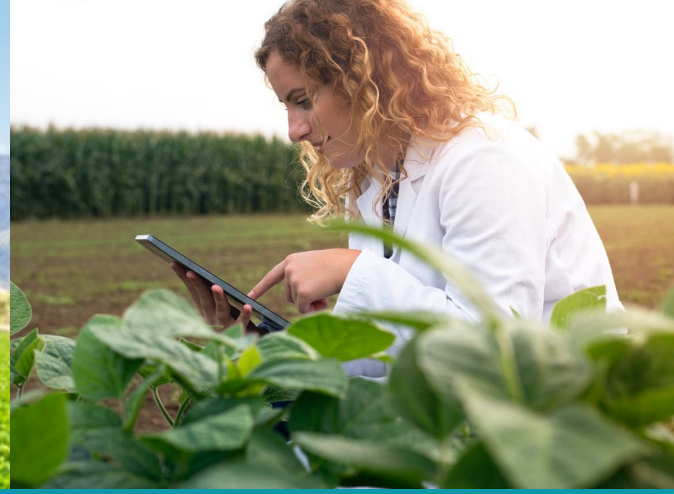


Fresh Produce Food Safety

Why Changing Our Focus Will Strengthen Food Safety: Hazard Versus Risk Management

De Ann Davis, PhD
SVP of Science, Western Growers

WESTERN GROWERS® SCIENCE

September 4, 2024

Disclosure

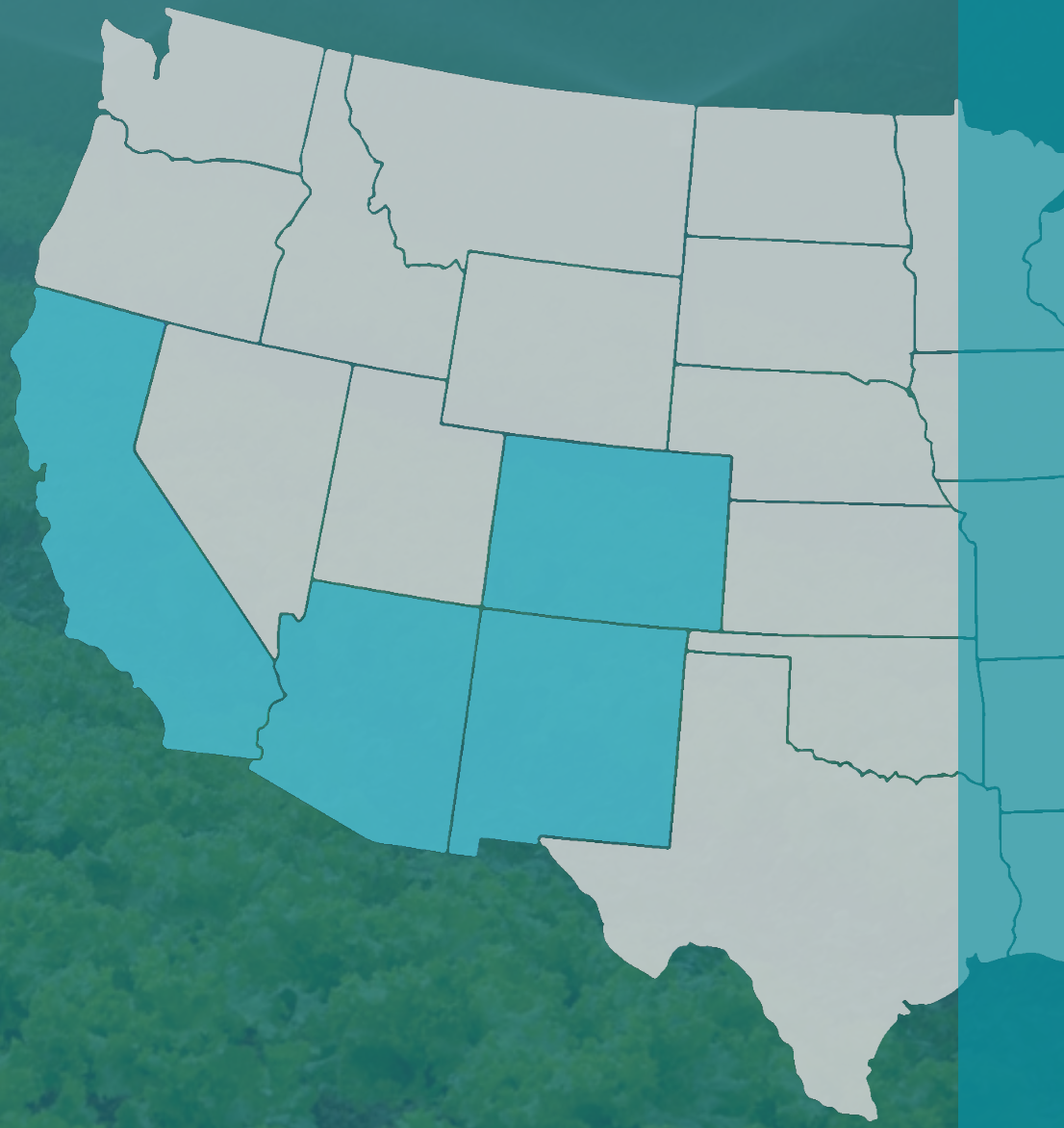
I have no conflicts to disclose.

WESTERN GROWERS®
FAMILY OF COMPANIES

Western Growers (WG) is a non-profit agricultural trade association that represents local and regional family farmers growing fresh produce in the Western US.

Our members and their workers provide roughly half the nation's fresh fruits, vegetables and tree nuts, including nearly half of America's fresh organic produce.

We have 2,200 members but to be a full voting member your home farm has to be in California, Arizona, New Mexico and Colorado



Rationale for Change

- Grower field food safety programs for fresh produce are largely hazard -focused. Meaning, successful management is avoiding the hazard (not managing the risk).
- Public health emphasis is placed on outbreaks as a measure of food safety performance. Investigations of outbreaks inform growers as to what may have gone wrong while providing little direction on “how” to improve.
- To strengthen food safety, we should not be focused on avoiding the next outbreak but on avoiding the next illness. This requires a focus by growers and public health authorities on prevention through continuous improvement.
- To get there, the grower needs a better quantitative understanding of successful food safety RISK management at growing, at harvesting and at packing. This requires changes in our national food safety agenda.

