GROW WITH SCIENCE.

Leafy Greens Seasonality Webinar Part 2: *Industry Efforts, Tools and Best Practices to Consider Before and During Transition Periods*

September 30, 2020

Western Growers Science

WEBINAR LOGISTICS

- Everyone is muted.
- Questions will be addressed during the Q&A session at the end of the presentation.
- This presentation is being recorded.
- The recording/slides will be available to WG members only.
- Adjourn (60 minutes).
- There will be 3 important survey questions at the conclusion of this webinar. Your responses will be appreciated.

AGENDA

- Welcome and Introductions
- Seasonality/transition industry survey results
- Seasonality impacts on water quality
- Water research conclusions and strategies to manage risk
- Best practices during and before transitions
- Information Sharing: WG's member
- Q&A
- Closing Remarks

Meet the Speakers

Sonia Salas
AVP of Food Safety
Science and Technology, Western Growers

Vicki Scott
President and Technical Assistant
Scott Resources and AZ LGMA

Dr. Channah Rock
Professor and Extension Specialist
University of Arizona

Cosme Pina
Director of Food Safety
Taylor Farms

Seasonality Transition: *Questionnaire Project*

Vicki Scott
President and Technical Assistant
Scott Resources and AZ LGMA

Task Force Seasonality-Transition Committee

- What are the characteristics that seem to link these two events
- How can we better understand this pattern – root cause
- Can methods be identified to address the issue
- Determine or identify if there are tangible, observable industry practices that might be contributing to outbreaks and to possibly measure some human behavior or industry break-downs in food safety culture during transition

What type of data and how to collect?

Develop a questionnaire to survey the industry to collect data

Create a team to conduct interviews using the questionnaire

Compile and analyze the data through a third party

Develop recommendations on how the metrics can be amended to address any identifiable issues based on the findings

Questionnaire Participants-Type and Role

- Grower/Producer
- Harvester
- Shipper/Processor
- Food Safety Professional
- Consultant
- Auditor
- Other
- Surveyed for job role, responsibility

General Survey Categories

- Production practices and processes
- Harvest Practices and processes
- Shipper – Processor processes
- Regulatory, LGMA, 3rd Party Audits, Shipper and Customer Requirements
- Emerging and/or Continuing Patterns and Conditions
- Theories or What do you think?

Interview Process to Encourage Discovery

- Weather events
- Water quality throughout the season
- Level, quality, and quantity of food safety training
- Skills and knowledge of labor force and staffing during critical periods
- Adjacent land uses
- Types of crops
- Animal intrusion
- Market conditions
- Other risk factors

Adjacent Land Use

- Adjacent land uses often lead to adjustments in planting, irrigating or harvesting the crop due to
    - Soil amendment use
    - Hobby farms
    - Pest pressures
    - Non-produce crops (cotton, wheat, dates)
    - Other food safety hazards and/or increased risks

Animal Activity, Intrusion

- Many indicated that they have experienced issues with animal activity and/or intrusion on at least one occasion that required corrective actions
    - Majority were categorized as low risk per LGMA required SOP's
    - All indicated that workers are trained per PSR and LGMA
    - Buffers are often used for mitigation per LGMA or customer

Soil Amendments, Compost, Fertilizer Inputs

- The majority of grower/producer interviewees indicated they use compost and other organic soil amendments or fertilizers
    - LGMA requirements were followed by all
    - 50%+ indicated they verify processes such as preparation, storage, handling and application practices

Water Use

- A variety of water sources are available for use. Surface water is the primary source for crop irrigation and there was awareness of water quality standards, seasonal variations and impacts from district maintenance activities.
    - Slight increase in generic E. coli based on water temperature
    - Majority collect water samples in-house
    - All follow LGMA metrics
    - There were no concerns with water used in pesticide applications

Weather Events

- Interviewees responded affirmatively that they are aware that unusual weather events may impact plant quality and health and may increase potential food safety risks
    - A list was generated that included freezing, blistering, unusual heat, high winds, high humidity, leaf wetness, disease
    - Responses noted that field workers are being trained to increase their understanding and awareness of potential food safety risks

Labor Practices

- The majority replied that they use a variety of labor: in-house, contract, or a combination of the two
    - Agreement that seasonal transition can impact food safety (reductions or changes in staffing/labor, not as well-trained)
    - Most use cross-training of employees
    - Training programs do not change throughout the season

Harvest Practices

- Respondents felt that SOP's and training were in place to ensure that cleaning and sanitizing of equipment was conducted at appropriate frequencies and adjusted to address situational or weather-related conditions
    - Efficacy of cleaning and sanitizing is not widely conducted
    - LGMA audits only a small portion of harvest crews
    - About half of the interviewees felt that there are harvesting methods that could contribute to potential food safety issues (contact with the ground)
    - Transition of equipment may be an issue

Regulatory, LGMA, 3rd Party Audits, Shipper, Customer Requirements

- Participants generally agreed that they are compliant with standards and expectations
    - No audits are fully addressing seasonality/transition in audits or inspections
    - Market conditions and decision-making is not addressed

Conclusions

- LGMA's have addressed several of the areas of concern including creating metrics for weather and water treatment for overhead uses within 21 days of harvest.
- Soil amendments and crop inputs are under review
- Adjacent land use is also undergoing review
- 'What do you think?' category provided many additional theories that have yet to be explored

Thank You!

