

**PROGRESS REPORT**  
**North Central Region**  
**Sustainable Agriculture Research and Education (SARE) Program**

**Progress Report Year:** 2014

**Project Title:** Development of Cost and Labor Effective Produce Sanitation Methods for Small Farms

**Project Number:** FNC 14-967

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**1. Describe in detail your work activities and how you used your grant funds this year. (Use another sheet if necessary.) 2. List the results of your project and what you have learned so far.**

Our goal is to identify cost and labor effective methods to wash and sanitize produce that needs gentle handling, like English cucumbers and tomatoes.

We began by talking with sellers at farmers markets, researching journals, databases and small farm websites. Keeping in mind the new FDA Food Safety Modernization Act, increasing expectations from produce buyers and greater liability for produce farmers, we included an evaluation of the bacterial loads as part of our project.

This first year we focused on identifying a minimal investment system that could be used by any size operation and would allow testing of various sanitizing agents.

Survey of research and various trials showed us that any process that involved dunking the vegetables would use more water, require more testing of the water for efficacy of the sanitizer, use more sanitizer, and require that the area is free draining and prevents pooling of water.

In addition, any materials used must be constructed to ensure that they can be effectively and efficiently cleaned and sanitized. Bacterial survival must be prevented. This excludes the use of any wood in the washing or packing line. All materials must be easy to maintain in a sanitary condition.

With all of these issues in mind, we began with a concept of some sort of surface over which we could spray wash and sanitize the produce in significant quantities.

We located a used 150 gallon (3' X 5') stainless steel meat cart and sheets of plastic extruded flooring. Laying the flooring on the cart provided an ideal surface for washing, sanitizing and drying the produce.

The greenhouse facility we purchased had a cooler room they had used for storing flowering plants. We skinned the room with painted metal roofing and installed lighting and brought in both hot and cold water lines.



We used regular garden hose and sprayers and installed a thermometer in the line so we could determine the water temperature.

The complete wash set up looks like this;



In a few minutes one person can quickly wash more than 90 English Cucumbers averaging 14-16” long. This process takes a fraction of the time compared to the previous method we used, which was hand washing and wiping each individual cucumber. The English cucumbers, like tomatoes, have a delicate skin and can be damaged easily.



It was important that we used a sprayer head and sufficient water pressure that the produce was washed but not bruised. Since they are greenhouse grown we didn't have as much soil as field grown, but we tested the system on some field grown produce and it successfully washed off visible soil.

For tomatoes, we found that using the same crate that we picked into to wash them was the most efficient. We purchased a variety of different picking crates, with the additional requirement that the crates would work in our second generation produce washer. They also needed to stack, be tall enough for the largest tomatoes and fit on some kind of wagon or rolling wheels to move around the greenhouse. The best option turned out to be commercial open dishwasher racks.



Once cleaned, the next step was sanitizing the produce.

While we had intended to test different sanitizing agents on microbial load of greenhouse and field grown produce, we decided to conduct this work in the second year so that we could evaluate both washing and sanitizing systems. We did get sufficient samples of three different commercial produce sanitizing products to use next season.

Dilute mixtures of chlorine bleach and water are often used for sanitizing raw fruits and vegetables. Contact times of one minute with approximately 200 ppm bleach in water effectively sanitizes raw produce. The produce then needs rinsed with potable water.

The problem is, the FDA requires that food grade or NSF bleach is used and that is not easily accessible by the average grower. One goal for next year is to identify the efficacy of several different sanitizing agents and compare the availability and cost for the small grower.

To facilitate sanitizing with agents that might require differing concentrations, we set up a dosamatic and tubing drawing from a simple bucket. Thus the concentration in the bucket could be varied to produce the desired concentration in the sanitizing solution.



At every sanitizing, the ppm of the product should be tested and recorded. The water temperature should be recorded as well.







We used a gentler spray nozzle for the sanitation step. It is important to thoroughly cover the produce with the sanitizing solution and then leave it on for at least one minute. Depending on the sanitizing agent, the produce is then washed with potable water.



