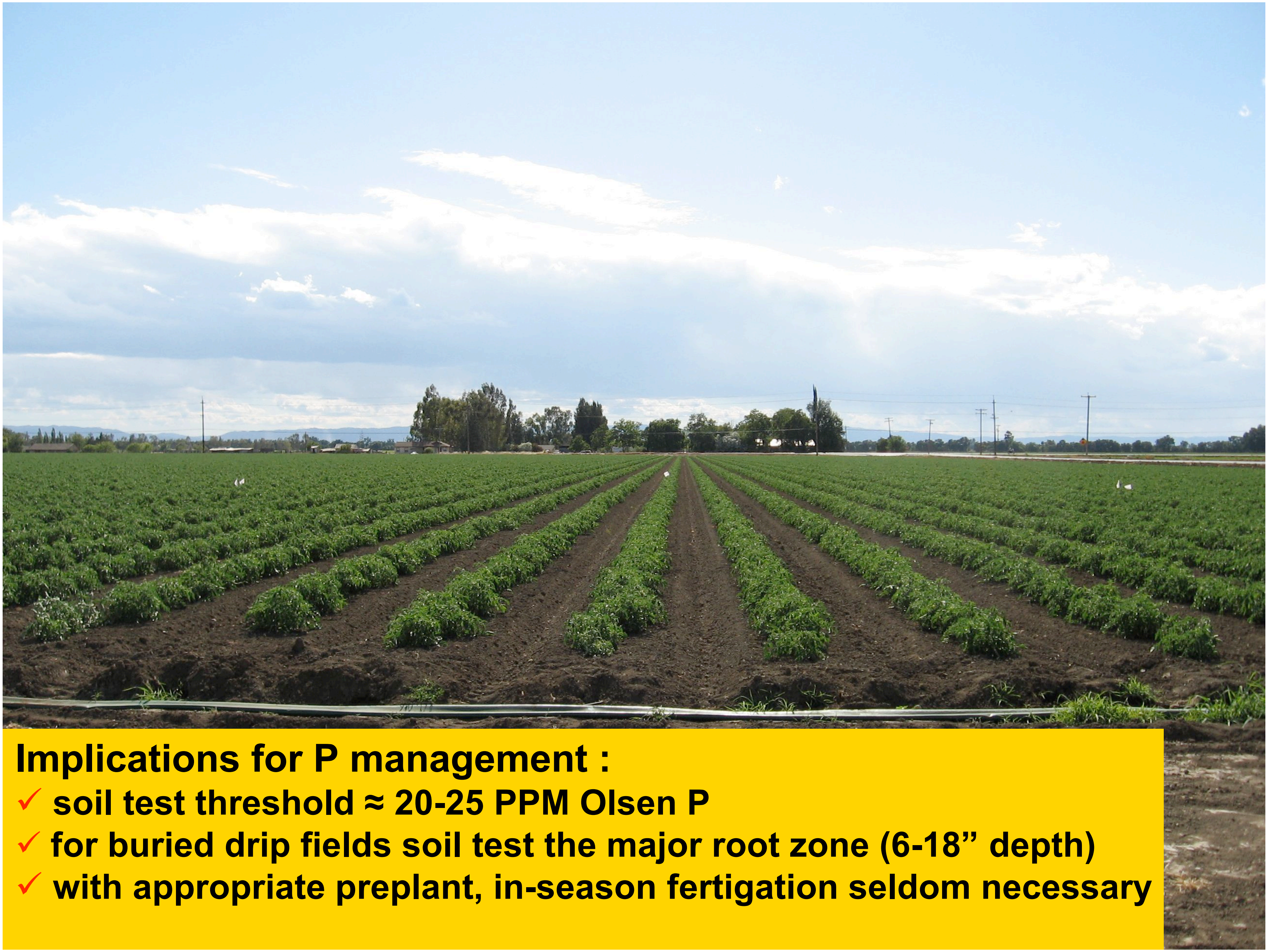


Growth stage	Daily crop N uptake (lb/acre)
Transplant – early fruit set	< 1
Early set – full bloom	5
Full bloom – first red fruit	3
First red fruit - harvest	< 2

