

# California Agricultural Neighbors



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

*Interim Report – June 2021*

## TABLE OF CONTENTS

<b>INTRODUCTION .....</b>	<b>3</b>
<b>PARTICIPANTS AND PROCESS TO DATE.....</b>	<b>4</b>
<b>FUTURE DIRECTION AND NEXT STEPS OF CALIFORNIA AGRICULTURAL NEIGHBORS (CAN).....</b>	<b>5</b>
<b>RECOMMENDATIONS, CONSIDERATIONS, AND OPPORTUNITIES .....</b>	<b>6</b>
I.    Fostering a Neighborly Culture of Awareness in Order to Collectively and Cooperatively Enhance Food Safety.....	6
II.   Reducing the Potential for <i>E. coli</i> O157:H7 in the Environment.....	7
III.  Fostering Best Practices of Biosecurity and Sanitation in Order to Support a One Health Approach .....	7
IV.  Evaluating Seasonal Changes, Wildlife, and Management Adaptations .....	8
V.    Operation Management, including Contracted Companies .....	9
<b>EXPERT INPUT – A WEBINAR SERIES TO SHARE RESOURCES, EXPERTISE, AND ENHANCE LEARNING .....</b>	<b>10</b>
I.    Session One: June 30 – Reservoirs of <i>E. coli</i> O157:H7 and other STEC.....	10
II.   Session Two: July 7 – Off-farm factors that may affect STEC movement on the landscape .....	11
III.  Session Three: July 14 – On-farm factors that may affect STEC survival and contact with produce.....	11
<b>ADDITIONAL RESOURCES .....</b>	<b>12</b>
Glossary of Terms .....	12

## INTRODUCTION

Food safety is a shared responsibility. Continued outbreaks of pathogenic *E. coli* O157:H7 associated with leafy greens in the Salinas Valley of California necessitated a robust response through efforts shared among the industry, the broader agricultural community, and local, state, and federal regulators in order to protect public health. Since January 2021, the agricultural community in the Salinas Valley has come together in an effort known as *California Agricultural Neighbors (CAN)*. CAN provides a roundtable opportunity to foster collaboration and discuss enhanced neighborly food safety practices when agriculture operations are adjacent to one another.

The work of CAN stemmed from a 2019 initiative, the [California Good Agriculture Neighbors Workshops](#), which was led by the UC Davis Western Institute for Food Safety and Security (WIFSS), funded and supported by the California Department of Food and Agriculture (CDFA). The workshop breakout sessions highlighted [three key areas](#) of notable next steps: Research, Communication, and Outreach and Training. While a body of research is underway, there was an ongoing need to enhance local communication for purposes of increased mutual understanding and problem-solving in the near term and additional research to provide more options of science-driven solutions among the diversity of agriculture stakeholders in California. Therein, a *CAN Steering Committee* and *Dialogue Group* were formed with three key goals in mind: 1) identifying practices for agriculture neighbors that can potentially help enhance food safety; 2) document the broader challenges of the CA regulatory landscape that impacts produce growers, ranchers, vineyards, compost operations, and wildlife ecology that may cause competing or conflicting demands with produce food safety practices; and 3) develop accurate messaging to enhance education and adoption of continuously improving food safety practices founded in science, while acknowledging that simple neighborly courtesy measures of communication can have beneficial, lasting impacts. These goals were adopted to help guide the framework of the *Dialogue Group* and to foster a collaborative approach to food safety, reduce the risks of pathogen contamination of produce, and strengthen neighborly practices that are supported by the current science.

*“Coming together to learn from each other and identify enhanced local food safety practices...”*



## PARTICIPANTS AND PROCESS TO DATE

The recommendations, considerations, and opportunities outlined in this report reflect those of a diverse *Dialogue Group* made up of 27 individuals. Involvement from various sectors includes:

- **Agriculture production:** leafy greens, cattle ranching, viticulture, compost (10)
- **Academia:** University of California, Davis, UC Cooperative Extension, and the UC Davis School of Veterinary Medicine (4)
- **Associations:** Industry associations/retail/consumer representation (7)
- **Government:** local, state, and federal government (6)

The *Dialogue Group* and a broader, invited *Expert Input Group* (composed of subject matter experts) were created to focus on specific aspects of a topic to further explore and address. In addition, a *Steering Committee* (nine members) was created to keep the overall process on track and task. The meetings continue to be coordinated by the Monterey County Farm Bureau and the California Department of Food and Agriculture and facilitated by Abby Dilley, [RESOLVE](#).

