

## Cleaning and Sanitizing Practices in the Mango Industry



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## Section 1. Instructor's Guide

### Introduction

The “Mango Industry Cleaning and Sanitation Practices Food Safety Training Kit” provides uniform food safety training for the benefit of the mango industry and the consuming public.

The program is designed to deliver food safety training to the sanitation crew employees about cleaning and sanitizing practices in the mango farms and packinghouses. Proper sanitation is one of the most important activities for minimizing the risk of contamination in the mango industry.

### Target Audience

The “Mango Industry Cleaning and Sanitation Practices Food Safety Training Kit“ was developed for sanitation supervisors, quality control personnel, extension agents, and/or industry consultants who wish to conduct sanitation training at mango farms and packinghouses.

This training is specifically targeted at workers who are part of the company's sanitation crew.

### Learning objectives

After completing this program, participants will be able to:

- State how sanitation directly affects the mango food safety.
- Understand how biofilms and harborage sites impact food safety and mango quality.
- Understand the importance of proper cleaning and sanitizing practices.
- Understand the company's formal sanitation program.
- List the steps for cleaning and sanitizing.
- Understand the sanitation verification procedures.



## How to use the “Mango Industry Cleaning and Sanitation Practices Food Safety Training Kit”



The training has been developed to rely on illustrations and visual aids containing simple messages related to sanitation at mango farms and packinghouses.

This training kit contains lessons designed to provide sanitation crew workers with the knowledge and skills they need to follow while performing sanitation activities.

The information in this training kit will also help workers understand “Why” certain practices must be conducted diligently to help reduce the risk of mango contamination at the farm or packinghouse. Training activities are also included in the kit.

In the pages that follow, copies of each slide are provided along with text. The figure on the following page depicts the format of a lesson plan.

This lesson page contains the PowerPoint slide that will be seen by the participants. On the page opposite to each slide there is text that the instructor can use to explain the material.

There is also information within brackets for the instructor about how to improve the learning experience — this is not meant to be read to participants.

Additionally, there are several activities and demonstrations in the program. These are included in the PowerPoint slides and come with specific instructions for conducting them.

The actual PowerPoint presentation can be downloaded from:  
[www.mangofoodsafety.org](http://www.mangofoodsafety.org)

It is not necessary for the instructor to memorize all of the text. However, to make the training session more effective, it is advisable for him/her to become familiar with it beforehand and to thoroughly understand it.





## Company policies

Before starting the training, carefully review and become familiar with the company's food safety and sanitation policies and make sure that what you teach is consistent with these rules. For instance, some companies might require the use of a specific sanitizer on a particular piece of equipment; also or the cleaning frequency for certain areas or equipment could differ between mango packinghouses. It is advisable that when teaching the program to relate the content of the slide with the practices at your company.

## Documenting food safety training

If your training is not documented, a food safety auditor will assume that it never happened. To provide evidence that each sanitation crew employee has received food safety training, the instructor should create a simple attendance sheet that records the date and the topics covered and signatures of employees present.

Each participant should sign the sheet, which should be filed along with other required audit documents. A sample training log is available at: [www.mangofoodsafety.org](http://www.mangofoodsafety.org)

## Acknowledgments

The Mango Industry Cleaning and Sanitation Practices Food Safety Training Kit was prepared by:

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Food Safety Consulting & Training Solutions, LLC. [www.foodsafetycts.com](http://www.foodsafetycts.com)

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It should be noted that all the improper situations that are included in the photos of this program were staged.

## Disclaimer

The National Mango Board (NMB), an instrument of the United States Department of Agriculture, commissioned this workshop in support of the Mango Industry. All efforts have been taken to ensure the accuracy and veracity of the information contained in this document. Nonetheless, the NMB and Food Safety Consulting & Training Solutions, LLC are not responsible, expressly or implied, for the ideas and recommendations contained in this document, as well as errors and omissions therein, and do not assume any legal responsibility for any loss or damage resulting from use of the information contained herein.





# The Mango Industry Cleaning and Sanitation Practices Food Safety Training Kit





## Section 2. Lesson Plan



### Introduction

Thank you for assisting in this training session about cleaning and sanitation. It is great to be with you, please raise your hand if you have any questions during the presentation. All questions are welcome; they may help to make sure that the subject was well understood.

Let's start by asking you a question:

Why are cleaning and sanitation practices important in a mango farm or packinghouse?

