

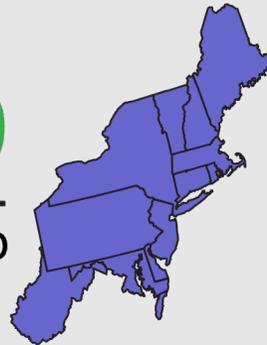
Summarizing and Extending Information from Existing Produce Safety Research

Anna Loewald, NECAFS
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USDA, NIFA

This project is funded by the Food Safety Outreach Program grant no. 2020-70020-32264 from the USDA National Institute of Food and Agriculture.

NECAFS

The Northeast Center to
Advance Food Safety



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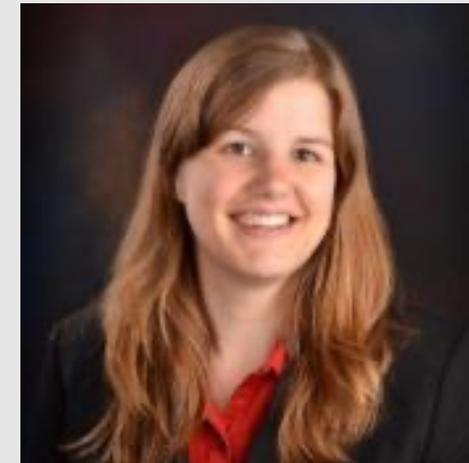
PI Team



Robert Hadad,
Cornell University



Lisa McKeag,
University of
Massachusetts Amherst



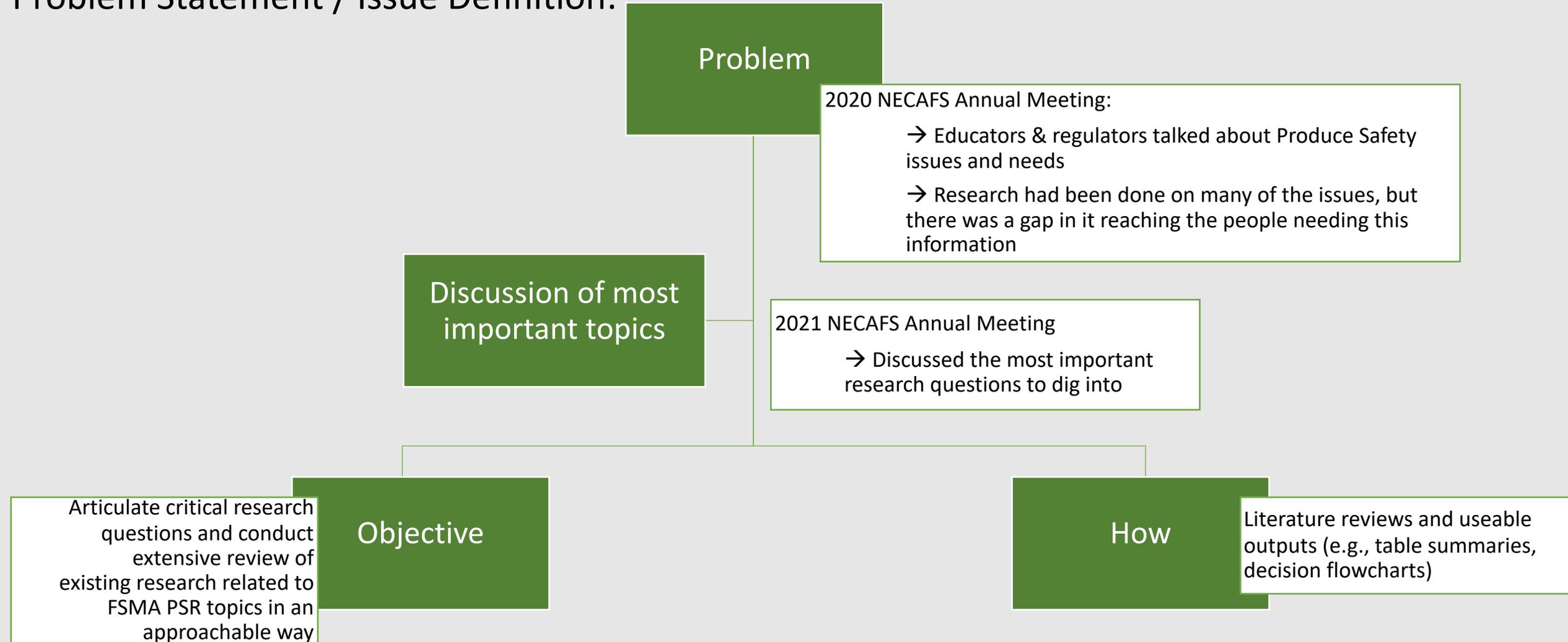
Elizabeth Newbold,
University of
Vermont

