



Research to Support Irrigation and Nutrient Management Decisions in Processing Tomatoes



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Processing Tomato Meeting, Woodland

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Overview

- Develop a decision support tool for processing tomatoes based on CropManage
- N mineralization study
- California Fertilization Guidelines





What is CropManage?

- Field-scale web application for managing irrigation and nitrogen
- Developed by UCCE for cool-season vegetables on the Central Coast
- Uses weather data from CIMIS stations
- Calculates crop water need (ET)
- Estimates crop N fertilizer need
- Test version for processing tomatoes is currently being developed by UC ANR





Tasks

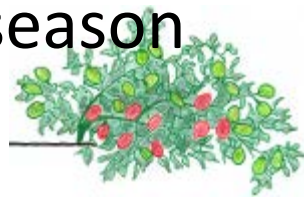
- Collect plant and soil data from commercial farms in the Central Valley
 - 2016:
 - 2 sites near Woodland
 - 3 sites near Stockton
 - 1 site near Huron
 - Variety trial with 15 varieties
 - 2017: Collect data from additional sites
- Develop CropManage
- Compare CropManage recommendation with growers' practices
 - Replicated trial at UC Davis
- Outreach, training





Data collected

- Evapotranspiration (ET)
 - Canopy development
 - Infrared picture
 - Handheld NDVI analyzer
 - Aerial photographs
 - ET estimates from Tule stations
- N uptake
- N input
 - Residual soil nitrate
 - Nitrogen mineralized during growing season
 - Fertilizer

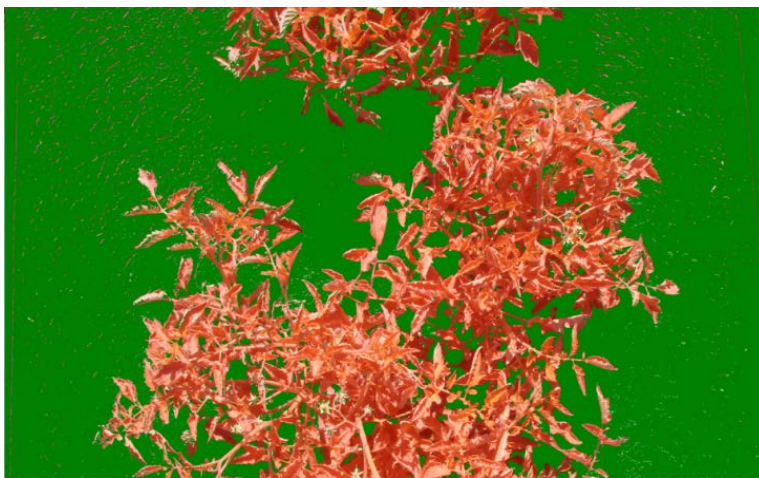




Canopy development

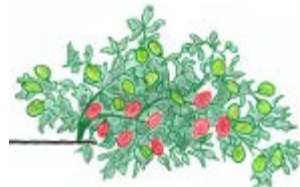
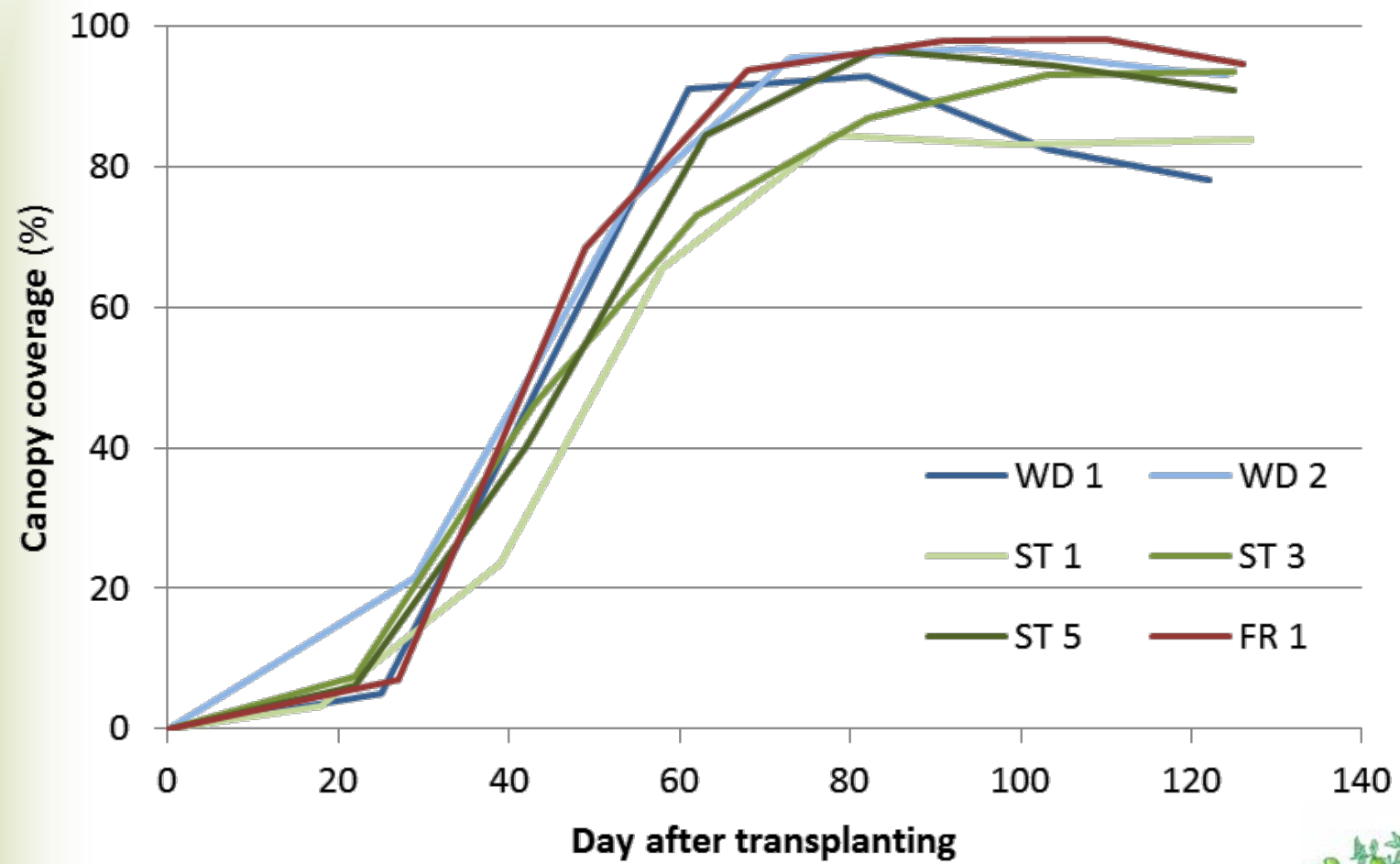