You can’t improve what you don’t measure.- Peter Druker

Today's Grower Challenges Are Extreme

A Farm's Realities

- Water
- Labor
- Climate change
- Pests
- Higher production costs vs import
- Invasive species
- Urbanization/loss of agricultural land

A Farm's Regulatory Environment

- Water
- Labor
- FSMA (food safety)
- Crop inputs/nitrogen management
- Pesticides
- Endangered species
- Resource conservation
- Transportation

Cartoon from Bing Images

Domestic Production Versus Imports

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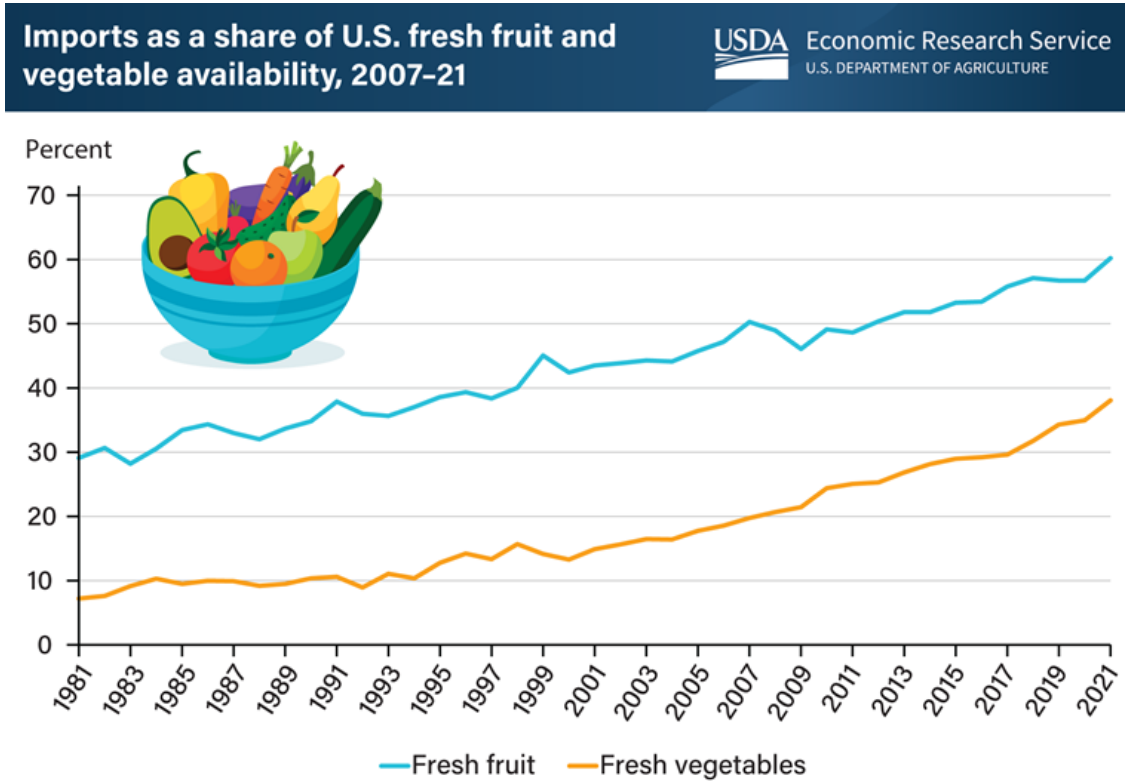
Imports continue to make up growing share of U.S. fresh fruit and vegetable supply



Note: Availability is calculated as production minus exports plus imports and is measured in terms of volume. The calculation for fresh vegetables excludes potatoes, sweet potatoes, and mushrooms.

Source: USDA, Economic Research Service (ERS) Fruit and Tree Nuts Yearbook Data and Vegetables and Pulses Yearbook Data.

California Agriculture Industry

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- More than **400** commodities.
- Over **one third** of the country's vegetables and nearly **three-fourths** of the country's fruits and tree nuts
- **68,400 farms and ranches*** covering **24 million acres**
- **21,000 farms**** covered under the FSMA Produce Safety Rule
- Market value of **$59 billion*****

**California Agricultural Statistics Review 2022-2023. **AMS/NASS/USDA report using data from 2017 Agricultural Census. ***USDA 2022 Census of Agriculture as of Feb 13 2024*

