2019–2020 Florida Citrus Production Guide: Food Safety Requirements and Considerations for the Florida Citrus Grower[1]

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Introduction and Objective

Florida citrus growers have long implemented *Good Agricultural Practices (GAPs)*, which refers to preharvest practices (e.g., in the field or before the farm gate) that are established to prevent, minimize, or eliminate contamination and hazards to human health. Essential components of the GAPs process include careful planning, implementation, and documentation of required steps and procedures that together analyze and minimize risks from biological, chemical, and physical hazards.

The development of GAPs is based on sound science, including from peer-reviewed scientific literature as well as outbreak investigations related to various fresh produce commodities and scientific literature. More recently, including in this document, GAPs are being updated to reflect the mandates outlined in the Produce Safety Rule (PSR) of the Food Safety Modernization Act (FSMA), which formalized and codified many of the previously voluntary GAPs that growers have practiced for many years. Although important scientific information and FDA guidance related to citrus GAPs and PSR requirements are still lacking, enough is known to develop a practical framework. GAPs related to citrus will continue to evolve as new information comes forth. Growers represent the first step in the farm-to-table food chain. Requirements for citrus growers under the PSR follow many of the GAPs principles already in place, and thus growers with a strong GAPs program will be well-positioned to transition smoothly into the regulatory environment.

The objective of this document is to present general GAPs principles and PSR requirements needed to plan, execute, and document production practices that will prevent, minimize, or eliminate the possibility of fruit contamination. The materials contained in this document are a combination of recommendations based on the best available science and minimum standards outlined in the PSR. The distinction between voluntary GAPs recommendations and PSR requirements is made in this document by the deliberate use of the words "must" and "should," where "must" is used to denote PSR requirements and "should" is used to denote voluntary GAPs. This document will be reviewed and updated as new risk data emerges; this is not a comprehensive list of all PSR requirements.

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Background

While the consumption of whole fresh citrus fruit has not been associated with foodborne illness or injury, GAPs represent important procedures that Florida citrus growers should follow to minimize the potential for fruit contamination and meet certain requirements of the PSR. Florida's citrus growers, processors, and fresh-fruit packers have invested considerable resources developing and implementing food safety protocols and participating in third-party audit programs. Many growers are documenting production, harvest, and transportation practices before the farm gate as part of their normal operations to mitigate the potential for foodborne illnesses and packers also adhere to their own food safety requirements. Citrus juice processors implement the *Hazard Analysis and Critical Control Point Program (HACCP),* which is required by the FDA (21 CFR Part 120). Farm owners and managers who produce citrus intended for fresh-squeezed juice should be aware of and follow the Juice HACCP regulation (21 CFR Part 120).

GAPs are a prerequisite of these fresh citrus packing and juicing food safety requirements. Although a full HACCP or Preventive Controls program with carefully controlled processes is not possible in an outdoor grove environment, the principles of hazard analysis and preventive measures can and need to be applied. A GAPs program that has been developed, supervised, and properly implemented protects the health of consumers and the producer's investment in the product.

In general, GAPs programs (http://edis.ifas.ufl.edu/topic_series_food_safety_on_the_farm) address the potential risk of three types of contamination or hazard:

1. Biological

2. Chemical

3. Physical

Biological hazards, including *pathogens* such as bacteria, viruses, and parasites, can lead to widespread foodborne illness if practices are not in place to minimize or eliminate product contact with such contamination. There are many routes biological hazards may take to contaminate produce. Biological contamination can occur by contact of fruit with feces. Direct contact may occur from untreated or improperly treated manure used as soil amendments or from animal feces contacting fruit in the grove. Indirect contact can include transfer from contaminated soil, water, bins, gloves, equipment, and hands or clothes of field workers onto produce during production, harvesting, or handling.

Chemical hazards can include residues of agrochemicals, sanitizers, and pathogen toxins that may be present in or on fruit. While agrochemicals can enhance production of horticultural commodities and are valuable tools for growers, practices must document that materials were applied only according to label instructions, because *the label is the law*.