- Mike Villaneva, retired CA LGMA Technical Director
- Francisco Tovar, Masters student
- Many interviewees who volunteered their insight and time

Contact Us

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Seasonality Impacts on Agricultural Water Quality:

Understanding impacts of seasonality on agricultural water quality and things industry can do to mitigate them

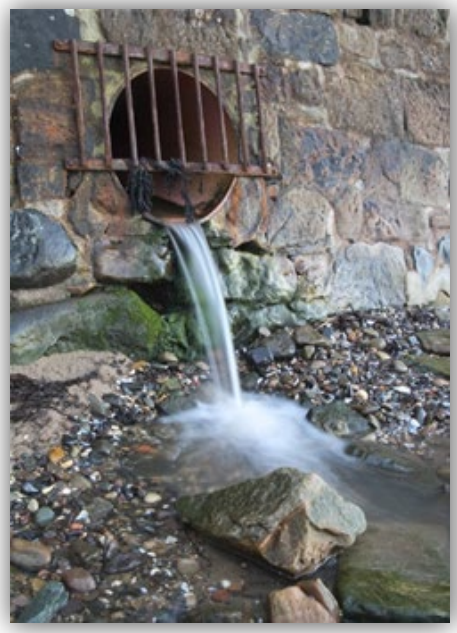
Dr. Channah Rock
Professor and Extension Specialist
University of Arizona

THE UNIVERSITY OF ARIZONA


Evidence shows that we should pay attention to our water sources as potential vectors for pathogens.

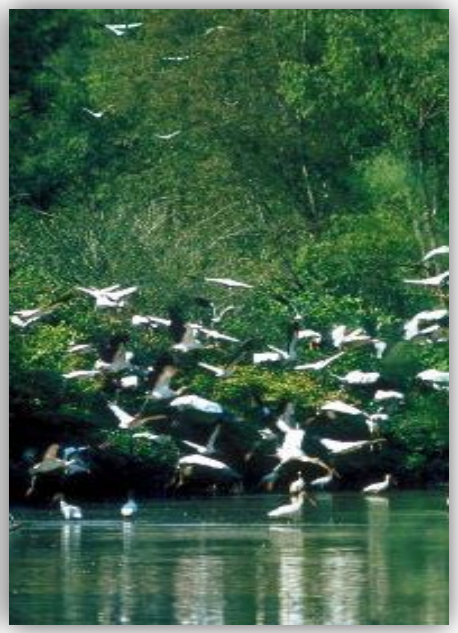
Contamination of Surface Water

There's *E.coli* in the water, but where did it come from?



Stormwater, Illegal Discharge or Un-treated Wastewater

Recreation



Wild or Domestic Animals

Pathogen Decay in the Environment

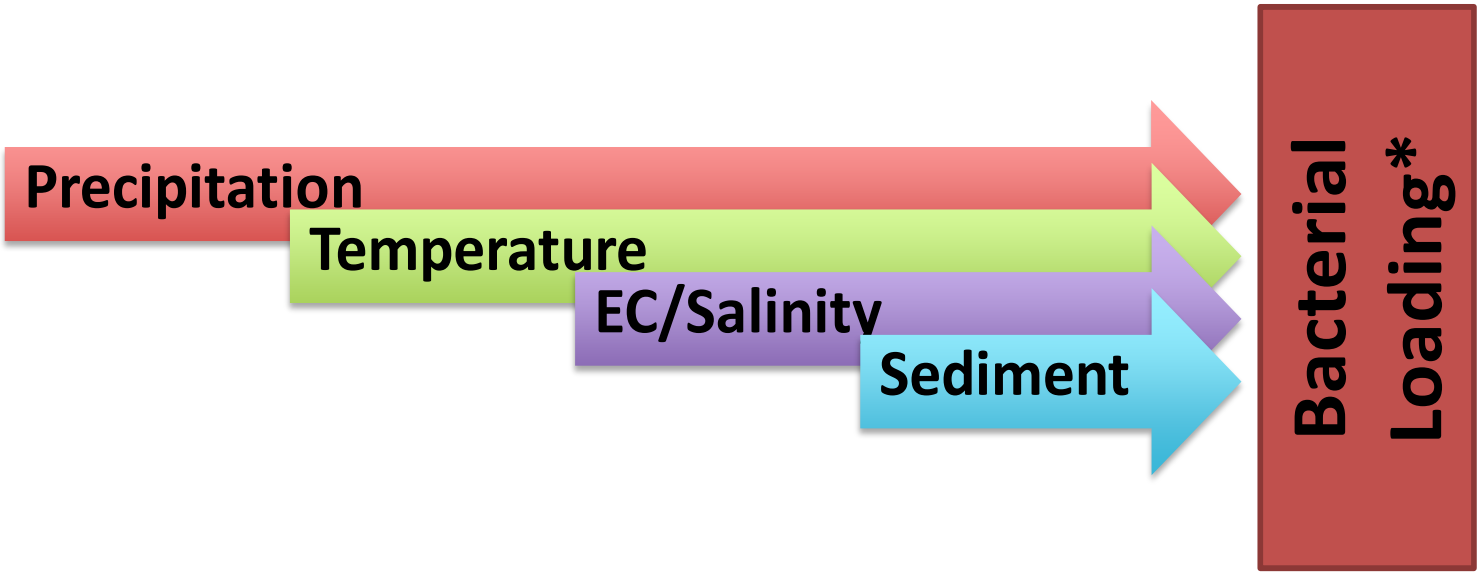
The environment provides “retention time”, allowing an additional opportunity for attenuation of microbial contaminants.