A couple of highlights

$3.2 billion in lettuce =

23.9 billion servings / yr*

$2.7 billion in strawberries =

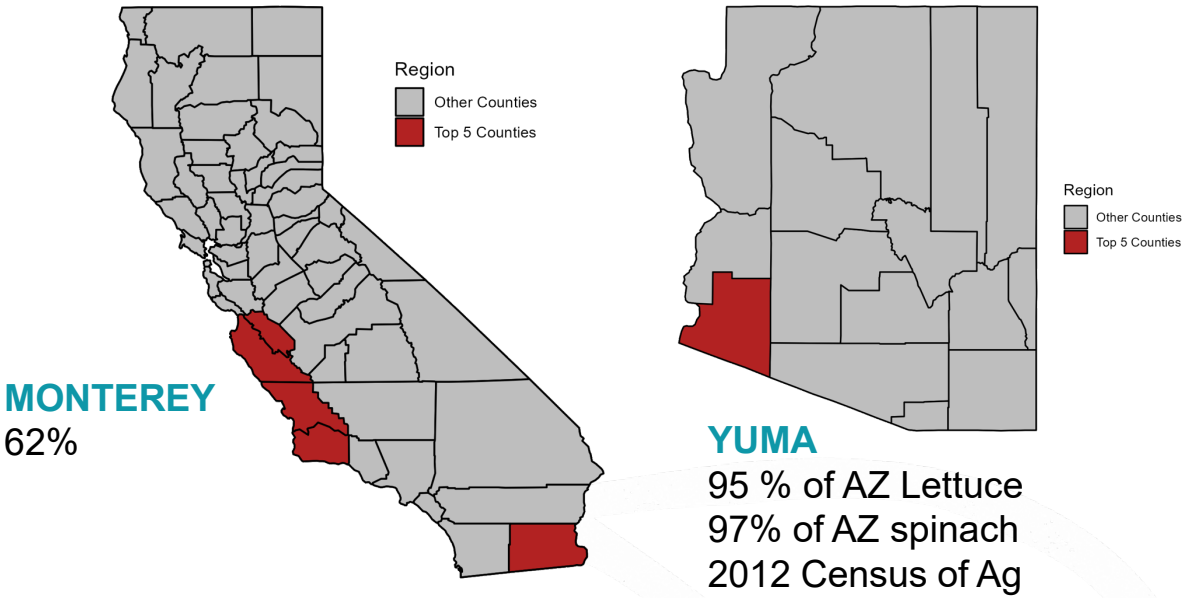
11.2 billion servings / yr*

California Agricultural Statistics Review 2022-2023
**Production in 2023 CDFA /Reference Amounts Customarily Consumed (FDA)*

Leafy Green Production

- In 2022, 9.97 billion lbs. of leafy greens were produced in the US.[1]
- **California** and **Arizona** account for **85%** of the area harvested for leafy greens.[2]
- Top producing counties in California include:
  - Monterey (62%)
  - Imperial (16%)
  - Santa Barbara (7%)
  - San Benito (5%)
  - San Luis Obispo (2%)
  - Other counties (9%)
- For Arizona, **Yuma** County produces >95% of leafy greens (spinach and lettuce).

California top 5 counties by area harvested



MONTEREY
62%

IMPERIAL
16%

YUMA
95 % of AZ Lettuce
97% of AZ spinach
2012 Census of Ag

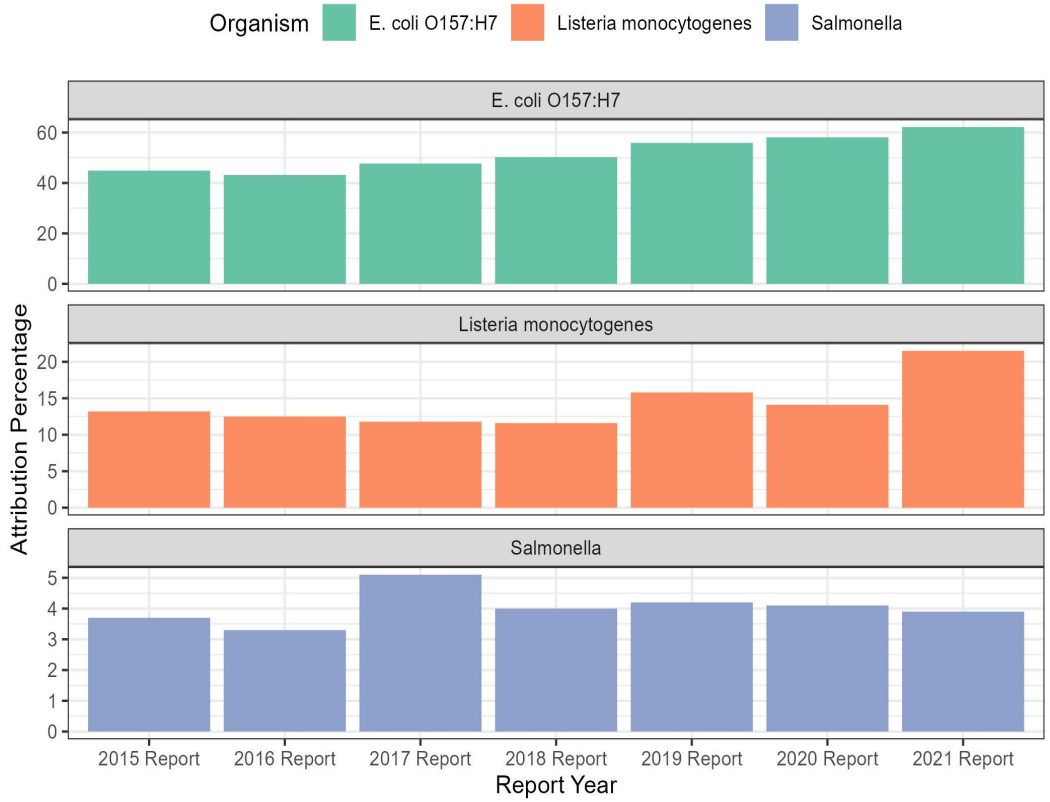
1. USDA ERS Yearbook Tables Vegetables and Pulses (sum of lettuce, spinach and cabbage)
2. 2022 Census of Agriculture: Sum of area harvested for lettuce, head cabbage, and spinach

Fresh Produce Illness Attribution Trends

Leafy green food safety continues to be a priority for public health.

- More infections are increasing being diagnosed by culture-independent diagnostic testing (CIDT). It is not fully understood how CIDT use impacts attribution.

Attribution of Foodborne Illness for Vegetables Row Crops



Foodborne illness source attribution estimates for Salmonella, Escherichia coli O157, and Listeria monocytogenes — United States, 2021 The Interagency Food Safety Analytics Collaboration (IFSAC) Nov. '23

Fresh Produce Food Safety – Today's View

Example:
Leafy Greens and Adjacent Land Uses

View of Production Areas and Varied Adjacent Land Uses

Leafy Green Outbreaks

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Outbreaks associated with leafy greens

- Since 2006, the CDC or FDA has investigated and reported 18 multistate outbreaks of leafy greens.
- Most common etiology is *E.coli* O157:H7 (13/18).
- In most cases the contamination source is unknown.
  - Water sources
  - Nearby cattle operations