40% canopy coverage



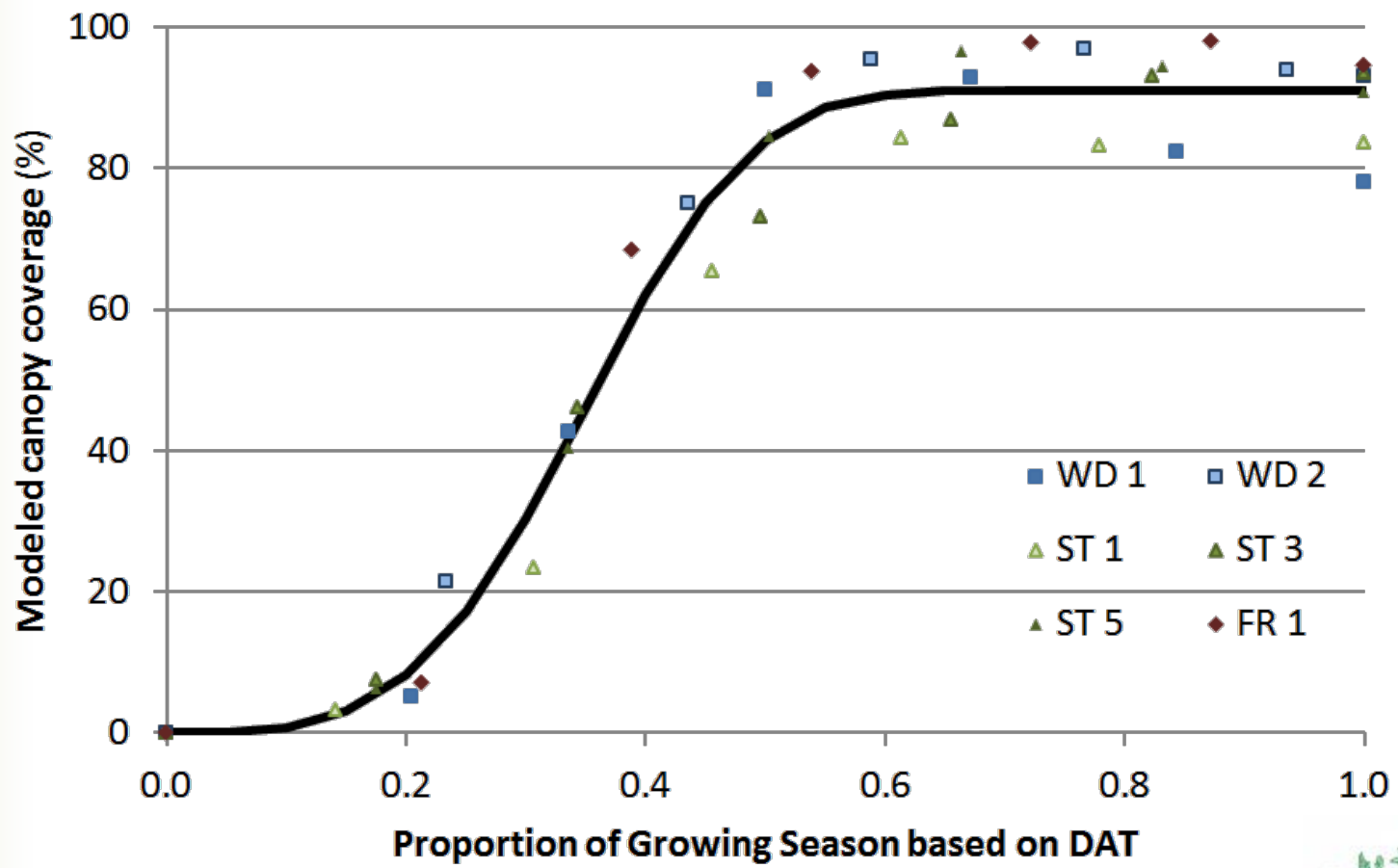


Canopy coverage



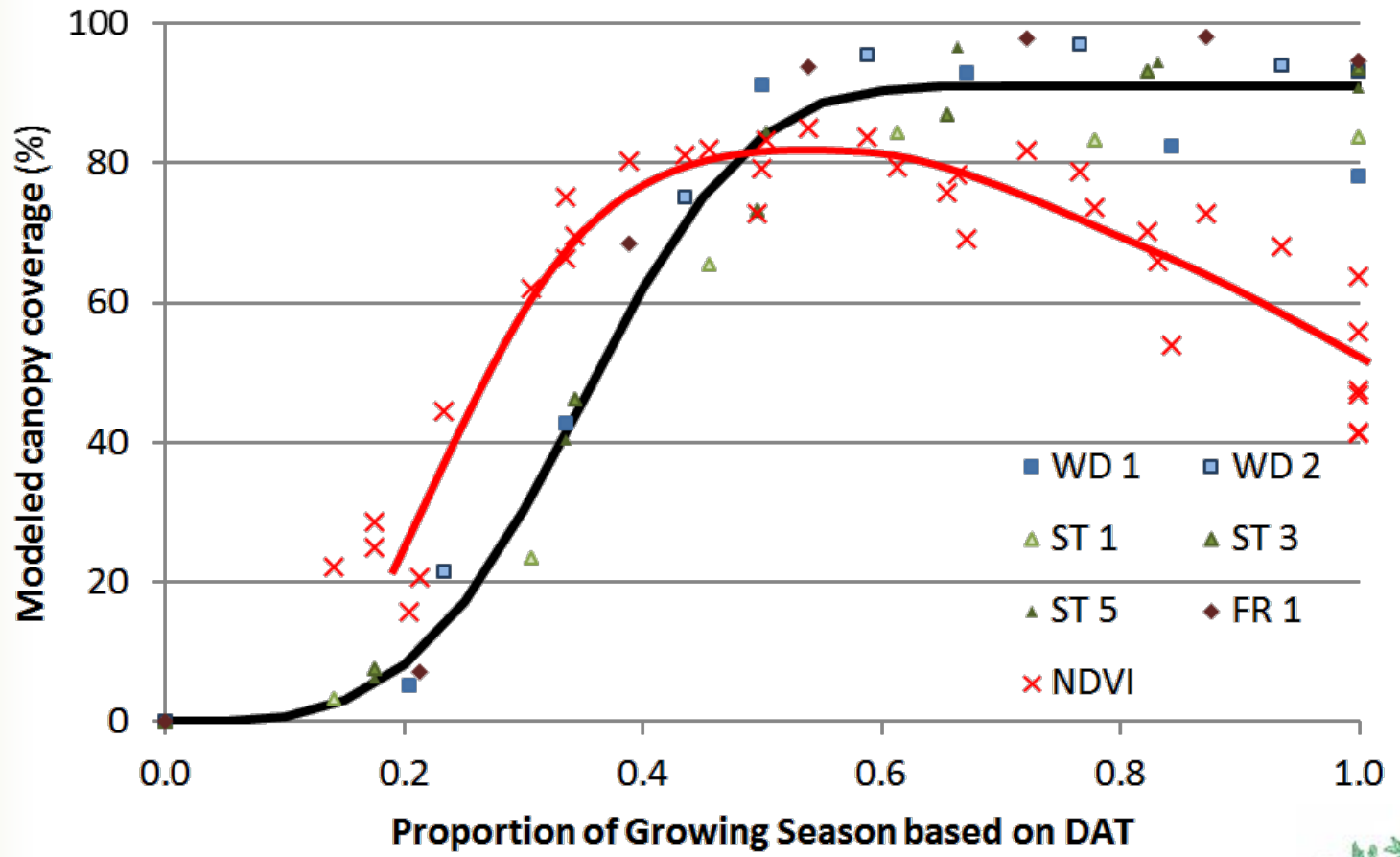


Modeled canopy coverage





Canopy coverage vs. NDVI



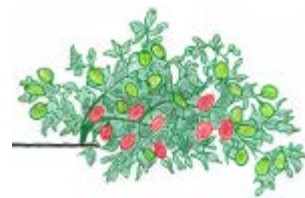