Physical hazards can include hard or sharp objects in food that may result in personal injuries. Such objects, if present, are removed during sorting and culling of citrus fruit.

While acknowledging the potential for chemical and physical hazards to exist, the FSMA PSR focuses exclusively on biological hazards and relies on proper implementation of GAPs programs to prevent the introduction of chemical or physical hazards into the food supply.

GAPs Topics

Management and Personnel Responsibility

Food safety is a shared responsibility; the collective efforts of growers, processors, packers, shippers, and regulators of fresh and processed citrus products are essential to ensure a safe and wholesome product. Each company must specifically designate an individual or team that is responsible for implementing food safety programs and ensuring compliance with the requirements of the PSR. For absentee landowners not directly involved with citrus production, grove caretaking companies or independent consultants may serve in this role through contractual agreement.

Worker Training, Health, and Hygiene

Proper worker hygiene is critical for implementation of GAPs. Without it, employees who work with citrus fruit may increase the risk of transmitting foodborne illness. A review highlighting information and requirements of field sanitation (OSHA Standard 1928.110) is available from OSHA (https://www.osha.gov/laws-regs/regulations/standardnumber/1928/1928.110) and expands on many of the subjects discussed below.

TRAIN WORKERS IN GOOD HYGIENE PROCEDURES AND DOCUMENT THEIR TRAINING

Begin with a written employee-training program, and document the dates training was conducted, the personnel trained, and the content of the training. All personnel must receive food safety training appropriate to their specific job duties at least annually.

Additionally, at least one supervisor or representative must have received food safety training at least equivalent to the standardized curriculum recognized as adequate by the FDA. Successfully completing a Produce Safety Alliance Grower Training course is a way to fulfill this requirement (https://producesafetyalliance.cornell.edu/training/grower-training-courses). Day-to-day duties and many other key food safety responsibilities can be and are delegated to qualified staff or other third parties but should be overseen by a responsible supervisor or representative.

Training for Employees Must Include

- Principles of food safety
- Health and personal hygiene (e.g., general cleanliness, proper handwashing and use of toilet, trash disposal, approved areas for food consumption)
- Identification of and policies regarding sick employees
- Recognizing contaminated fruit (i.e., visible fecal matter) that must not be harvested
- Inspecting harvest containers and equipment for contamination
- Procedures for correcting problems with harvest containers or equipment
- Cleaning, sanitizing, and storage of tools and equipment (when relevant to job duties)

HANDWASHING AND SANITARY FACILITIES

Poor management of wastes in the field can significantly increase the risk of contaminating produce. A minimum of one toilet and one handwashing facility must be maintained for every 20 employees. For both regulatory compliance and workers' convenience, handwashing and toilet facilities must be located within a one-quarter-mile walk or five-minute drive. Such facilities are not required for employees who do field work for three hours or less each day. For details, see:

- OSHA 29 CFR part 1928.110—Field Sanitation https://www.osha.gov/laws-regs/regulations/standardnumber/1928/1928.110), and
- Florida Administrative Code, Rule 64E-14.016—Field Sanitation (https://www.flrules.org/Gateway/View_notice.asp?id=6181051).

