



# **Working Committee 6**

## **Postharvest Handling**

Date: 04/13/2012

Revision: Final

## Introduction

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PSA working committee #6 was tasked with discussing the following areas related to post-harvest handling, with a special emphasis on co-management and NOP related issues.

### 6.1. Buildings-General Housekeeping

### 6.2. Water

#### 6.2.1. Uses

#### 6.2.2. Quality

#### 6.2.3. Monitoring

### 6.3. Equipment (sanitation, lubricants, maintenance, etc.)

### 6.4. Chemicals

#### 6.4.1. Cleaning agents

#### 6.4.2. Sanitizers

#### 6.4.3. Storage

### 6.5. Packing container storage

### 6.6. Storage & transportation

## Working Committee Chairs

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### Barry Eisenberg

*Vice President of Food Safety Services, United Fresh Produce Association*

### Wesley Kline

*Agricultural Agent, Cumberland County - New Jersey*

## Meetings Held

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Date	Attendance
June 7, 2011	22
August 4, 2011	21
August 18, 2011	17
September 8, 2011	17
September 29, 2011	11
November 3, 2011	17
December 22, 2011	14

**Total Meetings: 7**

**Total committee members<sup>1</sup>: 68**

<sup>1</sup> See [Appendix I](#) for full list of members

## Data Collection

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Information from committee members was collected during seven teleconferences held over five months (August to December of 2011). Each meeting held was approximately one hour long with open discussion between all participants. Detailed notes were taken and submitted to the committee after the meeting so that all participants, including those unable to attend, could review the content. Completed notes were then posted online at the PSA website.

A basic outline was created based on discussions and outcomes. This outline was then formatted into an online survey using SurveyMonkey (<http://www.surveymonkey.com/>). This survey was also made available in a printed version for those with limited access to computers. The nine question survey related to postharvest handling was drafted and reviewed by the committee co-chairs and PSA personnel including the program coordinator and director for thoroughness. The survey was designed to prioritize major topics areas for inclusion into the PSA curriculum. The survey was open to all committee members regardless of their level of participation on the conference calls to ensure we had the broadest participation possible. The primary goal of the survey was to establish a prioritization of topics to guide content development of the initial GAPs curriculum.

The results of the survey are attached to [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. Text highlighted in red denotes resources that are needed to address challenges identified for the development of the curriculum.

Due to the similarity of topics covered between the ten working committees that constitute the PSA, some priority areas, such as worker hygiene and training, are covered in multiple groups. The depth to which they are covered vary between groups but all outcomes are retained and will be represented in the overall PSA documents.

## Priority Areas

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### **I. Post-Harvest Water Use**

- a. Water Sources
- b. Treatment
  - i. Available Sanitizers
  - ii. Methods to Monitor Water Quality and Sanitizer Levels
  - iii. Recordkeeping
  - iv. Corrective Actions
  - v. Training Worksheets and Other Educational Materials

### **II. Sanitation and Maintenance of Facilities**

- a. Available Sanitizers
- b. Monitoring Facilities for Sanitary Conditions
- c. Developing and Implementing Standard Operating Procedures (SOPs)
- d. Sanitation and Use of Post-Harvest Tools
- e. Storage of Containers

### **III. Design of Washing and Packing Facilities**

- a. Construction Materials
- b. Ease of Cleaning
- c. Product Flow
- d. Worker Facilities

### **IV. Design and Proper Use of Cold Storage Facilities**

- a. Principles of Proper Cooling Methods
- b. Maintenance of Cold Storage Facilities

## Recommendations

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### I. Post-Harvest Water Use

#### a. Water Sources and Quality

- Water used for washing, cooling, or other processes on harvested or ripe product must be the microbial equivalent of drinking water (potable).
- Water should be tested for potability by an accredited third party laboratory.
- Single pass water should contain a disinfectant to minimize the potential for pathogens to grow and contaminate produce through the washing or cooling process.
  - Disinfectant (Sanitizer) can be omitted if the single pass water is only to be used on tables and machinery that are easily cleanable. (ie. small spray tables)
  - A final wash step with potable water should be utilized to remove residual sanitizer, i.e. for organic standards.
- Water used for post-harvest operations should be monitored for disinfection (sanitizer) levels and changed when soil and other organic material begins to build up, as this greatly reduces the effectiveness of sanitizers. Ice used in the operation is made from potable water and stored in a sanitary location.
- **Doc - Systems to remove debris in dump tanks, when to change water and what to do with water after changing.**
- **Resource – federal, state, and local water regulations applicable.**

