environmental farm plan
sustainably farmed

INFOSHEET #18

HORTICULTURAL PRODUCTION

How to address concerns identified in Environmental Farm Plan Worksheet #18

Based on Environmental Farm Plan Workbook, 5th ed. 2025

This infosheet outlines options to address concerns identified in your Environmental Farm Plan (EFP) as they relate to horticultural production.

For horticultural production in a Source Water Protection Zone, you may need to take measures to reduce risk. The **Farm Source Water Protection Plan framework** and workbook can help you work through the Source Water Protection Framework and its application on your farm.

All options in this infosheet are classed as **Actions** or **Compensating Factors**.

- **Actions** address the identified concern, and will change the EFP rating to (3) or (4) Best.
- **Compensating Factors** are alternatives that will adequately address the concern, but will not change the rating in the EFP worksheet.

In most cases, you'll need more information before choosing and implementing options. Sources for more information are noted at the end of this infosheet.

For help with technical terms, please see the full glossary in your EFP Workbook.

Sustainable Canadian Agricultural Partnership
OSCIA
Ontario
Canada

CONTROLLED ENVIRONMENT AGRICULTURE
(E.G., GREENHOUSES, VERTICAL FARMS, WAREHOUSE PRODUCTION)

18-1. Biosecurity

BACKGROUND

Diseases and pests can thrive in these production facilities and cost growers a lot of money.

Threats can be managed with preventative and control measures – including Integrated Pest Management (IPM) practices, eradication and sanitation. These measures are the foundation of biosecurity.

Develop a biosecurity plan to limit the risk of infestation to your operation and ensure all staff and visitors to your production facility (e.g., suppliers, service personnel) adhere to biosecurity procedures.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Thoroughly clean and disinfect the crop production area between crop cycles. Regularly clean and disinfect tools and equipment throughout production.

Complete a greenhouse biosecurity workshop certificate and self-assessment checklist.

OPTION 2 – ACTION

In addition to the actions in Option 1:

Provide employees with on-farm shoes and clean uniforms.

Control visitor access to your greenhouses:

- secure all doors to prevent unwanted entry
- install surveillance cameras

Establish a disinfection procedure/process for anyone entering the facility:

- install a double entrance at the entry point that is screened and vented outside of greenhouse complex
- ensure visitors and staff undergo disinfection procedures before entering

A biosecurity plan will help to counter pest and disease threats to your business. Strict adherence by all visitors is essential.

18–2. Monitoring for pest management

BACKGROUND

A monitoring program involves regular scouting for evidence of pests, familiarity with their life cycles, and gauging the stage and severity of infestation.

Careful monitoring provides reliable information to guide your IPM program and helps you make more effective and efficient use of control strategies.

WHAT CAN YOU DO?

OPTION 1 – ACTION

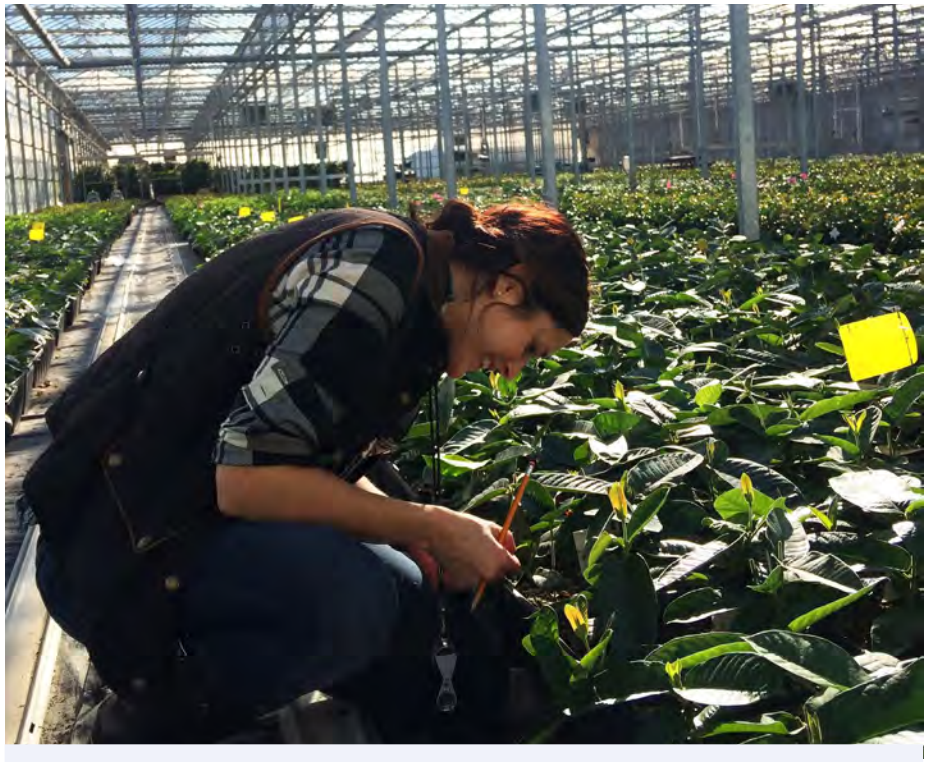
Establish a pest monitoring program:

- monitor/scout inside and outside production facilities on a regular basis
- be familiar with pest life cycles and threshold levels that trigger control measures
- keep records – you will have reliable data on which to fine-tune management decisions

OPTION 2 – ACTION

In addition to the actions in Option 1, increase scouting frequency to a weekly basis.

The Crop Protection Hub provides resources to find pest management and crop protection options. It is an excellent reference package for greenhouse vegetables growers.



Pest monitoring is site-specific. Scout inside and outside the production facility regularly.

18–3. Integrated Pest Management (IPM)

BACKGROUND

Consider using non-chemical control agents, including management techniques, and biological controls.

When using biological controls, chemical control options are still allowed but require extra attention during their use in order to not harm the biological controls (e.g., parasites).

This BMP booklet introduces the basics of IPM, such as pest monitoring, identification, thresholds, and an array of control strategies.

Biopesticides are living organisms, and their ability to control pest populations depends on their fitness – upon arrival and onsite.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Incorporate IPM techniques:

- **Biosecurity –** Limit the risk of infestation of your operation, and ensure all visitors (e.g., suppliers, service personnel) to your production facility, and all staff adhere to biosecurity procedures.
- **Production facility climate management –** Pests will thrive in certain climatic conditions and be less successful in others. Know the preferences of the targeted pest and adjust the climate accordingly, while still meeting the needs of the growing crop.
- **Exclusion –** If the pest can be denied access to the production facility in a cost-effective manner, management efforts can focus on other areas of improving production instead of reacting when the pest becomes a problem.
- **Biopesticides –** These are living organisms and their ability to control pest populations depends on their condition. All biopesticides should be inspected on delivery. Packages arriving during winter should be checked to ensure that they have not been frozen. Packages received during summer should be cool inside: otherwise, the biopesticides may be damaged.
- **Intensive scouting/monitoring –** Early detection is critical for a successful IPM program. Thorough scouting is time well-invested. Always make notes of observations for later reference.
- **Timely introduction of control management strategies –** When scouting reveals a pest issue, then decisions need to be made on how to best control the pest. At certain stages of the pest's life cycle, it will be easier to control and implementing a control strategy at this time will improve the chances of keeping the population at manageable levels.

18–4. Disposal of non-infested organic waste (e.g., prunings, culls, used growing media)

BACKGROUND

Plant debris is one of the primary sources of solid wastes from controlled environment facilities (e.g., greenhouses). Improperly managed, decomposing plant debris will produce odours and nutrient-rich runoff. In addition, culled plant materials can be a host to crop pests.

Organic wastes such as prunings and crop residues should be properly handled on the farm to reduce environmental impact from stockpiling.

Note: This question does not pertain to material that was disposed of due to biosecurity issues (pest-infested material related to disease, insects, etc.).

WHAT CAN YOU DO?

OPTION 1 – ACTION

- Sort waste into two streams – organics and non-organics
- Spread organic material on cropland and incorporate in a timely manner, if possible

OPTION 2 – ACTION

- Sort waste into two streams – organics and non-organics
- Compost organic wastes:
  - set up a properly managed compost pile and turn materials at regular intervals
  - keep woody waste from greenhouse vegetables out of the compost mix – use only vines and cull fruit material
  - spread finished compost on cropland and incorporate

OPTION 3 – ACTION

- Sort waste into two streams – organics and non-organics
- Growing media or plant material recycled for alternative uses (e.g., feedstock for anaerobic digester)

Plant material from production facilities should be properly handled (e.g., separated and composted) on the farm to reduce environmental impact from stockpiling.