	YEAR	FOOD	ETIOLOGY	ORIGIN	CONTAMINATION SOURCE
	2023	Leafy Greens	L. monocytogenes	Not confirmed	No confirmed
?	2021	Packed Salad	E. coli O157:H7	Organic spinach, mizuna, kale, and chard CA- Salinas AZ - Yuma	No confirmed - **Farm**
?	2021	Baby Spinach	E. coli O157:H7	CA, OR	Not identified
	2021	Prepackaged Salads	Salmonella Typhimurium	IL- Greenhouse	Not identified- Strain identified in storm water drainage basin
	2021	Packaged Salads	L. monocytogenes	IL - Facility	Facility
	2021	Packaged Salads	L. monocytogenes	AZ – Yuma equipment	Harvesting Equipment
Associated with nearby cattle	2020	Leafy Greens	E. coli O157:H7	Not confirmed	**Strain related to 2019**
Associated with nearby cattle	2019	Salad Kits	E. coli O157:H7	CA- Salinas	**Nearby Cattle**
Associated with nearby cattle	2019	Romaine Lettuce	E. coli O157:H7	CA- Salinas	**Nearby Cattle**
?	2018	Romaine Lettuce	E. coli O157:H7	red leaf lettuce, green leaf lettuce, and cauliflower CA - Central Coast	Identified in **water sediment**
?	2018	Romaine Lettuce	E. coli O157:H7	AZ- Yuma	Identified in **canal water**
	2017	Leafy Greens	E. coli O157:H7	Not confirmed	Not identified
	2016	Packaged Salads	L. monocytogenes	OH- Processing Facility	Processing facility
	2013	Ready-to-eat salad	E. coli O157:H7	Not confirmed	Not confirmed
	2012	Organic Spinach and Spring Mix	E. coli O157:H7	MA	Not confirmed
	2011	Romaine Lettuce	E. coli O157:H7	Not confirmed	Not confirmed
	2010	Shredded Romaine	E. coli O145	Suspect AZ- Yuma	Not confirmed
	2006	Fresh Spinach	E. coli O157:H7	CA- Salinas	**River water, cattle and swine feces**

Based on FDA and CDC Reports

Grower Checklist for Adjacent Land Use

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Adjacent Land Hazard Assessment

- **Wildlife**
  - Birds
  - Frogs
  - Elk
  - Deer
  - Pigs
  - Coyotes
  - Rodents
- **Non-crop vegetation**
  - Riparian areas
  - Hedgerows
  - Furrows
  - Buffer strips
  - Trees
  - Fallow land/weeds
- **Dust/wind**
  - Direction
  - Speed
  - Particle size
- **Insect vectors**
  - Flies
  - Beetles
- **Water Sources**
  - Flooding
  - Tailwater
  - Natural sources
  - Neighbor run-off
  - Reservoirs
- **Domestic Animals**
  - Dogs
  - Cats
  - Horses
  - Cattle
  - Goats
  - Poultry
  - Swine
- **Other Land Uses**
  - Compost
  - Construction
  - Dumps
  - Housing
  - Processing plants
  - Roads

Leafy Green Adjacent Land Set-Back Distances or Buffers

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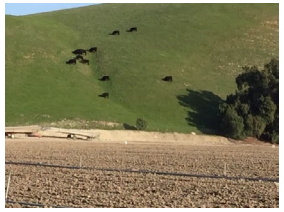
Adjacent Land Use	STANDARD			
	FSMA PSR	CALIFORNIA LEAFY GREEN MARKETING AGREEMENT	FOOD RETAILER 1	FOOD RETAILER 2
Concentrated Animal Feeding Operation (1-80k head)	"Must take all measures reasonably necessary to identify, and not harvest, covered produce that is reasonably likely to be contaminated with a known or reasonably foreseeable hazard." (U.S. FDA 2015a)	1 mile	1-2 miles	1200 ft to 1-2 miles
Riparian / Vegetative area		30 ft.	50-150 ft.	30-150 ft.
Irrigation reservoir / pond / catch basin		-	50 ft.	30 ft. with fencing
Large animal dropping		Minimum 5 ft. diameter	50 ft to prohibit entire field	5-10 ft.
Visible amphibian activity		-	Prohibit	Buffer or prohibit
Composting operation		400 ft.	-	400 ft.

Taken from CDFA: Food Safety and sustainable agricultural practices: Conflicts and their effects on policy and programs in California. Authors: Emily Zakowski and Kevi Mace

Hazard Based Management

Controlling for something that is capable of causing harm



Where do I start?

Which should I prioritize?

