

Nitrogen Management under Drip-irrigation

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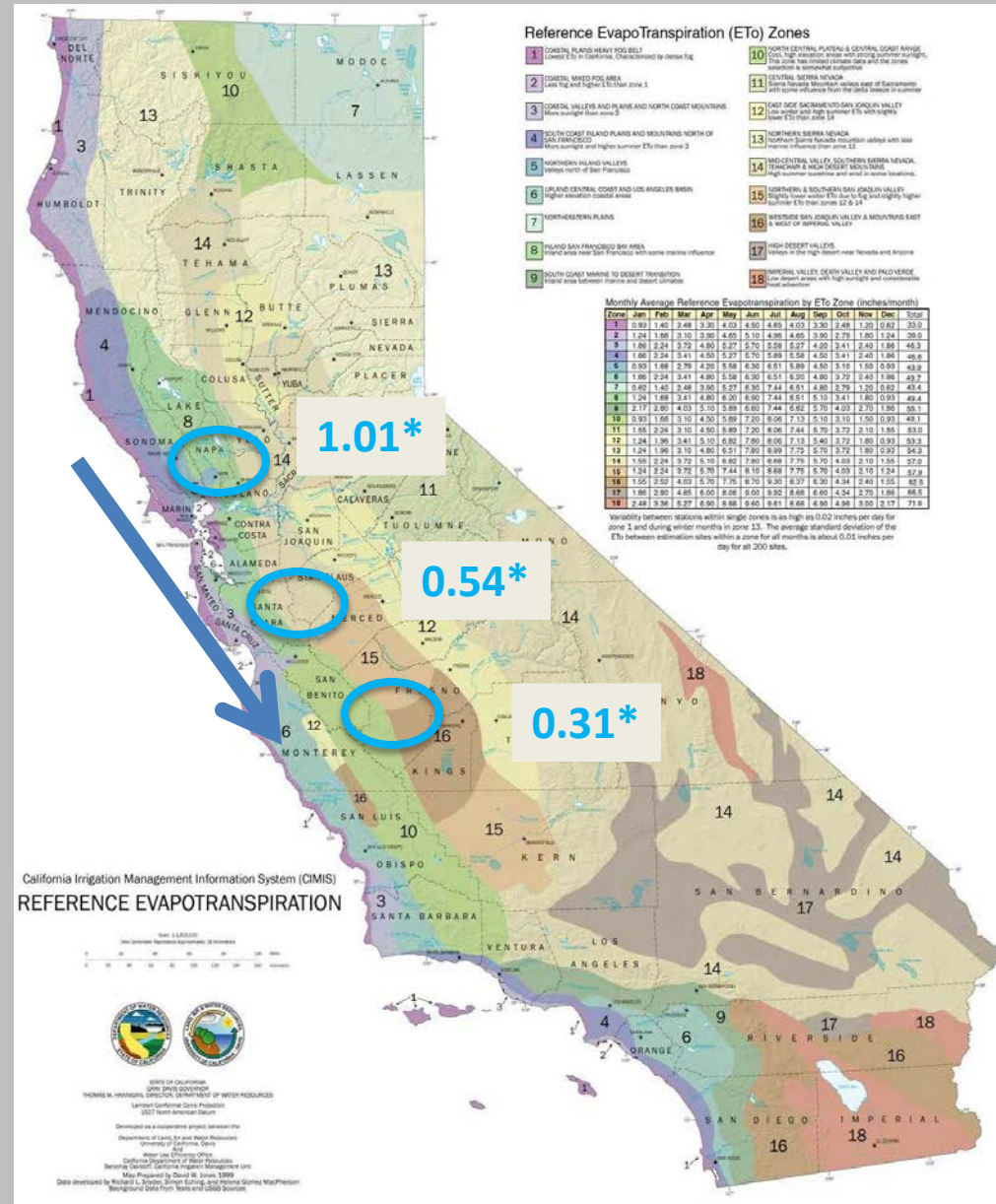
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Objectives

1. Spatial distribution of NO_3^- , as well as P and K, in relation to drip tape in three areas : Yolo, San Joaquin, Fresno counties
2. Develop a soil sampling protocol to estimate pre-plant availability of NO_3^- in SDI processing tomato systems.
3. Assess nitrogen use efficiency based on pre-plant NO_3^- levels, fertilizer N inputs , and N outputs (fruit & vines).