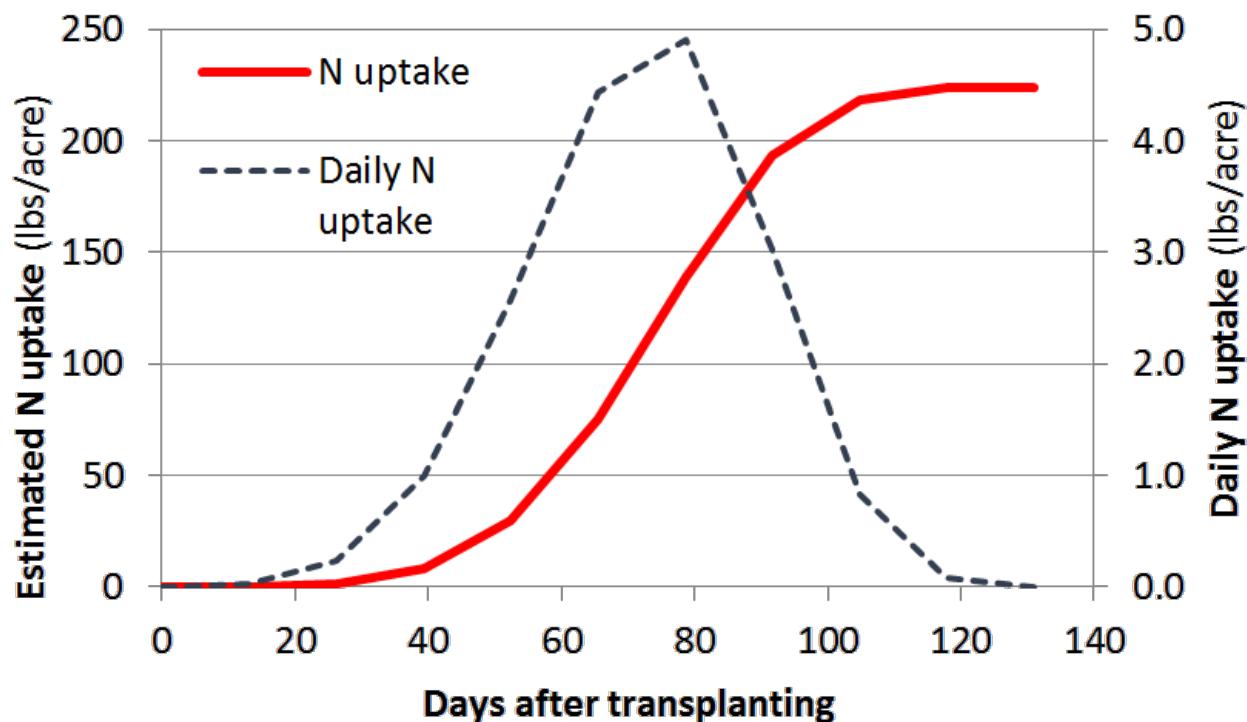


Seasonal N uptake

⇒ N in tomatoes: 2.99 lbs/ton

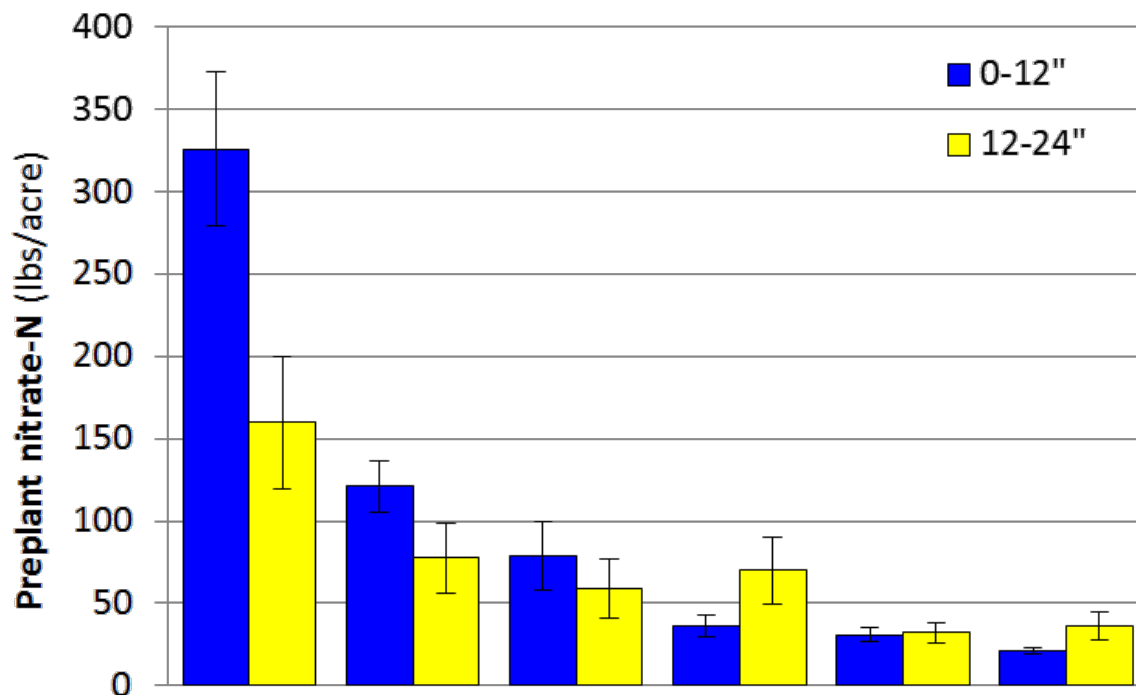
⇒ N in vines: 33% of total N

For a 50-ton total yield:

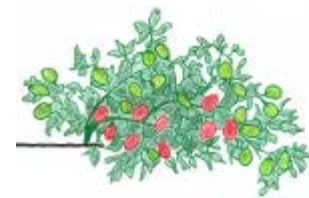




Residual soil nitrate I

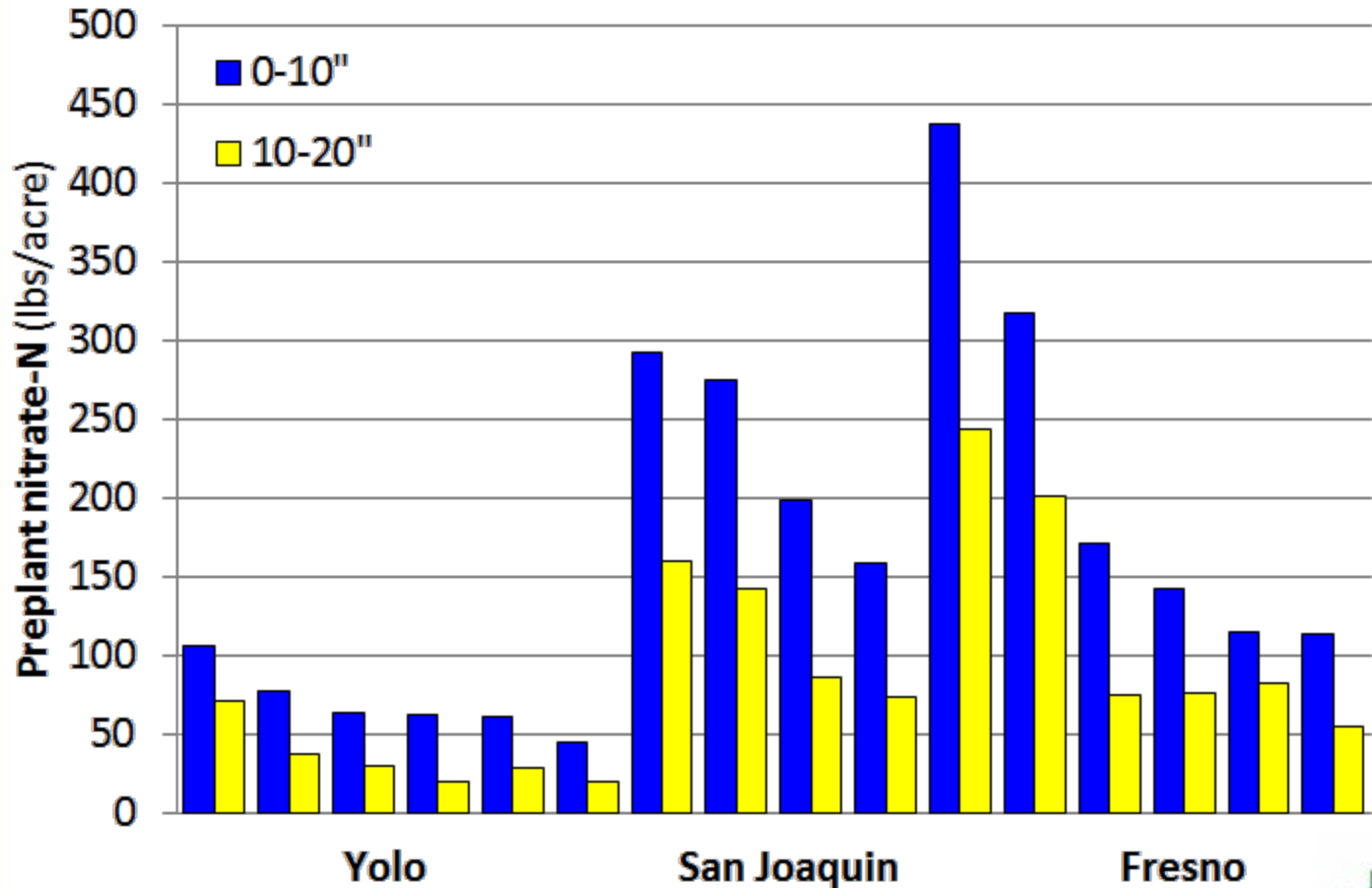


- Pre-plant nitrate-N highly variable
- Needs to be taken into account



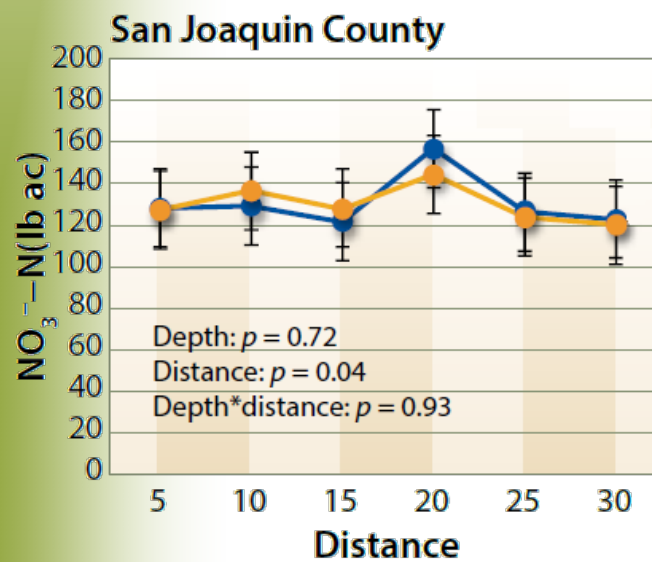
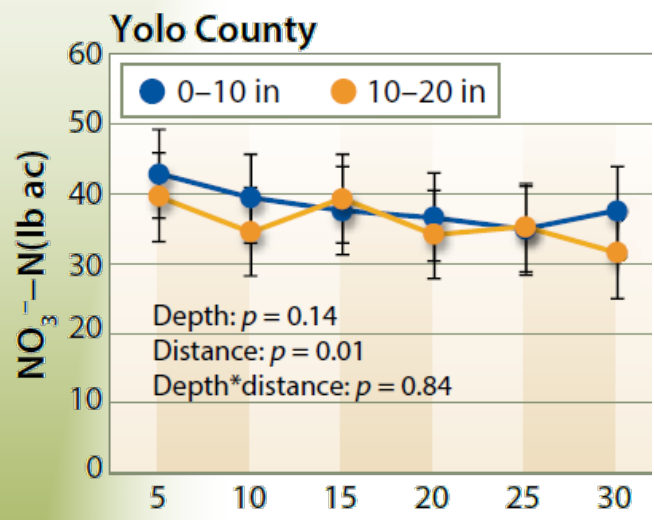