#### b. Treatment

##### ii. Available Sanitizers

- A list of effective water sanitizers for both conventional and organic growers and scientific data to support their effective use should be provided with emphasis on easily accessible and affordable chemicals such as chlorine and hypochlorite (bleach).
- **Doc – List of sanitizers, advantages and disadvantages of each including organic options**

##### iii. Methods to Monitor Water Quality and Sanitizer Levels

- Growers and packers should understand how their particular operation affects the quality of post-harvest water, such as through dumping large loads of produce into a wash tank (establish a baseline of water quality).
- A summary and additional resources for how to actively monitor the following parameters for proper water sanitation should be provided to growers and packers.
  - a. Chlorine or other disinfectants (sanitizers)
  - b. Temperature
  - c. pH
- **Doc – How to monitor, when (frequency) for each agent.**

- Growers must be aware of what tools are available for the monitoring of water pH, free chlorine or other disinfectants (sanitizers) used, and temperature based on the three primary resources used by small growers and packers.
  - Test strips
  - Colorimetric strips
  - Electronic Sensors
- **Doc – Different monitoring tools and advantages and disadvantages.**
- **Demonstration – Effectiveness of the sanitizers (i.e. chlorine in a jar with organic matter to show the breakdown of the chlorine).**
- Frequency of testing should be tailored to the operation’s needs.

**iv. Recordkeeping**

- Document the type and frequency of all water treatments using easily accessible and understandable recordkeeping sheets.
- **Doc – MSDS sheets for chemicals.**

**v. Corrective Actions**

- Examples: Sampling water for free chlorine levels with litmus paper. The original SOP states do this every hour, but results re-indicating levels are dropping too low when measured every hour. The corrective action would be to increase the frequency of monitoring free chlorine to every 30 minutes.

**vi. Training Worksheets and Other Educational Materials**

- One page instructional water treatment procedure sheet
- Data sheets for logging and calculating sanitizer levels
- One page instructions on how to clean equipment (SOP)
- **Case study – water use, treatment scenario and solutions.**

**II. Sanitation and Maintenance of Facilities**

**a. Available Sanitizers**

- Training should provide availability, efficacy, and cost of recommended sanitizers.

**b. Monitoring Facilities for Sanitary Conditions**

- Growers must be aware of what tools and operating procedures are useful for the monitoring of sanitary conditions in the packinghouse and storage facilities.
  - Be able to identify common harborage sites for bacteria and pathogens.
  - Effectively use a pre and post operation check sheets for sanitizing equipment, drains, floors, and other areas of the facility.

**c. Developing and Implementing Standard Operating Procedures (SOPs)**

- Sanitation standard operating procedures (SSOP) should be outlined by the policy manager and enforced consistently.

- Pest Control
- Sanitizing Equipment
- Worker Hygiene
- Workers are trained in the particular SOPs developed by the company and understand how to properly implement them.

**d. Sanitation and Use of Post-Harvest Tools**

- Hand tools, tables, and other post-harvest utensils should be sanitized and properly stored after use.
- Tools should have color designations for their use. For example, a color for contact with product and another color for debris/trash tools “green is clean”.

**e. Storage of Containers**

- Containers used for packing and shipping produce are stored in an area that is covered and preferably isolated from the packing area to ensure that bins are not exposed to rodents, dust, or condensation.

**III. Design of and proper Use of Washing and Packing Facilities**

**a. Construction Materials**

- Equipment, tools, and tables used for post-harvest washing or cooling should be in good condition and constructed of easy to clean materials.
- A document or series on how to retrofit buildings, barns, etc.
- Sheet on what materials to use for retrofitting grading tables, picking lines, etc. and how to make them food safe (e.g. caulking along joints)
- **Doc – retrofitting facilities for food-grade use.**
- **Doc – How product should flow through facility. Examples of different layouts for a packing operation.**

**b. Product Flow**

- The flow of fresh produce through the facility is designed to minimize the potential for clean produce to come into contact with dirty produce.
- Any farm equipment and vehicles which may have driven through animal operations where fresh manure is present should be parked or stored away from packing areas to avoid cross contamination.

