



Working Committee 4

Production

Date: 06/20/2012

Revision: Final

Introduction

This working committee was tasked with discussing the following areas related to fresh fruit and vegetable production, with a special emphasis on co-management and NOP related issues.

4.1. Agricultural inputs during production

- 4.1.1. Water
 - 4.1.1.1. Testing
- 4.1.2. Soil Amendments
 - 4.1.2.1. Manure
 - 4.1.2.2. Compost
 - 4.1.2.3. Non-manure/non-animal
- 4.1.3. Chemicals

4.2. Animals

- 4.2.1. Wildlife
- 4.2.2. Domestic animals
 - 4.2.2.1. Pets
 - 4.2.2.2. Animals used in production (horses)
 - 4.2.2.3. Livestock grown for food

Working Committee Chairs

Karen Killinger

Associate Professor, Washington State University

Fred Finney

Owner, Moreland Fruit Farm Ltd.

Meetings Held

Date	Attendance
June 24, 2011	-
July 15, 2011	-
August 5, 2011	22
August 26, 2011	21
September 16, 2011	22
October 7, 2011	16
October 28, 2011	13
February 17, 2012	14
March 30, 2012	17

Total Meetings: 9

Total committee members¹: 72

¹ See [Appendix I](#) for full list of members

Data Collection

Information from committee members was collected during nine teleconferences held in the months of June 2011 to March of 2012. Each meeting held was approximately one hour long where detailed notes were taken and submitted to the committee for review post-meeting. From the discussion topics covered during the teleconferences, a basic outline was created. This outline was then formatted into an on-line survey (also available in print version for those with limited access to computers) using SurveyMonkey (<http://www.surveymonkey.com/>). From the outline, eleven questions related to the production of fresh fruits and vegetables were drafted and reviewed with the committee co-chairs and PSA program director for appropriateness and thoroughness. The survey was designed to prioritize major topics areas for inclusion into the PSA curriculum. The prioritization survey will be used as a tool to guide future discussions and to ensure every committee member was able to participate in the decision-making process. Twenty-eight committee members completed the survey (41% response rate).

The results of the survey are located in [Appendix II](#).

From the results of the survey, the committee co-chairs and PSA facilitators moved forward to identify priority areas for the committee's discussion and final recommendations to the PSA Executive committee. Topics which were prioritized as lower importance will be kept on file in the committee's original meeting note document.

Priority Areas

4.1. Agricultural inputs during production

Agricultural inputs may be defined as any incoming material (e.g. seeds, fertilizers, water, agricultural chemicals, plant support, etc.) used for the primary production of fresh fruits and vegetables.

4.1.1. Water

Water can carry pathogens which, if applied during production or harvest, can contaminate fresh produce and cause foodborne illness.

- **Sources:** The quality of water can vary by source and location. The following sources of water should be highlighted as part of a risk assessment prior to water use for production.
 - Municipal
 - Well
 - Surface
 - Recycled
- **Application Method:** The type of irrigation method utilized may affect the overall risk of contamination. The highest risk for contamination of produce, if the source water is of poor quality, is by overhead irrigation because the water directly contacts the edible portion of the crop.
 - Overhead irrigation
 - Flood irrigation
 - Drip irrigation
 - Topical sprays
 - Dust abatement
 - Produce wash water (See WC #6- Postharvest Recommendations)
- **Regulatory Issues** may affect how water is used and managed on the farm depending on geographical location as well as local, state, and federal regulations and guidelines.
 - Varying state standards
 - Recreational water standards
 - Reclaimed water standards
 - Rainwater used for irrigation
- **Other considerations for the use of water on crops**
 - Human vs. animal food
 - Will the product be cooked (i.e. potatoes)
 - Status of crop (i.e. plant in flower or fruit)
 - Timing (close to harvest, throughout season)
 - Back flow devices present

4.1.1.1. Testing

Regardless of water source, testing and keeping test records is an important good agricultural practice.