*[Let participants answer.]*

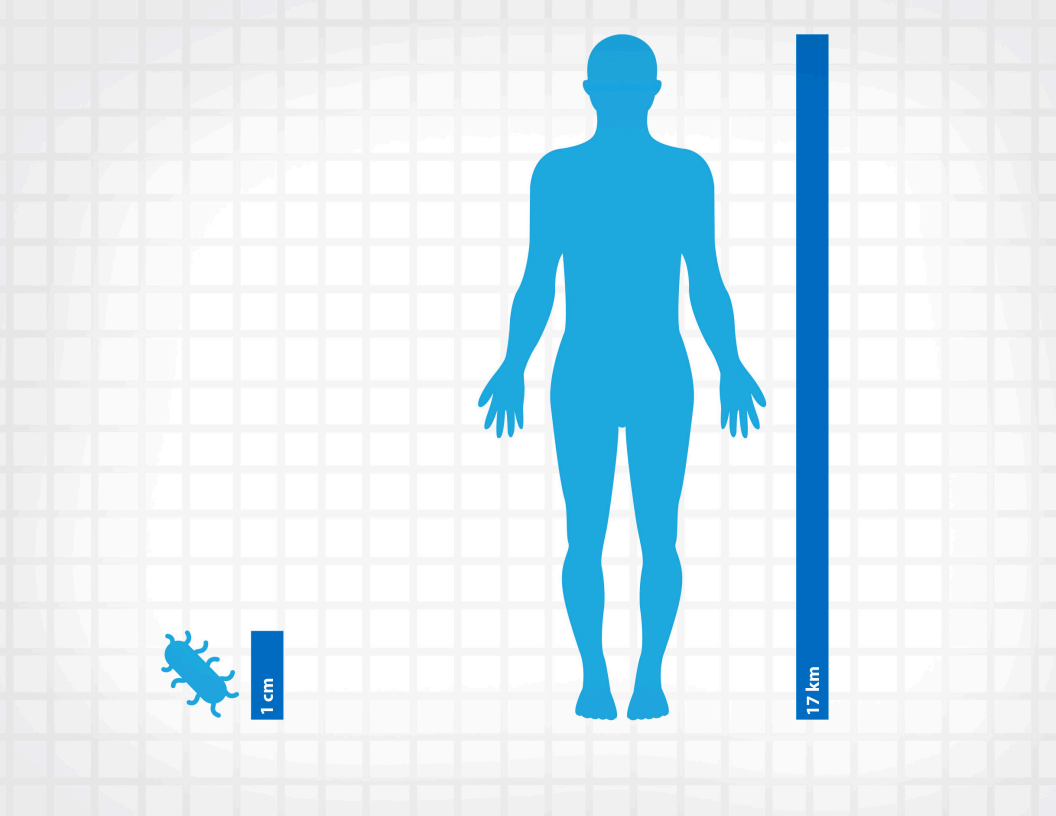
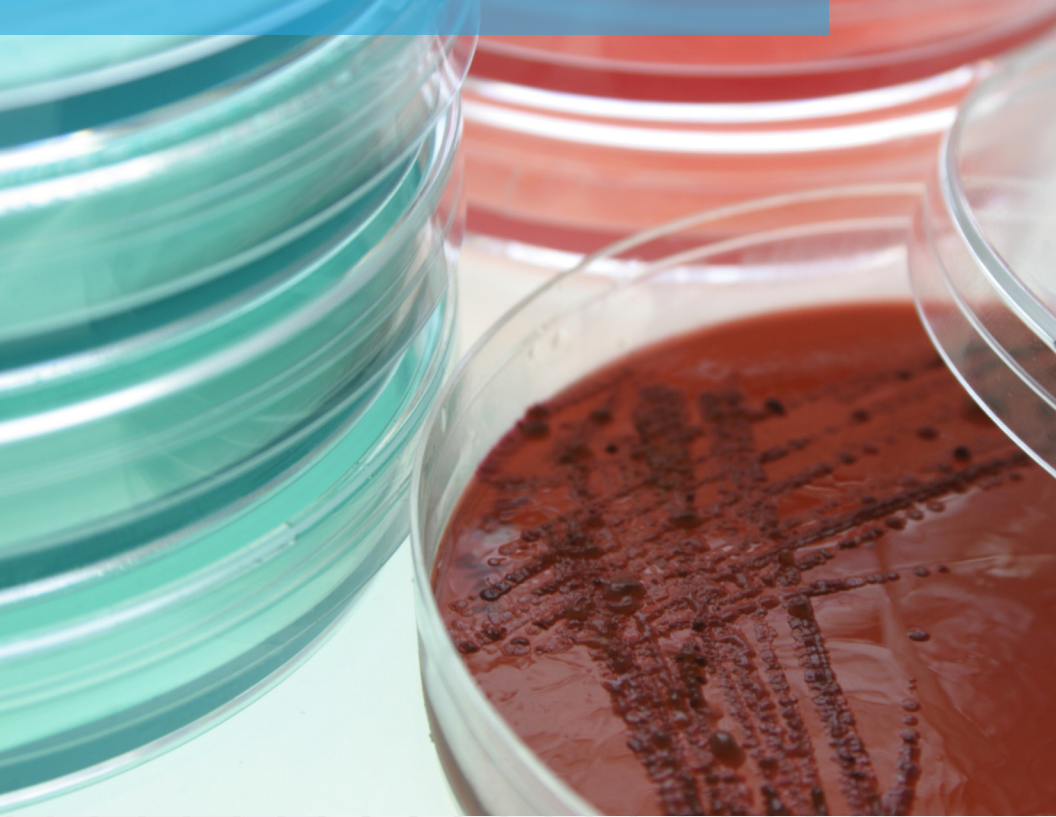
Proper sanitation helps minimize the risk of food contamination with microorganisms that cause spoilage or illness.

