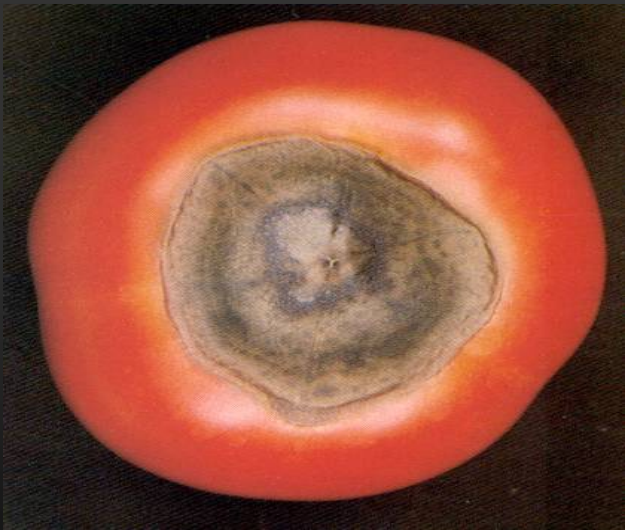




Understanding soil calcium issues



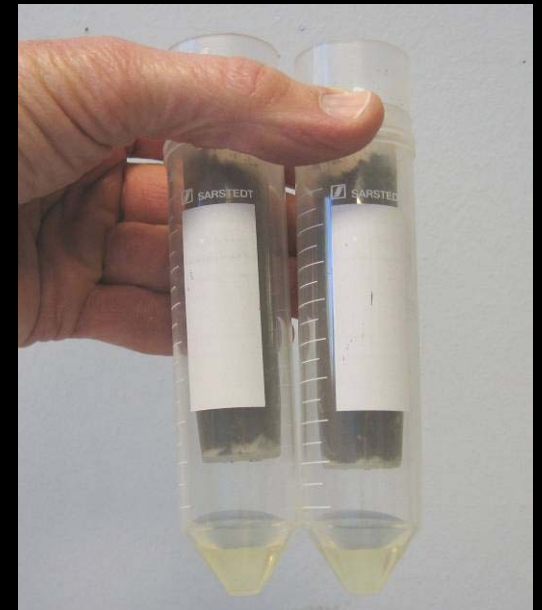
How to evaluate soil calcium status ?

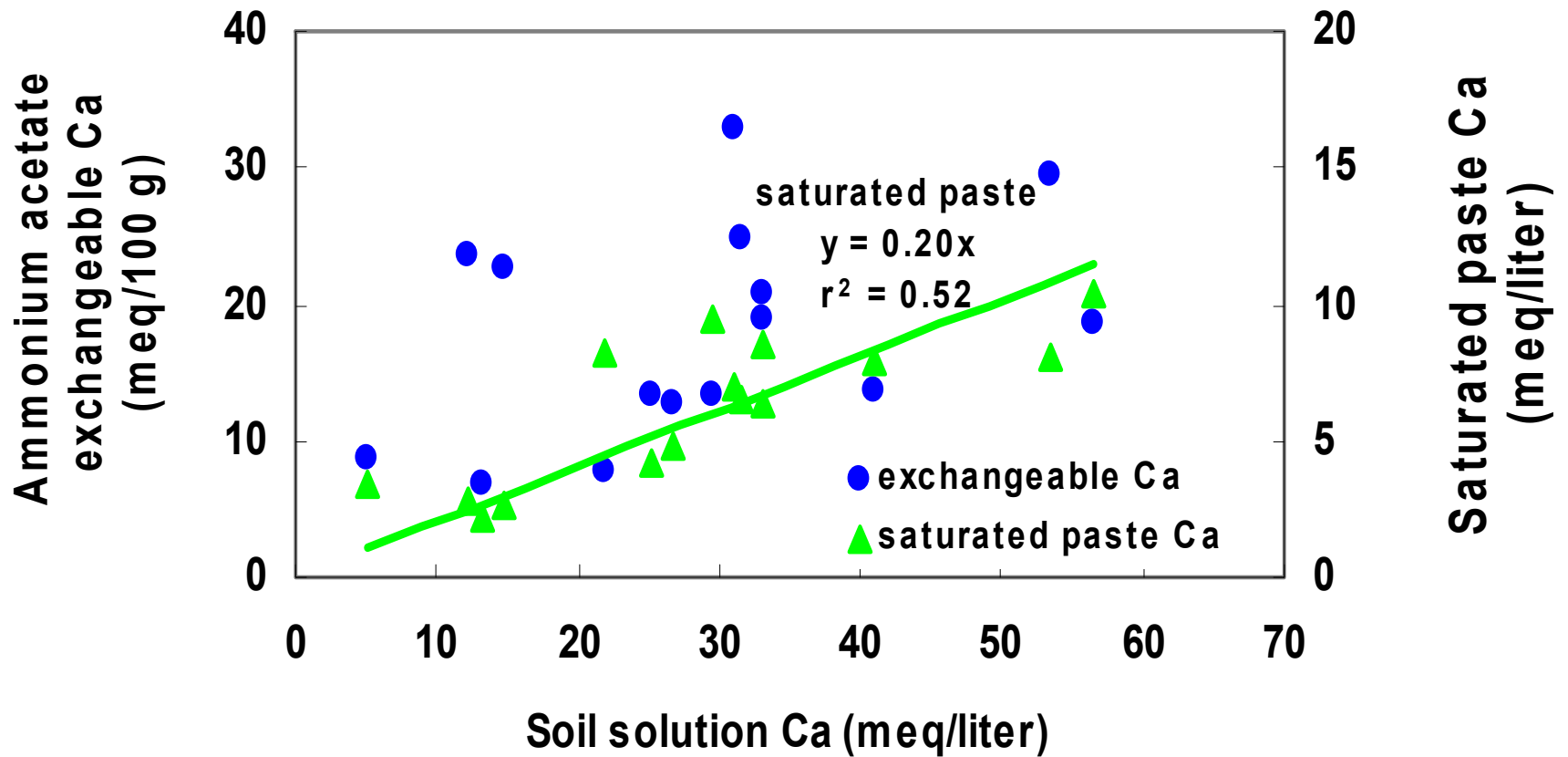
An aerial photograph of a rural landscape. In the foreground, a tractor is pulling a tillage implement through a field, creating distinct furrows in the soil. The field is divided into sections of different colors, likely representing different soil types or crop rotations. In the middle ground, there are several clusters of trees scattered across a green field. The background features rolling hills and mountains under a clear blue sky.