- Survival of microorganism in the environment
  - Temperature
  - Light
  - Oxygen
  - Nutrients
- Ability of microorganisms to be transported
- Rainfall and runoff

Research Shows

- Historical data from Arizona, California, Nevada, and Oregon
- Relationships were observed between **surrounding land use** and **environmental factors** on the occurrence of *E. coli* and *Salmonella* in irrigation water
- Additional factors may have **greater** influence on water quality
  - **Canal maintenance**
  - **Lined vs. Unlined**

Main Influential Factors on Irrigation Water Quality



**E.coli* and Salmonella in surface water conveyance systems

WHAT DO YOU FIRST THINK OF WHEN YOU HEAR “SEASONALITY” AND AGRICULTURAL WATER QUALITY?

Initial Thoughts

- Weather
  - Temperature
  - Humidity
  - Wind Speed/Direction
  - Rain or "Extreme" Events
- Water Use/Conveyance Activities
- Surrounding Land Use Activities
  - People
  - Animals

photo:azfamily.com

Environmental Factors - Weather

Air Temperature
Relative Humidity

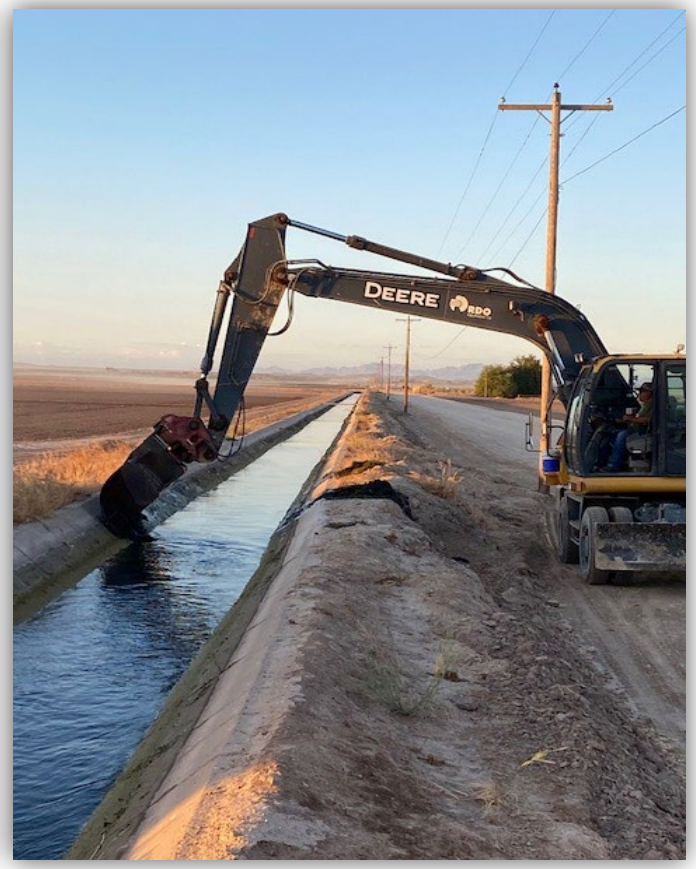
Solar Radiation
Rainfall Duration

Rainfall Quantity
Rainfall Intensity

Water Use/Conveyance

- The job of an irrigation district is to supply a volume of water to a specific location and time.
  - Sediment build-up over time
  - Algae removal
  - Invasive plants
  - Bank stabilization
  - Stagnant water

