



National Food Safety Guidelines for Cantaloupe and Netted Melons

Guidance for Growing, Harvesting,
Cooling, Packing, and Transportation

Version 2.6
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DISCLAIMER

This document offers guidance on cantaloupe and netted melons food safety practices. For the purposes of this document the term, “netted melons” is used to refer to whole uncut cantaloupe and all types of melon with a netted exterior. This document is not intended to replace a thorough review or application of the regulatory framework as it applies to each user’s products and operations. Adherence to the descriptions of regulatory requirements contained in this guide does not guarantee compliance with applicable laws and regulations. Please note that this guide does not constitute legal advice and does not create or imply an attorney-client relationship. The recommendations provided are not exhaustive and may not be applicable in every situation. The authors and contributors of the document do not assume responsibility for users’ compliance with applicable laws and regulations. We strongly recommend that users consult their own legal and technical advisers to ensure their procedures and operations meet federal, state, and local requirements.

About this document. This document is owned by Western Growers. The updates contained in this version were facilitated by the Association and developed through a national collaborative effort.

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GLOSSARY

Terms used in this document are defined as follows:

Term	Definition
agricultural inputs	Any internally sourced or created materials (e.g., on-farm manure, on-farm compost, extracted groundwater, retained open-pollinated (OP) seed) and all other buy-in or accepted materials used in crop production (e.g., commercial seed, nutrient management products, pest management products).
agricultural water (as used in this document)	Water that is intended to, or is likely to, contact netted melons or food contact surfaces, including water used in growing activities (including irrigation water applied using direct water application methods, water used for preparing crop sprays, and water used for growing sprouts) and in harvesting, packing, and holding activities (including water used for washing or cooling harvested netted melons and water used for preventing dehydration).
agricultural water systems	A source of agricultural water, the water distribution system, any building or structure that is part of the water distribution system (such as a well house, pump station, or shed), and any equipment used for application of agricultural water to netted melons during growing, harvesting, packing, or holding activities.
adjacent and nearby land	Land within a proximity that could potentially affect safe production of netted melons.
biosolids	<p>Solid, semisolid, or liquid residues generated during primary, secondary, or advanced treatment of domestic sanitary sewage through one or more controlled processes.</p> <ul style="list-style-type: none"> • Class A: Class A biosolids undergo a “Process to Further Reduce Pathogens (PFRP).” Pathogens are reduced to a level similar to the native soil and environment. Class A biosolids products can be used on hand golf courses, and other places where public contact is likely. Class A biosolids products include composted biosolids, lime pasteurized biosolids, and fertilizer pellets. Class A biosolids products are soil amendments, potting soils, and slow-release fertilizers. • Class B: Class B biosolids undergo a “Process to Significantly Reduce Pathogens (PSRP).” This means that while pathogens are significantly reduced to levels which are often below those found in animal manure, management practices (BMPs) are required at the site where they are used. Class B biosolids are used in bulk as fertilizers in agriculture and forestry and to reclaim barren lands. Site permits are required.
cantaloupe (in this document)	A particular variety of netted melon within the species, <i>Cucumis melo</i> .

GLOSSARY (continued)

Term	Definition
compost	Decayed organic matter product of a managed treatment process through which microorganisms break down plant and animal materials into more available forms suitable for application to the soil. For agricultural use, particularly in organic farming, compost must meet specific carbon-to-nitrogen ratios (25:1 to 40:1) and temperature requirements (131°F–170°F) for a set duration, ensuring proper decomposition and pathogen reduction.
cross-contamination	Transfer of a human pathogen (i.e., disease-causing bacteria and viruses), a chemical hazard, or any unintended substance from a contaminated item, surface or media to a previously uncontaminated item, surface, or media.
critical tracking event (CTE)	A point in the supply chain where Key Data Elements (KDEs) must be recorded and maintained to facilitate traceability. These events include activities such as growing, receiving, transforming, creating, and shipping food on the Food Traceability List (FTL). ¹
cull (verb)	To remove any product from the food stream that shows signs of physical damage or defect (such as skin breaks, decay, or market imperfection); noun: the product removed from the food stream; adjective: describes objects involved in or associated with the removal of said product (i.e., cull bin, cull chute).
cultivation	Any agricultural action or practice used by growers to allow and improve the growing conditions of fresh fruits or vegetables grown in the field (with or without cover) or in protected facilities (hydroponic systems, greenhouses).
deep cleaning	Cleaning tasks for areas considered hard to reach (i.e., hard to see, touch, or sample) and/or not included in routine cleaning.
dropped produce	Produce that drops to the ground before harvest; does not include root crops (e.g., carrots), crops that grow on the ground (e.g., netted melons), or produce that is intentionally dropped on the ground during harvest (e.g., almonds).
environmental assessment	An evaluation of the growing environment taking into consideration factors, including topography, hydrology, geographical features, climatic conditions, land history, adjacent and nearby land use, agricultural water, and local and migratory animal populations as well as human activities that may increase the potential for netted melons to be contaminated. Environmental assessments, as outlined in sections 6.1 and 6.9.1, should be conducted prior to planting, during growing activities, and immediately prior to harvest.
facilities	Any permanent or temporary establishment, structure or structures used in the production, packing, cooling, storage, and shipping of netted melons. This includes storage facilities for packing materials, chemicals, and equipment, but for the purposes of this guidance document, does not include processing or fresh-cut establishments.

GLOSSARY (continued)

Term	Definition
farm (for the purposes of this document)	An operation in which fresh netted melons are grown, harvested, and in some cases, field-packed.
flooding	The flowing or overflowing of a field with water outside a grower's control that is reasonably likely to contain microorganisms of significant public health concern and is reasonably likely to cause adulteration of edible portions of fresh produce in that field.
ground spot	An area on the surface of netted melons characterized by a lighter color, thin or no netting and which may be soft, typically caused by prolonged contact with the ground.
grower	The person responsible for the management of the primary production of netted melons.
handler	Any person who handles, processes, ships or distributes netted melons for market whether as owner, agent, employee, broker or otherwise. This definition does not include a retailer.
hazard	A biological, chemical, or physical agent or undeclared allergen in, or condition of, food with the potential to cause an adverse health effect.
key data element (KDE)	Information associated with a critical tracking event for which a record must be maintained and/or provided in accordance with subpart S of 21 CFR Part 1 .
manure	Raw and untreated animal excrement including incomplete or improperly composted or treated animal excrement.
microbial standards for drinking water	Code of Federal Regulations (CFR) Title 40 Part 141.52 "Maximum contaminant level goals for microbiological contaminants" (Total coliform = non-detected in 100 mL sample). ²
microorganisms	Include yeasts, molds, bacteria, viruses, nematodes, and parasites. When used as an adjective, the term "microbial" is used.
mitigation strategies	Includes avoidance, exclusion, prevention, prophylaxis, inactivation, and other corrective actions or measures.
netted melons	Refers to whole, uncut, organic and conventional melons of the species <i>Cucumis melo</i> that have ribbed, net-like rinds; also called muskmelon or rockmelon.
nonsynthetic fertilizer	Any agricultural input that contains animal manure, parts, products, plant-based extractions, and/or by-products or food or green waste that has not been appropriately treated to ensure it does not introduce human pathogens to the production environment.

GLOSSARY (continued)

Term	Definition
packing	The physical process or action of putting fresh netted melons in a package. This may take place in a field or in a facility.
packing facility	Any indoor, covered or partially enclosed area with food-contact surfaces in which fresh netted melons receive post-harvest treatment and/or are packaged.
pathogen	As used in this document - an infectious microorganism such as a virus, bacterium, parasite, or fungus that causes disease in humans.
periodic equipment cleaning (also referred to as "deep cleaning")	Cleaning tasks for areas considered hard to reach (i.e., hard to see, touch, or sample) and therefore need disassembly to enable cleaning. Examples of these areas could include but are not limited to: Wear strips under belts, sandwich spots (adjoined laminated surfaces such as support strips, flaps to chlorine tunnels), hidden surfaces, mechanical drive and support rollers, and bearings.
potable water	Water which meets quality standards of drinking water such as described in the US EPA Clean Water Act and WHO's Guidelines for Drinking Water Quality. ¹
primary production	Those steps involved in the growing (e.g., planting, irrigation, application of fertilizers, cultivation, pest management, application of agricultural chemicals), packing and harvesting of netted melons.
Produce Safety Rule	Established under the Food Safety Modernization Act (FSMA), sets science-based minimum standards for the safe growing, harvesting, packing, and holding of fruits and vegetable intended for human consumption. Fresh Produce growers must comply with the PSR for the growing, harvesting, packing and holding of covered fresh produce.
retail operations	Establishments that sell product directly to consumers.
ready-to-eat	Any food that is normally eaten in its raw state or any other food, including minimally processed foods, for which it is reasonably foreseeable that the food will be eaten without further processing that would significantly minimize biological hazards.
risk	The likelihood and severity of harm from an identified hazard that may occur during food production.
sanitary facilities	Toilets and hand-washing stations including both portable and permanent facilities.
shipper	Shipper and Handler are synonyms for purposes of this document. See definition of Handler .
standard operating procedure (SOP)	A document that describes a specific food safety or production practice and includes the goal/objective of the procedure, version date and author, requisite equipment and steps to accomplish the objective.

GLOSSARY (continued)

Term	Definition
standard sanitation operating procedure (SSOP)	A document that describes a specific sanitation process or practice and includes the goal/objective of the process, version date and author, requisite equipment, steps, and records to accomplish the objective and verification measures.
validation	Obtaining and evaluating scientific and technical evidence that a control measure, combination of control measures, or the food safety plan as a whole, when properly implemented, is capable of effectively controlling the identified hazards.
verification	The application of methods, procedures, tests and other evaluations, in addition to monitoring, to determine whether a control measure or combination of control measures is or has been operating as intended and to establish the validity of the food safety plan.
visitor	Any person (other than employees/workers/personnel) who enters your farm or facility with your permission.
worker	Includes the permit holder, person in charge, employee, person having supervisory or management duties, person on the payroll, family member, volunteer, person performing work under contractual agreement, or other person working on a farm or in a packing facility.

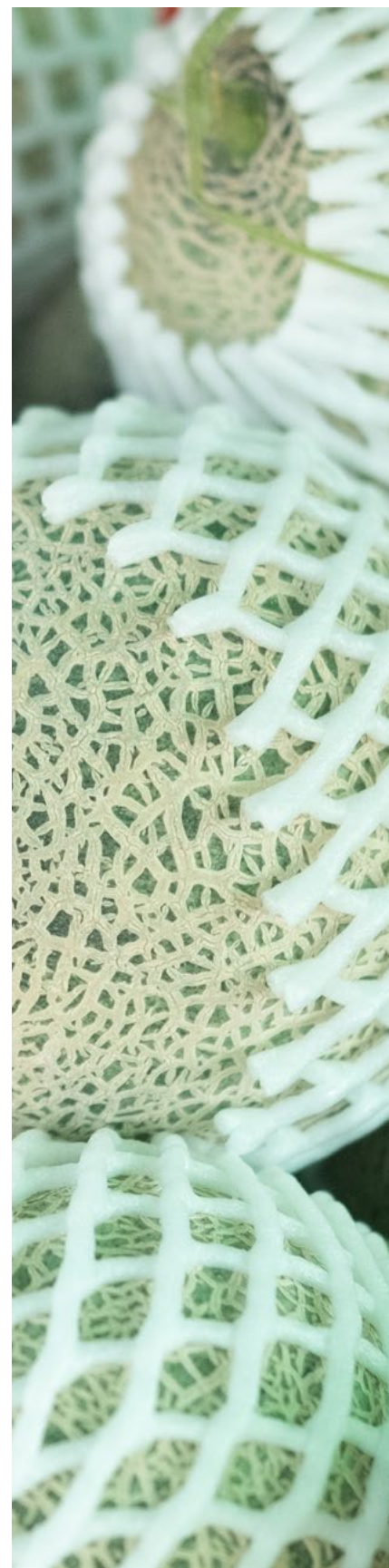


1 [Food Traceability List | FDA](#)

2 [National Primary Drinking Water Regulations | US EPA](#)

ACRONYMS AND ABBREVIATIONS

A2LA	American Association for Laboratory Accreditation
AFDO	Association of Food and Drug Officials
AFO	animal feeding operation
ANAB	ANSI National Accreditation Board
ATP	adenosine triphosphate
APC	aerobic plate count
BSAAO	biological soil amendments of animal origin
CAC	Codex Alimentarius Commission
CAFO	confined animal feeding operation
COA	certificate of analysis
COC	certificate of conformance
CTE	critical tracking event
DL	detection limit
EMP	environmental monitoring program
US EPA	United States Environmental Protection Agency
FDA	United States Food and Drug Administration
FSMA	Food Safety Modernization Act of 2011
FTL	food traceability list
GAPs	good agricultural practices
GMPs	good manufacturing practices
HACCP	hazard analysis and critical control point
ISO	International Organization for Standards
KDE	key data element
MRL	maximum residue limit/level
OSHA	Occupational Safety and Health Administration
PPE	personal protective equipment
PSR	Produce Safety Rule
RMBP	resistance management best practices program
SDS	safety data sheet
SOP	standard operating procedure
SSOP	standard sanitary operating procedure



1.0 INTRODUCTION

Netted melons including new types beyond traditional cantaloupe, muskmelons and rockmelons (all types are referred to as “netted melons” in this document), are often consumed alone, mixed with other foods such as in salads, smoothies, and cocktails, and used as garnishes. Netted melon demand has remained high as they are readily available in many countries year-round. In recent years, marketing of fresh-cut products in convenient packaging or in salad bars has grown in popularity. To satisfy consumer taste and demand for netted melons, new hybrid varieties have been developed with improved nutrient density, higher sugar content, more complex organoleptic flavor components, and other traits consumers value. In addition, new hybrids allow for expanded netted melon production in new geographic and climatic areas as well as an extended reach of distribution. These new locations may pose different risks than those areas traditionally used for the growth of netted melons. While this document focuses on providing specified guidance for different growing regions within the United States (U.S.), it may also be applied to international operations.

Like other fresh fruits and vegetables commonly eaten raw, the safety of netted melons depends on the identification, management, and reduction of potential contamination risks from biological, chemical, and physical hazards. Maintaining strong food safety programs (e.g., GAPs, GMPs, HACCP) throughout the supply chain during primary production, packing, processing, retail, and at the point of consumption is critical. Outbreaks, both domestic and international, attributed to netted melons raise concerns among consumers, government regulators, and industry partners. Historically, a large percentage of foodborne illness outbreaks associated with cantaloupe consumption have been caused by *Salmonella* spp. and more recently, *Listeria monocytogenes* contamination.^{3,4} Major risk factors for initial contamination or subsequent growth of bacterial pathogens, identified during cantaloupe outbreak investigations include, but have not been limited to water quality and use (both pre and postharvest), residual surface moisture, elevated risk that may be posed by adjacent and nearby land use, and failures in packing equipment and facility cleaning and sanitation.^{5,6} In addition, if human pathogen contamination occurs, the commodities intrinsic characteristics make netted melons particularly susceptible to pathogen persistence and even growth due to their sugar content, rough texture or netted rinds, which can harbor pathogens.

Following harvest, there may be opportunities for human pathogen contamination, survival and growth as netted melon products move through the supply chain. Factors contributing to pathogen survival and growth on netted melons include pH, temperature, competing organisms and availability of moisture and nutrients present on the rind tissues. Moreover, morphological characteristics of netted melons make them particularly susceptible to bacterial attachment and provide a good medium for growth of spoilage organisms and pathogens. Because netted melons are a low-acid and high sugars food, their edible flesh is conducive to supporting bacterial growth including human pathogens if they are introduced to sub-rind tissues and the temperature is favorable. Fresh netted melons are typically consumed without further processing or treatment that would eliminate or inactivate human pathogens. Thus, all parts of the netted melon supply chain need to be proactive to prevent, reduce, and eliminate the likelihood of contamination.

3 Report of the FAO to the Codex Committee on Food Hygiene Working Group on the development of an Annex on cantaloupes for the Code of Hygienic Practice for Fresh Fruits and Vegetables (CAC/RPC 53-2003)

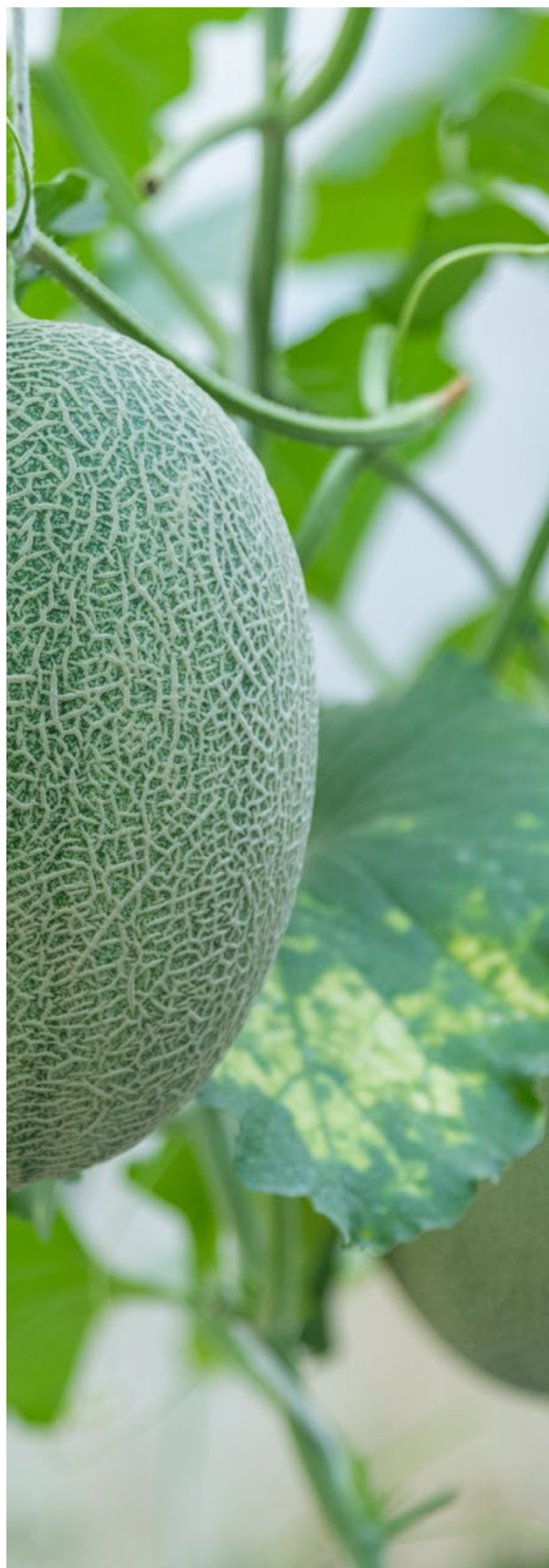
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2.0 OBJECTIVE

The primary purpose of this document is to provide practical guidance on how to manage microbial hazards and minimize risks during primary production, packing, and transport of fresh whole netted melons. However, physical and chemical hazards and risks are also covered. Companies in the netted melon supply chain are strongly encouraged to use this guidance to develop specific food safety programs and practices to ensure microbial, chemical, and physical hazards are managed and risks minimized in their operations. The original (2013) version of this document incorporates key elements of the Draft Annex on Melons (2011) to the *Code of Hygienic Practice for Fresh Fruits and Vegetables* (2003) developed by the FAO Codex Committee on Food Hygiene for the Codex Alimentarius Commission (CAC) as well as the *Produce GAPs Harmonized Food Safety Standard* (UFPA, 2011) and the *Commodity-Specific Food Safety Guidelines for the Production, Harvest, Cooling, Packing, Storage, and Transporting of Cantaloupes and Other Netted Melons* (2013). Recommendations for the primary production of fresh fruits are covered in general by other food safety documents (see **section 10.0 Additional Resources**), and include the CAC's *Code of Hygienic Practice for Fresh Fruits and Vegetables* (2003), Canada GAP's *On-Farm Food Safety Manual for the Production, Packing and Storage of Fruits and Vegetables* (2012), the FDA's *Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables* (1998) and SENASICA's *General Requirements to Recognize and Certify Systems Aimed at Reducing Contamination Risks during the Production of Agricultural Products*. This version of the guidance (2025) incorporates regulations promulgated under the FDA's Food Safety Modernization Act (FSMA), new knowledge and elements of the New South Wales (Australia) Government's *Melon Food Safety* and other commodity-specific food safety guidelines, and recognizes regional practices, such as those identified by Colorado State University and Rocky Ford in the document titled "*Cantaloupe production practices for the State of Colorado*".