- **Evaluated 15 soils from vegetable rotations**
 - pH from 6.7 to 7.8
 - texture from sandy loam to clay

Extraction procedures :

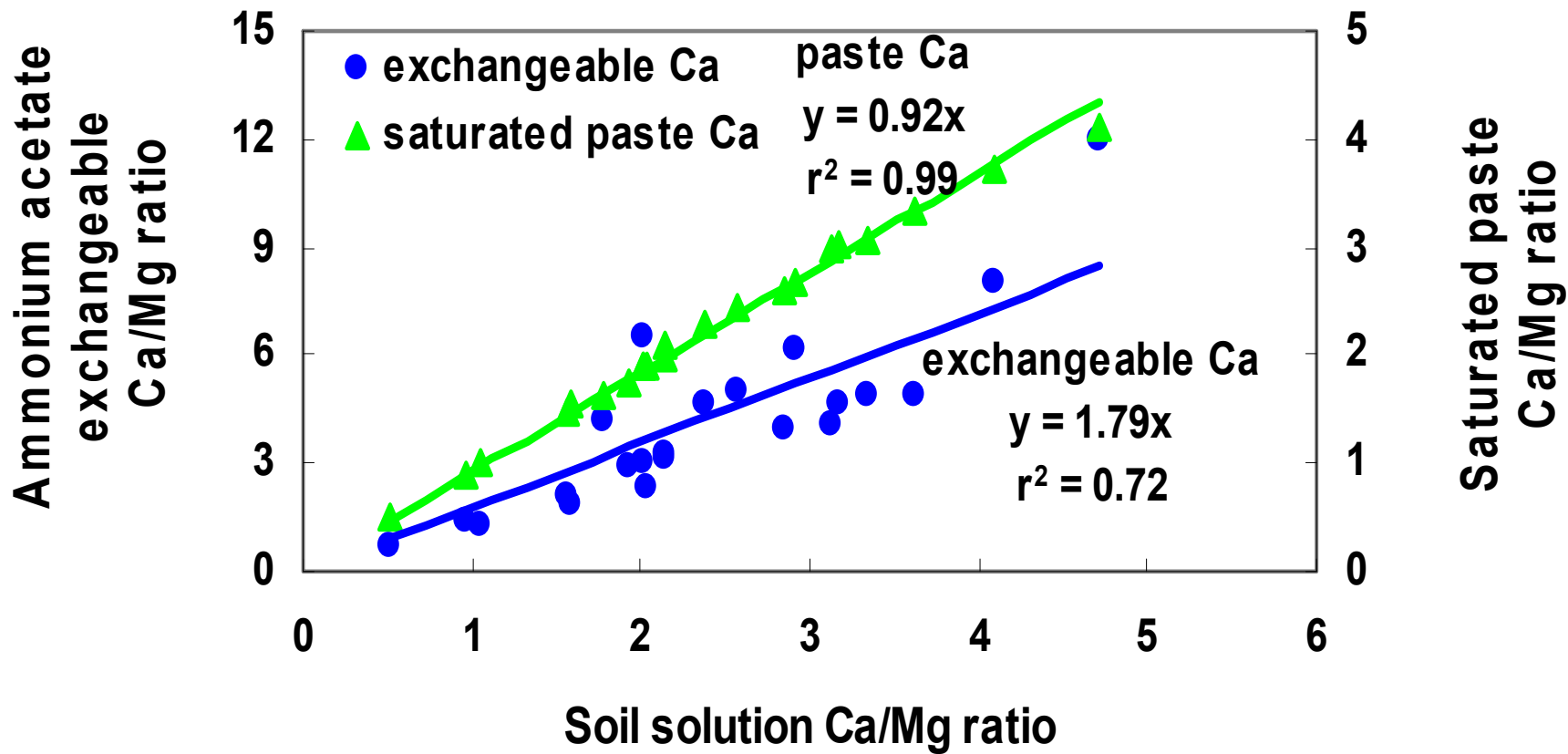
- **Ammonium acetate extraction**
- **Saturated paste extraction**
- **Extraction of soil solution by centrifugation**





1 meq Ca / liter = 20 PPM

for comparison, greenhouse nutrient solutions 5 – 10 meq/liter



How to evaluate soil Ca status ?

