



California Fertilization Guidelines



Daniel Geisseler

Nutrient Management CE Specialist, UC Davis

**Extension Methods Webinar,
March 27, 2024**



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

The 4Rs of Nutrient Management

Explore the Effects of Plants, Soil and Water on

California Fertilization Guidelines

These guidelines have been written by scientists from the [University of California, Davis](#) with support from [CDFA-FREP](#). The 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

 Alfalfa	 Barley	 Dry Beans	 Broccoli	 Carrot	 Cauliflower	 Celery	 Corn
 Cotton	 Lettuce	 Melons	 Onion Cebolla (en Español)	 Potato	 Rice	 Safflower	
 Strawberries Fresa (en Español)	 Sunflower	 Processing Tomatoes Tomate (en Español)	 Wheat	 Annual Crops in General Cultivos Anuales (en Español)			



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

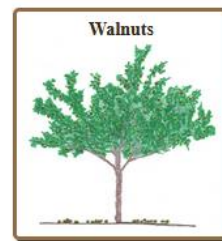
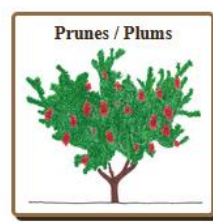
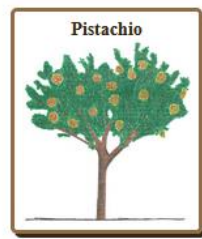
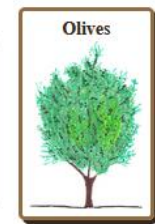
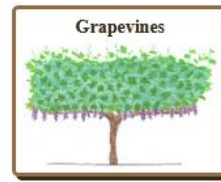
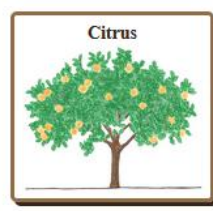
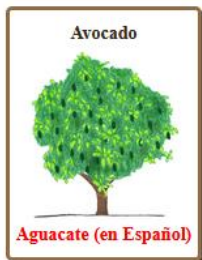
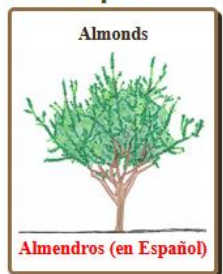
The 4Rs of Nutrient Management

Explore the Effects of Plants, Soil and Water on

California Fertilization Guidelines

These guidelines have been written by scientists from the [University of California, Davis](#) with support from [CDFA-FREP](#). The 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](#).

Tree crops





Fertilization Guidelines

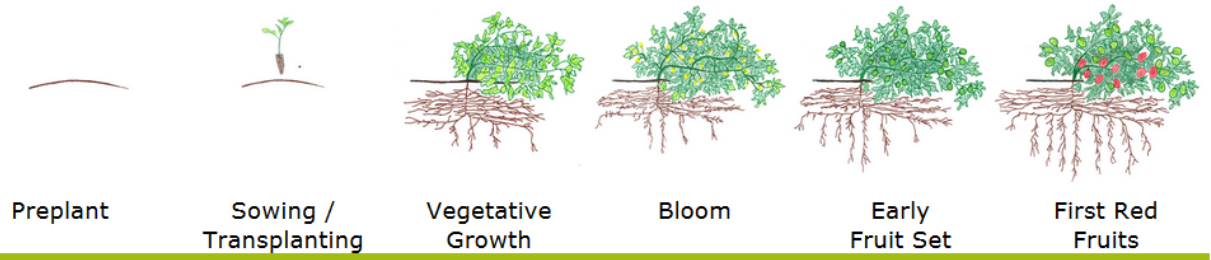
A collaboration between



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



California Fertilization Guidelines Processing Tomatoes



Nitrogen (N)

Soil Test

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 K Foliar K

- 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)