3.0 SCOPE

This document provides guidance for growing, harvesting, packing, cooling, storing, transporting, distributing, and handling of fresh whole netted melons. This document is intended as guidance only to assist individual operators to tailor their individual programs using high levels of prevention and protective practices where feasible. Strong preventive programs, based on good agricultural practices (GAPs), good manufacturing practices (GMPs) and commodity-specific guidelines such as these, also include food safety plans, documented standard operating procedures (SOPs) and standard sanitation operating procedures (SSOPs), record keeping, training, and committed food safety personnel or teams. Netted melon grower-shippers are encouraged to review regulations promulgated under FSMA, or the relevant national regulations, to ensure their programs are compliant.⁷

For the purposes of this document the term “netted melons” is used to refer to whole uncut cantaloupe and all varieties of melon with a full or partially netted exterior. This guidance is applicable to both organic and conventional netted melons grown in the field or in protected or semi-protected structures (e.g., hoop-houses, greenhouses or shade houses). It focuses on preventive controls to minimize the contamination risk from microbial, physical, and chemical hazards. These guidelines do not supersede requirements for physical, chemical, and biological hazards addressed by federal, state, or other regulatory bodies. In addition, the document provides a strong foundation for developing customized and comprehensive written food safety programs that identify potential hazards and assess risks and steps to address them. Each section of the document specifies the types of records that should be retained for a minimum of two years or as required by prevailing regulations. Not all documentation listed may be applicable to all operations.



⁷ [Food Safety Modernization Act \(FSMA\) | FDA](#)

4.0 GENERAL RECOMMENDATIONS

In addition to the regulatory requirements in the Produce Safety Rule and area-specific recommendations discussed in latter sections, there are several general recommendations that are part of an effective best practices program. These recommendations are outlined below.

- Every company should have a written policy signed by senior management that outlines the company's commitment to food safety, how it is implemented and how it is communicated to employees.
- Prepare a written food safety plan (FSP) that specifically addresses the practices listed in this document. This plan should address at least the following areas: water, soil amendments, environmental factors, work practices, and field sanitation.
 - Companies should review their FSP at least annually and make revisions as appropriate to their particular situation based on their operation-specific risk assessments, updated or new guidance, regulations, and/or changes to their operations (e.g., new field location, new equipment, new product formulations or new season).
 - Every company should have a policy that establishes corrective actions when food safety practices are not in compliance. Corrective actions should be completed within a specified timeframe and documented.



5.0 WORKER TRAINING AND HYGIENIC PRACTICES

Worker training programs should be designed to help workers understand what is expected of them and why these practices are important. Growers must comply with regulatory requirements, such as subpart C of the Produce Safety Rule for worker training. The following practices are recommended for each primary production operation:

- Every worker (including temporary, part-time, seasonal, and contracted workers) must receive mandatory training in the company's food safety policy and plan, food safety principles and procedures, sanitation, and personal hygiene appropriate to their job responsibilities at hire, at the start of the season, as needed, and thereafter, at least annually.⁸
- Establish a training policy and SOP(s) to address training requirements.
- Training programs must address operation-specific practices for workers as well as for visitors, third-party contractors, vendors and repair/service providers.
- All workers must have a combination of education, training, and experience necessary to perform their assigned duties in a manner that ensures compliance with the company's food safety plan.
- At least one supervisor or responsible party for your company must have successfully completed produce safety training at least equivalent to that received under standardized curriculum recognized as adequate by FDA.^{9,10}
- Worker training must be conducted in a manner that is easily understood by those being trained.¹¹
- Training must be repeated as necessary and appropriate considering observations or information indicating that workers are not meeting performance and compliance standards established by the company's food safety plan.¹²
- Document worker training sessions with a general description of the subject matter, the trainer's name, the date of training, and the signatures, initials, or list of workers attending the training.¹³

Documentation:

- Training SOP
- Worker training manual/materials
- Worker training records/logs
- Supervisors training certificates
- Verification review of training logs

5.1 Personal hygiene

Growers must comply with regulatory requirements, such as subpart D of the Produce Safety Rule for health and hygiene and state or federal worker safety and health requirements.¹⁴ To reduce the risk of pathogen contamination by humans, establish and implement SOPs that address the following:

- Establish written policy for worker health and hygiene and sanitary facilities. The policy should address worker hygiene training, use of the sanitary facilities, and if applicable, protective clothing or supplies to enable workers to practice proper hygiene.
- All workers (including contract workers), supervisors, and, as appropriate, visitors in netted melon production areas must adhere to the company's policy for personal hygiene.¹⁵
- Workers should begin the workday in appropriate, clean clothing or protective outer garments, and change if visibly contaminated or workers leave the site.

- Workers must remove or cover hand jewelry while handling netted melons.¹⁶
- For companies that provide or require workers to wear protective clothing:
 - Address how protective clothing is to be used, disposed, or stored, and cleaned.
 - Maintain log sheets to verify these procedures are being followed.
- Establish a handwashing SOP that provides instructions including:
 - When workers must wash their hands (e.g., before handling netted melons, at the beginning of the workday, after using the sanitary facilities, following breaks, after touching animals or animal waste, and any time workers touch phones or leave/return to the site).¹⁷
 - How to wash hands - proper techniques of washing using soap and potable running water (i.e., meets the microbial standards of drinking water)² and drying hands thoroughly using single-service towels, sanitary towel service, electric hand dryers, or adequate hand drying devices.¹⁶ For personnel working in areas where netted melons are present, hand sanitizers may be used after handwashing but not as a substitute for handwashing.
- Periodically monitor workers for compliance with company handwashing policies and procedures.
- When gloves are used, implement proper glove-use practices, including:¹⁸
 - Always wash and dry hands prior to putting on gloves.¹⁹
 - Appropriate handling and storing of reuseable gloves when using a field toilet.
 - Reusable gloves should be changed daily and made of materials that are easily cleaned and sanitized.
 - Prohibit use of personal reuseable gloves and taking gloves home; gloves are to be cleaned after each day of use by the company or third-party vendor.
 - Establish a captive glove SOP and SSOP for reuseable gloves.
 - Clean and sanitize reusable gloves regularly and store in a clean and controlled area.
 - Document and log the reuseable glove cleaning process.
 - Discard disposable gloves when they become torn or are uncleanable.²⁰
- Confine smoking, eating or drinking beverages other than water to designated areas.
- Prohibit urinating, defecating, spitting, and chewing gum (or similar) in the production and handling areas.
- Refrain from any behaviors or actions that could result in the contamination of netted melons (e.g., unprotected sneezing or coughing over netted melons or food-contact surfaces).

Documentation:

- Worker health and hygiene policy
- Sanitary facilities policy
- Handwashing SOP
- Protective clothing use and storage SOP
- Protective clothing and glove inventory/cleaning logs

5.2 Health status

To reduce the risk of pathogen contamination via human transmission, the following practices are recommended for all personnel and visitors in fields and facilities where netted melons are present:²¹

- Properly clean and disinfect cuts, wounds and other injuries and protect with waterproof dressings. Injuries should be immediately reported to management (e.g., supervisor, crew lead, etc.) to allow them to decide whether the injured personnel can continue to work in proximity to netted melons or food-contact surfaces.
- Prohibit people exhibiting symptoms or suspected of being a carrier of an infectious disease or illness from entering production and handling areas. Any person so afflicted must immediately report illness or symptoms of illness to management.⁷
- Keep records of observed and reported workers' symptoms of illness such as respiratory or gastrointestinal distress (e.g., head cold, sinus infection, bronchial or lung disorders, diarrhea, etc.). Records should be anonymous (i.e., should not include identification of the worker(s) with the reported symptoms).
- Workers should be trained to notice and report symptoms of diarrhea or food-transmissible infectious diseases in themselves and others.
- Establish a policy for handling/disposing of netted melons or disposable food-contact (packing materials) and non-disposable food-contact surfaces (belts, packing platforms) that have come into contact with blood or other bodily fluids.
- First aid kits, including appropriate wound coverings, should be readily available, well-provisioned, unexpired, in sanitary and usable condition, and maintained in accordance with prevailing regulations.

Documentation:

- Personnel illness and injury reporting policy
- Bodily fluids contamination response and responsibilities policy
- Illness and injury report records and corrective actions
- First aid kit inventories

8 § 112.21(a)&(b)

9 §112.23

10 [Draft Guidance for Industry: Evaluating Alternate Curricula for the Standards for the Growing, Harvesting, Packing, and Holding of Produce for Human Consumption | FDA](#)

11 § 112.21(c)

12 § 112.21(d)

13 § 112.30(b)

14 [1928.110 - Field Sanitation. | Occupational Safety and Health Administration](#)

15 § 112.31, § 112.32, § 112.33

16 § 112.32(b)(5)

17 § 112.32(b)(3)

18 § 112.32(b)(4)

19 § 112.32(b)(3)(ii)

20 Zhao IY, Jung J, Moyne AL, Schaffner DW, Harris LJ. 2021. Evaluation of glove type on survival and transfer of *Escherichia coli* in model systems and during hand harvesting of lettuce. *JSFA Rep.* 1(1):17-25.

21 §112.33

6.0 PRIMARY PRODUCTION

The production environment and production practices used for netted melons should be evaluated for food safety hazards, and preventive controls should be adopted where necessary.

6.1 Environmental Risk Assessment

An environmental risk assessment is an evaluation of the growing environment to identify potential sources of hazards, assess the likelihood of contamination posed by the hazard(s), and manage them prior to and during growing activities. Additional information on conducting environmental risk assessments is available in **Appendix A**.

6.1.1 Site selection assessment

When selecting a site for netted melon production, assess the field under consideration, adjacent and nearby land as well as for hazards associated with “in-proximity” land uses and features, water sources and waterways for potential sources of hazards and the likelihood of contamination from current and prior use including, but not limited to:

- Topographical and geographical features of the site – soil type and nearby vegetation, environmental water (e.g., drainage ditches, non-agricultural surface water, and public waterbodies), and the slope and the potential for runoff from nearby land/fields. This includes flood risk as well as hydrogeological traits and features of nearby sites and of regional groundwater, regional groundwater recharge practices, and water table fluctuations in relation to the production site.
- Adjacent and nearby land use – the proximity of activities and other factors that may present a contamination risk to production land, agricultural water and planted beds and may contact developing fruit and ground spot tissue. See **Table 1** for a description of these risk factors and potential mitigation strategies.
- Historical land use – any previous use of the site and adjacent and nearby land that may impact food safety (e.g., hazardous waste sites, landfills, concentrated animal operations, applications of soil amendments of animal origin, industrial activities).
- Climate and weather events – climatic conditions can affect risk in the growing environment. Examples of regional or local climate and microclimatic conditions that might elevate the likelihood of contamination to netted melon crops, include, but are not limited to:
 - Frequent or heavy rainfall that might result in flooding or persistent standing water, which may attract animals or increase the potential for human pathogen survival in the soil or on non-soil surfaces. Heavy rainfall events can potentially elevate contamination risk due to splashing microbial hazards onto the surface of the fruit.
 - Prevailing and counter prevailing or recurring seasonal high winds that might transport pathogens from sources outside the netted melon field.

6.1.2 Pre-planting assessment of the production environment

As close to the first planting of the season as possible, assess the production site location and adjacent and nearby land and water sources, waterways, modes of water extraction and managed distribution systems for potential hazards and contamination risks from current and prior use that would make a site unsuitable for production. Assessments should include, but not be limited to the following:

- Reassess the potential sources of hazards identified in the site selection assessment. Additional information on conducting a pre-planting environmental assessment is available in **Appendix A**.
- Analyze environmental assessment data (e.g., graph it to look for trends, calculate the mean and standard deviations, etc.) on a routine basis to increase your understanding of the baseline values that can then be compared to data points from events that potentially elevate or enhance the contamination risk.

Documentation:

- Site selection assessment SOP
- Pre-planting environmental assessment SOP
- Pre-planting environmental assessment findings and mitigation measures

Table 1: Crop land and water source adjacent and nearby land use

ADJACENT AND NEARBY LAND USES	EXAMPLES	POTENTIAL RISK FACTORS	POTENTIAL MITIGATIONS REQUIREMENTS
Animal operations	AFOs, CAFOs, grazing lands, domestic animals or hobby farms	Distance, topography, water runoff, number of animals, operation management practices, prevailing and counter-prevailing wind direction and seasonal patterns (wind speed, wind run, diurnal characteristics) land use history	Water treatment, vegetative buffers, barriers, increased buffer distances, animal and insect monitoring, communicating with neighbors to coordinate activities
Compost/Soil amendment operations	Compost operations, Non-synthetic soil amendment pile (with or without animal product)	Distance, timing of production, production process, volume, storage, topography, water runoff, wind direction, history, method of application	Preventive barriers, process and documentation verification, controlled storage
Hazardous waste sites	Dumps, manufacturing facilities (abandoned & functioning), waste treatment facilities	Distance, production processes, storage, topography, runoff, wind direction	

ADJACENT AND NEARBY LAND USES	EXAMPLES	POTENTIAL RISK FACTORS	POTENTIAL MITIGATIONS REQUIREMENTS
Other crop cultivation	Cover crops, perennial crops, other; timing of cultivation and harvesting activities	History of risk identification, distance from adjacent operation, topography, crop production timeline, foreign objects, animal/bird attractant, grazing animals, harvest practices, adjacent non-covered crop pest harborage.	Communication with neighbors, timing of soil amendments application and other practices, increased monitoring, physical barriers.
Water source	Well-head or surface water	Aquifer characteristics, well casing design, integrity, and depths of extraction, history of risk identification, distance from adjacent operation, topography, opportunity for water run off through or from untreated manure, or composting operations, soil leaching, pastures, feedlots	Adjacent operation management practices, increased monitoring, preventive barriers, type of system (closed vs open), water treatment
Water storage and conveyance	Stagnant/pooled water (non-flooding or rain-related); reservoirs; lagoons, integrity of the storage, conveyance and distribution systems.	History of risk identification, distance from an adjacent operation, topography, flooding, animal intrusion, trash and debris, excessive vegetation, the integrity of water storage, conveyance, and distribution.	Adjacent operation management practices, increased monitoring, type of system (closed vs open), water treatment
Urban and rural setting	Homes or buildings with septic leach field	History of risk identification, distance, topography, leach field status (active vs inactive), runoff. Presence of domesticated animals.	Preventive barriers, monitoring for septic leach field issues; outreach to community.
Other environmental considerations	Habitat/riparian areas	History of risk identification, distance from potential risk, topography, potential for animal intrusion, physical hazards	Preventive barriers, increased monitoring

6.1.3 Pre-season assessment of agricultural water (see section 6.5 for requirements related to pre-harvest water and water use)

To ensure suitability prior to use during the first planting of the season, conduct an annual pre-season assessment of your agricultural water source(s) and distribution system(s), irrigation system(s) and practices, and environmental conditions that may affect your agricultural water. When doing this assessment, growers must comply with regulatory requirements, such as subpart E of the Produce Safety Rule for agricultural water. Additional information on conducting agricultural water assessments is available in **Appendices A and C**.

- For all agricultural water sources, identify, map, and document potential sources of hazards, when they occur, etc.
 - Type of water (surface, deep well, shallow well, recycled, etc.)
 - Slotting or screening of well casing in vadose zone (above saturated aquifer)
 - Type of distribution system (open, closed, or combined)
 - Identify types of hazards associated with each water source.
 - Cross-connections and any opportunity for cross-contamination (e.g., wells, pumps, storage, backflow, air gaps)
- Assess and document agricultural water practices.
 - Type of application method (e.g., surface or subsurface drip, furrow, overhead, etc.)
 - Methods should minimize netted melons contact with water. (e.g., raised beds, plastic mulch combined with subsurface drip irrigation),
 - If applied water could potentially contact netted melons, water quality requirements may need to be adjusted (e.g., more stringent) to minimize risk to the crop.
 - A description of the water treatment process, if applicable (e.g., type, physical filter pore size, etc.), and measurable treatment parameters (pH, turbidity, flow rate, antimicrobial concentration, UV treatment dose, etc.)
- Growers should understand the baseline microbiological quality of their water sources and systems. If you do not have a historical microbial quality baseline for your water system at the source and point of use, the following approach is recommended to establish a baseline to support or revise your agricultural water assessment:
 - 30 days before first crown flower development or as practical as possible (i.e., considering your water availability and seasonal water distribution system activation for each crop production block), collect aseptically, as close to the point of use as possible, four 250 mL grab samples separated by at least one minute between samples and then combine into a 1-liter composite sample.
 - Submit the 1-liter sample or at least a 100 mL subsample from the 1-liter composite sample (aseptically drawn into or transferred to a standard lab container) to the laboratory for testing.
- Assess environmental conditions and weather changes (e.g., elevated/above normal temperature, heavy rainfall, flooding, high wind events, sandstorms, activities at nearby animal-feeding or composting operations or applications of BSAAO materials), based on the geographical areas of your operation, that may impact microbial water quality changes (i.e., increased turbidity, increased runoff, increased microbial load, animal intrusion, etc.).
- When an environmental assessment of historical and adjacent and nearby land use indicates a potential chemical hazard, water sources used in netted melon production should be tested for the identified chemical hazard prior to use.

Documentation:

- Agricultural water assessment documents
- Map of agricultural water sources and distribution systems
- Irrigation system, method, and practices
- Water treatment SOP (if applicable)
- Water sampling plan
- Irrigation water test results and any resulting corrective actions

6.1.4 Assessment of wildlife and domesticated animal activity

Any animal or human present in or near the production area can potentially introduce human pathogens into the environment including into surface water that may be used on unharvested netted melons. Factors such as presence, type, numbers, herd, flocking or grouping behaviors, daily activity habits, and habitats may influence the contamination risk animals pose to a netted melon production area. Prior to planting and harvesting activities and during harvest, it is important to conduct a thorough site-specific evaluation that is documented. To manage these contamination risks, the following practices are recommended:

- Prior to the first seasonal planting, prior to and during harvest, the grower, a designated food safety manager, or other trained personnel should assess the potential for wildlife, livestock, and domesticated animals to introduce human pathogens into the production environment. The assessment should:
 - Assess the risk for each potential hazard identified. A decision tree for evaluating animal hazards and fecal matter is presented in **Figure 1**. Additional information on conducting assessments of animal activity in the production area is available in **Appendix A**.
 - Include the corrective actions and/or strategies implemented to protect against, control or reduce the risk of hazards to the crop.
 - Describe strategies to minimize the likelihood of animal attraction (e.g., standing water, restricted access to water, non-crop food source (i.e. fruit tree adjacent to farmed land, a production site free of waste, debris, and clutter).
 - Mitigation strategies should comply with local, state, and federal regulations.
- Monitor netted melon production sites and handling areas for evidence of crop contamination (e.g., fecal matter, animal intrusion, feeding or other crop damage).
 - When identified, buffer the area(s) and do not harvest inside the buffer area.
 - When establishing a no-harvest buffer, the radius or size will depend on risk factors, which will have to be assessed prior to harvest (i.e., the quantity and distribution of the feces, meteorological factors such as a predicted rain event, high winds, or drift that could result in spreading).²²
 - The no-harvest buffer should be adequate for equipment usage without further spreading of contamination – especially when fecal matter is in the furrow where equipment or humans (e.g., harvest crews) travel. Document corrective actions implemented by a food safety professional (e.g., removal of a hazard, harvest buffers, destruction of crop, implementation of longer-term strategies to minimize ongoing risk, etc.).
 - When setting “no-harvest” buffers, conduct a root cause investigation to better understand the risk in relation to a set of site-specific conditions and document the findings.²³
 - Maintain netted melon production and handling areas to reduce the likelihood of animal attraction.

