

# Food Safety and FSMA in Pistachio Production



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AND TECHNOLOGY**

WESTERN CENTER *for* FOOD SAFETY  
  
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# Food Safety Modernization Act

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## Regulations

- Produce Safety ← Pistachio Growers
- Preventive Controls for Human Food
- Preventive Controls for Animal Food
- Foreign Supplier Verification
- Sanitary Transportation of Human and Animal Food
- Prevention of Intentional Contamination/Adulteration
- Accreditation of Third-Party Auditors/Certification Bodies



Focused on prevention of food safety issues and encompasses the entire food system

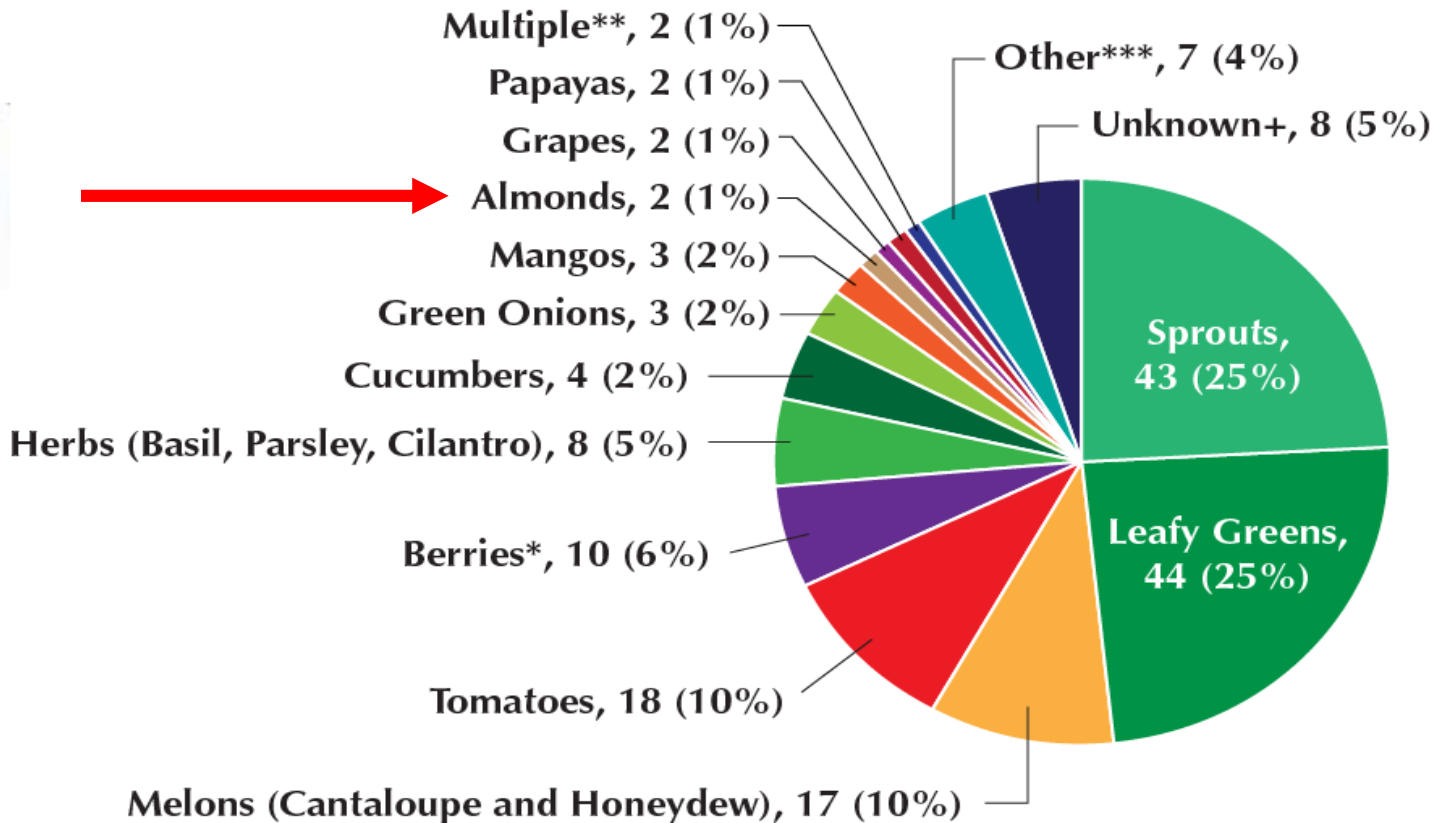


# Why Pistachios?

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# Outbreaks Associated with Produce