**c. Worker Facilities**

- Worker facilities should be located away from the packing line, but can be in same building.
- Worker hygiene is strictly enforced in the packing and washing areas. (Refer to WC #2 summary for more details on worker hygiene)

#### **IV. Design and Proper Use of Cold Storage Facilities**

##### **a. Principles of Proper Cooling Methods**

- Proper construction of facilities should be emphasized including information on the amount of insulation, cooling unit sizes, and alternative cooling systems for small operations.
- Provide resources to growers, packers, and shippers for how to maintain proper temperatures for safety and quality in transporting product, both for wholesale and retail (farmer's markets).
- Best practices for loading and placement of product for cold storage and shipping should be outlined.

##### **b. Maintenance of Cold Storage Facilities**

- Standard operating procedures should be written to outline storage policies, temperature management, and routine cleaning.



## APPENDIX I

### Working Committee Members: 68

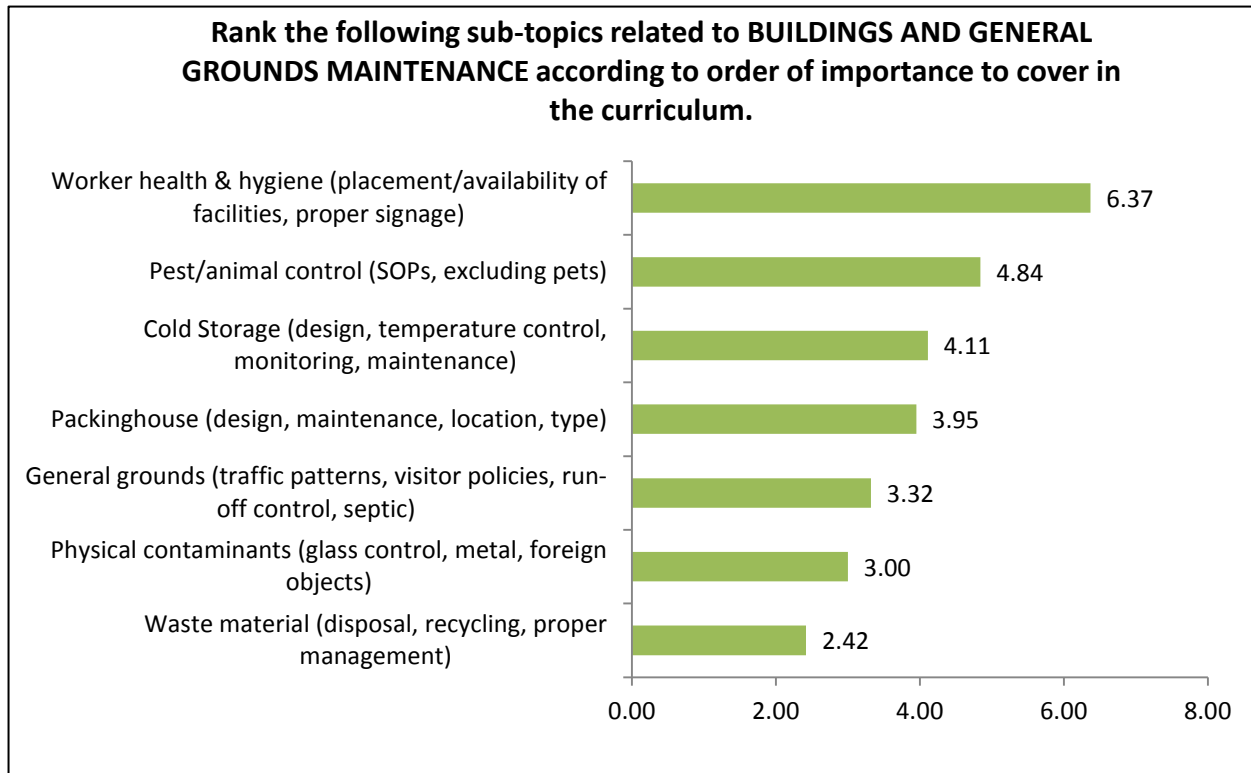
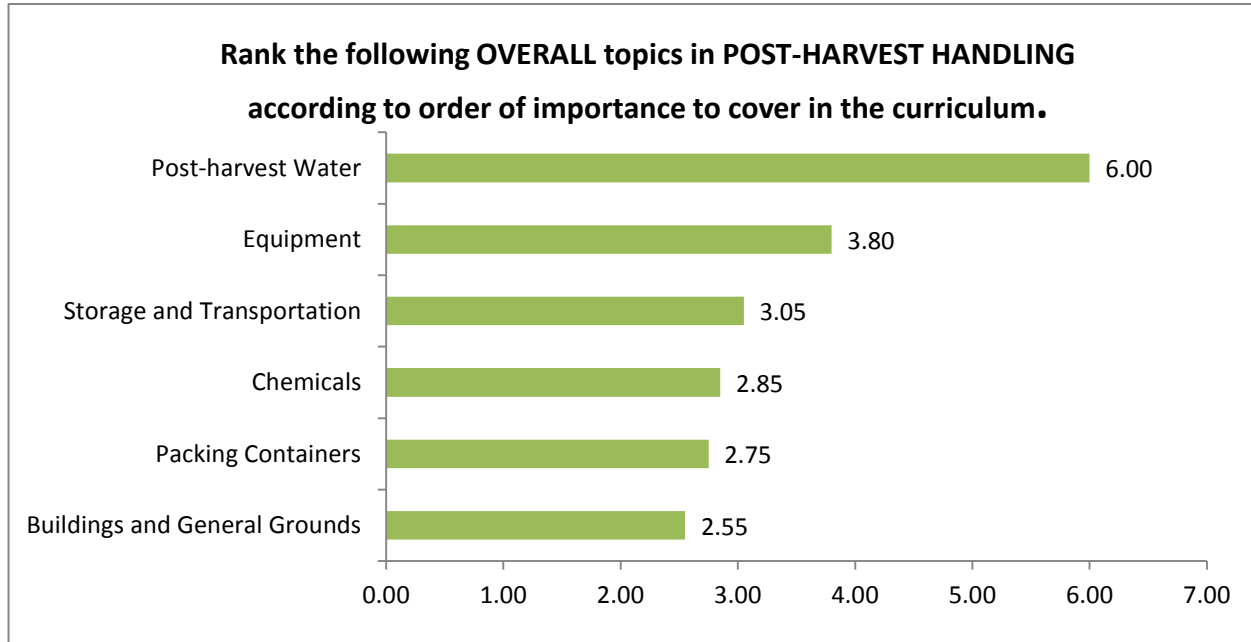
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1. Baros, Jonathan ; Extension Associate ; North Carolina State University
2. Beckman, Edward ; CEO ; California Tomato Farmers
3. Bessell, Ian ; Director of Business Development ; ABC Research Labs
4. Bihn, Elizabeth ; PSA Program Director ; Cornell University
5. Biltonen, Mike ; Consultant ; Red Jacket Orchards
6. Blakely, Bob ; Director of Industry ; California Citrus Mutual
7. Brown, Reggie ; Association Manager ; Florida Tomato Exchange
8. Bunning, Marisa ; Assistant Professor ; Colorado State University
9. Carlson, Cathy ; Food Safety Program Manager ; Community Alliance with Family Farmers
10. Chege, Peter ; Extension Specialist ; University of Illinois Extension
11. Dessaint, Louis ; Field Project Manager ; Brooks Tropicals, LLC
12. Deering, Amanda ; Post-Doc Researcher ; Purdue University