- Growers are encouraged to contact the relevant agencies (e.g., state and federal fish and wildlife agencies, departments of health and agriculture) to develop and document strategies to mitigate animal intrusion. Caution needs to be taken as some of the “pests” (e.g., birds, amphibians, rodents, etc.) could require a depredation permit or be protected or an endangered species, and thus it is important to understand how to manage them within the law.

Documentation:

- Assessment of animal intrusion (pre-plant, pre-harvest, harvest)
- Monitoring records
- Corrective actions/Mitigation measures
- Root cause investigation report

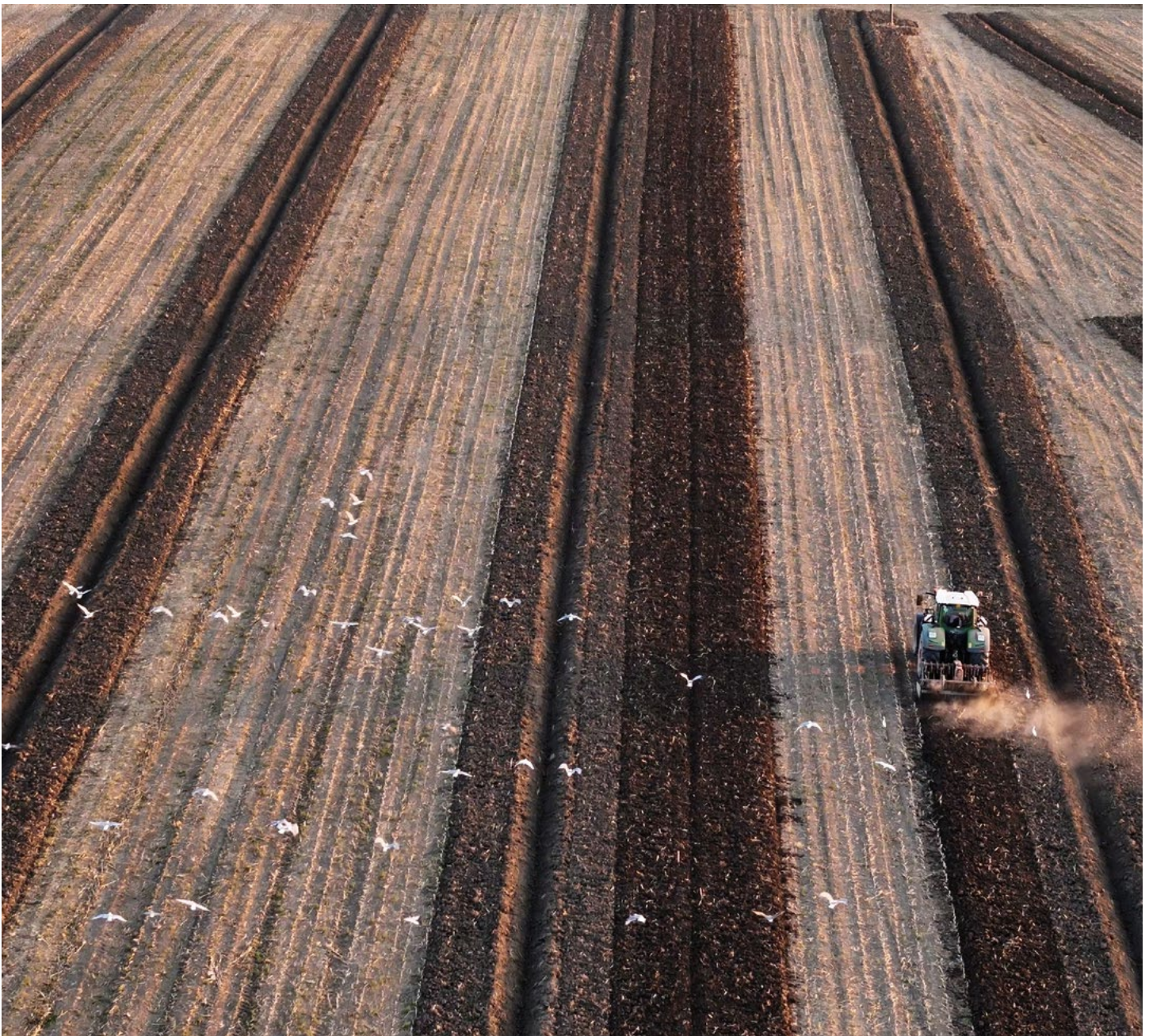
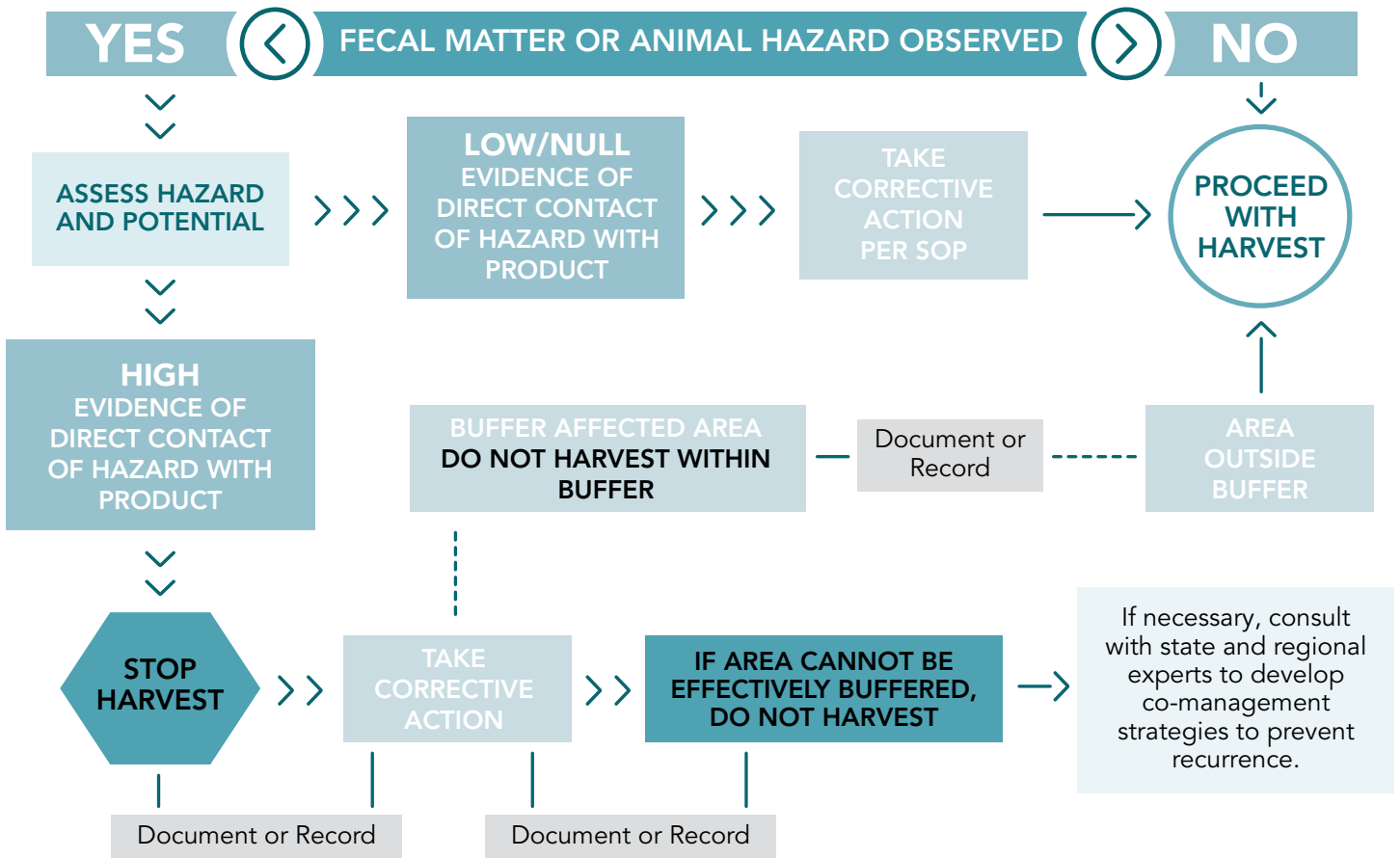
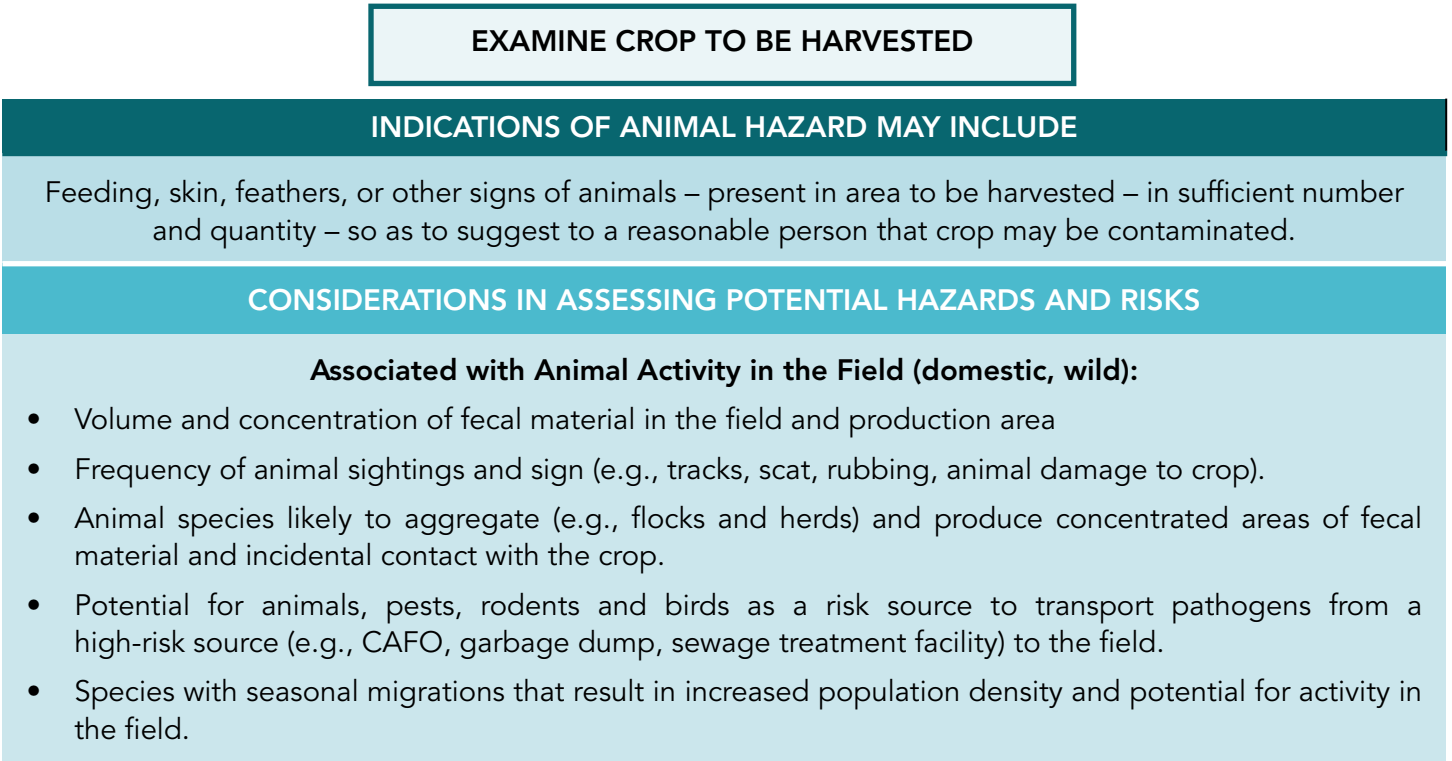


Figure 1: Environmental Assessment – Animal Hazard/Fecal Matter Decision Tree



6.2 Contact with the ground

The Produce Safety Rule includes provisions that exclude the harvesting of produce that drops to the ground before harvest. Crops such as netted melons that grow on the ground are excluded from the requirement to not harvest produce that has dropped on the ground. However, where netted melons are in direct contact with moist soil, ground cover or growth media, "ground spots" commonly form on the rind. Growers may use various measures to avoid or reduce ground spot formation. These measures should be evaluated to ensure that they do not increase the risk of crop contamination.

- Minimize crop contact with prolonged moist soil, ground cover, or media to avoid ground spot formation.
 - Use of irrigation methods that limit soil moisture crossing the planted bed (i.e., avoid water application to leaves and fruit).
- If physical barriers are used underneath netted melons, the barriers should be:
 - Clean (and sanitary, as appropriate) before being placed under and/or around the netted melons.
 - Used in the field in a manner that does not increase the risk of contaminating netted melons.
- Workers having direct contact with netted melons should follow the personal hygienic practices outlined in section **5.1 Personal hygiene** when handling or turning netted melons during growing activities.

6.3 Microbiological testing

When sampling plans and methodology are properly designed and performed, microbiological testing can be a useful tool to evaluate water quality, verify the effectiveness of composting methods and sanitation practices, and in general, provide information about a production area. The intended use of information obtained (e.g., evaluating the risk posed by a particular hazard) can aid in designing an appropriate sampling plan and determining the most appropriate microorganisms for which to test. For additional information on best practices for microbiological testing, please refer to **Appendix B** for guidance on microbiological testing.

- Minimize crop contact with prolonged moist soil, growth cover, or media to avoid ground spot formation.

6.3.1 Testing Program characteristics

Clearly establish the goal of microbiological testing program.

- Microbiological testing programs should be designed to meet the specific objectives and conditions of the production process. A testing program should be carefully tailored to the unique characteristics of the matrix, and potential contamination sources.
 - Optimize sampling performance: evaluate factors such as the number of samples, sample volume, sample mass, and type of sampling to maximize the statistical power of your sampling program.
 - Ensure robust testing methodology.
 - Use accredited reference methods validated by organizations like AOAC International.²⁴
 - Verify "fit for purpose" methods for specific matrices through validation or matrix extension studies when no official validations exist.

6.3.2 Laboratory selection

In selecting a third-party testing laboratory, growers should ensure that the laboratory:

- Is accredited according to a recognized standard such as ISO 17025 or equivalent²⁵ by either US or international accreditation bodies (such as A2LA, ANAB or equivalent body)²⁶ and uses test methods that have been validated for the intended use.
- Maintains a reliable, comprehensive chain of custody (i.e., systematic documentation of all actions taken with the samples; includes information like date, time, laboratory name, name of person responsible, etc.).
- Maintains good laboratory practices certification.
- Has experience in conducting the type of testing needed for the particular type of sample matrix (e.g., soil, water, compost, product, etc.).

6.3.3 Microbiological testing result management practices

When managing microbiological testing sampling and testing results growers should:

- Document the testing objective, sampling method specifications, and test results (see **Appendix B** for additional guidance).
- Establish a policy and communication SOP for handling a positive and actionable sample.
- Document, track, and analyze the test results at least annually to determine if there are any substantial changes, outliers, and/or patterns in water quality.

Documentation:

- Laboratory name, contact information
- Laboratory accreditation
- Test records: method of reference, objective, sampling method, test results
- SOP for handling a positive, actionable test result

6.4 Sanitary facilities

Sanitary facilities refer to both toilets and hand-washing stations including both portable and permanent facilities. In order to ensure that adequate personal hygiene can be maintained, sanitary facilities should be readily accessible to workers and visitors and, where required, must be located in accordance with prevailing regulations. The following practices are recommended:

- Train workers in proper use of sanitary facilities including toilet use, proper disposal of toilet paper, and proper hand-washing and drying procedures (see section **5.1 Personal hygiene**).
- Sanitary facilities must be available in sufficient numbers and readily accessible (per federal OSHA requirements²⁷ and, where applicable, state and local regulations) to accommodate personnel and be appropriate for all individuals in the workforce.
- Location:
 - o The location and sanitary design of sanitary facilities should be optimized to facilitate the control, reduction, and elimination of human pathogens from employee hands. Evaluate the location of sanitary facilities to maximize employee/visitor accessibility and use, while minimizing the potential for the facility to serve as a source of contamination.

- o Sanitary facilities should be placed such that the location minimizes the impact from potential leaks and/or spills while allowing access for cleaning and service.
- o Establish a response plan for sanitary facility leaks or spills.
- Cleaning and maintenance:
 - o Clean and maintain sanitary facilities on a regular basis according to an SSOP so as not to be a source of contamination; maintain cleaning logs.
 - o Do not clean portable sanitary facilities in growing and product handling areas or near irrigation water sources or conveyance systems.
 - o Sanitary facilities must include potable running water, unscented soap, toilet paper, and single-use disposable paper towels or an equivalent sanitary hand drying method; multiple-use cloth drying towels should not be used.⁷ Hand sanitizers cannot replace hand washing and should only be used after hands have been properly washed with soap and potable water. All portable units should have a tank that captures used hand wash water and a wastewater disposable plan.

Documentation:

- Sanitary facility leak/spill response plan
- Sanitary facility cleaning and maintenance SSOP

6.5 Pre-harvest water and water use

Industry practice is to use drip and furrow irrigation systems for irrigating netted melons. These two methods were considered for this section. If overhead irrigation is used, additional consideration related to the microbial water quality should be addressed as identified below. In addition, growers must comply with regulatory requirements, such as the regulations in subpart E of the Produce Safety Rule for pre-harvest water. The core of this regulation includes agricultural water system inspections and maintenance and agricultural water assessments for each agricultural water system.^{28,29} It is recommended that growers assess and manage the risk posed by these waters as follows:

6.5.1 Best practices for irrigation of netted melons

- Use irrigation methods and practices that minimize direct contact of irrigation water with netted melons following stand establishment and minimize the soil surface moisture content where netted melons contact the soil or growth medium. Overhead irrigation should only be used if the water has been treated.
- Use water of known quality that does not increase the risk of netted melon contamination when:
 - o Irrigating, fertigating, and applying foliar or furrow run treatments
 - o Using water for dust abatement and to maintain roads, yards, and parking lots in areas within or near netted melon production sites.
- Avoid creating persistent pools of water that may come into contact with netted melon rinds.
- Conduct agricultural water assessments and test water, following the steps below.