Requirements and Best Practices

- All employees who handle produce or food-contact surfaces must receive proper hygiene and food safety training upon hiring and again at least annually. Any responsible supervisor or representative may train employees.
- Toilet and handwashing facilities must be provided during harvesting activities.
- Handwashing facilities must be furnished with running water. Water should be potable (best practice) but at a minimum must not contain detectable generic *E. coli* in 100 milliliters.
- Handwashing facilities must also be furnished with soap and hand drying devices, which may be single-use towels (best practice) or electric dryers.
- Post signs indicating that water is only for handwashing purposes (best practice).
- Wash- and rinse-water and garbage must be contained for proper disposal after use.
- Place portable toilets outside the immediate crop production area (best practice) but within one quarter- mile of where workers will be working. At a minimum, toilets must be placed in a manner that prevents contamination of fruit with human waste.
- Toilet facilities must be maintained in clean condition. Keep on file any documentation for maintenance and servicing of toilet and handwashing facilities. Keep facilities well supplied with toilet paper, water, soap, and paper towels. Provide a trash container for used hand towels.
- Toilets must be serviced and cleaned to ensure proper use (i.e., employees don't avoid proper use of toilet due to smell or filth). When toilets must be cleaned or serviced near the field, use appropriate barriers to prevent contamination in case of an accidental leak or spill.
- Have a mitigation plan in place so that pickers and supervisors know the company response policy in the event of accidental or malicious sewage spill.
- Workers who display symptoms of infectious disease must either be assigned tasks that prevent them from coming in direct contact with fruit or sent home.
- If used for harvest, gloves must be kept as clean as possible and free from contamination during the work- day. Wash or replace gloves as needed.

- Hands must be washed before putting on gloves to reduce the risk of contaminating the gloves.
- Store harvest gloves properly (off the ground in a designated, clean area) when using the bathroom or on breaks. Do not carry gloves into toilet facility.
- Eating, drinking, and tobacco use must be limited to non-fruit-production areas.
- Workers with visible open wounds or sores should cover them sufficiently (for example, hand wounds should be bandaged and gloved) to prevent bodily fluids from contacting fruit.

Water

Citrus production relies on water supplies for several field operations including irrigation, freeze protection, and the application of agrochemicals. Moreover, water is used in cleaning hands and equipment. Water can be a direct or indirect source of contamination, so policies and procedures must be in place to minimize the risk that may be imposed. Water that is intended or likely to contact fruit or fruit-contact surfaces is called *agricultural water* and presents a higher level of risk than water that does not contact fruit or fruit-contact surfaces. Different sources of *agricultural water* can also present different levels of risk, with untreated surface water representing a higher level of risk than groundwater or treated water. These risk factors should be weighed when considering best uses of different water supplies (e.g., using higher-risk water sources for lower-risk applications and vice versa). For example, untreated surface water could be used for seepage or undercanopy irrigation while groundwater, municipal water, or properly treated surface water must be used for handwashing of harvest workers. For more information regarding water GAPs, refer to http://edis.ifas.ufl.edu/fs136.

Water for Field Use

Agricultural water quality must be safe and adequate for its intended use and meet all applicable federal, state, and local laws and regulations.

Note that *agricultural water* will need to meet specific PSR criteria; however, the FDA is currently reviewing the agricultural water criteria in the PSR and we anticipate FDA clarification around *agricultural water* requirements.

REQUIREMENTS AND BEST PRACTICES

- *Agricultural water* distribution systems must be assessed for potential food safety hazards at least annually, with consideration given to the type of water source (e.g., surface, ground), control and protection of each source (e.g., deep well, shared canal), adjacent land use, and maintenance issues, including keeping the source free of debris, trash, and domestic animals.
- Water used in foliar applications can be obtained from municipal, treated water sources, 2) groundwater obtained from a properly constructed well [http:// edis.ifas.ufl.edu/fe603] in good condition, and/or 3) surface water that is suitable for its intended use (e.g., as shown through microbial testing and visual inspection).
- Water sources used for foliar applications must be tested routinely as needed and records of water quality maintained. Treated water and municipal water do not require testing. The FDA is currently readdressing the microbial water quality criteria.
- Well water used for foliar applications should be drawn from properly engineered and protected sources. Wells should be properly cased and above grade. Wells must be inspected for cracks, leaks, etc. and records of repairs kept.
- If available, results of a microbial analysis of a water source from a public entity, such as the local water authority, may serve as acceptable documentation in lieu of testing by the grower and should be kept on file.
- Domestic animals must be excluded from surface water used for foliar application to the extent possible.
- Extend the amount of time between the last foliar application of agricultural water and harvest as much as possible to allow time for microbial die-off.

