

TWENTY YEARS OF PROGRESS

How California's Leafy Greens Industry Transformed Food Safety Through Science, Accountability & Continuous Improvement

A White Paper - 2026

EXECUTIVE SUMMARY

Twenty years ago, California's leafy greens industry reached an inflection point.

The 2006 spinach outbreak became one of the most significant food safety events in modern produce history. It challenged long-held assumptions, accelerated scientific research and prompted an unprecedented industry response centered on one question: **How can we build a stronger system that reduces food safety risk?**

The answer was not a single technology, regulation or policy. It was the creation of a comprehensive, science-based food safety system designed to continuously evolve as new knowledge emerged.

Since the California Leafy Greens Marketing Agreement (LGMA) was established in 2007, the industry's approach to food safety has fundamentally changed. Risks are evaluated before harvest. Standards are grounded in science. Compliance is independently verified through government audits. And continuous improvement, not static compliance, has become the operating philosophy.

The transformation extends beyond individual practices. Food safety has become an integrated system connecting growers, handlers, workers, researchers, regulators and buyers through common standards, training, verification, research and shared accountability.

This report examines that evolution: what changed, what the industry learned and how those lessons continue to shape the future.

After 20 years, perhaps the most important lesson is that food safety is never finished.

BY THE NUMBERS

94%

of all U.S. Leafy Greens
come from LGMA Members ^[19]

55 billion

servings of leafy greens
produced annually ^[19]

20+

updates to LGMA Standards
& Metrics over 20 Years ^[19]

8300+

government audits
over 20 years ^[1]

The Transformation

From Individual Programs to an Industry-Wide System

THEN

Prior to 2006, many growers maintained strong food safety programs. But practices often varied from company to company, verification methods differed and scientific guidance was still developing.

The 2006 outbreak demonstrated that meaningful industry change could not be achieved independently. Protecting consumers required something larger than individual company programs or single audits. It required a common framework built on science, accountability and continuous improvement.

TODAY

Twenty years later, California's leafy greens industry operates within one of the world's most comprehensive commodity-specific food safety systems.

The LGMA model connects science-based standards with government verification, training, research, operational experience and continuous improvement. It has helped advance collaboration and the application of science to real-world leafy greens production.

“Food safety moved from being a ‘should do’ to a ‘must do.’”

— TIM YORK, RETIRED PRODUCE BUYER

The mission of the LGMA is to provide the safest serving of leafy greens through science-based standards, regulated practices and resources that empower the industry. Its vision is equally direct: to set the standard for the world's safest leafy greens. At the center of both is a broader purpose—to promote public health and nourish communities with safe leafy greens.

Those goals are supported by principles that have become increasingly important over the past two decades: putting consumer safety first; earning trust through accountability and transparency; using science, data and subject-matter expertise to inform practical action; responding proactively and with urgency; and fostering collaboration across the leafy greens community.

Twenty years of lessons have changed not only the practices used to grow leafy greens, but the way the industry thinks about food safety.

Twenty Systemwide Changes Over the Past Twenty Years

GOVERNANCE

1. Creation of the California LGMA
2. Industry-wide science-based standards
3. Mandatory government audits
4. Developed and digitized food safety plans

PREVENTION

5. Agricultural water testing and risk assessment
6. Environmental assessments before harvest
7. Wildlife monitoring and response protocols
8. Standardized equipment sanitation

PEOPLE

9. Ongoing food safety training for workers
10. Accessible handwashing stations and restroom facilities
11. Expanded food safety staffing
12. Shared food safety culture across organizations

VERIFICATION

13. Comprehensive product and GAP documentation
14. Improved traceability
15. Independent verification through audits
16. Root cause investigations following food safety events

CONTINUOUS IMPROVEMENT

17. Ongoing revision of food safety metrics
18. Greater investment in scientific research
19. Increased collaboration across industry and government
20. A system designed to evolve, not remain static

Then		Today
Individual food safety programs	▶	Industry-wide science-based standards
Limited audit consistency	▶	Mandatory government audits
Variable worker training	▶	Ongoing documented food safety education
Minimal environmental assessments	▶	Comprehensive pre-harvest risk assessments
Limited water oversight	▶	Routine agricultural water assessment and monitoring
Basic sanitation practices	▶	Documented sanitation verification
Paper records with limited traceability	▶	Extensive electronic documentation supporting rapid
Corrective action	▶	Root cause analysis and continuous improvement

Accountability as a Foundation

One of the most significant changes to emerge from the creation of LGMA was a new expectation:

Food safety practices should not only be established—they should be independently verified.