6.5.2 Step 1: Agricultural water assessment:

- Regularly assess the potential for pathogen contamination (e.g., from livestock, human habitation, sewage treatment, manure and composting operations; see **Appendix C** for additional guidance) and the suitability of water's microbial quality for its intended use.³⁰

- Reassess your agricultural water system annually and whenever a significant change occurs.²⁹
- For wells/groundwater, perform an agricultural water assessment (AWA) that evaluates the following:
 - Well casing: Listen for water running down into the well. If you can hear water, there could be a crack or hole in the casing. If you can move the casing by pushing against it, you may also have a problem with the integrity of the casing.
 - Annular space (the space between two well casings or between the casing and the wall of the drilled bore hole): The annular space of the well should have a minimum of 25 feet of sealing material.
 - Well cap or seal: The well should be completely sealed against surface water, insects, or other foreign matter. Look for holes, missing plugs, leaking water (artesian flow).
 - Well vent: Check the cleanliness & integrity of the well vent screen. Look for tears or holes. Downward facing vents are a preferred design.
 - Proper functioning of the check-valve, which does not allow extended period of water pull-down (minutes not seconds), indicating backflow from water distribution connections and risers.
 - Concrete well pad: Look for cracks that would allow water to enter well casing.
 - Well pump: Make sure the pump is operating properly; check for corrosion.
 - Cleanliness surrounding the well: Look for potential contaminants, animal feces, or debris.
 - Assess gradient:
 - Is there standing water of unknown quality around the well or water draining toward the well?
 - Is well downstream from a potential contaminant source or subsurface seepage flow?
 - Potential contaminants such as:
 - Any sewer in proximity to the well
 - Watertight septic tank or subsurface sewage leaching field
 - Animal enclosures
 - Cesspool, seepage and manure.
- **For surface water**, perform an assessment that evaluates the following:
 - Animal hazards (fecal deposits, burrowing, or animal carcasses)
 - Contaminating water (water entering the water source) from excess rain or flooding.
 - Cleanliness: debris or accumulation of trash.
 - Macro-algal growth.
 - Nearby animal activities that may contaminate the water.
 - Upstream activities (e.g., weed and algal removal, sediment dredging) that could contribute to water contamination.
 - Water identified as a high-risk water source based on the pre-season water assessment (**section 6.1.3**).
 - Adjacent and nearby land use: roads, compost/manure piles or spreading, human sewage, etc.
- If events, environmental conditions (e.g., elevated temperatures, heavy rainfall, flooding or other conditions indicate that water quality may have changed from baseline measurements, repeat the agricultural water assessment as outlined in step 1 above.

6.5.3 Step 2: Water testing:

- When sampling agricultural water sources to determine the microbial quality as part of your AWA, conduct testing as follows:
 - For each water source, aseptically collect one 1-liter sample per month during the growing season. At the collection point, take a 1-liter composite sample composed of four 250 mL grab samples, separated by at least one minute between each 250 mL sample.
 - Submit the 1-liter sample or at least a 100 mL subsample from the 1-liter composite sample (aseptically drawn into or transferred to a standard lab container) to the laboratory for testing. Test groundwater samples for total coliform and surface water samples for generic *E. coli*.
 - Water should meet the following criteria:
 - For groundwater, submit the 1-liter sample or at least a 100 mL subsample from the 1-liter water sample (aseptically drawn into or transferred to a standard lab container).
 - Acceptance criteria for 1-liter sample: < 99 MPN total coliform per one liter for any single sample.
 - Acceptance criteria for 100 mL sample: 9.9 MPN per 100 mL for any single sample.
 - For surface water, submit a 100 mL subsample from the 1-liter water sample (aseptically drawn into or transferred to a standard lab container).
 - Acceptance criteria: ≤ 126 MPN generic *E. coli* per 100 mL (rolling geometric mean of this sample and the previous four samples) and ≤ 235 MPN generic *E. coli* per 100 mL for any single sample.
 - When a sample exceeds the single sample maximum threshold for generic *E. coli*, perform an investigation of your water source. Evaluate factors that may have contributed to elevated levels of generic *E. coli* in the surface water (see **Appendices A and C** for guidance on assessing water sources for potential microbial hazards).
- In addition, record the following information:
 - Parameters pertinent to assessing water quality (e.g., the temperature of the water sample, water source location, the concentration of antimicrobial chemicals, water pH, weather description)
 - Frequency and seasonality of testing
 - Location and manner of sample collection and handling
 - What the test outcomes indicate, including how they relate to historical data (e.g., trends or patterns).
 - How test results will be used to define corrective actions
- During the season, all water sources should be tested at least monthly.

6.5.4 Corrective actions

- If the water source is found to have levels of indicator organisms that suggest the potential for contamination with pathogen or is contaminated with pathogens, corrective actions should be taken and documented to ensure that the water is not a source of contamination.³¹ These may include:
 - Eliminating potential sources of contamination in the water source or in the water distribution system,

- o Discontinue use and use a different water source until the contamination source is corrected; re-inspect the entire affected agricultural water system to the extent it is under your control, and/or
- o Treating water (with physical treatment, including using a pesticide device as defined by the US EPA; EPA-registered antimicrobial pesticide product; or other suitable method)³² to eliminate pathogens in a manner that is acceptable for contact with food. Testing frequency should be increased until consecutive microbial test results are achieved within the acceptable range as indicated in **Section 6.5.3.**³³
- When an environmental assessment of historical and adjacent and nearby land use indicates a potential chemical hazard, water sources used in netted melon production should be tested for the identified chemical hazard prior to use.

Documentation:

- Ag water assessment
- Ag water sampling plan
- Ag water test results
- Corrective actions
- Verify implementation of corrective measures

6.5.5 Water for fertilizers, pest control, and harvest activities where water can contact netted melons directly

Pathogens can survive and grow in water and many agrichemical solutions, including some pesticides. To reduce the likelihood of pathogen contamination:

- Do not use untreated surface water.
- When using untreated groundwater, ensure water meets the microbial standards in **Table 2** during the application of aqueous fertilizers and pesticides and during harvest activities if there is direct contact or likely to be direct contact with netted melons.³⁴ See **Table 2** for sampling and testing criteria.
- Maintain documentation or certificates of compliance that demonstrate the water meets those microbial requirements, when using water from any public water supply or a public water system.³⁵

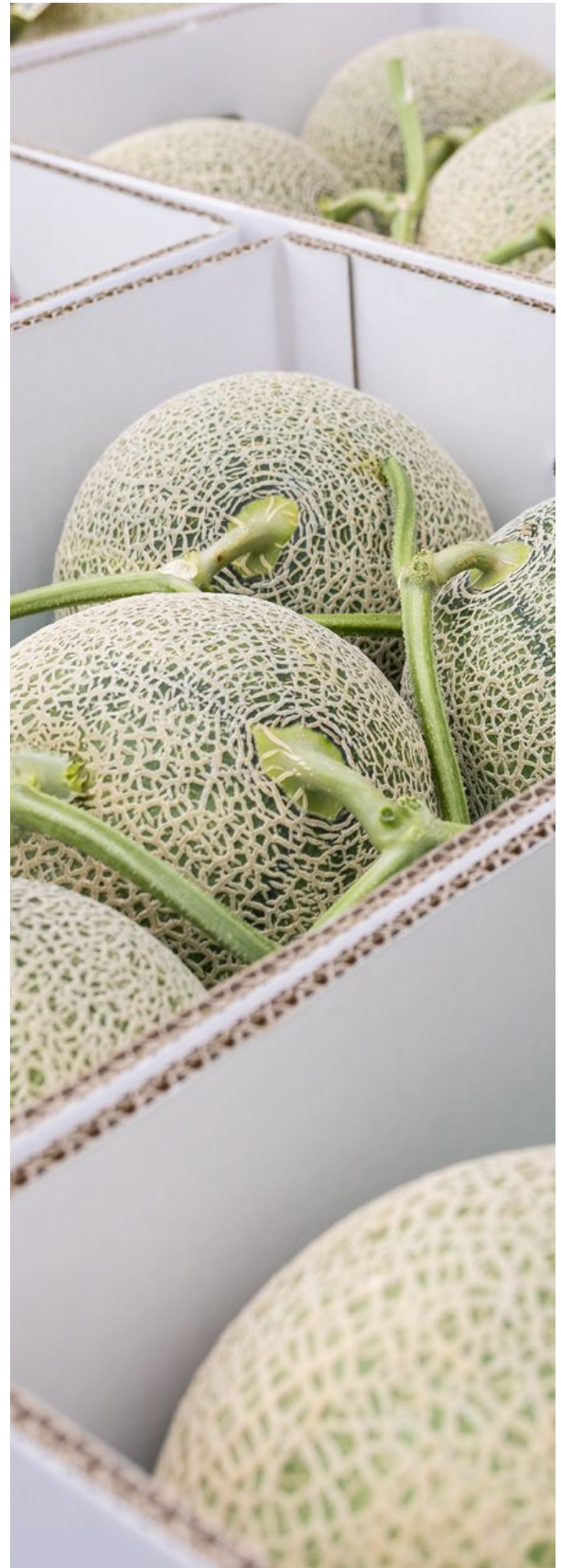


Table 2. Microbiological water quality standards for untreated groundwater used in fertilizers, pest control and harvest activities where agricultural water contacts netted melons.

UNTREATED GROUNDWATER SOURCES	
Initial microbiological water quality testing	
Sampling procedure	At least five times during the growing season or over a period of one year, aseptically collect one 1-liter composite sample of each source of untreated groundwater that is representative of the intended use(s). The 1-liter composite sample should be taken at the source and composed of four 250 mL samples separated by at least one minute between samples.
Sample volume	Submit the 1-liter composite sample or at least a 100 mL subsample (aseptically drawn from the 1-liter sample into a standard lab container).
Acceptance criteria	For 1-liter sample: < 99 MPN total coliform per 1-liter composite sample For 100 mL sample: < 9.9 MPN total coliform per 100 mL subsample
Corrective actions (i.e., when water does not meet the acceptance criteria)	<ul style="list-style-type: none"> • Do not use water for crop contact. • Assess the water source, re-inspect the entire affected agricultural water system to the extent it is under your control, and conduct a root-cause analysis (RCA). • Make necessary changes based on the RCA and take adequate measures to determine if your changes were effective (verification). • Re-sample the water prior to the next irrigation event and evaluate if it meets the acceptance criteria.
Routine monitoring	<ul style="list-style-type: none"> • If your five initial sample results meet the microbial quality criterion, you may test once annually thereafter, using a minimum of one sample collected aseptically and representative of the intended use(s). • If any annual test fails to meet the microbial quality criterion, resume testing at least 4 times per growing season or year until all of the test results collected in a year meet the microbial quality criterion.

Documentation:

- Microbial water quality test results for direct contact water
- Water treatment SOP

6.6 Soil amendments

Growers must comply with regulatory requirements, such as subpart F of the Produce Safety Rule for use of biological soil amendments of animal origin (BSAAO). BSAAO (e.g., manure, biosolids and other non-synthetic (non-conventional) fertilizers) may contain human or animal waste, animal parts or products. Because of this, foodborne pathogens may be present and may persist for weeks or even months, particularly if treatment of these materials is inadequate. If done properly, composting can be a practical and efficient method to inactivate foodborne pathogens in manure. Therefore, it is recommended that growers:

- Do not use biosolids or human waste in any form.
- Do not use raw, untreated, and/or partially treated:
 - Manure
 - BSAAO
- If raw manure has been applied to netted melon fields:
 - And netted melons have already been planted, do not harvest the netted melons.
 - Wait a minimum of 1 year before planting netted melons; waiting period should include planting of a cover crop or other non-food agronomic or horticultural crop.
- When using composted and/or treated soil amendments, growers should:
 - Use only compost that has undergone a validated commercial physical, chemical or biological method to reduce the risk of potential pathogen survival such as the U.S. Composting Council's Test Methods for the Examination of Compost and Composting (TMECC).
 - When producing on-farm soil amendments, follow a validated treatment method and follow testing procedures. See **Table 3** for detailed information.
 - When purchasing compost and other nonsynthetic fertilizers and soil amendments that have been treated to reduce microbial contaminants, obtain documentation from the commercial supplier that identifies the origin, treatment used, laboratory tests performed, and the results thereof. See **Table 3** for detailed information.
 - Implement management plans that control, reduce or eliminate cross-contamination of netted melon production or handling areas in close proximity to on-farm manure or manure-based soil amendment storage, treatment or composting sites.
 - Implement management plans for soil amendment transport and delivery to the field.
 - Prevent cross-contamination from runoff or leaching by securing areas between on-farm treated and untreated soil amendments.
 - Minimize risk of contamination from untreated or unknown soil amendments used on adjoining fields.
 - If potential contamination sources or routes from soil amendment stacking or use on adjoining fields or adjacent and nearby lands are identified, minimize the risk (i.e., from run-off or aerosols) by implementing preventive actions (e.g., application method (injection vs. spray) for applications under your control or aerosol controls such as ditches, berms, barriers).
 - Retain all documentation related to soil amendment production and application for at least 2 years.

Documentation:

- Purchased SA records: COC of treatment process, COA for finished product
- SA handling (including transport, delivery, and storage) SOP
- On-farm SA production SOP (if applicable)
- SA application logs (type, method and timing)

Table 3. Parameters to consider when producing on-site soil amendments or when purchasing from third-party suppliers

On-site vs. Third-party soil amendments	Parameters
<p>Soil amendments from third-party suppliers</p>	<p>A Treatment process documentation:</p> <p>Request a Certificate of Conformance (COC) that confirms the treatment is a scientifically valid process (e.g., U.S. Composting Council’s TMECC) that was carried out with appropriate process monitoring. For BSAAOs, require at a minimum the supplier to follow the processes noted above and request supporting treatment documentation. Collect treatment documentation to evaluate the treatment process. This may include:</p> <ul style="list-style-type: none"> • Time and temperature records • Number and timing of turnings • Validation studies and COAs demonstrating treatment effectiveness to achieve the following microbial standards in a composite sample of >15 subsamples that are each >1,000 cm³:^{36,37} <ul style="list-style-type: none"> o <i>Salmonella</i> species: < 3 MPN/4 grams of dry compost o Fecal coliforms: < 1,000 MPN/gram of dry compost <p>Handling:</p> <p>Require your suppliers to provide you with their procedure to handle, convey, and store SA.</p> <p>Receiving and storage:</p> <p>Assign a location to minimize the risk of cross-contamination and pathogen growth and amplification. The location should be secure (e.g., do not store compost adjacent to a neighboring netted melon field).</p> <p>Certificate of Analysis components:³⁸</p> <p>Obtain a COA that includes the following information</p> <ul style="list-style-type: none"> • Proof that the product complies with the microbial criteria specified above, and method of reference for the different tests performed. • Lot information • Sample mass or volume tested



6.7 Agricultural chemicals

The inappropriate use, handling and storage of agricultural chemicals may result in a chemical hazard. When using agricultural chemicals follow the instructions for appropriate use provided by the manufacturer. In addition:

- Use only agricultural chemicals which have been approved for netted melons and in accordance with the manufacturer's label instructions.
- Follow all federal, state, and local laws to handle agricultural chemicals, such as the US EPA's worker protection standard to handle agricultural pesticides. Pesticide residue "maximum residue limit/level" or "tolerance" as established by regulatory authorities in the destination market(s), shall not be exceeded.³⁹
- Workers who apply agricultural chemicals should be trained in proper application procedures and supplied with proper protective gear. Individually fitted respiratory PPE may be required by label and state or local regulations or ordinances.
- Keep records of all agricultural chemical applications per prevailing regulations. Records should include information on the date of application, the chemical used, the crop sprayed, the purpose of the applications, the concentration, method of application, and records on harvesting to verify that the time between application and harvest is in accordance with pre-harvest intervals on the product label.
- Agricultural chemical application equipment, including sprayers, should be calibrated at a frequency that is necessary to control the accuracy of application. Calibration records should be maintained.
- The mixing of agricultural chemicals should be carried out in a designated location to avoid contamination of water and land in the surrounding areas and to protect employees.
- Thoroughly wash application equipment such as sprayers and mixing containers after use, especially when used with different agricultural chemicals on different crops, to avoid spraying a chemical on netted melons that has not been approved for use on netted melons.
- Agricultural chemicals should be kept in their original containers, labeled with the name of the chemical and the instructions for application.
- Store agricultural chemicals in a safe, well-ventilated place, away from production areas, living areas and harvested product.
- Dispose of agricultural chemicals in a manner that does not pose a risk of contaminating crops, waterways, watersheds, water sources, pollinators, the inhabitants of the area, or the production environment.
- Dispose of empty agricultural chemical containers as indicated by the manufacturer's label. They should not be burned or used for other food-related purposes.

Documentation:

- List of ag chemicals
- Resistance management best practices program
- Ag chemical application SOP
- Ag chemical application equipment calibration SOP
- Ag chemical mixing SOP
- Ag chemical application maintenance and cleaning SOP
- Ag chemical labeling and storage SOP

6.8 Equipment associated with production, harvesting, and field-packing

Equipment used during growing and harvesting, including tools and containers used to hold harvested netted melons, should be constructed and maintained in a manner that minimizes the potential to become a source of contamination. Growers must comply with regulatory requirements, such as the regulations in subpart L of the Produce Safety Rule, addressing equipment, tools, building and sanitation.

6.8.1 Equipment design, construction, use, and maintenance

Standard operating procedures should ensure that production and harvesting equipment is in an appropriate state of repair and condition that facilitates cleaning and sanitizing.

- Annually, and whenever modifying or purchasing harvesting equipment, conduct a hygienic design review. The review should especially assess whether the equipment's design and construction ensure it minimizes the risk of contamination and development of bacterial niches (See **Appendix D** for additional information.). Document the findings of the review and develop a plan to implement any repairs, modifications, or replacement needs for the identified issues.
- Follow the technical specifications recommended by the equipment manufacturers for their proper use and maintenance.
 - Develop an SOP for the appropriate use of production and harvesting equipment.
 - Develop an SOP for the repair and routine maintenance of production and harvesting equipment.
 - Train workers to follow the SOPs on equipment use and maintenance.
- Equipment surfaces should be designed to be accessible for inspection, maintenance, cleaning, and sanitation.
- Food-contact surfaces (e.g., padding, cutting tools, product containers) should be constructed of or covered/sleeved with materials that facilitate cleaning and sanitizing, that are non-toxic, and will not harbor pathogens (e.g., non-porous, self-draining to eliminate water pooling, hermetically sealed hollow areas, smooth and rounded to prevent bacterial niches).
- Equipment should be maintained in good order and function according to its intended use without damaging netted melons.
- Establish and implement an SOP regarding monitoring of all containers used in harvesting and field-packing for cleanliness and condition prior to use, including the following practices:
 - Repair damaged containers before use.
 - Do not use containers designated for holding netted melons for other purposes (e.g., should not hold personal items, trash/waste, culled netted melons, etc.).
 - Segregate or otherwise identify containers for waste, by-products and inedible or dangerous substances to prevent their use as harvesting containers. Such containers should be suitably constructed and, where appropriate, made of impervious material so as not to leak. Where appropriate, secure such containers to prevent intentional or accidental contamination of netted melons or agricultural inputs.
- Manage equipment lubrication to not contaminate netted melons. Use food-grade lubricants on packing equipment where food contact may occur. Food-grade and non-food-grade lubricants are to be properly labeled and stored separately.
- Properly store equipment that is not in use so as not to pose a risk of contamination to netted melons.