18–5. Disposal of non-organic waste
(e.g., twine, clips, plastic, non-organic growth media)

BACKGROUND

Plant debris and associated production material (e.g., twine, clips, non-organic growth media) are one of the primary sources of solid wastes from controlled environment facilities (e.g., greenhouses). This material needs to be sorted into two waste streams before it can be disposed of.

Non-organic wastes such as twine, clips or growth media should be properly disposed of off-farm to reduce environmental impact from stockpiling.

WHAT CAN YOU DO?

OPTION 1 – ACTION

- Sort waste into two streams – organics and non-organics:
  - recycle inorganic material when possible
  - take non-recyclables and unusable materials to the waste management facility

18-6. On-farm food safety

BACKGROUND

Increasingly, retailers are demanding a full food safety program as a business requirement and for market access. Additionally, the traceability component of an on-farm food safety program may improve inventory control, resulting in a reduction of lost product and improved margins.

Food safety requires a comprehensive management strategy that includes not only best management practices but also the recording or documentation of these activities. Good records verify good management and provide reference points for continuous improvement.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Establish an on-farm food safety program:

- implement a record-keeping system to document food safety activities that were carried out

OPTION 2 – ACTION

Implement a third-party audit of existing food safety program:

- undertake audits of documented food safety activities that were carried out

18-7. Food traceability

BACKGROUND

Traceability plays a significant role in helping businesses be competitive in the domestic and global marketplace. The ability to trace a product through all stages of production, processing, distribution, transport and retail to the end point (or consumer) is becoming a standard business practice for everyone involved in today's food supply chain.

Without an effective traceability system, you may be shut out of lucrative new markets or lose your existing markets to businesses that can demonstrate the value of their traceability system.

Outbreaks of food illness show the financial devastation to businesses and whole sectors when their reputation for providing safe food is put into question and effective traceability programs are not in place.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Establish a system of information exchange with electronic records:

- set up a third-party audit system with complete records

OPTION 2 – ACTION

Set up a food traceability system with paper records.

For more information on food traceability, check out the Canadian Food Inspection Agency's site on traceability for food.

Records and information-sharing provide the basis for review or traceability by a third party.

18–8. Maintenance of heating system (e.g., air furnaces, unit heaters, boilers, heat distribution lines)

BACKGROUND

Heating of controlled environment facilities represents one of the larger operating costs associated with these facilities. Proper maintenance of heating systems will reduce energy consumption and repair costs. It can also increase the life expectancy of the equipment.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Schedule regular maintenance and inspections within a defined calendar period. Regular maintenance may include:

- engaging a qualified professional to perform maintenance and inspections
- changing air and fuel filters
- checking wear and tension on fan belts
- lubricating bearings on fan motors
- insulating distribution pipes and vents

Regular boiler maintenance enhances heating efficiency.

18–9. Climate controls

BACKGROUND

Up-to-date computerized control of heating systems helps increase energy efficiency while providing the best conditions for plant growth. Proper environmental conditions also reduce disease pressure on the crop.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Install a fully automated self-adjusting climate control system with properly calibrated sensors.

OPTION 2 – ACTION

Install a fully automated, self-adjusting, control system with properly calibrated sensors which tracks multiple climate factors (e.g., weather, solar, temperature above and below energy curtains, vapor pressure deficit, and CO_2), and maintain updated software (less than 3 years old).

Using automated controls in production facilities can result in significant savings in energy consumption and costs.

18-10. Fuel use efficiency and flue gas use

BACKGROUND

Use of energy efficient heating systems will lead to a decrease in fuel usage. Heat and carbon dioxide produced by gas-fired heating equipment (e.g., boilers) can be re-captured from flue gas vents and re-used in the growing/production area to promote optimal crop performance.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Use energy-efficient controls with flue gas CO_2 and hot water storage tanks.

OPTION 2 – ACTION

Install energy curtains to reduce night-time heat loss and reduce light impacts.

Capturing heat and $C0_2$ from flue gas allows for the recycling of energy that would otherwise be wasted.

Energy-efficient structures are a major factor in achieving a competitive cost of production for greenhouse crops.