FDA Outbreaks Linked to Produce Contamination Likely Prior to Retail: 1996–2014



# Since 2009: 12 US Recalls and 2 Outbreaks Linked to Pistachios



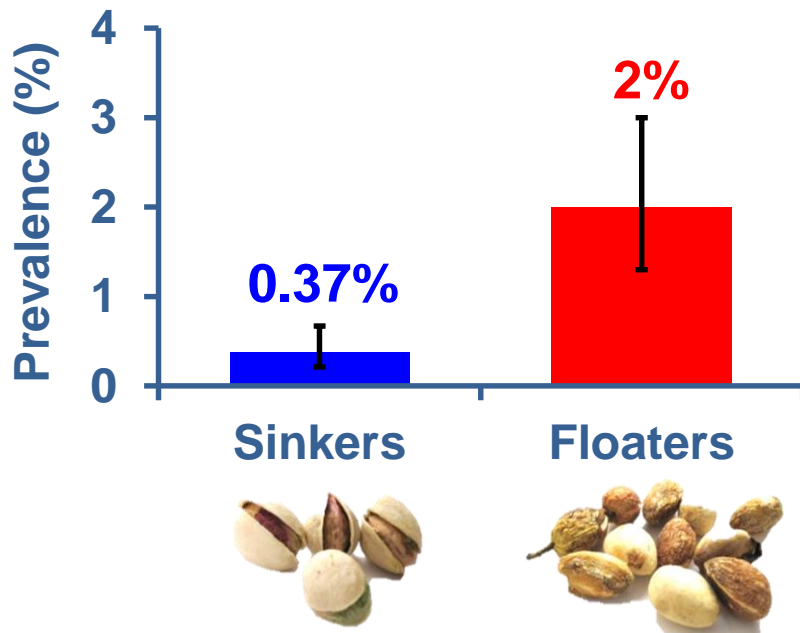
Date of recall	Pistachio type	Reason given	Illnesses
Dec 2016	Raw	Possible <i>Salmonella</i> contamination	None
June 2016	Raw	<i>Salmonella</i> isolated by FDA (retail survey)	None
Mar 2016	Roasted	Possible <i>Salmonella</i> contamination	None
Mar 2016	Raw	<i>Salmonella</i> isolated by FDA (retail survey)	None
Mar 2016	Roasted	<i>Salmonella</i> (linked to outbreak)	11
Feb 2016	Raw	<i>Salmonella</i> isolated by FDA (retail survey)	None
Feb 2016	Raw	<i>Salmonella</i> isolated by FDA (retail survey)	None
Jun 2013	Raw and Roasted	<i>Salmonella</i> (linked to outbreak)	8
Dec 2012	Raw	<i>Salmonella</i> isolated	None
Dec 2012	Roasted	<i>Salmonella</i> isolated	None
Aug 2010	Roasted and Raw	Possible <i>Salmonella</i> contamination	None
Mar 2009	Roasted and Raw	<i>Salmonella</i> isolated	1