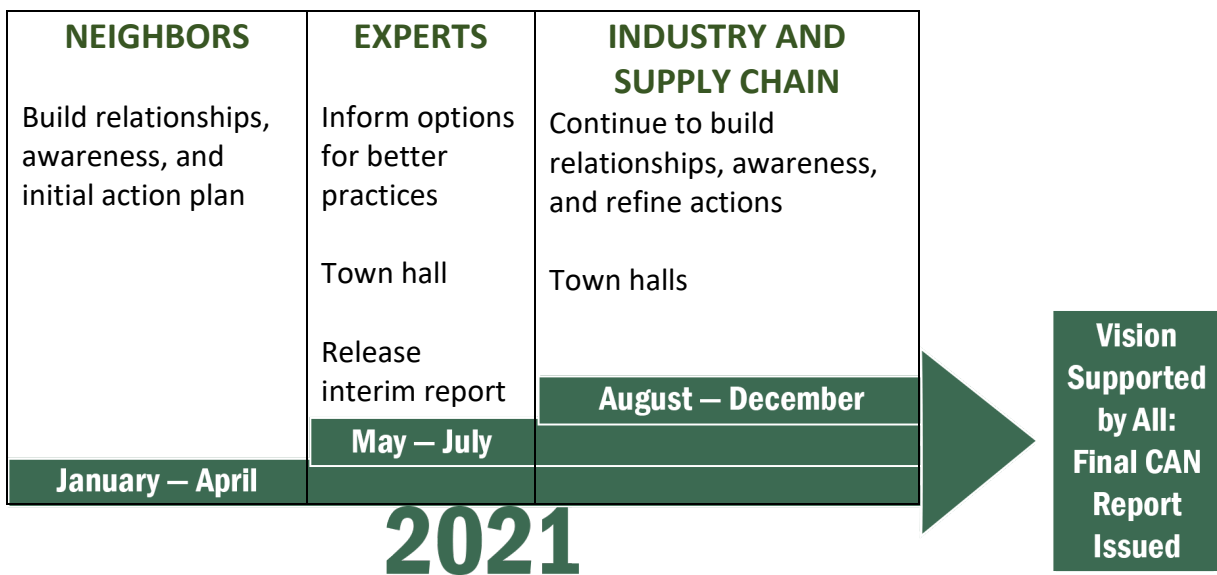
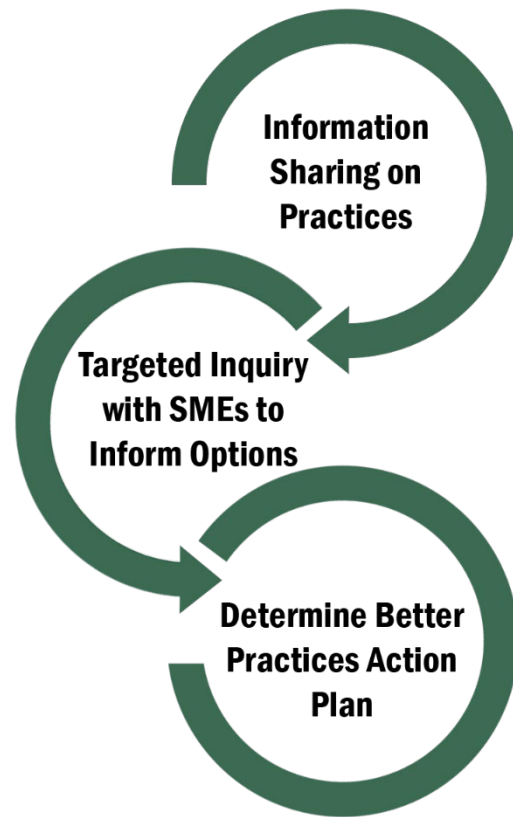
The goal continues to be to create a safe space for sharing of practices, problem solving, and deliberations with a good faith effort in providing information, resolving challenges, and supporting near-term outcomes for recommended improved practices to enhance food safety. The *Expert Input Group* offers scientific resources to drill down to better understand and untangle complex issues in order to help inform the *Dialogue Group*. The *Steering Committee* helps draft meeting agendas, track progress on meeting goals and expectations, and engage with other stakeholders (interested parties and key experts) to support this project's success. *Community Engagement via Town Halls* is occurring to create awareness about CAN and this report being created to enhance localized food safety efforts. As this project continues through the balance of 2021, there will be efforts to expand the *Dialogue Group* to include additional key industry members, end-to-end supply chain engagement, local wildlife experts, as well as collaboration with key principals leading similar efforts in Arizona.



## FUTURE DIRECTION AND NEXT STEPS OF CALIFORNIA AGRICULTURAL NEIGHBORS (CAN)

The initiative of CAN has been unique and is a pioneering effort led by CDFA, the Monterey County Farm Bureau and many agricultural partners to bring together diverse sectors of the agriculture community to build understanding, respect and exploration of options for change that are critical to all to address food safety. This CAN dialogue has created an opportunity to show the way for more ambitious objectives, reinforcing and informing why it has been critical to approach this in a stepwise fashion.

Throughout the balance of 2021 the stepwise effort that includes information sharing, options generation, refinement, and the development of a near-term action plan for enhanced practices will continue. Additionally, the engagement of an ever-broadening roster of stakeholders, starting with neighbors, expanding to subject matter experts (SMEs), and then including the broader industry and supply chain are planned.



## RECOMMENDATIONS, CONSIDERATIONS, AND OPPORTUNITIES

The work conducted by the CAN Dialogue Group from January 2021 through June 2021 has fostered a deeper understanding among Salinas Valley agriculture neighbors of the practices that commonly take place throughout the year. It should be noted that each operation is unique to itself given its growing or ranching region within the Salinas Valley or specific business structure. We also recognize that measures to enhance food safety require a layered approach; each layer adds to managing and therefore reducing the risk of pathogen contamination. There is no one solution that addresses environmental pathogens, but several measures that when combined are known to yield effective results.

Through the series of meetings with the Dialogue Group, the following areas became collective themes of discussion, recommendations or consideration, or noted opportunities for subject matter expertise to expand on current knowledge and understanding. It is important to acknowledge that this is an Interim Report. As such, some areas lend themselves to ease of implementation, while other areas are notably in progress and/or need additional discussion and input from subject matter experts.

### **I. Fostering a Neighborly Culture of Awareness in Order to Collectively and Cooperatively Enhance Food Safety**

- Engage in a conversation with neighbors on the other side of the industry fence to know in detail their practices and the changes that occur throughout the year. It is also good to inform your neighbors of the various activities taking place in your operation for mutual awareness.
- Establish neighbor-to-neighbor methods to notify the appropriate personnel about seasonal changes noted as important food safety factors to your operation.
- Understand your neighbors' activities that occur during the off-season.
- Share data analytics and observations as possible. Localized information is more important than ever and can help identify issues and prevent potential problems as growers and ranchers continue to think of food safety as a shared responsibility.

Resources:

<https://lgmatech.com/resources/>

<https://www.wga.com/advocacy/food-safety>

<https://www.centerforproducesafety.org/>

## II. Reducing the Potential for *E. coli* O157:H7 in the Environment

- Incorporate Production Best Practices as appropriate and feasible.<sup>1, 2</sup>
- Invest in research trials that help inform the effectiveness of *E. coli* O157:H7 vaccines on rangeland cattle.<sup>3</sup>
- Understand more from subject matter experts and/or through research about feed additives (e.g. probiotics, direct fed microbials, sodium chlorate) that have the potential to reduce shedding of *E. coli* O157:H7 in cattle; those that are scientifically validated to reduce shedding of *E. coli* O157:H7 specifically in rangeland cattle; and, if there are models that can fully support the economic feasibility for neighboring operations should the science support their use and effectiveness.