As a member of the sanitation crew you play a key role in providing safe to consumers.

This training will help you to understand the general cleaning and sanitation practices in the mango industry and why sanitizing procedures are necessary.



# Microorganisms



Microorganisms, or microbes, are living organisms so small that they can only be seen through a microscope. To put that in context, if microorganisms were 0.40 inches long (1 centimeter), then an average man would be 10.5 miles tall (17 kilometers).

There are microorganisms everywhere: in the air, water, soil, on skin, and even in food. Most microorganisms will not harm us, but there are several that, if present, could make us sick.

Some examples of human pathogens include:

- *E. coli* O157:H7.
- *Salmonella*.
- *Listeria monocytogenes*.

## Microorganisms

### Notes:

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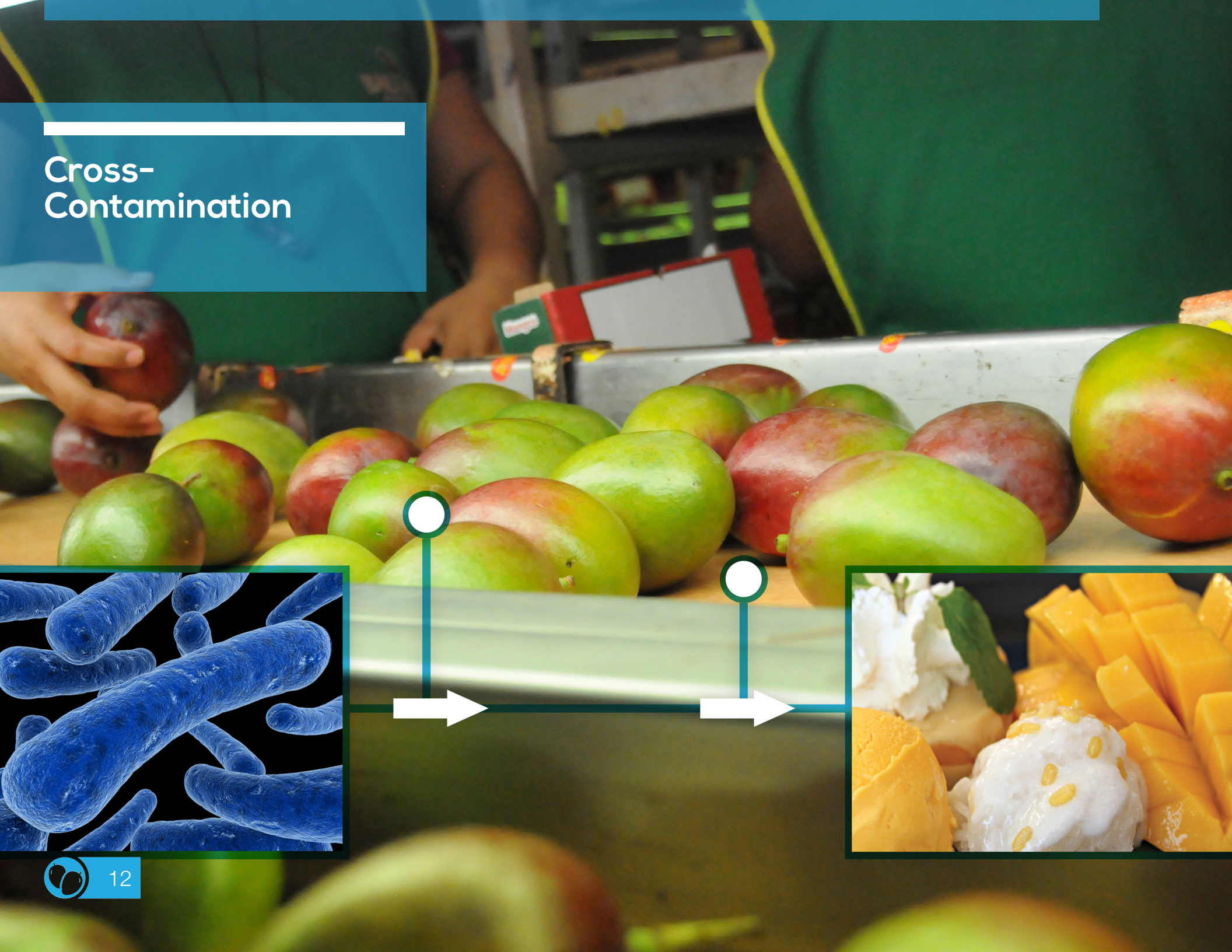
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# Cross-Contamination