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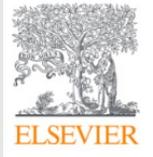
Problem Statement / Issue Definition:



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REVIEW

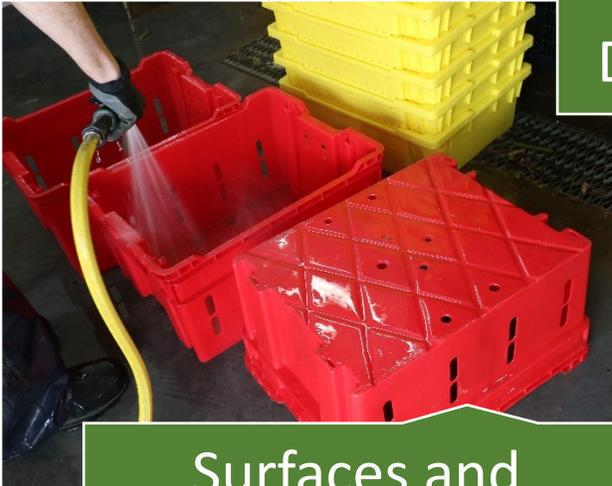
Food Safety Risks of Harvesting Dropped and Drooping Produce: A Review

Johanna Doren¹, Robert Hadad², Lisa McKeag³, Caitlin Tucker²,
Elizabeth Newbold¹  



Dropped and Drooping Produce

Animal Intrusion



Surfaces and Pathogen Survival



Wash Water



Water Systems

Current Work:



Animal Intrusion

Question:

- What are the risk factors when considering animal intrusion and contamination of produce at harvest?

Current Work:

Step 1: Summarize Literature Findings

- Summarizing various factors influencing animal intrusion risk
- Writing Literature Review