Documentation:

- Equipment manufacturer specifications
- Equipment use SOP
- Equipment maintenance SOP
- Harvest container inspection SOP

6.8.2 Equipment cleaning and sanitation programs

Cleaning and sanitizing procedures (SSOPs) should be in place to ensure that cleaning and sanitizing is carried out effectively and appropriately. The following practices are recommended:

- Establish specific cleaning and sanitation requirements in SSOPs for all equipment, tools, and containers that is used in production, harvesting, and field-packing. The appropriate cleaning and sanitizing methods and materials will depend on the type of equipment and its construction. The following procedures are recommended:
 - Only use cleaning and sanitizing agents and materials for their intended purpose according to the instructions on the manufacturer's label.
 - Properly label cleaning and sanitizing agents and materials.
 - Store cleaning and sanitizing agents and materials separately in a secure storage location.
 - Maintain safety data sheets (SDS) for all cleaning and sanitizing agents and materials.
 - Cleaning procedures should include the removal of debris from equipment surfaces, application of a detergent solution, rinsing with potable water, and, where appropriate, sanitizing.
 - Clean and sanitize reusable containers regularly or after potential contamination.
 - Dry equipment in a manner that does not result in contamination (e.g., air dry, single-use disposable towels).
 - Develop a schedule for daily cleaning and sanitation activities as well as a master schedule for periodic cleaning events.
 - Regularly review and adapt SSOP to reflect changing circumstances such as new equipment or new cleaning equipment, method, or product.
 - Protective clothing worn by workers during cleaning and sanitizing equipment should be routinely cleaned and stored in a manner that protects them from biological and chemical contamination.
 - Monitor the effectiveness of cleaning and sanitizing procedures with a quantitative verification method (see **Table 4**).



Table 4. Verification methods for equipment cleaning and sanitation

VERIFICATION TYPE	DESCRIPTION	COMMENTS
ATP readings	<p>An ATP meter is used to quickly assess surface cleanliness by measuring ATP levels, which indicate biological contamination typically present as organic matter.</p> <p>After swabbing a surface, the sample is placed in the meter, which quantifies ATP through a luminescence reaction, with results displayed in relative light units (RLU). Higher RLU readings suggest higher organic matter levels, allowing for immediate corrective action if cleanliness standards are not met.</p> <p>Limitations: little correlation with microbial load or presence of pathogens</p>	<p>Entry point for monitoring, useful for first time swabbing and continued use on food-contact surfaces.</p> <p>Should ONLY be done after routine cleaning activities.</p> <p>Reading and acceptance should be relative to historical data and observations of factors such as the type of ATP unit, different surfaces, etc.</p>
Microbial testing	<p>Indicator organisms:</p> <ul style="list-style-type: none"> • Directly verify the effectiveness of cleaning and sanitation • Serves as early warning of potential pathogen presence • APCs, coliforms, generic <i>E. coli</i>, <i>Listeria spp.</i> <p>Human pathogens:</p> <ul style="list-style-type: none"> • Can be used to verify control measures • Useful in “seek and destroy” programs • <i>L. monocytogenes</i>, <i>Salmonella</i> 	<p>Ideally, microbial verification would be done as a method to verify the efficacy of the cleaning and sanitation procedures.</p>

- Production and harvesting equipment, including containers and tools that come into direct contact with netted melons should be cleaned and sanitized according to an established, documented schedule and as needed to minimize the risk of contamination.
 - o For equipment in direct contact with netted melons, conduct cleaning and sanitizing after daily use.
 - o Conduct cleaning and sanitizing when excessive (e.g., more than typical) soil has built up and when moving between fields (i.e., any area where product being harvested is considered a different lot from previously harvested product).
- Water used to clean all equipment directly contacting netted melons, including harvesting and transportation equipment, containers, and tools, must meet the PSR’s microbial standards for harvest and post-harvest agricultural water use (no detectable *E. coli* in a 100 mL sample) and cannot be sourced from untreated surface water.⁴⁰

- Conduct cleaning and sanitizing programs in a location where the rinse water will not contaminate netted melons or food-contact surfaces.
- Regularly review and adapt SOP/SSOP to reflect changing circumstances such as new equipment.
- Dispose of wastewater discharge in alignment with federal, state and local requirements.

Documentation:

- Equipment SSOPs (methods, chemicals, procedures, etc.)
- Equipment cleaning/sanitizing schedule
- Equipment cleaning/sanitizing logs
- SDS for cleaning/sanitizing agents and materials
- Cleaning/Sanitizing verification method and results
- Wastewater discharge SOP

6.9 Flooding

Flooding for purposes of this document is defined as the flowing or overflowing of a field with water outside of a grower's control, that is reasonably likely to contain microorganisms of significant public health concern and is reasonably likely to cause adulteration of the edible portions of fresh produce in that field. Pooled water (e.g., rainfall) that is not reasonably likely to contain microorganisms of significant public health concern and is not reasonably likely to cause adulteration of the edible portion of fresh produce should not be considered flooding.

The FDA considers ready-to-eat crops that have been in contact with flood waters to be adulterated due to potential exposure to sewage, animal waste, heavy metals, pathogenic microorganisms, or other contaminants. The FDA is not aware of any method of reconditioning these crops that will provide a reasonable assurance of safety for human food use or otherwise bring them into compliance with the law. Therefore, the FDA recommends that such crops be excluded from the human food supply and disposed of in a manner that ensures they do not contaminate unaffected crops during harvesting, storage or distribution.⁴¹

Areas that have been flooded can be separated into three groups: 1) product that has come into contact with flood water, 2) product that is in proximity to a flooded field but has not been contacted by flood water, and 3) production ground that was partially or completely flooded in the past before a crop was planted. The considerations for each situation are described below and presented in **Table 5**.

6.9.1 Product that has come into contact with flood water

- See **Table 5** for numerical criteria for netted melon production fields that have possibly come into contact with flood waters.
- FDA considers any crop that has come into contact with floodwater to be an "adulterated" commodity that cannot be sold for human consumption.⁴²
- To reduce the potential for cross-contamination do not drive harvest equipment through flooded areas reasonably likely to contain microorganisms of public health significance.

Table 5. Flooding – When evidence of flooding in a production block occurs.

PRACTICE	METRIC/RATIONALE
Flooding defined	The flowing or overflowing of a field with water outside a grower’s control that is reasonably likely to contain microorganisms of significant public health concern and is reasonably likely to cause adulteration of edible portions of fresh produce in that field. Additional discussion of this definition and implications for production is provided in the text portion of this document.
Allowable harvest distance from flooding	<ul style="list-style-type: none"> • Buffer and do not harvest any product within 30 ft. of the flooding. • Required buffer distance may be greater than 30 ft. based on risk analysis by a food safety professional. • If there is evidence of flooding, the production block must undergo a detailed food safety assessment by appropriately trained food safety personnel (as defined in the glossary) prior to harvest, as defined in section 6.1 Environmental risk assessments.
Verification	<ul style="list-style-type: none"> • Documentation must be archived for a period of two years following the flooding event. Documentation may include photographs, sketched maps, or other means of delineating affected portions of production fields.
Time interval before planting can commence following the receding floodwaters	<ul style="list-style-type: none"> • 60 days prior to planting provided that the soil has sufficient time to dry out. • Appropriate soil testing can be used to shorten this period to 20 days prior to planting. Testing should be performed in accordance with the sampling and testing requirements explained in section 6.9.3 Formerly flooded production ground. See Appendix B for additional guidance on microbiological testing.
Rationale	<ul style="list-style-type: none"> • The basis for the 30 ft. distance is due to the known potential for subsurface horizontal water movement and seepage that is not necessarily visible.

6.9.2 Product in proximity to a flooded area, but not connected by flood water

- Prevent cross-contamination between flooded and non-flooded areas (e.g., cleaning equipment, eliminating contact of any farming or harvesting equipment or personnel with the flooded area during growth and harvest of non-flooded areas).
- To facilitate avoiding contaminated/adulterated produce, place markers identifying both the high-water line of the flooding and an interval 30 feet beyond this line. If 30 feet is not sufficient to prevent cross-contamination while turning harvesting or other farm equipment in the field, use a greater appropriate interval. Take photographs of the area for documentation. Do not harvest product within the 30-foot buffer zone.

6.9.3 Formerly flooded production ground

- Prior to replanting or soil testing, the designated food safety professional for the grower should perform a detailed food safety assessment of the production field. This designated professional will be responsible for assessing the relative merits of testing versus observing the appropriate time interval for planting. They will also coordinate any soil testing plan with appropriate third-party consultants and/or laboratories that have experience in this type of testing.

- Evaluate the source of flood waters (e.g., drainage canal, river, irrigation canal, etc.) for potential significant upstream contributors of human pathogens at levels that pose a significant threat to human health.
- Allow soils to dry sufficiently and be reworked prior to planting subsequent crops on formerly flooded production ground.
- Do not replant formerly flooded production ground for at least 60 days following the receding of floodwaters. This period or longer and active tillage of the soil provide additional protection against the survival of pathogenic organisms.
- If flooding has occurred in the past on the property, soil clearance testing may be conducted prior to planting netted melons. Soil testing may be used to shorten the clearance period to 20 days. If performed, testing must indicate negative for STEC and/or EHEC, *E. coli* O157:H7, and *Salmonella* and all samples must be ≤ 10 MPN/gram of soil for generic *E. coli*.

6.10 Harvest and field-packing operations

Preventive controls to minimize pathogen presence established during pre-harvest production should be continued throughout harvest and field-packing operations. Growers must comply with regulatory requirements, such as the regulations in subpart K and L of the Produce Safety Rule (PSR) for harvesting and field-packing operations.

6.10.1 Preharvest assessment

A preharvest assessment should identify chemical, physical, or microbiological hazards, assess their occurrence likelihood and severity. The following practices are recommended:

- Establish a preharvest environmental assessment process and checklist that describes how and when the assessment is to be performed and includes an evaluation of hazards and risks, which may potentially result in physical, chemical or microbiological contamination of netted melons. The assessment should include a review of the pre-planting environmental assessment for any changes in the production area and adjacent and nearby land that may increase the risk of contamination (see section **6.1 Environmental risk assessment for details on pre-planting assessments**).
- Before harvesting begins, check food-contact surfaces to ensure they are in good condition and have been cleaned and sanitized. (For additional details on equipment maintenance, cleaning and sanitizing, see section **6.8 Equipment associated with production, harvesting, and field-packing**.)
- Document any corresponding corrective actions taken to address identified hazards.

Documentation:

- Preharvest environmental assessment checklist
- Corresponding corrective actions

6.10.2 Prevention of contamination, cross-contamination and mechanical damage

During harvest and field-packing operations, implement specific control measures to reduce and minimize the risk of contamination from physical, chemical and biological hazards. The following practices are recommended:

- Do not harvest or pack netted melons which have naturally or physically separated from the vine prior to harvest or with evidence of mechanical damage or injury (e.g., rind punctures and extensive bruising from previous harvesting operations; does not pertain to naturally occurring rind cracking during ripening), as the resulting wounds may provide entry points for pathogens and sites for pathogen survival and multiplication.

- Handle and dispose of damaged netted melons in a manner that does not pose an increased risk of contamination to other netted melons.
- Worker hygiene practices are critical to prevent surface contamination of netted melons. Ensure workers are following hygienic practices as outlined in **section 5.0 Worker Training and Hygiene Practices**.

Documentation:

- Harvest and packing SOP

6.10.3 Harvest

To minimize risks related to multiple harvests, harvesting tools, and direct contact of harvested netted melons with soil and humans, the following practices are recommended:

- As harvest time approaches, schedule irrigation so as to avoid exposing netted melons to excessive irrigation water.
- Prior to every harvesting event, an individual trained in basic food safety practices (e.g., GAPs, Good Handling Practices) should be designated as responsible for harvesting food safety. This person should be available when netted melons are being harvested.
- During harvest operations, workers participating in harvesting activities should receive training in:
 - Recognizing and not harvesting netted melons that have mechanical damage or are injured (i.e., contain rind punctures and extensive bruising from previous harvest operations; does not pertain to naturally occurring rind cracking during ripening) as wounds may provide entry points for pathogens and sites for pathogen survival and multiplication.
 - Inspecting harvest containers and equipment to ensure that they are functioning properly, clean, and maintained so as not to become a source of contamination of covered produce with known or reasonably foreseeable hazards; and
 - Correcting problems with harvest containers or equipment, or reporting such problems to the supervisor (or other responsible party), as appropriate to the person's job responsibilities
- During harvest operations, workers in the field should monitor or look for sources of hazards that increase the likelihood of contamination including, but not limited to:
 - Evidence of animal intrusion and fecal contamination.
 - Evidence of debris such as glass, plastic, and metal. Remove the debris or do not harvest netted melons in close proximity to the debris if the safety of the netted melons is compromised by their presence.
 - Evidence of open and/or unsecured pesticides, fertilizers and other chemicals.
- Document any corresponding corrective actions taken to address identified hazards. Include the name and contact information of the party responsible for the harvest crew in the assessment record.
- Harvesting tools should be properly sharpened, cleaned and sanitized. If improperly used, harvesting tools can wound netted melon rinds and provide a point of entry for contaminants. For additional details on equipment use and cleaning, see **section 6.8 Equipment associated with production, harvesting, and field-packing**.
- When a field is harvested more than once, reassess the field for potential hazards (according to **section 6.10.1 Preharvest assessment**) and develop practices and procedures to protect against the introduction of pathogens between harvests.

Documentation:

- Harvest crew employer name and contact information
- Harvest crew supervisor name and contact information
- Harvest worker training
- Corrective actions taken to address/remove hazards from fields

6.10.4 Packing netted melons in the field

Netted melons are often packed directly in the field. Field-packing includes any practice that involves grading, sorting, cleaning, and/or packing of netted melons into containers for commerce while still in the field. (Note that guidance for packing netted melons in a packinghouse is provided in **section 7.0 Packing and Cooling Operations**.) In order to minimize the risk of contamination and cross-contamination during field-packing operations, the following practices are recommended:

- Food-contact equipment used in field packing operations and equipment contacting food-contact surfaces should be designed, maintained, cleaned and sanitized as described in **section 6.8 Equipment associated with production, harvesting, and field-packing**, to minimize the potential for contamination during packing.
- Store and stage cartons in clean areas off from the ground, protect cartons from pests, or other potential contaminants. Ensure the staging areas are free from standing water, mud, protected as much as possible from any animal feeding operation or small holding area or other potential sources of contamination considering human pathogens, often attached to particulates, can travel significant distances with wind currents.
- Establish and implement an SOP for assembling and staging cartons on the packing platform or secondary vehicle (e.g., flat-bed truck).
- Establish and implement an SOP for inspecting and accepting or rejecting (e.g., culling) netted melons on the packing table.
- Discard foreign objects and debris in an appropriate location (e.g., dumpster) so they are not a potential source of contamination.
- If loose soil is removed from netted melons prior to packing use methods that do not enhance the likelihood of product cross-contamination (e.g., reuse of dirty cloth towels to remove loose soil or muddy melons from excess rain).
- Cool/Remove field heat from harvested netted melons; minimize holding time prior to cooling. When cooling netted melons, consider the following:
 - o Forced air cooling is the preferred method of cooling as the provides rapid cooling as opposed to simply holding palletized product in cooling rooms, which takes much longer to cool the fruit.
 - o Ensure uniform distribution of cool air to allow uniform heat removal.
 - o Do not use the same cooling room for pre-and post-processing fruit.
 - o Avoid the use of hydrocooling. Hydrocooling has been shown to promote internalization of pathogens, if they are present in inadequately treated and unverified (achieved critical dose and scientifically valid microbial reductions) water or on the netted melon surface.
- Establish and implement an SOP to ensure that all essential field harvest information is appropriately maintained, transferred and accessible to downstream operations for recordkeeping.

Documentation:

- SOP for carton assembling and staging on the packing platform
- Netted melon inspection SOP
- Traceability (field harvest information) SOP

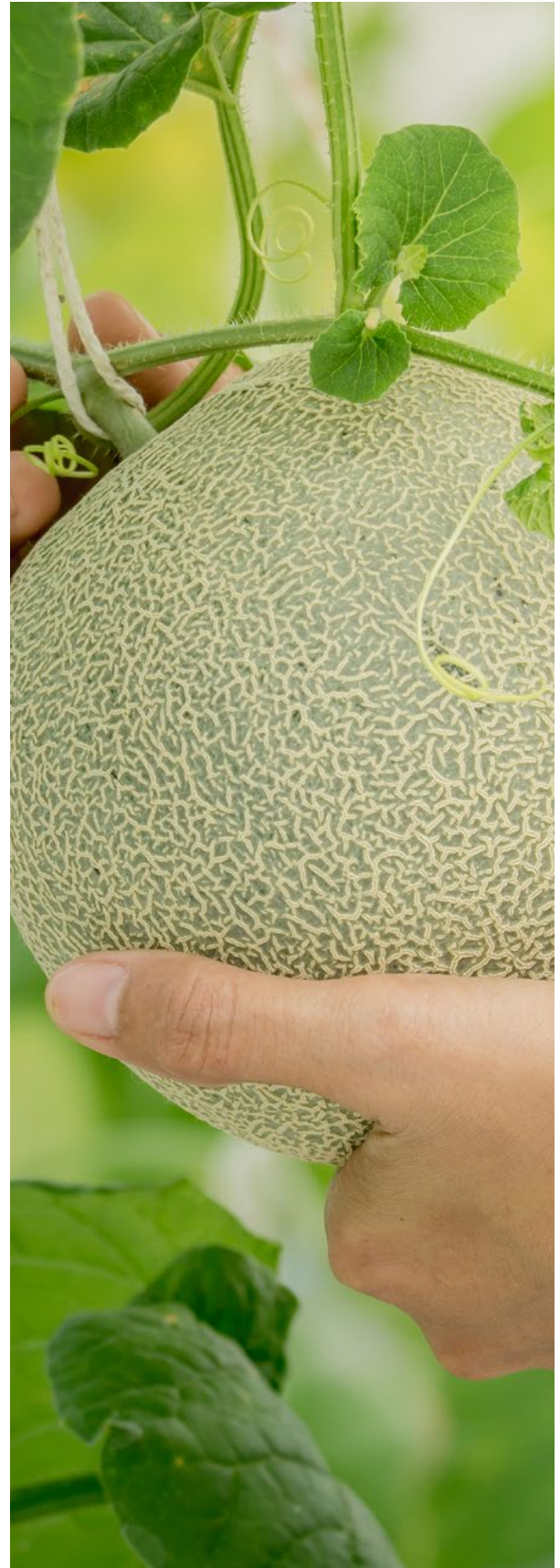
6.10.5 Equipment-facilitated cross-contamination

- Identify any activities or procedures that may pose a risk for equipment-facilitated cross-contamination of netted melons. These include but are not limited to: Vehicles and farm equipment utilized in the fields, vehicles used to transport workers, and vehicles used to haul culls and waste. For such activities or procedures, develop appropriate means of controlling the possible transfer of pathogens from equipment to netted melons or soil, water, concrete and other surfaces that may directly contact netted melons.
- Segregate equipment exposed to high levels of contamination (e.g., equipment used to manipulate unfinished compost or that travels through animal-related operations, cleaning out waste pits or lagoons), and store in a designated area away from the netted melon production and handling areas.
- Do not use equipment in the netted melon field that has previously been used in a high-risk operation (e.g., to transport animal carcasses, untreated manure or soil amendments, to remove fecal contamination or crops damaged by animals, etc.), unless effective means of equipment cleaning and sanitation are applied and verified before subsequent use in netted melon fields.

6.11 Supplier verification, receiving, and pre-cooling

When sourcing netted melons from third parties it is important to consider supplier verification to ensure that suppliers meet food safety standards, and if imported, that netted melons meet the requirements for foreign suppliers under FSMA's Foreign Supplier Verification Program.

When netted melons are received at the packinghouse, there are important items to consider regarding time intervals between harvest and cooling and the transfer of information. Because some microbes multiply rapidly under warm, moist conditions, the time from harvest to cooling should be minimized.



6.11.1 Supplier verification

Follow the good, better, best approach described below when sourcing netted melons from a third party. When netted melons come from your own operations, ensure that the farm(s) follows GAPs, and the best practices identified in this guidance.

Table 6. Supplier verification when sourcing netted melons from third parties.