Resources:

<sup>1</sup> <https://www.beefresearch.org/resources/beef-safety/fact-sheets/pre-harvest-interventions>

<sup>2</sup> <https://ucanr.edu/sites/BeefCattle/>

<sup>3</sup> This trial is currently underway and funded by CDFA focusing on rangeland cattle operations while aligning with typical herd management activities and timing. For more information, contact Dr. Michele Jay-Russell, UC Davis, Western Center for Food Safety, [mjay@ucdavis.edu](mailto:mjay@ucdavis.edu); or Dr. Gabriele Maier, UC Davis, School of Veterinary Medicine, [gumaier@ucdavis.edu](mailto:gumaier@ucdavis.edu).

## III. Fostering Best Practices of Biosecurity and Sanitation in Order to Support a One Health Approach

Note: In this section it will be critical to receive additional input from subject matter experts to help illuminate the final report recommendations. Also, some areas noted are covered through existing or new enhancements in the Leafy Green Marketing Agreement (LGMA) metrics.

Finally, areas for additional research needs are noted as such:

- Consider appropriate visitor practices for any outside persons visiting or working on the farm.
- Biosecurity protocols should be considered for movement of vehicles onto and between leafy green ranches. This includes harvest crews (including their personal vehicles), harvest equipment, work crews, salespersons, contract company representatives, farm manager, etc.
- Movement of vehicles between or among mixed-type agriculture operations should undergo appropriate cleaning and sanitation prior to entering a leafy green field or location where harvest equipment is staged or stored (and rechecked when entering a leafy green field).
- Neighbors should consider ways to reduce or eliminate material carried onto shared/common roadways that could carry pathogens (e.g. material that could potentially fall off of the transport vehicle undercarriage). This area requires additional research to help inform enhanced practices.

- Additional cleaning and sanitation of vehicles and equipment may be necessary by leafy green growers and harvesters during times of the year when local shared roadways experience seasonal traffic due to the transport of cattle or movement of soil inputs (manure) between facilities. (See Section IV for additional information). This is partially addressed in the LGMA metrics, but this area requires additional research to help inform enhanced practices.
- Consider security of vehicles and harvest equipment when idle for potential biosecurity exposures.
- Compost facilities with movement of raw feedstocks (manure) into a facility and finished product movement out of a facility should ensure no cross contamination of vehicle ingress and egress, including roadways.
- Ensure personnel clothing and footwear are clean before entering the farm.

Resources:

<https://www.cdc.gov/onehealth/basics/index.html>

<http://www.cdfa.ca.gov/ahfss/SecureFoodSupply.html>

#### **IV. Evaluating Seasonal Changes, Wildlife, and Management Adaptations**

- Recognize how individual industry management practices impact food safety and consider alterations for neighboring operations based on seasonal weather patterns and year-to-year changes (e.g., temperature, wind speed and direction, precipitation, flooding events). This type of information will be critical to help inform more streamlined future research efforts.
- Evaluate seasonal pressures (i.e. drought) and consider how this may change localized wildlife incursions (feral pigs, birds, rodents, etc.).
- Realize seasonal changes and the effect that weather has on grass availability for cattle grazing operations. Explore the timing and changes of practices that take place (e.g., time of year when feeding begins, location of feeding, if increased wildlife activity is observed due to the presence of feed and water, etc.).
- Understand your neighbors' seasonal management events and communicate with one another when specific events are occurring and location (e.g. vineyard fruit thinning/de-clustering, gathering and shipping cattle, mulch application, and harvest activities). Continue to consider creative ways to foster ongoing communication among neighbors.
- Discuss your neighbors' wildlife management plan and strategies to address pressures; align management practices to reduce risk of conflicting objectives.

Resources:

<https://wildlife.ca.gov/Conservation>

<https://www.nrcs.usda.gov/wps/portal/nrcs/site/national/home/>



## V. Operation Management, including Contracted Companies

Note: In this section it will be critical to receive additional input from subject matter experts to help illuminate the final report recommendations. Also, some areas noted are covered through existing or new enhancements in the Leafy Green Marketing Agreement (LGMA) metrics.

- Discuss with your neighbors their routine annual cycle of management activities in the context of 1) the general overview of practices with regards to what they are producing/growing and activities close to direct neighbors, as well as activities in the broader community of neighbors and, 2) management specifically for increasing food safety/reducing pathogens.
- Periodically inspect and maintain operations by removing waste materials and reducing harborage of insect and rodent populations.
- Monitor set back distances and fencing for possible breaches by domesticated and feral animals and note any new or heavily used wildlife trails and migration or feeding/water-seeking patterns.

The following areas are already being addressed by the existing or new LGMA metrics, but were key areas to note as part of the group discussions:

- Monitor drip irrigation system for any damage, including places where wildlife chewing may inadvertently cause excess surface flows.
- Identify the location where animals are fed or handled and may congregate for brief periods of time in numbers.
- Discuss with neighbors how they manage, store or handle raw materials (manure for compost) arriving or staged for pick-up and haul off (such as pen scrapings).
- Understand how neighboring facilities handle bulk raw or uncured material, and the timing of when the product is received and how long the material is on-site.
- Know what soil inputs are being applied, who is applying it and where, and what the input formulations consist of.
- Know the diligence of your harvest crew – what training they received about risks during harvest and how to respond, where they have been prior to harvest, equipment cleaning and sanitation and frequency, and use of shared roadways by other sectors of agriculture.
- Note other contractors that visit a farm or ranch and ensure they are aware of established facility biosecurity expectations, including those managing water systems, pesticide applicators, planting and weeding crews, thinning crews, etc.
- Ensure that contracted (non-agriculture entities) allowances follow similar protocols (e.g., food trucks/lunch wagons, hunting clubs, etc.).