- **Standards** must be highlighted to guide growers in the interpretation of water testing results for their geographical location. Currently, irrigation water standards for some industry and commodity groups (e.g. LGMA) are based on the United States Environmental Protection Agency's (EPA) recreational water quality criteria for full body contact (US EPA 1973).
 - EPA
 - Other requirements (state, local, or audit requirements)
- **Pre-test Water Assessment** should identify the following characteristics as part of a risk assessment.
 - Source of water (see section 4.1.1-Water Sources)
 - Type of crop water is being applied to (leafy green, root crop, tree fruit)
 - Timing within production season (close to harvest, during production season)
 - Potential sources of contamination (animal, environmental, human)
- **Design of sampling plan** is a critical component for growers to understand HOW to collect water samples from the farm. This may include examples for how to conduct sampling or hands on exercises. Trainings should assist growers in identifying and implementing their options for water testing.
 - Number of samples
 - Sample collection point
 - Directly from source
 - Close to point of use (application to plant)
 - Frequency
 - How to collect the sample
 - Where to ship the sample
 - How to ship the sample
 - Coordination with testing lab protocols
- **Testing labs** which serve the grower's particular location should be identified by the person responsible for conducting the training. Qualification of the testing lab must be considered, especially to satisfy some audit requirements. Good Laboratory Practices (GLPs) are required for testing labs as a part of the Harmonized Audit Scheme. The general curriculum may highlight the following areas for trainers to include during their training sessions to help connect growers with the appropriate resources they need to complete the task.
 - Location
 - Availability
 - Testing fees
 - Types of testing offered
 - Assistance in interpreting results
- **Testing Methods** should be explained to growers so that they can request the correct test from the lab and understand how to interpret the results. As most growers are not

microbiologists, this topic will need to be presented in a way that any grower can understand the basics.

- Quantitative tests
- Presence/absence tests
- Differences between indicator organisms and pathogen tests
- **Corrective Actions** must be recommended for water samples which may return high counts or out of the grower's 'normal range'. This may include treatment options (e.g. resources for how to shock a well).
 - Interpreting results
 - Definition of units (CFU, MPN)
 - What is considered high or low
 - How to establish a 'normal range'
- **Documentation** must be paramount to any water management plan. The areas below should be documented to help establish baseline water quality data as well as for those planning to participate in audits.
 - Testing results
 - Keep track of any treatments done to water sources
 - Monitor data to visualize trends (establish a normal range for your water source)

4.1.2. Soil Amendments

The addition of soil amendments is a common practice in fruit and vegetable production. These inputs range from natural manure and compost to chemical and synthetic fertilizers for purposes of adding nutrients to soil and preparing/conditioning the soil for planting.

- Laws, standards, regulations regarding soil amendments may vary by location and production method (e.g. organic vs. conventional).
- Soil amendments may include other organic amendments from plant or animal origin to be described below.

4.1.2.1. Manure

Also referred to as "raw" manure, is considered animal feces that have NOT been composted, regardless of how long it may have sat and aged. Manure management practices that reduce negative environmental impacts (e.g. planting buffer strips), such as run-off and odor, can also reduce risk for contamination of edible crops with human pathogens. The type of manure, application method, and timing may greatly affect the risk for contamination of fresh produce.

- Application

The below application days are currently available standards that are used in the industry, but not an exhaustive list.

 - 90-120 days prior to harvest depending on crop (NOP)
 - 120 days prior to harvest (USDA)
 - One year prior to harvest (LGMA)
 - Other buyer requirements (may be longer)
- Handling
 - Potential for cross-contamination and run-off
 - Maintain separate tools and equipment for manure and produce harvest

- Storage considerations (location, management)
- Type of manure
 - Animal source
 - Intentionally Applied
 - Unintentional (e.g. grazing)
 - Human source (biosolids)
 - Alternate animal derived byproducts (blood/bone/feathermeal)

4.1.2.2. Compost

Compost is broken down organic material that has been heated by microbial activity to an adequate temperature for a defined amount of time to achieve optimum pathogen depletion and aged for maturity. Compost presents a lower microbial risk when processed properly. The points below highlight areas which should be mentioned as part of a module on composting.

