

# Cleaning and Sanitizing

**NECAFS**

The Northeast Center to Advance Food Safety



The Food Safety Modernization Act's Produce Safety Rule (FSMA PSR) sets mandatory standards for growing, harvesting, packing, and holding produce for human consumption.

Farms that are covered by the FSMA PSR will be held to certain standards designed to reduce the presence of foodborne illness causing organisms that can contaminate produce. This factsheet outlines the requirements for covered farms and uses the word "must" when the practice is required by the FSMA PSR.

For farms that may not be subject to the FSMA PSR, it is important to consider the implementation of these practices to ensure your produce is safe.

## Introduction

The cleaning and sanitizing requirements of the Food Safety Modernization Act Produce Safety Rule (FSMA PSR) apply to hydroponic and aquaponic production environments as well as packing areas. The objective of this factsheet is to help growers identify their food contact surfaces and non-food contact surfaces to inform the creation of a cleaning and sanitizing schedule and appropriate standard operating procedures (SOPs).



### The key points covered in this factsheet include:

- How to identify zones and define food contact surfaces and non-food contact surfaces within an operation.
- The importance of including buildings, transport equipment, trash, litter, and waste in an operation's cleaning procedure.
- Establishing a cleaning and sanitizing schedule for the different zones while considering existing practices (for example: removal of biofilm).
- It may be beneficial to simplify procedures by choosing a sanitizer labeled for all uses in an operation.

## WHAT ARE CLEANING AND SANITIZING?



**Cleaning:** Physical removal of dirt or other debris from surfaces, including rinsing with clean water and detergent.

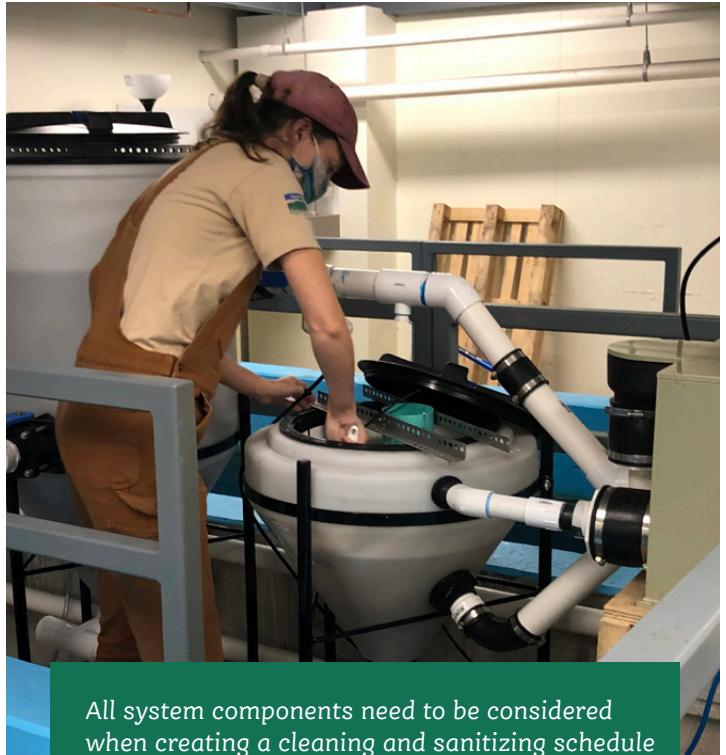
**Sanitizing:** Treatment of a cleaned surface to reduce or eliminate microorganisms. A surface cannot be sanitized before it is cleaned.  Proper cleaning of surfaces will ensure the sanitizer is effective at the manufacturer's recommended concentrations. 



# Cleaning and Sanitizing in Hydroponic and Aquaponic Operations

The Food Safety Modernization Act Produce Safety Rule (FSMA PSR) outlines cleaning and sanitizing requirements for equipment, tools, and buildings. In field agriculture, where crops are grown in the ground and generally outside, these requirements are more commonly applied in the harvest (harvest tools and equipment) and postharvest settings (operation's packhouse). However, for hydroponics and aquaponics, the produce is grown in equipment that recirculates a water-based nutrient solution. Additionally, they may be located inside a partially or fully enclosed building where harvest and postharvest activities likely also take place. Therefore, growers need to understand that cleaning and sanitizing requirements must be applied to the equipment, tools, and buildings across the entire operation (i.e., growing, harvesting, packing, and holding).