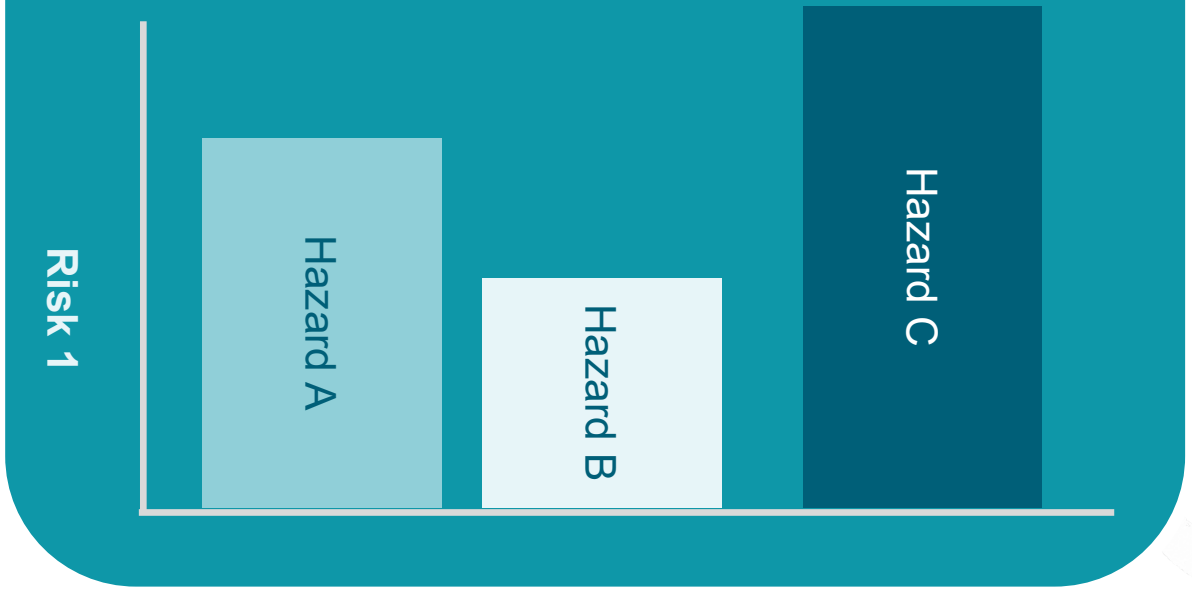
Hazard versus Risk-Based Management

Hazard Based Management

Controlling for something that is capable of causing harm

Risk Assessment

Identifying which hazards are relevant and how to best manage them



Hazard versus Risk-Based Management

Hazard Based Management

Controlling for something that is capable of causing harm

Risk Assessment

Identifying which hazards are relevant and how to best manage them

Risk Based Management

Effectively control for those hazards that are most likely to cause harm

PRIORITIES

1. Control Hazard C
2. Control Hazard A
3. Control Hazard B

Adjacent Land "By-The-Numbers"

Quantitative Microbial Risk Assessment Model Salinas Valley California Growing Region

Action 3: QMRA Work Group

Waterways & source module
- Prevalence
- Concentration
- Seasonality
- Growth/survival

Animal Operations (AO) Module
- Type of herd
- Size of herd
- O157 prevalence (more?)
- Seasonality of prevalence
- Reduction/growth opportunities

CFU

Wildlife Module
- Birds from AO
- Insects from AO
- Rodents from AO
- Ruminant wildlife

Environmental Transfer Module
- Air dispersion
- Runoff – direct
- Runoff - indirect
- Waterway prevalence
- Vehicles/people
- Growth/Survival
- Etc…

CFU

Lettuce growing module
- Irrigation water quality
- Water treatment
- Fertilizer input
- Pest inputs
- Weeding
- Target growth/survival
- Etc.

CFU

Lettuce processing module
- Harvest – hand
- Harvest – mechanical
- Cut-to-cool
- Cooling
- Processing – chopping/slicing
- Wash flumes
- Packaging

CFU

Consumption module
- Cold chain post-processing
- Consumer refrigerators
- Growth/reductions
- Servings consumed
- Dose response

Final output

Contaminated servings & Illnesses

Flow diagram is an example – not intended to be complete. For understanding purposes only.

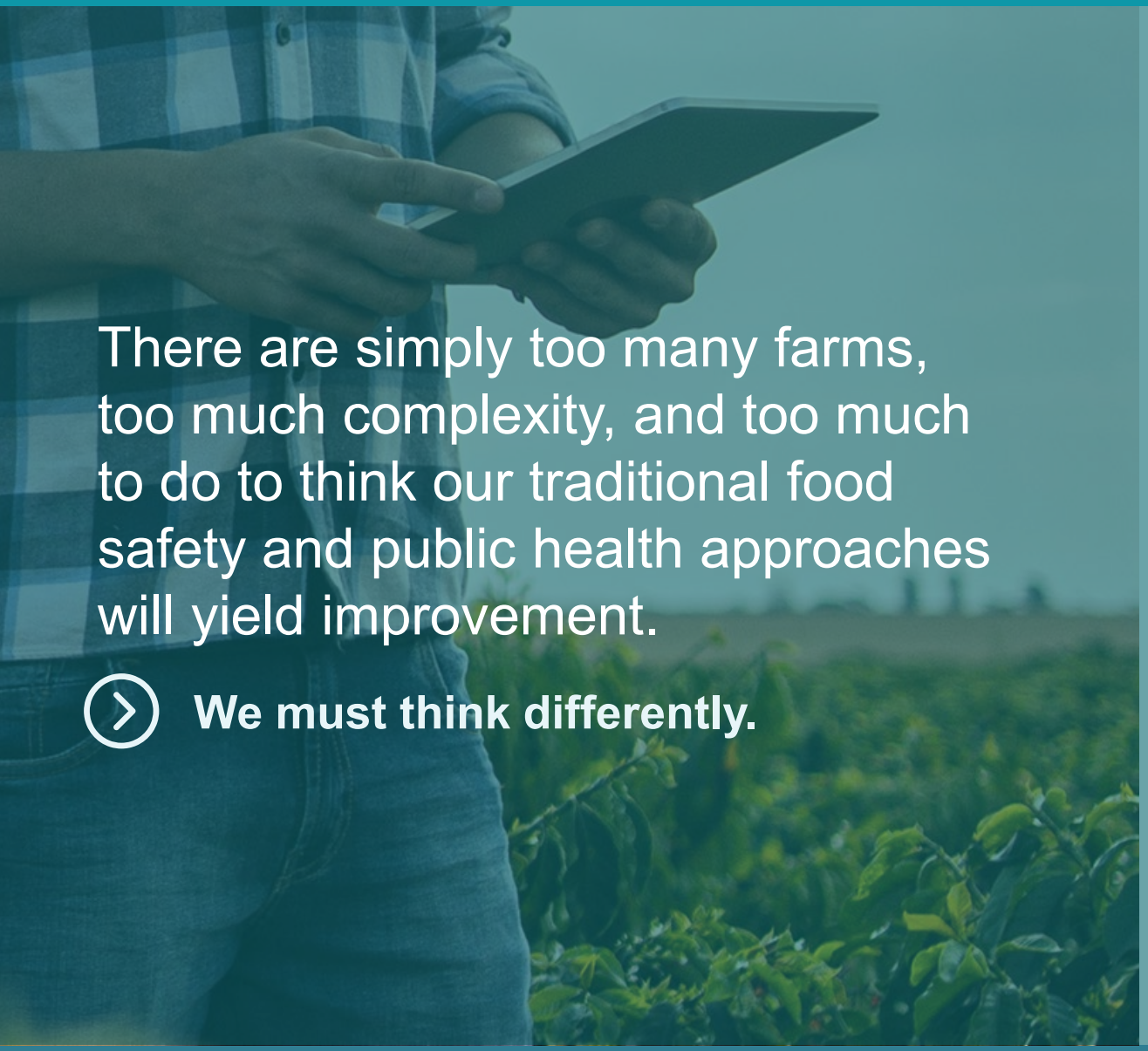
Challenges to Advancing Food Safety in The Field

- Many, many farms and very limited technical experts
- Reliance on checklists and prescribed hazard-based standards (they work until they don't)
- Public health pressure to do "something" in response to an outbreak
- Limited regional/local-based approaches
- Few quantitative measures to provide feedback for field food safety management?
  (did the risk change? Is the control working or not?)
- Difficult to measure progress in food safety
  (are we getting better?)

