

Soil sampling protocol for subsurface drip-irrigated tomato cropping systems

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Problem:

Subsurface drip irrigation has led to increases in processing tomato yields and as been adopted by most growers in California. Incremental delivery of nutrients (i.e. fertilizer) close to the roots according to plant needs potentially increases nutrient use efficiency. However, in addition to fertilizer N, other N sources such as residual N (soil nitrate), in-season mineralizable N, and nitrate in the irrigation water also contribute to tomato mineral nutrition and must be considered in cropping system N budgets. Excess nitrate in the soil poses a risk to groundwater.

How do we reliably and economically assess soil nitrate levels in drip-irrigated tomato systems in order to adjust fertilizer N levels?

Concerns:

- Nitrate is mobile in the soil and its concentration is highly variable.
- Nitrate and other nutrients may be depleted around the drip lines where most of the roots are.
- Nitrate may build up on the periphery of the wetted zone.

Objectives:

- Survey of pre-plant **nitrate**, **phosphorus** (Olsen-P), and exchangeable **potassium** in the 0-20 inch depth layer of 16 grower fields in Yolo, San Joaquin, and Fresno counties (2013).
- Develop **guidelines** on how to economically assess pre-plant nitrate.

Figure 1. Survey of nitrate levels in 16 grower fields.

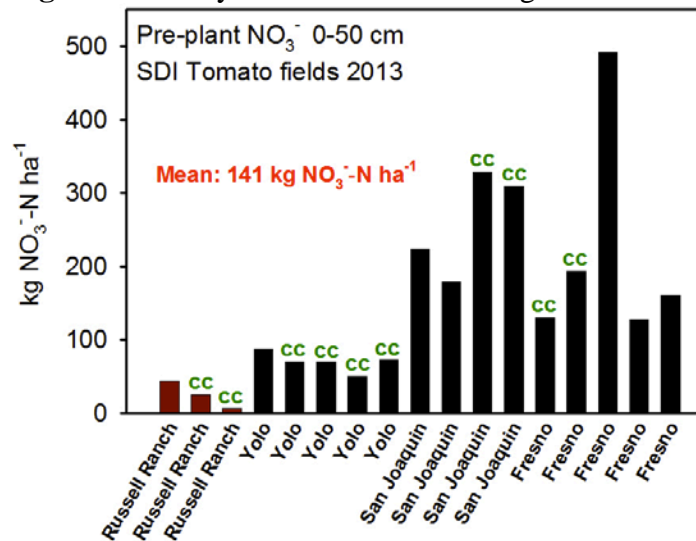
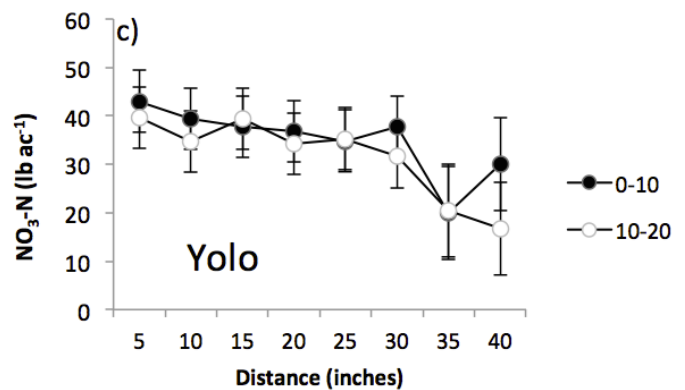
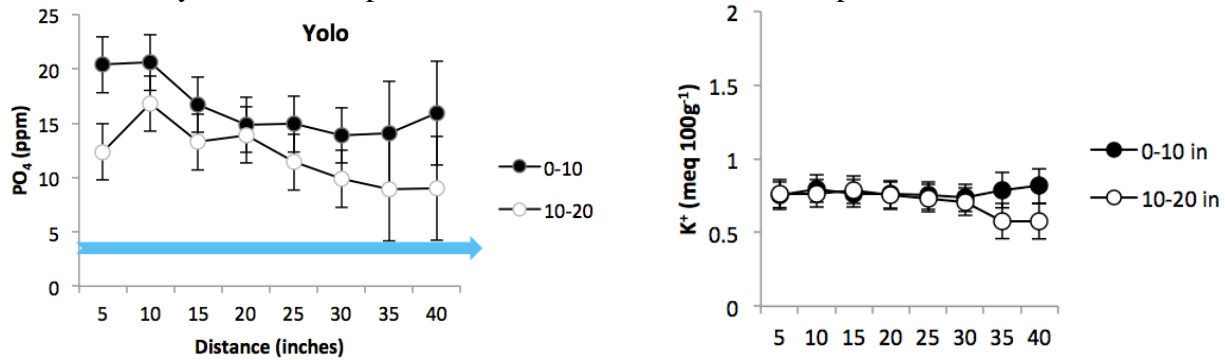


Figure 2. Nitrate in relation to lateral distance from the center of beds in Yolo county fields.



In general, pre-plant nitrate levels increased with years of back-to-back tomato cultivation. Distribution of pre-plant nitrate in relation to the drip tape position was relatively uniform.

Figure 3. Distribution of Olsen-P and exchangeable potassium in relation to the center of the bed in Yolo county fields. No depletion of these nutrients near the drip lines was observed.



Sampling recommendations:

In 60-inch beds, take three cores in the top 20 inches (cores can be pooled for the analyses) at three locations per field; in 80-inch beds, take two cores at four locations per field.

Pre-plant nitrate sampling protocol for 60-inch beds

Field ID	Field average	5"+10"+20" from center	5"+20"+25" from center
lbs N per acre			
Y6	64.7	62.2	67.2
Y5	45.0	46.4	43.7
Y4	64.2	66.6	61.9
Y3	63.6	59.7	67.5
Y2	123.8	126.1	121.4
SJ4	275.1	252.5	297.7
SJ3	293.0	294.8	291.3
F2	318.0	293.6	342.4
F4	437.7	459.7	415.6
F3	171.7	163.2	180.2
F1	115.7	111.4	120.0
Relative Error (%)		4.4	4.4

Pre-plant nitrate sampling protocol for 80-inch beds

Field ID	Field avg.	15" + 30" from center	20" + 25" from center
lbs N per acre			
Y1	78	83	76
SJ1	159	159	162
SJ2	199	183	213
F5	113	110	114
F6	149	141	152
Relative error		4.4%	2.9%