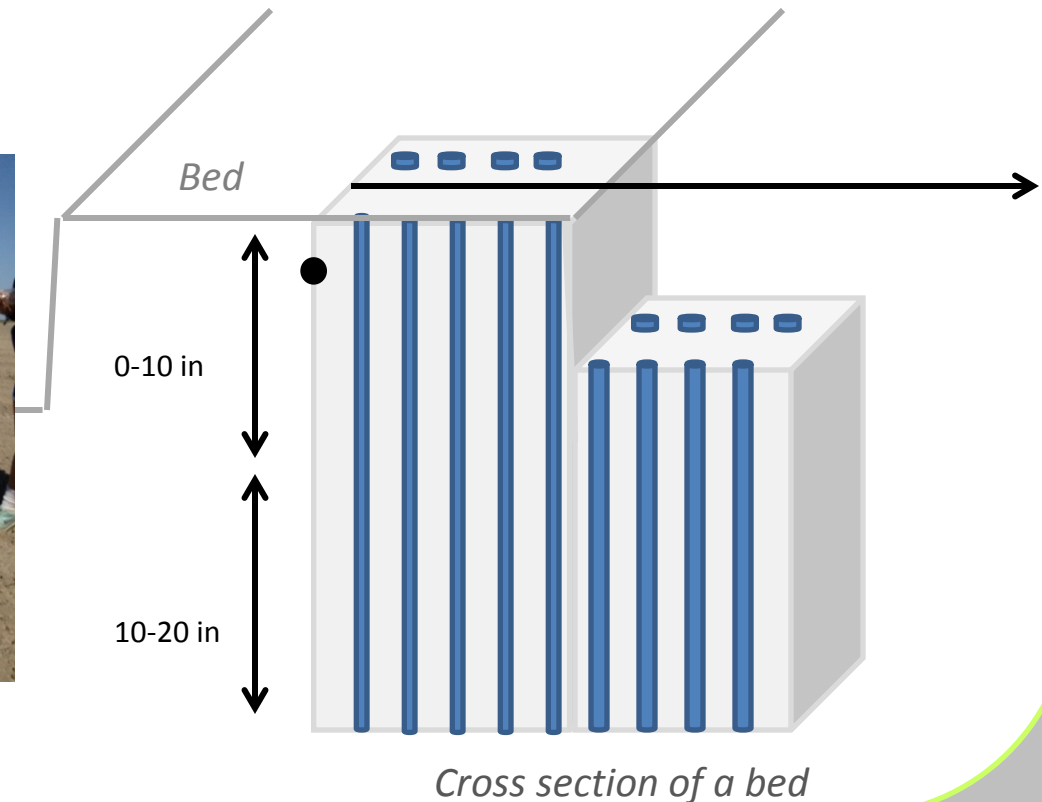
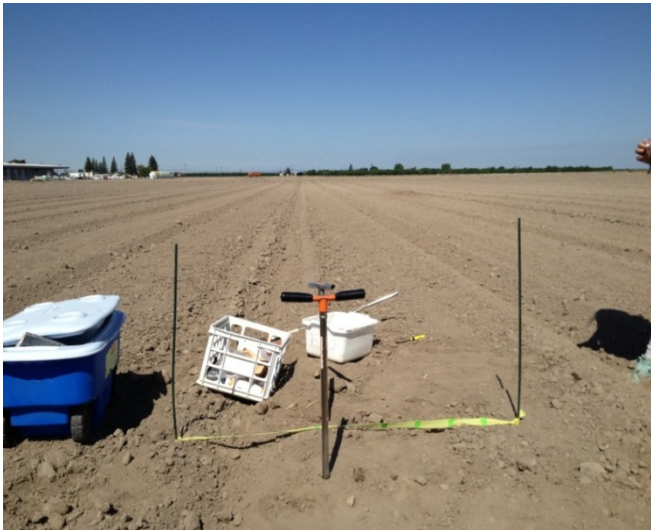
Approach

- ▶ Systematic soil sampling in 16 commercial SDI fields
- ▶ Transect of decreasing precipitation to ET ratio
- ▶ Yolo (6 fields)
- ▶ San Joaquin(4)
- ▶ Fresno counties (6)



Amount and distribution of NO_3^- , P and K available at pre-plant

- ▶ In each field: five random sampling locations
- ▶ At each location: Samples in 5 inch intervals, 2 depths
- ▶ Calculation of relative error among all combinations relative to field average and selection of combination with lowest relative error (<5%)



Results

Sampling Protocol

lbs N / acre

60'' Bed Fields	Field	5''+10''+20''
Yolo 2	61.9	60.7
Yolo 3	31.1	31.0
Yolo 4	31.8	33.7
Yolo 5	22.5	21.8
Yolo 6	32.3	33.6
San Joaquin 3	146.5	145.6
San Joaquin 4	139.9	148.9
Fresno 1	57.9	60.0
Fresno 2	85.9	90.1
Fresno 3	218.8	207.8
Fresno 4	159.0	171.2