Depending on the operation and surface type, the approach, ease, purpose, and frequency of cleaning and sanitizing will all vary. Growers are likely already cleaning and sanitizing surfaces, tools, and equipment to reduce fish and plant pathogen transmission or algae and associated biofilm. Therefore, it is important for growers to be aware of the cleaning and sanitizing requirements of the FSMA PSR and understand if existing practices need any additions or adjustments.



All system components need to be considered when creating a cleaning and sanitizing schedule and standard operating procedure (SOP). For example, the cleaning of filters or fish tanks must be done in a way that does not cross-contaminate food contact surfaces or produce.

CANOPY FARMS

## Identifying Zones



The type of surface (food contact surface or non-food contact surface) informs the cleaning and sanitizing practices a grower must implement. One approach to identifying these surfaces is to define Zones 1-4 (as covered in the Produce Safety Alliance Grower Training) of their operation by mapping out the flow of produce from the growing system through the harvesting, washing, packing, storing, and shipping process. By defining zones, growers can prioritize and target cleaning

and sanitizing efforts on their equipment, tools, and buildings. These efforts will depend on whether each surface is a food contact surface or non-food contact surface and how it impacts fresh produce.

Hydroponic and aquaponic operations have a high-intensity and nearly continuous production cycle. Therefore, there are no natural clean breaks in the production/harvest cycle as large volumes of produce move through the system over time. Some food contact surfaces may also

be present across multiple activities impacted by the FSMA PSR. For example, many surfaces present during growing are also present at harvest, such as, the growing raft in a deep water culture system, the channel of a nutrient film technique system, or the tray/flood table in a flood and drain system. Mapping out the flow of produce through an operation using zones and identifying surface types can be a first step in developing effective standard operating procedures (SOPs) for each unique farm.






## DEFINING THE ZONES

**ZONE 1** is a food contact surface and is any surface that directly touches the harvestable portion of the crop.

**ZONE 2** is not a direct food contact surface, but in close proximity to produce and food contact surfaces.

**ZONE 3** is other, non food contact surfaces within the production and handling environment.

**ZONE 4** is areas outside the production and handling environment.

Please note that what is presented here is an example of how zones can be applied. Zones may be defined differently depending on the workflow in each operation. The key point is to consider each component of the operation and its proximity to produce. For example, non-food contact surfaces can become food contact surfaces if produce is overgrown and contacts the outside surfaces of grow beds or channels. 



## IDENTIFYING FOOD CONTACT SURFACES – ZONE 1

The FSMA PSR requires that all food contact surfaces be inspected, maintained, cleaned, and when reasonably necessary, sanitized. A food contact surface is one that comes into direct contact with the harvestable portion of the crop during growing, harvesting, packing, and holding. To adopt the necessary inspection, maintenance, cleaning, and when necessary, sanitizing requirements, first, growers need to identify all the **food contact surfaces (zone 1)** across their operation. Second, growers need to create procedures that establish a cleaning and

sanitizing schedule for their food contact surfaces. For example, deep water culture using Styrofoam rafts does provide an opportunity for cleaning and sanitizing of the raft surfaces when rafts are removed after harvest and before a new crop is planted in the rafts. This is one of the most straightforward examples of appropriate cleaning and sanitizing of a food contact surface in the production area.

With some system designs, however, the growing media surface is more challenging to remove, clean, and sanitize. In these cases other practice decisions

can be made to eliminate contact between the harvestable portion of the crop and surfaces, thereby converting a food contact surface to a non-food contact surface.

The FSMA PSR requires that all food contact surfaces be inspected, maintained, cleaned, and when reasonably necessary, sanitized.





## IDENTIFYING FOOD CONTACT SURFACES – ZONE 1 (continued)



NICHOLAS VAN DER WAL

In this deep water culture hydroponic system, the top of the raft is a food contact surface (zone 1).



CANOPY FARMS

It can be advantageous to grow crops whose harvestable portions won't touch nearby surfaces, as in this example of walking stick kale growing in expanded clay pebbles.



NICHOLAS VAN DER WAL

Crops grown in potting media should be harvested at a height above the media, where it will not contaminate the harvested portion.



PETER KONJOIAN

In this flood and drain system, the grower has a couple of choices: 1) Cull the leaves that touch the edges of the flood tray, or 2) establish a regular cleaning and sanitizing schedule for that food contact surface (zone 1).

