Commodity Specific Florida Citrus Food Safety Good Agricultural Practices Guidelines

Prepared by

Florida Citrus Packers

Indian River Citrus League

Working Paper Ver. 3

October, 2011

ACKNOWLEDGEMENTS

This working paper was developed after many meetings of individuals representing the Florida citrus industry including growers, harvesters, packers and sales organizations.

University of Florida Institute of Food and Agricultural Sciences (IFAS) faculty reviewed and commented on portions of this document.

Our sincere thanks go to all these individuals and groups and the support of the Florida Citrus Packers and the Indian River Citrus League.

PREFACE

The purpose of this document is to assemble relevant reference guideline materials for use by Florida citrus growers in developing food safety procedures, processes and practices. The Federal Food, Drug and Cosmetic Act (FFDCA) states that "Owners, operators, or agents in charge of domestic or foreign facilities that manufacture/process, pack, or hold food for consumption in the U.S. are required to register the facility with the FDA1." Farms are exempt from registration; however, their identity is preserved by rules related to product traceability and record keeping.

The FDA Food Safety Modernization Act (FSMA) amends the FFDCA to identify standards for produce safety under Section 419. The FSMA identifies six issues which will be addressed by standards that consider "hazards that occur naturally, may be unintentionally introduced, or may be intentionally introduced, including by acts of terrorism."3 The issues are:

1. soil amendments,
2. hygiene,
3. packaging,
4. temperature controls,
5. animals in the growing area, and
6. water.

To conform to the amended FFDCA legislation, Florida citrus producers are encouraged to develop written Food Safety Plans (FSPs). In accepting management responsibility for development of FSPs, citrus producers may need to assess risks for #1, 2, 5, and 6 identified above—such as provided by an example in Part C: Item 4.

In addition, it is also strongly advised that each grower review all of Parts A, B and C to benefit from this guidance document. Producers who have large acreages or complex organizations may choose to formalize a written FSP according to Third-Party audit criteria such as the United Fresh "Field Operations and Harvesting Harmonized Food Safety Standard"(ver. 7/22/2011).

This working paper guidance document compiles information about food safety focused on pre-farm gate Good Agricultural Practices (GAPs). It is intended to provide current reference materials that may guide decisions during development of "updated Good Agricultural Practices and guidance for the safe production of specific types of fresh produce…4" as required by the FSMA.

This guideline document does **NOT** mandate food safety standards or audit template criteria.

CONTENTS

Note: Content of these guidelines assumes access to the basic resources referenced in parts A, B and C. In electronic format, all links are live. Anyone in need of access or clarification of the references given throughout these guidelines may contact the Florida Citrus Packers, the Indian River Citrus League or the local extension service office. These guidelines are not exhaustive or final.

Part A

Guidelines for fundamental components identified by growers to develop individualized Food Safety Good Agricultural Practices Programs

The Florida citrus industry embraces changes that are appropriate and feasible to continue and enhance food safety and food defense for all Florida fresh citrus produce supplied to domestic and international markets. These industry efforts are not intended to initiate redundant restrictions, impose unfair trade barriers**,** or cause impaired market economies. Where available, links to references are indicated in **the text by Roman numerals and are included in the Endnotes.**

On the contrary, they are "to enhance the competitiveness …in the areas of food safety knowledge, technical skills, and organizational capacity,5"[i] and they are directed toward providing safe and healthful products to all consumers who appreciate the nutritious dietary role of Florida citrus products.

Passage of H.R. 2751, "FDA Food Safety Modernization Act (FSMA)" in January 2011 intends to improve the "capacity to prevent food safety problems.6"[ii] In recent years foodborne disease outbreaks have occurred at levels that would not reasonably have been expected with the many current food safety procedures, processes**,** and practices used by fruit and vegetable producers.

To achieve substantial and timely improvements, commodity specific food safety and food defense guidelines are under development. Florida fresh citrus growers and packers accepted the responsibility to provide the FDA with comments--see FDA-2010-N-0085-0428-- concerning national efforts.