The final step is drying the produce, if necessary. We found that a blower produced for drying livestock was ideal. You could have just air or heated air and it successfully blew off all the water without injuring the produce. The produce can then be boxed, bagged or put in crates for fresh market sales.

Excluding the room renovation costs (metal and trim \$910, sealed light fixtures \$100) one could replicate this wash set up for less than \$1000.

- 1) Stainless, polypropylene or other washable tank of some sort. While ours was a used commercial meat lug, new livestock tanks (\$150) could be used. A new meat cart like we used would run \$500-700, but the used one we purchased was \$50.
- 2) Dosatron, \$300
- 3) Hoses, spray nozzles, pex fittings, valves \$70
- 4) in-line thermometer (ours came off the dishwasher to be described next), but \$20 new
- 5) Poultry flooring 2' X 4', \$25 new
- 6) Livestock Blower \$300
- 7) Picking guns \$11.00 a piece (minimum 10-20)

To this point we have proven we can develop a cost effective, efficient washing station for delicate produce. The station can be completely sanitized. Now we want to make it even more labor efficient. If you didn't want to invest in the dosatron and separate lines for the sanitizing solution, you could use a battery operated backpack sprayer mounted on the wall – for \$200.

Other things we learned:

- 1) Essentially all the bleach that a produce might locally purchase is not food grade and thus legally cannot be used to sanitize food prep areas for produce
- 2) Some lugs made for picking produce will leave indents on produce if kept in them for any length of time. We have tried four different company's lugs and have some specific recommendations, including that fact that for fragile produce, solid bottom sides are the best if storing or transporting them.
- 3) Many of the commercial sanitizers, including some manufacturers of food grade bleach don't want to deal with smaller producers and may incur excess shipping charges because of the handling requirements
- 4) The company we are selling much of our produce to, will begin requiring audits. Due to lack of auditors, getting a produce audit in Indiana will be expensive and hard to schedule.
- 5) The greenhouse is a side operation for us, we all have either full time jobs or full time school, have 200 acres of alfalfa hay and 60 cows. Once produce/hay season starts, it is really difficult to find time to work on changing processes. Once we had this unit up and going, we couldn't take it apart and install the automatic washer.
- 6) Sellers at farmers markets have dozens of ways they clean the produce for sale. As a group, they believe that signs posted saying "wash your produce before eating" will protect them from liability.

### 3. Describe your work plan for next year.

1. Replumb and adapt commercial washer to wash produce
2. Edit video of current washing system
3. Sample field and greenhouse tomatoes, unwashed, washed in both systems for bacteriological determination
4. Film and edit video of automatic system (if it works)
5. Produce brochure for extension specialists, farmers market supervisors and others and disseminate. Put videos on line.

In 2105 we plan to use a modified commercial dish washer to wash and sanitize produce. Produce processed in both systems will be evaluated for bacterial loads with the assistance of the Purdue Food Science Department.

We have purchased a second hand commercial dishwasher from a school system. They appear to be available fairly frequently when restaurants, schools, hospitals etc. renovate kitchen facilities. The one we purchased came with several feet of stainless counter top extending from the end. We also purchased a short conveyor belt to extend outside the unit to put the produce lugs on.



The entrance to the dishwasher – it will require some sort of conveyor to put produce lugs on as you bring them in from field or greenhouse



Above and below- the side of the unit, we will have to replumb it to spray wash, sanitizer and rinse (if necessary) water.



**4. How did you share information from your project with others?** (Include the number of people who attended field days or demonstrations.) What plans do you have for sharing information next year?

This year we talked with growers in four fairly large farmers markets about how they washed their produce and how the FSMA might affect them.

When completed, we will post online videos, and develop a brochure detailing our results. We will disseminate the brochure to state horticulture extension specialists in the North Central SARE region for them to make available, if they wish. We will provide to farmers market supervisors in the region as well.

**Send completed report by e-mail (e-mail is preferred) or mail to:**

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