Developing a user-friendly risk assessment tool to assess the food safety risks of fresh produce production and landscape use

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Summary

Contamination of fresh produce with *E. coli* O157:H7 is a public health issue and a burden to the agriculture industry. Various pathways of contamination have been identified, including wildlife intrusion, contaminated water, adjacent livestock, and climatic or weather patterns. What is still lacking are models that take into account how these factors act together and contribute to risk in a specific location and time. The quantitative risk assessment model we propose will enable produce growers to easily assess their specific risk so that appropriate intervention measures may be taken. This model will be populated with available data and expert opinion whenever data are missing. We will develop a user-friendly web-based decision support tool for the implementation of best practices for risk mitigation under different scenarios.

Objectives

1. To conduct focus groups who collect and discuss inputs for a quantitative risk assessment model.
2. To build a quantitative risk assessment of fresh produce contamination under various production, climatic, and environmental system scenarios.
3. To develop an online user-friendly decision support tool to assist with the implementation of mitigation strategies. (**Fig 1**)

Methods

Objective 1: Discussion sessions including researchers, extension specialists, industry representatives, and regulators will produce qualitative inputs.

Objective 2: Qualitative and quantitative data from different sources will be translated into probability distributions to develop a spatial-explicit quantitative microbiological risk assessment model (QMRA) that will estimate the risk of contamination of fresh produce in fields under different settings (i.e., cattle stock density, wildlife presence/absence and migration patterns, flooding/ water contamination risk, season, and regions) (**Fig 2**).

Objective 3: The model will be integrated into a user-friendly web-based platform, i.e., dashboards that facilitate the visualization of the risk estimates, risk maps and sensitivity analyses interactively, using R and R package Shiny.

Results to Date

Objective 1: Lists of stakeholders and meeting protocols have been put together.

Objective 2: The literature review of contamination pathways, which also identifies knowledge gaps in the scientific literature, is underway. We have also started compiling data from publicly available datasets on landscape, land use, and weather-related factors for the Salinas Valley and are reviewing current risk assessment tools available to the industry.

Objective 3: A demo dashboard to illustrate and discuss the conceptual framework during meetings with stakeholders has been developed (**Fig 3**).

Benefits to the Industry

This project will create a framework for the implementation of best practices for risk mitigation of fresh produce contamination under different scenarios. Results will provide stakeholders, growers, regulatory agencies, policy makers, and auditors with tools to assess the risks of contamination of fresh produce fields. While the most immediate beneficiaries of the proposed project are produce growers and their customers in California, the risk model may also serve produce growers beyond the two main growing regions in California with comparable landscape or climate inputs. In addition, the model may result in evidence-based mitigation strategies that may ease tensions with surrounding commodities.