Since each of the many diverse components of the Florida citrus industry requires production practices that cannot be generalized to make "one size fits all," these guidelines are intended to enable Florida citrus growers to develop individualized Florida Citrus Food Safety Good Agricultural Practices (FSGAPs) applicable to citrus fruit production and harvesting. The FSGAPs procedures, processes and practices developed by each grower should conform to national legislation as intended by the anticipated FDA publication "Safety standards for fresh produce at the farm and packing house"[iii] and the FSMA to:

> set forth those procedures, processes, and practices that the Secretary *"Health and Human Services"* determines to minimize the risk of serious adverse health consequences or death including procedures, processes, and practices that the Secretary determines to be reasonably necessary to prevent the introduction of known or reasonably foreseeable biological, chemical, and physical hazards, including hazards that occur naturally, may be unintentionally introduced, or may be intentionally introduced, including by acts of terrorism, into fruits and vegetables, including specific mixes or categories

> of fruits and vegetables, that are raw agricultural commodities and to provide reasonable assurances that the produce is not adulterated under Section 4027.[iv]

FSGAPs are essential prerequisites for Good Handling Practices (GHPs) and Good Manufacturing Practices (GMPs) to ensure the safety of Florida fresh citrus produce. Thus, these guidelines represent contributions from all sectors of the Florida Citrus Industry detailing their shared responsibility for assuring produce food safety and food defense throughout production, harvesting, transportation, packing and/or processing by application of science-based Food Safety Good Agricultural Practices.

The fundamental components listed in this Part A can be assembled **by each grower** to develop an individualized FSGAPs program by reference to , and use of, resources identified in Part B and with examples in Part C which

> will provide more specific preventive guidelines to minimize risk including such components as management responsibility, requirement for a Food Safety plan, recordkeeping, corrective actions, worker education and training, traceability and recall, field production issues including history and risk assessment, worker health and hygiene, water sources and systems, agricultural chemicals and pesticides, sanitation of equipment and facilities, soil amendments, and animal control for pre harvest, harvesting and post harvest handling of citrus8.[v]

These components or fundamental procedures, processes and practices should be considered in each grower's written FSGAPs program. By application of risk analysis procedures, each individual commercial citrus operation should identify the fundamentals required to provide compliance with local, state, and federal regulations. This compilation will provide an individualized FSGAPs program which is commodity specific and tailored to the grower. Florida citrus is a specialty crop. "Specialty crops are defined as fruits and vegetables, tree nuts, dried fruits and nursery crops (including floriculture), and **are not usually subsidized**" (emphasis in the original)9.[vi]

Introduction to Fundamentals

The first two items below are initial considerations in understanding basics in the development of a Food Safety Good Agricultural Practices program. After reviewing these issues, the fundamentals which follow should be incorporated into the individualized plans as appropriate. Where available, links to resource references for these fundamentals are indicated in **the text by Roman numerals and are included in the Endnotes.**

1. *Management Responsibility* is the obligation of the property owner, caretaker and/or farm manager for execution of all fundamentals in the Food Safety Plan.[vii]

> Effective management of food safety requires that responsibility be clearly established between the many parties involved in the production of fresh produce. There may be many different permutations of ownership and business arrangements during the growing, harvesting and packing of fresh produce. For this reason, it is incumbent upon everyone involved to identify which responsibilities rest with which parties, and to ensure that these responsibilities are clearly defined….Responsibilities may be delegated to individuals within the firm or may be formally addressed in contractual agreements when third parties are involved. It is important to ensure that each party is aware of its responsibilities so that food safety roles are clearly understood and regulatory response or enforcement action is directed to the responsible partyviii.[ix]

2. The *Requirement for a Food Safety Plan* is the "umbrella" for these food safety fundamentals that are documented in the FSGAPs prograxm**.** Included in Part C is a sample template for a Good Agricultural Practices Food Safety plan developed by Pennsylvania State University.[ix]

Additional Fundamentals are listed below:

3. Accurate and legible *Recordkeeping* is an essential part of each Florida commercial citrus operation's food safety plan. The grower should maintain accessible documents which record all activities related to grove production practices, for example, risk assessment, documentation of WPS training, pesticide applications and water consumptive use permit (CUP) information.

4. *Corrective Actions* are required when non-compliances are discovered and records of corrective actions must be kept. The particular format for the Corrective and Preventative Action Report may vary. For example, see "Corrective-Preventive Action Package List of Filesxi".[x]

5. *Worker Education and Training.* Highly trained and technically competent personnel are essential to a Food Safety Plan. Examples include training for commercial or private pesticide applicator licenses and worker health and hygiene trainingxii.[xi]

6. *Traceability and Recall.* Included in recordkeeping is the ability to trace a product back to its source. The grower should document and record all activities related to grove production practices. It is the grower's responsibility to confirm the regulatory requirements for records retention which may be required legislatively or as identified in the Food Recall Manual.xiii [xii]

7. *Field Production Issues Including History and Risk Assessment* involve risk analyses of previous land uses, adjacent land uses, and future uses of citrus production areas. These integrate food safety, site specific knowledge, and technical skills. A structured risk assessment is provided by Global G.A.P Ver. 4.0xiv.[xiii]

8. Documented *Worker Health and Hygiene* training is a critical preventive control for appropriate compliance with field sanitation requirementxvs.[xiv]

9. *Water Sources and Systems*. Florida citrus growers operate in compliance with the Florida Department of Environmental Protection (FDEP) Class IV classification of Agricultural Waters. Principles and guidelines for the conduct of microbiological risk assessment are described by *Codex Alimentarius* to confirm the suitability of waters for their intended usxvie[xv]. The World Health Organization (WHO) Technical Report 778 (1989) "Health Guidelines for the Use of Wastewater in Agriculture and Aquaculture" may also serve as a reference for risk assessment in determining adequate microbiological criteria.