Fresh Produce Food Safety – Future Vision

Prevention

Improve The Focus on Prevention



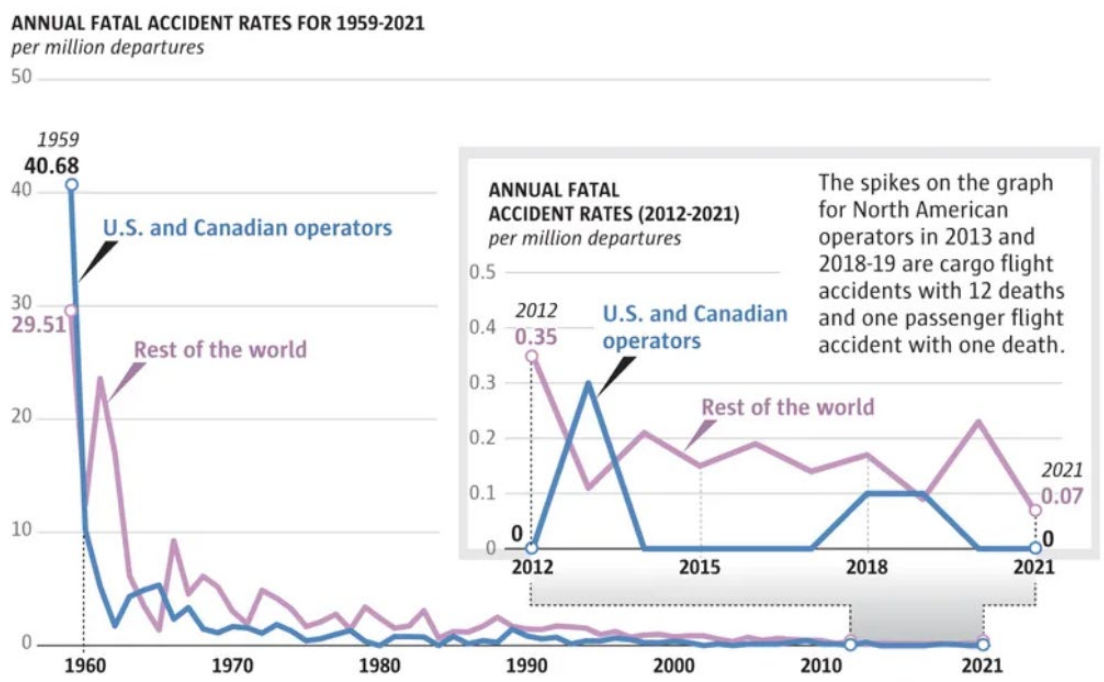
There are simply too many farms, too much complexity, and too much to do to think our traditional food safety and public health approaches will yield improvement.

We must think differently.

FAA and the Airline Industry

A steady decline in commercial aviation accident rates since the jet age began

Fatal accident rates fell steeply in the 1960s as the manufacturers fixed issues with early jet aircraft. Accident rates have since fallen to very low levels. In the past 10 years, the safety record continued to improve.



Source: Boeing, Statistical Summary of Commercial Jet Airplane Accidents, Worldwide Operations, 1959 – 2021

MARK NOWLIN / THE SEATTLE TIMES

A National Agenda Focused on Prevention

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A prevention focus for fresh produce food safety could be achieved through private/public partnership models that relay on transparency, engagement, trust, data-based understanding of risk, and collaborative solutions.

Prevention-focused concepts include:

State Program Development Focused on Education and Outreach
- Build resources that provide regionally-based technical expertise

Comprehensive Industry-Led Commodity Best Practices for Growing, Harvesting and Packing
- Document best practices utilizing industry, academic and public health experts, include data-based verification, implementation and adoption plan along with international outreach

Private/Public Data-Sharing Collaborations
- Develop data tools to allow for understanding agricultural regions at a system level, to inform and better understand quantitative risk management of field level food safety practices

Risk-Informed Research Agendas - (One Health Focus)
- Inform research priorities through collaborative cross-agency, industry and academic forums

Scientific Workforce Investment (Public/Private)
- Create a program of undergraduate/graduate student opportunities in food safety (FSIS model)

Collaborations are Moving Us Forward

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U.S. FOOD & DRUG ADMINISTRATION

Southwest Agricultural Region Environmental Microbiology Study (2019 – 2024)

Leafy Greens STEC Action Plan

Share | Tweet | LinkedIn | Email | Print

Healthy People 2030 One Health

CPS CENTER for PRODUCE SAFETY

Comprehensive REVIEWS in Food Science and Food Safety

COMPREHENSIVE REVIEW

Understanding potential cattle contribution to leafy green outbreaks: A scoping review of the literature and public health reports

Onay B. Dogan, Makenzie G. Flach, Markus F. Miller, Mindy M. Brashears

First published: 08 July 2023 | https://doi.org/10.1111/1541-4337.13200

CDC Centers for Disease Control and Prevention
CDC 24/7: Saving Lives, Protecting People™

Healthy Water

Other Uses and Types of Water

Healthy Water Home > Other Uses of Water > Agricultural

Other Uses of Water

Agricultural

Considerations and Resources for Conducting an On-Farm Environmental Investigation

Collaborative industry effort in harvesting to improve food safety throughout the produce supply chain