Implications for N management :

- ✓ **crop N demand is predictable**
- ✓ **not all N needs to come from fertilizer**
  - **- seasonal N rates > 200 lb/acre seldom justified, less needed in high NO_3-N residual fields**
- ✓ **N fertigation should be concentrated from early set through full bloom**

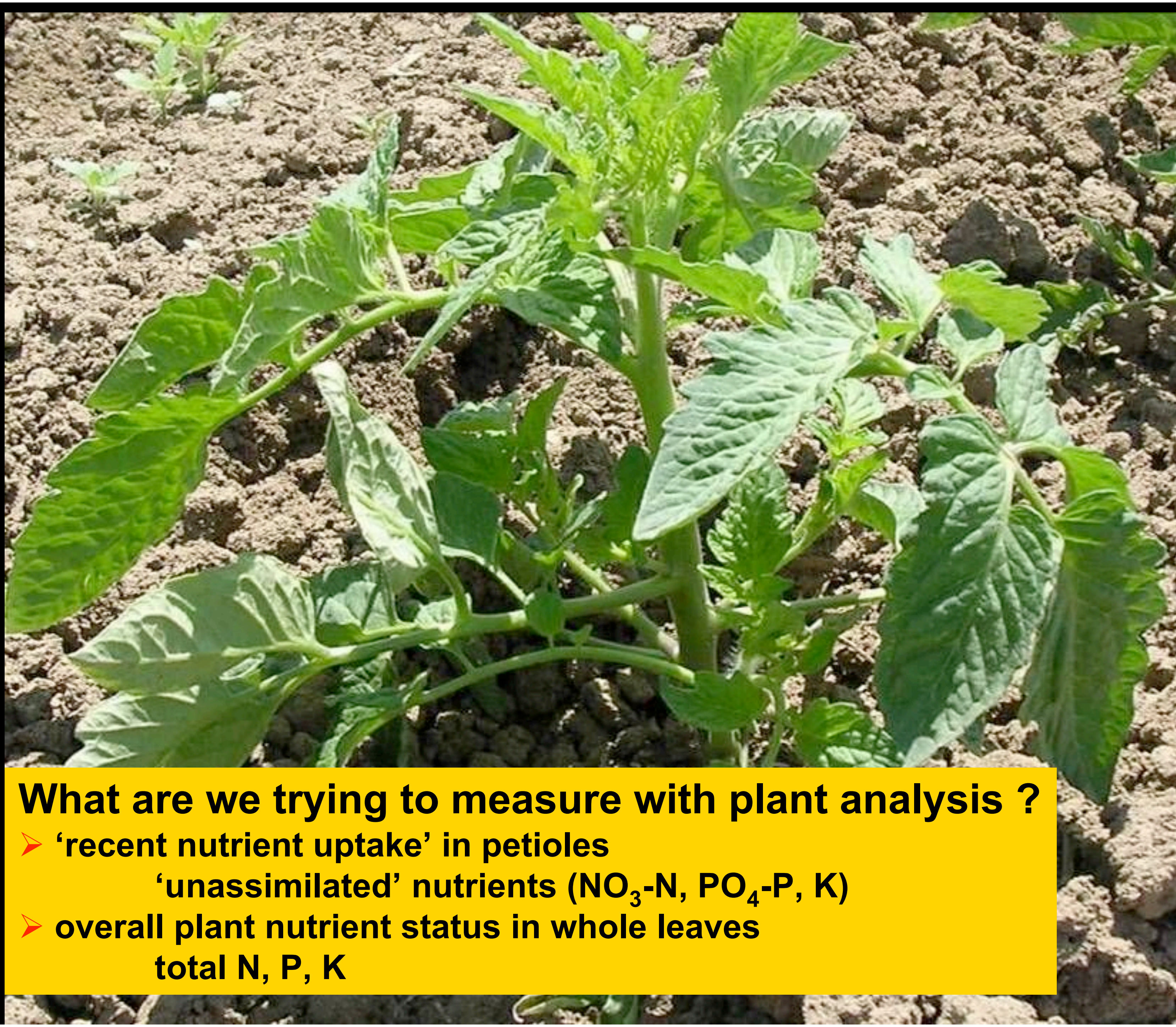


Implications for P management :