10. *Agricultural Chemicals and Pesticides*. The use of agricultural chemicals and pesticides is limited to products officially registered for use on Florida citrus. Guidance for selecting products is provided by the annual Florida Citrus Pest Management Guide (SP43xvii)[xvi], and individual product use is governed by each respective label.

11. *Sanitation of Equipment and Facilities*. Schedule 11 of The Citrus Health Response Program (CHRPxviii)[xvii] provides an example guideline for sanitation of equipment and facilities.

12. *Soil Amendments.* The guidelines provided by the USDA – Natural Resource Conservation Service (NRCSxix)[xviii] and "Nutrition of Florida Citrus Trees" (SL 25xx3)[xix] can be used to enhance the physical and/or chemical properties of the soil making it suitable for production of citrus fruit through which food safety and quality criteria can be achieved.

13. *Animal Control for Pre Harvest.* The grove owner/operator should take reasonable measures to prevent crop contamination especially prior to, and during, harvest operations. The NRCS Wildlife Habitat Incentive Prograxxim [xx] provides information concerning co-management of animals and crop production.

14. *Harvesting and Post Harvest Handling of Citrus*. Phytosanitary guidelines for harvesting and post harvesting handling of citrus are prescribed by the CHRxxiiP[xxi] relative to the "Grower/Caretaker" and "Harvester" compliance agreements, with reference to "Schedule 11." Essential complements to the CHRP provisions are worker health and hygiene programsxxiii.[xxii]

15. *Food Defense.* Provisions for Food Defense (intentional contamination) were initiated by the Bioterrorism Act of 2002. The grower should conduct a Vulnerability Assessment as referenced in section 106 of the Food Safety Modernization Act (FSMAxxiv).[xxiii] The grower's food safety plan, which includes food defense, provides controls for both unintentional and intentional contamination.

Part B
International, domestic and Florida-specific food safety resource materials

"Food safety" is defined by the *Codex Alimentarius Commission* as "assurance that food will not cause harm to the consumer when it is prepared and/or eaten according to its intended use:" (CAC/RCP 1-1969, Rev. 4-2003, p.5)**.** This definition corresponds to the ISO 22000 Food Safety Management Systems publication "An easy-to-use checklist for small business—Are you ready?" (2007), which concisely states in Part 1.2 "Food safety is everyone's responsibility." (p. 12)**.**

Chemical, physical and/or biological hazards, if associated with Florida citrus products, may have the potential to compromise food safety. Each such hazard should be risk assessed to identify required controls—to **prevent, eliminate, or significantly minimize hazards—**to ensure food safety, and thus, avoid potential illness, injury, or death in the absence of its control.

These resources include contributions from all sectors of the Florida Citrus industry in the interest of their shared responsibility for assuring product food safety throughout the production, harvesting, transportation, packing and/or processing by exemplary application of science-based Florida Citrus Good Agricultural Practices.

Although these guidelines have been prepared by the Florida fresh citrus fruit sector, the provisions can be implemented by growers of both fresh and processed citrus. The components of a FSGAPs program focus on issues related to food safety that are required in producing citrus fruit at the pre-farm gate, grove level as required by law.

Background

Florida citrus products are recognized world-wide for their excellence. This market reputation would not have been possible without science-based Food Safety Good Agricultural Practices (FSGAPs) developed by Florida Citrus Industry growers, production managers,
private industry researchers, and research faculty from colleges and universities. FSGAPs, when integrated with the industry's Good Handling Practices (GHPs) and Good Manufacturing Practices (GMPs), have allowed Florida citrus products to achieve all market access requirements.

These guidelines are designed to be living documents subject to change and developed for ease of use in either paper or electronic formats. They have been developed to facilitate continual updating and/or revising of required changes "to respond to new hazards and developments in scientific understanding" (FSMA, Section 103, p.7).

A FSGAPs program developed by the grower (with guidance provided by the resources in Parts A, B and C, herein) shall "be appropriate to the scale and diversity of the production and harvesting" of Florida citrus fruits (FSMA, Section 105, p. 16).