# Raw Pistachio Survey 2010-2012

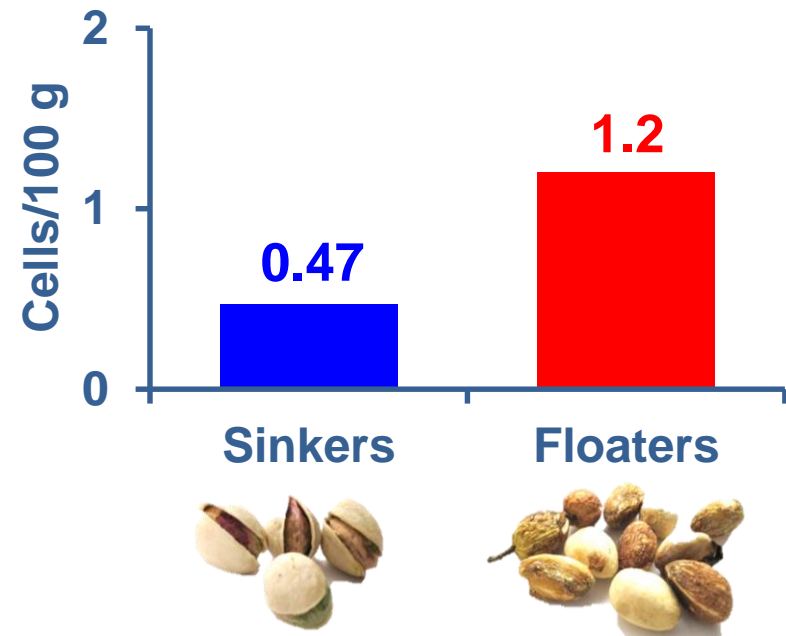
- 7 participating processors  
(98% of California pistachio production)
- ~ 4,000 100-g samples of inshell pistachios  
Floaters: 1,032 samples; Sinkers: 2,936 samples



## Prevalence of *Salmonella*



## Level of *Salmonella*

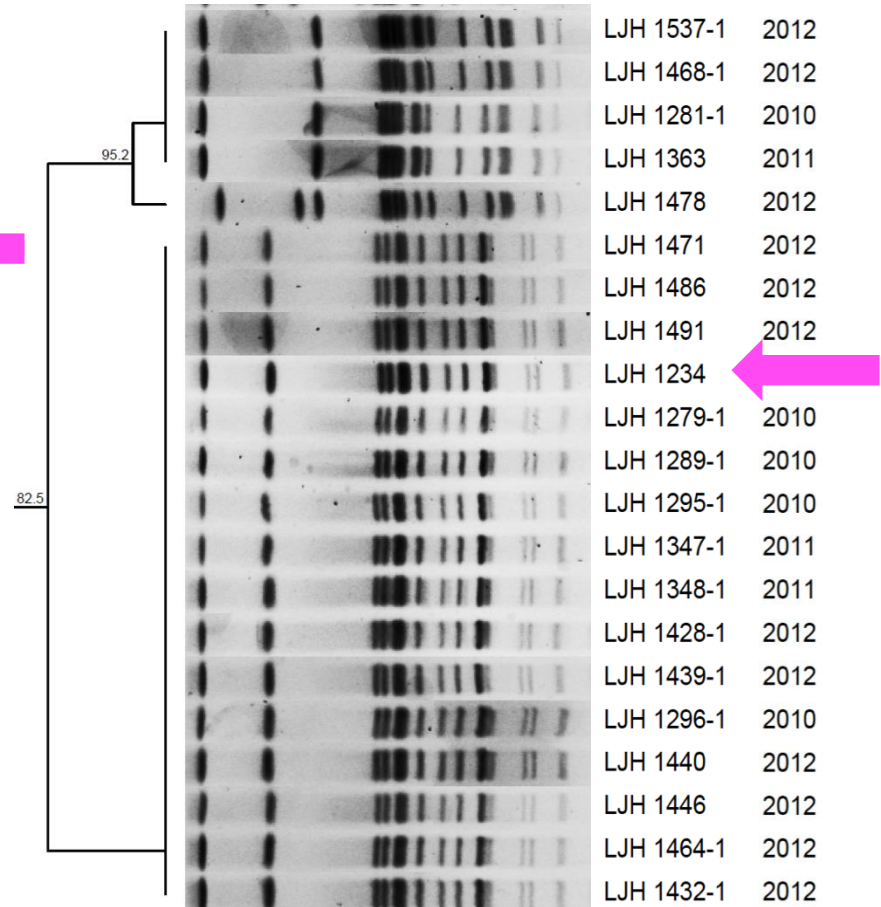




# Narrow range of *Salmonella* in pistachios



Year	Serovar
2007	<i>Salmonella</i> Montevideo?*
2008	<i>Salmonella</i> Montevideo?*
2009	<i>Salmonella</i> Montevideo* <i>Salmonella</i> Newport <i>Salmonella</i> Senftenberg
2010	<i>Salmonella</i> Montevideo* <i>Salmonella</i> Senftenberg
2011	<i>Salmonella</i> Montevideo*
2012	<i>Salmonella</i> Montevideo* <i>Salmonella</i> Senftenberg
2013	<i>Salmonella</i> Senftenberg
2016	<i>Salmonella</i> Montevideo*?