Government verification has been a foundational part of the LGMA system since its earliest years. From 2007 through 2012 alone, LGMA reported 2,585 government-conducted food safety audits. Today, approximately 250 audits are conducted each year.^[1]

The LGMA audit system is designed to reach 100% of members every year. Each member is targeted for a minimum of three government audits annually, with audit frequency tied to the operation's active harvest season. Every member is also required to undergo at least one unannounced government audit during its active harvest season.^{[2][3]}

LGMA audits are conducted by the California Department of Food and Agriculture, with oversight from the U.S. Department of Agriculture. That structure combines industry-developed, science-based standards with independent government verification and accountability.^[2]

Audits extend beyond paperwork. They evaluate areas including:

- Agricultural water testing records
- Biological soil amendment records
- Crop-treatment records
- Environmental and adjacent-land risks
- Previous risk assessments
- Worker food safety practices
- Standard operating procedures and sanitation
- Toilet and handwashing facility sanitation
- Harvest equipment, tools and machinery cleaning and sanitizing^[3]

Continuous Improvement In Practice

“Continuous improvement is a key principle—taking in new data and setting standards that reflect the newest science.”

— **MIKE TAYLOR, FORMER FDA DEPUTY COMMISSIONER FOR FOODS AND VETERINARY MEDICINE**

A defining principle of the LGMA system is that food safety standards and verification practices are not intended to remain static. As science advances, new data becomes available and experience in the field reveals opportunities for improvement, the system is designed to evolve. Recent efforts illustrate an increasing emphasis on making food safety more data-driven, targeted and collaborative.

SMARTER AUDITS

Smarter Audits takes a multi-phase approach to streamlining the audit checklist, focusing greater attention on food safety practices considered most critical and making information generated through audits more useful.

BY THE NUMBERS

3+

government audits targeted per member each year^[2]

100%

of members targeted for annual verification^[2]

1+

unannounced audit required each active season^[3]

6–8

weeks between audits during active harvest seasons^[3]



TRAQTION

Traqtion brings digital management to the audit process, from scheduling through corrective actions, while enabling LGMA to track key performance indicators and make greater use of audit data.

ROMAINE TEST & LEARN

Romaine farmers began sharing pathogen-testing data across the industry, creating an opportunity to identify broader patterns, better understand potential risks and use collective learning to inform future food safety practices.

Together, these efforts illustrate what continuous improvement increasingly means in practice:

Collect better information. Learn from it. Focus resources where they can have the greatest food safety impact. Translate those lessons into stronger standards and practices.

The tools may change as science and technology advance, but the underlying principle remains constant: The system must continue to learn and evolve.

From Science to the Field

Strong food safety systems depend on more than any single practice or point of control.

They require science to identify and understand risk, standards to translate that knowledge into clear expectations, practical tools that help people consistently put those expectations into practice, and verification to demonstrate that practices are being implemented.

Over the past two decades, research into agricultural water, pathogens, environmental conditions, wildlife and adjacent land, soil amendments and sanitation has expanded the industry's understanding of where food safety risks exist and how they can be reduced.

LGMA draws from research conducted by organizations including the Center for Produce Safety and USDA and works with university researchers, government agencies and industry experts to identify emerging science relevant to its standards.

But research alone does not change what happens in a field. The critical step is translating knowledge into standards that can be implemented and verified. Scientific findings enter LGMA's standards-review process, where research is considered alongside regulatory requirements, data, subject-matter expertise and operational experience.

"The turnaround from science to implementation in the produce industry over the last 20 years has been tremendous."

— MARTIN WIEDMANN, DVM, PH.D., GELLERT FAMILY PROFESSOR IN FOOD SAFETY - CORNELL UNIVERSITY

The result is a connected system of prevention, verification and response in which individual safeguards reinforce one another—and standards can continue evolving as knowledge grows.