# Sanitation







# Cleaning







# Sanitizing

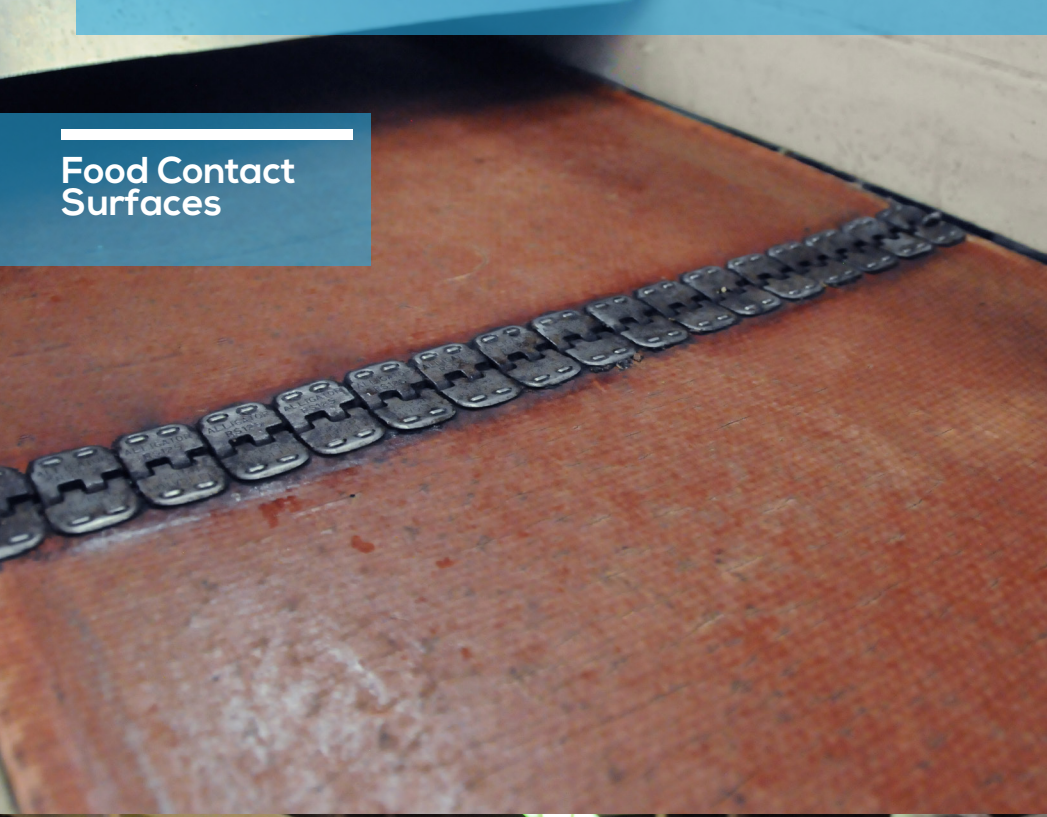








Food Contact Surfaces



Food Contact Surfaces



Food Contact Surfaces



Food Contact Surfaces









Food Contact Surfaces



Food Contact Surfaces



Food Contact Surfaces



Food Contact Surfaces











Non-Food  
Contact Surfaces



Non-Food  
Contact Surfaces



Non-Food  
Contact Surfaces



Non-Food  
Contact Surfaces









Harborage  
Sites



Harborage  
Sites



Harborage  
Sites



Harborage  
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Harborage Sites



Harborage Sites



Harborage Sites



Harborage Sites

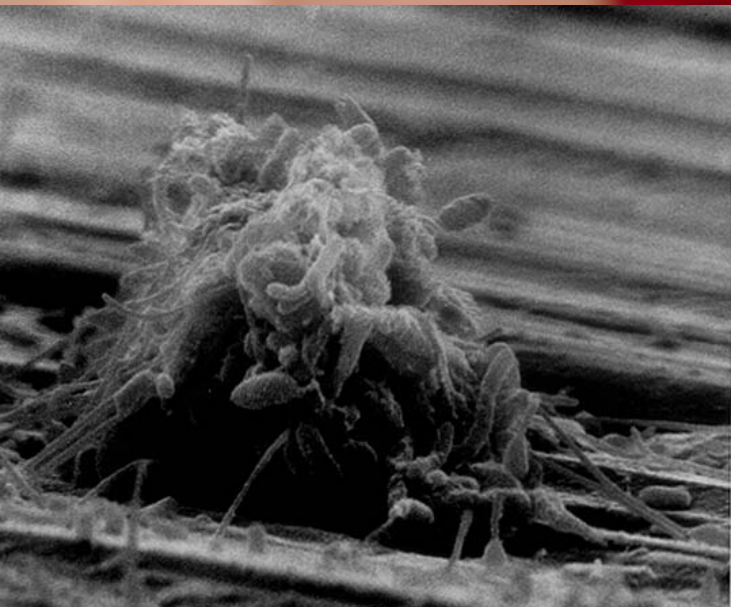






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# Biofilms



Biofilms are the accumulation of microorganisms stuck on a surface and are frequently found in a hard-to-remove structure of bacterial origin. This structure houses and protects them from the external agents of the environment in which they are in, and provides an anchorage point for other microorganisms and colonies to join the biofilm's surface.

Biofilms form on surfaces that have not been cleaned and sanitized properly.

An excellent example of a biofilm is the scum or plaque that builds up on your teeth. If you brush your teeth at night, by morning the bacteria will have built up a film on the surface of the teeth. Even after brushing, bacteria remain in the warm and moist environment of your mouth.

The same sort of film can build up on equipment surfaces in the packinghouse and lead to product contamination. The porous, wet, and hard-to-reach surfaces on equipment are the perfect environment for microorganisms to grow. As the colonies grow, microorganisms produce more of the biofilm to protect them from cleaning chemicals and sanitizers.

Biofilms are an area of concern when it comes to cleaning and sanitizing equipment in the packinghouse. If not cleaned properly, the water and mango debris can become a source of nutrition for the microorganisms in the biofilm, contributing to their growth.

Because of this, regular cleaning and sanitizing is the best way to prevent the formation of biofilm and prevent mango contamination. Scrub the food contact surfaces on the equipment thoroughly when cleaning, giving special attention to harborage sites.