Resources:

[LGMA Updated Metrics available mid-summer 2021](#)

## **EXPERT INPUT – A WEBINAR SERIES TO SHARE RESOURCES, EXPERTISE, AND ENHANCE LEARNING**

As noted above, expert input in specific scientific subjects is an important part of this process. Additional information was requested by the Dialogue Group in order to help continued development and/or refinement of the initial recommendations, considerations, and opportunities. The webinars are designed for learning and as part of the overall stepwise process are to foster engagement of others and create an open opportunity for broader collaborative learning and discussion.

Three webinars will be hosted June 30, July 7, and July 14, 2021, by the California Farm Bureau with support from the Monterey County Farm Bureau and the California Department of Food and Agriculture.

Webinar goals include:

- A partnership learning opportunity among California Agricultural Neighbors (CAN) Dialogue Group members and interested stakeholders.
- Opportunity to share progress of CAN to date and outline the next steps, including future opportunities for broader input.
- Address questions on specific topics that have come forward from the CAN Steering Committee and Dialogue Group members.

### **I. Session One: 1.5 hours**

#### **Reservoirs of *E. coli* O157:H7 and other STEC**

**1:00 – 2:30 p.m. (PDT) June 30, 2021**

A series of speakers will share the research and current knowledge of *E. coli* O157:H7 in cattle and wildlife populations. They will cover the challenges and opportunities to reduce shedding of *E. coli* in cattle populations and will discuss the transference of pathogens among populations in a localized environment.

Title: *E. coli* O157:H7 *Harboring in Wildlife and Movement Among Populations*  
Dr. Michele Jay-Russell, UC Davis

Title: *Case Studies: Two Epidemiological Surveys of E. coli O157:H7 in California Cow-Calf Operations*  
Dr. Rob Atwill, UC Davis

Title: *E. coli* O157 *Reduction in Beef Cattle: Challenges and Opportunities*  
Dr. Gaby Maier, UC Davis

## II. Session Two: 1.5 hours

### **Off-farm factors that may affect STEC movement on the landscape**

**9:00 – 10:30 a.m. (PDT) July 7, 2021**

There are opportunities to share biosecurity best practices across agriculture disciplines. In this discussion, animal agriculture biosecurity practices will be shared to address practical, science-based solutions that can help reduce pathogen transference in the environment among neighboring agriculture operations. In addition, an overview of management practices will be shared by a local Salinas Valley cattle producer and an expert will shed light on regional climate and weather factors and how these may be important factors related to food safety.

Title: *Types and Seasonality of Cattle Operations in the Salinas Area* (Draft title)  
Scott Violini, Monterey County Cattlemen’s Association (tentative)

Title: *Best Practices for Farm Biosecurity – Pathogen Prevention*  
Dr. Alexi Haack, CDFA

Topic: *Climate Seasonality and Implications Related to Potential STEC Carrier Movements (such as Dust, Water, Wildlife)*

Title and Speaker: TBD

## III. Session Three: 2 hours

### **On-farm factors that may affect STEC survival and contact with produce**

**9:00 – 11:00 a.m. (PDT) July 14, 2021**

The U.S. Food and Drug Administration, Center for Food Safety and Applied Nutrition, Risk Assessment and Modeling team is uniquely focused on the issue of modeling for pathogen persistence and contamination of produce and will present some of their work that they have published recently in this regard. In addition, information will be shared on leafy green seasonality trends and learnings.

Title: *Use of Machine Learning Modeling to Improve Food Safety Quantitative Microbiological Risk Assessments: Case Study – A Predictive Model for Survival of Escherichia coli O157:H7 and Generic E. coli in Soil Amended with Untreated Animal Manure*

Dr. Hao Pang, FDA

Title: *STEC on Leafy Greens; Always there or Seasonal Arrival?*

Dr. Trevor Suslow, UC Davis Emeritus

10-minute break

Round Table Discussion/Synthesis (50 minutes)

Invited Panelists: All speakers, CDFA, CA/Monterey County Farm Bureau, LGMA, others from CAN Dialogue Group

## ADDITIONAL RESOURCES

### California Agricultural Neighbors (CAN) Glossary of Terms

(\*Note: The glossary is a work in progress taking into account definitions utilized by agricultural partners including the California Leafy Greens Marketing Agreement (LGMA); terms will be brought into alignment in the final report.)

<b>Adjacent Lands</b>	Land within a proximity where production (irrigated) fields share a fence or are within radius of rangeland that could potentially affect safe production of leafy greens.
<b>Aerial Application</b>	Any application administered from above leafy greens where water may come in contact with the edible portion of the crop; may be delivered by aircraft, sprayer, sprinkler, etc.
<b>Aerosolized</b>	The dispersion or discharge of a substance under pressure that generates a suspension of fine particles in air or other gasses.
<b>AFO</b>	Animal Feed Operation: facility where animals are kept and raised in confined situations. An AFO is a lot or facility (other than an aquatic animal production facility) where the following conditions are met: animals have been, are, or will be stabled or confined and fed or maintained for a total of 45 days or more in any 12-month period, and crops, vegetation, forage growth, or post-harvest residues are not sustained in the normal growing season over any portion of the lot or facility. Less than 1,000 animal units. Does not meet the requirements of a Concentrated Animal Feed Operation (CAFO).
<b>Ancillary Equipment</b>	Temporary storage of equipment for fertilizers such as third-party storage tanks, pony tanks, etc.
<b>Animal By-Product</b>	Most parts of an animal that do not include unprocessed muscle meat, including organ meat, nervous tissue, cartilage, bone, blood, feathers, and excrement. Also includes worm castings, guano, and other animal-based products and excrements. Also see Mortality Composting.
<b>Animal Hazard</b>	Feeding, skin, feathers, fecal matter, or indications of animal presence in an area to be harvested, in sufficient number and quantity to suggest under reasonable assumption that the crop may be contaminated.
<b>Animal Unit</b>	An animal unit (AU) is the equivalent of 1,000 pounds of "live" animal weight. Three definitions utilized: cow-calf unit, live weight of 1,000 pounds, based on an energy basis.
<b>Application Interval</b>	The time between application of a farming input, such as a soil amendment, to a growing area, and harvest of leafy greens from the growing area where the application was applied.
<b>AUD</b>	Animal Unit Days.
<b>AUM</b>	Animal Unit Months.