- Laws, standards, regulations
 - NOP standards
 - State laws
- Treatment Processes
 - Static (Passive) vs. Actively Managed
 - Differences for animal vs. non-animal based manures
- Testing
 - Collection of samples
 - Accredited labs
 - Frequency
- Documentation
 - Certificate of Analysis (COA)/Testing results
 - SOPs
- Verification
 - Compost containing animal manure is considered raw manure if the compost treatment cannot be verified.

4.1.3. Chemicals

Many types of chemicals exist for agricultural use. Chemicals may be a source of produce contamination if they are used improperly. ALWAYS read and follow the label before using chemicals in the field, packinghouse, or near production areas.

- Types
 1. Agricultural, for plant production (e.g. fertilizers, pesticides, herbicides, soil amendments)
 2. Other chemicals not used for plant production (e.g. gasoline, diesel, sanitizers, oil)
- Purchase and Use

This information may not be directly linked to food safety; however, it is important for those who plan to participate in future audits. Additionally, being aware of the requirements and following all directions is a necessary part of daily practices on the farm.

- Chemicals and pesticides must have EPA approval

- Growers should understand that federal, state, and local regulations exist
- Licensing for application may be necessary
- Chemicals may be labeled for intended crop or use
- Source (letters of guarantee) should be kept on file
- Personnel
 - Qualifications of chemical handlers and restricted use may apply
 - Personal protective equipment should always be utilized
 - Training is mandatory for most chemical and pesticide applications on the farm
- Application
 - Read label and follow instructions!
 - Be aware of timing of application
 - Take into account weather to avoid chemical drift (wind) or run off (rain)
 - Keep application equipment properly calibrated
 - Have a knowledge of adjacent land use (e.g. organic fields – See WC #3 summary document)
- Documentation/Recordkeeping
 - MSDS should be kept on file for audits and in case of emergency
 - Application amounts/date/crop are part of a good recordkeeping program
- Storage
 - Proper labels, security (locks), inventory maintenance, and temperature management are all key aspects for the storage of chemicals.
- Spill Management & Disposal
 - Response plans may be required for certain audits
 - Chemicals should be disposed of properly to prevent the contamination of water sources and soils

4.2. Animals

Whether wild or domestic, animals have been shown to carry several human pathogens in their feces. Whenever possible, animals should be excluded from fresh fruit and vegetable production areas.

4.2.1. Wildlife

The risk of extensive contamination from wildlife is low, however, will never be zero. While it is unreasonable to expect complete wild animal exclusion from the field and packing areas, active controls and deterrents should be used whenever possible.

- Type
 - Wildlife diversity will depend on geographic location and natural resources. Common wildlife in produce fields includes, but is not limited to deer, geese, feral pigs, field rodents, etc.
- Habitat
 - Co-management: Farmers can produce safe food without sacrificing responsible on-farm conservation measures, such as maintaining riparian habitat or other non-crop vegetation. By using risk assessment strategies and explaining their rationale for management decisions that include conservation measures, farmers can more effectively advocate for their farming practices with buyers and food safety auditors.

- Intrusion
 - Should be evaluated for the frequency (more intrusion, higher contamination risk), type of activity (passing through wildlife corridor or eating crop), and presence of fecal material.
 - Management practices should be developed as part of the food safety plan to exclude animals from the production areas.
- Animal Fecal Contamination
 - Must be addressed for guidelines and resources on allowable harvest distances, disposal of the contaminated product, further crop block assessments, sanitation of equipment, and hand washing.
- Corrective Action
 - Should be developed in the event of wildlife fecal contamination. These actions may include physical barriers (fencing), removal of cull piles/animal feed, management of water sources, or noise/visual deterrents.