Water Contamination Risk from Adjacent Land

Farmland or other uses and activities on adjacent land may pose a risk for run-off or leaching of microbiological or chemical contaminants. Producers should work with local watershed authorities to understand watershed issues and consider mitigation strategies such as berms or ditches where necessary to minimize run-off.

REQUIREMENTS AND BEST PRACTICES

- Risks from adjacent land and water must be identified and documented as part of the annual inspection of your agricultural water source(s). Such risks can include landfill sites, sewage treatment facilities, and septic tanks and leach fields, or surrounding farm operations such as dairy farms or compost producers.
- Preventive or corrective actions must be taken and documented if water contamination sources are identified.

Such actions can include construction of physical barriers (berms, ditches, or fencing) or use of a catch basin. You must inspect your water sources on an annual basis to ensure mitigation steps are still functioning as intended.

Land Use and Soil Amendments

Land use prior to grove establishment and patterns of adjacent land use can have food safety implications. The grower has no control over historic uses, but awareness of potential problems may help determine if mitigation is needed and what control options are feasible.

Biological soil amendments of animal origin are identified in the PSR as the soil amendments most vulnerable to microbial contamination. Manure or biosolids can serve as effective and safe fertilizer if proper treatment and application procedures are in place. Such treatment procedures can include composting to reduce microbial pathogens in number, thereby reducing the risks associated with their presence in soil amendments. The PSR outlines the criteria to determine whether a biological soil amendment of animal origin is considered treated or untreated, and such designation determines the allowable application methods and minimum application-to-harvest intervals. Only specific composting methods can be used to produce treated amendments, and certain treatment conditions must be monitored and documented. Currently, the FDA does not intend to take exception to growers using (raw) manure in compliance with National Organic Program standards. Additional research and risk assessments are being conducted to determine an appropriate time interval between application of raw manure and crop harvest. The PSR does not restrict use of Class A biosolids. Detailed GAPs related to manure and biosolids are available at http://edis.ifas.ufl.edu/fs150. Preventing fruit from touching the ground will greatly reduce the potential for contamination. In cases where fruit may fall to the ground, they must never be harvested for use in the fresh market.

Recommendations and Best Practices

- Avoid planting citrus in land previously used for any operations engaged in risk-accumulation practices (best practice, i.e., avoid areas previously spread with contaminated wastes or those of an unknown industrial use).
- If needed, conduct a title search, environmental assessment, or question state/local officials to establish whether previous land use involved disposal of chemical or biological wastes (best practice).
- Document the source of the soil amendment, compost producer, amount used, and when and how it was applied (best practice).
- Record the type of application and time interval between application and harvest (best practice).
- Obtain certificate of conformance annually from compost suppliers to demonstrate the compost treatment process met PSR requirements for treated compost (required if using purchased compost in a way that it may contact fruit during or after application).
- Apply treated compost in a way that prevents contact with fruit (best practice).
- Untreated compost must never be applied in a way that it contacts fruit during application.
- Compost must be handled and stored in a location and manner to minimize potential for contamination of citrus fruit and surface waters.

Animal Control

Wildlife and domestic animals, including but not limited to dogs, cattle, rodents, hogs, deer, reptiles, amphibians, and birds may serve as sources of contamination. While minimizing animal contact with fresh produce also minimizes the risk of product contamination, it is understood that wildlife is difficult to control in grove settings. Growers must balance these management efforts with their responsibility for environmental stewardship; this is commonly referred to as co-managing food safety and ecological health (https://producesafetyalliance.cornell.edu/sites/producesafetyalliance.cornell.edu/files/shared/documents/MillsCo-Management.pdf).

Domestic Animals

The activities of domestic animals are the easiest to manage and their access into production, packing, and equipment storage areas should be prevented. If not totally excluded (e.g., in the case of guide or guard dogs), reasonable precautions should be taken to prevent contamination.