Building a Food Safety Culture Through Training

Standards are only as effective as the people responsible for putting them into practice.

Over the past two decades, training has become an increasingly important part of the LGMA system—helping translate technical requirements into actions that can be understood and consistently applied in fields, harvest operations and facilities.

Today, LGMA training reaches growers, handlers, harvesters, service providers and cleaning and sanitizing companies. Education addresses both the requirements and their practical application.

Training is provided at no charge to the leafy greens industry through in-person and on-demand learning, with major courses available in English and Spanish. LGMA's broader technical resource library extends that education through webinars, videos and practical materials that can be used beyond a single classroom or workshop.^[7]

These efforts support the industry's broader shift from compliance to culture.

Food safety is not solely the responsibility of an auditor or food safety manager. It depends on decisions made throughout an operation. Training helps people understand not only what the standards require, but why they matter and how to put them into practice every day.

“In 2007, the challenge was creating a food safety culture. Today, that culture is established.”

— HERMAN COSSIO; DIRECTOR OF FOOD SAFETY · IPPOLITO
INTERNATIONAL

BY THE NUMBERS

2

languages for
food safety training^[7]

2

training delivery formats^[7]

5+

industry audiences served
by LGMA training^[7]

7+

harvest equipment
sanitation resources^[8]

15

technical resource categories^[8]

~30

educational video resources^[8]



Together, these elements create a continuous connection between science and real-world prevention:

Research expands knowledge. Knowledge informs standards. Standards are translated into tools, training and practices. Government audits verify implementation. Experience and data create new learning—and the cycle begins again.

From Response to Continuous Improvement

KEY MILESTONES

The changes of the past 20 years did not happen all at once. Beginning with the industry response to the 2006 outbreak and the formation of LGMA in 2007, each new challenge, scientific finding and operational lesson helped shape what came next.

TIMELINE ^[19]

- 2007** ◆ **LGMA Established**
Science-based food safety standards become the industry framework.
- 2008** ◆ **Unannounced Audits Added**
Unannounced government audits strengthen independent verification and accountability.
- 2011** ◆ **2,500 Audits Conducted**
LGMA reaches major milestone: 2,500 government food safety audits conducted since the program began.
- 2013-14** ◆ **Science Drives the Standards**
LGMA formalizes its commitment to keeping metrics current with emerging research.
- 2017** ◆ **Meeting and Exceeding Federal Standards**
LGMA requirements are found to meet or exceed FDA Produce Safety Rule requirements in key areas.
- 2018** ◆ **Food Safety Modernization Act (FSMA) Alignment** ^[10]
By January 2018, mandatory LGMA government audits were officially recognized as verification of compliance with federal FSMA laws.
- 2018-19** ^[13] ◆ **Responding to New Risks**
Food safety standards continue to evolve alongside new science, regulation and outbreak findings.
- 2019** ◆ **Agricultural Water Revisions**
Stronger requirements address agricultural water used near harvest.
- 2020** ◆ **50+ Food Safety Updates**
Major changes strengthen agricultural water and harvest sanitation requirements.
- 2021** ◆ **Risk-Based Prevention Expands**
Root cause analysis, adjacent-land assessments and risk-based pre-harvest testing strengthen prevention.
- 2023** ◆ **Romaine Test & Learn**
Romaine farmers begin sharing pathogen-testing data collectively to advance industry-wide learning.
- 2024** ◆ **Water & Sanitation Advance Again**
Agricultural water and harvest sanitation standards undergo another major review.
- 2024+** ◆ **From Standards to Shared Learning**
Smarter Audits and shared pathogen data help turn experience into continuous improvement.
- 2026** ◆ **CA & AZ Leafy Greens Strategic Plan**
A new strategic plan establishes priorities for food safety standards and audits, industry and supply-chain engagement, and government advocacy and public trust building.
- 2026-2028** ◆ **Metrics/Standards Modernization**
Preparing the standards for the next generation.

Communication & Collaboration

THE CONNECTION BEHIND THE SYSTEM

Food safety at this scale cannot be advanced by one organization, company or discipline alone. LGMA provides a forum where those perspectives can come together around a shared objective: safer leafy greens.

“It was imperative that we work together to raise the level of food safety for everybody. If one company had a problem, it affected all of us.”