FSGAPs are essential prerequisites for GHPs and GMPs to ensure the safety of Florida citrus products. By using the "Guidelines for the Application of the HACCP System" (*Codex Alimentarius Commission*—CAC/RCP1-1969, Rev. 4-2003—Annex, p. 24), citrus growers, harvesters, packers, and processors may comply with performance standards to achieve food safety.

For example, in addition to the text of the FSMA , a contemporary and partial library may include the following FSGAPs technical guideline references:

- **Pesticide regulations:**
    - the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA, 1972, 40 C.F.R. Parts 150-189);
    - the Florida Pesticide Law (Chapter 487 F. S., 2001) and its accompanying rules Chapter 5E-2 FAC (1995) and Chapter 5E-9 FAC (1995, 2004);
    - the "2011 Florida Citrus Pest Management Guide (SP 43) and its sub-section: "Pesticides Registered for Use on Florida Citrus" (ENY 601),
    - from the EPA, "The Worker Protection Standard for Agricultural Pesticides, and
    - the National Worker Safety Trainer Handbook: Pesticide Safety for Agricultural Workers".

- **Issues related to food hygiene:**
    - the FDA "Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables" (1998**);**
    - "Food Safety Begins on the Farm: A Grower's Guide" (Cornell University, 2000**);**
    - "Recommended International Code of Practice: General Principles of Food Hygiene (*Codex Alimentarius Commission*—CAC/RCP1-1969, Rev. 4-2003)**;**
    - "Code of Hygienic Practice for Fresh Fruits and Vegetables" *(Codex Alimentarius Commission*—CAC/RCP 53-2003)**;**
    - Code of Federal Regulatigeons Title 21 - Food and Drugs**.**

- **Issues related to produce safety and water:**
    - "Model Code for Produce Safety" (Association of Food and Drug Officials, Nov., 2009);
    - "Health guidelines for the use of wastewater in agriculture and aquaculture," (WHO, Technical Report Series 778, 1989);
    - "Principles for the Establishment and Application of Microbiological Criteria for Foods" (*Codex Alimentarius Commission*—CAC/GL 21-1997)

In addition to the above references addressing food safety, the Florida citrus industry has, for many years, operated under a wide range of guidelines and regulations for citrus quality. As noted in *Citrus Growing in Florida* (5th ed., Davies, F.S. and L. K. Jackson, University of Florida Press, 2009, p. 245),

> as early as 1911 legislation was initiated to protect the reputation of Florida citrus by implementing uniform fruit maturity standards. As the Florida citrus industry has increased in size and complexity, more and more laws and regulations have been necessary to control the operations of growers, packers, and shippers for the best interests of the whole industry. These regulations assure the marketing only of a quality product that the consumer can buy with confidence. These

regulations pertain to fruit maturity, sizes, and grades that can be handled commercially. They are rather extensive, since it is necessary to establish different standards for each of the different kinds of citrus fruits. Each shipment of fresh fruit and each lot of fruit delivered to the cannery or concentrate plant is inspected to see that it meets the applicable legal and regulatory standards.

Ancillary to food safety guidelines, but nonetheless important, are grade, quality, and specification standards for Florida citrus products (Florida Citrus Code F.S. Chapter 601--2010).

Traceability

All commercial citrus operations are responsible for identifying the origin or source of the food (one step back) and also the place to which the food has been shipped/sold (one step forward).

The Canadian Horticultural Council clearly defines "traceability" in their comment to the FDA (FDA-2010-N-0085-0405, Aug., 2, 2010 Glossary, p. xxi) as a recall strategy that "permits the source of the product to be identified and maintained at any state in the supply/distribution system". Global G.A.P. has an expanded definition: "The ability to retrace the history, use or location of a product (that is the origin of materials and parts, the history of processes applied to the product, or the distribution and placement of the product after delivery) by the means of recorded identification." (Global G.A.P. Ver. 4.) Traceability is critical during investigations of foodborne disease outbreaks "to stop the current outbreak, determine how the contamination occurred, and implement prevention-based approaches to minimize the risk for future outbreaks" (Guidelines for Foodborne Disease Outbreak Response" Ch 6, p. 127). Traceability is generally achieved by use of a tool described in *Codex Alimentarius Commission* (CAC/GL 60-2006, p.2): "The traceability/produce tracing tool should be able to identify at any specified stage of the food chain (from production to distribution) from where the food came (one step back) and to where the food went (one step forward), as appropriate to the objectives of the food inspection and certification system."