Canal Cleaning



Brush Removal

Stagnant Water

- Low or no water use during the off season may create areas of water stagnation

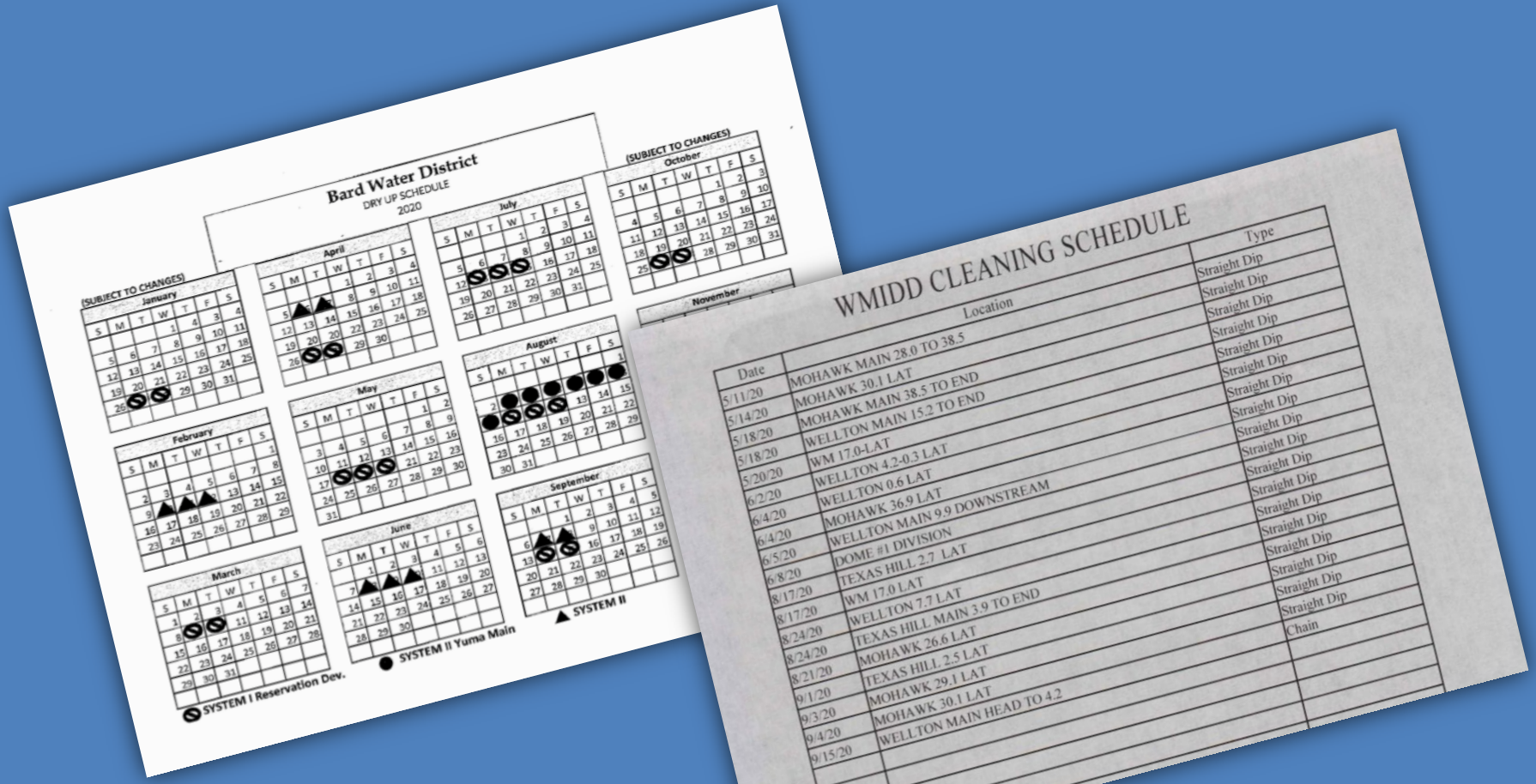
Water Treatment

- Water treatment can be a solution!

- However…
  - Organic Matter
  - pH
  - Temperature
  - Turbidity

- Get to know your water source and identify what are typical seasonal trends versus those that are **NOT** typical.

Example Communication from Irrigation Districts



Bard Water District

DRY UP SCHEDULE

2020

(SUBJECT TO CHANGES)

January

February

March

April

May

June

July

August

September

October

November

SYSTEM I Reservation Dev.

SYSTEM II Yuma Main

SYSTEM II

WMIDD CLEANING SCHEDULE

Date	Location	Type
5/11/20	MOHAWK MAIN 28.0 TO 38.5	Straight Dip
5/14/20	MOHAWK 30.1 LAT	Straight Dip
5/18/20	MOHAWK MAIN 38.5 TO END	Straight Dip
5/18/20	WELLTON MAIN 15.2 TO END	Straight Dip
5/20/20	WM 17.0-LAT	Straight Dip
6/2/20	WELLTON 4.2-0.3 LAT	Straight Dip
6/4/20	WELLTON 0.6 LAT	Straight Dip
6/4/20	MOHAWK 36.9 LAT	Straight Dip
6/5/20	WELLTON MAIN 9.9 DOWNSTREAM	Straight Dip
6/8/20	DOME #1 DIVISION	Straight Dip
8/17/20	TEXAS HILL 2.7 LAT	Straight Dip
8/17/20	WM 17.0 LAT	Straight Dip
8/24/20	WELLTON 7.7 LAT	Straight Dip
8/24/20	TEXAS HILL MAIN 3.9 TO END	Straight Dip
8/21/20	MOHAWK 26.6 LAT	Straight Dip
9/1/20	TEXAS HILL 2.5 LAT	Straight Dip
9/3/20	MOHAWK 29.1 LAT	Straight Dip
9/4/20	MOHAWK 30.1 LAT	Chain
9/15/20	WELLTON MAIN HEAD TO 4.2	

Surrounding Land Use

- Location
  - Main
  - Lateral
  - Pond/Reservoir Size
- Landscape Features
  - Urban/Rural
  - CAFO/Ranch
  - Land Slope
  - Bridge/Road
  - Canal Width/Depth
  - Lined or Unlined
  - Vegetation

Surrounding land use – What are your neighbors up to?