- ✓ soil test threshold ≈ 20-25 PPM Olsen P
- ✓ for buried drip fields soil test the major root zone (6-18” depth)
- ✓ with appropriate preplant, in-season fertigation seldom necessary

Implications for K management :

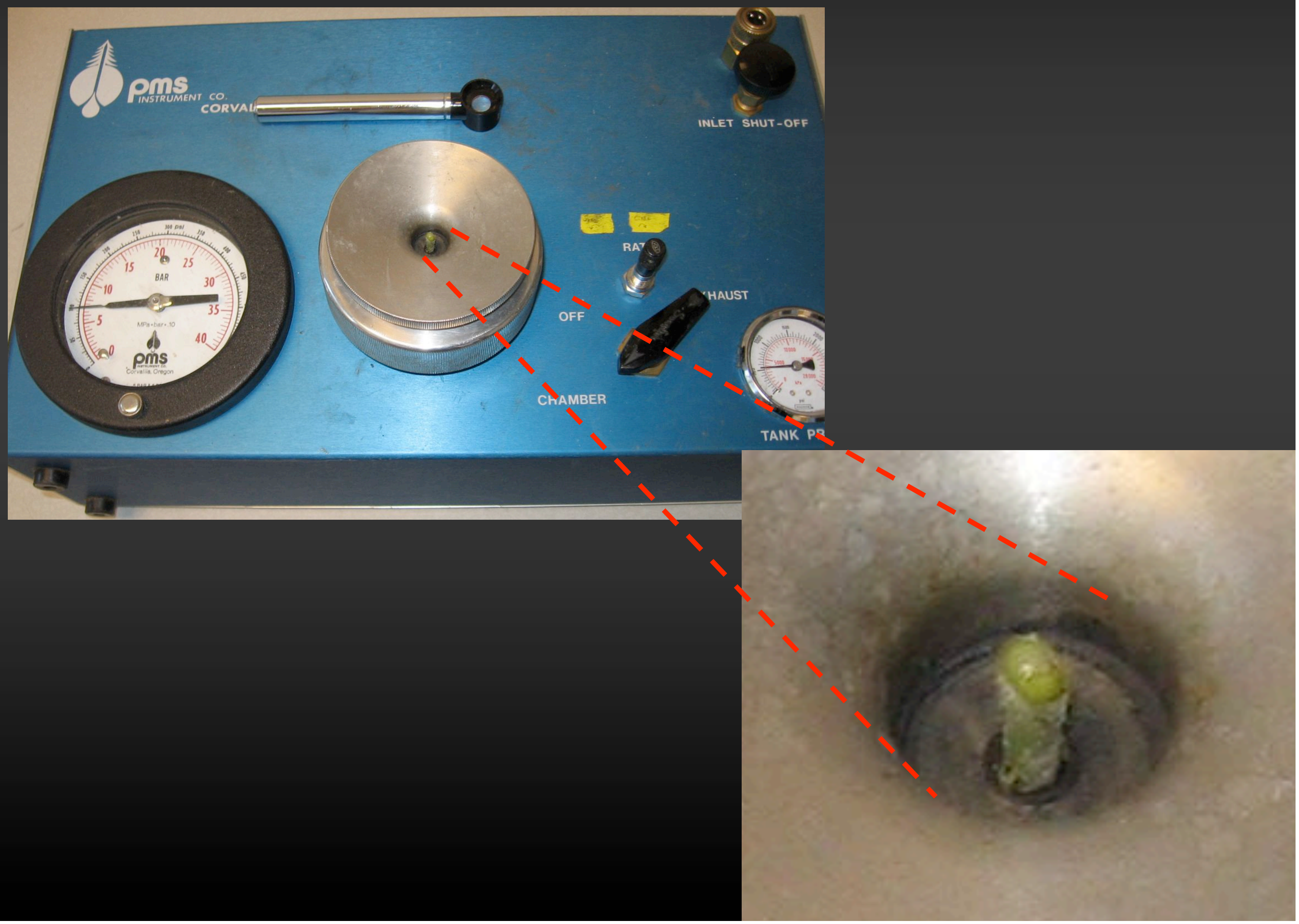
- ✓ for buried drip fields soil test the major root zone (6-18" depth)
- ✓ soil test K threshold hard to pin down
    - for soils < 150 PPM likely to require K fertigation
    - soils up to 250 PPM may require fertigation
- ✓ use tissue analysis to guide K fertigation program



