



Kentucky Farm Food Safety Agriculture Water Testing Pilot Project

Summary of Kentucky Horticulture Council's 2019 "Ag Water Quality Testing Project" primarily funded by the National Farmers Union (NFU) Local Food Safety Collaborative (LFSC)

Program Background

On August 7, 2018, the National Farmers Union (NFU) was awarded a cooperative agreement grant (#1U01FD005770) in the amount of \$1,469,086 by the Food and Drug Administration for the project "*Enabling local produce growers and processors to comply with the Food Safety Modernization Act (FSMA) through specialized, needs-specific resources and training opportunities*". This grant included a sub-award totaling \$34,997 to the Kentucky Horticulture Council (KHC) to fulfill the terms of the subaward agreement for the project "*Kentucky Farm Food Safety Agriculture Water Testing Pilot Project*".



KHC Contributions

To provide training, education, and outreach, and to facilitate identification of appropriate technical assistance resources for local producers and processors related to applicable federal regulations under the Food Safety Modernization Act (FSMA), especially the Produce Safety and Preventive Controls for Human Food rules. Specifically, KHC agreed to:

- Identify 12 growers for water sample training and testing. Growers will be made up of surface and well water as well as GAP and non-GAP certified operations
- Provide a training on produce safety basics and information related to water testing
- Take required number of samples for each grower to establish their baseline for water testing according to PSR requirements as they currently stand
- Troubleshoot with grower via site visits if test results come back beyond compliance standard
- Hold a training for technicians conducting ag water analysis in KY

Program Duration

February 13 – August 31, 2019; Extension to November 1, 2019



Project Highlights

- 17 growers received baseline analyses of water sources used for produce production
- 11 additional growers participated in sampling activities and received technical assistance
- 135 surface and ground water samples were collected and tested
- 5 growers received intensive troubleshooting assistance to implement management strategies
- 6 food safety resources developed for growers and laboratories
- 4 field days educated growers and technical service providers on FSMA, produce safety basics, ag water testing, and treatment strategies
- 564 stakeholders were engaged
- 702 food safety resources distributed
- 25 laboratories with capabilities to test for growers were engaged; 20 laboratories participated in on-site training to increase knowledge of FSMA, ag water analysis, and strategies to better serve Kentucky produce growers
- 11 UK County Extension Agents were engaged and trained on sampling and calculations

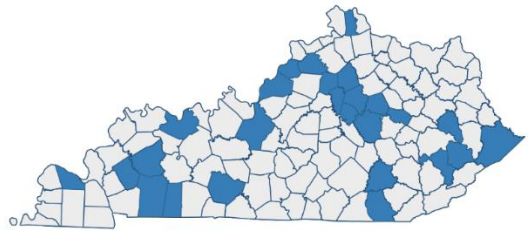


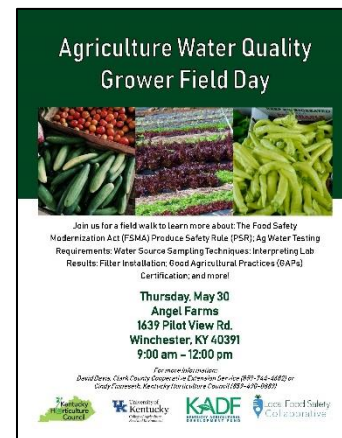
Fig. 1. Geographic distribution of farms and laboratories participating in the program.



Fig. 2. Surface water sample collection.



Fig. 3. Clark County Ag Water Field Day (Angel Farms, May 30, 2019).