# Possible Contamination Sources

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## Preharvest

- Before harvest
- During harvest



Produce Safety Rule

## Postharvest

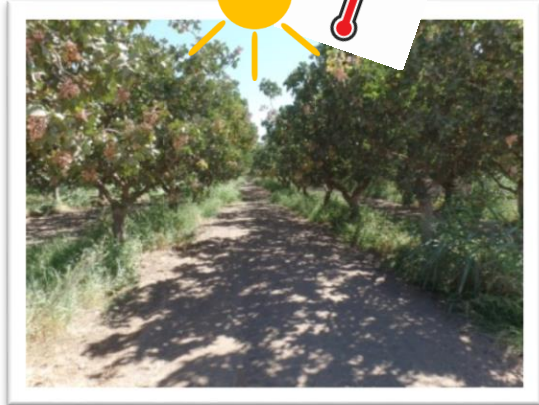
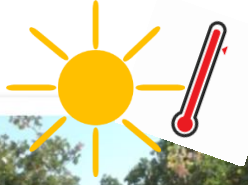
- During postharvest handling
- Before pasteurization
- After pasteurization/roasting



Preventive Controls For Human Foods



# Pistachio Harvest Choreography



Climate/time of harvest



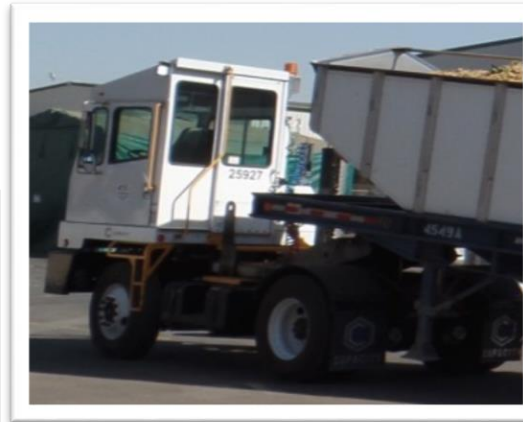
Harvest Crews



Harvest Equipment



Harvest Volume (millions lbs)