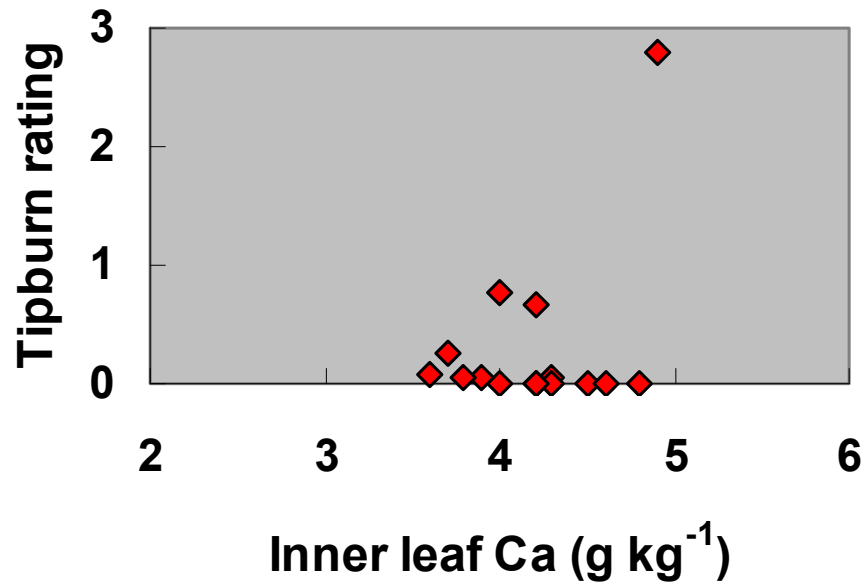
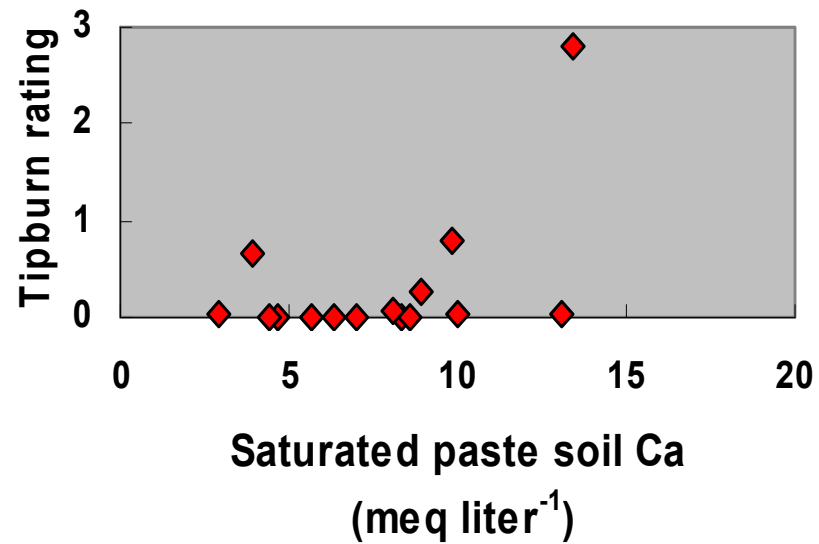
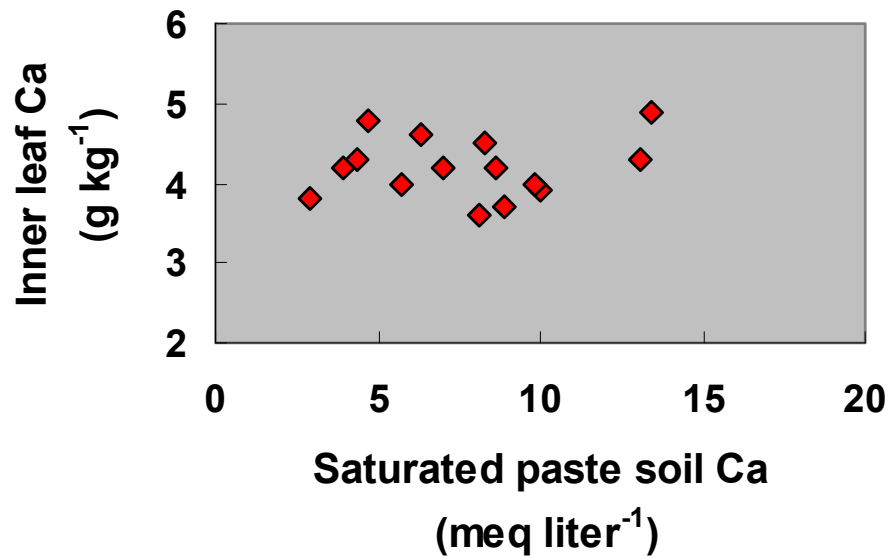
- Soil solution is best measurement, but not practical for routine testing
- Saturated paste extraction is good, but systematically underestimates Ca
- saturated paste Ca x 5 \approx soil solution Ca
- Ammonium acetate extraction gives little information about Ca bioavailability