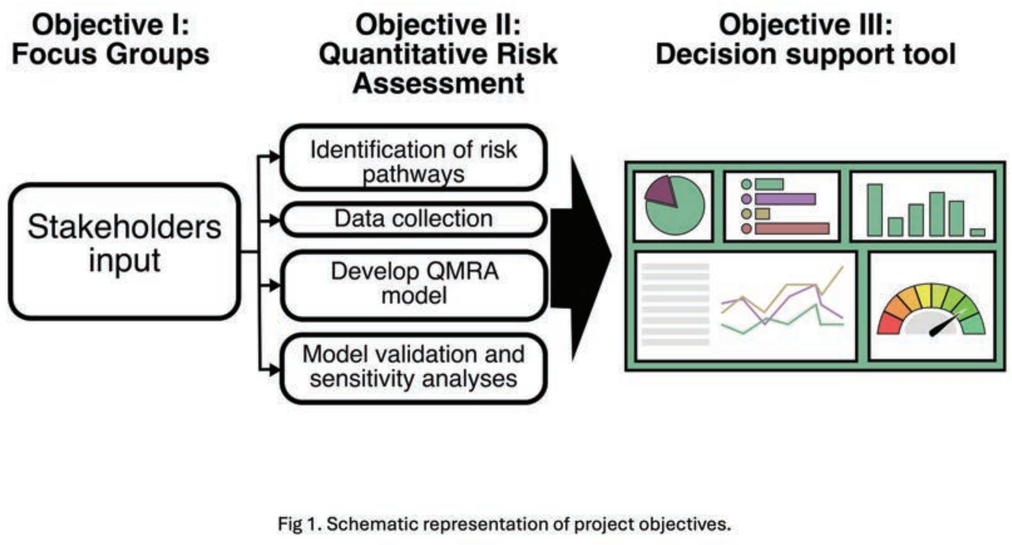

Fig 1. Schematic representation of project objectives.

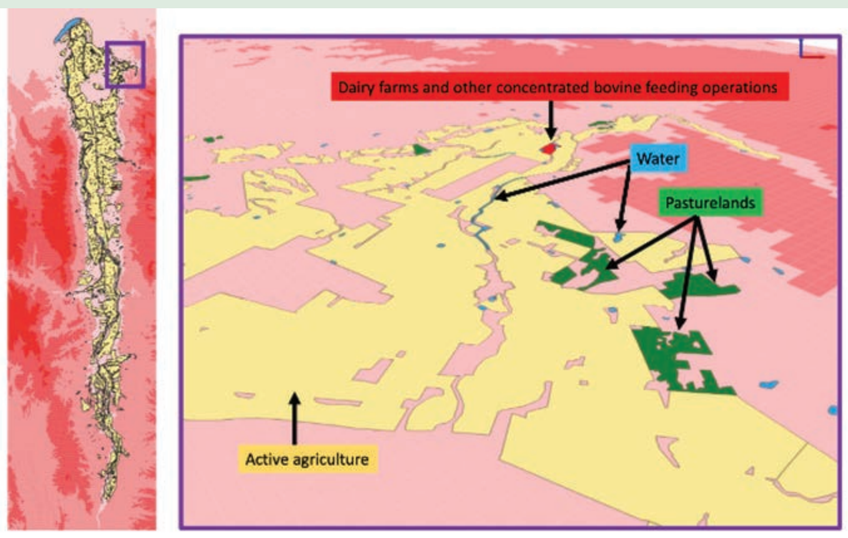

Fig 2. Land use/ land cover (yellow polygon layer) and hydrogeological model (red raster layer) for Salinas Valley (a) with detail of an area where dairy farms, pastures and active agriculture are in close proximity (b).

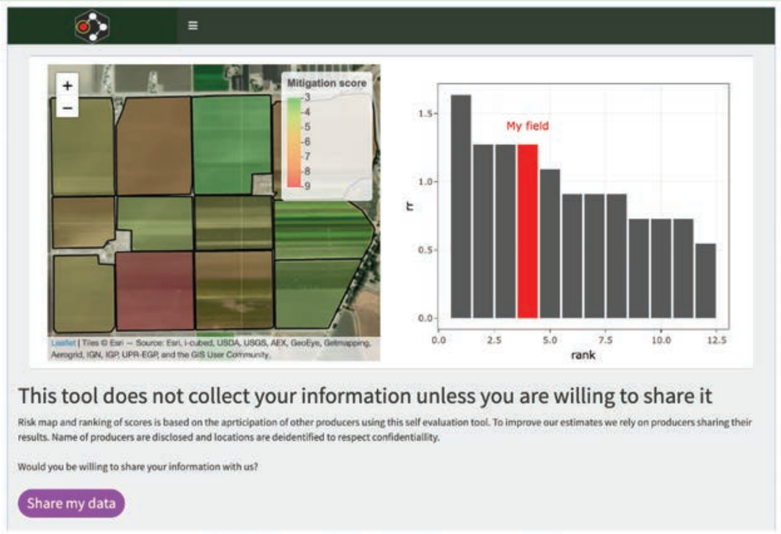

Fig 3. Demo of the decision support tool.