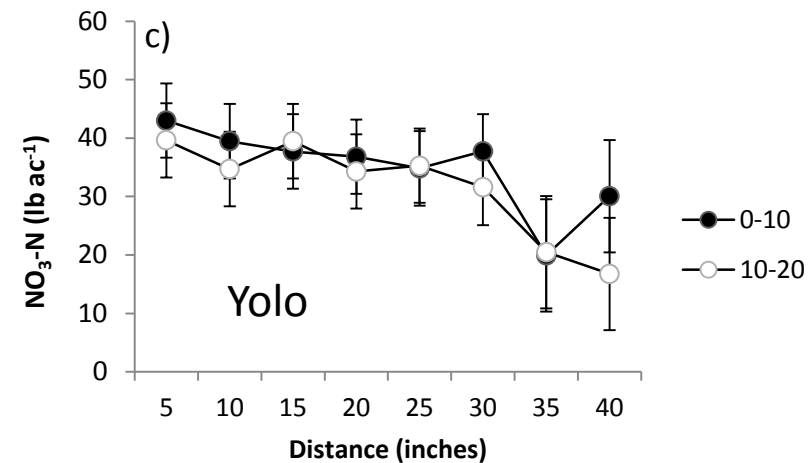
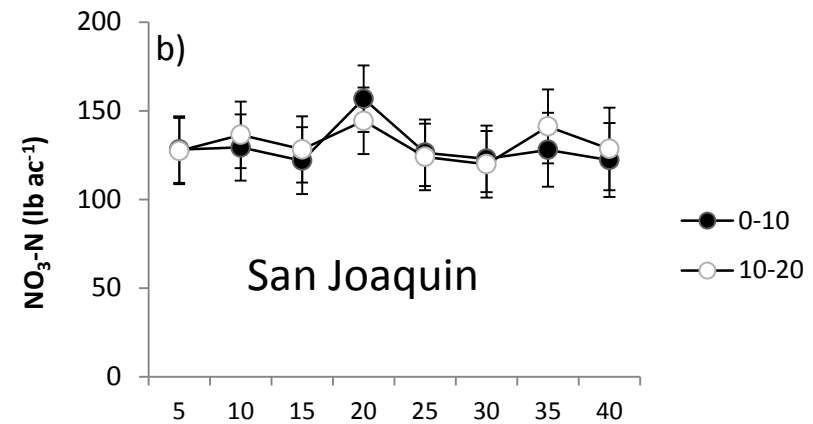
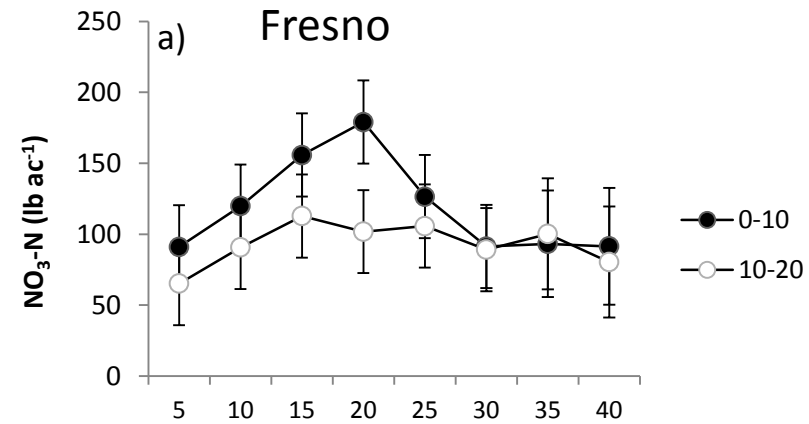
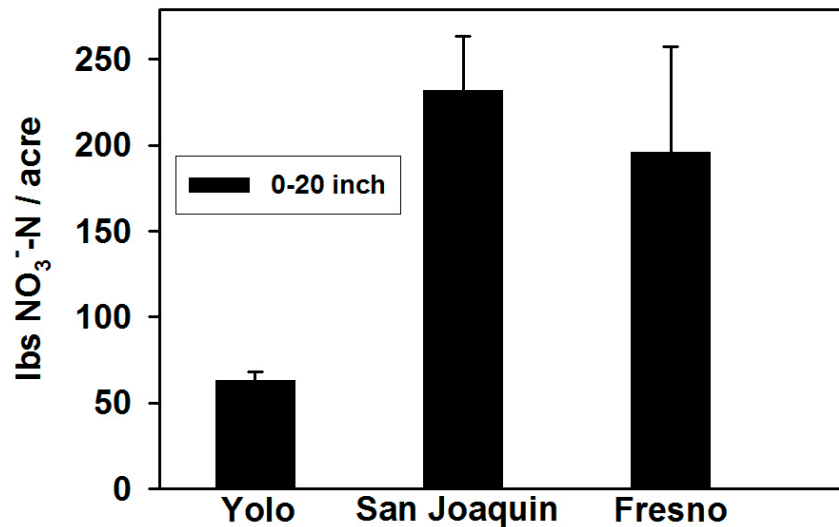
lbs N / acre

