RESEARCH IN PROCESS

Establishment of vegetative buffer zones to reduce the risk of STEC and *Salmonella* transmission from animal operations to fresh produce on co-managed farms

SUMMARY

To provide fresh, healthy and safe produce to consumers, we need to find effective and efficient practices that will allow us to continue farming with limited resources and land availability. Sustainable farming practices have, at their core, an integration of crops and livestock, recycling of nutrients and the well-being of humans and the environment. These farming practices increase crop productivity and environmental stewardship, although knowledge gaps exist, specific to the presence or removal of vegetative buffer zones (VBZ) between animal production areas and produce fields and the potential relationship for pathogen transfer. This project will evaluate the effectiveness in reducing or eliminating movement of Shiga toxin–producing *Escherichia coli* (STEC) and *Salmonella* from animal production areas to adjacent produce fields by establishing a fast-growing and cost-effective VBZ between these areas within a 1–2 year growing season. Our proposal is unique and based on data collected from previous CPS and USDA projects.

OBJECTIVES

We propose to follow a hurdle approach to address important and elusive questions around co-management. Our proposed study will:

1. Develop a fast-growing and cost-effective VBZ that growers in the southeastern United States can implement within a 1–2 year period to prevent movement of STEC and *Salmonella* from animal production areas (APAs) to fresh produce fields.
2. Evaluate the fate and potential movement of STEC and *Salmonella* before, during and after the establishment of a VBZ between APAs and fresh produce fields.
3. Determine the potential of the VBZ to reintroduce STEC and *Salmonella* contamination into adjacent produce fields.

RESULTS TO DATE

To meet the requirements of Objective 1, a fast-growing and cost-effective vegetative buffer zone (VBZ) is already established—this was initiated in April 2016 between Dairy and Poultry operations and produce fields at the Piedmont Research Station. Figure 1 shows the overall layout in April 2016, and Figure 2 shows the same layout as of November 2017. Each buffer zone is 100 ft long and 30 ft wide. The 30-ft distance is divided into 4 sections: (1) one row of rapid growing hardwood trees, (2) two rows of evergreen trees and shrubs, (3) a non-manicured grass strip, and (4) a pollinator planting directly adjacent to the produce field. The projected growth rate of the selected species will allow a final staggered cover two years after planting, with the following heights: 10 ft (section 1), 8 and 5 ft (section 2), 3 ft (section 3) and 1–2 ft (section 4).

BENEFITS TO THE INDUSTRY

Based on our preliminary data we have shown that pathogen transmission does occur at distances of 400 ft between the animal source and the fresh produce fields. We anticipate that the effectiveness of our proposed interventions will have a significant impact on reducing or eliminating the transmission of pathogens from animals to fresh produce. We are confident that the proposed study will result in:

a) Reduction of transmission and pathogen load of STEC and *Salmonella* from animal sources to fresh produce fields due to the establishment of a VBZ between APAs and adjacent produce fields.
b) Assessment of the costs of managing and implementing these VBZ and their potential food safety benefit for farmers in reducing survival and transmission of STEC and *Salmonella* in co-managed farms.

METHODS

As of April 2018, we began collecting manure, air and soil from each of the selected locations (Figure 1) to establish the source and background population of indicator organisms, STEC and *Salmonella* in all samples. We will visit each location (Dairy and Poultry) 8 times within each calendar year and for a period of 2 years. A total of 1,100 samples will be collected each year, which includes soil, air, manure and produce. The most-probable-number approach will be used to determine the population of representative STEC and *Salmonella* coming from the soil, while the presence of these pathogens will be determined from manure and air samples. Once we have established this new baseline and account for the imminent presence of STEC and *Salmonella* in soil, we will first treat the soil using a hurdle approach.

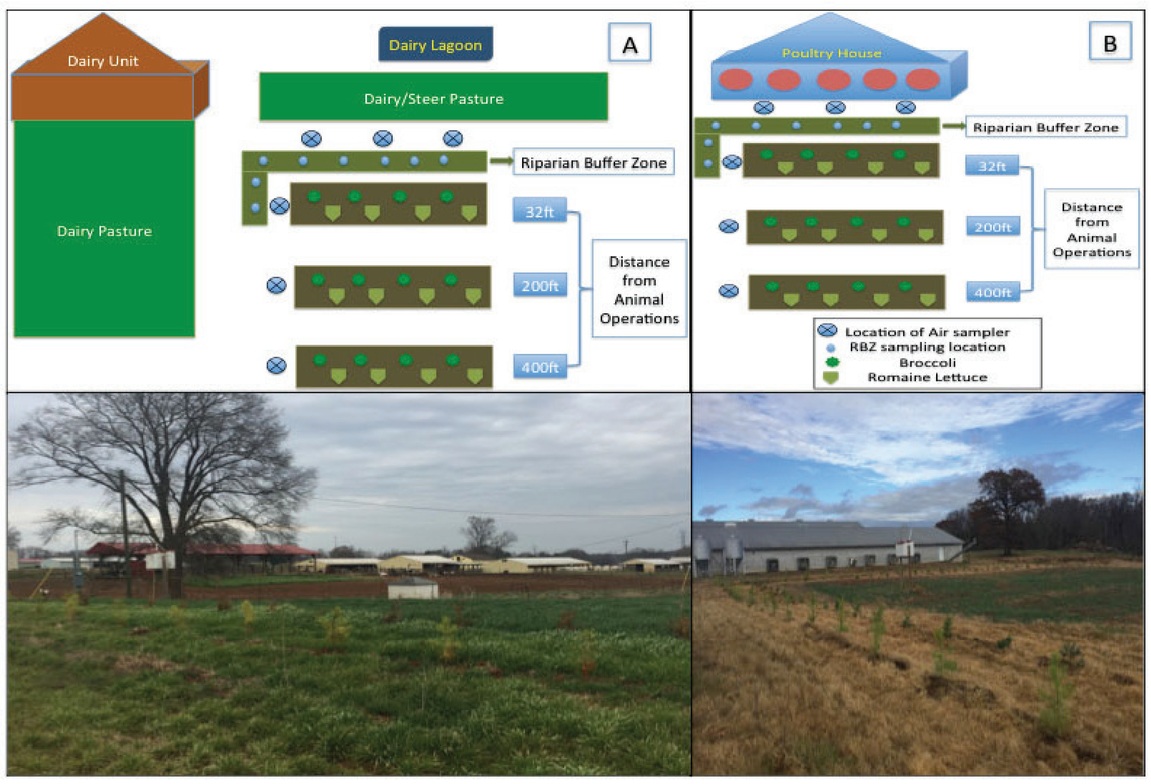

Figure 1. Schematic and overall layout of the buffer zone established at the Dairy (A) and Poultry (B) operations located at the Piedmont Research Station in April 2016. Schematic depicts the location of each animal operation in reference to the location of each produce field, the buffer zone and the locations of the crops.

Figure 2. Overall layout of the VBZ established at the Dairy (A) and Poultry (B) operations located at the Piedmont Research Station in November 2017. Photos depict the location of each animal operation in reference to the location of each produce field, the VBZ, and the locations of crops.

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