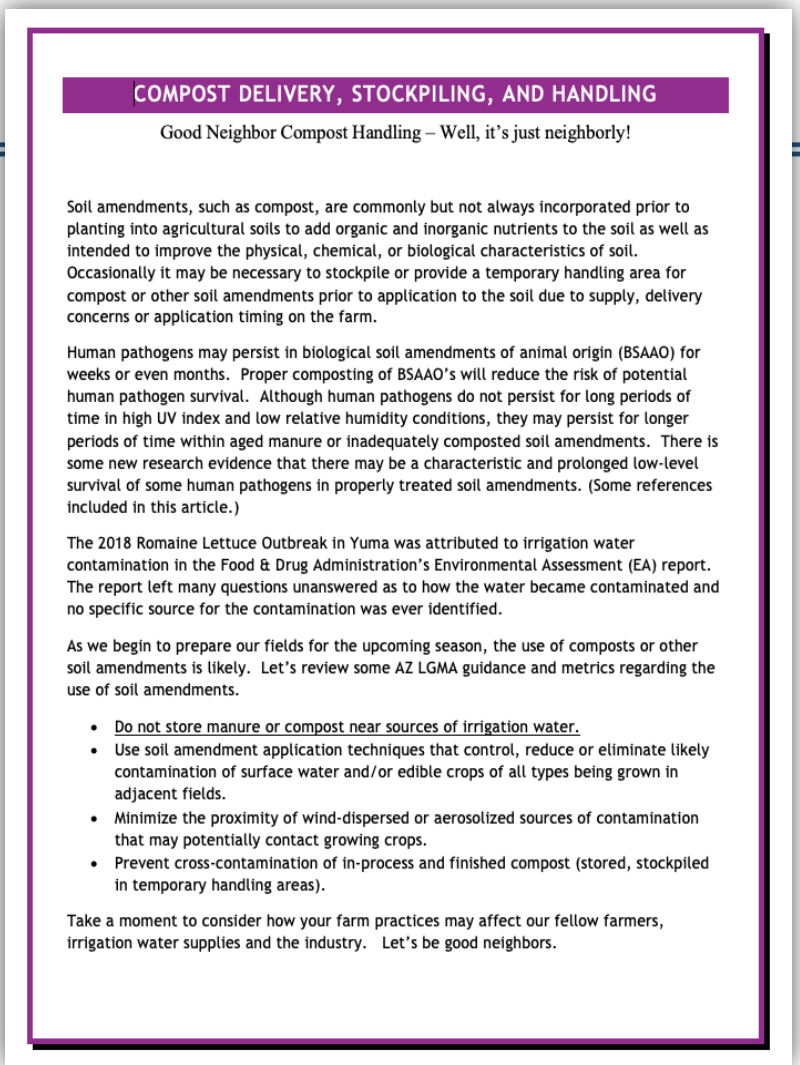
Compost Staging Near Canal

Poultry Litter Application

What crop products are being applied in the off-season or on surrounding lands?

Good Neighbor Communications

(Reminder – not all of your neighbors are in produce!)



COMPOST DELIVERY, STOCKPILING, AND HANDLING

Good Neighbor Compost Handling – Well, it's just neighborly!

Soil amendments, such as compost, are commonly but not always incorporated prior to planting into agricultural soils to add organic and inorganic nutrients to the soil as well as intended to improve the physical, chemical, or biological characteristics of soil. Occasionally it may be necessary to stockpile or provide a temporary handling area for compost or other soil amendments prior to application to the soil due to supply, delivery concerns or application timing on the farm.

Human pathogens may persist in biological soil amendments of animal origin (BSAAO) for weeks or even months. Proper composting of BSAAO's will reduce the risk of potential human pathogen survival. Although human pathogens do not persist for long periods of time in high UV index and low relative humidity conditions, they may persist for longer periods of time within aged manure or inadequately composted soil amendments. There is some new research evidence that there may be a characteristic and prolonged low-level survival of some human pathogens in properly treated soil amendments. (Some references included in this article.)

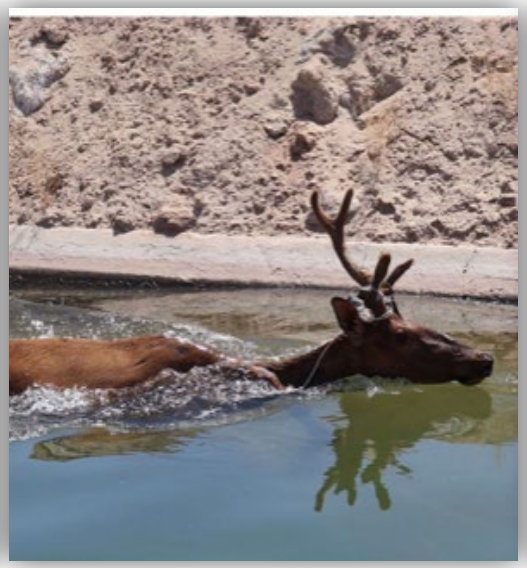
The 2018 Romaine Lettuce Outbreak in Yuma was attributed to irrigation water contamination in the Food & Drug Administration's Environmental Assessment (EA) report. The report left many questions unanswered as to how the water became contaminated and no specific source for the contamination was ever identified.

