

# Food Safety —

## Good Agricultural Practices (GAPs)

# 4

Vegetables may become contaminated by microbial, chemical or physical hazards at various points along the production, handling and marketing chain. These contaminants have the potential to cause food-borne illness in consumers. Growers must carefully manage their crop production and food handling methods to minimize the risk of contamination.

### Biological Hazards

- Microorganisms in numbers that could cause food borne illness (i.e. bacteria, viruses, parasites, etc.)

By using good agricultural practices (GAPs) in the following key areas, growers can minimize the risk of food contamination.

### Manure

Growers should use either aged or composted manure in the year of harvest. Aged manure has been stored for at least three months without the addition of additional fresh/raw manure. The level of pathogenic activity will vary depending on storage time and conditions. Composted manure has been actively managed to greatly reduce the level of pathogens. Composting requires regular turning of the manure and generation of temperatures greater than 55°C for at least 3 days.

Manure should be stored at least 30 meters (100 ft) away from any watercourse or domestic well. Manure should not be stored in a location where there is a risk of runoff or the potential to generate dust and contamination of nearby crops, land or equipment. During and after manure application precautions must be taken to prevent any cross contamination. All field stored manure piles must be covered between October 1<sup>st</sup> and April 30<sup>th</sup>.

Vegetable growers should maximize the time between application of manure to the crop and harvest. Manure should be well incorporated into the soil. Manure or manured soil should be kept from contacting non-root vegetables or harvesting containers.

### Worker Hygiene

Growers are responsible for providing pickers with proper sanitation facilities. Toilet and handwashing units must be located conveniently and serviced regularly. They must also be self-contained, with holding tanks that are routinely pumped out and maintained.

A proper handwash unit includes clean water, liquid soap dispenser, wash basin, individual paper towel dispenser and a trash bin.

Additionally and more importantly, growers should have a basic employee training program, covering personal hygiene, good picking practices and farm sanitation.

Harvest workers should be instructed to remove or cover jewelry, cover cuts and wounds and report illnesses.

### Irrigation Water

Poor quality irrigation water can contaminate vegetables, especially if used close to or during harvest. Ditch or other surface water may be high in coliforms (bacteria), especially if there are livestock operations in the area. Well water generally has better water quality. Water should be tested for coliform levels. There is much less risk of contamination with drip irrigation compared to overhead sprinkler irrigation. See Table 2.2 “Water Quality Evaluation Characteristics”.

## Crop Wash Water

Your water source should be tested to determine if it is acceptable for crop washing. Surface water sources, especially ditches, may have high fecal and total coliform counts.

The Canadian Horticultural Council’s “On Farm Food Safety Guidelines” state that the water used in the dump tank or for washing or fluming **prior to a final rinse** must be of adequate quality. The water can be reused if monitoring procedures are in place to control the accumulation of soil, organic debris, foam or other pathogens.

Water used for **final** rinsing, cooling or fluming should be of potable (drinking) quality. The acceptable standard for potable water is <1cfu (colony forming units)/100 mL of *E.coli* or total coliform. Water can be reused in these processes, providing that proper monitoring and treatment is done to ensure that the potable quality is maintained.

Treatment is generally the addition of an appropriate chemical such as chlorine. Monitoring is required to ensure that the chlorine level is not excessive, which may cause the formation of toxic compounds such as chloramine. Insufficient amounts however will not provide the protection required to kill pathogens (bacteria that can cause illness).

## Harvesting Containers

Containers that come into contact with soil may contaminate vegetables with bacteria. Try to store picking containers off the ground. This will also help to prevent contamination with insects, slugs and rocks.

Harvesting equipment and picking containers should be washed regularly and stored to prevent contamination.

## Post-Harvest Handling

If vegetables are allowed to heat up after harvest, levels of bacteria, yeast and mold may increase substantially. Keep harvested product out of direct sun and ship as quickly as possible.

To obtain more information on how to develop on-farm food safety programs, contact your commodity organization or BCMAL. For more

information on good agricultural practices for the leafy green sector refer to the following link:

<http://www.caleafygreens.ca.gov/applications/DocumentLibraryManager/upload/10%2016%202007%20Leafy%20Greens%20Guidance%20Clean.pdf> .

## Chemical Hazards

- Pesticide residues which exceed maximum residue limits (MRLs)
- Pesticide residues of non-registered products
- Other chemicals such as fertilizers, fuel, lubricants, cleaning agents etc.

## Pesticides

Illegal or harmful chemical residues will not occur if growers follow pesticide application rates, days to harvest restrictions and other pest management recommendations in this guide. It is essential for growers to use the right equipment that is well-maintained, calibrated, and operates to ensure accurate and uniform application. (See the Sprayer Equipment & Calibration sections [Chapters 10 & 11] in this guide.) To ensure pesticide effectiveness and prevent possible contamination, a good quality water source should be used.

Pesticides must be kept in a locked, well-ventilated storage area posted with a warning sign. Chemical spills must be cleaned promptly according to the procedure outlined by the product manufacturer. (See Pesticide Regulations and Safety, Chapter 8.)

## Other Chemicals

Ensure that fertilizers, lubricants and other chemicals are stored away from food and food handling areas and that all machinery is properly maintained to prevent fluid leaks. Food-grade lubricants and fluids should be used in harvesting equipment.

## Physical Hazards

Careful harvesting and handling can prevent contamination with materials such as glass, metal and rocks.