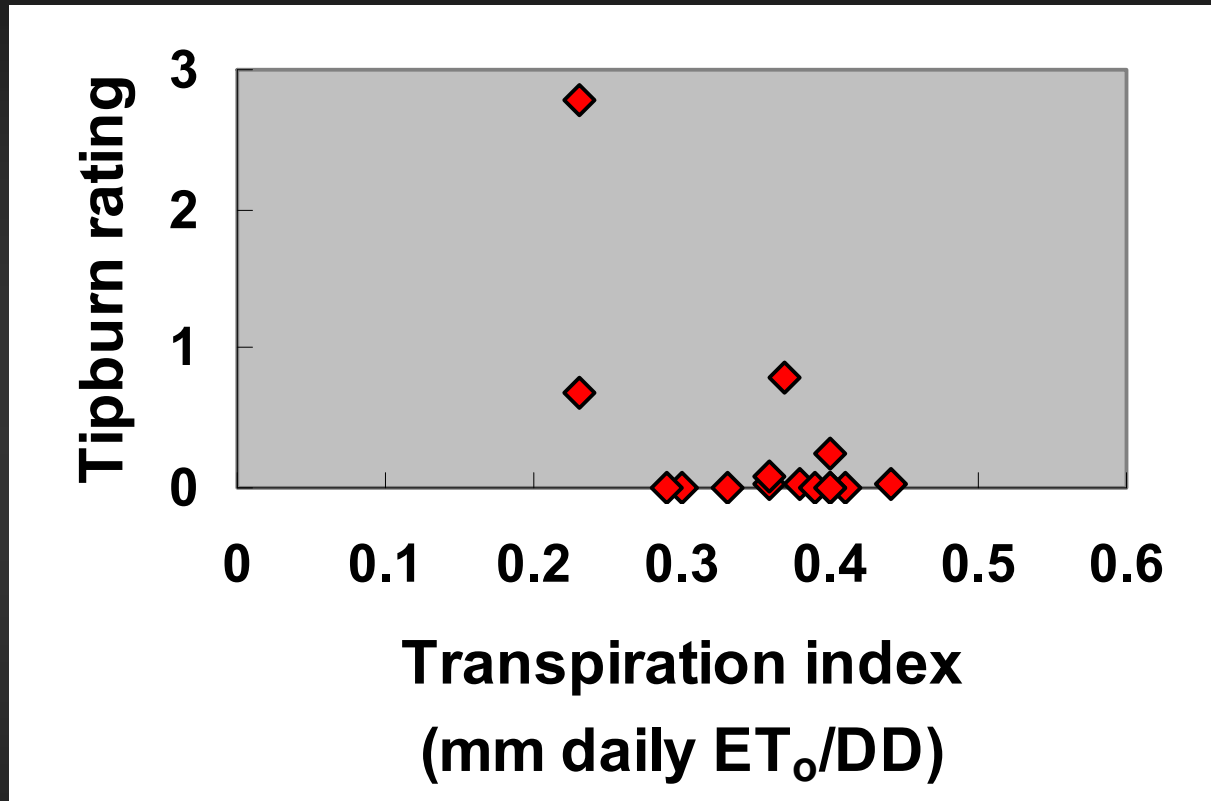


Are calcium disorders really related to soil Ca status ?

Calcium effects on tipburn of romaine lettuce :
Survey of 15 commercial fields for tipburn severity, and soil and plant Ca



If not soil Ca status, what drives tipburn ?



Transpiration index = transpiration per unit of growth potential

Is calcium fertilization useful ?

Ca fertigation trials :

- 3 on romaine lettuce
- 2 on melons

Fertilizers evaluated :

- calcium nitrate
- calcium thiosulfate
- calcium chloride





Results :

- ✓ **No effect on lettuce Ca concentration or tipburn severity**
- ✓ **No effects on melon fruit Ca concentration or flesh firmness**

Link between transpiration and tissue Ca :

Crop	Plant part	Ca (% dry wt)
Lettuce	oldest leaf	1.5 – 2.5
	wrapper leaf	1.0 – 1.5
	inner leaf	0.4 – 0.6
Melon	leaf	2.0 – 5.0
	fruit	0.05 – 0.15



Bottom line :

