

Presence and Persistence of Generic *E.coli*, STEC, and *Listeria monocytogenes* in Organic Integrated Crop Livestock Spinach Field in California and Minnesota

Introduction

- Integrated Crop-Livestock Farming (ICLF) enhances soil health and quality of organic fields by using animals to graze crop residue or cover crops, before transplanting fresh produce to the fields.
- However, untreated animal manure may mediate **transfer of foodborne pathogens** to fresh produce through soil contamination.

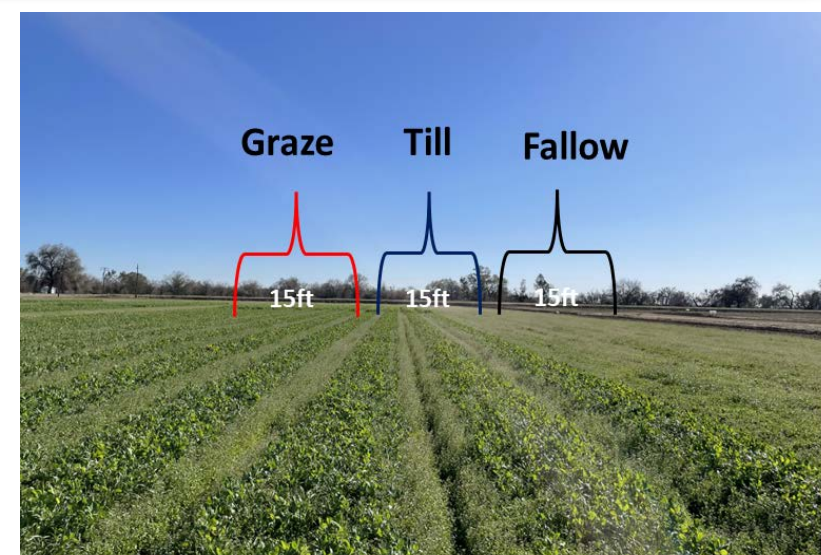


Aim

- Assess presence and persistence of generic *E. coli* (gEc) and presence of *E. coli* O157:H7, non-O157 Shiga toxin-producing *E. coli* (STEC) and *Listeria monocytogenes* (Lm) in certified organic spinach fields where small ruminants graze cover-crop in California and Minnesota.

Method

- Randomized complete block experiment (4 replicates) with winter cover-crop grazed with sheep/goat (WG), winter cover crop tilled without grazing (WT), and fallow (WF) treatments



Sample Collection and Processing

- 36 soil samples (3 samples x 3 treatments x 4 blocks) collected on 0-, 7-, 30-, 60-, 90-, and 120-days post-grazing (DPG).
- 20 pre- and post-grazing fecal samples and spinach were collected.
- All the samples were tested for gEc, *E. coli* O157:H7, non-O157 STEC, and Lm. The amount of gEc in soil was quantified by Most Probable Number (MPN).

Data analysis

- Descriptive statistics were used to summarize the prevalence of foodborne pathogens (*E. coli* O157:H7, non-O157 STEC, Lm).
- ANOVA was used to compare mean MPN of gEc (log MPN +1/g) in soil among treatments on each sampling day.

Acknowledgements

Funding for this project was made possible by the USDA -AMS through grant AM200100XXXXG032. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the USDA.