<b>Available Forage</b>	Forage produced less the amount of residual dry matter (RDM) desired. There is no baseline developed on RDM; measurements by ranchers may be unnecessary when there is a buffer zone from the fence (to reduce pathogen loading). RDM should be measured for an entire pasture, not just buffer zone or congregation areas.
<b>Biofertilizer</b>	Fertilizer materials or products that contain microorganisms such as bacteria, fungi, and cyanobacteria that shall promote soil biological activities.
<b>Biosolids</b>	Solid, semisolid, or liquid residues generated during primary, secondary, or advanced treatment of domestic sanitary sewage through one or more controlled processes.
<b>Branding</b>	Marking of cattle for ownership; usually with a hot branding iron. Cattle are grazing in large pastures and may be brought in a day or two ahead of time to facilitate ease of gathering and less stress to the animals. These animals are not in a smaller area for more than maybe one day.
<b>Breakpoint</b>	Point at which the disinfection demand has been met.
<b>Breeding of Cattle</b>	The natural act of insemination of cows for pregnancy; bulls are generally kept in separate pastures until time to join with the cows for breeding. There is no real threat or concentration of these animals; this just adds a few numbers to the existing herds. Central Coast introduction is generally a 90-120-day period. Bulls are put with the cows in November and December and are taken out in April and May.
<b>Browsing</b>	See Grazing.
<b>Buffer Zone Grazing</b>	Setback area from fence that borders production fields. This would be an agreement between the grazers and the irrigated operations; food safety managers monitor and negotiate these arrangements. LGMA requests 30-foot buffer but most are 800-feet. These buffer areas create a habitat for smaller species that can infiltrate the leafy greens production areas when left unmanaged. Buffers also create a large area of increased dead grasses could have a negative impact on the climate and wildfire fuel loads.
<b>CAFO</b>	Concentrated Animal Feed Operation. CAFO, as defined by the United States Department of Agriculture, is an intensive animal feeding operation in which over 1,000 animal units are confined for over 45 days a year. 1,000 pounds of "live" animal weight.
<b>Calving</b>	References a cow giving birth to a calf. Cows graze in the natural settings and are not confined to smaller areas; birth takes place in these areas, generally; the only exception may be first calf heifers that could be brought into a smaller pasture so they can be watched more closely in case they need assistance calving; after calving they are turned out with the larger group. General time frame on calving is 90 days; months of September to February.
<b>Carbohydrate</b>	Ingredient for soil amendments and crop inputs that could improve bacteria growth.
<b>Colony Forming Units</b>	Viable microorganisms (bacteria, yeasts, and molds) either consisting of single cells or groups of cells, capable of growth under the prescribed conditions (medium, atmosphere, time, and temperature) to develop into visible colony forming units (CFU) which are counted.
<b>Co-Management</b>	An approach to conserving soil, water, air, wildlife, and other natural resources while simultaneously minimizing microbiological hazards associated with food production.

<b>Compost</b>	The product manufactured through the controlled aerobic, biological decomposition of biodegradable materials. The product has undergone mesophilic and thermophilic temperatures, which significantly reduces the viability of pathogens and weed seeds and stabilizes the carbon such that it is beneficial to plant growth. Compost is typically used as a soil amendment, but may also contribute to plant nutrients.
<b>Compost Tea</b>	A water extract of biological materials (such as compost, manure, non-fecal animal byproducts, peat moss, pre-consumer vegetative waste, table waste, or yard trimmings), excluding any form of human waste, produced to transfer microbial biomass, fine particulate organic matter, and soluble chemical components into an aqueous phase. Compost teas are held for longer than one hour before application and are considered non-synthetic crop inputs.
<b>Compost-Active</b>	Compost feedstock that is in the process of being rapidly decomposed and is unstable. Active compost is generating temperatures of 122 degrees Fahrenheit (50 degrees Celsius) during decomposition or is releasing carbon dioxide at a rate of at least 15 milligrams per gram of compost per day, or the equivalent of oxygen uptake.
<b>Compost-Aerated Static Pile</b>	Composting process where active ingredients are covered with an insulating material and air is forced through the product; maintained at a minimum of 131 degrees Fahrenheit for 3 days.
<b>Compost-Curing</b>	The secondary phase of the composting process; as the active phase slows down and the temperature drops, mesophilic microorganisms recolonize and continue to breakdown the remaining organic matter. The process is also known as the maturation step.
<b>Compost-Curing Requirements</b>	Length of the compost-curing process depends on several factors: temperature, oxygen levels, moisture levels, etc. The typical duration of the curing process requires 1-4 months but could take as long as 12 months. Nitrogen levels, pH and many other factors are measurements that need to be taken to prevent damaging of plants when applied to the soil.
<b>Compost-Feedstock</b>	Product ingredients that are used to make compost, including leaves, yard waste (green waste), crop residues, tree and vine trimmings, silviculture waste, bovine and horse manure, poultry manure, food scraps, feathers, etc. Does not include use of mortality composting components.
<b>Compost-Immature</b>	Any form of compost that has not gone through a complete, validated composting process and does not have test showing that fecal coliforms <i>E. coli</i> , listeria, and salmonella have been eliminated.
<b>Composting</b>	A process to produce compost in which organic material is decomposed by the actions of microorganisms under thermophilic conditions for a designated time period at a designated temperature, followed by a curing stage under cooler conditions.
<b>Compost-Mortality</b> <i>(Currently illegal to compost mammals in California)</i>	Mortality composting addresses composting as a method to manage livestock mortalities, butcher wastes, and roadkill animals when rendering services are not available. Can include mass mortalities resulting from a species disease or natural disaster. Currently, composting of mammalian mortality (deadstock) is illegal in California; so if used during an emergency, material must eventually go to a permitted landfill.