4.2.2. Domestic animals

Livestock, animals used in production, and family pets present the same risks to produce contamination as wildlife, if not excluded from fresh fruit and vegetable fields close to harvest.

4.2.2.1. Pets

- Cats, dogs, and other animals should not be present in the field close to harvest. The use of pets as wildlife deterrents (e.g. cats and mice in the packinghouse, dogs and deer in the field) should be assessed as a potential risk and weighed against the potential benefits.
- Farm visitors (such as in U-Pick operations or agritourism) should be instructed to leave their pets at home.

4.2.2.2. Animals used in production (horses)

Livestock are easier to manage than wildlife. When practical, exclude animals from fields during the growing season, especially close to harvest time. Their presence is primarily a concern due to the fecal material they can deposit on or near fresh fruit and vegetable production areas. If horses or other animals are needed during the growing season, be sure to flag and remove any fecal deposits and not harvest produce from that area.

- Grazing locations (e.g. away from irrigation water source), and potential cross contamination from personnel (boots, clothing, or hands) and equipment should also be addressed.

4.2.2.3. Livestock grown for food

- Grazing schemes may affect the ability to plant crops based on the standards for application of raw manure (e.g. NOP, audit standards)
- Livestock should be kept away from irrigation water sources.
- Location and management of manure piles and runoff from livestock areas must be assessed as a potential source of contamination.

Appendix I: Working Committee Members (72)

1. Aerts, Michael J. ; Director ; Florida Fruit and Vegetable Association
2. Aller, Marion ; Assoc. of Food & Drug Officials ; FL Dept. of Agriculture & Consumer Services
3. Baumgartner, Jo Ann ; Director ; Wild Farm Alliance
4. Becker, Anastasia ; IPM Program Manager ; Missouri Department of Agriculture
5. Beckman, Edward ; CEO ; California Tomato Farmers
6. Bianchi, Mary L. ; Extension Farm Advisor ; UC Cooperative Extension
7. Bihn, Elizabeth ; PSA Program Director ; Cornell University
8. Blakely, Bob ; Director of Industry ; California Citrus Mutual
9. Brandenberger, Lynn ; Horticulturist, Professor ; Oklahoma State University
10. Brown, Reggie ; Association Manager ; Florida Tomato Exchange
11. Carlson, Cathy ; Food Safety Program Manager ; Community Alliance with Family Farmers
12. Chege, Peter ; Extension Specialist ; University of Illinois Extension
13. Danyluk, Michelle ; Assistant Professor ; University of Florida
14. Deering, Amanda ; Post-Doc Researcher ; Purdue University
15. Dessaint, Louis ; Field Project Manager ; Brooks Tropicals, LLC
16. Eisenberg, Barry ; VP Food Safety Services ; United Fresh Produce Association
17. Elliott, Bob ; Direct of Food Safety ; Sunkist Growers, Inc.
18. Erickson, Marilyn ; Associate Professor ; University of Georgia
19. Farwell, Mike ; Farm Products Inspector ; NYS Dept. of Agriculture
20. Finney, Fred ; Famer/Owner ; Moreland Fruit Farm/Farmers Produce Auction
21. Giclas, Hank ; Senior Vice President ; Western Growers
22. Gregory, Laura ; Grower Communications ; California Strawberry Commission
23. Gunter, Chris ; Co-chair NC Fresh Produce Safety Task Force ; North Carolina State University
24. Hajmeer, Maha ; Research Scientist IV ; CA Dept. of Public Health, Food & Drug Branch
25. Hari, Michael ; Auditor/Inspector ; Equicert
26. Haskins, Cynthia ; Consultant ; Illinois Farm Bureau
27. Ingram, David ; Research Microbiologist ; USDA-ARS Environmental Microbial & Food Safety Lab
28. Jay-Russell, Michele ; Project Manager ; Western Center for Food Safety
29. Johnson, Donna ; DLJ Food Consulting ; Owner
30. Kanitz, William ; ScoringAg.com ; President
31. Kiger, Luana ; Special Assistant to STC ; USDA NRCS
32. Killinger, Karen ; Associate Professor ; Washington State University
33. Kline, Wesley ; Agricultural Agent ; Rutgers Cooperative Extension
34. Kolb, Karl ; President ; The High Sierra Group
35. Kulhanek, Ashley ; Food Safety Education Associate ; The Ohio State University
36. Langdon, Sue ; Extension Director ; North Carolina Sweet Potato Commission
37. Lanini, Sharan ; Raw Product Food Safety Mgr ; Chiquita Brands International/Fresh Express
38. Lowell, Karen ; Agricultural Scientist ; L&L Consulting
39. Mahovic, Michael ; Consumer Safety Officer ; FDA-CFSAN Produce Safety Staff
40. Maynard, Liz ; Extension Specialist ; Purdue University
41. McGinnis, Yvonne ; CEO ; Remembering Mary, LLC
42. Miele, Brendan ; Director CA Farming Ops ; Jacobs Farm/Del Cabo, Inc.
43. Miller, Bill ; Farm Prod. Grdg. Insp. 3 ; NYS Dept. of Agriculture and Markets—Div. of FSI