13. Deomano, Edgar ; Technical Director ; National Wooden Pallet and Container Association
14. D'lima, Carol ; Produce Safety Staff Fellow ; FDA-CFSAN
15. Elliott, Bob ; Director of Food Safety ; Sunkist Growers, Inc.
16. Eisenberg, Barry ; VP Food Safety Services ; United Fresh Produce Association
17. Farwell, Mike ; Farm Products Inspector ; NYS Dept. of Agriculture
18. Flores, Nancy ; Extension Food Technology Specialist ; New Mexico State University
19. Giclas, Hank ; Senior Vice President ; Western Growers
20. Gilman, Steve ; NOFA-IC Policy Director ; NOFA
21. Green, William ; Quality Assurance Mgr ; Phillips Mushroom Farms
22. Hari, Michael B. ; Auditor/Inspector ; Equicert
23. Haskins, Cynthia ; Consultant ; Illinois Farm Bureau
24. Herbert, Melissa ; Director of Industry Affairs ; Neogen Corporation
25. Johnson, Donna ; DLJ Food Consulting ; Owner
26. Kanitz, William ; President ; ScoringAg.com
27. Kahlke, Craig, J. ; Extension Educator ; Cornell Cooperative Extension
28. Killinger, Karen ; Assistant Professor ; Washington State University
29. Kimes, Ken ; Farmer ; Greensward/New Natives, LLC
30. Kline, Wesley ; Agricultural Agent ; Rutgers Cooperative Extension
31. Kolb, Karl ; President ; The High Sierra Group
32. Kotapalli, Mythili ; QA/QC Manager ; Gourmet Kitchens, Inc.
33. Kulhanek, Ashley ; Food Safety Education Associate ; The Ohio State University
34. Langdon, Sue ; Extension Director ; North Carolina Sweet Potato Commission
35. Lanini, Sharan ; Raw Product Food Safety Mgr ; Chiquita Brands International/Fresh Express
36. Lu, Jianbo ; Director of Food Safety ; Global Food Safety Forum
37. Lucas, Jeff ; VP Tech Services ; Quanta Lab
38. Long, Jasmine ; Produce Safety Intern ; Publix Super Markets, Inc.
39. Mahovic, Michael ; Consumer Safety Officer ; FDA-CFSAN Produce Safety Staff
40. McGinnis, Yvonne ; CEO ; Remembering Mary, LLC
41. Miller, Bill ; Farm Prod. Grdg. Insp. 3 ; NYS Dept. of Agriculture and Markets