80'' Bed Fields	Field	20''+25''
Yolo1	39.1	37.8
San Joaquin 1	79.6	80.8
San Joaquin 2	100.0	106.4
Fresno 5	56.7	57.0
Fresno 6	77.8	76.1

Results

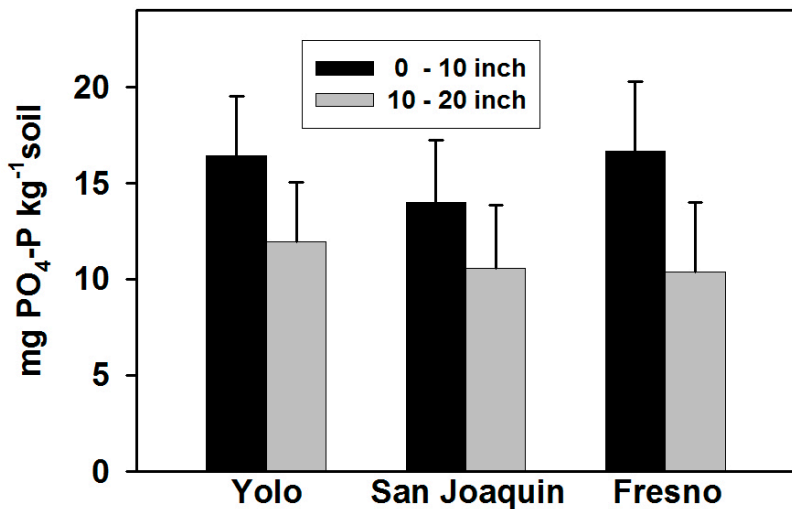
Residual soil NO₃-N at pre-plant

- ▶ No particular pattern in NO₃-N distribution around the drip tape across or within the different growing areas.

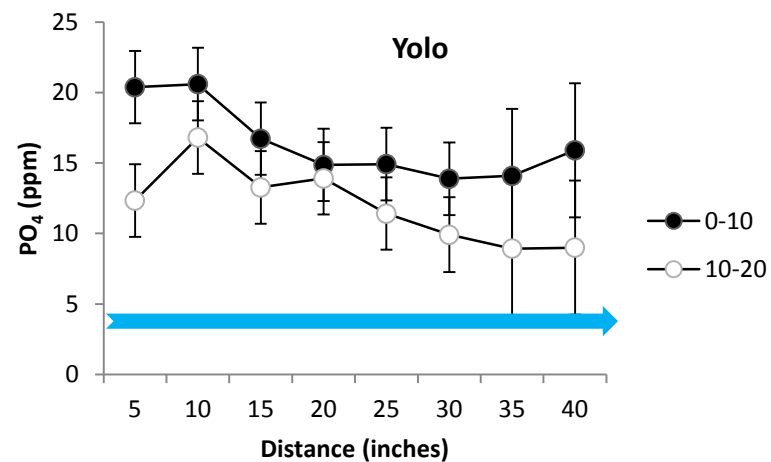
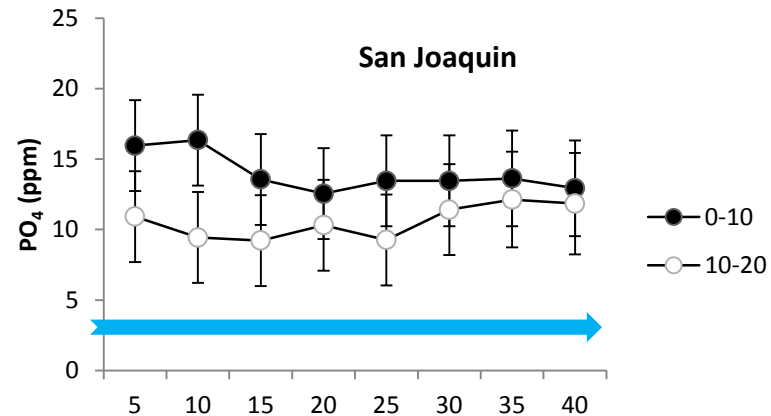
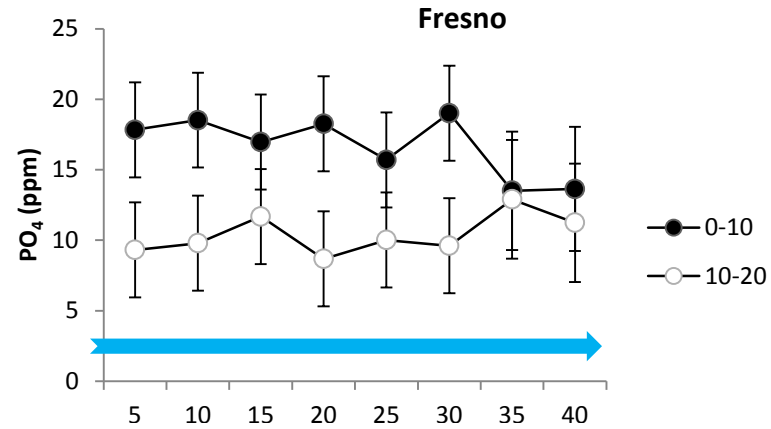