## ESTABLISHING CLEANING AND SANITIZING PROCEDURES FOR FOOD CONTACT SURFACES – ZONE 1

The FSMA PSR does not specify the cleaning and sanitizing frequency and procedure for food contact surfaces and outlines that they must be inspected, maintained, cleaned, and when reasonably necessary, sanitized. When developing a schedule that follows this requirement, growers must assess their unique setup and create

SOPs for cleaning and sanitizing food contact surfaces to reduce the chances of produce contamination. Schedules will vary depending on the operation.

One approach to establishing an appropriate SOP may be to evaluate existing cleaning procedures and identify opportunities to adjust or document them to meet the FSMA

PSR requirements. For example, many growers are already cleaning to remove biofilm, a slimy film that forms on a variety of surfaces and is difficult to remove. Biofilms can harbor pathogens and act as a barrier against sanitizers, preventing them from reaching the target surfaces. In this case, adjusting an

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existing biofilm cleaning schedule to include cleaning and sanitizing food contact surfaces would be appropriate.

Other approaches may consider the operation's production flow and schedule (e.g., daily harvest and clean breaks between lots). For example, a grower may change the layout of the harvest process to reduce the number of food contact surfaces. Or a grower may consider preventing contact between produce and a surface.

In this example, the growing containers that touch the produce are food contact surfaces and must be cleaned and sanitized. However, the grower can decide to tie up the tomato branches and prevent contact between the produce and the growing containers. This modification would convert the growing containers to non-food contact surfaces.



SEAN FOGARTY

## SANITIZERS



There are several different categories of sanitizers that can be used in different parts of hydroponic operations. These may include chlorine-based products (sodium hypochlorite, calcium hypochlorite, chlorine dioxide), peroxyacetic acid products (e.g., Sanidate, Peraclean), quaternary ammonium compounds (QACs or "quats"), and combination products. When selecting a sanitizer for food contact surfaces, the most important thing is to ensure that the product is labeled for its intended use (i.e., to

control human pathogens) and used in accordance with the label directions. Additionally, when possible, tools and equipment should be cleaned and sanitized in an area other than a production area. If that is not possible, care should be taken to avoid contaminating other areas within the production areas, including irrigation water.

It may be beneficial to simplify operations by choosing sanitizers that are labeled for all potential uses in an operation. The three agricultural uses on EPA labels for

sanitizers are:

- Non-porous food contact surfaces
- Fruit and vegetable wash water
- Irrigation water

To ensure proper use and storage of chemicals and sanitizers, growers should document all types of chemicals used, their concentrations, and dates of application. Workers must be trained on labeling and safe storage of cleaning chemicals and sanitizers.

FULL LIST OF SANITIZERS LABELED FOR PRODUCE: <https://foodsafetyclearinghouse.org/resources/labeled-sanitizers-produce-tool>



THIS SYMBOL MEANS YOU CAN FIND ADDITIONAL RESOURCES ON THE TOPIC DISCUSSED ON PAGE 7

## NON-FOOD CONTACT SURFACES – ZONES 2, 3, AND 4

Non-food contact surfaces includes all surfaces that do not touch the harvestable portion of the crop in the production and packing environment. It is important for growers to identify non-food contact surfaces throughout an operation, which includes both the growing and packing areas. Since the growing and packing areas may be in the same area or close proximity to each other, consideration should be given to potential cross contamination between the growing area, packing area, food contact surfaces, and non-food contact surfaces. Growers must maintain and clean non-food contact surfaces when necessary to prevent cross-contamination by implementing cleaning practices on a regular schedule as appropriate

to the operation. These procedures may change based on observations of cross-contamination throughout the crop cycle and as an operation matures. Some non-food contact surfaces in growing areas may include hydroponic rafts, nutrient film channels, flood and drain tables, and other surfaces in the growing area. However, it is important to note that, depending on the operation and the type of crop being grown, some of these surfaces may become a food contact surface. If the harvestable portion of the crop touches, for example the raft or the side of the channel, those surfaces become food contact surfaces. This is true, even if it is not intended for the harvestable portion to touch the surface. In harvest and packing



ANDREW CHAMBERLIN

This scale is a non-food contact surface but still must be maintained and cleaned when necessary to prevent it from becoming a source of contamination.

areas, non-food contact surfaces can include parts of equipment, for example the outside surfaces of scales, sinks, flumes, and conveyor systems. Handles of tools such as knives, mechanical harvesters, and brushes are also included in this category.