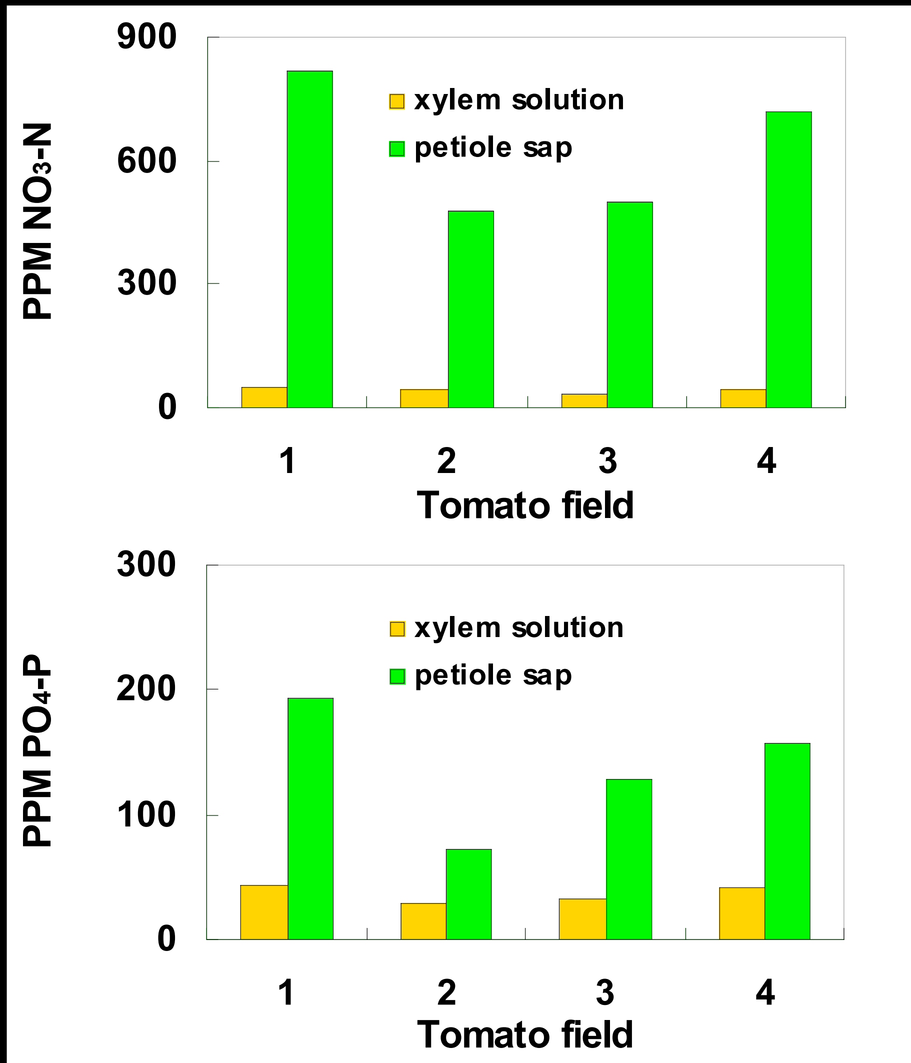
What are we trying to measure with plant analysis ?