<b>Compost-Vessel Process</b>	Enclosed composting process where ingredients are maintained at a minimum of 131 degrees Fahrenheit for at least three days.
<b>Congregation</b>	A gathering or coming together at a central location, such as a water trough, feeder, supplement block, or other attractant. Congregations of animals may have adverse effects to riparian areas, pastures, plant health, other species, geomorphological characteristics. Variables such as timing, duration, and frequency of grazing, stocking rate, and animal distribution should be subject to management control; management of water trough placement in areas of concern to production fields; management of these areas should be at the rancher's discretion.
<b>Covered Produce</b>	Food & Drug Administration term that identifies food commodities that are generally consumed raw, such as leafy greens.
<b>Cow-Calf Operation</b>	An operational method of raising beef cattle in which a permanent herd of cows is kept by a rancher to produce calves for later sale.
<b>Crop Input</b>	Materials that are commonly applied post-emergence for pest and disease control, greening, and to provide organic and inorganic nutrients to the plant during the growth cycle.
<b>Cross-Contamination</b>	The transfer of microorganisms, such as bacteria and viruses, from one place to another.
<b>Culling the Herd</b>	Management practice that reduces herd size for a variety of reasons. Livestock graze in larger pastures until being herded to a smaller field for ease of handling and then brought to the corral for processing or shipping. Not all cattle are shipped on the same day; there may be multiple groups brought to the same corral over a period of a week or two depending on the marketing of the animals and availability of the veterinarian for pregnancy checking or semen checking of bulls.
<b>Detection Limit</b>	A detection limit is the lowest quantity of a substance or measurable target that can be distinguished from the absence of that substance or measurable target. Methods that estimate bacterial populations in serial dilutions are limited to a minimum level of <2.2 MPN/100 mL and methods that count bacterial colonies growing on media are limited to a minimum level of <1.0 CFU/100 mL.
<b>Enterohemorrhagic E. Coli</b>	Shiga toxin-producing <i>E. coli</i> clinically associated with bloody diarrhea.
<b>Escherichia (E). Coli</b>	Common bacteria that live in the lower intestines of animals (including humans) and are generally not harmful. <i>E. coli</i> are frequently used as an indicator of fecal contamination but can be found in nature from non-fecal sources.
<b>Fecal Coliforms</b>	Coliform bacteria that grow at elevated temperatures and may or may not be of fecal origin. Useful to monitor effectiveness of composting process. Also called "thermotolerant coliforms."
<b>Flooding</b>	Flowing or overflowing of a field with water outside a grower's control that is reasonably likely to contain microorganisms of significant public health concern and is reasonably likely to cause adulteration of edible portions of fresh produce in that field.
<b>Food Safety Assessment</b>	Standardized procedure that predicts the likelihood of harm resulting from exposure to chemical, microbial, and physical agents in the diet.
<b>Food Safety Personnel</b>	Trained in basic food safety precautions and principles and/or working under the auspices of a food safety professional.
<b>Food Safety Professional</b>	Entrusted with management-level responsibility for conducting food safety assessments before food reaches consumers; requires documented training in

	scientific principles and a solid understanding of the principles of food safety as applied to agricultural production. In addition, must have successfully completed food safety training at least equivalent to that received under standardized curriculum recognized as adequate by the Food and Drug Administration.
<b>Food-Contact Surface</b>	Those surfaces that contact human food and those surfaces from which drainage, or other transfer, onto the food or onto surfaces that contact food, that occurs ordinarily during the normal course of operations. Includes food-contact surface of equipment and tools used during harvest, packing, and holding.
<b>Grazing</b>	Refers to the consumption of standing forage (edible grasses and forbs) by livestock or wildlife; while browsing is the consumption of edible leaves and twigs from woody plants (trees and shrubs) by larger-hoofed animals.
<b>Grazing Capacity</b>	Quantifies the amount of available forage for grazing animals on a given site, expressed in pounds or tons of forage produced. May be described in Animal Unit Months (AUMs) or Animal Unit Days (AUDs). Measurement of grazing capacity not mandated (and should not be).
<b>Grazing Intensity</b>	A relative and general term usually expressed as light, moderate, or heavy. Intensity of use strongly affects a site's response to grazing. Two variables – stocking rate and length of grazing period(s) – are the principal controls that can be prescribed to achieve the grazing intensity desired for a site.
<b>Grazing Periods</b>	The length of time that grazing animals occupy a specific land area.
<b>Grazing Season</b>	The time period, during a year, when grazing is feasible or practical. In low-elevation California, the grazing season can be year-round.
<b>Green Waste</b>	Any plant material that is separated at the point of generation that contains no greater than 1.0 percent of physical contaminants by weight. Green waste materials include: yard trimmings, untreated wood wastes, natural fiber products, construction and demolition wood waste, tree and vine trimmings, weeds, and others. Materials cannot be commingled with other materials during handling, transport, or storage. Green materials do not include biosolids, mixed solid waste, treated wood products, or mixed debris.
<b>Harvest Equipment</b>	Any kind of equipment that is used during or to assist with the harvesting process (harvesting machines, food-contact table, belts, knives, etc.)
<b>Harvesting</b>	Activities that are traditionally performed on farms for the purpose of removing leafy greens from the field and preparing them for use as food; does not include activities that transform a raw agricultural commodity into a processed food item (value-added product). Examples of harvest activities are: cutting the edible portion of the leafy greens from the plant and removing or trimming parts, cooling, field coring, gathering, hulling, removing stems, trimming of outer leaves, and washing.
<b>Hazard</b>	Any biological, physical, or chemical agent that has the potential to cause illness or injury in the absence of control.
<b>Hazard-Known or Foreseeable</b>	A biological, chemical, and physical hazard that is known to be, or has the potential to be, associated with the farm or the food.
<b>Heat-Treated Soil Amendment</b>	Relates to raw animal manure; alternative treatments are recommended for reducing or eliminating pathogens. Processed manure products must be treated so that all portions of the product reach a minimum temperature of either 150 degrees Fahrenheit for at least one hour or 165 degree Fahrenheit and are dried to a maximum moisture level of 12 percent.