## BUILDINGS AND TRANSPORT

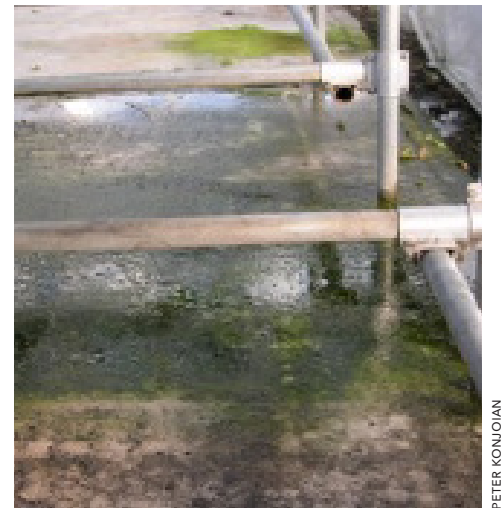
Buildings for growing, harvesting, packing, and holding must be suitably designed and constructed to facilitate sanitary operations. In areas where water or other liquid waste is discharged, floors must provide adequate drainage and must be cleaned in a way that does not contaminate produce or other clean surfaces through spraying or splashing. Similarly, measures must be implemented to prevent contamination from walls, ceilings, fixtures, ducts, pipes, or other structural elements that may drip on to produce.

When transporting produce, equipment must adequately protect produce from contamination. This means transport equipment must be properly maintained and cleaned before use.

## TRASH, LITTER, AND WASTE

Managing trash, litter, and waste is an important component of an operation's cleaning procedure. It must be stored in a way that minimizes pest attraction and does not contaminate produce, water sources, and water distribution systems. If an operation is keeping any waste in a growing or packing area, then it must be stored in secure containers that can't be opened by animals and should be disposed of frequently.

If an operation is treating liquid waste of any kind, such as in some aquaponic systems, the waste must be handled in a way that avoids it becoming a potential source of contamination.



PETER KONJOJIAN

Floors must be included in a cleaning procedure and should be cleaned in a way that does not contaminate fresh produce or other surfaces. For example, it would be inappropriate to use a high-pressure power sprayer to clean biofilm and debris off a floor in a growing or packing area where produce is present.



# Cleaning and Sanitizing Takeaways

Cleaning and sanitizing procedures in hydroponic and aquaponic operations may be more complex than in other production systems and apply to both the production and packing areas. Identifying the surfaces, whether food contact or non-food contact, is an essential step in developing cleaning and sanitizing procedures.

The continuous and intensive nature of hydroponic and aquaponic operations, along with

the proximity of production and packing activities, make an effective cleaning and sanitizing program especially important. A cleaning and sanitizing schedule needs to fit the characteristics of each unique operation.

To do this, growers should map out the flow of their produce, adapt existing cleaning schedules, and possibly adjust production schedules or practices.

## Additional Resources

Some of the resource links provided here may be general in nature and can be adapted to hydroponic and aquaponic operations. These links do not represent an exhaustive list of content on this topic and are intended as a starting point to guide the user toward finding additional relevant resources.

### **Cleaning and Sanitizing of Farm Tools and Equipment for Produce Farms:**

<https://foodsafetyclearinghouse.org/resources/online-resource-cleaning-and-sanitizing-farm-tools-and-equipment-produce-farms>

### **Cleaning, Sanitizing and Hygienic Design:**

<https://instituteforfoodsafety.cornell.edu/resources/cleaning-sanitizing-and-hygienic-design/>

### **Dry Cleaning on Produce Farms: Alternatives to Using Water & Detergents:**

<https://foodsafetyclearinghouse.org/node/1079>

### **Labeled Sanitizers for Produce:**

<https://foodsafetyclearinghouse.org/resources/labeled-sanitizers-produce-tool>

### **Packinghouse Environmental Monitoring Programs: Identifying Packinghouse Zones:**

<https://extension.uga.edu/publications/detail.html?number=B1524-1>

### **SCRUB (Sanitizing and Cleaning Resources for your Business) Project Resources:**

<https://blog.uvm.edu/cwcallah/scrub-project-resources/>



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