Residual soil nitrate II





Sampling in drip irrigated fields



Recommendation:

- At each location in the field, take three cores at 5", 10", and 20" from center.
- Pool samples

Our experience:

- 5" too close to tape
- 20" almost on the shoulder

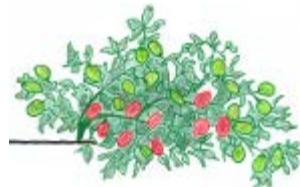
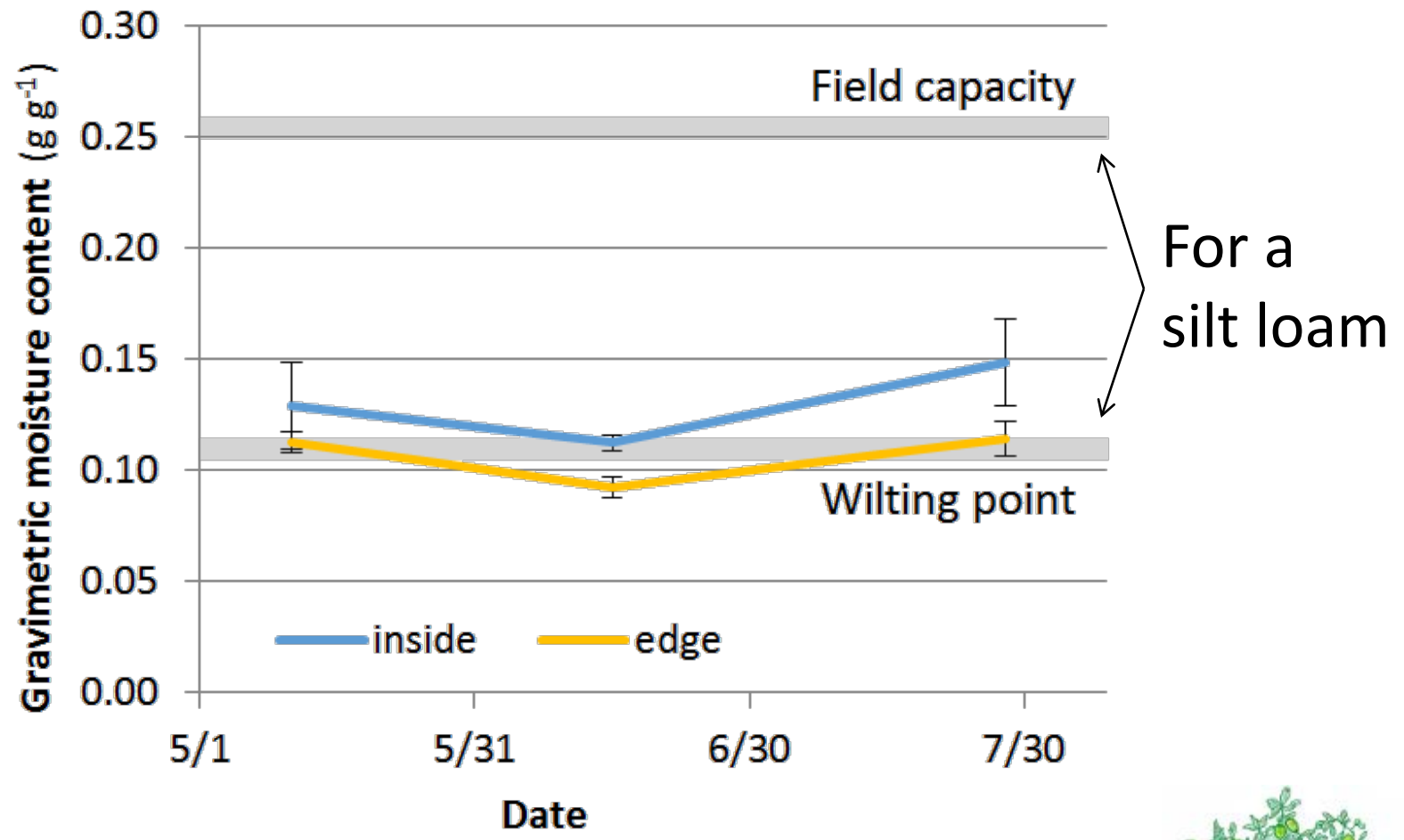
Our approach:

- Take two cores at 7.5" and 15"