- ✓ Most mineral soils in California have high soil Ca availability
- ✓ Ca-related disorders of vegetable crops are typically affected more by environmental factors than by soil Ca availability
- ✓ Low-rate Ca fertigation is seldom of any practical value

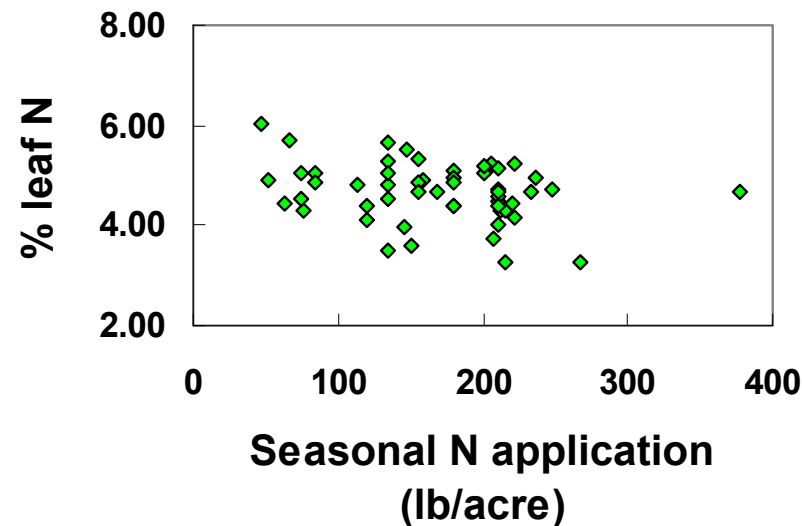
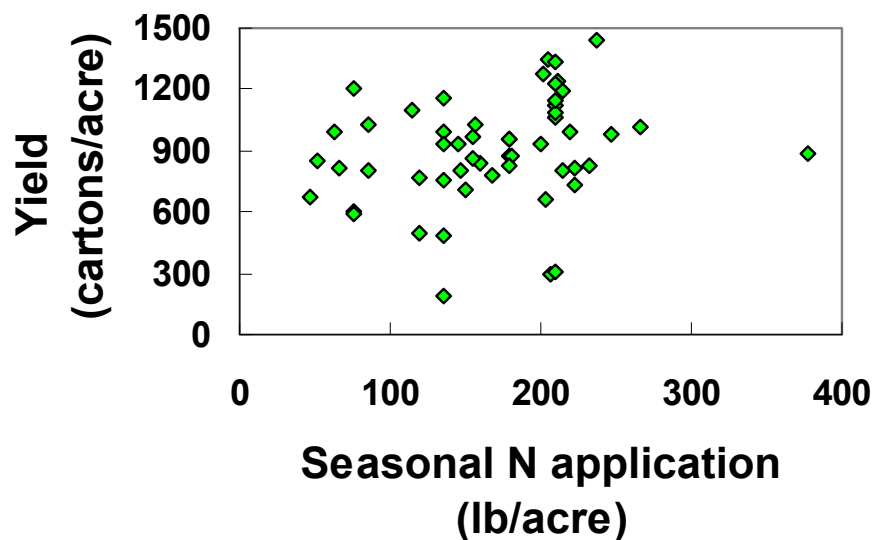




**Regulation and persuasion in improving
fertilizer management**

How efficient is current fertilizer management ?

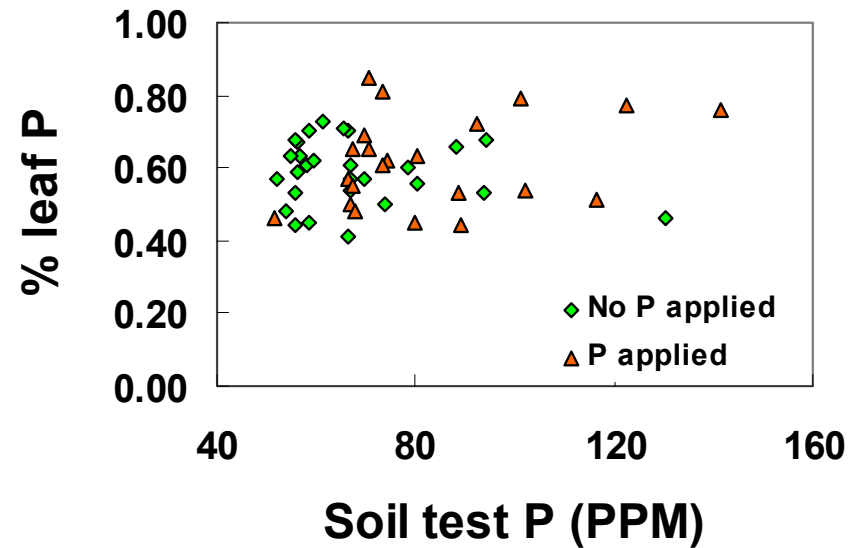
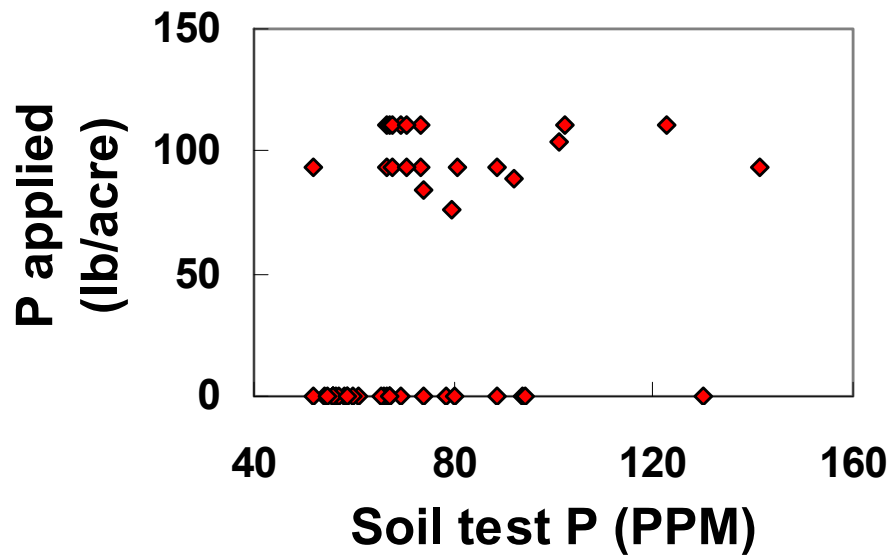
N management in lettuce :