BEST PRACTICES

- Maintain fencing or other barriers to prevent intrusion by neighboring cattle or other domestic livestock, as appropriate.
- Have a policy in place to mitigate fecal material deposited by domestic animals in the grove to the extent possible.

Wild Animals

Growers are not expected to take extraordinary measures to exclude all animals from outdoor growing areas or to destroy wildlife habitat. However, if there is a reasonable possibility that animals will contaminate crops, the grove areas must be monitored for evidence of animal intrusion immediately prior to harvest and as needed throughout the year. Fruit visibly contaminated with feces must not be harvested.

REQUIREMENTS AND BEST PRACTICES

- To the extent possible, minimize animal attractants by discarding old equipment and containers and removing excess water from the field.
- Inspect storage areas for rodents, birds, and insects and use pest control procedures (e.g., traps, screens, etc.) to minimize pests.
- Keep cull and debris piles away from crop production areas.
- Have a policy in place to look for and mitigate risks from fecal material deposited by wild animals in the grove to the extent possible.
- Fruit with visible fecal contamination should be removed from the grove and must never be harvested for the fresh market.

Agrochemical Use

This GAPs document is not intended to provide guidance for pest management practices (for this guidance, please see the *UF/IFAS Citrus Production Guide* [https://crec.ifas.ufl.edu/program-areas/florida-citrus-production-guide/]).

Agrochemicals such as sanitizers, disinfectants, fungicides, insecticides, and herbicides can enhance production, quality, and the safety of horticultural commodities when used according to their product labels. Pesticides are closely regulated by the EPA, and EPA approval of each pesticide formulation includes specific limitations regarding the means by which the agrochemical may be applied, conditions of application, labeled rates, target organisms against which the chemical may be employed, use restrictions, and requirements for pesticide disposal and its containers.

The EPA also has the responsibility to determine tolerances or exemptions from tolerances for pesticide residues on raw agricultural commodities in the United States. Residue tolerances for export markets are regulated and enforced by their respective countries. Proper pesticide use involves close working relationships among citrus growers, packers, shippers, and processors. A table of citrus maximum residue limits (MRLs) for domestic and several export markets is available at https://edis.ifas.ufl.edu/hs1301.

Pesticides

As part of GAPs documentation, labels and safety data sheets (SDS) of pesticides used must be kept on file, and a detailed written procedure for the application of all pesticides must be recorded. Pesticide labels clearly state the maximum allowable rate, methods of application, and the target organism. Using a pesticide in a manner inconsistent with its label, including for a purpose not specifically identified on the label, constitutes a violation of federal and state law. Florida law requires maintaining specific records for Restricted Use Products (i.e., products for which use and application is restricted to certified applicators or under the direct supervision of such) that include the EPA registration number, the date each pesticide was applied, the quantity used, and where and how the application was made. For additional information and requirements, see the Florida Department of Agriculture and Consumer Services, Pesticide Applicator Licenses website (https://www.freshfromflorida.com/Business-Services/Pesticide-Licensing/Pesticide-Applicator-Licenses/Pesticide-Applicator-Certification-and-Licensing).

REQUIREMENTS AND BEST PRACTICES

- Use only pesticides registered for the citrus variety to be treated.
- Follow all label requirements. Remember, "the label is the law!"
- Meet all federal, state, and local pesticide application, field posting, preharvest intervals, and documentation requirements.
- Verify proper licensing and registration of sub-contractors, custom applicators, crop advisors, etc.
- Document compliance with the EPA's Worker Protection Standard (https://www.epa.gov/pesticide-worker-safety/agricultural-worker-protection-standard-wps).

Field Sanitation, Harvest, and Transport

Fresh produce can become contaminated when contacted by soil, fertilizers, water, workers, and harvesting equipment during growing and harvest activities. General sanitation of the grove, bins, and equipment is necessary to prevent contamination of fruit with biological hazards.