- **‘recent nutrient uptake’ in petioles**
  ‘unassimilated’ nutrients (NO_3-N, PO_4-P, K)
- **overall plant nutrient status in whole leaves**
  total N, P, K

Does petiole analysis really show ‘recent’ nutrient uptake ?



2007 Processing tomato monitoring, early fruit set



Conclusion :

- **most petiole NO_3-N and PO_4-P are already stored in plant cells,** ***and therefore subject to many confounding influences***

2007 UCD fertigation trial

Limitations of petiole analysis :

✓ plants stockpile small amounts of unassimilated nutrients,
so petiole concentrations can change rapidly

Excess N treatment :

Growth stage	lb/acre Total plant N content	Total plant NO_3-N content	N uptake/day
Early bloom	28	3	1
Mid fruit set	89	11	4

Whole leaf analysis :

Advantages:

✓ Correlates with whole plant nutrient status

2007 UCD fertigation trial

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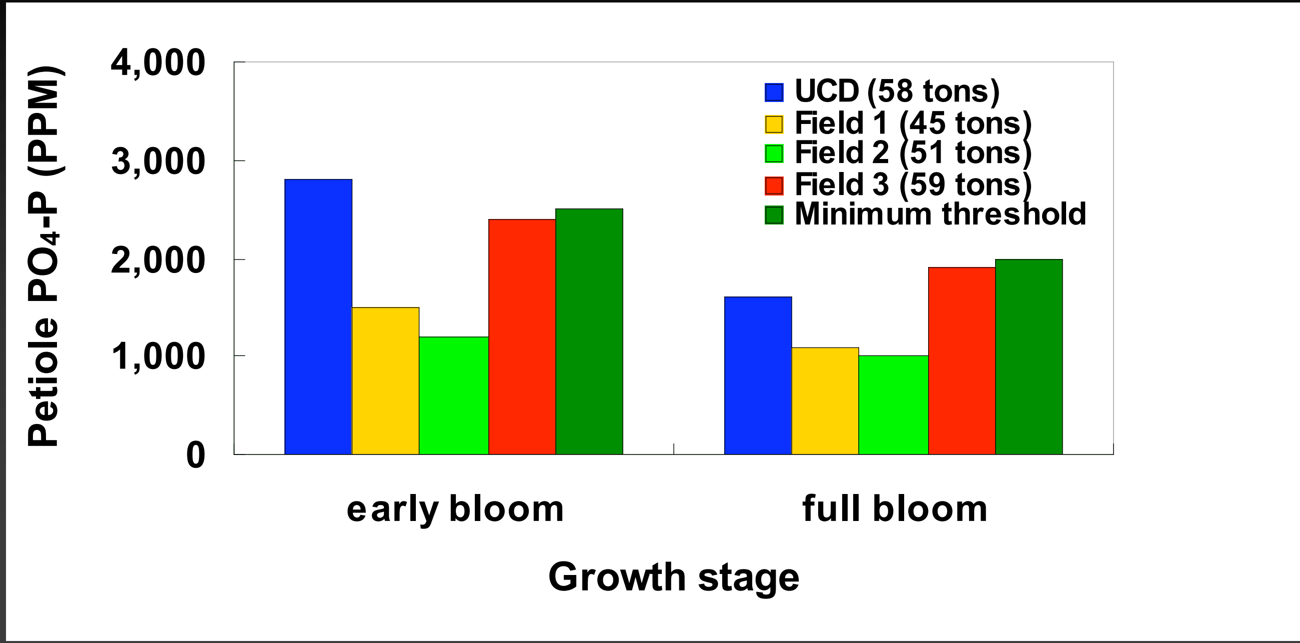
Excess N treatment :

	lb/acre		
Growth stage	Total plant N content	N uptake/day	Daily uptake as % of biomass N
Early bloom	28	1	4
Mid fruit set	89	4	4