## Biofilms

### Notes:

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# Sanitation Program

Master  
Cleaning  
Schedule

Sanitation Standard Operating Procedures (SSOP's)

Monitoring of Cleaning and Sanitizing Activities

Verification Activities

Corrective Actions

Records







# Master Cleaning Schedule. What Needs to be Cleaned and Sanitized?









# Master Cleaning Schedule. What Needs to be Cleaned and Sanitized?









# Sanitation Standard Operating Procedures (SSOPs)







## Steps for Cleaning and Sanitizing Equipment







# Steps for Cleaning and Sanitizing Equipment









# Steps for Cleaning and Sanitizing Equipment







# 1. Area and Equipment Preparation









## 2. Removal of Debris





### 3. Pre-Rinse or Pre-Cleaning





## 4. Cleaning









# Cleaning Agents





There are many different types of cleaning agents available. Each one is designed especially for a specific type of soil.

There is no one-size-fits-all cleaning agent. Therefore, a different cleaner may be used, depending on the area or type of soil. Your supervisor will tell you which one you must use.

Manufacturers design cleaning agents to work better for particular types of soil and to be used under specific conditions such as pH, water temperature, etc. There are basically four groups of cleaning agents:

1. Detergents.
2. Degreasers.
3. Acid cleaners.
4. Abrasive cleaners.

Cleaners are not to be mixed arbitrarily; mixing can cause injuries since cleaners are designed for specific uses.

ALWAYS follow your company's policies and the manufacturer's instructions while handling cleaners. If you are not sure what to do, ask your supervisor.

## Cleaning Agents

### Notes:

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## Working Conditions for Cleaners







## 5. Rinsing







# 6. Sanitizing



In Step number six, equipment and food-contact surfaces of equipment are sanitized after cleaning.

During the sanitizing process, a clean surface is treated with a sanitizer that will reduce the number of microorganisms to safe levels, but the appropriate sanitizer contact time and concentration must be followed to accomplish this task.

Equipment is sanitized by applying heat or an approved chemical sanitizer. Most mango packinghouses use an approved chemical sanitizer. Chemical sanitizing occurs when a sanitizer is put in contact with the different surfaces of the equipment.