2004-05 Salinas Valley survey

How efficient is current fertilizer management ?

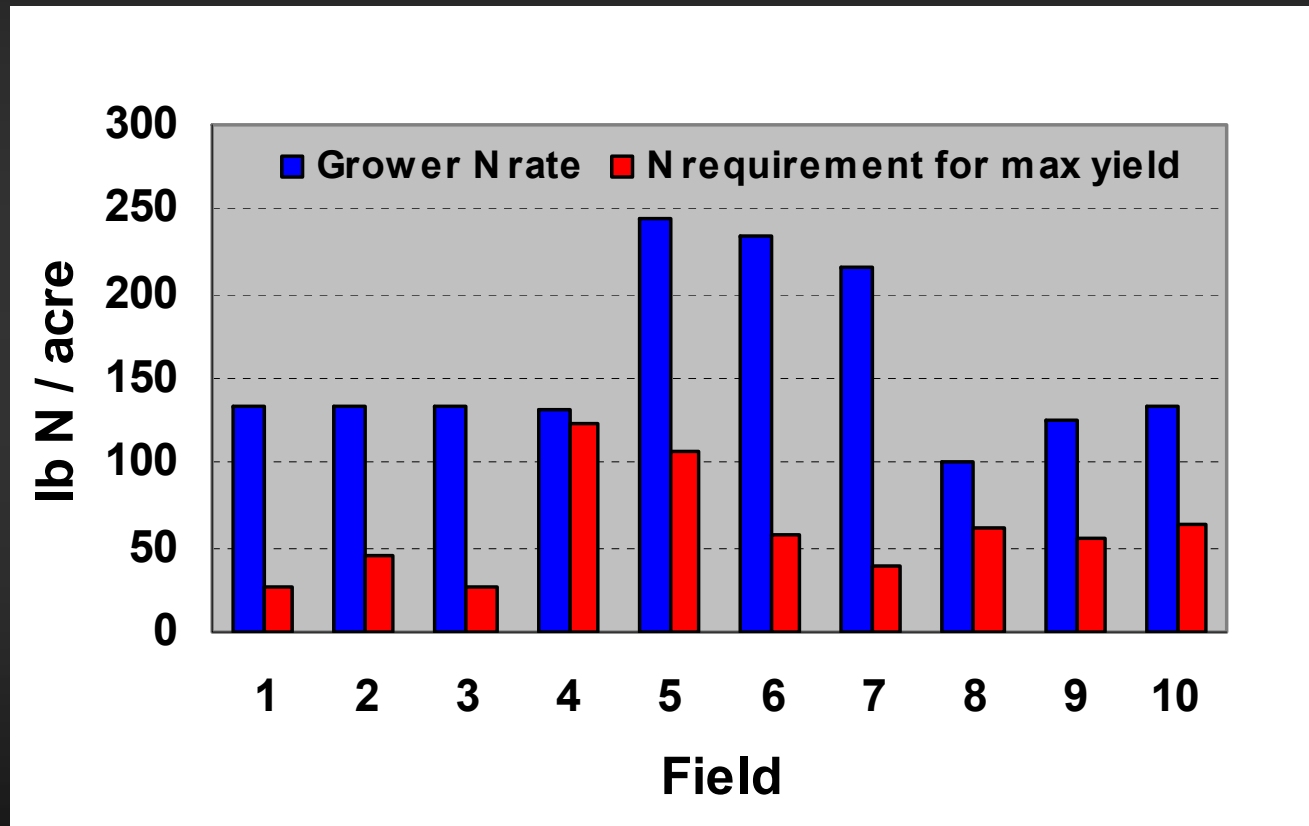
P management in lettuce :



2004-05 Salinas Valley survey

How efficient is current fertilizer management ?

