



# Ideal Produce Wash Station for Small-scale Farmers: The Importance, Principles, Workflow Design, Water Quality, Washing, and Cooling Methods

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## Introduction

Wash stations are important for crop production operations but could also be a source of food contamination if best practices are ignored. It is the central point between the harvest and distribution of farm vegetables. Depending on the design and the capacity, wash stations can serve several purposes such as washing, packing, cold storage, and loading. Wash stations come in different designs from very simple (Fig. 1a) to complex with conveyor belts (Fig. 1b).

They all have the same goal to reduce contamination. This paper discusses the importance, basic principles, components and workflow designs of a produce wash station, as well as, water, and storage factors in the context of small-scale farmers.

## Importance of a well-planned wash station

- Remove dirt and potential contamination from fresh fruits and vegetables and improve their quality and appeal.
- Smooth delivery through packaging and organized workflow.
- Help to meet good handling practice (GHP) and good agriculture practice (GAP) regulations set by the United States Department of Agriculture (USDA). These practices are also part of the Food Safety Modernization Act (FSMA) rules and standards.



Figure 1: Simple (a) and Complex (b). (Photo a by Isaac Mpanga from Whipstone Farms in Paulden and b by Produce Safety Alliance 2019)

- Streamline record keeping on harvest, request, and invoicing.
- Increase vegetable value that may influence reasonable prices and more profit.

## Principles of a safe wash station

1. Wash stations should be in an enclosed area with walls that are covered with washable material. In some cases, a wash station could be without walls, especially at very small-scale farms.
2. Cement the floor and make sure to have side drainage with a slope. The floor should be easy to maintain cleanliness and avoid slippery floors and pooling water.
3. Use stainless steel material for tables and sinks. Do not use wood, absorbent, or rusting materials.
4. Use tables and platforms that have wheels for easy movement and rearrangement to suit good workflow.
5. Have different table heights for people of varying height to ensure work safety and comfort while working.
6. Use very clean and pathogen free water to wash your produce and discard used water correctly to meet food safety requirements. Always test your water source to make sure it is pathogen free or below the recommended indicator organism threshold. Read more about water for agriculture under the further reading resources at the end of this publication.
7. Have proper water delivery with excellent pressure. You can build water pressure by reducing the hose size at the delivery.
8. Have good lighting in the wash station. Bright and happy light is recommended to help employees see and clean well. Also, use light fixtures to prevent glass from falling into the wash sink or on produce in case there is a bulb break.
9. Have good workplace sanitation practices in place.
  - a. Have a hand wash station at the entrance for handwashing at entry and exit
  - b. Clean and disinfect surfaces including the floor, equipment, sinks before and after each session.
  - c. Make the wash station rodent-proof, especially in storage areas.

- d. Always mark out a workflow to avoid cross contamination between washed and unwashed produce.
- e. Avoid putting hoses and other equipment on the floor. Read more on best practices for fresh produce food safety based on the **Food Safety Modernization Act (FSMA)**. Link provided under the further reading resources at the end of this publication.
- f. All containers and other surfaces used in transporting produce to and from the wash station should be cleaned and sanitized before and after use. Same for storage. Cover to reduce cross-contamination when not in use.

## Principal components and workflow design of a wash station

An ideal wash station includes an entrance, harvest arrival spot, washing area, air drying area, packaging, cold storage, office/records space, loading, and exit. The designs can range from simple (Fig. 2) to complex (Fig. 3) depending on the scale of operation, space available, type of commodity, budget, and target market. The simple stations (Fig. 2) are more appropriate for small farms with limited space and budget while the complex (Fig. 3) is ideal for medium scale growers with diverse produce and market. The critical factors for any design are to eliminate cross-contamination, be efficient with workflow, ensure safety, and comfort of anyone using the facility.

## What produce do you really need to wash?

Not all produce needs to be washed nor does it have to be washed in the same way. Do not rinse or wash produce that appears clean after harvesting. Some produce just needs a little tidy up by dry brushing visible particles and dirt on the surface of the commodity without washing with water. Only wash vegetables when they appear muddy and cannot be cleaned by dry brushing. When appropriate, conduct the post-harvest washing step and use sanitizers in the wash tank to reduce cross contamination of potential pathogens



Figure 2: Simple wash station design with linear workflow

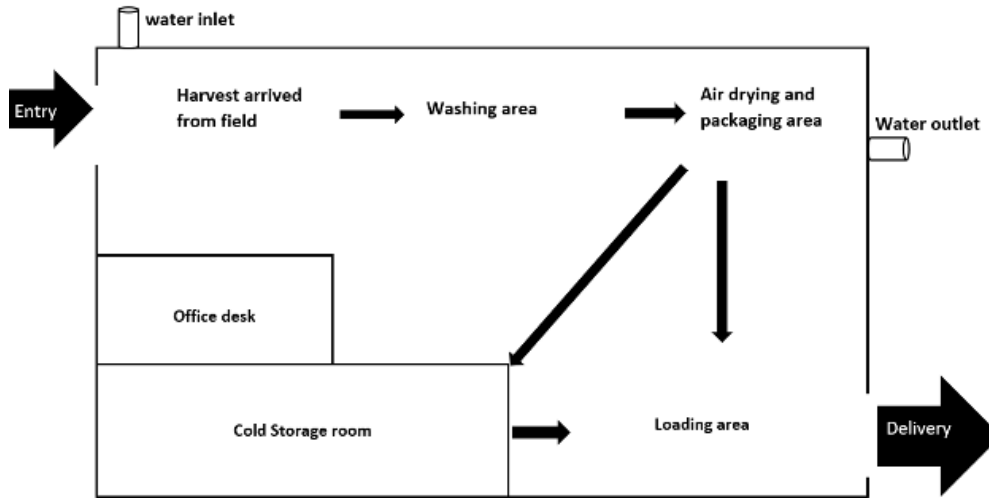


Figure 3: Complex and detailed wash station with arrows showing workflow (created by Isaac Mpanga).