The Association of Food and Drug Officials (AFDO), in the "Model Code for Produce Safety" (Nov. 2009), identifies general requirements for a "Product-Tracing System." The details of the AFDO "Product-Tracing System" are these:

"Product-Tracing System

1. All entities involved in the produce supply chain, within the scope of this code, shall maintain a system and records to facilitate the identification of the immediate past source of the produce and immediate subsequent recipient of the produce.
2. For every lot shipped or received, records shall be readily available, legible, and the information they contain shall be readily interpretable and include:
    a) Identification of the immediate past source of the produce;
    b) Commodity identification;
    c) Lot identification;
    d) Quantity;
    e) Date packed;
    f) Date shipped or received;
    g) Identity of carrier; and
    h) The immediate subsequent recipient of the produce.

3. For every lot shipped, records shall be readily available, legible, and the information they contain shall be readily interpretable and enable tracing to the sources of all components.
4. In the event of commingling or repacking of produce, records shall be maintained for raw product accountability that enable tracing of all incoming products to outgoing products in which they are components.
5. Labels and/or labeling shall be accurate and contain sufficient information to assure product tracing.
    a) Labels that are inaccurate shall be removed or defaced prior to packing.
6. The operation shall test its product-tracing system at least annually to ensure it is adequate."

Recall

Recall is a "means for an operation to remove from further sale or use, or to correct, a marketed product (i.e., that has been sold or distributed) that may have an impact on food safety" (FDA-2010-N-0085-0405, Aug., 2, 2010 Glossary, p. xx).

The Food Recall Manual (developed by the University of Florida, Food Science and Human Nutrition Department with assistance from the Association of Food and Drug Officials, 2004), Section 1: "Why a Food Recall Manual? "(p 1) opens with the following:

> Recalls are procedures used to identify and recover potentially adulterated, misbranded, and/or hazardous foods in order to prevent potential food safety problems or economic fraud. The recall procedures outlined in this text are based on traditional industry practices that have proven to be effective for all foods, in all levels of commerce. The procedures comply with the expectations of both the state and federal regulatory authorities in the United States, and they apply to domestic and international commerce for all food products.
>
> The threat of terrorism has now extended to the food supply. The possibility of food being used as a vehicle for biological, chemical, or physical agents of harm has been recognized for several years. There are some parallels between terrorism in the form of purposeful contamination of food, and product tampering. The main difference between the two is intent: the terrorist intends to create fear and economic chaos, with or without adverse effects on human or animal health. When an individual commits product tampering, it is usually with a motive to defraud, extort, or cause harm or death.
>
> Preventing purposeful contamination of food is the ultimate goal, but from the experience gained from years of observing "natural" occurrences of food contamination, prevention is far from 100% achievable. Thus, assuming that total prevention is not possible, containment of an event becomes a worthy goal.
>
> To that end, the Food Science and Human Nutrition Department of the University of Florida has assembled this manual to assist food businesses, at all parts of the food chain, in learning to conduct rapid and effective product recalls, should that become necessary. Quickly removing purposefully contaminated foods from commerce will undoubtedly limit human exposure, and thus, harm.

The conduct of a recall is time-sensitive, and therefore, a successful recall requires detailed information and procedures to be in place. At the time of a recall, the consideration of a wide range of possible contamination issues is essential. For example, the following from *Procedures to Investigate Foodborne Illness (*5th edition—1999, Rev. 2007*,* International Association for Food Protection, p 1)[xxiv] state10s:

> During production, harvesting, processing, packaging, transportation, preparation, storage, and service, any food may be exposed to contamination with poisonous substances or infectious or toxigenic microorganisms. Processing or preparation failure may lead to survival of microorganisms or toxins, and time-temperature abuse can allow proliferation of pathogenic bacteria and molds. In addition, some plants are intrinsically toxic. Animals may acquire toxins from their food or metabolize them, or they become infected with or colonized by pathogenic bacteria, viruses, and parasites. If a product contaminated with sufficient quantities of poisonous substances or pathogenic microorganisms is eaten, susceptible

> persons will develop foodborne illness. The food supply is global. Fresh as well as shelf stable food is available from sources all over the world. Foodborne illness outbreaks are routinely being linked to sources of contamination far distant from the point of consumption. Therefore, foodborne illness surveillance, investigation and response systems require the close collaboration and coordination of food safety and puibli11c[xxv] health agencies at local, state/provincial, federal/national and international levels.

The Food Recall manual should therefore additionally include provisions for the requirements of the Reportable Food Registry (RFR). The "Guidelines for Foodborne Disease Outbreak Response" provide an overall understanding of effective traceability and recall programs.