Technical Staff

KHC hired and trained a part-time, temporary field technician (Paul Dengel) to work with growers and deliver samples to the laboratory for testing and recruited an Extension Associate (Daniel Becker) in Western Kentucky to make site visits and sample, which increased the geographic reach of the project. Because of the geographic dispersion of growers across Kentucky, site visits were carefully planned to provide adequate technical assistance to growers while ensuring samples were collected and delivered to the laboratory within the required time interval. After the first round of grower visits which required more detailed face-to-face education, time to conduct the farm visit and sampling was greatly reduced, which allowed for more efficient collection and delivery routes and ability to add more growers to the program. An activity log to record hours and expenses was developed to make internal financial tracking and reporting easier specific to this project. Our technician developed a sampling summary template to capture activity and sample details to create an archive to reference in the future.

Grower participation

Project technician (Paul Dengel) worked with 11 growers, making site visits to sample water sources and deliver samples to the laboratory for testing, with subsequent assistance to interpret sample results. KHC (Cindy Finneseth) worked with 1 grower in Central Kentucky. WKY Extension Associate (Daniel Becker) worked with 6 growers. Details about each farming operation and water sources being used were captured. An additional 11 growers received introductory sampling (1/farm) with basic food safety and ag water specific training. More than 120 ground and surface water samples were collected, analyzed, and reported. The 17 primary growers who participated in the project received at least one baseline profile for their farm (ground water = 4 samples; surface water = 5 samples) along with a project debrief and grower packet of information.



Fig. 6. Flushing irrigation equipment before sampling.

Based on laboratory testing, 5 farms had baseline water source values that exceeded the current acceptable standards. These farms received training on management strategies including microbial die-off rates and information on treatment methods to remediate water sources. These growers expressed appreciation of the assistance provided and support expanding the pilot program and providing more information on treatment options. It is clear that coaching on corrective measures is necessary when test results have exceeded compliance standards.

Grower debrief packet

Each grower received an informational packet which contained: a grower letter about the project; copies of all farm sample lab reports; printout from the Excel calculator showing GM and STV (along with any compliance issues highlighted) for ag water sample; FDA at a Glance. Key Requirements: Final Rule on Produce Safety <https://www.fda.gov/media/94738/download>; Food Safety



Modernization Act (FSMA): Produce Safety Rule Agricultural Water, Introduction (CCD-PFS-2) https://www.uky.edu/ccd/sites/www.uky.edu.ccd/files/FSMA_Water_Introduction_Final_update2.pdf; Food Safety Modernization Act (FSMA): Produce Safety Rule Agricultural Water, Part 2 (CCD-PFS-4) https://www.uky.edu/ccd/sites/www.uky.edu.ccd/files/FSMA_Water_Part2_Final.pdf; ag water compliance dates at-a-glance; the LFSC one-pager; list of laboratories in Kentucky offering ag water testing; and a flash drive with copies of all the information provided. A survey with self-addressed stamped envelope was also provided to get feedback about the project.

Lab activities

KHC worked with lab staff at Kentucky State University (KSU) as well as several private laboratories to ensure timely and affordable sample analysis. Geographic distribution of growers and limitations on sample receiving made it impossible to use the intended lab (KSU) for analysis of all collected samples. To overcome testing barriers, local commercial laboratories were identified and used for sample analysis. This strategy also worked well for the growers, who now have a local point of contact for ag water quality testing, and for the laboratories, receiving revenue and one-on-one education about the ag water sampling program and tips for how to work with growers who are using their test results as a management tool and to ensure future FSMA compliance. Project benefits include experiencing protocols and customer service of several laboratories to develop best practices that will aid growers after the project ends. Because of lack of familiarity with FSMA and the PSR, a resource packet for analytical staff was created. At the start of the project, only 14 labs had been identified. Over the course of the project, 11 additional labs (for a total of 25 labs) were identified that use accepted test methods for *E. coli* detection in ag water samples. All laboratories now appear on a geographic resource map (www.uky.edu/ccd/maps; Fig. 8) and information has been distributed on demand to growers and via social media channels.