GOOD	BETTER	BEST
<p>Compliance with Produce Safety Rule</p> <p>Verify through review of records that raw netted melons from third parties were grown, harvested, packed, cooled, and shipped in compliance with 21CFR, Part 112 (the Produce Safety Rule).</p> <p>Supplier documentation</p> <p>Obtain documentation of verification activities from suppliers (i.e. water risk assessments, environmental assessments)</p> <p>Develop a list of approved suppliers</p> <p>Develop a list of approved suppliers and try to source only from suppliers on this list.</p> <p>Determine verification activities</p> <p>Determine verification activities for approved suppliers (e.g., on-site audits, documentation review, etc.).</p>	<p>In addition to those practices in good.</p> <p>Yearly review.</p> <p>Commit to updating the “approved supplier” list each year to assess supplier and to verify that the food safety documentation is current and meets your company’s expectations.</p> <p>No purchases from unapproved suppliers.</p> <p>Establish a corporate policy requiring that whole netted melons be sourced exclusively from suppliers on the approved supplier list.</p>	<p>In addition to those practices in good and better</p> <p>Onsite visits and inspections</p> <p>Develop a schedule to conduct onsite visits and inspections for the approved suppliers. During the visits point out any food safety concerns and request corrective actions. Document the findings and corrective action plan.</p> <p>Hazard identification and risk assessment</p> <p>Perform hazard identification and risk assessment for all supplier-growing operations. Engage with each supplier to ensure management strategies are implemented to mitigate identified risks.</p>



6.11.2 Receiving

- Establish a procedure for inspecting and accepting or rejecting incoming loads of netted melons.
- Only accept netted melons from approved suppliers (see **Table 6**).
- Remove damaged or decayed netted melons and place them in a designated area (e.g., cull truck or bin) in a manner that does not serve to attract pests or cross-contaminate other netted melons.
- Establish procedures to ensure netted melons are held and stored in designated areas and handled under proper conditions. Product staging areas should be kept clean and free of debris, vermin, and pests.
- Use covered receiving areas and minimize the time between receiving and product cooling.

Documentation:

- List of approved suppliers
- Suppliers' verification activities
- Onsite visit inspections
- SOP of product acceptance/rejection criteria
- Holding and storing SOP

6.12 Transport from the production site to the packing and cooling facilities

To manage the potential for contamination during transport from the production site, the following practices are recommended:

- Shipping containers should be constructed of materials that can be cleaned and sanitized. Prior to use, shipping containers and transport trailers should be cleaned and made sanitary. Each transporter should have an SOP for shipping containers/trailers for cleaning, sanitizing and maintenance.
- Establish SOP for inspecting the shipping container/trailer prior to loading to ensure it is clean, functional, and free of objectionable odors.
- If shipping containers/trailers are used to transport items other than netted melons, procedures should be established to ensure that shipping containers/trailers will not potentially contaminate netted melons with biological, chemical, or physical contaminants or undeclared allergens.
- Do not transport fresh netted melons in shipping containers/trailers previously used to carry potential sources of contamination, such as animals, animal manure or biosolids, trash, chemicals, or non-food grade equipment or tools.
- Load and unload netted melons in a manner that minimizes damage and contamination.
- When not in use, store cleaned shipping containers and transport trailers in a manner to minimize potential contamination (e.g., from insects, lizards, birds, rodents, dust, water).
- Repair or replace damaged shipping containers and transport trailers.

Documentation:

- Shipping container/trailer inspection SOP
- Shipping containers/trailers for cleaning and sanitizing SSOP
- Shipping containers/trailers maintenance SOP

22 Produce Safety Alliance. Module 4: Wildlife, domesticated animals, and land use.

23 Conducting Root Cause Analysis: A “How-To” Guide for the Produce Industry. [RCA Guidance for the Produce Industry How to do RCA.pdf](#)

24 AOAC INTERNATIONAL - In Food & Agriculture, We Set the Standard

25 ISO - ISO/IEC 17025 — Testing and calibration laboratories

26 Laboratory Accreditation for Analyses of Food (LAAF) Program & Final Rule ([Laboratory Accreditation for Analyses of Foods \(LAAF\) Program & Final Rule | FDA](#))

27 U.S. Dept of Labor, OSHA standards for agriculture: 1928.110 - Field Sanitation. | [Occupational Safety and Health Administration](#)

28 § 112.42

29 § 112.43(a)

30 § 112.43(c)(3)(i)

31 § 112.43(c) & § 112.45

32 § 112.46(a)

33 § 112.46(b)

34 § 112.44

35 § 112.44(c); Water that meets the microbial requirements as defined under the Safe Drinking Water Act (SDWA) federal regulations, 40 CFR part 141 or under the regulations of a State (as defined in 40 CFR 141.2) approved to administer the SDWA public water supply program.

36 U.S. Composting Council and USDA. 2015 Update of Test Methods for the Examination of Composting and Compost

37 U.S. Composting Council: [STA Certified Compost Test Result Limits for Compost Manufacturers](#)

38 OSU Extension Services 2018 Interpreting compost analyses: [Interpreting compost analyses | OSU Extension Service](#)

39 USDA's International Maximum Residue Level database: [Maximum Residue Limits \(MRL\) Database | USDA Foreign Agricultural Service](#)

40 § 112.44(a)

41 Adulterated food may be subject to seizure under the Federal Food, Drug, and Cosmetic Act, and those responsible for its introduction or delivery for introduction into interstate commerce may be enjoined from continuing to do so or prosecuted for having done so. Food produced under unsanitary conditions whereby it may be rendered injurious to health is adulterated under § 402(a)(4) of the Federal Food, Drug, and Cosmetic Act (21 U.S.C. 342(a) (4); (US FDA 2004).

42 Guidance for Industry: [Evaluating the Safety of Flood-affected Food Crops for Human Consumption | FDA](#)



7.0 PACKAGING AND COOLING OPERATIONS

This section covers the packing and cooling of whole netted melons. It does not address fresh-cut melon packing, processing or cooling. Packing and cooling operations must comply with regulatory requirements, such as the regulations in subpart K and L of the Produce Safety Rule.

7.1 GAPs and cGMPs for packinghouse and cooling facilities

Packing and cooling operations should pay special attention to product flow and segregation of incoming and outgoing product to avoid cross-contamination. The following components and practices of food safety hazard control plans are recommended:

- A product flow diagram depicting the handling or process steps in the operation. See process flow in **Figure 2**.
- Using the flow diagram as a guide, identify and analyze hazards that may pose a contamination risk in netted melon packing and cooling operations.
- If the operator changes the process (e.g., updated equipment), then the plan should be updated and revised.
- Develop a risk management plan that incorporates the activities identified in **Table 7**.
- Establish training routine/materials and train workers to perform the activities identified in **Table 7**.
- Conduct periodic (a minimum of annually) review and update of the hazards and the preventive control/risk management procedures, especially whenever the operation changes.

Documentation:

- Operational/product flow diagram
- Hazard analysis for packinghouse and cooling facilities
- Risk management plan
- Worker training program

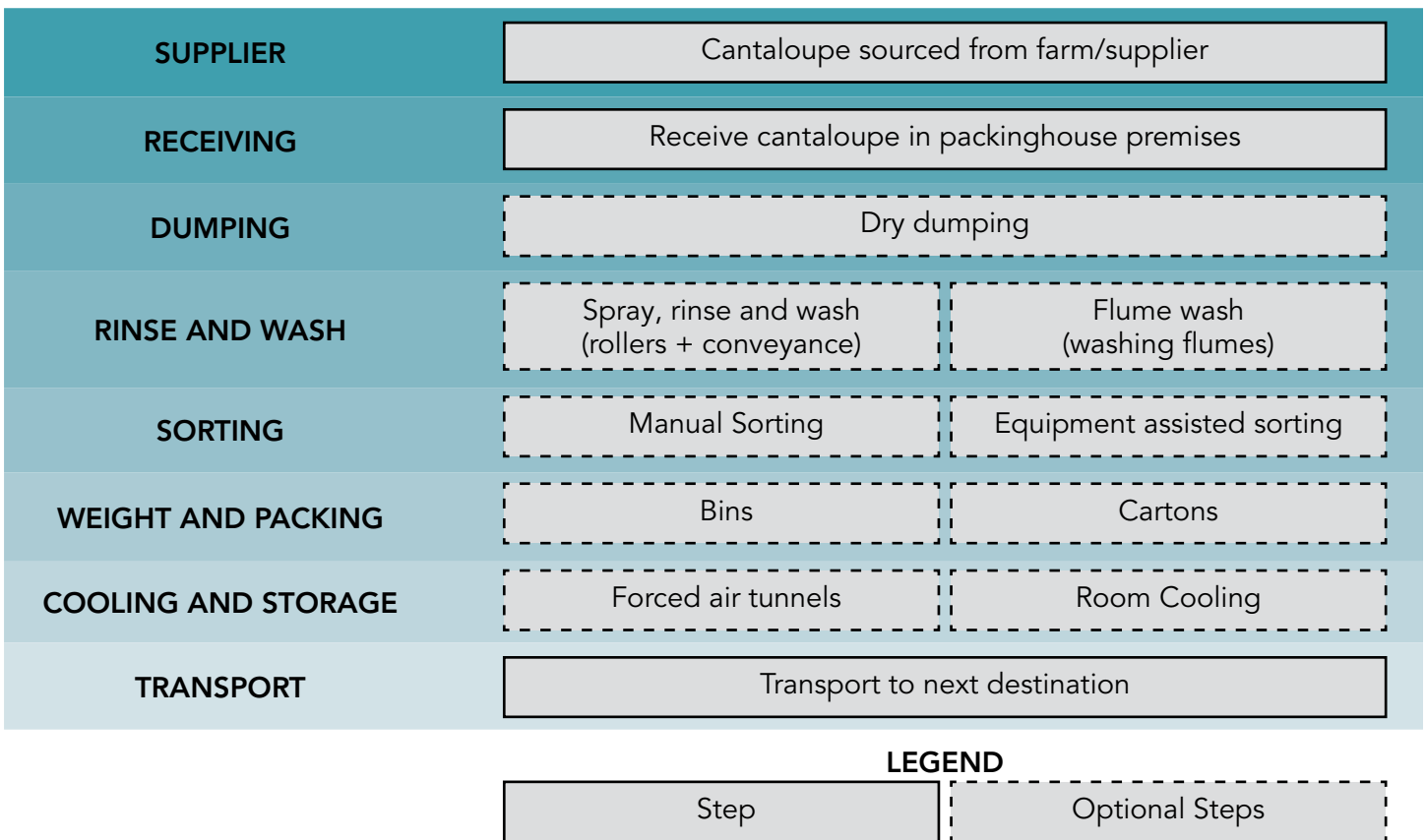


Table 7. Activities to be performed as part of cGMPs for packinghouse and cooling facilities

ACTIVITY	DESCRIPTION	WHAT TO DOCUMENT
Training	Ensure personnel are trained in hygiene practices, sanitation and cleaning, facility and equipment maintenance, and relevant preventive controls, in particular those required under the Produce Safety Rule.	Training records – date, time, attendees, and topics covered ⁴³
Hazard Identification and Risk Assessment	<p>Identify potential hazards and evaluate potential risks to the operation.</p> <p><u>Example</u></p> <p>Identification of a microbiological hazard: potential contamination with <i>L. monocytogenes</i> during post-harvest handling in a packinghouse with condensation issues.</p> <p>Risk evaluation: High risk because condensation can drip onto produce, equipment or surfaces and <i>L. monocytogenes</i> can lead to contamination and serious foodborne illnesses and recalls. It is crucial to identify controls to remove condensation from the packing area and mitigate the risk).</p>	Document the identified conditions as part of your food safety plan.
Risk Management	<p>Identify and implement effective controls or risk management procedures for the identified conditions, practices and processes critical to product safety.</p> <p><u>Example</u></p> <p>To mitigate the risk of <i>L. monocytogenes</i> contamination from condensation, implement a combination of programs and process controls to manage humid conditions, such as the use of drip shields to prevent condensation from contacting products; training employees in sanitation practices, implementing an environmental monitoring program (EMP) and maintaining thorough records of monitoring and corrective actions)</p>	Document the risk management practices to control the identified hazards in the food safety plan.

ACTIVITY	DESCRIPTION	WHAT TO DOCUMENT
Monitoring	Monitor control or risk management procedures to ensure their continued implementation and effectiveness.	Maintain records of monitoring activities, including dates, methods, results, and personnel responsible, as part of the food safety plan.
Corrective Actions	Address deviations from control or risk management procedures to restore control and prevent recurrence.	Document corrective actions taken, including the root cause analysis and steps implemented to prevent recurrence, in the food safety plan.

Figure 2. Typical whole, packed netted melon packinghouse and cooling facility process flow (it does not account for all region-specific details)



7.2 Environmental monitoring program (EMP) and verification of cleaning and sanitation activities.

When sampling plans and methodology are properly designed and performed for facilities and equipment, microbiological testing can be a useful tool to evaluate and verify the effectiveness of safety and sanitation practices, and provide information about the environment, a process, positive or negative evidence of equipment hygienic design and risk management procedures. The intended use of information obtained (e.g., evaluating the effectiveness of a sanitation practice, evaluating the risk posed by a particular hazard) can aid in designing an appropriate sampling plan and determining which microorganisms are most appropriate to test for. Selected test methods should be validated for the intended use. Trend analysis of testing data should be undertaken to evaluate the effectiveness of food safety control systems. See **Appendices B and E** for additional information on microbiological testing and an EMP.

7.2.1 Environmental monitoring programs

This section provides best practices for designing, implementing, and maintaining an effective EMP tailored to netted melon operations.

Consider the following best practices when developing your EMP.

- **Risk assessment:** Conduct a thorough risk assessment of the packing operation. High-risk areas often include food-contact surfaces, hard-to-reach areas, uncleanable surfaces and entrapment points, water sources, and high-traffic zones.
- **Facility mapping and zoning:** Develop a facility map that identifies the different hygienic zones based on risk (see **Table 8** for a description of hygienic zones).
- **Sampling plan:** Establish a consistent and regular sampling plan, focusing on high-risk areas within the facility. The sampling plan should contain the following components:
 - **Sampling frequency:** Establish your sampling frequencies specific to your facility and based on your risk assessment.
 - **Randomized sampling:** Within designated high-risk zones, randomly select surfaces and equipment to avoid sampling bias and ensure comprehensive coverage over time. You should try to aim for those areas that have a higher chance of harboring bacteria.
- **Testing:** Ensure EMP testing methods are validated for pathogens and indicator organisms. See **Appendix E** for different types of test methods.
 - Areas swabbed should not contain any chemical residues that may interfere with the detection of organisms and commercial swabs use neutralizing wetting agents.
 - Carefully determine which areas are best swabbed with sponge-type methods and those better assessed with Q-tip type units.
- **What should my EMP test for:** The indicator your testing targets depends on the goals of your EMP. Typical microbial targets for EMPs include indicator organisms, and/or pathogens. If testing for pathogens, do not use equipment until test results are available. See Appendix E for more information.
- **When to take samples:** Pre-operational samples should be taken immediately after equipment has been cleaned but prior to the application of a sanitizer. In-operation samples should be collected 3-4 hours into production to release potentially embedded contamination in areas not easily accessed; these areas should be targeted at the next disassembly and periodic cleaning interval.

Table 8. Classification of environmental sampling sites

ZONE	EXAMPLES
Zone 1: High-risk areas - direct food-contact surfaces where contamination directly impacts food safety.	Conveyor belts, cutting boards, harvest bins, rollers, brushes, graders, packing tables
Zone 2: Adjacent areas - non-food-contact surfaces close to Zone 1 that could contaminate Zone 1 indirectly.	External surfaces of equipment (e.g., framework) control panels, handles
Zone 3: Peripheral areas - non-food contact surfaces further removed but within the food processing environment.	Floors, walls, drains, storage shelves in processing areas.
Zone 4: Remote areas - areas outside the food processing area that could indirectly impact Zones 1–3.	Locker rooms, offices, hallways, break rooms, maintenance areas.

Corrective actions

Corrective actions will depend on the type of organisms you have designed your plan to test for (indicator organisms for which you have set acceptable limits, or indicator organisms for which you conduct a presence or absence test).

The International Fresh Produce Association’s Guide uses *Listeria* spp. as the indicator of choice for the EMP for produce operations.⁴⁴ Pointing out testing for pathogens (*Listeria monocytogenes*) to be done only when (i) recurring detections of *Listeria* spp. (persistent detections after corrective action may indicate entrenchment rather than transient contamination), and (ii) zone 1 detections for *Listeria* spp. will require further investigation.

Typical corrective actions for indicator organisms beyond the acceptable limit include:

- Cleaning and sanitation of the area where the out-of-tolerance test was taken.
- Repeat and perform 365° vector sampling (i.e., samples taken in a “starburst” pattern around the out-of-tolerance site) and testing of the out-of-tolerance area. Based on the results:
 - o Positive: Conduct a deep cleaning of the area. Repeat swabbing, cleaning, and sanitation until a negative result is obtained.
 - o Negative: Continue with activities but increase the frequency of environmental monitoring.

Typical corrective actions for a human pathogen result in zone 1:

- Cleaning and sanitation activities
- Before starting processing, repeat swabbing for zone 1 and 2.
 - o Incorporate vectoring while conducting additional swabbing. This process helps identify potential harborage sites and contamination pathways, enabling targeted corrective actions to eliminate the pathogen from the environment.

- o Positive: Conduct deep cleaning of equipment and area. This may require disassembling equipment. Repeat swabbing until negative results are obtained. Conduct root cause analysis/"seek and destroy" process to identify and eliminate the potential sources of contamination.
- o Negative: Continue with activities but increase the frequency of environmental monitoring.

Documentation:

- Facility hazard identification and risk assessment
- Facility map
- EMP sampling plan
- EMP sampling schedule
- EMP test results
- Corrective actions for out-of-tolerance test results

7.3 Packinghouse and cooling facilities construction, design and maintenance

Packers must comply with regulatory requirements, such as the regulations in subpart K and L of the Produce Safety Rule for packing operations. Although a packinghouse is not considered a manufacturing or processing facility, operations that pack and cool netted melons should follow the requirements for buildings and grounds, packing and holding of foods, equipment and utensils, toilet facilities and controls, and sanitary operations as provided under cGMPs in 21 CFR Part 117 subpart B, as appropriate to the operation, especially when wet conditions are present or when water is used in product handling and postharvest treatments.

7.3.1 Facility grounds

Grounds maintenance includes, but is not limited to:

- Store equipment properly, remove litter and waste, and cut weeds or grass around the buildings or structures that may constitute an attraction, breeding place, or harborage for pests.
- Maintain roads, yards, and parking lots so that they do not constitute a source of contamination in areas where food is exposed. Roads should be paved or otherwise managed to prevent dust.
- Evaluate adjacent and nearby land uses to ensure that they do not pose a significant risk of product contamination.
 - o Conduct an assessment of adjacent and nearby land as identified in **section 6.1. Environmental risk assessment**. Hazards to look for include adjacent and nearby animal operations (e.g., AFOs and CAFOs), hobby farms, urban areas, composting locations, and other agricultural operations.
- Adequately drain areas that may contribute to netted melon contamination by seepage, by transfer to facility via foot traffic, or by providing a breeding place for pests.
- Operate systems for waste treatment and disposal in an adequate manner so that they do not constitute a source of contamination in areas where food is exposed.

7.3.2 Construction and design

Packinghouse and cooling facilities and equipment design, construction and maintenance should include, but not be limited to the following:

- Maintain the building structure to exclude pests from gaining entrance to the facility. If the facility is closed to protect against external sources of contamination, then adequately protect windows, vents, fans, and similar features to minimize entry of pests and other contaminants. If the facility is

open, then adequately protect food-contact surfaces to minimize contamination from pests or other contaminants.