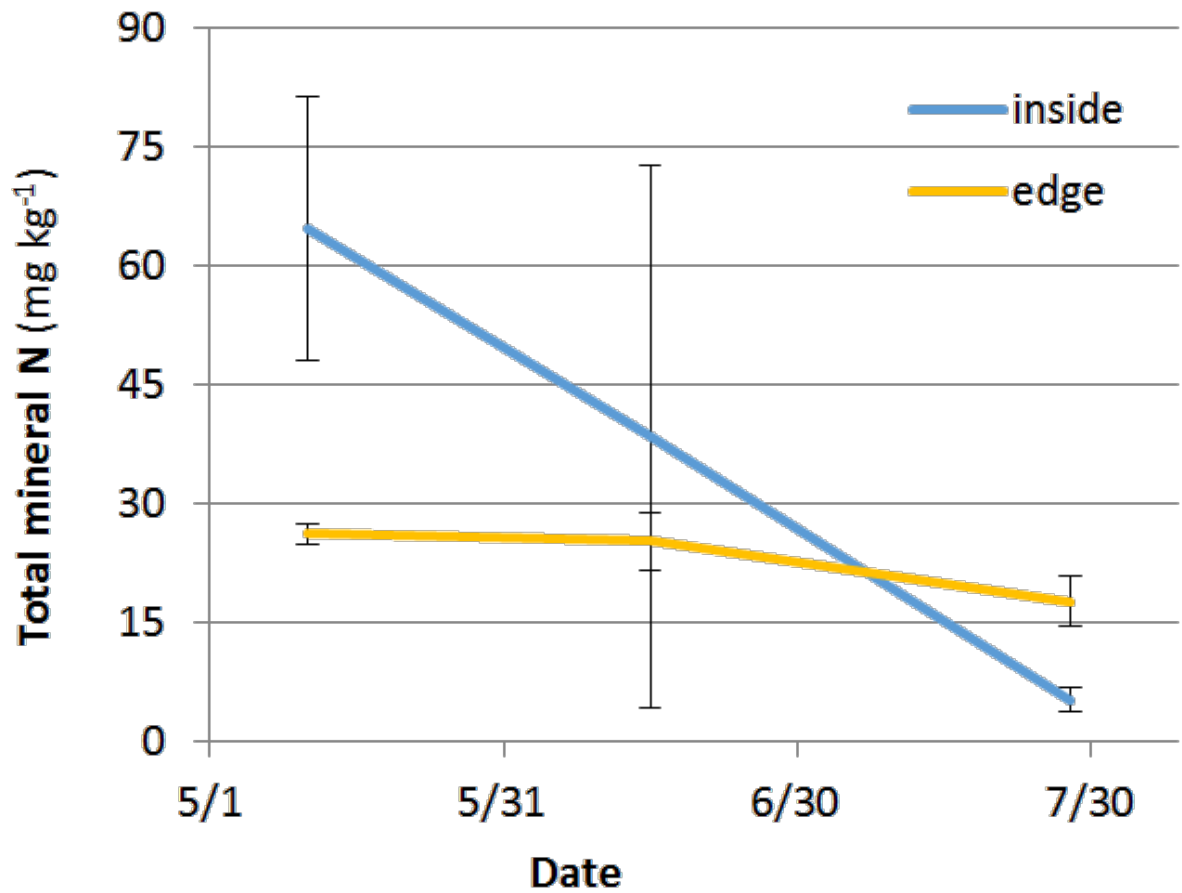


Soil moisture in the top 6 inches of the profile



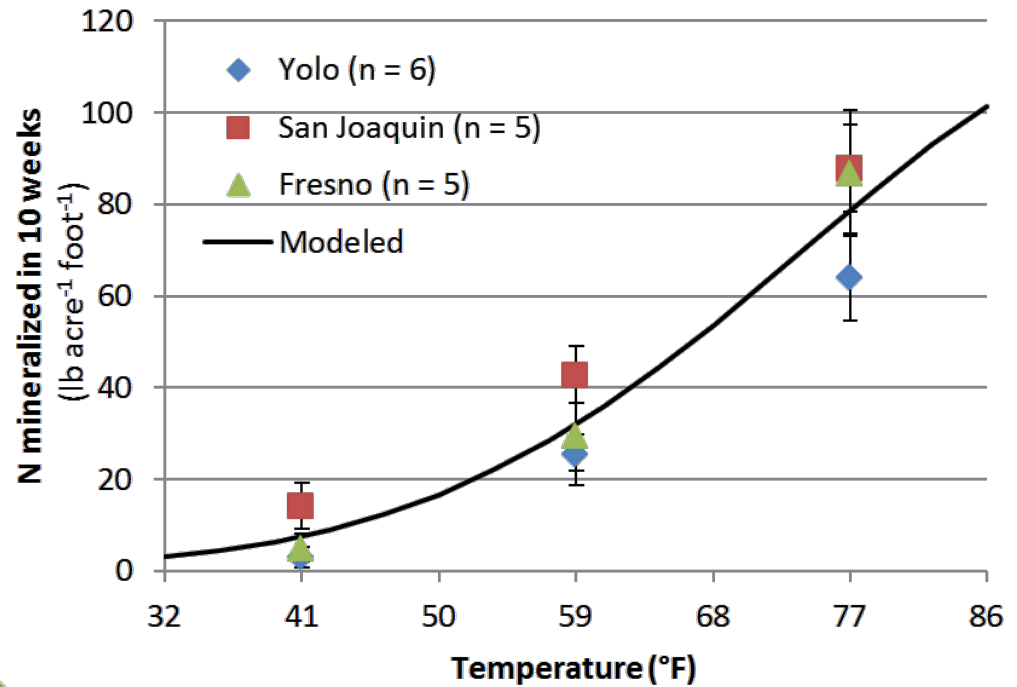
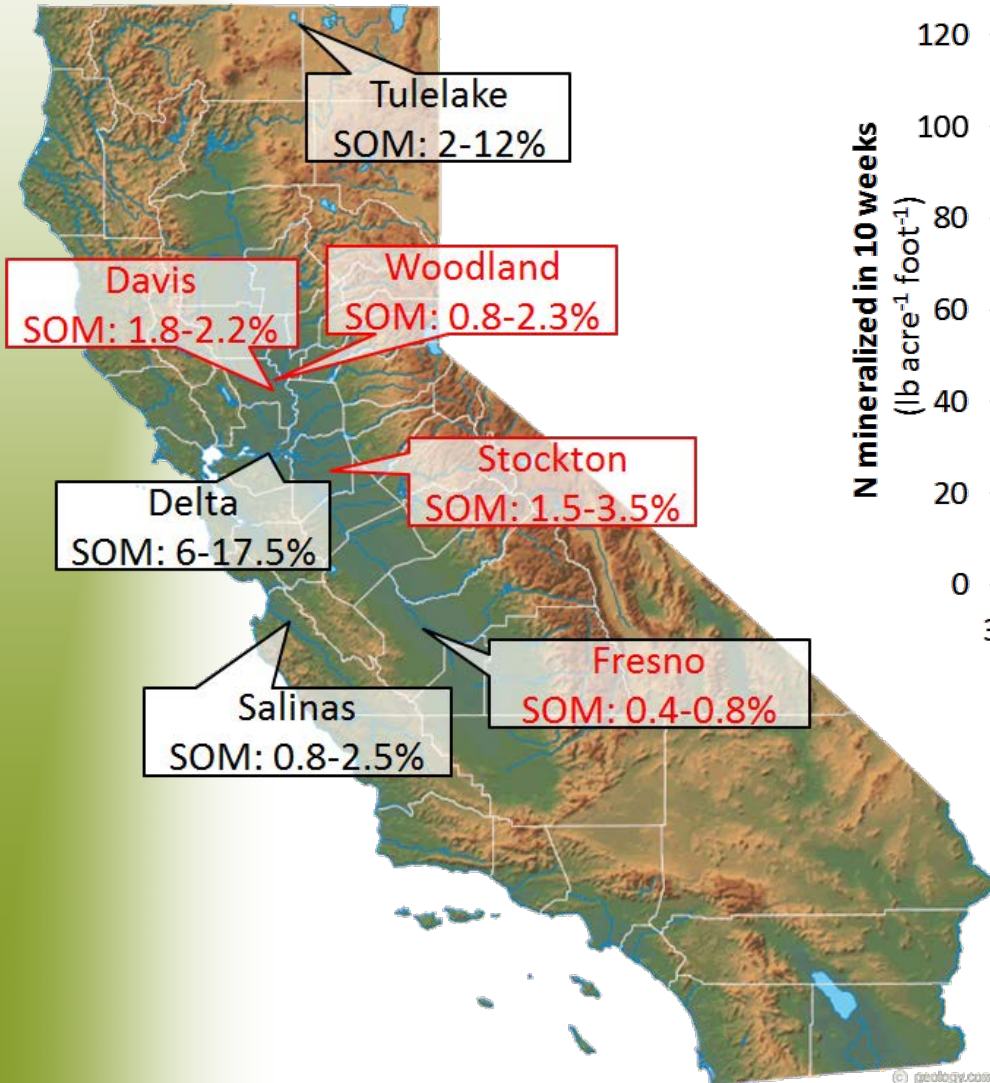