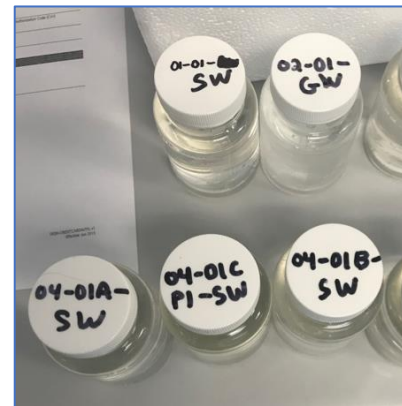
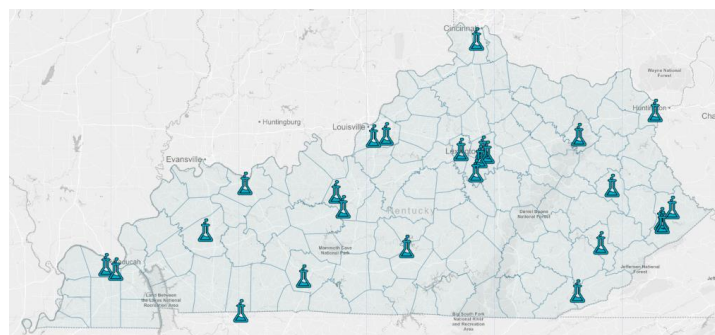


Fig. 7. Samples ready for testing, submitted within the accepted holding period.



*Fig. 8. Geographic directory of laboratories in Kentucky that offer *E. coli* tested of ag water samples for produce growers (www.uky.edu/ccd/maps.)*

Lab Training

Ability to participate in laboratory training was disappointing, primarily because most labs in Kentucky are staffed in a way that it is not feasible for lab personnel to commit to a day-long off-site training session. Therefore, 19 of the 25 identified labs were visited and face-to-face training conducted on site. A lab resource binder was prepared containing project information, FSMA background resources, and a FAQ for labs working with growers. Initial feedback from lab staff and management has been very positive, with many lab managers requesting more information. Labs not visited during the project will receive a visit and delivery of a resource packet in the future when KHC staff is in the local area.

Outreach

The project was described and promoted at several grower meetings which resulted in invitations to present at other meetings. Food safety and ag water for production and post-harvest educational events reached more than 250 growers. County agents (120), university extension associates (6) and specialists (2) were informed of the project, provided with a project summary, and encouraged to engage growers to talk about testing and recruiting for project. In each of the counties that had a participating grower, the local county ag or horticulture agent was contacted to ensure they are aware of the FSMA requirements, our project and that project activities were conducted in their counties. Each also received Excel spreadsheet templates for ground and surface water calculations and instructions for use as well as directions to additional resources.

As part of the project, KHC staff presented on food safety and ag water quality monitoring with grower recruitment at:

- Organic Association of KY (OAK) Annual Conference (3/2/19) (Lexington, Fayette Co)
- Farm-to-School Training (4/22/2019) (London, Laurel Co)
- University of Kentucky Horticulture Department Seminar Series (4/29/2019) (Lexington, Fayette Co)
- Farm-to-School/Food Safety Training (5/7/2019) (Danville, Boyle Co)
- Ag Water Field Day (5/30/2019) (Winchester, Clark Co)
- Ag Water Sampling Event (6/9/2019) (Hazard, Perry Co)
- Vegetable Production Twilight Tour (6/11/2019) (Fairview, Christian Co)
- Food Safety / Ag Water Office Hours (9/5/2019) (Stanton, Powell Co)



Ag Water Sampling Event (Perry County)

On June 19, the Kentucky Horticulture Council (KHC) co-hosted an ag water sampling event in Hazard, KY with the Perry Co and Breathitt Co Cooperative Extension Services, Community Farm Alliance (CFA), and the Perry County Farmers Market. Agents Charles May and Chad Conway along with Jennifer Weeber (CFA) recruited area produce growers to participate in the program, explaining sampling and handing out test kits, with instructions to collect and deliver samples on the designated market day. Cindy Finneseth, KHC Executive Director, was on-site to receive samples and answer questions about safe production of food and agriculture water. Eight growers participated, receiving free transportation of samples to the lab for testing, complimentary analysis, and customized interpretation of their sample results after testing.