<b>Holding</b>	Storage of leafy greens in warehouses and cold storage, including activities performed incidental to storage (including safe and effective storage measures) as well as activities performed as a practical necessity for leafy green distribution (blending or breaking down pallets). Does not include activities that transform raw commodity into a processed food product (value-added product).
<b>Hydroponic</b>	Growing of plants in nutrient solutions with or without an inert medium, such as soil, to provide mechanical support.
<b>Indicator Microorganisms</b>	An organism that when present suggests the possibility of contamination, including during processing.
<b>Listeria</b>	Any genus of small, gram-positive, rod-shaped bacteria that do not form spores and have a tendency to grow in chains; include one ( <i>Listeria monocytogenes</i> ) that causes listeriosis (a serious infection). A common germ found in many foods, not just limited to leafy greens.
<b>Lot</b>	A specific quality of a finished product or other material that is intended to have uniform character and quality, within specified limits, and is produced according to a single manufacturing or production order during the same cycle.
<b>Manure</b>	Animal excreta, alone or in combination with litter; used as a soil amendment.
<b>Microorganisms</b>	Yeasts, molds, bacteria, viruses, protozoa, and microscopic parasites; includes species having public health significance and those subjecting leafy greens to decomposition, or that otherwise may cause leafy greens to be adulterated.
<b>Monitor</b>	Conduct a planned sequence of observations or measurements to assess whether a process, point, or procedure is under control and, when required, to produce an accurate record of the observation or measurement.
<b>Most Probable Number</b>	Estimates values that are statistical in nature; most probable number (MPN) is a method for enumeration of microbes in a sample, particularly when present in small numbers.
<b>Non-Detect</b>	Not present but consideration should be given to the limit of detection of the approved laboratory method used for biological or chemical analysis.
<b>Non-Synthetic Soil Amendments</b>	Any soil amendment and/or crop input that contains animal manure, an animal byproduct, and/or an animal byproduct that is reasonable likely to contain human pathogens. Includes compost teas.
<b>Packing</b>	Placing leafy greens into a container other than packaging; also includes activities performed incidental to packing (safe and effective packing measures, such as sorting, culling, grading, and weighing; incidental to packing or repacking).
<b>Parts per Million</b>	Describes concentration of substances in water or soil; one particle of a given substance for every 999,999 other particles (PPM).
<b>Parts per Trillion</b>	Describes concentration of substances in water or soil; one particle of a given substance for every 999,999,999 other particles (PPT).
<b>Pathogen</b>	A disease-causing agent such as a bacteria, virus, or parasite.
<b>Pest</b>	Any objectionable animals or insects, including birds, rodents, flies, and larvae.
<b>Process Authority</b>	A regulatory body, person, or organization that has specific responsibility and knowledge regarding a process or method; these authorities publish standards, metrics, and guidance for particular processes and/or methods.
<b>RDM</b>	Residual Dry Matter: mulch or the dead plants above the soil surface, beneficial to controlling erosion and has a direct effect of composition of range plants.
<b>Ready-to-Eat Food</b>	In a form that is edible without additional preparation to achieve food safety; includes raw fruits and vegetables that are washed, fruits and vegetables that are

	cooked for hot holding, and plant food which further washing, cooking, or other processing is not required from food safety (such as rinds, peels, husks, or shells when removed).
<b>Riparian Area</b>	A vegetated ecosystem along a waterbody through which energy, materials, and water pass. Riparian areas characteristically have a high water table and are subject to periodic flooding and influence from the adjacent waterbody. These systems encompass wetlands, uplands, or some combination of those two landforms. They will sometimes, but not in all cases, have all the characteristics necessary to be also classified as wetlands (US EPA 2005).
<b>Risk Mitigation</b>	Actions to reduce the severity and impacts of a risk.
<b>Salmonella</b>	A gram-negative facultative rod-shaped bacterium in the same proteobacterial family as <i>E. coli</i> ; lives in the intestinal tracts of warm- and cold-blooded animals. In humans, causes two diseases called salmonellosis: typhoid and acute gastroenteritis.
<b>Sanitary Facility</b>	Includes both toilet and hand-washing stations.
<b>Sanitize</b>	Adequately treat cleaned surfaces by a process that is effective in destroying vegetative cells of microorganisms of public health significance, and in substantially reducing numbers of other undesirable microorganisms, but without adversely affecting the product or its safety for the consumer.
<b>Sediment</b>	Undissolved organic and inorganic material transported or deposited by water.
<b>Shedding</b>	A term used to describe excretion levels of an organism such as a bacterium or virus from a host animal. In this context, it refers to excretion of <i>E. coli</i> O157 in cattle feces.
<b>Shiga-Toxin Producing <i>E. coli</i></b>	Bacteria found in the environment, foods, and animal and human intestines that produce a potent disease-causing toxin. Commonly associated with severe illness and hospitalization, with over 50 serogroups that can cause illness.
<b>Shipping Unit</b>	Any cargo area used to transport leafy greens on the farm or from the farm to cooling, packing, or processing facilities.
<b>Soil Amendment</b>	Elements added to the soil, such as compost, peat moss, or fertilizer, to improve soil capacity to support plant life.
<b>Stocker Cattle</b>	Introduction of additional animals to existing herd. Density on the grazing lands increase somewhat because these animals are smaller in frame (two of these type to one cow/calf generally). The pasture grasses are utilized to increase weight gain on this particular group; generally grazed the same as a cow/calf but for a shorter period of time (generally introduced to grazing in November to April) and mostly grazed during the green, wet season. Producer involvement limited in scope only to a few operations do this; does not increase the carrying capacity of the acreage involved.
<b>Stocking Concentration</b>	See Stocking Density.
<b>Stocking Density</b>	Number of animals per unit area of land at any one point in time. Can be expressed as Animal Units (AUs) per acres.
<b>Stocking Rate</b>	The number of animals grazing the available forage for a given period of time. It is expressed as Animal Units (AUs) per time period. Following units apply to cattle: weaned calf to yearling 0.6 unit; steers and heifers (1-2 years) 1.0 unit; mature cows with or without calf 1.0 unit; and mature bulls 1.3 units.