- To provide adequate drainage and prevent accumulation of water, keep floors in good repair and sloped to drain.
- Keep floors as dry as possible using appropriate methods.
- Train workers to properly remove standing water or push standing water to the drains.
- Design floor drains to be accessible for effective cleaning and sanitizing to prevent foodborne pathogens (e.g., *Listeria monocytogenes*) from becoming established in the environment and serving as a source of product contamination.
- Design floor drains to be capable of preventing pest entry.
- Construct food-contact surfaces of materials that are smooth, nonabsorbent, smoothly bonded, without niches, and sealed so that they are easily cleaned and sanitized and do not serve as harborage of microbial pathogens.
- Avoid use of hollow structures such as table legs, conveyer rollers, and racks because they may collect water and debris, and thus, harbor pathogens.
- Manage equipment lubrication so as not to contaminate netted melons. Use food grade lubricants on packing equipment where food contact may occur. Store food-grade and non-food-grade lubricants separately.
- Sufficiently elevate food-contact surfaces above the floor to prevent contamination from floor splashes.
- Separate raw and finished product storage areas to reduce the potential for cross-contamination.
- Design all lights for sufficient visibility and to prevent the potential for broken glass contamination of the product (i.e., contain shatter-proof bulbs or be sealed in a protective covering).
- Drain cooling systems' condensation units directly into drainage systems. Emptying of this water into floor drains should be prohibited.
- Design overhead equipment, structures or fixtures, skylights, catwalks, walls, pipelines, etc. to avoid the potential for buildup that could become a contamination source for product, food-contact surfaces, and packaging (i.e., dripping water, condensation formation, dirt).
- Equip facility water systems with back-flow prevention devices to prevent potential contamination of the water supply.
- Design wastewater collection areas to prevent product and equipment contamination.
- Provide a designated area not in a food handling area for employees to store personal items.

7.3.3 Toilets and hand-washing stations construction and design

The design and construction of toilets facilities and hand-washing stations should include, but not be limited to the following:

- The design and construction of toilet facilities and hand-washing stations including number and location must be in compliance with applicable local, state, and federal regulations.
- The number of toilets and hand-washing stations must meet OSHA requirements as outlined in 29 CFR 1910.141.⁴⁵
- Evaluate the location of toilet facilities and hand-washing stations to maximize accessibility and use, while minimizing the potential for contamination.

- Construct toilets and hand-washing stations of materials that can be easily cleaned and sanitized using cleaners and/or oxidizing agents.
- If the toilets and hand-washing stations have any openings to the outside (e.g., windows, vents), screen openings properly to exclude vermin.
- Construct toilet facilities and hand-washing stations with properly designed drainage systems.
- Doors to the toilet facilities:
 - Should not open directly into areas where product is located.
 - Should be self-closing.
 - Should be lockable from the inside if entry is to a single-person facility.
- Each individual toilet stall should have doors that are self-closing and lockable from the inside and toilet paper in a proper holder.
- Locate hand-washing units where employees wash their hands before returning to their workstations in a location where handwashing can be observed. All hand-washing units should be equipped with:
 - Potable, hot and cold running water. The quality of the water should be verified by testing to ensure its microbial quality is acceptable according to local standards for potable water.
 - Soap or other suitable cleansing agents in dispensers.
 - Single-use paper towels.
 - Hands-free “on/off” switches for water (i.e., workable without using potentially soiled hands).
 - Trash containers with covers.
 - Signs indicating that the water is only for hand-washing purposes (in appropriate languages).
 - Sealed catch basins with plumbing free of wastewater leaks.

Documentation:

- Maintenance schedule and records
- Toilet and handwashing stations checklist

7.4 Water and chemicals used in packinghouse and cooling operations

Washing netted melons may include using antimicrobial chemicals in the wash water or using spray type wash treatments instead of submerging. Alternatively, netted melons may be cooled by means other than hydrocooling.

7.4.1 Best practices for washing netted melons

- Use water quality as described in **section 7.4.2**.
- Water used for washing netted melons should contain an anti-microbial agent at an effective concentration to prevent cross-contamination. Routinely monitor the concentration with an appropriate device and record the result.
- If possible, install automated systems for antimicrobial dosing and monitoring to maintain constant levels of wash chemicals. These systems should be regularly calibrated and verified, and the chemical injection pumps should be checked to ensure they are actively pumping.
- Introduce a pre-wash rinse step to loosen and remove dirt from the fruit surface allowing better interaction between the antimicrobial and the netted skin. Check spray nozzles to ensure they are not clogged and are functioning as expected.

- It is recommended to use a single pass system (e.g., spray wash system) to minimize food safety risks.
- Do not use dump tanks as submersion in water can cause pathogens on the surface to infiltrate the netted melon's porous rind.
- Maintain washing and cooling equipment to ensure there is no build-up of soil and organic materials that could serve as a source of contamination.

7.4.2 Water quality

- The water used in packinghouse operations (on product, food-contact surfaces, and human hands) must comply with U.S. EPA's potable water standards.^{46,47}
 - If a municipal water source is used, microbial water quality information from the respective municipal water authority may be obtained and archived if it is reported as total coliforms.
 - Facilities using municipal water should periodically test water at the point of use to verify the integrity of the facility water distribution system.
 - Develop an action plan in case municipal water authorities issue a water quality alert or warning such as "boil water warning." Document and archive any warning or alerts issued by the water authority as well as corrective actions taken by your firm to address this issue.
- To ensure efficient operation, routinely inspect and maintain facility water distribution system and equipment designed to assist in maintaining water quality such as chlorine injectors, filtration systems, and backflow devices. Inspections and maintenance should be documented.
- Water holding tanks used at the facility should be kept clean and sanitary. All cleaning and sanitation verification activities should be documented.

Documentation:

- Warnings/alerts from municipal/irrigation district water authority
- Facility water distribution system inspection
- Facility water distribution system maintenance
- Water holding tank cleaning verification records

7.4.3 Antimicrobial agents and other chemical use

- If netted melons are washed before being packed, use a scientifically validated water treatment process to prevent cross-contamination. Water used on netted melons or food-contact surfaces in the packinghouse should have sufficient levels of antimicrobial agent to prevent cross-contamination. Operators should verify the washing process by documenting wash water system parameters (e.g., antimicrobial levels, water changes, pH control, exposure time, and mass-to-volume ratios) that are effective in controlling microbial levels in their system.
- If antimicrobial agents are used in the water, monitor and maintain levels throughout the process by testing the concentration and pH. Measure and document active levels of antimicrobial agent (i.e., free chlorine and not total chlorine); continuous and automated monitoring is preferred.
- Follow manufacturers' directions for mixing antimicrobial chemicals to obtain effective concentrations; do not exceed the manufacturer's suggested or allowable level in washing and cooling water.
- The person monitoring the antimicrobial agent levels in the water should know when to add more based on values obtained.
- Any other substance (e.g., processing aids or organic acids for pH control) used to treat the wash water should be approved by the US EPA or FDA for use in the manner that it is applied and monitored to verify correct concentration. Monitoring activities should be documented.

- Adequately maintain and periodically calibrate all monitoring equipment. Calibrate all devices used to measure antimicrobial agent daily and document the calibration occurrence (date, time, value, signature of the person doing the calibration).⁴⁷
- Maintain a log of maintenance and calibration events.

7.5 Fungicidal treatments

Fungicides may be applied, per label instructions, to netted melons by use of an aqueous spray or immersion to extend the post-harvest shelf-life of the fruit. Maximum residue limits/levels vary among countries, so handlers should be aware of MRLs for the area in which they are growing as well as in the destination market when applying fungicides. The following are recommended:

- Only use fungicides authorized for use on netted melons by the prevailing regulatory authorities in both the country of origin and destination markets. Use all fungicides and pesticides according to the manufacturer's label instructions. All federal, state, and local laws must be followed including those regulating MRLs.⁴⁸ Avoid mixing fungicides and antimicrobials, review recommended manufacturers specifications to assess any potential interactions, mixing these may compromise the efficacy of these chemicals.
- Water that meets the microbial standards of drinking water should be used in water-based chemical treatments to ensure that the water does not contaminate the netted melons with pathogens.^{45, 46}
- If hot water or steam treatments are used as an alternative to post-harvest chemical fungicide or other pest control treatments, water/vapor temperature and contact time should be evaluated and monitored to ensure that the appropriate water temperature and contact time is maintained.

Documentation:

- Wash water management plan (e.g., the levels of sanitizers, water changes, pH control, exposure time, and mass-to-volume ratios)
- Source water test schedule and results
- SDS for water antimicrobial/fungicidal chemicals
- Water treatment validation study
- SOP for ice transporting, handling, and storage
- SOP for adding antimicrobial/other chemicals to wash water
- SOP for monitoring antimicrobial agent in the wash water
- Antimicrobial/wash water chemical monitoring logs
- All measuring and monitoring equipment calibration logs
- Monitoring equipment maintenance logs
- Monitoring equipment calibration logs
- Water temperature logs for hot water treatments



7.6 Post-harvest product containers, packaging materials, finished product containers and pallets

During harvest, netted melons are generally placed into containers before being transported to a customer or to a packinghouse for further washing, sorting, and/or packing. Post-harvest product containers finished product containers, and pallets may be a source of microbial contamination if they are not handled and stored in a sanitary manner. Finally, pallets used to transport empty containers, packing materials, and finished product should be kept clean and in good condition.

7.6.1 Postharvest product containers

- Post-harvest product containers should be distinguishable from field containers (e.g., by color, design, or label). Field containers should be used, maintained, and inventoried separately from post-harvest product containers.
- Develop SSOPs for cleaning and sanitizing reused post-harvest product containers. Topics addressed should include (but are not limited to):
 - Cleaning frequency, sanitizer type and concentration, and specific cleaning procedure.
 - Documentation should include the concentration of sanitizer used, date and time of cleaning, and the initials of the employee performing the task.

7.6.2 Finished product containers, packaging materials and pallets

- Finished product containers should be unused and constructed with materials that are non-toxic.
- Establish an SOP for inspecting all incoming finished product packing materials and shipping containers to ensure that they are in sanitary condition and suitable for use. The inspection procedure should also include an inspection of vehicles that transport these containers to ensure no foreign material, pests, or pest contamination exists.
- Store finished product containers in a designated area on clean pallets in a controlled area with coverings to protect them from potential contamination and prevent the intrusion of foreign material including wind-blown dust and debris.
- Include finished product container storage areas in the company's pest control program.
- The finished product containers' storage area should be maintained with an 18-inch perimeter to facilitate inspection, cleaning, and placement of pest control devices.
- Any finished product containers that are identified as potentially contaminated and not suitable for use in storing food products should be discarded.
- Establish a pallet inspection and repair program SOP. Pallets used with post-harvest and finished product containers should be in good condition (i.e., free from loose pieces such as nails or staples) and not used for production and harvesting activities. Do not use damaged wood pallets.

Documentation:

- Container identification key
- SSOP for reused post-harvest product containers (sanitizer concentration, date and time of cleaning, and the initials of the employee performing the task)
- Pallet inspection SOP
- SOP for inspection of finished product packing materials and shipping containers

7.7 Packinghouse and cooling facilities sanitary operations

Sanitary operations refer to continuous practices integrated into daily activities to maintain cleanliness, hygiene and prevent contamination. Contamination by location and/or flow of humans, product, equipment, and air can be prevented by adequate food safety controls, operating practices, and facility design. A packinghouse or cooling facility should be designed so that netted melons arriving from the field never cross paths with, or are commingled with, finished product. Operators should be aware of and operate in accordance with all relevant laws and regulations that describe facility sanitation practices.

7.7.1 General Items for sanitary operations

- Each facility should have a flow diagram of the packinghouse and/or cooling operation and should perform a hazard analysis for the operation. This analysis should be documented and available for review. If the operator should change the process (e.g., updated equipment), then the analysis should be updated and revised.
- Store chemicals in a separate, designated area that is physically isolated from food production, handling, and storage areas to prevent cross-contamination. Ensure the storage area is dry, well-ventilated, and secured to prevent unauthorized access, while also being equipped with spill containment measures and emergency equipment.
- Netted melons should not come into contact with the floor or any other non-food-contact surface. Discard netted melons that fall on the floor.
- Floors in packing or storage areas should have proper drainage to avoid water build-up and reduce the potential for cross-contamination.
- Protect food-contact surfaces from contact with non-potable water.
- Avoid practices that cause condensation to form in the facility. Condensation provides conditions optimal for microbial growth and may potentially serve as a source of cross-contamination. If condensation forms in any part of the facility, it should be cleaned and the area sanitized.
- All packinghouse or cooling facility tools should be clearly designated to denote those tools that are only used for food-contact and those that are used for general cleaning and may contact non-food-contact surfaces.
- Old, unused equipment should be removed from the packing and cooling areas and stored in a manner that does not present a food safety hazard.
- Appropriate signage should be displayed throughout the packinghouse and cooling facility to remind employees to adhere to company policies related to food safety (e.g., use of equipment, hygiene).

7.7.2 Waste water disposal

Systems for waste treatment and disposal should operate in a manner so as not to constitute a source of contamination for netted melons or the facility. To ensure adequate waste disposal the following practices are recommended:

- Within the facility flow diagram, evaluate traffic patterns, movement of water, movement of product, and disposal location(s) to ensure these do not pose a risk for cross-contamination of netted melons.
- Areas for garbage, recyclables, and compostable waste should be located away from produce handling areas. Weeds and other pest harborage should be minimized around the containers.
- Receptacles should be clearly designated for their intended use (e.g., trash, recyclable materials or product that might be re-worked). Employees should be trained to recognize and use material receptacles appropriately.

- Pest control devices around dumpsites should be used per their labeled directions.
- Waste should be stored in appropriate receptacles that are covered or closed (except for waste collection/cull trailers in active use), removed from the facility on a regularly scheduled basis, and disposed of in a manner to minimize contamination including any controls necessary to ensure that vehicles used to transport waste from the facility do not themselves serve as a source of contamination.

7.7.3 Pest control

Packinghouse and cooling operation facilities may be dormant for many months and should be appropriately protected from pest infestations. Appropriate cleaning, sanitation, and pest removal/exclusion measures should occur before operations commence. Effective measures should be taken to exclude pests from the packinghouse and cooling areas and to protect against the contamination of food on the premises by pests.

- All pesticides, traps, bait, and chemicals used in pest control should be acceptable for use in and around a food packing facility and used in accordance with local, state, and federal regulations.
 - Permit the use of insecticides or rodenticides inside the facility only under precautions and restrictions that will protect against the contamination of netted melons, food-contact surfaces, and food-packaging materials. Rodent bait materials are not to be used within production areas or packaging material storage areas.
 - These materials should only be used by properly trained and accredited personnel. A record of use should be kept available for inspection along with the appropriate applicator's licenses and documentation. Applicators should also show records of training, continuing education, etc.
 - If rodent traps are deployed around the inside of the facility and bait stations along the outside perimeter of the facility, detailed maps demonstrating the location of each trap and bait station should be available for review. Traps and bait stations should be inspected routinely and any corrective actions (e.g., cleaning out traps, replacing damaged traps) documented.
 - Pest control chemicals and baits should be securely stored if kept on-site.
 - A procedure should be implemented for the disposal of waste pest control chemicals and empty containers and for cleaning of application equipment that protects against product and production area contamination.
- Measures should be taken to protect packaging materials from rodents or other pests. The storage area or carton yard should be kept clean and should be included in the facility pest control program. All packaging should be covered so as to mitigate contamination by rodents, birds, wind-blown dirt, or chemical sprays.
- Open windows, vents, fans, and similar features should be adequately screened to prevent pest entry.
- Measures (e.g., roof spikes, netting, etc.) should be taken to control/deter birds from nesting and resting on or near roof edges.
- Doors or entrances to the facility should remain closed during operation to prevent pest entrance. Strip curtains or similar devices may be used for high traffic areas.
- An inspection buffer of 18 inches should be maintained on both the inside and outside perimeters of the physical facility (e.g., pallets, raw product and equipment may not be stored flush against the wall of the facility).
- If pest control is performed internally or by a third-party pest control company, a copy of the applicator's license, any chemicals used, SDS, and a schedule of the applicator's activities and actions should be maintained and available for review.

Documentation:

- Trap and bait station location maps
- Trap and bait station inspection log
- SDS for pest control chemicals
- Pest control applicator's license(s)
- Pest control chemical application/activities log

7.8 Packinghouse and cooling facility sanitation

Sanitation programs are critical to ensuring that netted melons exiting the packinghouse and/or cooling operations have not been contaminated with pathogens. Pathogenic microorganisms may be found on floors, in drains, and on equipment surfaces and components. A packinghouse or cooling facility should be designed so that netted melons arriving from the field never cross paths with, or are commingled with, finished product.

When netted melons arrive at the packinghouse, they are routinely cooled to remove field heat. Cooling operations may spread product contamination if cooling equipment is not cleaned and sanitized regularly. Without appropriate sanitation practices, packinghouse and cooling facilities may be a source of microbial contamination. Cleaning and sanitizing of facilities and equipment should be conducted in a manner that protects against contamination of netted melons, food-contact surfaces, or packaging materials. Operators should be aware of and operate in accordance with all relevant laws and regulations that describe facility sanitation practices, including the posting of SDS.^{49,50}

7.8.1 General facility sanitation

- Clean and sanitize the non-food-contact components of the facility (e.g., walls, ceilings, floors, drains, cooling equipment, mezzanines, storage areas) on a routine basis. Establish a master sanitation schedule for these areas that clearly identifies cleaning frequency, sanitizers to be used, precautions, etc.
- Conduct a pre-operative inspection of the packinghouse and cooling facility operations daily to verify that sanitation has been satisfactorily completed, the equipment is safe and ready for use, pest control measures are in place and functioning, and all food safety protocols are being followed. Use a checklist and document any corrective actions taken to address deficiencies.
- Ensure all equipment and facilities are hygienically designed to prevent contamination, facilitate easy cleaning, and eliminate hard-to-reach areas where residue or bacteria could accumulate. Verify that the appropriate chemical combinations are used for cleaning and sanitizing, considering factors such as:
 - o Material compatibility to avoid damage to equipment surfaces.
 - o Effectiveness against specific microorganisms and residues.
- Cleaning compounds and other chemicals used in a netted melon operation should be approved for their intended use.⁵¹
- Use a secure, vented storage area for storing facility sanitizing chemicals and cleaning tools. Locate the storage area away from the food handling area and any storage areas for raw or finished product packaging.
- Use floor cleaning techniques that do not pose a risk of cross-contamination of product or food-contact surfaces. When using water to clean the floors, train workers on the potential for cross-contamination from splashing.

- Train personnel with cleaning and sanitation duties:
 - To understand the principles and methods required for effective cleaning and sanitation, especially as they relate to food safety.
 - To use, handle, and store cleaning and sanitizing chemicals safely.
 - In the proper cleaning and sanitizing steps of the equipment and facility.
 - In the proper use of cleaning equipment.
- Document employee training and keep records for at least 2 years.
- Use and label all chemicals used in cleaning operations in accordance with the manufacturer's instructions and in accordance with relevant federal, state, and local government regulations.
- Establish a procedure for the disposal of waste sanitation chemicals and empty containers and for cleaning of equipment used in cleaning and sanitation that protects against product and production area contamination.
- Keep SDS on file for each cleaning and sanitizing chemical.
- Verify the efficacy of the facility cleaning and sanitation with routine environmental testing (e.g., conventional or rapid microbiological methods such as total count or bioluminescence testing). Keep testing data on file.