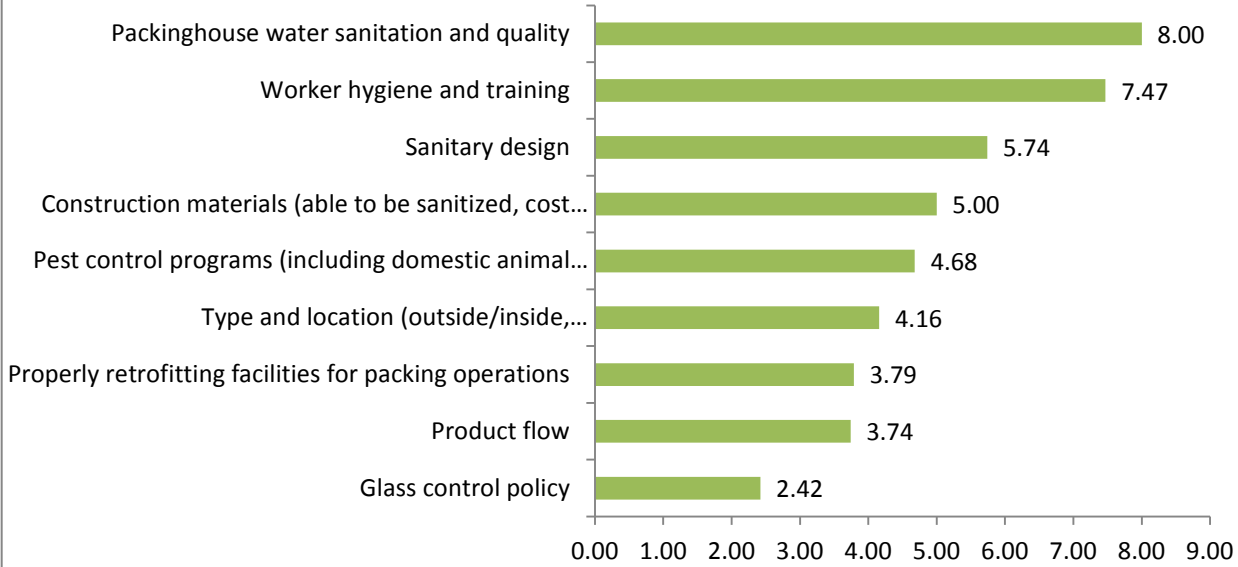
42. Monroe, James Scott ; Extension Educator ; Purdue University Cooperative Extension
43. Morales, Saul ; Senior Department Manager, QC ; Sysco Quality Assurance
44. Mudahar, Gurmail ; Vice President ; Taniumra & Antle
45. Nolte, Kurt ; Extension Agent ; University of Arizona
46. Normandin, Vicki ; Ag Consultant ; Self
47. Nwadike, Londa ; Extension Food Safety ; University of Vermont Extension
48. Oblinger, James ; Professor ; North Carolina State University
49. Ogle, Tamara ; Extension Educator ; Purdue Extension
50. Queenan, Mark ; VP of Quality ; Backyard Farms, LLC
51. Reeves, Brian ; Farmer ; Reeves Farms
52. Roberson, Michael ; Director of CQA-Produce ; Publix Super Markets, Inc.
53. Roberts, Martha Rhodes ; Special Assistant to Dean for Research ; University of Florida
54. Rushing, Jim ; Training and Program Manager ; University of Maryland
55. Sage, Bob ; Grower ; Sage's Apples
56. Sanchez, Marcos ; Food Safety Specialist ; IICA
57. Schneider, Keith ; Associate Professor ; University of Florida
58. Sharp, Adam ; Public Policy ; Ohio Farm Bureau Federation
59. Simmons, Chip ; Assistant Professor ; North Carolina State University
60. Sullivan, Bradley ; Managing Attorney ; Lombardo & Gilles, LLP
61. Sitch, Stephen ; Director ; NY State Dept. of Agriculture and Markets
62. Suslow, Trevor ; Extension Specialist ; University of California
63. Swiger, Joshua ; Attorney ; Weinberg, Wheeler, Hudgings, Gunn & Dial, LLC
64. Tocco, Phil ; Extension Educator ; Michigan State University Extension
65. Turner, Lynn ; Emeritus Professor ; North Carolina State University
66. Wall, Gretchen ; PSA Program Coordinator ; Cornell University
67. Wiemers, Andrew ; Grower Communications ; California Strawberry Commission
68. Yudin, Richard ; Technical Manager ; Fyffes