N management in processing tomatoes :



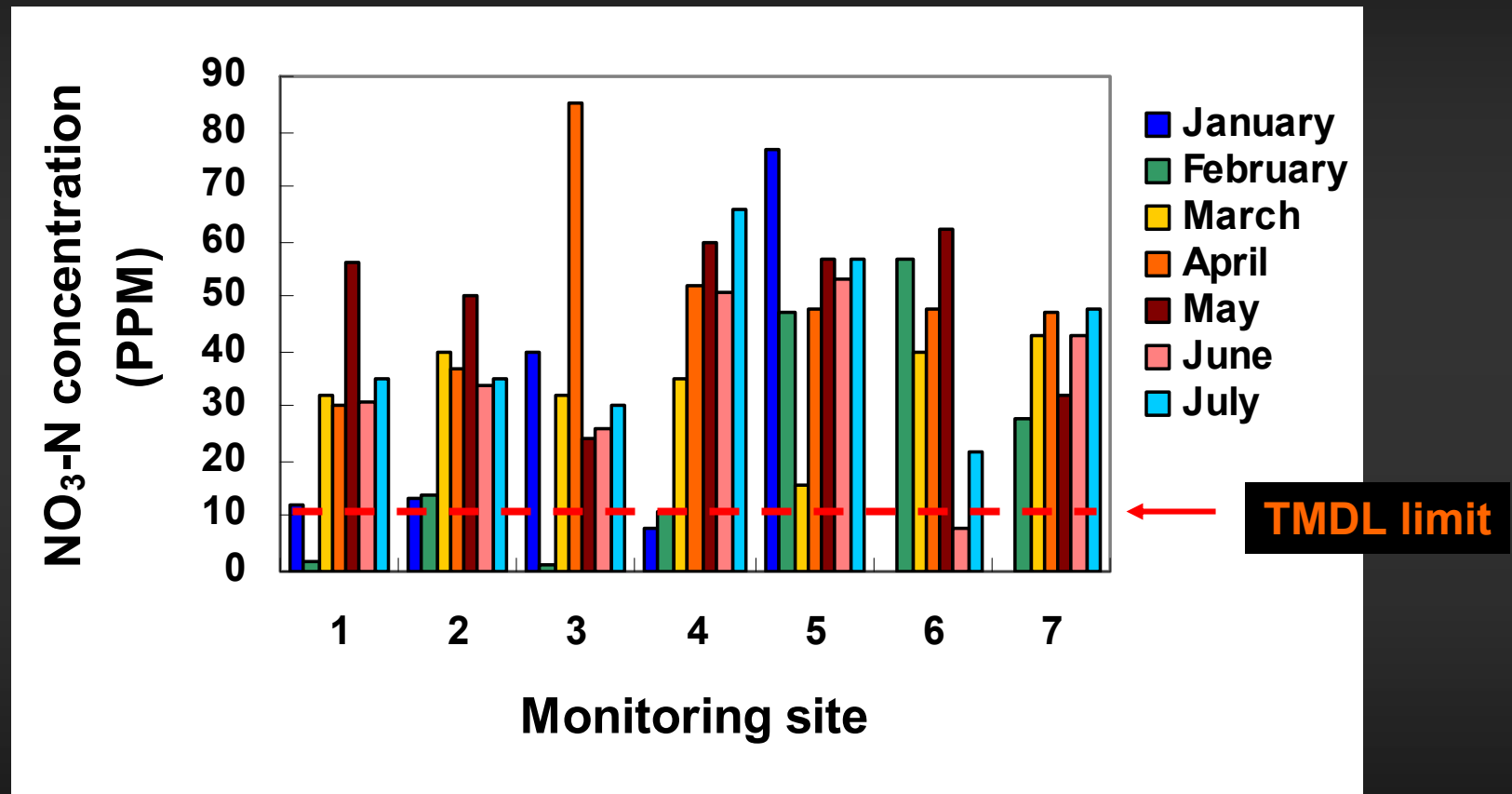
How efficient is current fertilizer management ?

N management in melons :