18-11. Greenhouse construction (structural energy efficiency)

BACKGROUND

As energy costs continue to increase, so do the benefits from timely maintenance of buildings. Tightly glazed, gutter-connected, well-maintained greenhouses are more energy-efficient.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Maintain and repair existing structures:

- repair foundation and add sufficient insulation to the foundation and heat-transfer pipes
- maintain/repair glass to ensure that glazing is tightly sealed, and replace broken panes
- install and maintain gaskets on vents to prevent air escaping

OPTION 2 – ACTION

Replace old greenhouses or free-standing cold frames with gutter-connected houses.

18–12. Greenhouse construction – energy saving plastic covering

BACKGROUND

Polyethylene-covered greenhouses are less expensive and more energy-efficient than glass greenhouses if two layers are used. Many newer production areas have inflated double- or triple-layer 6 mil polyethylene as the greenhouse roof covering.

WHAT CAN YOU DO?

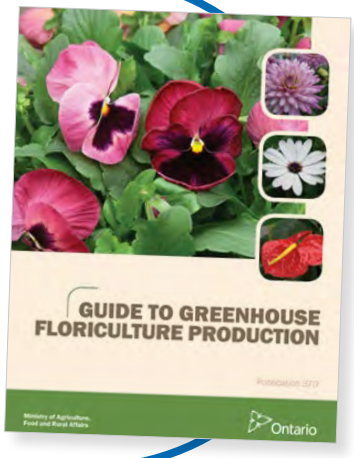
OPTION 1 – ACTION

Inspect all layers of a double- or triple-layer plastic greenhouse covering to ensure there are no leaks.

OPTION 2 – ACTION

Install a thermal energy curtain to reduce heat loss inside single- or double-layer plastic greenhouses.

Guide to Greenhouse Floriculture Production, Publication 370 covers pesticide use, nutrition, pests and diseases, control strategies, and growth regulators.



When constructing a plastic-covered greenhouse, consider how to make it as energy-efficient as possible.

When constructing a glass-covered greenhouse, consider how to make it as energy-efficient as possible.

18–13. Greenhouse construction – glass covering

BACKGROUND

Glass construction has many benefits, including:

- a lifespan of 20+ years
- higher light levels – critical to crop quality and production during winter

WHAT CAN YOU DO?

OPTION 1 – ACTION

Replace greenhouse covering with double pane glass covering that has a diffuse coating or liquid shading agent (whitewash coating) and install energy efficient screens (e.g., shading or thermal curtains) inside greenhouse.

OPTION 2 – ACTION

Replace greenhouse covering with single pane glass covering with diffuse coating or liquid shading agent (whitewash coating) and install energy efficient screens (e.g., shading and thermal curtains) inside greenhouse.

18–14. Night-time lighting impact offsite

BACKGROUND

Supplemental night-time lighting has become a common part of greenhouse production, but when light escapes the production area, it can negatively impact neighbours.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Reduce offsite impact of greenhouse lighting:

- install and use light abatement curtains to eliminate offsite impact
- locate supplemental lighting so that it minimizes offsite impact

Refer to this OMAFA factsheet:

Effect of greenhouse light abatement curtains

Light abatement curtains will reduce the offsite impact of night-time lighting.

FERTILITY MANAGEMENT – CONTROLLED ENVIRONMENT PRODUCTION

18-15. Plant, media and nutrient solution testing

BACKGROUND

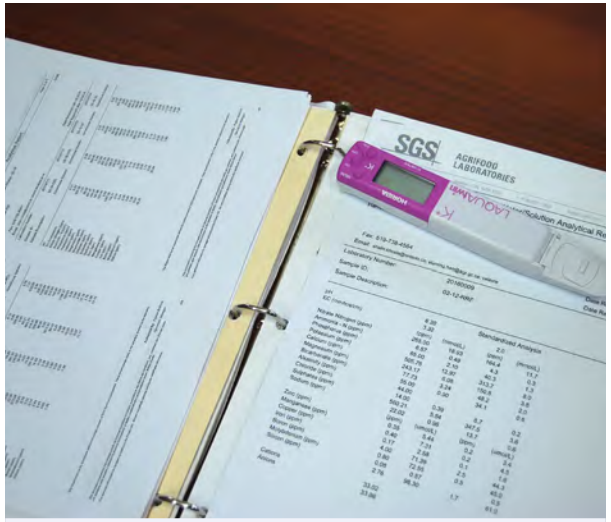
The chemistry of growth media changes as nutrients and water are applied. Testing for salts (EC) and pH provides useful information to inform nutrient and water use efficiency. Media testing throughout crop growth ensures appropriate amounts of fertilizers are used.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Implement regular media testing:

- regularly complete media and nutrient solution testing by a certified laboratory
- perform regular testing with automated or portable sensors
- include media testing on a defined schedule as part of management of the crop
- perform in-house testing of EC and pH
- designate and train staff to do in-house media testing on a defined schedule
- conduct monthly monitoring of N and K levels, as well as leaf tissue testing



Regular media and nutrient solution testing help you achieve optimum production and limit purchases of fertilizers to what is required.

18-16. Record-keeping and fertility program adjustment

BACKGROUND

Keeping good fertility records for each crop and adjusting fertilizer applications to match the crop requirements will prevent excess fertilizer use and reduce input costs.

WHAT CAN YOU DO

OPTION 1 – ACTION

Maintain a regularly updated record-keeping system for water and nutrient inputs for each crop.

Adjust fertility program based on past performance and crop needs.

Self-Assessment and Best Management Practices for Water and Fertilizer Use in Greenhouse Vegetable Production and Best Management Practices and Self-Assessment: Water and Fertilizer Use for Greenhouse Floriculture Production show how to assess an operation's water and fertilizer management practices and describes key BMPs to improve outcomes.

18–17. Management of fertigation equipment

BACKGROUND

Fertilizer is an important component of any agricultural operation. However, rising raw material costs have put all crop inputs under scrutiny.

Fertigation systems boost fertilizer use efficiency, allowing growers to tailor fertilizer applications to both crop growth and environmental impacts.

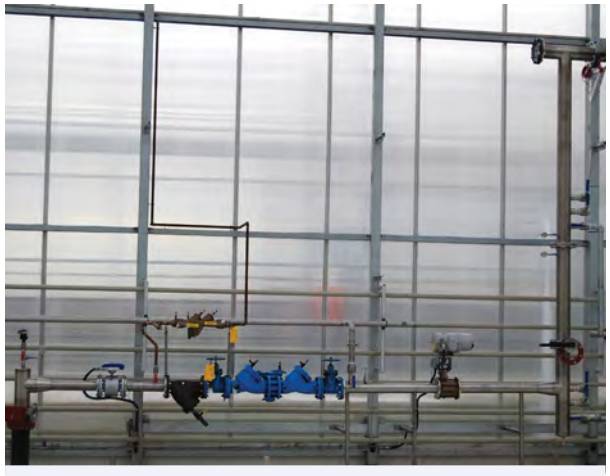
However, there is a potential environmental risk when mixing fertilizer with water. Backflow prevention devices are important in avoiding contamination of your water supply.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Calibrate fertigation equipment whenever the fertility program is changed.

Have a certified technician test backflow prevention equipment annually.



Whenever fertigation equipment is used, always check that anti-backflow devices are installed and operating properly to prevent any backflow contamination of the water system.

18–18. Precision fertigation management

BACKGROUND

Excessive or insufficient fertigation can cause production, economic and environmental concerns. Properly managed, a variety of devices can ensure timely fertigation of water and nutrients.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Integrate automated technology to help with the precise initiation and delivery of the fertigation solution:

- use monitoring technology, tests and sensors to determine when to start fertigation (e.g., weigh scales, start tray, tension meters, and media water content sensors)
- adjust rates based on media and nutrient solution laboratory test results

For best results, use and monitor devices such as weigh scales to detect when fertigation should start.

18–19. Precision irrigation management

BACKGROUND

One of the challenges with irrigation is providing the right rate, at the right place, when the crop requires it. Application rates, evapotranspiration and moisture content can be monitored and the information used to schedule irrigation events. Water use efficiency is improved by the use of a monitoring system and automated feedback equipment.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Monitor water use by setting up an automated feedback and monitoring system. This will help you meet the specific water needs of plants, supplying the right amount of water for efficient plant production.

Monitoring water use is essential to meeting plant needs and achieving a high level of water use efficiency.

Fertilizer application can be improved through the use of water-soluble fertilizers in closed irrigation systems.