Trucks



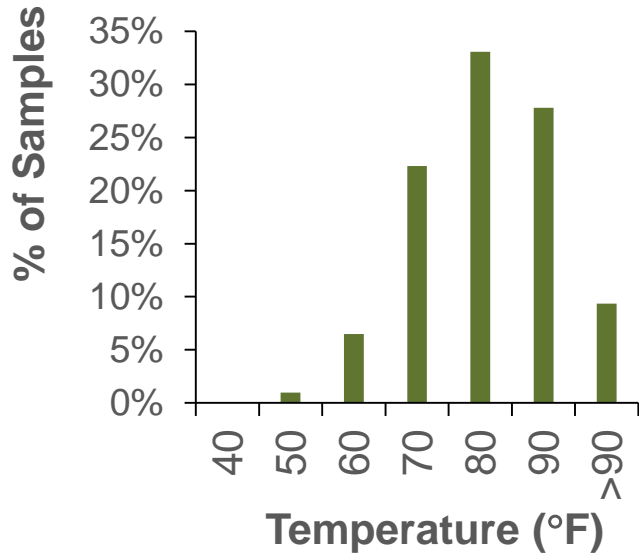
Trailers



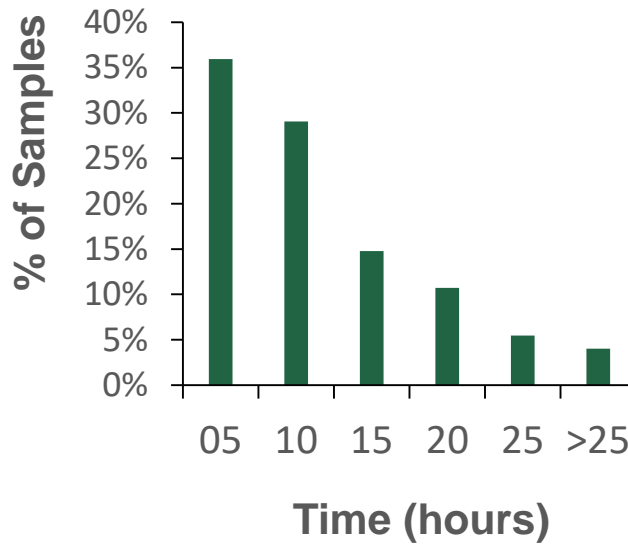
Processing Capacity

# *Salmonella* can grow in harvested pistachios

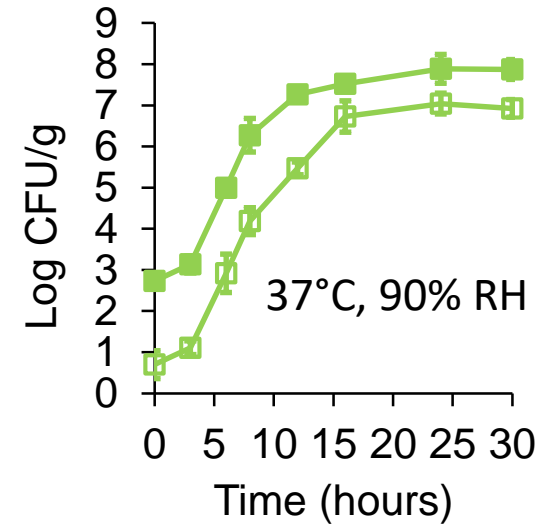
### TRAILER RECEIPT TEMP



### TRAILER WAIT TIME



### *Salmonella* GROWTH





# Contamination Sources



Humans



Soil



Produce



Preharvest

Animals

Buildings  
Equipment  
Tools

Water



Postharvest

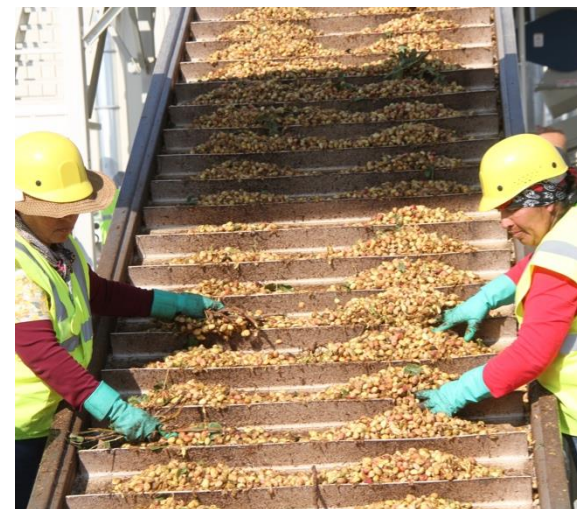
# Soil – Soil Amendments

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# Humans

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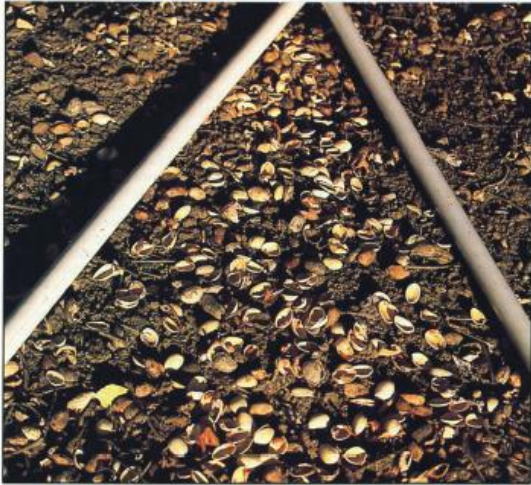


# Animals

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# Birds Recognized as an Agricultural Pest of Pistachios Since 1986



The extent of damage to pistachios by some birds that knock nuts to the ground, where they hull, shell, and eat them, can be measured. Losses to birds that pluck nuts from the tree and fly off to eat them elsewhere can only be estimated.

## Bird damage to pistachios

Terrell P. Salmon □ A. Charles Crabb □ Rex E. Marsh

***Crows are the primary culprits followed by ravens and jays***

counties to the south. District II (C is Merced, Madera, Fresno, and counties. District III (Northern) is 1 rey, San Benito, Inyo, and all coun the north of Merced County.