High leaf N can indicate sufficient biomass N to accommodate 7+ days of crop growth

Comparing petiole and whole leaf analysis :

2007 monitoring :



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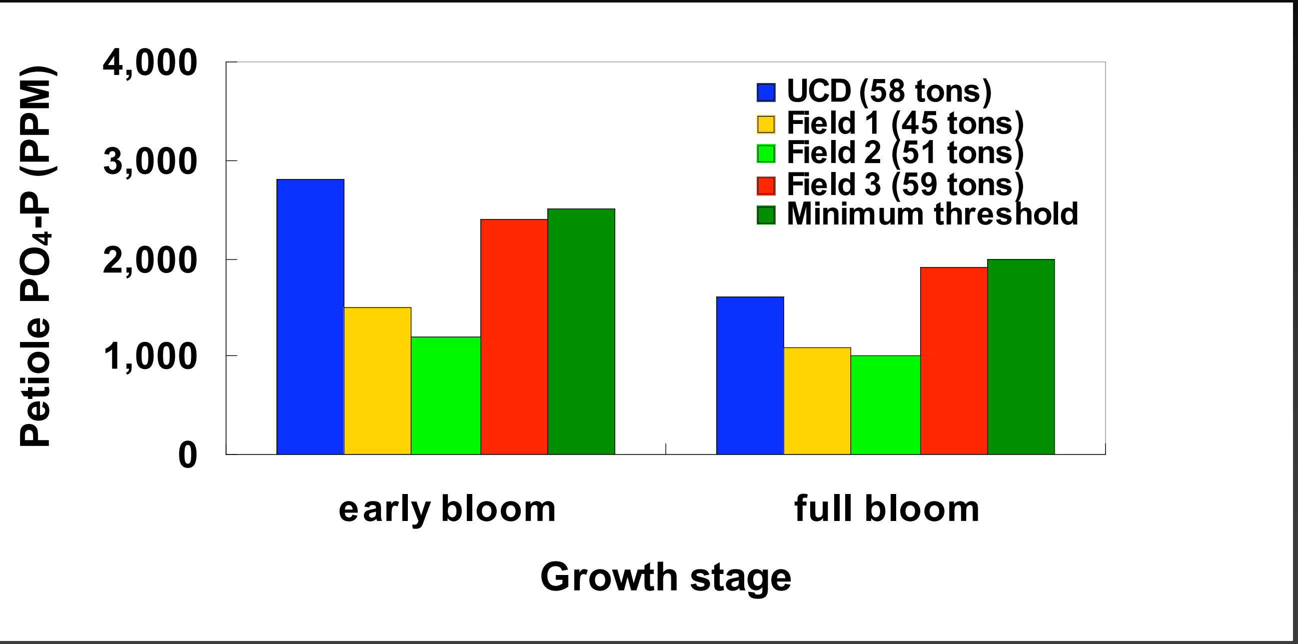