Spatial distribution of residual PO_4 at pre-plant

- ▶ P content significantly higher in 0-10 than in the 10-20 inches layer.
- ▶ No clear spatial pattern around drip tape in Fresno & San Joaquin counties.
- ▶ Higher concentrations near the drip tape in Yolo County.



➤ Potassium analysis is pending



Harvest sampling

Soil:

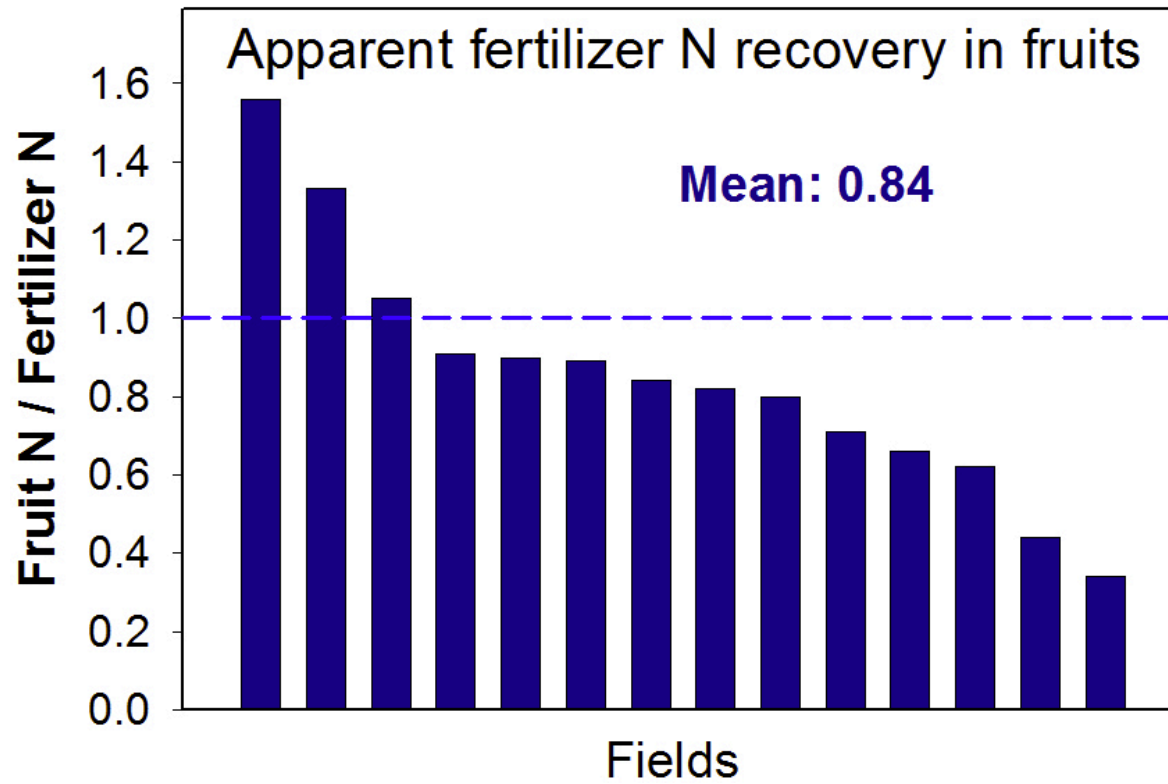
- ▶ The same five sampling locations in each field
- ▶ Measure residual NO_3^-

Plants:

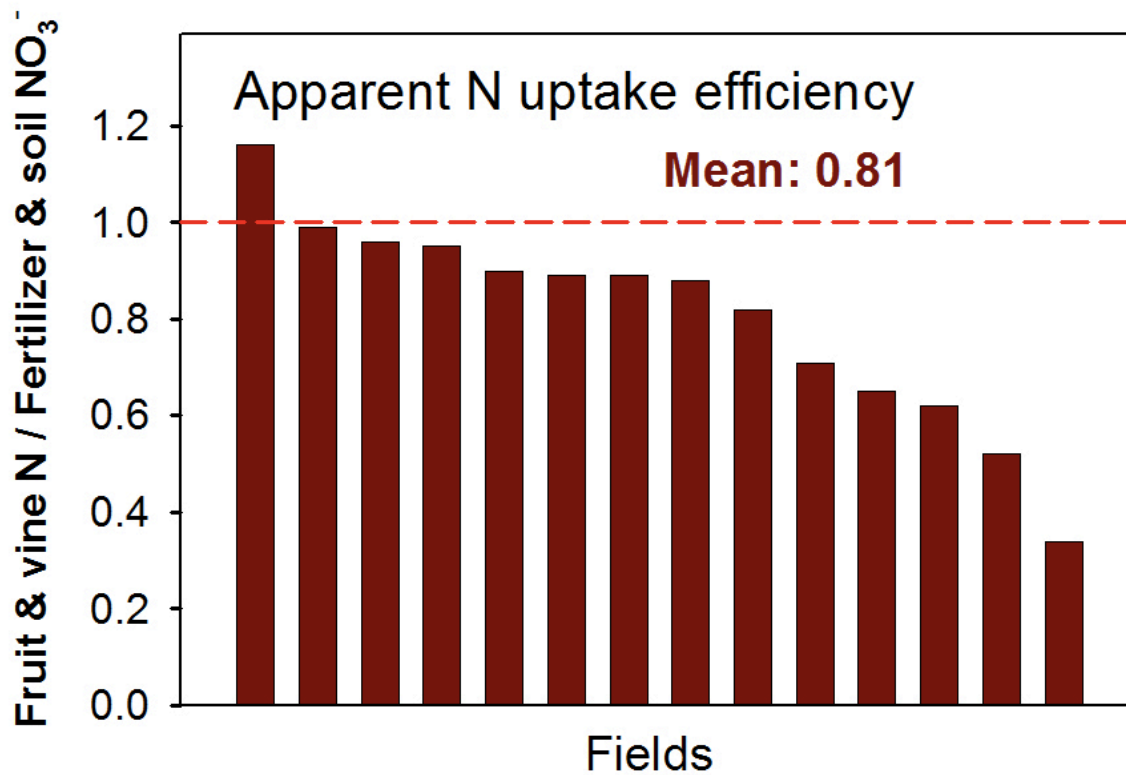
- ▶ Measure vine and fruit biomass & N content
- ▶ Calculate Nitrogen use efficiency based on yields & N inputs reported by growers