Clark County Ag Water Quality Field Day, Winchester, KY



Fairview Produce Auction Twilight Event, Fairview, KY



KHC staff attended trainings to improve knowledge of FSMA/PSR and network with others interested in ag water quality, including:

- International Association for Food Protection (IAFP) (Louisville, KY; July 21-24). The IAFP annual meeting was an opportunity to participate in sessions on current and emerging food safety issues, the latest science, innovative solutions to new and recurring problems, and



the opportunity to network with food safety professionals from domestic and international locations.

- **Bridging the GAPS: Approaches for Treating Water On-Farm** (Lake Alfred, FL; August 7). This multi-state program was a short course/workshop for treatment of pre-harvest agricultural water, considering several different technologies that are currently available (e.g., UV, AccuTab, and chemical injection systems). Modules covered: circumstances in which a grower may want to consider a water treatment technology and how to approach using water treatment systems to mitigate food safety risks in the context of Produce Safety Rule requirements and third-party audit standards; commercially available technologies that can be used to treat agricultural water with a focus on UV light, chlorine, and peroxyacetic acid and also covers modes of action of each system and the critical criteria for choosing the best matched water treatment system for different scenarios (volume, contact time, interactions with pesticides/fertilizers, and worker protection/safety); and key aspects of setting up the different types of water treatment technologies and validating their efficacy. Along the way, there are several interactive and hands-on components to demonstrate monitoring and calibration activities for each type of system. Complete units were on-site to demonstrate the use of each different treatment.



Fig. 4. Classroom training on ag water.



Fig. 5. Mobile ag water treatment training unit.

Challenges Encountered: Limited methods of communication are available when working with Plain Community (i.e. Amish and Mennonite) growers, which has taught us that advance planning (i.e. traditional mail communications) is necessary when working with these growers. It is critical to serve this population as many have diversified operations with livestock in close proximity to FSMA PSR-covered produce fields as well as the common practice of using horses and mules for cultivation and transport, which introduces an additional risk of introduction of pathogens through animal waste. Our network has worked to establish relationships with elders in several communities to provide education to and testing for this population of growers. While nearly all samples collected from these growers were within tolerance levels, there was a lag in delivering/receiving information due to reliance on the postal system or planning face-to-face encounters around other work commitments. Because of technology limitations, these growers were provided instructions for hand calculation of the GM and STV for their sample sets, which has proven to be quite cumbersome and available resources simply are not adequate. The county ag or horticulture agent specifically in each of these counties with Plain Community growers has been engaged to ensure they are aware of the project and training on use of Excel spreadsheet templates

for ground and surface water calculations. Due to sensitivity of test results, the agents aren't being provided with grower information. Growers are being encouraged to take their lab reports (and thumbdrive, if accepted) to the county office to have the agent perform the calculations for them.

There is little information about remediation strategies for water sources with high *E. coli* presence. It is difficult to provide good recommendations for growers with limited research-based analysis of options. Cost of remediation systems has been identified as a point of concern. KHC has identified several partners to test different systems to gain information about efficacy and cost (installation and operational) to help growers pick the most appropriate system for their operation. This work will continue beyond conclusion of this grant. For example, an Ag Water Field Day is planned in Eastern Kentucky on the local University of Kentucky research farm for April 15, 2020 to cover food safety basics for produce growers and to demonstrate sampling and treatment systems including a chlorinator unit, UV filter and acid injection system.

Grower Survey

All growers were asked to complete a survey at the end of the project; six growers responded. Overall, the project was highly successful and valuable to the growers. Survey results follow:

- 1) Prior to this program, which of the following items had you addressed to improve food safety policies and procedures?