Risk Analyses

The pre-farm gate operations have for many years been derived from the practices identified in the BMP programs. BMP programs are recognized by Florida Administrative Rule and confirmed by checklist audits for FDACS Office of Agricultural Water Policy implementation assurance. The many practices outlined in BMP programs are based on sound science and common sense.

Through the use of risk analyses, BMP programs were established throughout the state "to effect pollutant reduction through the implementation of non-regulatory and incentive based programs which may be determined to have minimal individual or cumulative adverse impacts to the water resources of the state" (FDACS/Florida Administrative Code, Rule: 5M-2.001).

According to the *Report on the Implementation of Agricultural Best Management Practices* (FDACS, Office of Agricultural Water Policy, October 2009, p i),

> The Florida Department of Environmental Protection (FDEP) identifies impaired waters and develops and adopts Total Maximum Daily Loads (TMDLs) for impaired waters. A TMDL is a water quality target that establishes the maximum amount of a given pollutant a water body can absorb without exceeding applicable water quality standards. Pollutants for which TMDLs have been set include total phosphorus, total nitrogen, iron, and fecal coliform bacteria, among others. .....
>
> Agricultural water quality and quantity Best Management Practices (BMPs) are an integral part of water resource protection. The Florida Legislature has recognized this in various statutes, including the Florida Watershed Restoration Act (403.067, F.S.), under which the Florida Department of Environmental Protection establishes total maximum daily loads (TMDLs), water quality targets, for impaired waters. Under the Act, nonpoint sources, including agriculture, are responsible for implementing BMPs to help achieve TMDLs. BMPs include management and structural practices, such as efficient use of fertilizer, efficient irrigation, erosion control, stormwater ponds, and setbacks from waterbodies, among others.

This document suggests guidelines developed in a manner comparable to those of the BMP programs, which may be used in a similar fashion for the development of commodity specific food safety guidelines for the Florida Citrus Industry. **However**, food safety guidelines derived from good agricultural practices differ from BMPs because they focus on programs to achieve food safety as a priority with technical and feasible strategies to achieve fruit quality, yield and

integrated crop management.

Underlying almost all the above practices are risk analyses. As defined in the *Federal Register*, Vol. 68, No. 207, October 27, 2003, p 61183**,**

> Risk analysis includes three elements—risk assessment, risk management, and risk communication. Risk assessment is a scientifically based process of evaluating hazards and the likelihood of exposure to those hazards, and then estimating the resulting public health impact. Risk management involves using all of the information gathered during the assessment to evaluate policy options and then selecting and implementing measures that can be applied to reduce the risk. Risk communication involves communication of the process and results of the risk assessment to the general public, as well as the ongoing communication among risk assessors, managers, and stakeholders during the entire process.

This definition of risk analysis, used as a core goal by the USDA-Food Safety and Inspection Service (FSIS), is applicable in the construction of Florida citrus FSGAPs. The guidelines suggested here for FSGAPs are structured to achieve the performance standards required for processed citrus products and those performance standards required for fresh citrus products. As identified in Fundamental # 9 of Part A, the microbiological risk assessment described by *Codex* is critical.

These guidelines focus on performance standards that ensure food safety for commercial Florida citrus products. As revealed by history, Florida citrus growers have, and must always, place food safety at the foremost of risk mitigation strategies implemented through Food Safety Good Agricultural Practices. FSGAPs employed by growers to achieve performance standards are quite diverse in methods, materials, equipment, manpower, and the use of rapidly changing application systems and information technology. According to the *FDACS/OAWP 2009 Implementation Assurance Report, (p 12),* during site visits to confirm BMP practices, "Recordkeeping systems varied from pocket notebooks with fertilizer receipts to electronic database systems." Similarly, documentation of FSGAPs may be achieved using a wide variety of techniques.

Using scientifically based and credible technical guidelines, each grower can achieve "adequate" (defined as "satisfactory for a particular purpose; fully sufficient; suitable or fit"xxvi [1]) performance compliance with food safety standards regardless of the size of operation, fresh or processed product utilization, or the complexity of the business organization. The food safety performance standards achieved through the application of FSGAPs at field level by the grower/producer must be integrated with food safety performance standards resulting from the appropriate implementation of Good Handling Practices (GHPs) and Good Manufacturing Practices (GMPs) during harvesting, hauling, packing, and processing operations.

Other factors may be included in production practice changes which result in sustainable resource management, improving product food safety, lessening environmental impact (soil, water, air, plant and animal), maximizing the utility of renewable resources, lowering energy costs, and many other horticultural, environmental and social benefits. Some changes are necessary to balance revenues and expenses to achieve earning potentials in production of citrus fruit products traded in global markets.