— JOE PEZZINI, LEAFY GREENS INDUSTRY EXECUTIVE

Today, these relationships form a community around leafy greens food safety. One in which knowledge is shared, problems are examined collectively and improvements can move more quickly from discovery to implementation.

“There’s a community now that works together—government, industry, academia—to drive continuous improvement. I don’t think that was there in 2006.”

— MARTIN WIEDMANN, DVM, PH.D., GELLERT FAMILY PROFESSOR IN FOOD SAFETY - CORNELL UNIVERSITY

Collaboration in Action

2009–2012 | RESEARCH

LGMA + CDFA + Center for Produce Safety

LGMA government audit data was used to identify compliance trends and inform grower training, workshops and recommendations for improvements to LGMA Metrics and audit methods. ^[18]

2018 | CRISIS RESPONSE

Leafy Greens Food Safety Task Force

Following the Yuma romaine outbreak, researchers, growers, FDA, CDC, state agriculture agencies, foodservice and retail representatives came together to identify lessons learned and recommend changes to leafy greens food safety practices. ^[13]

2020 | BUYER ENGAGEMENT

Food Marketing Institute (FMI)

FMI engaged with LGMA to better understand industry prevention efforts and ultimately included LGMA certification in its food safety recommendations—demonstrating how buyers can reinforce food safety expectations through purchasing requirements. ^[15]

2021–2026 | GOVERNMENT + SCIENCE

FDA + CDFA + UC Davis

A five-year Central Coast environmental study investigated how pathogens may enter and move through leafy greens growing environments, bringing together government and university expertise to strengthen the industry’s understanding of environmental risk. ^[17]

2009–2012 | RESEARCH

LGMA + CDFA + Center for Produce Safety

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THE NEXT CHAPTER

TWENTY YEARS OF BUILDING A STRONGER SYSTEM

The impact of the past 20 years cannot be captured by a single statistic, audit or standard. It can be seen in the food safety infrastructure that now surrounds California leafy greens production.

What began as an industry response to the events of 2006 has grown into a connected system of standards, training, government verification, research and shared accountability.

The changes are also visible in how the industry responds to what it learns.

Outbreak investigations have contributed to stronger approaches to environmental assessment, adjacent-land risks, pre-harvest testing and root cause analysis. Technical working groups bring expertise to standards review. Smarter Audits seeks to generate more meaningful information through verification. Romaine Test & Learn enables participating companies to learn collectively from pathogen-testing data.

Together, these efforts represent a food safety infrastructure that is more connected, informed and equipped to act on new information than it was 20 years ago.

“I don’t think food safety will ever be finished.”

— MARTIN WIEDMANN, DVM, PH.D., GELLERT FAMILY PROFESSOR IN FOOD SAFETY, CORNELL UNIVERSITY

That perspective is particularly relevant as LGMA enters its next chapter.

Its 2026 strategic plan identifies three priorities:

- ▶ **Food Safety Standards & Audits** — Strengthen standards and audit processes to remain relevant, practical and focused on food safety impact.
- ▶ **Industry & Supply Chain Engagement** — Help growers and handlers implement evolving standards while engaging buyers and other supply-chain partners in the value of the LGMA system.
- ▶ **Government Advocacy & Public Trust Building** — Strengthen coordination with government and continue building confidence through accountability and transparency.

MODERNIZING THE FOUNDATION

One of the significant projects supporting that next chapter is the Metrics/Standards Modernization process, with estimated completion in 2028.

For nearly two decades, LGMA’s food safety standards have continuously evolved as new science, data, regulations and lessons emerged.

“The next generation will be starting from a higher point than we did 20 years ago—with the advantage of science and technology.”

— RON RATTO, LEAFY GREENS INDUSTRY EXECUTIVE

New technologies, data and scientific capabilities will create new ways to understand and manage risk. New challenges will inevitably test the system in ways that cannot yet be anticipated.

The goal, however, remains unchanged: to promote public health and nourish communities with safe leafy greens. The work required to achieve it will continue to evolve.

Twenty years later, perhaps the most important lesson is this: Food safety is not defined by where we started—or even by how far we’ve come. It is defined by our commitment to keep learning, keep improving and keep moving forward.

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