As we begin to prepare our fields for the upcoming season, the use of composts or other soil amendments is likely. Let's review some AZ LGMA guidance and metrics regarding the use of soil amendments.

- Do not store manure or compost near sources of irrigation water.
- Use soil amendment application techniques that control, reduce or eliminate likely contamination of surface water and/or edible crops of all types being grown in adjacent fields.
- Minimize the proximity of wind-dispersed or aerosolized sources of contamination that may potentially contact growing crops.
- Prevent cross-contamination of in-process and finished compost (stored, stockpiled in temporary handling areas).

Take a moment to consider how your farm practices may affect our fellow farmers, irrigation water supplies and the industry. Let's be good neighbors.

Wild and Domestic Animals



Animal movement patterns during the year shift/change. Also, climate/seasonal impacts on water availability may motivate animals to seek alternate water sources.

Migratory Birds

- When do birds arrive? When do birds leave?
- Where do they roost/land – usually close to water, bridges, trees, etc.
- Can we reduce their roosting activities around water sources?

People

Do you know what is happening upstream?

Irrigation Wells

- Many issues associated with the proper function of a well are **not** visible from the surface.
- Integrity (state of repair) of well components should be evaluated such as well casing, annular space, well cap/seal/venting, and pump.
- Inspect the condition of the area surrounding the well including the concrete well pad.
- Check your well on a regular basis for cleanliness, appropriate gradient and potential contamination sources.

Seasonal Well Issues

- Use flushing if the well has been inactive and be prepared to disinfect and evaluate microbiologically through testing.

- Have the well inspected annually by an experienced professional.

What can industry do?

- Be aware of surrounding and up-stream land use activities.
- Talk to your neighbors!
- Encourage irrigation district(s) to conduct maintenance activities well before pre-season assessments occur.
- Recognize that you may need to flush your ditch, lateral, well, or other water delivery system.

THANK YOU!

Channah Rock, PhD

Water Quality Specialist & Professor

University of Arizona Cooperative Extension

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Best Practices during transition periods and end of the season

Sonia Salas
AVP of Science
Western Growers

Transition periods are critical – extra vigilance is key!

- Leafy Green Industry – under pressure and scrutiny
- FDA's Leafy Green STEC Action Plan – includes increased surveillance during transition periods
- Canada's temporary requirements - Oct, Nov and Dec new requirements for romaine imported from the U.S.
- WG's Best Practices Sheet –available online

Considerations for Leafy Greens Food Safety Programs during Transition Periods, End of Season Harvesting

Data on foodborne illness outbreaks associated with leafy greens indicate that there have been more contamination events during the final months of the season in both coastal California (October and November) and the desert growing regions (March and April). As a precaution we encourage food safety personnel, ranch managers, and harvesting crews to be extra vigilant about minimizing the risks from microbial hazards during end-of-the-season harvest. Below is a list of recommendations to consider as you implement your food safety program during this time.

Environmental Assessments

- Check crops for weather-related damage.
- Check on any known potential contamination sources near fields to ensure situation has not changed (i.e., worsened).
- Look for previously unknown potential contamination sources
- If you are near a Concentrated Animal Feeding Operation, check in with its managers regarding their activities over the final weeks of harvest.
- Record your findings and take a corrective action.

Irrigation Water

- Check on any known potential upstream contamination sources to ensure the situation has not changed.
- Look for unknown potential upstream contaminants that threaten your irrigation water sources.
- Be on alert for increased water turbidity due to rainfall / storms.
- If water quality appears to be worse than normal, increase testing of water sources that is used for overhead irrigation.
- Decrease pumping rates for shallow or highly turbid water sources.
- If you are treating irrigation water, redouble efforts to ensure it contains effective sanitizer levels.
- Record your findings and take a corrective action.

Crop Treatments

- Make sure the water utilized for foliar applications meet your water quality criteria.

Worker Practices

- Hold brief retraining exercises emphasizing good hygiene practices and worker health policies.
- Encourage and enforce increased vigilance in hand washing practices.
- Make extra gloves available.

WG's Best Practices Sheet

Outbreaks are most likely *not* due to one risk factor or hazard, but a combination of conditions and events that create a "perfect storm."

WG's information sheet addresses:

- Environmental Assessments
- Irrigation Water
- Crop Treatments
- Worker Practices

WG's Best Practices Sheet

Environmental Assessments

- Check crops for weather-related damage
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- Look for previously unknown potential contamination sources
- If you are near a CAFO, check in with its managers regarding their activities over the final weeks of harvest
- Record your findings and take a corrective action

WG's Best Practices Sheet.- Environmental Assessments

Frost damage:

Wind & soil damage:

Numerous studies provide evidence that crops that are damaged from weather or disease are more susceptible to pathogens.