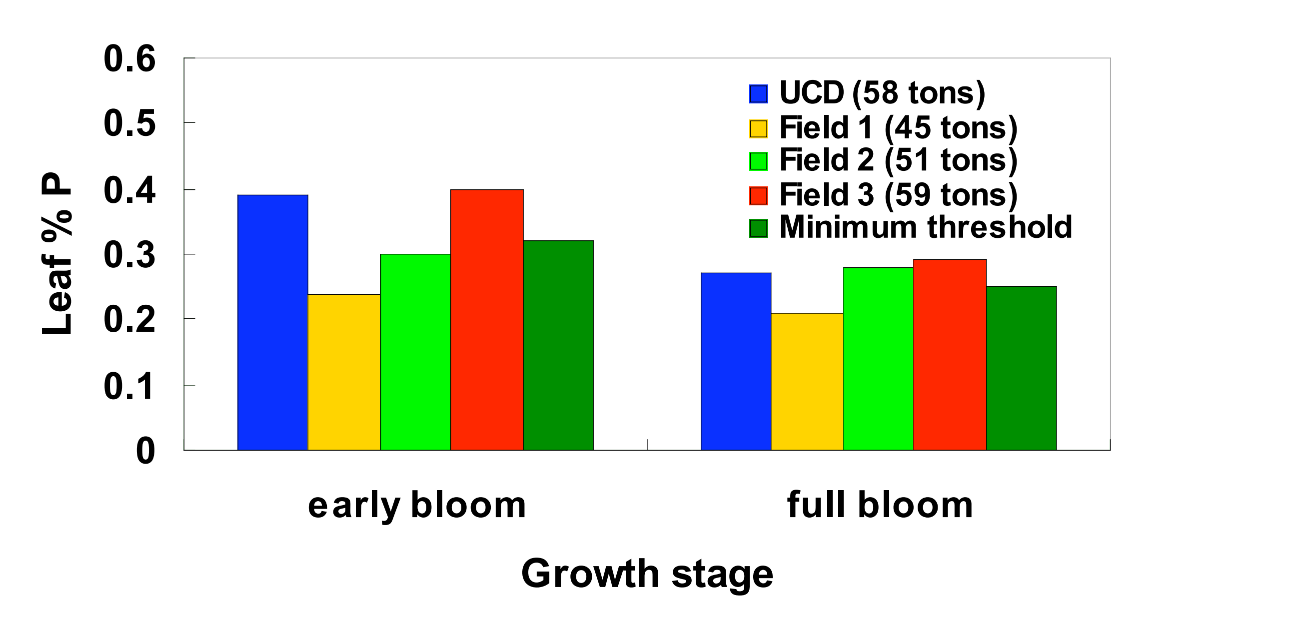

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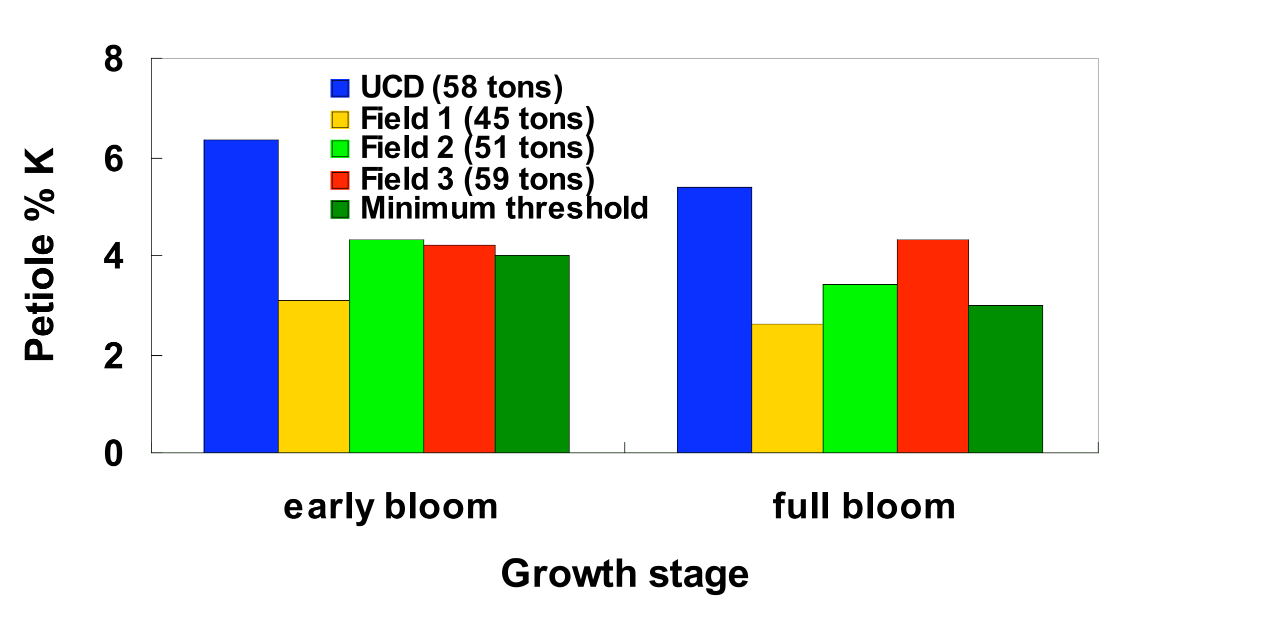