brought in from the field. It is a good practice to place a note on packaging, if possible, to inform your customers to wash the produce at home before eating (Burrows, 2019).

### Water quality and washing methods

Washing fresh produce, also called surface treatment, is used to reduce the potential for microbial food safety hazards. It is important to ensure the water source is clean and meets FDA standard (within the threshold of indicator organism, zero detectable generic *E. coli* and allowable amounts of heavy metals). Most microbial contaminants are on the surface of the produce, which could easily be removed by simply washing with clean water using the right procedure and protocols.

**Wash methods:** Washing can be done using vigorous methods without brushes such as pressure hoses. Care must be taken to avoid produce bruises and injury with this method. The use of brushes is more effective for washing produce and will also lower the potential of cross contamination of microorganisms

on to other produce and surfaces. Other methods used to wash different types of produce include submersion (Figure 4 a & b) and spray (Figure 4c).

Regardless of wash method used, the most important factor is for operators to implement employee health and hygiene practices such as regular handwashing, maintain clean and sanitized work spaces, always follow good and strict water quality management practices and avoid cross contamination by using good workflow as in Figure 2 and 3.

**Maintain the efficacy of wash treatments:** No single treatment is best for removing all potentially hazardous microorganisms, so adopt a series of washing steps. For example, packers may consider using an initial wash treatment to remove the bulk of field soil from produce on arrival to the wash station then follow with a washing and sanitizing dip and a final rinse with fresh and clean water. Also make sure the produce is cleaned before submerging it into water that has zero detectable generic *E. coli*.



Figure 4: Some water washing methods (a and b = submersion; c= spray) (Photos by Produce Safety Alliance, 2019).

**Consider the wash water temperature for certain produce:** Some produce such as apples, celery and tomatoes are more temperature sensitive and require temperature of the wash water to be greater than that of the produce to avoid infiltration or internalization of water containing microorganisms. Instead of heating water, produce can also be air cooled before immersion. Other crops with high density, such as carrots, heating the water or cooling the produce may not be necessary. In situations where neither heating nor cooling can be achieved in washing the temperature sensitive crops, consider using food grade antimicrobial chemicals in the wash water, using spray wash treatments instead of submerging produce. Dry cleaning with a brush, scraping, and blowing air could be more appropriate to use with temperature sensitive produce. Ensure, equipment is cleaned and sanitized to reduce the potential for cross-contamination (FDA, 1998).

## Cooling Operations

There are several methods for cooling produce, which include water, ice, and forced air. Factors such as type of fruit or vegetable and the resources of the operator influence the choice of cooling method. However, cooling with air (vacuum coolers or fans) has the lowest risk of contamination as compared to water and ice with associated potential sources of microbial pathogens. Especially, reuse of water to cool several loads of produce may create a high-risk ground for cross-contamination. Follow good and strict management practices for chilling to avoid food safety hazards. Read (FDA, 1998) for more information on cooling operation.

## Conclusion

Food safety is crucial for our food systems, so make a good investment into your wash station.

Make sure your design eliminates cross-contamination, allows efficient workflow, and is safe and comfortable for anyone using the facility.

Consult and make improvements in your existing wash station and keep improving until you meet your desired design.

Use clean water, the right washing method, temperature, and the low risk cooling systems.

## References

1. Burrows, Rhoda (2019). Food Safety from Production to the Farmers Market. <https://extension.sdstate.edu/food-safety-production-farmers-market>
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3. Produce Safety Alliance (PSA) (2019). Food Safety Modernization Act Produce Safety Rule Grower Training Course. Version 1.2. Module 5-2 Agricultural Water Part 2: Postharvest Water, 41-59.
4. FDA (1998). A Guide to minimizing microbial food safety hazards in fruits and vegetables. <https://www.fda.gov/media/117408/download> (Accessed on 08/30/2020)

## Further reading resources

5. Floor Design for Vegetable Wash, Pack and Storage Areas <https://blog.uvm.edu/cwcallah/2018/05/21/floor-design-for-vegetable-wash-pack-and-storage-areas/>
6. Callahan, Chris (2013). Wash and pack stations. <https://blog.uvm.edu/cwcallah/2013/02/16/wash-and-pack-stations/>
7. Best Practices for Fresh Produce Food Safety. <https://extension.psu.edu/best-practices-for-fresh-produce-food-safety#section-61>
7. Agricultural Water. <https://producesafetyalliance.cornell.edu/curriculum/grower-training-manual-links/module-5/>



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