Step 2: Translate Findings into Useable Output

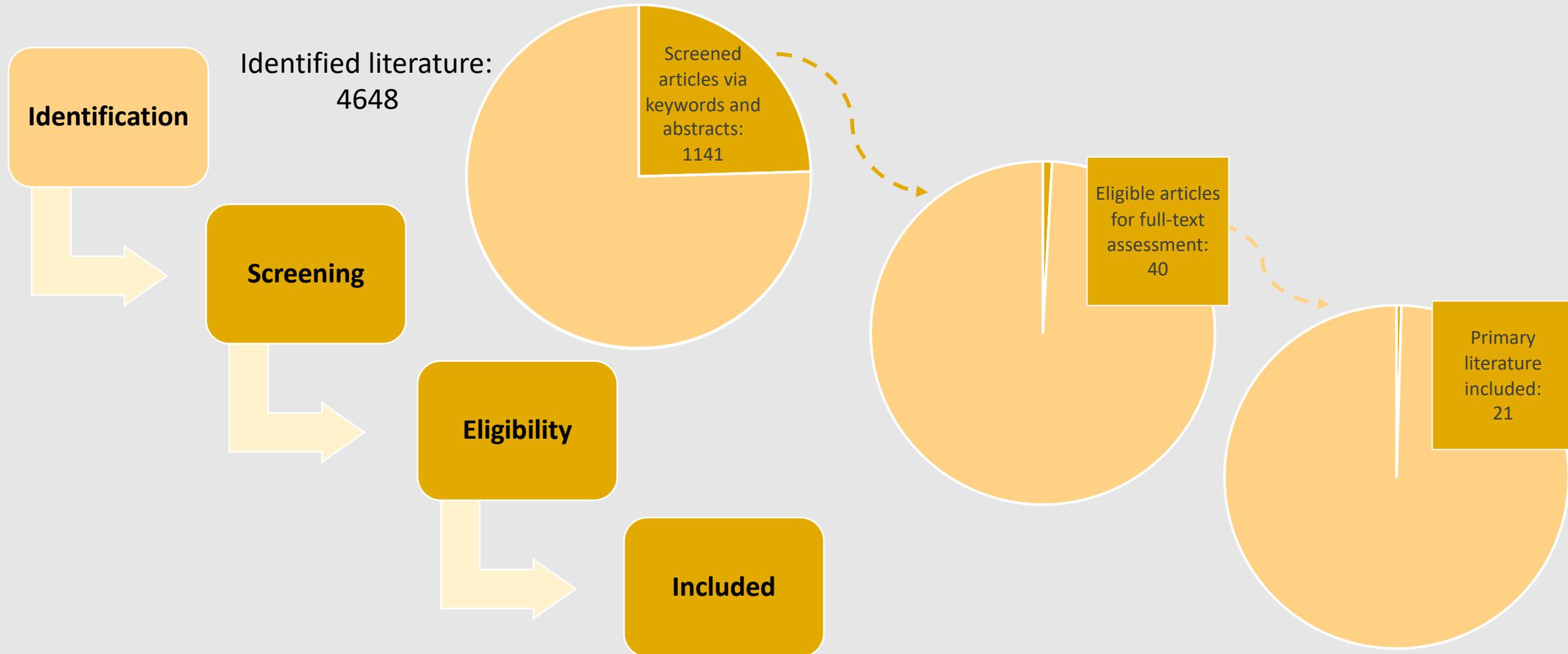
- Use findings from literature to inform the output that will help growers implement best practices
- Create Useable Output

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Step 1: Methods: Conducting extensive and comprehensive literature reviews surrounding existing produce safety research



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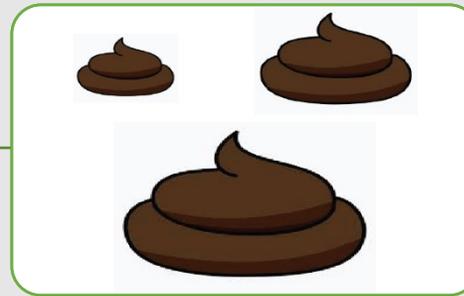
Step 1:

Results

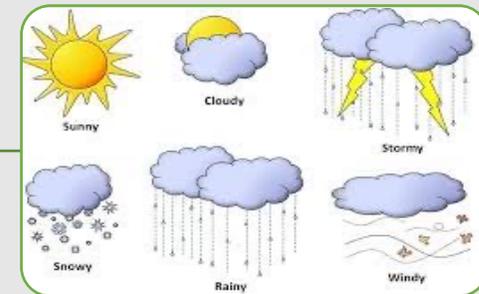
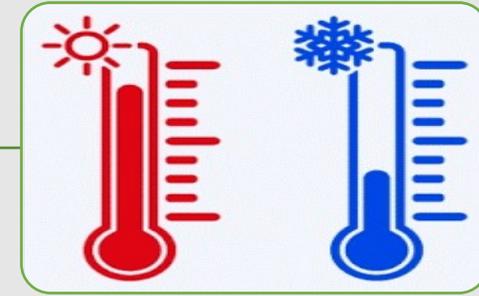
Animal Types