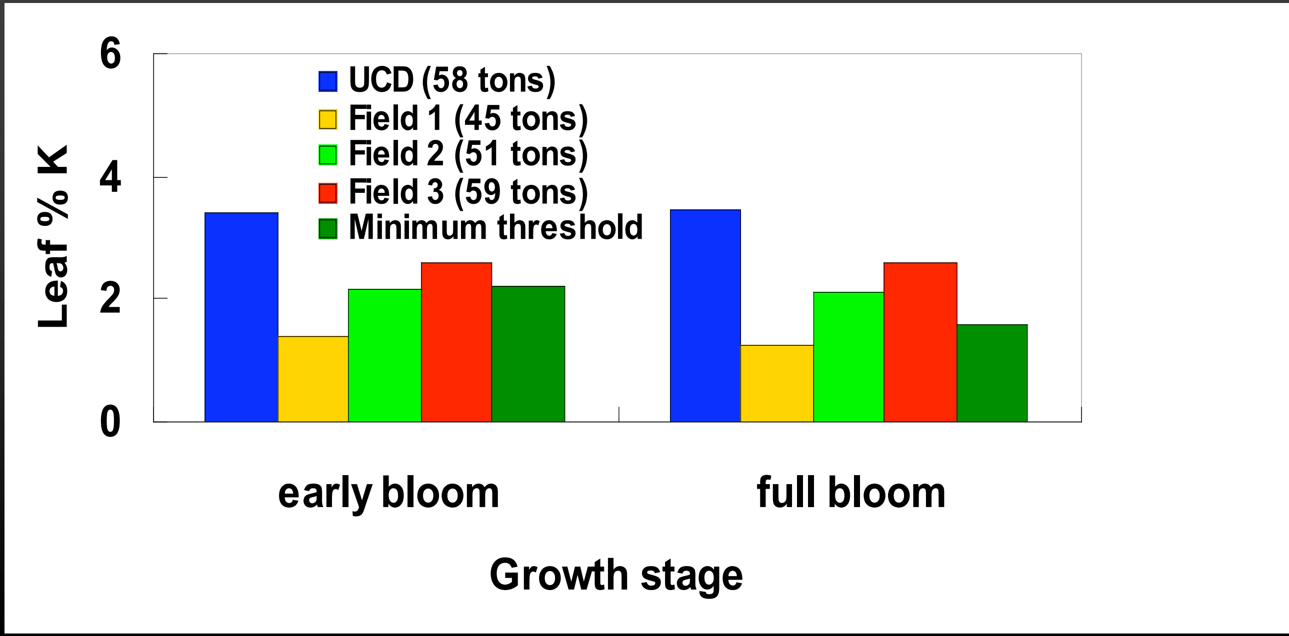

Bottom line on tissue analysis :

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Bottom line on tissue analysis :

- ✓ current petiole NO_3-N and PO_4-P sufficiency levels are too high
- ✓ petiole analysis can document current sufficiency, but nothing more
- ✓ leaf analysis for total N and P is more stable, more reliable measure of crop nutrient status
- ✓ crop K status can be estimated by either tissue test