44. Mudahar, Gurmail ; Vice President ; Taniumra & Antle
45. Mountjoy, Daniel ; Asst. State Conservationist ; USDA NRCS
46. Nolte, Kurt ; Extension Agent ; University of Arizona
47. Phillips, Ellen ; Extension Educator ; University of Illinois Extension
48. Queenan, Mark ; VP of Quality ; Backyard Farms, LLC
49. Reeves, Brian ; Farmer ; Reeves Farms
50. Roberts, Martha Rhodes ; Special Assistant to Dean for Research ; University of Florida
51. Rubbo, Colby ; Food Safety Manager ; Costa Farms, Inc.
52. Runsten, David ; Policy Director ; Community Alliance with Family Farmers
53. Rushing, Jim ; Training and Program Manager ; University of Maryland
54. Sage, Bob ; Farmer ; Sage's Apples
55. Santoro, Al ; Farmer ; Poamoho Organic Produce
56. Schermann, Michele ; Research Fellow ; University of Minnesota
57. Schneider, Keith ; Associate Professor ; University of Florida
58. Schrock, Lloyd ; Chairman of the Board and Mgr. ; Lincoln Co. Produce Auction
59. Scott, Vicki ; Director of Quality ; Amigo Farms
60. Sharp, Adam J. ; Public Policy ; Ohio Farm Bureau Federation
61. Simmons, Chip ; Research Assistant Professor ; North Carolina State University
62. Stearns, Ken ; Food Safety Director ; D'Arrigo Bros.
63. Stoltzfus, Jeff ; Ag Instructor ; ELANCO School District
64. Stopyra, Tom ; Technical Crop Advisor ; The Packers of Indian River, Ltd
65. Sullivan, Bradley ; Managing Attorney ; Lombardo & Gilles, LLP
66. Suslow, Trevor ; Extension Specialist ; University of CA
67. Swiger, Joshua ; Attorney ; Weinberg, Wheeler, Hudgings, Gunn & Dial, LLC
68. Villaneva, Michael ; Consultant ; California Leafy Greens Marketing Agreement
69. Wall, Gretchen ; PSA Program Coordinator ; Cornell University
70. Wiemers, Andrew ; Grower Communications ; California Strawberry Commission
71. Yoder, Raymond ; Grower ; Yoder's Produce
72. Zomorodi, Brian ; Sr. VP Science and Technology ; Ready Pac Foods, Inc.

APPENDIX II: Results of Prioritization Survey