Soil Applied N ✖

Application Rate

Mode of Application

Fertilizer Type

Time of Application



Fertilization Guidelines

A collaboration between

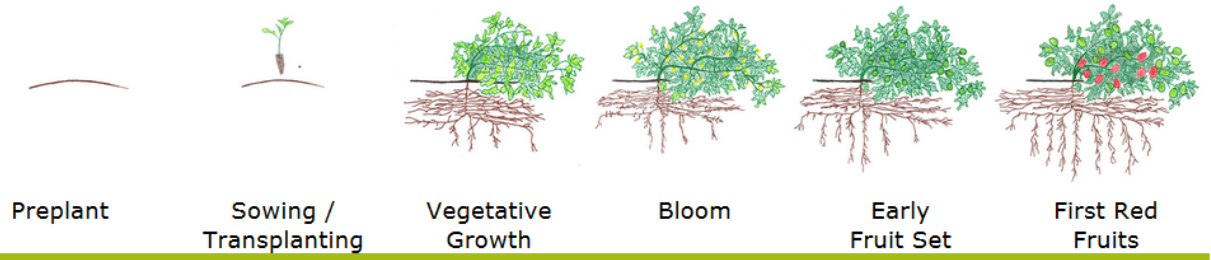


- Guidelines Home**
- Acknowledgments
- Additional Information:**
- Tomato Nitrogen Uptake and Partitioning**
- Tomato Production in California
- Tomato Nitrogen Management Brochure
- FREP Database

- 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 K Foliar K

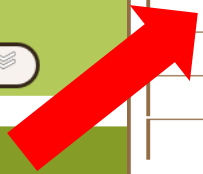
Soil Applied N

Application Rate

Mode of Application

Fertilizer Type

Time of Application



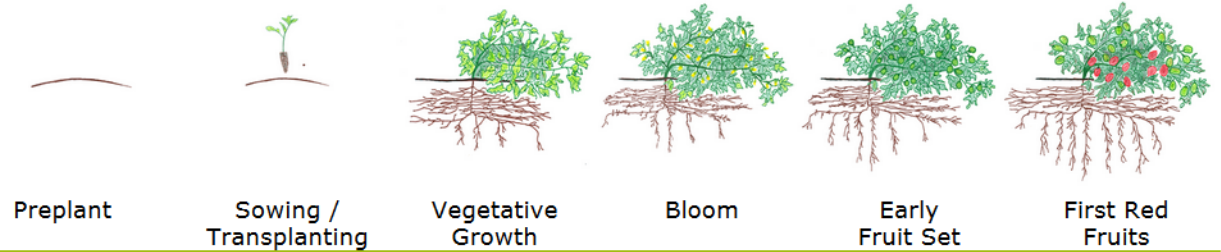


Fertilization Guidelines



- 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)
 - Processing Tomato Advisory Board
 - World Processing Tomato Council
 - Tomato & Health
 - Tomato Wellness



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 was observed. The total available N in these fields, which included the pre-sidedress nitrate-N in the top 2 feet of the profile and the sidedress N, averaged 170 lbs/acre^[N10]. Based on this and other studies, the recommended seasonal N application rate for furrow irrigated tomatoes is 100-150 lbs N/acre^[N8].

Mode of Application

Fertilizer Type

Time of Application

TOP OF PAGE

References:

Nitrogen

- de C. Carmello, Q.A., Anti G.R., 2006. Accumulation of nutrients and growth...
- Elia, A., Conversa, G., 2012. Agronomic and physiological responses of a tomato crop to nitrogen input. European Journal of Agronomy 40, 64-74.
- Hammami, M., Daghari, H., 2007. Tomato root's distribution and water uptake: contribution for trickle irrigation management. Acta Horticulturae 758, 227-234.
- Hartz, T.K, Bottoms, T.G., 2009. Nitrogen requirements of drip-irrigated processing tomatoes. HortScience 44, 1988-1993.
- Hartz, T.K, Hanson, B., 2009. Drip irrigation and fertigation management of processing tomato. University of California Vegetable Research and...