By Rick Katz | October 28, 2020
Source: Commercial Food Sanitation

CONTACT PRODUCE SAFETY RESEARCH

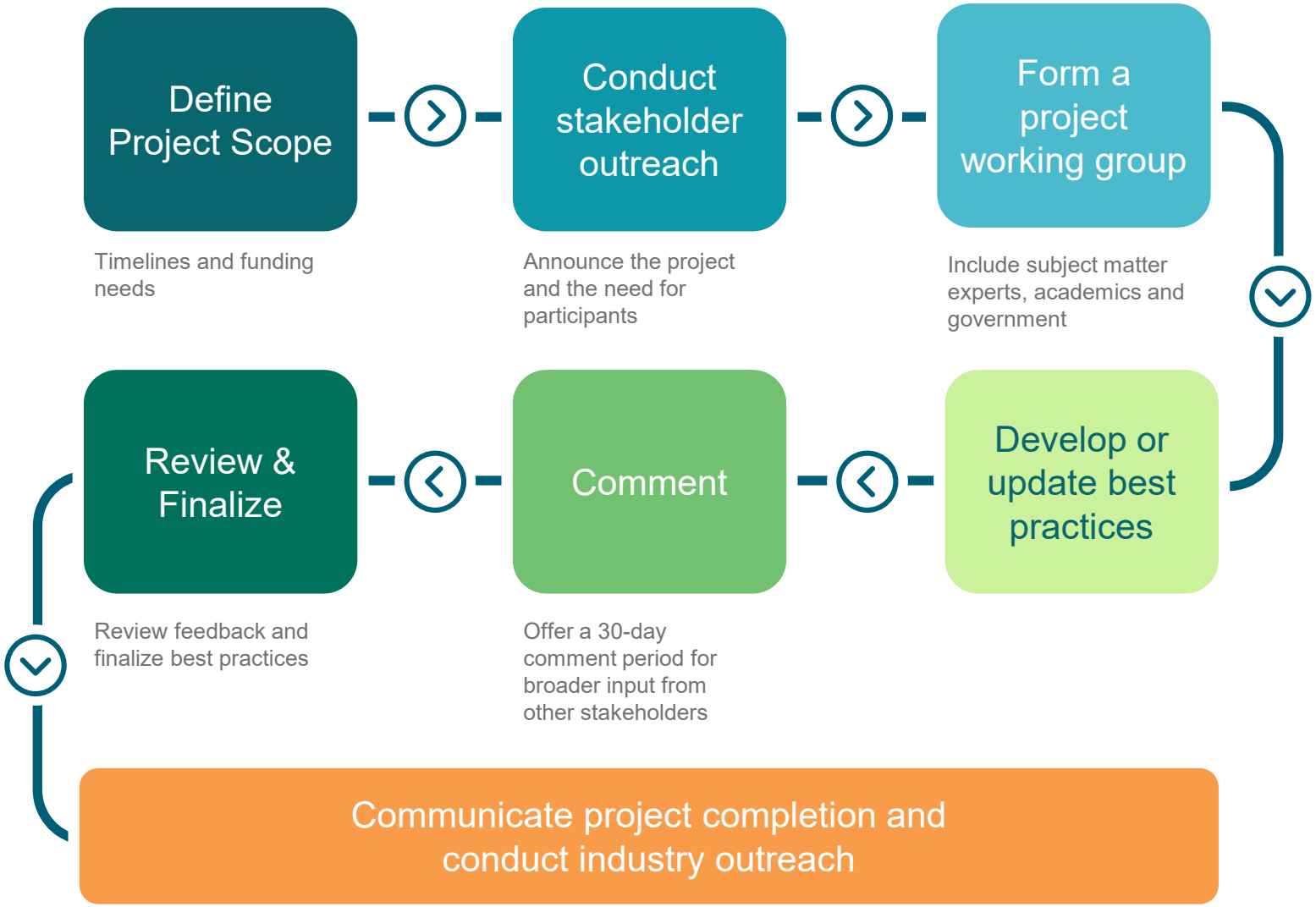
California Agricultural Neighbors

Neighbor-to-neighbor best practices to help enhance localized food safety efforts

Action Report – June 2022

CALIFORNIA AGRICULTURAL NEIGHBORS – ACTION REPORT – JUNE 2022 Page 1 of 58

National Cantaloupe Best Practices Development and Update Process Flowchart



Western Growers Science

Leveraging Data to Advance Food Safety: Western Growers' GreenLink®

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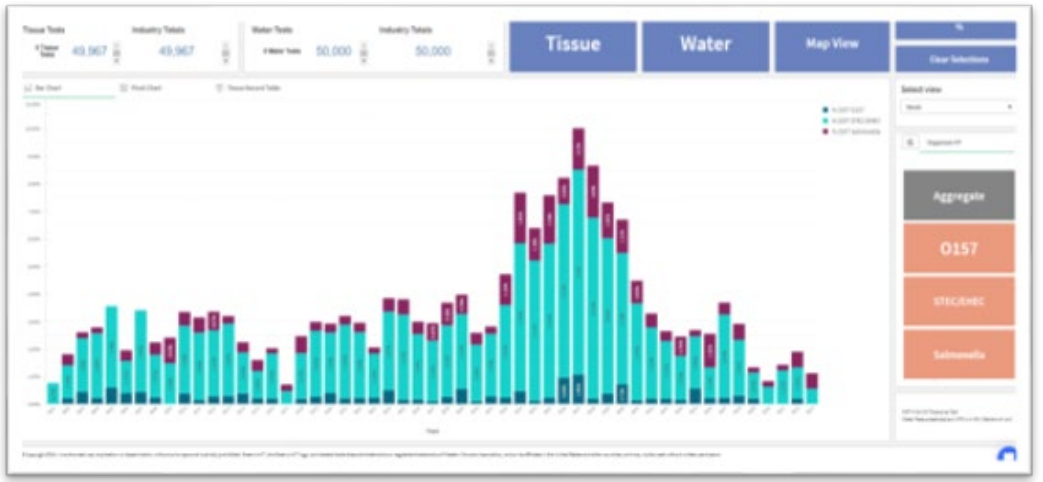
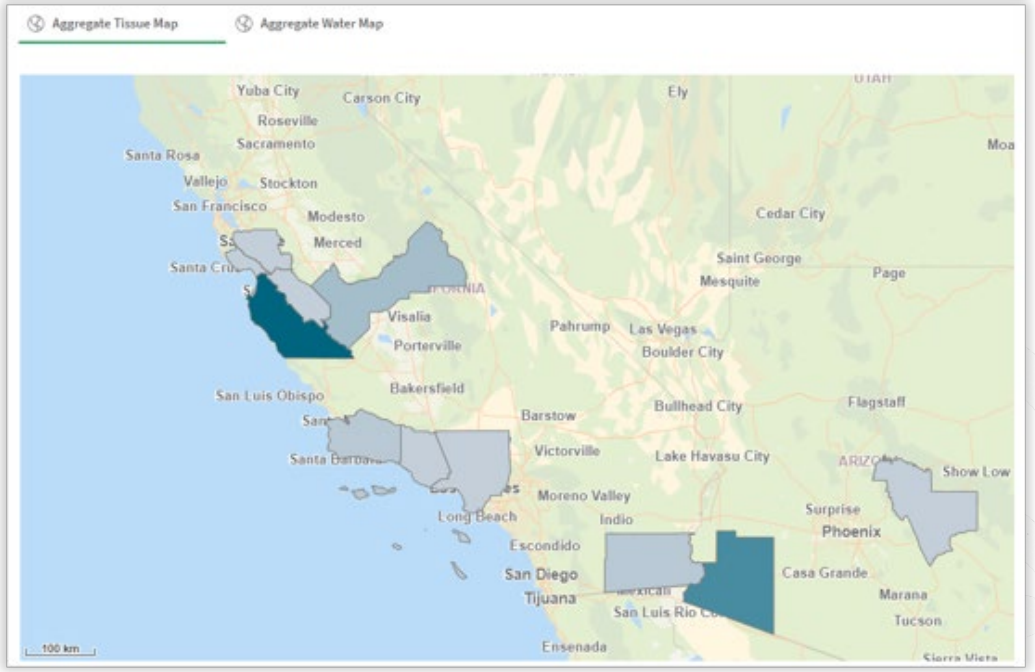
A Potential Solution:

Grower-Led Data Sharing Project

- A cloud-based flexible modular platform
- Allows data sharing, collection and visualization
- Connects data residing in silos
- To allow users to benchmark and learn from collective data



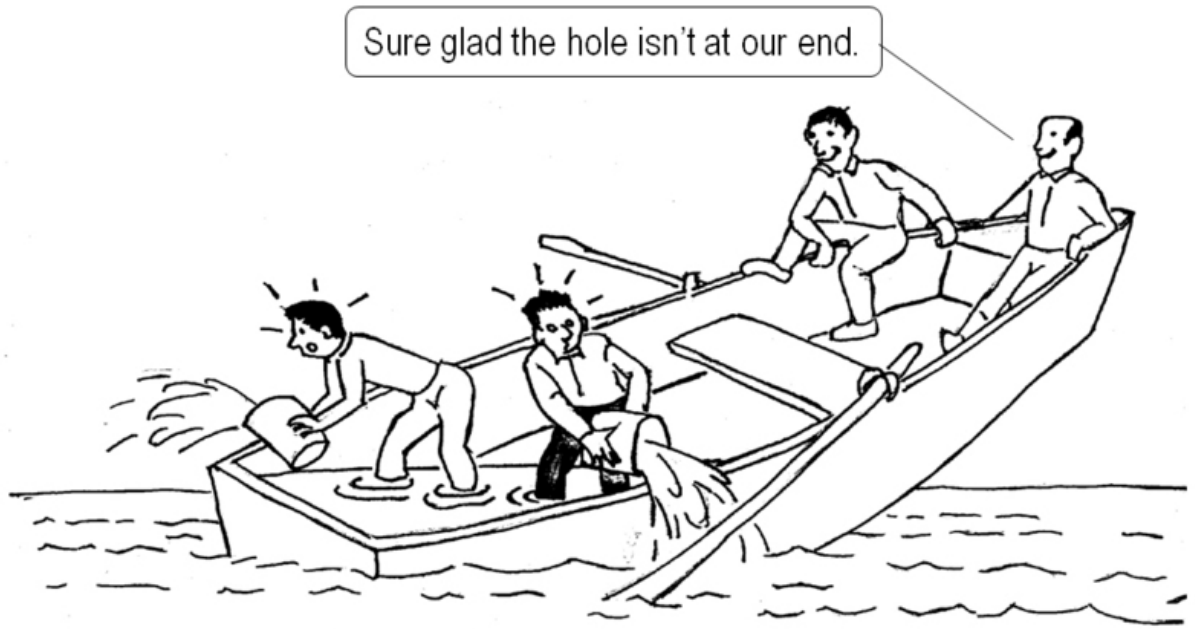


GreenLink®

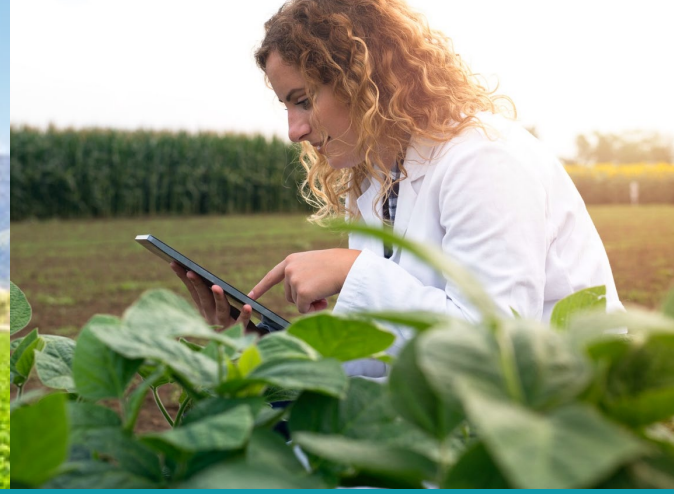
These screenshots do not contain actual data. For demonstration purposes only.

Prevention Needs To Be A Shared Goal

- We all share the same goal, a safe abundant supply of fresh produce.
- We don't want to miss the opportunity to improve public health and nutritional security
- So let's think differently and our focus on fresh produce food safety
- And Build A Prevention Agenda for Fresh Produce



Cartoon from Bing Images



THANK YOU

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WESTERN GROWERS® SCIENCE

September 4, 2024