Fecal Pellet Factors



Environmental Factors



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Step 1: Results

Splash of feces via irrigation/rain →
Distance / No-Harvest Buffer Zone



Data from:
Jeamsripong et al. 2019

Legend

 Non-contaminated lettuce



National Institute of Food and Agriculture

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Step 1: Results

Splash of feces via irrigation/rain → Die-off

Fecal Event → Irrigation

Irrigation → Harvest

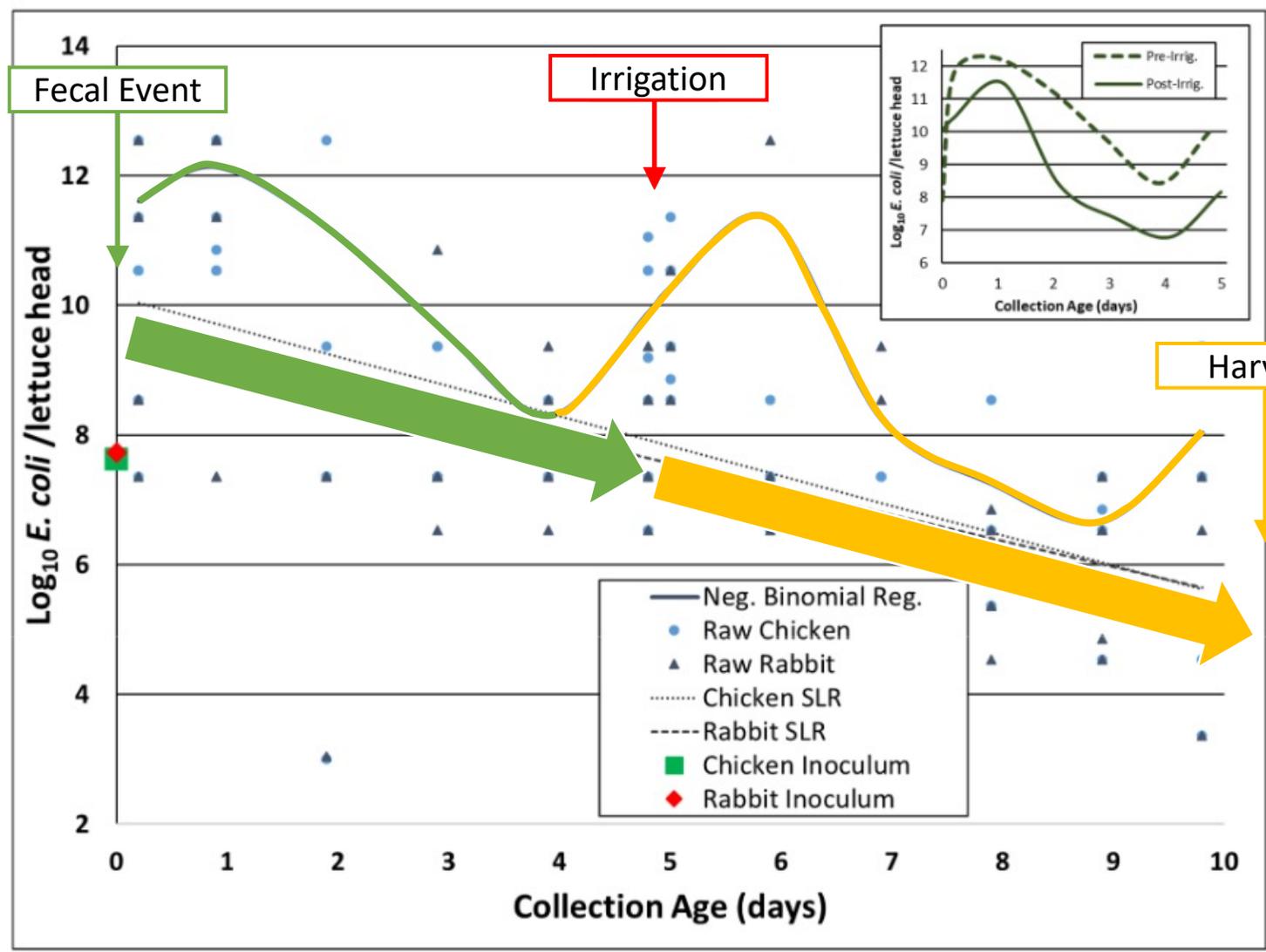


Figure from: Jeamsripong et al. 2019

Current Work:

Step 1: Summarize Literature Findings

- Summarizing various factors influencing animal intrusion risk
- Writing Literature Review

Step 2: Translate Findings into Useable Output

- Use findings from literature to inform the output that will help growers implement best practices
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Step 2: Recommendations

Prevention

Remediation



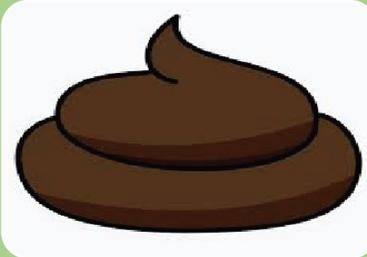
Step 2: Recommendations

Prevention



Animal

- Monitor animal presence
- Manage animals in fields



Feces

- Remove fecal material prior to irrigation
- Monitor for feces prior to rain event

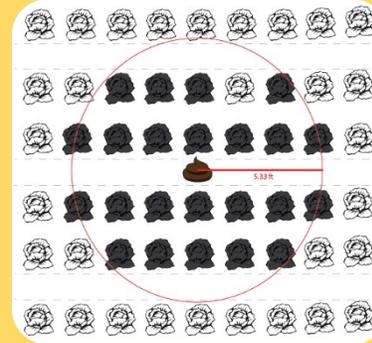


Irrigation

- Use drip irrigation/don't overhead irrigate
- Reduce droplet size +/- irrigation intensity

Step 2: Recommendations

Remediation



Distance/No-Harvest Buffer Zone

- What kind of feces? How old is the feces? What is the fecal consistency? How big is the fecal pellet?
- How long did you irrigate? What was the droplet size? What was the intensity? Do you see secondary splash potential?



Pathogen Die-off

- What season is it? What has been the average monthly temp/precip?
- Do you know how old the feces was when irrigation/rain occurred?
- How long can you wait post-irrigation/rain to harvest?

Step 2: Useable Output

Prevention



Did you monitor for animal presence?



Did you remove feces from raw ag product fields?



Did you switch to drip irrigation?

Remediation

Did you find feces in your raw ag produce field?

YES

Did it rain heavily +/- or did you overhead irrigate within the last 10 days?

YES

Wait as long as you can before harvesting



Determine a reasonable no-harvest buffer zone using these questions as guidance:

What size was the fecal pellet?

How long did it rain/irrigate?

Was there potential for secondary splash?

What would be helpful for you and the people you work with?

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Limitations:



Animal

- Risk of contamination sources other than feces (saliva, feet, feathers etc.)
- Look at different species depending on region
- Risk of different bird species/forage types
- How to mitigate animal attractants



Feces

- Size of pellet
- Different animal's feces
- Other foodborne pathogens than *E. coli*
- Study the effect of fecal surface structure changes on splash transfer
- Analyze other factors of fecal pellets



Environmental Factors

- Environmental conditions over multiple growing seasons
- Design studies for long-term and season weather effects
- Studies in different regions
- Analyzing farm management practices and their interactions with weather conditions
- Precipitation:
 - Intensity, relative humidity, dew etc.



Distance/No-Harvest Buffer Zone

- Study splash transfer of feces distance past 1 m
- Conduct studies using other types of fecal pellets than rabbit pellets
- Use other produce than romaine lettuce
- Replicate studies in different regions
- Determine most important factors in splash



Die-off

- Study pathogen die-off rates for longer than 10 days
- Effect of damaged produce
- Further analyze the "rinsing effect"
- Conduct studies using other types of fecal pellets than rabbit pellets
- Use other produce than romaine lettuce