## Adjacent Land Use

Activities on neighbouring sites are a potential source of contamination. Some examples include:

- Exhaust fans from neighbouring barns blowing dust into the fields or onto picking containers or equipment
- Spray drift from adjacent crops
- Run-off from animal operations or industrial sites
- Improper field storage of manure
- Overhead irrigation using a contaminated water source
- Manure spreading on windy days or without adequate buffer zones between properties
- Overhead manure spreading

Growers should work with neighbours to identify potential hazards on adjacent properties, and introduce measures to minimize the risk. This may include buffer zones between properties or physical barriers (i.e. hedges).

## Record Keeping

Growers should keep records of their production inputs including pesticide application, manure application, water testing, irrigation scheduling and harvesting dates. Sample checklists can be found on the following 5 pages.

In a crisis situation, proper records can be invaluable in demonstrating that reasonable steps were taken to prevent and reduce the risk of food borne illness on the farm.

## More Information

A number of resources are currently available to assist growers in implementing on-farm food safety programs. For more information contact BCMAL, your industry organization or packer/processor.

**Pesticide/Chemical Checklist**

FARM NAME: \_\_\_\_\_ ADDRESS: \_\_\_\_\_

INSPECTION	YES	NO	N/A	IF NO, CORRECTIVE ACTION	COMPLETED DATE
<b>Pesticide(s) are stored:</b>					
- in a locked, leak proof and ventilated location, with warning & caution signs posted at the door of the storage					
<b>Sprayer(s) &amp; Other Equipment are:</b>					
serviced and calibrated at least once a year					
- maintained to prevent leaks					
- cleaned & maintained in a way that prevents berry & water contamination					
<b>Other:</b>					
Spraying staff are aware of what must be done in case of a spill					
Fertilizers, fuels & oils are stored to prevent crop & water contamination					

Applicator's license:

Name: \_\_\_\_\_ Valid until: \_\_\_\_\_

License Number: \_\_\_\_\_

Attach Completed Sprayer Tune-Up/Calibration Worksheet found in Sprayer Calibration section of this guide

Attach Pesticide Re-certification Credit Sheet

INSPECTED BY: \_\_\_\_\_

DATE: \_\_\_\_\_



### Manure Checklist

FARM NAME: \_\_\_\_\_ ADDRESS: \_\_\_\_\_

INSPECTION	YES	NO	N/A	IF No, CORRECTIVE ACTION	COMPLETED DATE
<b>Manure is stored:</b>					
- at least 30 m (100ft) from watercourse or well					
- to prevent crop harvesting container(s) & equipment contamination					
<b>Field stored manure:</b>					
- piles are covered from October 1 <sup>st</sup> to April 1 <sup>st</sup>					
<b>Manure is applied:</b>					
- between mid-February and mid-April					
- using a technique that minimizes manure contact with the crop					

INSPECTED BY: \_\_\_\_\_ DATE: \_\_\_\_\_

### Irrigation & Spray Water Checklist

FARM NAME: \_\_\_\_\_ ADDRESS: \_\_\_\_\_

INSPECTION	YES	NO	N/A	IF No, CORRECTIVE ACTION	COMPLETED DATE
<b>Water source(s):</b>					
- used for irrigation & sprays are tested for E. coli and/or fecal coliforms					
- has been found safe for intended use					
- is not being contaminated by runoff or any other contaminant					

Attach Water Quality Lab Test Results

INSPECTED BY: \_\_\_\_\_ DATE: \_\_\_\_\_

## Pre-Harvest Food Safety Checklist

FARM NAME: \_\_\_\_\_ ADDRESS: \_\_\_\_\_

INSPECTION	YES	NO	N/A	IF NO, CORRECTIVE ACTION	COMPLETED DATE
<b>Have Picked Up or Ordered:</b>					
- employee training materials and hygiene signs					
- proper toilets, hand washing units and other sanitary supplies (delivery to occur prior to harvest)					
<b>Toilet and Hand Washing Stations are:</b>					
- in the field and are easily accessible by employees					
- located to prevent berry & water contamination					
<b>Other:</b>					
- a supervisor is designated to monitor practices and train new employees in safe & good practices					
- sanitary supplies (dispensing soap, paper towels, and waste containers) are provided					
- personal hygiene reminder signs are in place					
<b>Mechanical Harvester(s), Flats &amp; Picking Containers/Bins are:</b>					
- located to prevent contamination					
<b>Employees:</b>					
- are trained in good hygiene & harvesting practices					
- have received and understand the Food Safety Guide for Berry Pickers					

INSPECTED BY: \_\_\_\_\_

DATE: \_\_\_\_\_

### During Harvest Food Safety Checklist

FARM NAME: \_\_\_\_\_ ADDRESS: \_\_\_\_\_

INSPECTION	YES	NO	N/A	IF NO, CORRECTIVE ACTION	COMPLETED DATE
<b>Toilets are:</b>					
- easily accessible and an adequate number are placed in the field					
- emptied, serviced and cleaned regularly					
<b>Hand Washing Station(s) are:</b>					
- easily accessible and an adequate number are placed in the field					
- replenished with supplies and cleaned regularly					
<b>Field Trash Bins are:</b>					
- emptied regularly					
<b>Mechanical Harvesters &amp; Picking Containers are:</b>					
- cleaned thoroughly as needed					
<b>All Employees are:</b>					
- trained in and are following safe and good hygiene & harvesting practices					
<b>Vegetables are:</b>					
- kept covered in a cool location that is clean					

INSPECTED BY: \_\_\_\_\_

DATE: \_\_\_\_\_