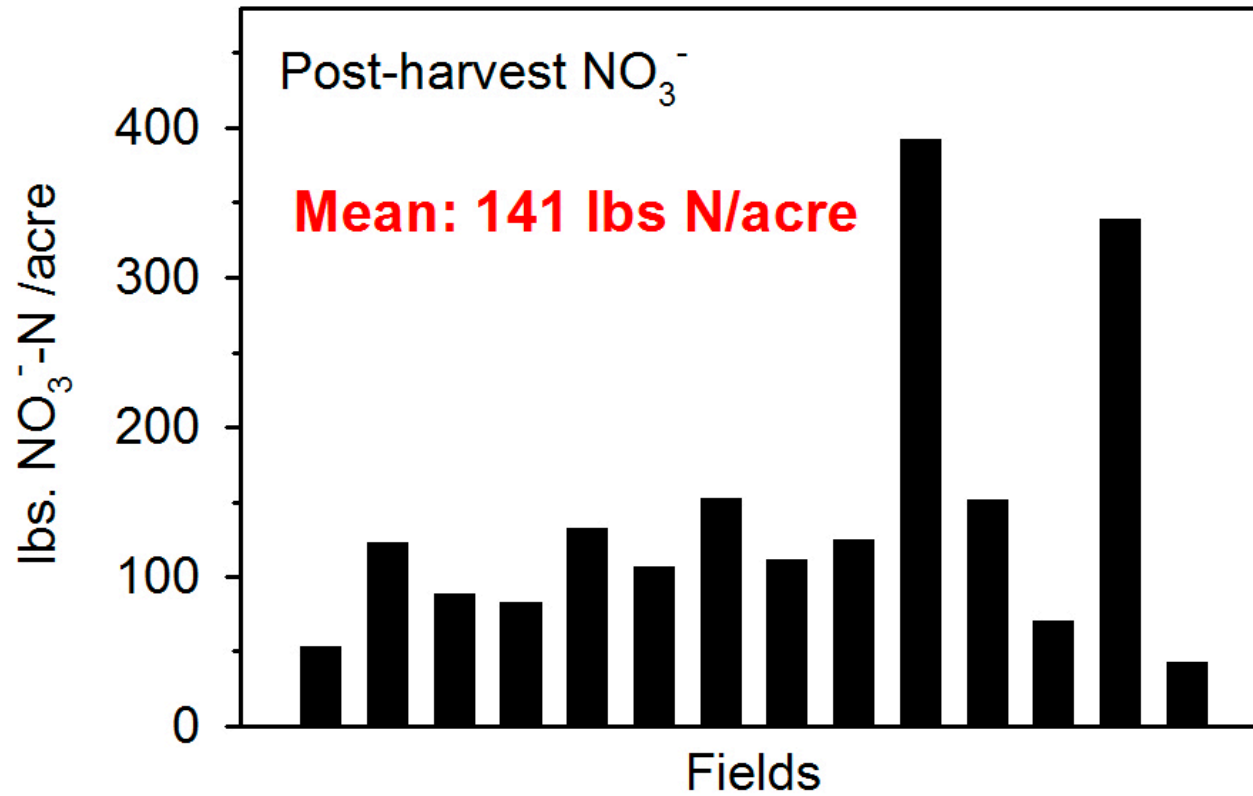
Results : N use efficiency



Results: N use efficiency

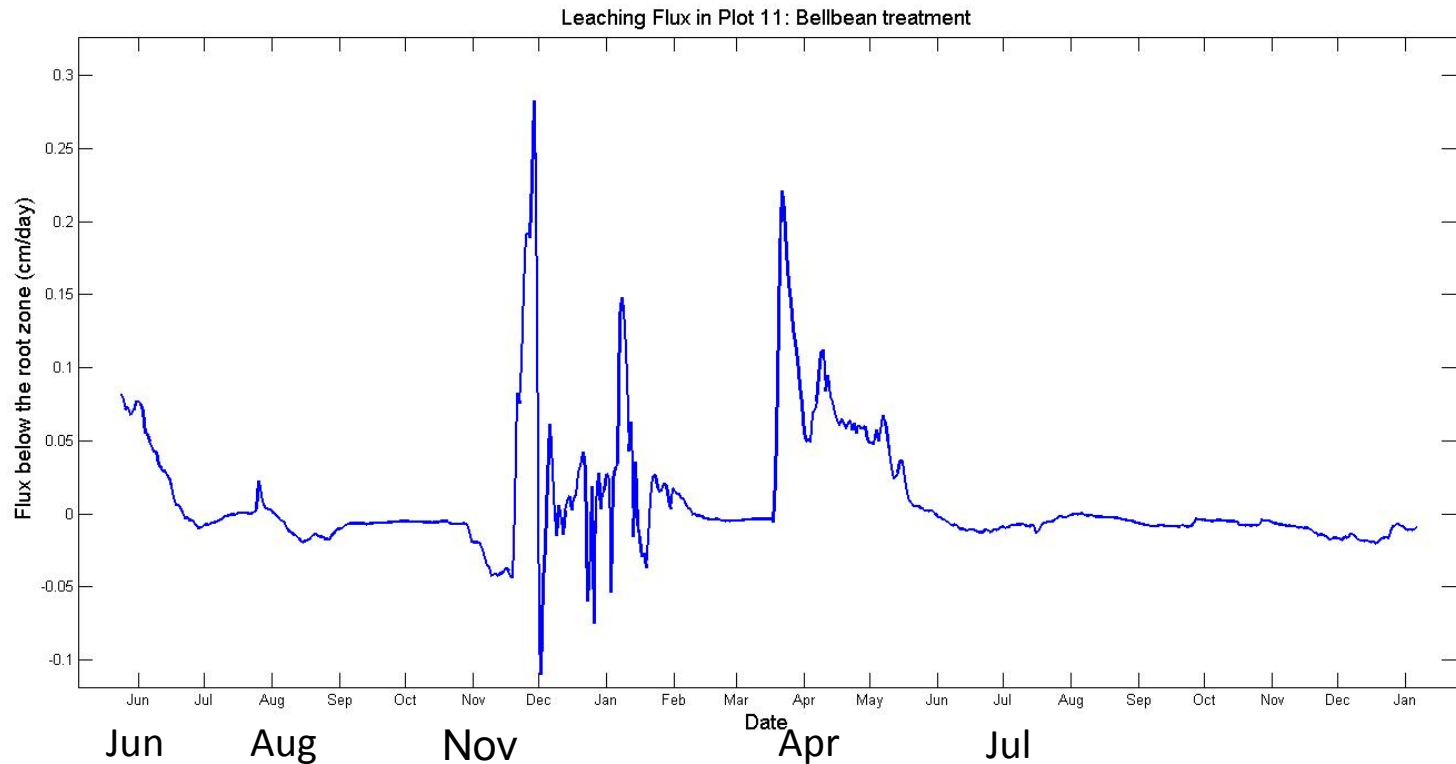


Results: N budget



Potential Fate of NO₃⁻ ?