This process can be accomplished by immersing the piece of equipment or utensil in a sanitizing solution at a given concentration or by applying or spraying the sanitizing solution on the surface.

Keep in mind that you cannot sanitize a dirty surface. It must be thoroughly cleaned and all detergents or cleaners removed before being sanitized!

Any remaining soil and dirt will prevent the sanitizer from doing its job, which is to kill the microorganisms.

Make sure you apply sanitizer to all parts of the equipment — both contact and non-food-contact surfaces.

## 6. Sanitizing

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# Chemical Sanitizers



The four basic types of sanitizers are chlorine, iodophors, peracetic acid, and quaternary ammonium compounds (quats). As with cleaning agents, manufacturers design sanitizers to work under specific conditions. Employees are probably not responsible for choosing the sanitizer, but they are responsible for using it correctly. Three basic factors must be taken into account when using a sanitizer:

**Concentration.** Sanitizers should be used at the proper concentration to ensure their effectiveness. More is not necessarily better, be sure to follow your company's procedures and manufacturer's instructions. Use a test kit or other appropriate device to check the concentration of the sanitizing solution. Lastly, do not mix them arbitrarily because it can be dangerous.

**Temperature.** The temperature of the sanitizing solution does have an influence on the effectiveness of the sanitizer. Always follow the manufacturer's instructions.

**Contact time.** Do not rush the sanitizing process. Sanitizers should have enough contact time with the surface that is being sanitized to allow for sufficient inactivation of microorganisms.

Rotating sanitizers is a good practice that may increase their effectiveness. If you only use a single sanitizer, microorganisms can become resistant to it and become harder to eliminate. You are responsible for ALWAYS following your company's recommendations.

*[In this section the instructor should go over the cleaners and sanitizers and the concentrations that are being used in the facility. It is advisable to physically display or show the products to the participants.]*

## Chemical Sanitizers

### Notes:

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## 7. Air-Drying







## 8. Equipment Inspection and Reassembly







# Monitoring







# The Bucket Method





There is equipment in the packinghouses such as metal detectors, overwrappers, conveyor belts, light fixtures, electrical boxes, etc. that can't get cleaned and sanitized using a hose or a pressure washer because excessive water would damage them.

These pieces of equipment can still be cleaned and sanitized using the "bucket method."

Take your time to perform this operation. Fill a bucket with water and the proper cleaner at the proper concentration.

With a clean, damp towel or sponge, wipe down the entire unit. Allow the cleaner enough time to act according to the instructions from your written procedure (SSOP). If needed, brush/scrub the surface with a damp towel.

Rinse thoroughly with water using a sponge or clean damp towel dedicated to this purpose.

Fill another bucket or sprayer with sanitizer at the appropriate concentration and wipe the equipment down with sanitizer on all surfaces. When you are done, do not rinse — air-dry.

If you use single-use disposable sanitizer wipes, use them in accordance with the manufacturer's label instructions.

Make sure you UNPLUG any electrical connections and ensure that NO water gets into any of the panels, electrical components or sensors. If necessary, cover them with plastic even though this task may take you some more time.

## The Bucket Method

### Notes:

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# Demonstration





Take participants to a workstation to conduct a demonstration.

What are the company's procedures for cleaning and sanitizing?

Can any of you remember the 8 steps for cleaning and sanitizing equipment?

*[Let participants answer]*

Let's demonstrate the proper way to clean any piece of equipment in the packinghouse.

Conduct a demonstration. Select a piece of equipment to be cleaned and gather all the utensils and supplies.

Demonstrate the proper way to clean a piece of equipment using your company's sanitation standard operating procedure (SSOP). During the demonstration, go over in detail each of the 8 steps for cleaning and sanitizing equipment and how they apply to the piece of equipment that is being used in the demonstration.

1. Area and equipment preparation.
2. Removal of debris.
3. Pre-rinse or pre-cleaning.
4. Cleaning.
5. Rinsing.
6. Sanitizing.
7. Air-drying.
8. Equipment reassembly and inspection.

Make sure participants get some hands on experience. Get them involved in this activity.

## Demonstration

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# Records



Records are a key component of a sanitation program. Records are kept in the form of checklists that will help you and your team to take care of all the required details and to develop good sanitation habits.

Auditors will look for signs or evidence that a program is in place.

Records are the evidence that proper sanitation takes place every day. If you can't show me that you did it, then you did not do it.

The most common sanitation checklists include daily sanitation checklists, monthly/quarterly sanitation checklists, daily ATP bioluminescence tests for food-contact surfaces and non-food contact surfaces and pre-operational sanitation inspection logs.

Some of you are probably in charge of filling out sanitation logs.