Florida citrus growers commonly employ some or all of the technical references listed below by topic as guidelines for their production operations:

- **Nutrients**

1. Nutrition of Florida Citrus Trees, Second Edition. University of Florida Extension SL 253 (July, 2008). This publication replaced Nutrition of Florida Citrus Trees (SP 169) published in 1995.
2. Recommended Fertilizers and Nutritional Sprays for Citrus (Bulletin 536D) Koo, R.C.J. ed, Agricultural Experiment Stations, IFAS, University of Florida, Gainesville, 1984.
3. Natural Resources Conservation Service (NRCS) Nutrient Management Conservation Practice Job Sheet, FL590JS. August, 2006.
4. The Florida Phosphorus Index Series.

Included in the above technical reference material is information concerning the use of manures and foliar applications of nutrient materials that may impact food safety criteria.

- **Integrated Pest Management**

"Integrated Pest Management (IPM) involved the careful consideration of all available pest control techniques and the subsequent integration of appropriate measures that discourage the development of pest populations, and keeps plant protection products and other interventions to levels that are economically justified and **reduce or minimize risks to human health** (emphasis added) and the environment."

1. 2011 Florida Citrus Pest Management Guide: Use of Pesticides in Citrus IPM (CPMG03).
2. University of Florida IFAS Extension Integrated Pest Management (SPG 043--2011).
3. Global G.A.P Control Points and Compliance Criteria, Crops Base, Annex CB.1 IPM (pg. 24-25).
4. Assured Food Standards "Generic Crop Protocol Guidance Notes" 2006-2007 (See "Crop Protection Decision Triangle," p 10).
5. Natural Resources Conservation Service (NRCS) Agronomy Technical Note No. 5: "Pest Management in the Conservation Planning Process," February 2011
6. Natural Resources Conservation Service: Conservation Practice Standard, Field Office Technical Guide, Section IV: "Integrated Pest Management (IPM), Code 595" NRCS, FL, Dec. 2010

- **Pesticides**

1. *Agricultural Tree Crop Pest Control* (SM 63), Fishel, Fred (2008, UF IFAS).
2. *Applying Pesticides Correctly* (SM 1), Fishel, Fred (1998, UF IFAS).
3. "Pesticide Drift Management" (SM 67), Dean, Thomas (1999, UF IFAS).
4. "Airblast Sprayer Calibration" (SM 62), Dean, Thomas (1997, UF, IFAS).
5. "Spray Equipment and Calibration" (SM 38), Hofman, Vern, et.al. (1988, UF IFAS).
6. "2011 Florida Citrus Pest Management Guide: Pesticides Registered for Use on Florida Citrus." (ENY-601).

7. "Guidance for producers/others for potential reasons for MRL exceedance that should be considered during on farm risk assessment," GLOBALG.A.P., April 2008.

- **Irrigation**

1. "Citrus Irrigation Management" Tucker, D.P.H (1985, Cir 444, UF IFAS).
2. *Water and Florida Citrus. Use, Regulation, Irrigation, Systems, and Management*. Brian J. Boman, ed., University of Florida, IFAS, July 2002, ISBN 0-916287-38-6.
3. "WHO Guidelines for the Safe Use of Wastewater, Excreta and Greywater" (2006)
4. World Health Organization, Water, Sanitation and Health--website.

- **Food Safety Training**

The creation of a functional GAP program requires analysis of the growing and handling practices and the implementation of strategies to address any chemical or microbial risk factors that are identified. Employee training should focus on personal hygiene, proper hand-washing techniques, segregation of food and drink from fruit handling areas, and the need for reporting illnesses, cuts and open sores to supervisors so that employees with such conditions are excluded from fruit handling and food contact surface exposure. Training should be refreshed at least annually for continuing employees and all employees should be trained on food safety principles prior to beginning work. The goal of repeated training is to create a culture of food safety awareness and action within the organizatio12n[1].

1. "An Ounce of Prevention: Personal Health and Hygiene for Fresh Produce Handlers" Simonne, Amy (et.al), UF IFAS, n.d.
2. "Good Worker Health and Hygiene Practices: Training Manual for Produce Handler" FCS8769, Simonne, Amy (et.al) 2008, UF IFAS.
3. "Worker Health and Hygiene Program for the Produce Industry" DVD 899 (UF, IFAS Bookstore).
4. "Food Safety Begins on the Farm: A Grower's Guide" Rangarajan, Anusuya, et. al. (Cornell University, 2000).
5. "Fruits, Vegetables, and Food Safety: Health and Hygiene on the Farm" DVD (Cornell University, 2007).