Assessed farm for food safety practices	4 (67%)
Sampled irrigation and/or postharvest ag water	3 (50%)
Participated in a USDA GAPs audit	1 (17%)
Attended PSA Grower Training to fulfill FSMA requirement	4 (67%)

- 2) For each of the topic areas listed below, rate your knowledge and understanding as it relates to produce safety. (On the right-hand side, rate your knowledge BEFORE the ag water training program; on the left-hand side, rate your knowledge AFTER the training program.)

	Knowledge BEFORE Program				Knowledge AFTER Program			
	Poor	Average	Good	Excellent	Poor	Average	Good	Excellent
FSMA Ag Water Requirements	2 (33%)	4 (67%)				1 (17%)	3 (50%)	2 (33%)
How to Properly Take a Water Sample		5 (83%)	1 (17%)			1 (17%)	2 (33%)	3 (50%)
Interpreting Sample Results	1 (17%)	5 (83%)				2 (33%)	1 (17%)	3 (50%)
Water Quality Remediation Strategies		6 (100%)				2 (33%)	2 (33%)	2 (33%)
GAPs/Third Party Audit Ag Water Requirements	4 (67%)	2 (33%)				2 (33%)	1 (17%)	3 (50%)
Resources to Help with Any of the Above	1 (17%)	2 (33%)					1 (17%)	5 (83%)



3) Which area(s) are of greatest concern to you? (Select all that apply.)

Agricultural Water – 5 (83%) Soil Amendments – 4 (67%) Post-harvest Handling – 3 (50%)
 Facilities – 3 (50%) Workers and Employee Training – 3 (50%) Records/Documentation – 4 (67%)

4) For each statement, select the description that best describes your experience with the ag water testing program.

	Strongly Disagree	Disagree	Agree	Strongly Agree
The subject matter was timely for me			2 (33%)	4 (67%)
The technicians were effective			2 (33%)	4 (67%)
The information provided was practical for me			3 (50%)	3 (50%)
I can use the information I learned in my operation			3 (50%)	3 (50%)
Overall, this was a very educational program			3 (50%)	3 (50%)

5) What are critical program needs that would have a positive economic impact on your business?

3 (60%): Food safety; Good Agricultural Practices (GAPs); IPM/Scouting

2 (40%): Production planning: high tunnel; Production planning: greenhouse; Soil testing; Marketing strategies

1 (20%): Production planning: field; Site selection; High tunnel basics; Low tunnel production; Post-harvest handling; Other – educate public on organic produce

6) Please share any other comments or suggestions:

Thank you! Paul was very helpful!

I would like to connect with larger wholesale buyer of USDA certified organic produce.

I am pleased to be educated on safer ways to grow and handle food. At the same time, I am concerned that laws might be made that will make it harder for the small farmer. Please allow the small farmer to remain a small farmer! Thank you!

Thank you!



Sustaining the Project:

With recent changes to implementation dates for water quality testing, this has reduced the criticality for growers to establish their farm microbial water quality baselines immediately. Capitalizing on this flexibility allows us to implement the best practice of providing more education in advance of regulation. The online map will continue to be maintained with up-to-date information for each testing laboratory. During the pre-compliance date interval (estimated 2022 for very large farms), we will be able to work with project partners and new collaborators to reach more growers through traditional outreach methods (grower meetings, conferences, newsletters, for example) as well as through one-on-one site visits to ensure growers understand the why, how, and when of ag water testing. Because of the cost concerns and logistical challenges in growers accessing labs as well as the value cited by produce growers in Kentucky who participated in the program, KHC is committed to pursuing additional funding sources to continue and expand the project to serve more Kentucky produce growers.

Project Team, Collaborators, and Funding Partners:

Cindy Finneseth, Kentucky Horticulture Council
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Bryan Brady, Cultivate Kentucky, University of Kentucky Food Connection
Paul Vijayakumar, University of Kentucky Food Systems Innovation Center
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Shreya Patel, Kentucky State University
Ben Conner, Kentucky Department of Agriculture Food Safety Program



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