Nitrate concentration in the top 6 inches of the profile





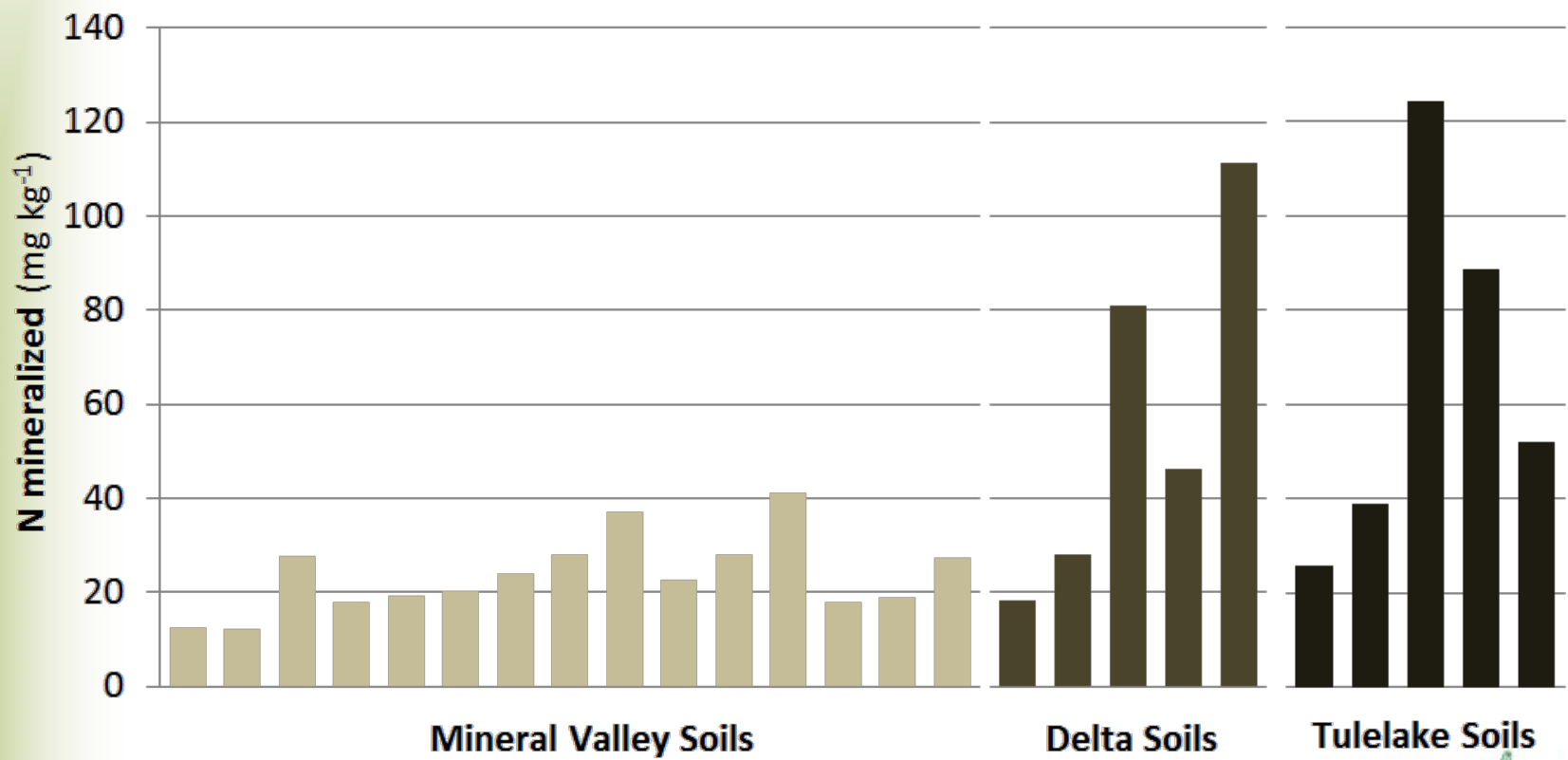
Soil N mineralization rates





N mineralization

10 weeks at 77 °F and optimal moisture content

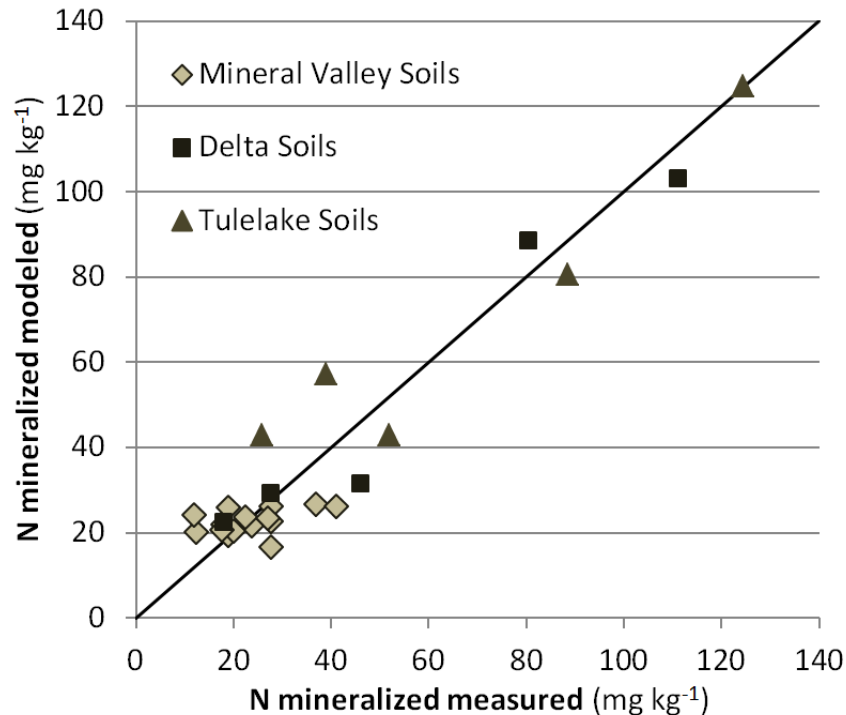




Estimating N mineralization

Soil properties included in model:

- Total C and N
- Particulate organic C





Fertilization guidelines

A collaboration between



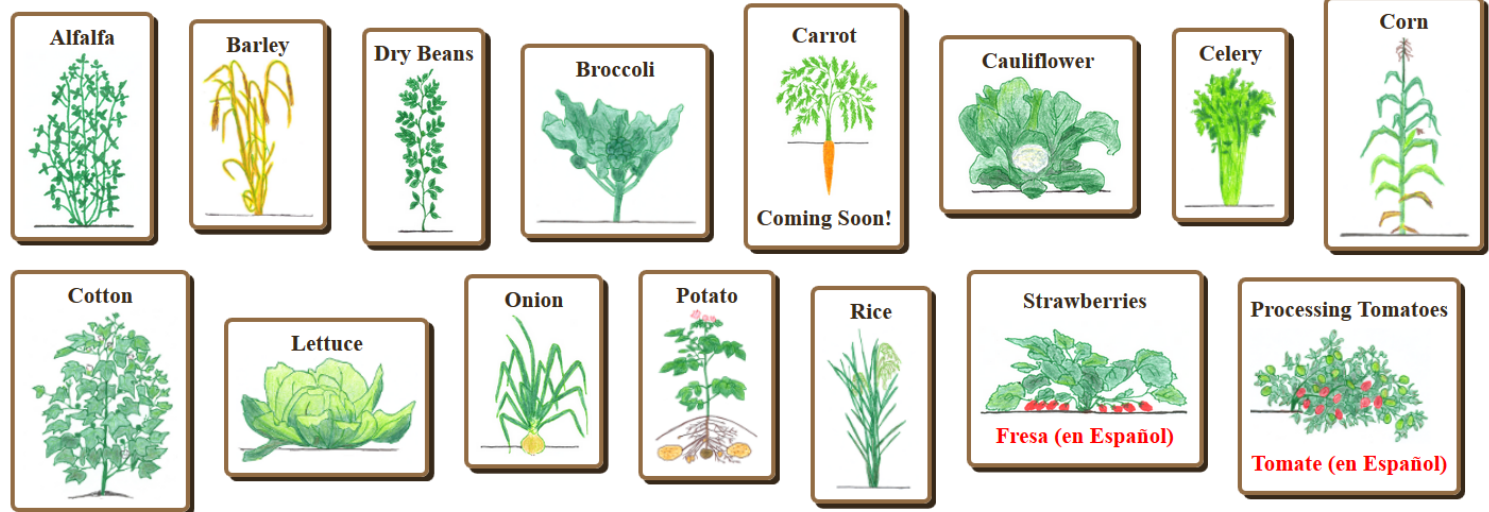
Additional Information

- Soil Sampling
 - Soil Test Sampling Instructions
 - Sampling for Soil Nitrate Determination
 - Soil Sampling in Orchards
- Plant Tissue Sampling
 - Field Crops and Vegetables
 - Orchards and Vineyards
- Resources, Links
- Nitrogen Partitioning and Seasonal Uptake Curves
- A Discussion about Site-Specific Adjustments

California Fertilization Guidelines

These guidelines are based on research results from studies carried out in California and elsewhere. For an optimal fertilization program, site-specific information needs to be taken into account. A discussion about site-specific adjustments can be found [here](#).

Field crops and vegetables





Fertilization guidelines

A collaboration between

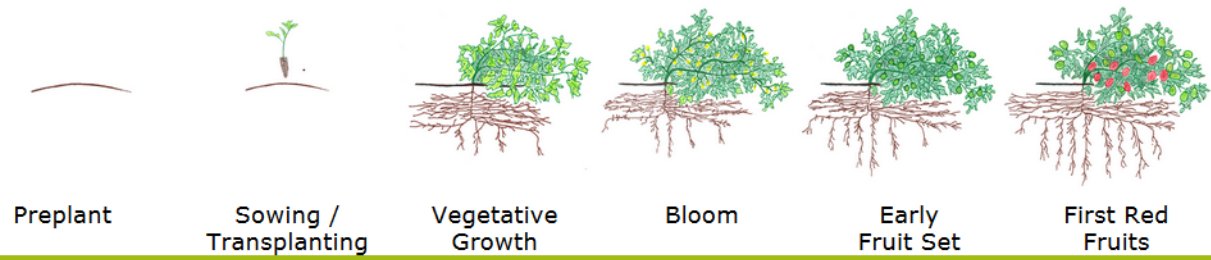


- [Guidelines Home](#)
- [Acknowledgments](#)
- Additional Information:**
- [Tomato Nitrogen Uptake and Partitioning](#)
- [Tomato Production in California](#)
- [Tomato Nitrogen Management Brochure](#)
- [FREP Database](#)

- Links:**
- [UCCE Vegetable Research & Information Center](#)
- [UC Vegetable Crops Nutrient Management](#)
- [UC Integrated Pest Management online](#)
- [California Tomato Research Institute](#)
- [California Tomato Growers Association \(CTGA\)](#)



California Fertilization Guidelines Processing Tomatoes



Nitrogen (N)

Soil Test Leaf Analysis

Preplant N Starter N Soil Applied N Foliar N

Phosphorus (P₂O₅)

Soil Test

Preplant P Starter P

Potassium (K₂O)

Soil Test

Preplant K Starter K

Soil Applied N

Application Rate

For drip-irrigated processing tomatoes, Hartz and Bottoms^[N4] found that a seasonal rate of approximately 175 lbs N/acre is adequate to maximize fruit yields in most soils. Contact your local [farm advisor](#) for more information.

Krusekopf and coworkers^[N10] carried out a study in the Central Valley in ten furrow irrigated fields. A response to N fertilization was observed in only four fields. In the responsive fields, no significant yield increase with sidedress N application rates above 100 lbs/acre



Fertilization guidelines

A collaboration between



<https://apps1.cdfa.ca.gov/FertilizerResearch/docs/>
or just google: California Fertilization Guidelines

Guidelines Home

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California Fertilization Guidelines Processing Tomatoes



Preplant

Sowing /
Transplanting

Vegetative
Growth

Bloom

Early
Fruit Set

First Red
Fruits



Nitrogen (N)

Soil Test

Leaf Analysis

Preplant N

Starter N

Soil Applied N

Foliar N

Phosphorus (P₂O₅)

Soil Test

Leaf Analysis

Preplant P

Starter P

Soil Applied P

Foliar P

Potassium (K₂O)

Soil Test

Leaf Analysis

Preplant K

Starter K

Soil Applied K

Foliar K



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