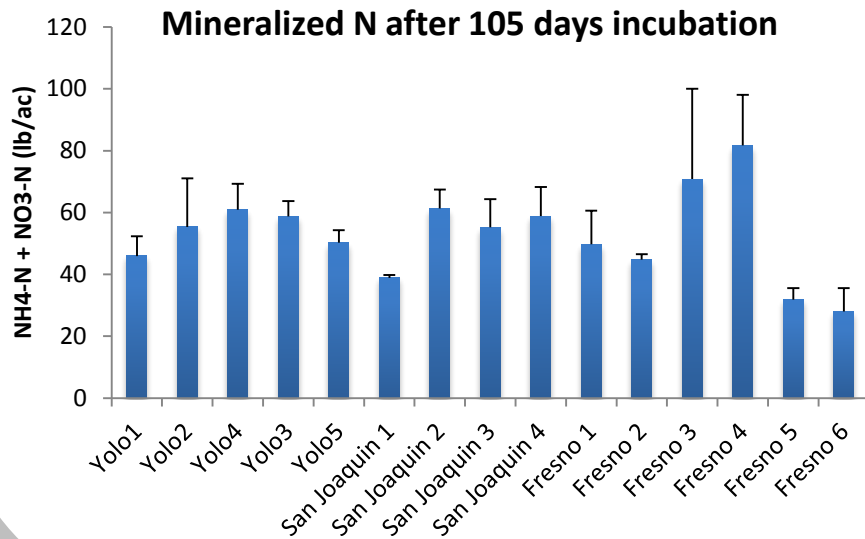
Water flux below root zone (7 ft. depth)



Russell Ranch 2012/13 : 6 - 8 inches

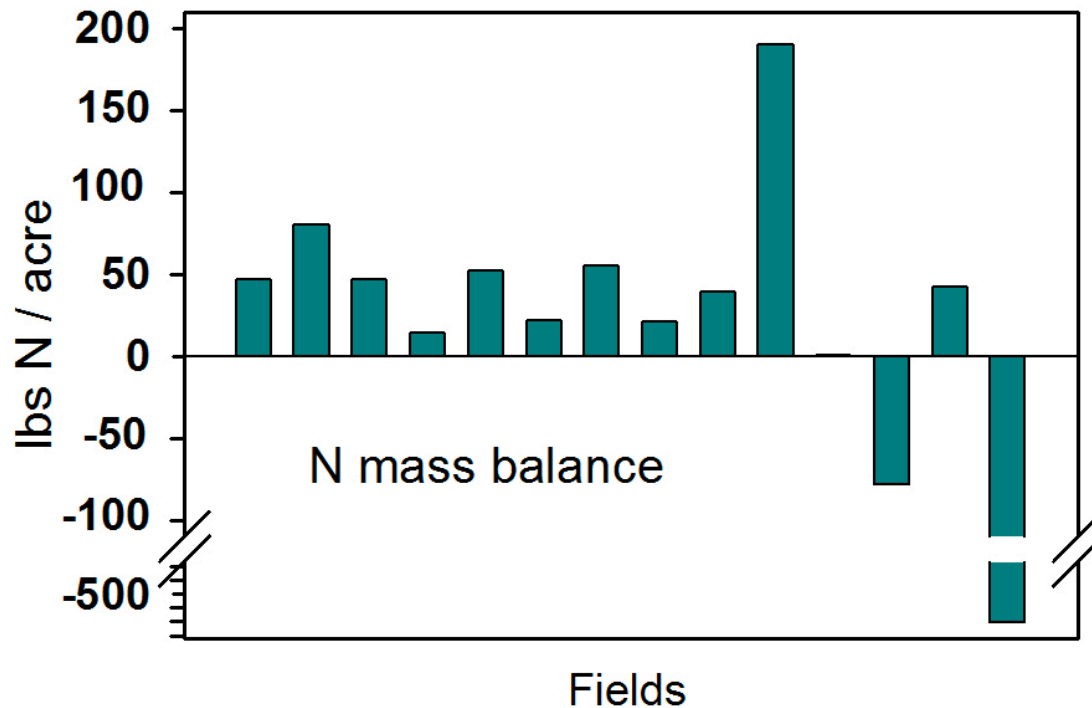
Results: N budget

How much soil N is mineralized?



On average in top 10 inches:
50 lbs N/ acre

Results: N budget



Outputs:

- + Fruit N
- + vine-N
- + post-harvest soil NO_3^-

Inputs:

- pre-plant soil NO_3^-
- fertilizer N
- soil mineralizable N

Thank you!