Part C
Information about Sample Food Safety Plans, Audits and Checklists

The circumstances of each individual grower and/or site may require different FSGAPs considerations. In the links to the resources below are examples of plans and/or forms that can be used by those involved in the Florida Citrus Industry to develop a FSGAPs program relevant to what they required.

1. "USDA Good Agricultural Practices and Good Handling Practices Audit Verification Checklist", (USDA, June 6, 2011)
2. "Policies and Procedures Applicable Toward Meeting USDA GAP Standards", (Penn State University Department of Food Science, 2010)
3. "Good Agricultural Practices Food Safety Plan", (Penn State University Department of Food Science, 2010)
4. "Field Operations and Harvesting Harmonized Food Safety Standard", (United Fresh Fruit & Vegetable Association, Version 1: 07/22/2011)
5. "Example Food Safety Plan: Florida Citrus Operation" (updated April 15, 2011)

Endnotes:

[i] "Final Report for Phase One," *Food Safety Project for the Wisconsin Fresh Fruit and Vegetable Industry*, pp 4-5, Wisconsin Department of Agriculture, Trade and Consumer Protection, n.d.

[ii] Title 1: H.R. 2751, 05 January 2011, p.1

[iii] *Federal Register.* Vol. 75, No. 35, Tuesday, February 23, 2010, p 8086

[iv] FSMA, section 104, p. 17

[v] Dr. Martha R. Roberts, e-mail of August 29, 2010, to Peter Chaires, Subject: RE: Preliminary Working Papers from Florida Citrus Packers

[vi] Brochure: "Florida Agriculture," University of Florida, IFAS, rev. Sept 2010 (p.8)

[vii] "Model Code for Produce Safety" (Nov. 2009, p 1)

[ix] "Farm Food Safety: Policies and Procedures," Pennsylvania State University, College of Agricultural Sciences, Extension Division

[x] "Corrective-Preventive Action Package List of Files", ISO 9001:2008 Auditor Training Course and Forms (rev. 4-21-09, copyright 2009, ISO 9000 Checklist)

[xi] *Worker Safety Trainer Handbook: Pesticide Safety for Agricultural Workers* , National Association of State Departments of Agriculture Foundation (www.nasda.org, Washington, D.C., July 2008)

[xii] "The Food Recall Manual": Archer, Douglas L, et.al. (University of Florida IFAS Extension, Publication #FSHN0410)

[xiii] "Integrated Farm Assurance Version 4: Documents Fruits and Vegetables," GlobalG.A.P., North America, Inc.

[xiv] "Good Worker Health and Hygiene Practices: Training Manual for Produce Handlers": Simonne, Amy, et.al. (University of Florida IFAS Extension, Publication #FCS8769

[xv] "Principles and Guidelines for the Conduct of Microbiological Risk Assessment," FAO Corporate Document Repository, Produced by Agricultural and Consumer Protection (CAC/GL-30—1999)

[xvi] SP 043: Florida Citrus Pest Management Guide, 2011" University of Florida IFAS Extension/Electronic Data Information Source (EDIS)

[xvii] Citrus Health Response Program (CHRP), Florida Department of Agriculture and Consumer Services, Division of Plant Industry (2004)

[xviii] "Nutrient Management (Acre) Code 590," Natural Resources Conservation Service, Conservation Practice Standard, USDA

[xix] "Nutrition of Florida Citrus Trees, 2nd Edition,") Thomas A. Obreza and Kelly T. Morgan (editors), University of Florida IFAS Extension, Publication # SL253 (reviewed Feb. 2011)

[xx] "Financial Assistance: NRCS Conservation Programs," Natural Resources Conservation Service, USDA (last modified 08/04/2011)

[xxi] Citrus Health Response Program (CHRP), Florida Department of Agriculture and Consumer Services, Division of Plant Industry (2004)

[xxii] "Good Worker Health and Hygiene Practices: Training Manual for Produce Handlers": Simonne, Amy, et.al. (University of Florida IFAS Extension, Publication #FCS8769

[xxiii] "Text of S.510: Food Safety Modernization Act," 111th Congress (2009-2010) Govtrack.us

[xxiv] Reprinted with permission from *Procedures to Investigate Foodborne Illness,* (5th edition, 1999-Rev.2007). Copyright held by the International Association for Food Protection, Des Moines, Iowa, U.S.A. This book is available for purchase from the International Association for Food Protection, 6200 Aurora Ave., St. 200W, Des Moines, IA 50322, tel:800-369-6337, fax 515-275-8655, Website: www.foodprotection.org.

[xxv] As spelled in the original

[xxvi] "Model Code for Produce Safety" (Nov. 2009, p 1)