### Scope of the problem

We received 105 responses (23 pe from the 458 surveys mailed. Th (12.7 percent) were excluded from sis, because the orchards repre were not in production, were outsid fornia, or were managed by anothe son. The remaining 92 indicated th pistachio losses due to one or mor species.

3-1-1986

## BIRD PROBLEMS IN CALIFORNIA PISTACHIO PRODUCTION

A. Charles Crabb

*Crop Science Department, Cal Poly, San Luis Obispo, California*

Terrell P. Salmon

*Wildlife Extension, University of California, Davis, California*

Rex E. Marsh

*Wildlife and Fisheries Biology, University of California, Davis, California*

# Equipment







What is in the tree  
is in the bin.

What is on the  
orchard floor  
is transferred.



# Water

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# Water Requirements

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## Production Water

- Water used **in contact** with produce during growth
  - Irrigation, fertigation, foliar sprays, frost protection
- “Agricultural water is defined in part as water that is intended to, or is likely to, contact the harvestable portion of covered produce or food-contact surfaces”

**Harvestable** is not yet clearly defined

**Pistachios – foliar sprays**





# Requirements for Public Water Sources

Source	Testing Requirement
<b>Public Water Supply</b>	Copy of test results or current certificates of compliance

- With appropriate documentation, there is no requirement to test water that meets the requirements for public water supplies.



# Microbial Water Quality Profile: Survey of Ground Water Sources

Source	Initial and Annual Testing Requirement
Ground	4 or more times during the growing season or over the period of a year 1 or more samples rolled into profile every year after initial year

- Profile samples must be representative of use and must be collected as close in time as practicable to, but before, harvest



# Microbial Water Quality Profile: Survey of Surface Water Sources

Source	Initial and Annual Testing Requirement
Surface	20 or more times over a period of <b>2 to 4 years</b> 5 or more samples rolled into profile every year after initial survey

- Profile samples must be representative of use and must be collected as close in time as practicable to, but before, harvest



# Produce Safety Rule Compliance

## \*Except Agricultural Water

Business Size	Years to Comply After Effective Date (1-26-16)*
All other businesses (>\$500K)	2 (1-26-18)
Small businesses (>\$250K-500K)	3 (1-26-19)
Very small businesses (>\$25K-250K)	4 (1-26-20)

72 days from today



# Produce Safety Rule Compliance

## Agricultural Water

\*Proposed 9-2017

Business Size	Years to Comply After Effective Date (1-26-16)*
All other businesses (>\$500K)	2 (1-26-20/22*)
Small businesses (>\$250K-500K)	3 (1-26-21/23*)
Very small businesses (>\$25K-250K)	4 (1-26-22/24*)

2 to 4 years and  
72 days from today

CAUTION:  
Needs 2 to 4 years  
to prepare §





# Steps Towards Produce Safety

- 1 • Assess Produce Safety Risks
- 2 • Implement Practices
- 3 • Monitor Practices
- 4 • Use Corrective Actions
- 5 • Keep Records

# Produce Safety Rule

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**At least one supervisor from the farm** must complete food safety training at least equivalent to the standardized curriculum

- The Produce Safety Alliance training satisfies this FSMA requirement



# Pistachio Research Board Grant

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- Produce Safety Alliance (PSA) curriculum training relevant to California pistachio production practices.



- Next course Bakersfield, CA  
– November 27/28, 2017



# UC Food Safety



- Home
- Better Process Control Schools
- Consumers
- Food Safety Links
- Pre- & Post-harvest Produce**
- Food Service/Retail
- Food Processing
- Food Industry Contacts
- UC Publications
- Contact Us
- Upcoming Training

## Pistachio Grower Resources

### Agricultural Water

### Farm Food Safety Plan Resources

- [Decision Trees: Farm Food Safety Decision Making Made Easy](#) (Cornell University)
- [Food Safety Plan](#) (Colorado State University Ext.) (PDF 383 KB)
- [Write a Food Safety Plan](#) (Pennsylvania State University Extension)

### Grower Training Manual

- [Produce Safety Association / Cornell University's Grower Training Manual References and Links](#)