Pictures Source: Dr. Steven Koike, Plant Pathology Farm Advisor (UC ANR's article on frost and wind damage)

WG's Best Practices Sheet - Irrigation Water

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WG's Best Practices Sheet - Irrigation Water

How do current conditions affect irrigation water? (Extreme weather impacts)

- Hot, dry conditions may impact need for more irrigation activity than normal
- Storms stirring up surface water, producing runoff into irrigation water sources

Heat damage picture: Royal Food Service

Look for changes in conditions and make adjustments to testing routines and treatment protocols

Best Practices - Crop Treatments

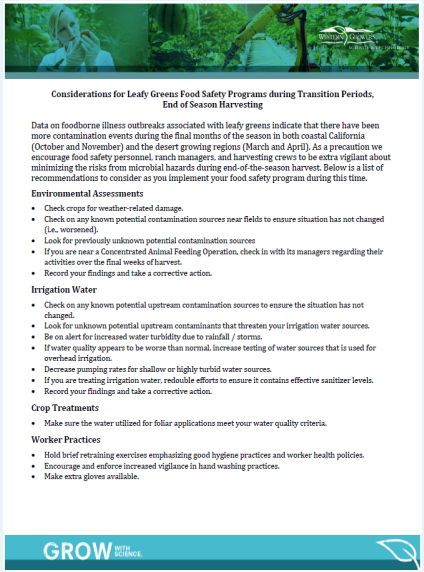
- Make sure the water utilized for foliar applications meet your ***water quality criteria***

Best Practices - Worker Practices

- Hold brief retraining exercises emphasizing good hygiene practices and worker health policies
- Encourage and enforce increased vigilance in hand washing practices
- Make extra gloves available, if provided
- Bottom line: ***Train and raise awareness during transition periods***

Best Practices - Equipment

- Retraining exercises on current equipment cleaning and sanitation procedures
- Check quality of water used to clean equipment
- Clean and sanitize equipment after use and when moving between fields
- Do not allow uncleaned equipment to sit in fields overnight
- Covering equipment at night if needed
- Check efficacy parameters more frequently (re-circulated rinse or antioxidant solutions)
- Verify cleaning and sanitation
- Bottom line: ***Consider more frequent training, more frequent monitoring, verification activities and/or additional measures***



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https://www.wga.com/sites/default/files/wg_transition_recommendations_v2.pdf

THANK YOU

Sonia Salas

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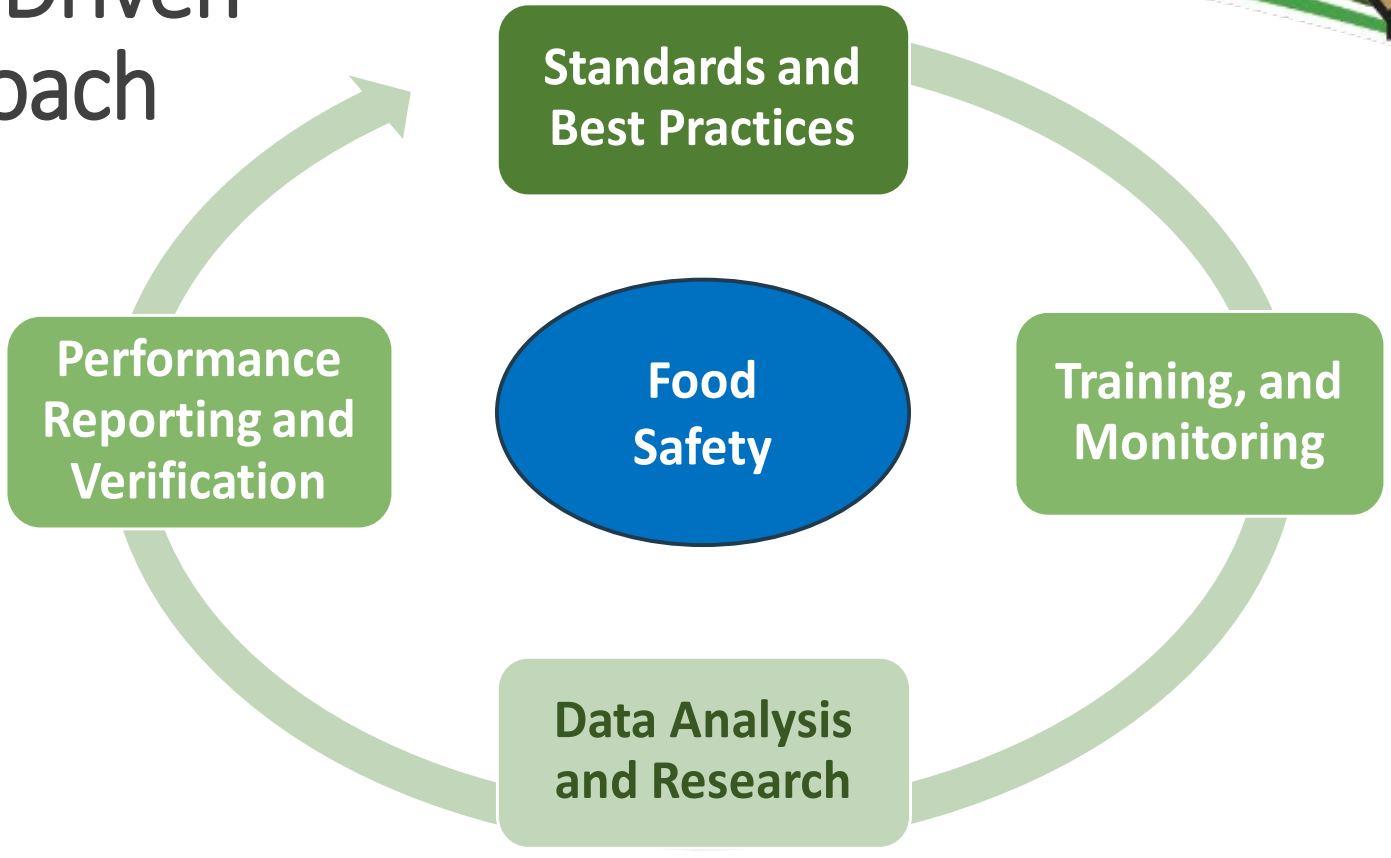
Identifying Critical Produce Food Safety Practices