These logs cover the entire area of the facility and equipment and must include: date, list of areas/equipment that were cleaned, the individual accountable and sign off for each task completed.

Keep in mind that there are some good documentation practices that must be followed:

- Logs must be filled out completely using permanent ink, not pencil.
- No use of "correction fluid" ("white-out") is allowed. If a mistake is made, no scratches or overlap of data are allowed, the mistake should be crossed out and initialed by the employee making the change.
- Falsification of data may result in an automatic failure of an audit.
- Each log must be completed at the time of performing the task.

## Records

### Notes:

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## Records



Completing and signing records carries a great responsibility. If you do not understand something or have a question, ask your supervisor immediately.

*[Bring few sample checklists to the class and run a demonstration on how to fill out records properly. Provide participants with pens and checklists so they get hand-on experience with this. Guide them through the process of filling out the checklists.]*

Documentation and records are critical components of a sanitation program: they should not be overlooked or performed haphazardly. Individuals responsible for filling records have a big responsibility.

## Records

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# Verification



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How do we make sure we are doing a good job?

You learned the importance of cleaning and sanitizing and are now aware that the equipment used in the packinghouse should be properly cleaned and sanitized to minimize the risk of mango contamination. However, how do we make sure we are doing a good job cleaning and sanitizing?

Packinghouses generally use 3 methods to verify that their cleaning and sanitizing practices are effective:

1. Visual inspection, to verify that there is no visible dirt or debris. However, microorganisms can't be seen with the naked eye.
2. Microbiological sampling of equipment surfaces. This method provides a count of microbes on a given surface; however, the results are not provided instantly. The sampling is conducted by the quality control employees and an external laboratory at a predetermined frequency according to the company's sampling plan.
3. Using a luminometer. This is a handy tool that measures a small amount of light given off in a chemical reaction. The amount of light is related to the amount of bacteria on the surface – the more bacteria, the more light. The cleanliness of a surface can be assessed in few seconds using a luminometer; these measurements help you to make decisions on the spot / immediately.

## Verification

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# Verification

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Do not verify your own work. If you perform the activity, your supervisor must verify it. Monitoring is the sanitation crew leader or the supervisor's responsibility. The individual(s) responsible for observing cleaning crews should spend time in the packinghouse supervising the cleaning crew's work.

Monitor food contact surfaces paying attention to the hard to clean areas of the machines and making sure the harborage sites have been properly cleaned and sanitized.

Closely monitor all of the food contact surfaces and make sure that the chemical concentrations stated in SSOPs are used at all times.

## Verification

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# Labeling, Use, and Storage of Chemical Products

 **ALMACEN DE PRODUCTOS QUIMICOS**

EXCLUSIVO  
CERA





When working with cleaners and sanitizers, remember that they are chemicals and can be dangerous if not handled properly. Store chemicals in the designated areas and never near mangos.

Do not mix and match chemicals. For instance, when chlorine is mixed with acid solutions, chlorine gas can be generated, which is not only corrosive, but can cause respiratory irritation to humans.

All cleaners and sanitizers, both in use and in storage, should be clearly labeled and identified at all times. Secondary or smaller containers must be labeled with the name of the contents. Do not put chemicals in food containers.

**ALWAYS** use the proper concentration of chemicals, follow the manufacturer's instructions and use the appropriate personal protection equipment.

Keep in mind that more of a chemical or sanitizer is not necessarily better.

If your company has a color coding system in place for utensils, follow it at all times and remember that certain utensils are exclusive to certain areas, such as brushes for use in the bathroom or those brushes used to clean drains.

## Labeling, Use, and Storage of Chemical Products

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## Activity: Testing a Sanitizer Concentration Using Testing Strips



The purpose of this activity is to demonstrate the procedure for testing a sanitizer concentration using testing strips.

### Materials

- 4 cups, jars, or buckets.
- Water.
- A sanitizer used at the mushroom packinghouse (i.e. chlorine).
- Test kit strips.

### Preparation

Before starting the training session, prepare four containers of sanitizing solution at four different concentrations. Include one container with no sanitizer (just water) and another one that exceeds the recommended concentration. For instance, if using chlorine labeled for use on food-contact surfaces at a concentration between 50 and 200 ppm, prepare a solution at 0 ppm, 50 ppm, 150 ppm, and 300 ppm.

If the packinghouse requires that the concentration be monitored, bring a blank log for record-keeping purposes during the demonstration.

### Introductory remarks

It can be a problem if the sanitizer is not at the appropriate concentration. If the concentration is too low, it will not do its job of killing microorganisms. If it is too high, it can become a source of chemical contamination. Therefore, it is necessary to monitor the concentration of the sanitizer constantly using a test kit to measure chemical sanitizer concentrations. There are test kits for each type of sanitizer, but they are not interchangeable.