7.8.2 Cooling facility sanitation

- Establish a written sanitation program and master sanitation schedule covering equipment, refrigeration units, icing equipment, forced air rooms, floors, drains, and the storage/distribution area.
- Sanitation should be conducted by personnel trained in handling sanitation chemicals and knowledgeable in sanitation practices.
- Per **section 7.2 Environmental monitoring program**, establish a documented EMP screening for *Listeria* spp. with testing targeted to areas where moisture, soil or debris may accumulate (e.g., icing rooms). If test results are positive for *Listeria* spp., then conduct targeted cleaning and sanitizing and repeat testing for *Listeria* spp.⁵²
- Bins, shovels, and other equipment used to contain and/or move ice should be clean and sanitary, used only with ice, and stored in a sanitary manner when not in use.

7.8.3 Equipment sanitation

All sorting, grading, and packing equipment that makes contact with netted melons may serve as a vehicle for spreading microbial contamination. Packinghouse and cooling facility equipment should be maintained clean and free from debris.

- Packinghouse and cooling facility equipment should be inspected for cleanliness before packing and/or cooling operations begin each day.
- At minimum all food-contact surfaces should be cleaned and sanitized daily.
- A master sanitation schedule should be developed for all packinghouse and cooling facility equipment. This schedule should clearly indicate the name or ID number of the piece of equipment, the frequency with which it is to be cleaned (e.g., daily, weekly, monthly or seasonally) and the process to be used for cleaning (e.g., wash, sanitize and rinse if necessary).
- Each piece of packinghouse and cooling facility equipment should have written procedures for cleaning (SSOPs).

- Cleaning and sanitizing of utensils and equipment should be conducted in a manner that protects against contamination of food, food-contact surfaces, or food-packaging materials.
- Equipment filters should be backflushed and sanitized as part of the master sanitation schedule for packing equipment.
- Avoid cleaning and sanitizing equipment during packing operations.
- Verify the efficacy of the equipment cleaning and sanitation with routine environmental testing (e.g., conventional or rapid microbiological methods such as total count or bioluminescence testing). Testing data should be kept on file.
- All equipment inspection, maintenance, cleaning, and sanitizing activities should be documented.

7.8.4 Toilets and hand-washing stations sanitation

Individual toilet and hand-washing units should be properly maintained in a clean and sanitary condition for the worker's health, safety, and comfort. Inadequately supplied or improperly maintained restrooms and hand washing facilities may cause direct or indirect contamination of netted melons and/or water sources used on netted melons.

- Establish a written cleaning and sanitation schedule for toilet and hand-washing facilities.
- Establish SSOPs for toilet and hand-washing facilities including a checklist of facility supplies.
- Maintain written documentation of service and maintenance of toilet facilities and hand-washing stations that demonstrates compliance with applicable worker health and safety regulations.

7.8.5 Toilets and hand-washing stations waste disposal

Operations with poor management of wastes in the packinghouse or cooling facility can significantly increase the risk of contaminating netted melons.

- Maintain a written waste collection service schedule.
- All waste from sanitation facilities should be disposed of according to applicable laws and regulations.
- Disposal of used hand-washing water should not cause unsanitary conditions or contamination of the packinghouse/cooling facility.
- Used toilet paper should be disposed of in a sanitary manner that prevents cross-contamination, specifically flushing it down the toilet. In some areas or countries, the plumbing and waste disposal system can't handle toilet paper: in these cases, toilet or waste baskets should be used and managed so as not to allow the wastepaper to spill onto the floor.

Documentation:

- Non-food-contact surface SSOP
- Non-food-contact surface master sanitation schedule
- Cooling facility SSOP
- Cooling facility master sanitation schedule
- Toilet and hand-washing facilities SSOP
- Toilet and hand-washing facilities master sanitation schedule
- Equipment SSOP
- Equipment master sanitation schedule
- Pre-operative inspection checklist
- Corrective action log

- Employee SSOP training records
- SDS for cleaning chemicals
- Environmental/verification testing schedule and results
- Toilet and hand-washing facilities service and maintenance log
- Waste water records

7.9 Cold storage and warehousing

In post-harvest unit operations, cold storage and warehouse facilities are often the last area that house netted melons before they are shipped to the next point of the supply chain. The conditions and sanitation programs of these facilities are critical in maintaining the integrity of the finished product before it exits the facility.

- Place and store product in a sanitary arrangement/distribution to prevent cross-contamination (e.g., do not place pallets on top of bins).
- Store finished netted melons under conditions that will protect them against physical, chemical, and microbial contamination as well as against deterioration of the product and the container.
- The packing facility should have a cold storage area with refrigeration that is appropriate for the product.
- Inspect refrigeration units on a regular basis and to keep them in good operating condition.
- Place temperature monitoring devices in the warmest area of the refrigerator unit; calibrate the devices on a regular basis.
- Avoid practices that cause condensation to form in the facility (i.e. putting product into storage before it is properly cooled).
- Condensate/water from evaporator-type refrigeration systems should be contained in catchments designed to ensure that it does not become a source of contamination. Water from refrigeration catchments should be drained into a drainage line and not onto the floor.
- Include the storage area on cleaning and sanitation schedules. If finished product is present during cleaning of ceiling, floors or drains and equipment such as pressure washer/sprayers, steam or foam cleaners are being used, take measures to ensure that water does not splash on product.
- Include the storage area in the facility pest control program.
- Clean forklifts and other pallet moving equipment on a regular basis and include them in the master sanitation schedule and should be cleaned on a regular basis.
- Verify the efficacy of the cold storage and warehouse cleaning and sanitation with routine environmental testing (e.g., conventional microbiological methods or rapid methods for total bacterial count or bioluminescence testing). Testing data should be maintained on file.
- Cleaning and sanitation activities should be documented.

Documentation:

- Cold storage/warehouse SSOP
- Forklift SSOP
- Refrigeration unit inspection SOP
- Refrigeration unit inspection log
- Temperature monitoring device calibration log
- Cleaning and sanitation activity logs
- Environmental/verification testing schedule and results

7.10 Transportation between packing/cooling facilities and retail

Conditions under which netted melons are transported to the next stage in the market may provide opportunities for microbial contamination. Temperature control during transportation of netted melons should be managed to reduce, control, or eliminate the risk of contamination. For example, if netted melons are pre-cooled, refrigerated transport should be used to maintain the temperature of pre-cooled netted melons throughout transport. In addition to the recommendations listed in **section 6.12 Transport from the production site to the packing/ processing facility**, the following practices for transport between packing/cooling facilities and retail are recommended:

- Proper vehicle maintenance: Before loading ensure all vehicles and transportation equipment are cleaned and, when necessary and appropriate, sanitized and are free from contamination risks such as pests, residues, or odors.
- Temperature control: Maintain appropriate temperatures for perishable goods during transit, using calibrated monitoring devices to ensure compliance with required conditions.
- Separation of goods: Segregate food items from non-food items, chemicals, or allergens to prevent cross-contamination during transportation.
- Documentation and recordkeeping: Maintain detailed records of sanitation procedures, temperature logs, and shipment details for traceability and compliance with regulations.
- Training and awareness: Provide training for drivers and handlers on food safety practices, proper equipment use, and procedures for managing temperature control and contamination risks.
- Sealed and secured loads: Use tamper-evident seals on trailers or containers to protect against unauthorized access and potential contamination.
- Inspection and reporting: Regularly inspect transportation equipment and report any issues or deviations to the relevant authorities for prompt corrective action.

43 § 112.30(b) and applicable provisions from subpart O

44 Guidance on Environmental Monitoring and Control of Listeria for the Fresh Produce Industry ([FINAL-UFPA-Listeria-Guidance5.pdf](#))

45 OSHA. Sanitation. 29 CFR 1910.141. http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9790

46 §§ 112.41, 112.42, 112.44 – 112.50

47 National drinking water standards: [National Primary Drinking Water Regulations | US EPA](#)

48 USDA's International Maximum Residue Limits database: [Maximum Residue Limits \(MRL\) Database | USDA Foreign Agricultural Service](#)

49 OSHA. Sanitation 1910.141

http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9790

50 Code of Federal Regulations, Title 21, Part 117 – Current Good Manufacturing Practice, Hazard Analysis, and Risk-Based Preventive Controls for Human Food. [eCFR :: 21 CFR Part 117 -- Current Good Manufacturing Practice, Hazard Analysis, and Risk-Based Preventive Controls for Human Food](#)

51 Appropriate chemical use can be verified in NSF's White Book™ - Nonfood Compounds Listings Directory available at [Listing Category Search Page | NSF International](#)

52 FDA. 2017. Draft Guidance: Control of Listeria monocytogenes in Ready-to-Eat Foods. [Draft Guidance for Industry: Control of Listeria monocytogenes in Ready-To-Eat Foods | FDA](#)

8.0 TRACEABILITY PROGRAM

Whole fresh netted melons are included in the FDA's 2022 *Food Traceability List* under the FSMA 204 regulation and subject to enhanced traceability requirements contained in the Food Traceability Rule.^{53,54} Netted melons growing, packing and shipping operations should establish an internal program to generate and maintain key data elements (KDEs) or traceable data and records during critical tracking events (CTEs) such as harvesting, packing, processing, and shipping operations. The following practices are recommended:

- Establish a documented traceability program that meets FSMA 204 and other applicable regulations. At a minimum, maintain the following records for at least two years:
 - A traceability plan that includes the following:^{55,56}

meet the following criteria:

 - A description of the procedures you use to maintain the records, including the format and location of these records.
 - A description of how you assign traceability lot codes to netted melons (if applicable).
 - A statement identifying a point of contact for questions regarding your traceability plan and records.
 - A farm map showing the areas in which you grow or raise such foods. The farm map should include the location and name of each field (or other growing area), including geographic coordinates and any other information needed to identify the location of each field or growing area.
 - Records of the applicable CTEs and KDEs that enable reconciliation of product delivered to recipients (one step forward) should be maintained except for direct-to-consumer sales.
 - Records of the applicable CTEs and KDEs should be maintained to link product with their source and other supplies and raw materials (one step backward).
- Records should include all KDEs required for a given CTE (see **section 8.1**).
- A trace-back and trace-forward exercise should be conducted at least annually and should achieve accurate traceability within four hours or as required by applicable regulations. The trace exercise should achieve an account of all the products (100% reconciliation).

8.1 CTEs and KDEs

Below is a list of all the CTEs and KDEs that apply to harvesting, cooling, packing, and shipping operations (**Tables 9-12**).

8.1.1 Harvesting

Records: Records for all KDEs below must be maintained, along with the harvester's business name and phone number.

Provide these records to the initial packer either directly from the harvester or throughout the supply chain. Reference document type and document do not need to be passed forward.²¹



Table 9. KDEs for Harvesting⁵⁷

KEY DATA ELEMENT	COMMENTS
The location description for the immediate subsequent recipient (other than a transporter) of the food	Generally, the initial packer location or cooling facility, if separate from the packer location.
The commodity and, if applicable, variety	Describe the commodity; be consistent throughout your records.
The quantity and unit of measure	Depending on how the product is harvested, i.e., could be bins or cases if the product is field-packed.
The location description for the farm where the netted melons was harvested	Farm location description includes the business name, physical address or GIS coordinates, city, state, zip, country and phone number.
The name of the field or other growing area from which the netted melons were harvested (which must correspond to the name used by the grower), or other information identifying the harvest location at least as precisely as the field or other growing area name	Be consistent with the name of the field assigned in the grower's traceability plan.
The date of harvesting	PTI recommends that if harvesting over multiple days, record the final day of harvest.
The reference document type and reference document number*	Documents may include but are not limited to purchase orders, sales orders, production orders, etc.



8.1.2 Cooling (before initial packing)

Records: Records for all KDEs below must be maintained before the netted melons are initially packed. Reference document type and document do not need to be passed forward.

Provide these records to the initial packer.

Table 10. KDEs for cooling before initial packing CTE²⁶

KEY DATA ELEMENT	COMMENTS
The location description for the immediate subsequent recipient (other than a transporter) of netted melons	The location of the initial packer. If cooling in the same location as the packer, record the cooling location.
The commodity and, if applicable, variety of the food	Same as captured in harvest and should stay consistent throughout the process.
The quantity and unit of measure of the food	Could be cases or bins.
The location description for where you cooled the food	Record the cooling location, which could be the same as the initial packer.
The date of cooling	Record date; if multiple days use the final date before the product went to packing
The location description for the farm where the food was harvested	Farm location description includes the business name, physical address or GIS coordinates, city, state, zip, country and phone number.
The reference document type and reference document number*	Documents may include but are not limited to purchase orders, sales orders, production orders, etc.

8.1.3 Initial packing

Records: For each traceability lot of netted melons, maintain records containing the information in **Table 11** and linking this information to the traceability lot.



Table 11. KDEs for initial packing⁵⁸

KDE	COMMENTS
The commodity and, if applicable, variety of the food	Should be the same as captured in harvest and should stay consistent throughout the process.
The date you received the food	Record the receiving date.
The quantity and unit of measure	Similar to cooling, most likely will be bins.
The location description for the farm where the netted melons were harvested	Farm location description includes the business name, physical address or GIS coordinates, city, state, zip, country and phone number.
The business name and phone number of the harvester	Be consistent throughout your records.
The date of initial packing	Use the same date as in the harvesting KDEs. PTI: If packing spans more than one day, use the last day of packing.
The location description for where the food was cooled	Use the same location as the cooling KDEs.
Traceability Lot Code	TLC you assigned.
The location description for where you initially packed the food (<i>i.e.</i> , the traceability lot code source), and (if applicable) the traceability lot code source reference	Use information from the traceability lot code source. Information includes business name, phone number, physical location address or GIS coordinates, city, state and zip code.
The reference document type and reference document number	Relevant documents include but are not limited to: Purchase order, bill of lading, work order, etc.

If the netted melons you are packing is received from a person to whom the Food Traceability Rule does not apply, you must maintain the following records: (1) the commodity and variety, if applicable, (2) the date of receipt, (3) the quantity and unit of measure of the food, (4) the location description for the person from whom you received the food, (5) the traceability lot code you assigned, (6) the product description of the packed food, (7) quantity and unit of measure of the packed food, (8) the location description of where the food was initially packed, (9) the date of packing, and (10) the reference document type and reference document number.

8.1.4 Shipping

Records: For each traceability lot of a food on the Food Traceability List you ship, you must maintain records containing the following information and linking this information to the traceability lot.⁵⁹ *NOTE: This section does not apply to the shipment of a food that occurs before the food is initially packed.*

Provide these records to: All KDEs except the reference document type, and reference document number must be provided to the immediate subsequent recipient (electronic, paper or written form).

Table 12. KDEs for shipping²⁸

KDE	COMMENTS
The traceability lot code for the food	See FDAs guide . Also PTIs guide .
The quantity and unit of measure of the food	These will be the cases that are being shipped.
The product description for the food	Product name (including, if applicable, the brand name, commodity and variety), packaging size, packaging style.
The location description for the immediate subsequent recipient (other than a transporter) of the food	Ship-to-location, physical location where the product is being shipped to: Information includes business name, phone number, physical location address or GIS coordinates, city, state and zip code.
The location description for the location from which you shipped the food	Ship-from-location, physical location where product is being shipped from: Information includes business name, phone number, physical location address or GIS coordinates, city, state and zip code.
The date you shipped the food	Date when product leaves the physical location from which it is shipped.
The location description for the traceability lot code source or the traceability lot code source reference	Use information from the traceability lot code source from initial packing or transformation. Information includes business name, phone number, physical location address or GIS coordinates, city, state and zip code.
The reference document type and reference document number*	Could be the packing list, bill of lading, invoice, etc. Make sure this is being tracked in the sortable spreadsheet.

Documentation:

- Traceability program
- KDEs for each of the applicable CTEs.
- Supplier verification records (domestic or international)
- Traceability exercise SOP and performance log

53 [FSMA Final Rule on Requirements for Additional Traceability Records for Certain Foods | FDA](#)

54 [Food Traceability List | FDA](#)

55 [FDA Fact Sheet: The FDA Food Traceability Rule \(FTR\) At-A-Glance](#)

56 A traceability plan is required under FSMA Rule 204 – 21CFR Part 1 Subpart S § 1.1315

57 As required under FSMA Rule 204 codified in 21CFR Part 1 Subpart S § 1.1325

58 As required under FSMA Rule 204 codified in 21CFR Part 1 Subpart S § 1.1330

59 As required under FSMA Rule 204 and codified in 21CFR Part 1 Subpart S § 1.1340

9.0 RECALL PROGRAM

Recall programs are procedures to remove product from commerce when there is reason to believe the product is or may be contaminated. The following practices are recommended:

- A documented recall program, including written procedures, should be established.⁶⁰ The documented program should include:
 - A designated recall team with team members' 24-hour, seven-days-a-week contact information.
 - A 24-hour contact list of customer point people to be called if product requires recall.
 - A contact list of key regulatory officials (e.g., federal and state) that may need to be notified if a recall is warranted.
 - A contact list of commodity organizations and trade association experts that could be called upon to provide technical help if needed.
- A documented mock recall exercise should be performed at least annually. The mock recall should test the ability to execute a recall, including communication, product retrieval and documentation with 100% reconciliation of product.

Documentation:

- Recall program
- Mock recall SOP and performance log

⁶⁰ FDA's Guidance for Industry: Product recalls, including removals and corrections. [Product Recalls, Including Removals and Corrections | FDA](#)



ADDITIONAL RESOURCES

9.1 Good Agricultural Practice Guidance Documents

- Association of Food and Drug Officials' (AFDO) *Produce Safety Regulatory and Industry Guidance*. [Produce Safety Regulatory and Industry Guidance – Association of Food and Drug Officials](#)
- CanadaGAP. *On-Farm Food Safety for Fresh Fruits and Vegetables*. [CanadaGAP Fruit and Vegetable Manual ENG](#)
- Codex Alimentarius Commission. *Code of Hygienic Practice for Fresh Fruits and Vegetables*. [fao.org/fao-who-codexalimentarius/sh-proxy/pt/?lnk=1&url=https%253A%252F%252Fworkspace.fao.org%252Fsites%252Fcodex%252Fstandards%252FCXC%2B53-2003%252FCXC_053e.pdf](https://www.fao.org/fao-who-codexalimentarius/sh-proxy/pt/?lnk=1&url=https%253A%252F%252Fworkspace.fao.org%252Fsites%252Fcodex%252Fstandards%252FCXC%2B53-2003%252FCXC_053e.pdf)
- Good Agricultural Practices Manual - Improving the safety and quality of fresh fruits and vegetables: A training manual for trainers. College Park: Joint Institute for Food Safety and Applied Nutrition, 2010. [improving-the-safety-and-quality-of-fresh-fruit-and-vegetables.pdf](#)
- SENASICA. *General Requirements to Recognize and Certify Systems Aimed at Reducing Contamination Risks during the Production of Agricultural Products*.
- U.S. Department of Agriculture. Agricultural Marketing Service. Harmonized Standards – Field Operations and Harvesting. [Harmonized GAP | Agricultural Marketing Service](#)
- U.S. Food and Drug Administration. *Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables*. [Guidance for Industry: Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables | FDA](#)

9.2 Good Manufacturing Practices Guidance Documents

- FDA's Guidance for Industry: Product recalls, including removals and corrections. [Product Recalls, Including Removals and Corrections | FDA](#)
- Good Manufacturing Practices for Harvesting and Handling Fresh Produce - Improving the safety and quality of fresh fruits and vegetables: A training manual for trainers. College Park: Joint Institute for Food Safety and Applied Nutrition, 2010. <http://www.jifsan.umd.edu/training/gaps.php>
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- U.S. Department of Agriculture. Agricultural Marketing Service. Harmonized Standards – Post-Harvest Operations. [Harmonized GAP | Agricultural Marketing Service](#)

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