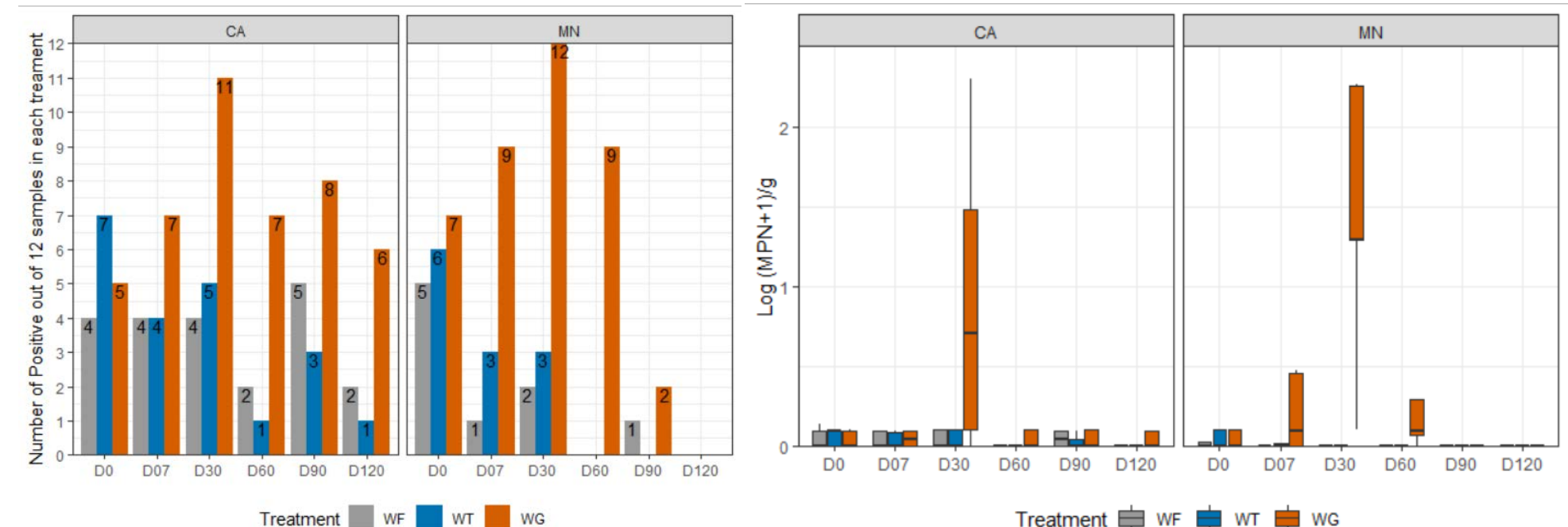
Results

Foodborne pathogens

- No foodborne pathogens (*E. coli* O157:H7, non-O157 STEC, Lm) in Soil and Spinach were observed both in CA and MN (year1).
- Non-O157 STEC (4/12, 33%) was observed in post-graze fecal samples from sheep in CA, and Lm (5/40, 12.5%) was observed in pre-graze fecal samples from goats in MN. None of *E. coli* O157:H7 was observed in the fecal samples from CA and MN.

Generic *E. coli* as a surrogate of foodborne pathogens

Number of positive and mean concentration of gEc in soil over time



- In both CA and MN, mean gEc MPNs (log MPN +1/g) were highest at 30-DPG in WG, but those in WF or WT remained constantly low.
- A significant difference in mean gEc MPNs among treatments was observed at 30-DPG in CA, and at 7-, 30-, and 60-DPG in MN.
- Preliminary data from this study (year1) indicate that ICLF shows minimal risk of transferring foodborne pathogens to produce after 120-days post-grazing, showing no difference from non-grazed area. Additional studies are needed to assess the effect of climate, animals, and soil conditions on pathogen persistence.

For more information and news & updates on this project, Please check this QR code.
<https://linktr.ee/pireslab>



Sejin Cheong¹, Carolyn Chandler¹, Sequoia R Williams², Amelie Gaudin², Emily Evans³, Lee Klossner³, Paulo Pagliari³, Michele T Jay-Russell⁴, Peiman Aminabadi⁴, Pat Millner⁵, Fawzy Hashem⁶, Alda Pires¹ (pires@ucdavis.edu)

¹ Department of Population Health and Reproduction, University of California-Davis, ² Department of Plant Sciences, University of California-Davis, ³ Department of Soil, Water, and Climate, College of Food, Agriculture and Natural Resources Sciences, University of Minnesota, ⁴ Western Center for Food Safety, University of California-Davis, ⁵ U.S. Department of Agriculture-ARS-NEA-BARC, Beltsville, ⁶ Department of Agriculture, Food, and Resource Sciences, University of Maryland Eastern Shore