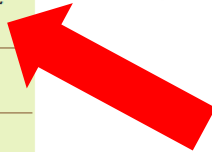


Fertilization Guidelines

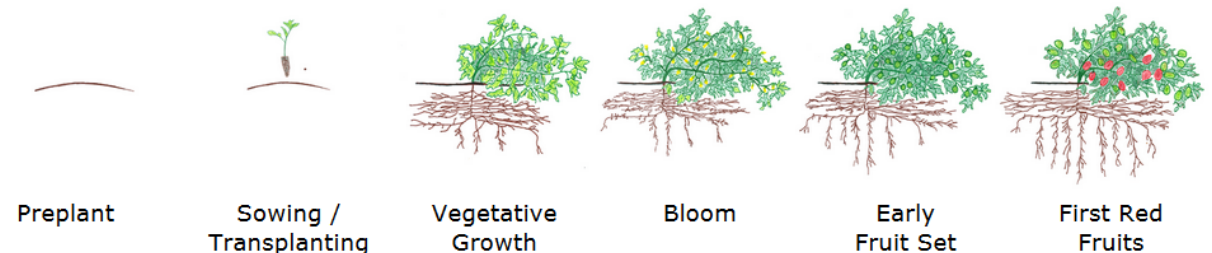
A collaboration between



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



California Fertilization Guidelines Processing Tomatoes



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

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



Fertilization Guidelines

N uptake and removal rates

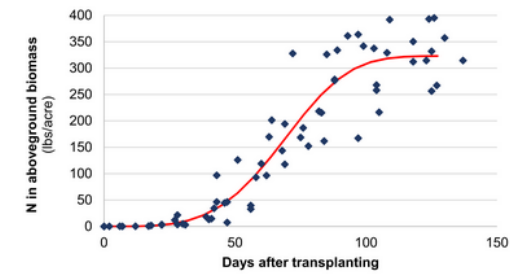
A collaboration between



- [Guidelines Home](#)
- [Nitrogen Removal Report](#)
- Crops**
- Overview**
- [Almonds](#)
- [Avocado](#)
- [Barley](#)
- [Broccoli](#)
- [Carrot](#)
- [Cauliflower](#)
- [Celery](#)
- [Citrus](#)
- [Corn for Grain](#)
- [Corn for Silage](#)
- [Cotton](#)
- [Grapevines](#)
- [Lettuce](#)
- [Melons](#)
- [Olives](#)
- [Onion](#)
- [Peach and Nectarine](#)

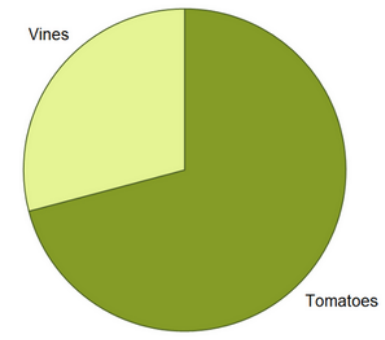
Tomato Nitrogen Uptake and Partitioning

Seasonal N Uptake



Nitrogen in the aboveground biomass of processing tomatoes measured in 11 commercial fields in the Central Valley. Uptake was determined by harvesting the aboveground biomass at different times during the season [3].

Nitrogen Partitioning



Approximately 70% of the total aboveground N of processing tomatoes grown in research plots at UC Davis and in commercial fields was in the fruits, with the rest being in the vines [4].

Nitrogen Removed at Harvest

Nitrogen removed at harvest of processing tomatoes. The overall average is weighted for the number of observations in each data set. More information can be found [here](#) [2].

Location	Years	Removal (lbs N/ton fresh weight)		Source
		Mean	Range	
Hartz and Bottoms, 2009	2007-2008	3.00	2.6 - 3.3	[4]



Fertilization Guidelines

A collaboration between

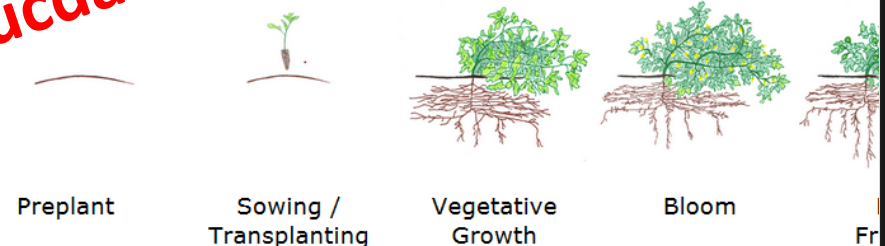


California Fertilization Guidelines Processing Tomatoes

<http://geisseler.ucdavis.edu/Guidelines/Home.html>

- 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)



Nitrogen (N)	Soil Test	Leaf Analysis	Preplant N	Starter N	Soil Applied N	Foliar N
Phosphorus (P ₂ O ₅)	Soil Test	Leaf Analysis	Preplant P	Starter P	Soil Applied P	Foliar P
Potassium (K ₂ O)	Soil Test	Leaf Analysis	Preplant K	Starter K	Soil Applied K	Foliar K