**APPENDIX II**

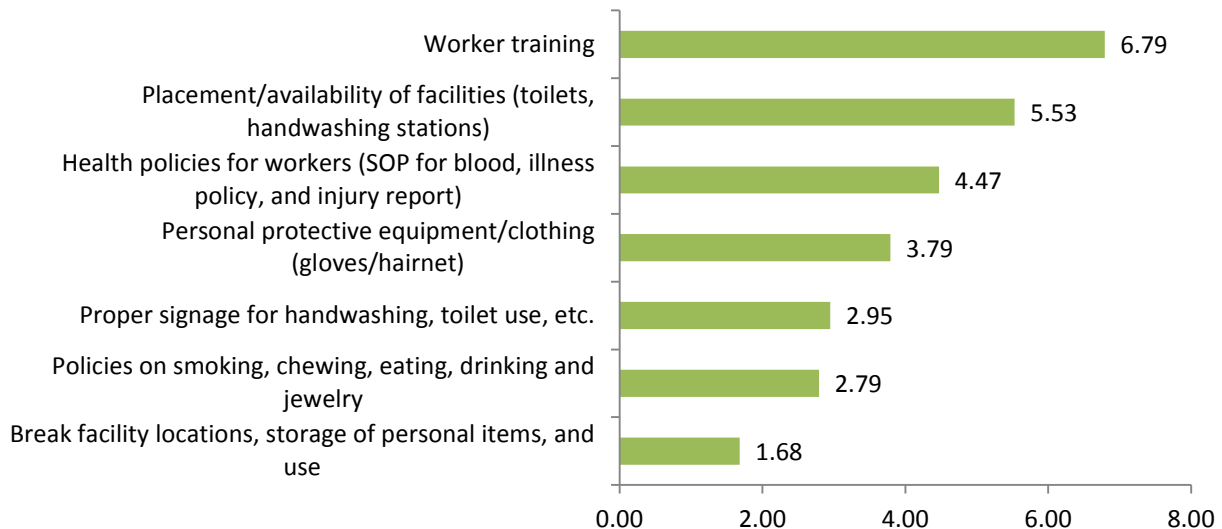
**Results of Prioritization Survey**



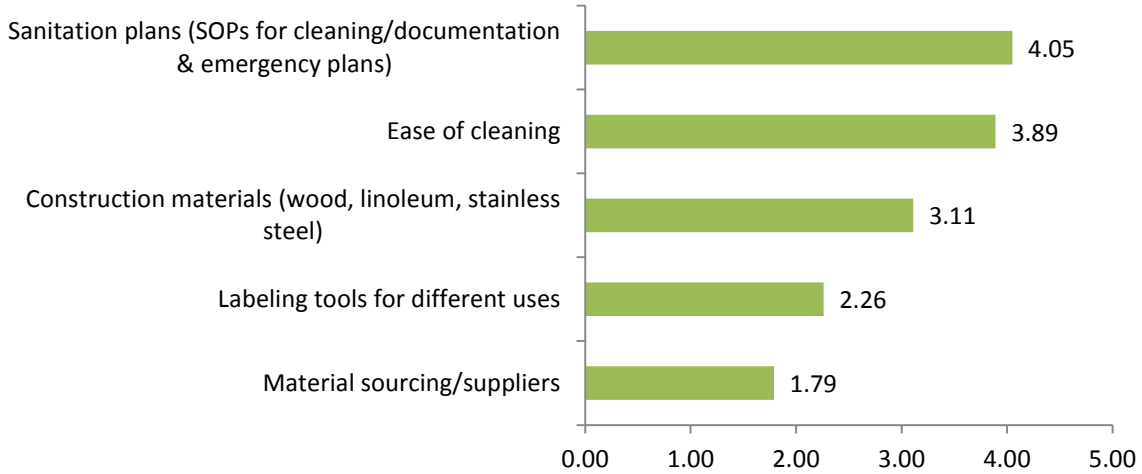
**Rank the following sub-topics related to PACKINGHOUSE OPERATIONS according to order