Cosme Pina
Director of Food Safety
Taylor Farms

Data-Driven Approach



Critical Best Practices

What are the outbreaks telling us?
What are the investigations telling us?
What is our data telling us?

Critical Food Safety - Overview

Field Food Safety

- Research
- Crop & Soil Amendments
- Livestock Activity
- Water Management
- Harvesting

Field Food Safety

GAP Food Safety

- Dedicated Field Food Safety Professionals- boots on the ground
- Grower and Harvester Interfacing
- Electronic Data Collection –GPS/GIS programs.

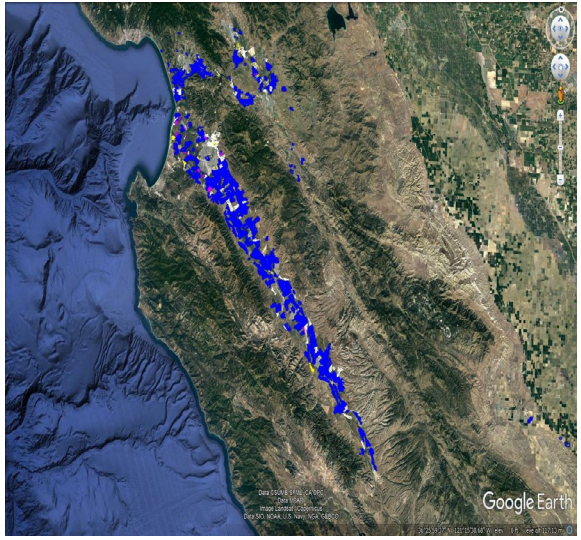
Historical Database on Regional and Ranch History

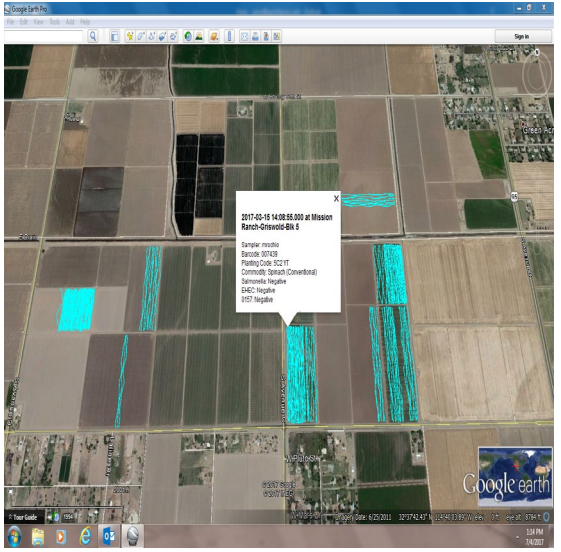
- Water Treatment
- Ground Selection
- Crop Cycle

Harvest Practices

- Sanitary Design
- Sanitation Schedule
- Automated Harvesting
- Optical Sorting

GPS/GIS Programs





Field Food Safety – Research Learnings

- Any single positive test is not always useful but over time can help identify risks.
- When you do get a positive more often than not you will not see a repeat positive.
- When you do see a repeat positive it can point to a specific practice.
- Over time, we have seen a generalized decrease in positives, we rarely if ever see O157:H7, and a crop or “seasonality” parallel is not always clear.
- Overall “positive” findings run very, very low. Well below 1%.
- Most of what we see is EHEC, followed by Salmonella, and then very little O157:H7

Field Food Safety – Research Learnings

Together with growers, we have used this data to drive change in our growing practices, field selection and other handling steps

- Not all Irrigation Water is Created Equal
- Soil Amendments Must be Monitored & Handled Carefully
  - Validated Treatment Processes
  - Tested
  - Mixing amendments can lead to a new level of risk
- We can't test our way to safety, but data from testing is critical to develop mitigations to reduce risk

Field Food Safety- Other Learnings

Finding the Gaps in GAP'S

- Compost Practices and Supply Chain
- Other Crop and Soil Amendment Transportation, Application, Storage, and Supply Chain Practices
- Harvest Methods - on ground.
- Harvest equipment sanitation/verification.
- Harvest container and packaging staging and storage.
- Adjacent land changes.
- Animal intrusion.
- Grazing land activity.
- Unusual weather events.
- Porta-potty management and clean out procedures.

Q&A Session

Thank You!