<b>Supplemental Feed</b>	Additional hay or grains provided to supplement natural grass. Cattle are usually fed in large pastures in several different areas; and are not fed in the same area every day on the same pasture as it will kill and damage the grass and soil. Most ranchers will rotate the feeding zones for this reason. In the Central Coast Mediterranean climate, this is a general practice because the grass is dry and contains low energy value in the fall of the year (September-November) and the cows need some additional energy (supplemental hay) to support the calf.
<b>Supplemental Molasses/Salt</b>	These items are distributed throughout pastures to benefit the animals and keep them in a rotational basis within large pastures. Cattle will concentrate around such areas, much the same as a watering trough. These areas are selected to minimize damage to soil and grasses.
<b>Synthetic Soil Amendments</b>	Any soil amendment and/or crop input that may be refined, and/or chemically synthesized, and/or transformed through a chemical process, such as gypsum, lime, sulfur, potash, ammonium sulfate, etc.
<b>Tailwater</b>	Excess run-off water (surface flow) which is generated (and may be collected) during the process of irrigation.
<b>Total Coliforms</b>	A group of related bacteria that are not harmful to humans (with a few exceptions); found in soils and water. Total coliforms are a useful indicator of the possible presence of other pathogens in drinking water and are used to determine adequacy of water treatment as well as the integrity of a water distribution system.
<b>Transporter</b>	Entity responsible for transporting product from the field.
<b>Ultraviolet Index</b>	A measure of the solar ultraviolet (UV) intensity at the Earth's surface; indicates any day's exposure to ultraviolet rays. UV index is measured around noon for one hour.
<b>Vaccinations</b>	Providing medicinal supplements and disease prevention "shots" to animals, usually at the time of branding.
<b>Validated Process</b>	A process that has been demonstrated to be effective through a statistically based study, literature, or regulatory guidance.
<b>Validation</b>	The act of determining whether products or services conform to meet specific requirements.
<b>Verification</b>	The act of confirming a product or service meets the requirements for which it was intended.
<b>Visitor</b>	Any person who enters a field operation with permission, other than operational personnel.
<b>Waste-Post Consumer</b>	Waste type produced by the end consumer of a material stream; this is discarded materials, generally after use, in a trash can, incinerator, or dump. Includes packaging, human and pet waste, and unconsumed food.
<b>Waste-Pre-Consumer</b>	A food item that was produced for consumption but that was never purchased, consumed, or otherwise used.
<b>Water Distribution System</b>	Consisting of pipes, pumps, valves, storage tanks, reservoirs, meters, fittings, and other hydraulic appurtenances to carry water from its primary source to point of use.
<b>Water Source</b>	The location from which water originates; water sources can be municipal, well, or surface waters.
<b>Water System</b>	Each distinct, separate combination of water sources, conveyance, and storage used to carry water from its primary source to its point of use; includes wells, irrigation canals, pumps, valves, storage tanks, reservoirs, meters, pipes, fittings, and sprinklers.

<b>Water Treatment</b>	Any process that improves water quality and safety to make it more acceptable for a specific end use.
<b>Water-Antimicrobial Treatment</b>	A physical, energetic, or chemical agent, applied alone, in combination, or as a sequential process, to achieve and maintain a defined microbiological water quality standard.
<b>Water-Blue Pipes &amp; Valves</b>	Pipes and valves which are used as a closed conveyance system for moving agricultural surface water from water source to irrigation systems or reservoirs for farm use.
<b>Water-Closed Delivery System</b>	Water storage or conveyance system which is fully enclosed and protected such that water is not exposed to the environment from the water source to the point of use.
<b>Water-Direct Application</b>	Using agricultural water in a manner whereby the water is intended to, or is likely to, contact leafy greens or food-contact surfaces during use of the water.
<b>Water-Groundwater</b>	Supply of fresh water found beneath the earth's surface, usually in aquifers, which supply wells and springs. Does not include any water that meets the definition of "surface water."
<b>Water-Irrigation and Processing</b>	Water used in crop production that is intended to, or is likely to, contact leafy greens or food-contact surfaces, including water used in growing activities (including water used for preparing crop sprays) and harvest, packing, and holding activities (including water used for washing or cooling harvested leafy greens and water used for preventing dehydration of leafy greens).
<b>Water-Irrigation Treatment</b>	Any system used to treat agricultural water so the quality is adequate for its intended use.
<b>Water-Monthly Sampling</b>	Because irrigation schedules and delivery of water are not always in a grower's control, "monthly" for the purposes of water sampling means within 35 days of the previous sample.
<b>Water-Open Delivery System</b>	A water storage or conveyance system which is partially or fully open and unprotected such that water is exposed to the environment at any point from the water source to the point of use.
<b>Water-Pooled</b>	An accumulation of standing water; not free-flowing.
<b>Water-Potable</b>	Water that is safe to drink or to use for food preparation without risk of health issues; municipal water supply systems must meet strict standards for portable water supplies.
<b>Water-Surface</b>	Water either stored or conveyed on the ground surface and open to the environment (rivers, lakes, streams, reservoirs, etc.). Does not include any water that meets the definition of "groundwater."
<b>Water-Treatment System</b>	An add-on to agricultural water system that improves the quality and safety of the water to make it more acceptable for a specific end use. The water treatment system may treat multiple farm fields, water sources or batches of water as defined by the water system definition.
<b>Weaning</b>	The practice of separating calves from their source of milk. Weaning calves reduces the nutrient requirements of the cow. It will allow the cow to transfer nutrients previously going to milk production to her own body function, improving her own condition and preparing for the next calving.
<b>Wildlife Control</b>	The means to control wildlife from entering production areas. Ranchers and livestock operations have no control over the wildlife as the rules of engagement are set by the California State Fish and Game Commission. Tags and depredation

	require money and time. The method of control is up to the individual landowner. Growers operate in the same environment as the wildlife; open space, unincumbered freedom for wildlife to roam within the boundary fences of the property.
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