If the kit runs out of supplies, let a supervisor know immediately.

## Activity: Testing a Sanitizer Concentration Using Testing Strips

### Notes:

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## Activity: Testing a Sanitizer Concentration Using Testing Strips







# Cleaning and Sanitizing Harvesting Equipment





There is a variety of equipment and utensils used to harvest and transport mangos from the field to the packinghouse.

Some harvesting utensils to consider include:

- Knives.
- Nets.
- Scissors.
- Hooks.

Each unit of equipment and utensil presents different challenges in its cleaning and sanitizing procedures. Get to know the equipment well in order to understand the challenges to effectively cleaning and sanitizing each unit.

In addition to “harvesting equipment and utensils”, there are other types of equipment that are part of the harvesting operation. Everything needs to be part of the cleaning regime and have its own dedicated set of cleaning and sanitizing procedures.

The cleaning and sanitation procedure for harvesting utensils consists of three steps:

1. First the harvester cleans the net with a detergent, scrubbing it with a fiber to remove dirt and debris.
2. The net is then rinsed with clean water.
3. Finally it is submerged in a sanitizing solution.

## Cleaning and Sanitizing Harvesting Equipment

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# Harvesting Containers







# Mango Transportation Equipment









# Case Studies

## Instructions

Read each of the next case studies out loud and ask participants to describe what should have been done in each situation. Discuss the answers with the entire group.



Hugo was in charge of the cleaning and sanitation of the conveyor belts in the mango classification equipment. He was in a hurry and wanted to finish before the start of the football game. He did not want to wait the 15 minutes that the foam cleaner has to be in contact with the equipment, so he doubled the foam concentration and only waited five minutes before rinsing the equipment. What should have Hugo done?

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Jose, the person in charge of the company's chemical products storage, had left the packinghouse to go to the bank when he received a call from a worker in the sanitation crew. The sanitation crew was out of foam/detergent needed to clean the mango-washing tank and needed Jose to supply them with more. The bank closed at 4:00 pm, so Jose was in a hurry and told them to use the detergent used to clean the offices and that he would supply the foam/detergent the following day. What should have Jose and the cleaning crew have done?

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Edwin finished sanitizing the equipment and was filling in his inspection records while it was air-dried. The production supervisor arrived at the packinghouse and was in a hurry to start the process. The cleaning crew used a wet rag to finish drying off the equipment so that other workers could start work early and maybe even return home early. What should the cleaning crew and the production supervisor have done?

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Luisa likes to fill out the sanitation records with a pencil and then go over them with a permanent ink pen. Her documents are generally crossed out and disorganized but legible. What is the correct practice that Luisa should follow?

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Luis is the sanitation crew's supervisor; he was monitoring the crew which was finishing the cleaning step when he realized that the sanitizer tank was near empty. Production was scheduled to start very soon, and he didn't want to go back and prepare more sanitizer to fill up the tank, so he decided to fill up the tank with pure water. The solution in the tank was applied to the equipment and the equipment was left to air-dry before production started. What should have Luis and the cleaning crew have done?

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Adriana, the sanitation crew's supervisor, had to run out of the packinghouse for a personal errand and couldn't make it back in time to do the final sanitation inspection on the mango conveyor belts. She filled out the inspection record in advance, and since there was no one there to inspect the equipment, the workers only cleaned those parts of the equipment that were visibly dirty and didn't use any sanitizer. What should have Adriana and the cleaning crew have done?

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What did we Learn /  
What is my Job?



In this lesson we learned:

- The importance of good sanitation and the difference between cleaning and sanitizing. We want to remind you that you should always follow all the steps listed/described in the company's SSOP (standard sanitation operating procedures); each step is required for performing a proper sanitation process.
- The basic steps for cleaning and sanitizing equipment. Always take all the steps, do not take sanitation shortcuts. While shortcuts may make your job go faster, it may compromise the safety of mangos that are going to consumers.
- Remember, a surface must be cleaned in order to be sanitized.
- What are biofilms and harborage sites? Pay extra attention to harborage sites. These sites may need a little extra effort to properly sanitize, since they are the most likely places for bacteria to hide and grow.
- Basic concepts for handling chemicals. Have respect for the chemical products you handle, always use them according to the manufacturer's instructions.
- Lastly, it is important to notify your supervisor of any sanitation lapses or hygiene issues that you see in the packinghouse.
- This is the end of our discussion about sanitation in mango packinghouses.
- Are there any questions?

Thank you for participating.

Please make sure you have signed the attendance sheet.

## What did we Learn / What is my Job?

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## Mango Industry Cleaning and Sanitation Practices