of importance to cover in the curriculum.**



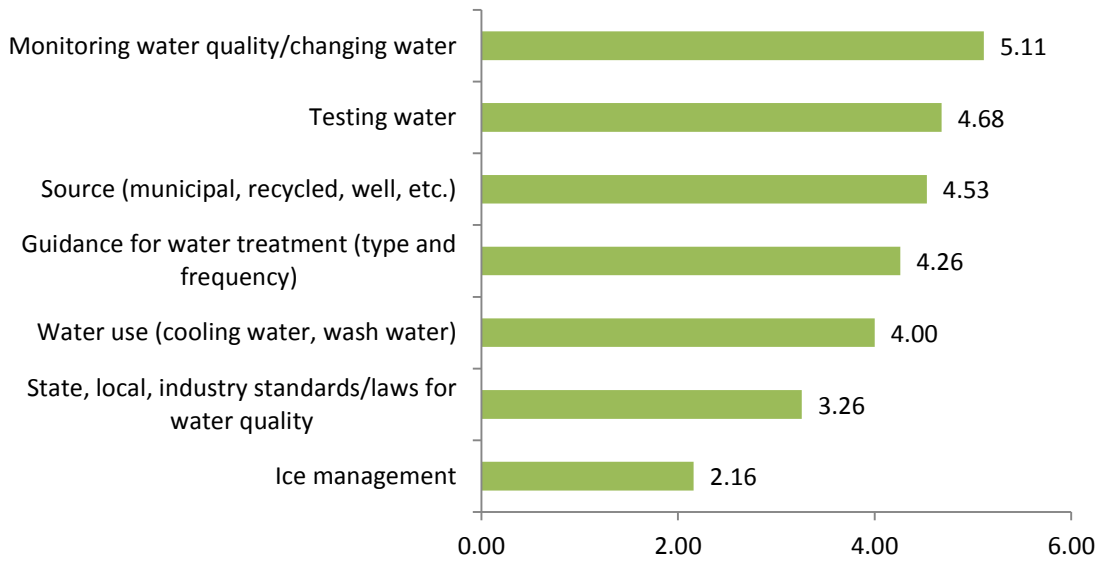
**Rank the following sub-topics under WORKER HEALTH and HYGIENE during POST-HARVEST HANDLING according to order of importance.**