Harvest Equipment and Bins

Requirements and Best Practices

- Harvesting equipment such as gloves, hand tools, and picking sacks must be routinely cleaned and sanitized as appropriate.
- Document procedures and schedules for cleaning and sanitizing equipment used in the field. At a minimum, a cleaning record is required for fruit contact tools and equipment.
- Picking bins must be maintained free from debris and contaminants. A pressurized sprayer with a labeled cleaning agent can be an effective means to remove field dirt.
- Bins should be used only for the purpose of holding and transporting fruit. Any out-of-service bins used for storage need to be clearly marked and never returned to service.
- Inspect bins regularly for evidence of animal intrusion. Clean and sanitize as needed and document.
- Separate, segregate, and dispose of fruit if exposed to hydraulic oils or other chemical contaminants from harvesting equipment.
- Exclude from the fresh market all fruit that touch the ground or are visibly contaminated with fecal matter.

Transportation

Proper transport of fresh produce will help reduce the potential for biological hazards.

REQUIREMENTS AND BEST PRACTICES

- Good hygienic and sanitation practices should be used when loading, unloading, and inspecting produce.
- Inspect transportation vehicles for obvious dirt and debris before loading. The vehicle must be cleaned and sanitized if evidence of debris, animal manure, or other raw animal by-product exists.
- Load produce carefully to minimize physical damage.

Traceability and Record Keeping

A written food safety plan is central to successfully implementing any GAPs program, although a full food safety plan is not required by the PSR. Having records to document these practices, and the resulting traceability benefits, are vital to the GAPs process. Documentation, including records of all corrective actions, is required to prove to regulatory agencies, handlers, and retailers that you are following GAPs. Such documentation is important to demonstrate that proper procedures (e.g., cleaning and sanitation) were followed.

Traceability is an important part of GAPs documentation. *Traceback* is the ability to track food back to its source. *Traceforward* is the ability to identify all receivers of your citrus fruit from a given grove or source. It is critical that growers establish tracking systems from the earliest stages that follow their fruit within the distribution system. This system includes supply-chain partners involved in processing, packing, storing, shipping, and transporting Florida citrus fruit. Both traceback and traceforward actions are necessary to identify the potential source of any safety problems that might occur and for supply-chain partners to implement targeted recalls efficiently and effectively. GAPs forms should be readily available or collected together in a single location for ease of rapid access in the event that fruit is associated with an alleged contamination issue. For more information about preparing for and conducting a recall, see the *UF/IFAS Food Recall Manual* (https://edis.ifas.ufl.edu/fs108).

Basic sample record-keeping forms are available online (https://producesafetyalliance.cornell.edu/sites/producesafetyalliance.cornell.edu/files/shared/documents/Records-Required-by-the-FSMA-PSR.pdf), but these are not intended to replace other required state report forms or forms prescribed by your packer or processor as part of their quality management systems. While they represent excellent examples, forms should be adapted to fit individual operation needs.

In addition to the documentation and record-keeping indicated in this document, each load of harvested product should include the source of the product, the date of harvest, farm identification, and a record of who handled the product. These may include properly completed Trip Tickets (https://www.flrules.org/gateway/ChapterHome.asp?Chapter=20-2).

Best Practices

- Ensure a food safety plan and traceability plan are in place.
- Organize all documentation so that records can be accessed quickly.
- Demonstrate that product can be traced one step forward and one step back.
- Include tracking information with each citrus load (e.g., fruit source, harvest date, harvest crew, etc.). This can usually be satisfied with a properly completed Trip Ticket.

Summary

It is important to ensure the food safety of all citrus commodities in order to minimize food safety risk and maintain consumer trust. As with other commodities, producers of Florida citrus should follow the guidelines and requirements outlined above. Audit tools generally follow these guidelines quite closely, although individual customers often impose requirements of their own that must be addressed.