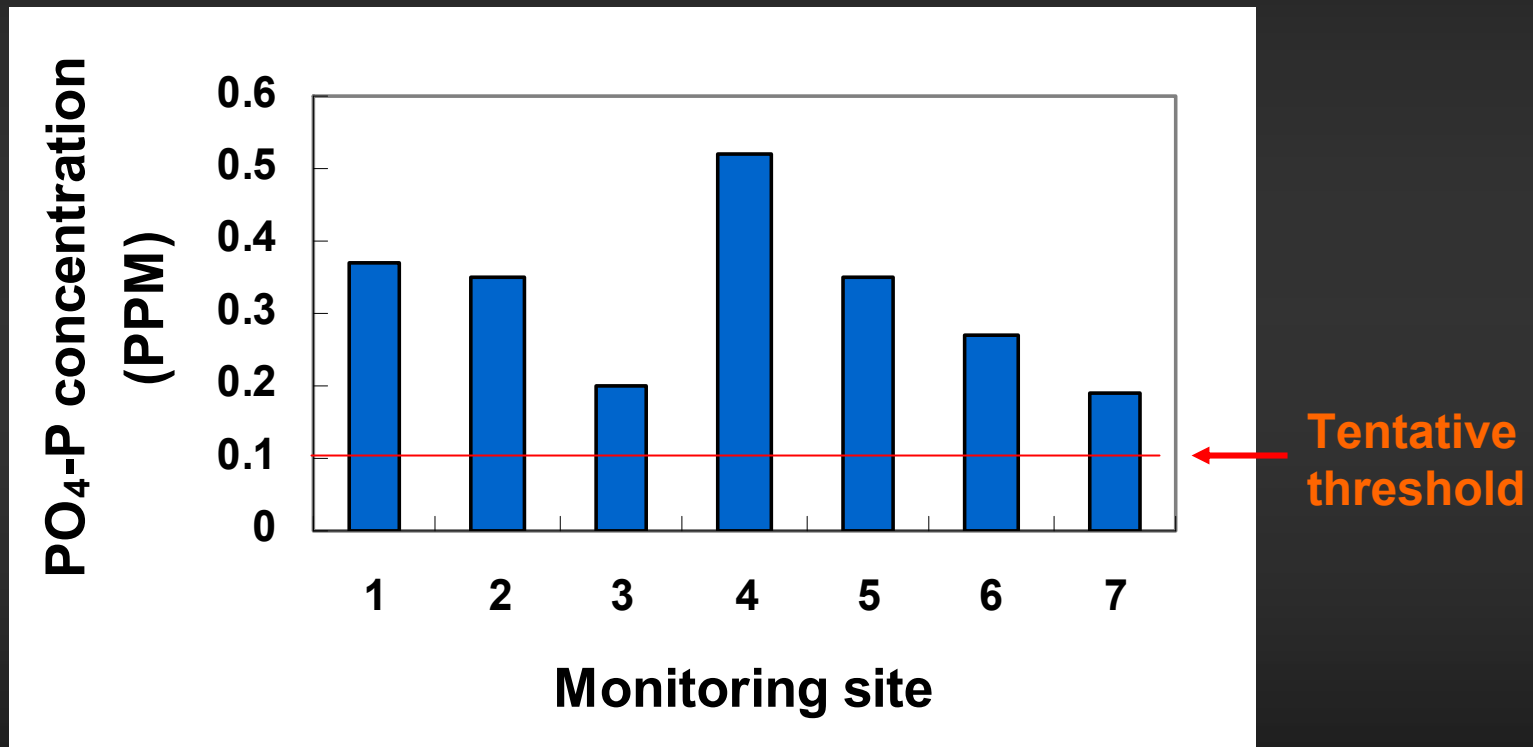
Typical application (lb/acre)

	N	P ₂ O ₅
Sacramento Valley	60-80	40-60
San Joaquin valley	80-100	40-100
Imperial Valley	120-180	100-200

2005 Santa Maria surface water quality monitoring :



2005 Santa Maria surface water quality monitoring :



Mean of January – July sampling

EQIP

Environmental Quality Incentives Program

NRCS now includes nutrient management as an EQIP-eligible practice

- ✓ **Growers can apply for EQIP funding specifically to help pay for upgrading their fertilizer management practices**
- ✓ **Including nutrient management as an element in an overall EQIP application may increase the chances for approval**
- ✓ **This may set a precedent for a nutrient management plan to be a requirement for obtaining NRCS funding for other types of projects in the future**

What is included in a nutrient management plan ?

Initial Nutrient Budget								
Producer:				Date:				
Field or Fields								
Crop			Crop 1		Crop 2			
	Planted area	acres						
	Plant Date							
	Yield Goal	Tons/Acre						
	Planned N Requirement for Yield Goal	lb N/acre						
	Planned P Requirement for Yield Goal	lb P ₂ O ₅ /acre						
	Planned K Requirement for Yield Goal	lb K ₂ O/acre						
Nutrients from sources other than fertilizers								
			N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O
	Irrigation water N	lb /acre						
	Legume (alfalfa) N credit	lb /acre						
	Available from residual organic material	lb /acre						
	Soil Analysis	lb /acre						
	Other	lb /acre						
	Nutrients needed from manure and fertilizer	lb /acre	0	0	0	0	0	0
Nutrients to be applied, by source								
	Commercial Fertilizer	lb /acre						
	Certified Organic Nutrients	lb /acre						
	Other*	lb /acre						
	Total nutrients to be applied	lb /acre	0	0	0	0	0	0

'Approved practices' for nutrient management plans :

- ✓ **Pre-plant soil testing (P, K, residual NO₃-N)**
- ✓ **Pre-sidedress NO₃-N testing**
- ✓ **Irrigation water testing for NO₃-N**
- ✓ **Use of GPS and variable rate application**
- ✓ **Plant tissue testing**
- ✓ **Consult with a Certified Crop Advisor**