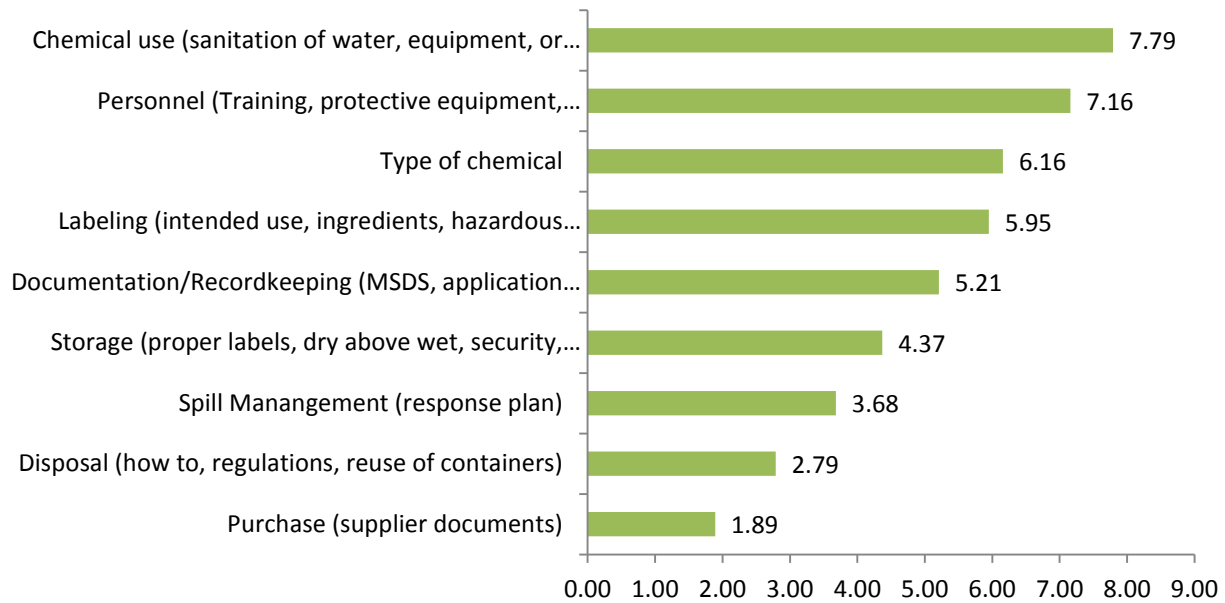
**When considering EQUIPMENT USES FOR POST-HARVEST HANDLING, please rank the following topics according to order of importance to be addressed in the PSA curriculum.**



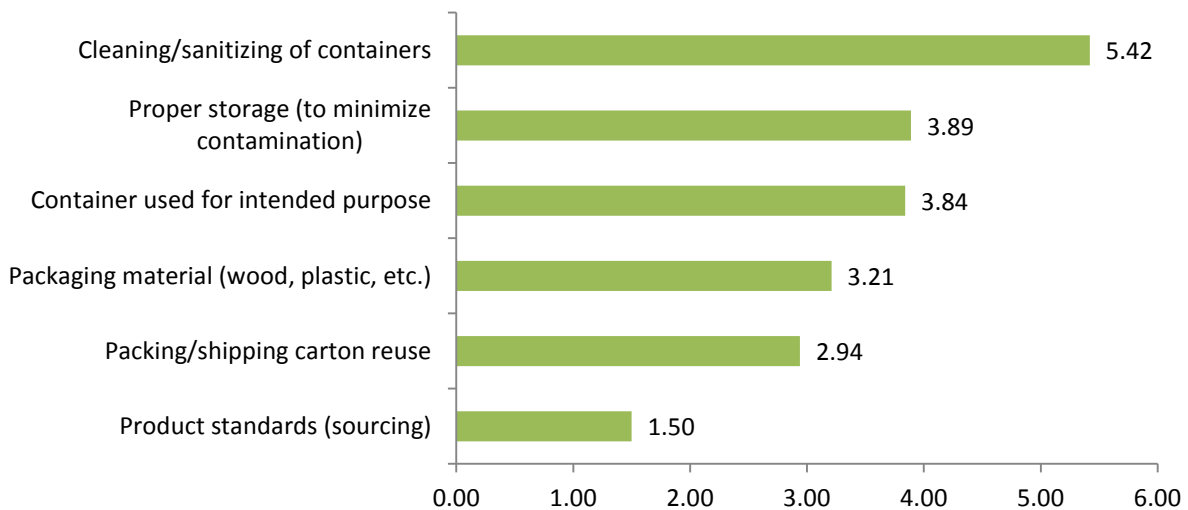
**Rank the following sub-topics under WATER for POST-HARVEST USE according to order of importance to cover in the curriculum.**



**Rank the following sub-topics under CHEMICALS during post-harvest handling according to order of importance to cover in the curriculum**



**Rank the following sub-topics under PACKING CONTAINERS FOR POST-HARVEST HANDLING according to order of importance.**



**When considering STORAGE AND TRANSPORTATION during POST-HARVEST HANDLING, please rank the following topics according to order of importance to be addressed in the PSA curriculum.**