18–20. Fertilizer management (container production)

BACKGROUND

Applying nutrients at the right times in the plant growth cycles improves fertilizer use efficiency. It also helps address environmental concerns regarding nutrients in wastewater.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Use controlled-release fertilizers in the containers to reduce amount of nutrient runoff.

OPTION 2 – ACTION

Use water-soluble fertilizers delivered via drip irrigation systems to the containers.

18–21. Fertigation recycling, filtration and disinfection

BACKGROUND

Fertilizer leachate can pose an environmental hazard to surface water due to nutrient loading. It must be collected and not allowed to escape. Proper treatment allows for safe recycling of nutrient solutions. This practice helps to improve water and nutrient use efficiency.

Be aware the nutrient solution should be disinfected prior to reuse to avoid the risk of spreading water-borne pathogens and organisms to crops.

Collection of leachate is necessary to avoid nutrient loading of surface waters.

WHAT CAN YOU DO?

OPTION 1 – ACTION:

Install a closed recirculating system to collect excess fertilizer solution not used by the plants.

Disinfect reused nutrient solution before application by:

- heat pasteurization
- ultraviolet treatment, or
- ozonation

Reuse fertilizer solution in the system.

For more about water disinfection, read this article in Greenhouse Product News:

www.gpnmag.com/grower-101-water-disinfection

OPTION 2 – ACTION:

Install a closed recirculating system to retain and reuse the fertilizer solutions.

Note: the disposal or land application of nutrient feedwater must be managed in accordance with applicable legislation such as the Ontario Water Resources Act, Environmental Protection Act, and Nutrient Management Act.

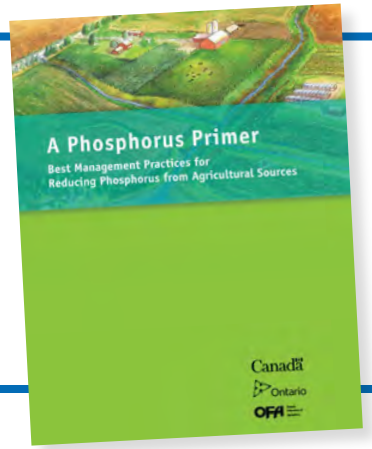
Disinfecting the nutrient solution before reusing will reduce the risk of spreading diseases among crops.

18–22. Recycled fertigation wastewater management

BACKGROUND

Offsite movement of water and nutrients poses an environmental risk to surface water. Eliminating discharge water is important for the greenhouse sector's sustainability.

Treatment technology is available to reuse water, which means the need to discharge any water or solution from the greenhouse can be significantly reduced or eliminated altogether.



Unless properly managed, phosphorus can move from irrigation water and nutrient-enriched water to surface water – harming fish habitat and water quality. This introductory BMP booklet explains what happens to phosphorus in soil and water, and shows how it can travel in runoff, leaks and tile drainage systems. BMPs for containment and reduction in a farm operation are presented.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Install a treatment system so that all greenhouse water is reused, and discharge from the greenhouse is eliminated.

OPTION 2 – ACTION

Construct a stock tank to contain nutrient solution. Wastewater is managed by a third-party waste disposal service provider.

Note: the disposal or land application of nutrient feedwater must be managed in accordance with applicable legislation such as the Ontario Water Resources Act, Environmental Protection Act, and Nutrient Management Act.

18–23. Location and type of stock tank

BACKGROUND

If a spill or leak occurs, large quantities of concentrated fertilizer solutions could put surface water and groundwater quality at risk. Stock tanks located in high-traffic areas are more susceptible to damage or puncture due to work activities and should have special protection from vehicle contact.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Construct a separate, secured room for stock tanks.

Use non-corrosive tanks (e.g., plastic, fibreglass).

OPTION 2 – ACTION

Improve safety of tank location:

- protect tanks from accidental vehicle impact (e.g., install bollards, concrete or metal barriers)
- use non-corrosive material for tanks (e.g., plastic, fibreglass)

Locate stock tanks in areas with minimal or no vehicle traffic and protect them from accidental impact.

18–24. Spill containment for stock tank

BACKGROUND

Greenhouse fertilizer storage areas contain concentrated nutrients that must be stored and managed properly. Secondary containment of stock fertilizer solutions will prevent spills from reaching surface water and groundwater.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Construct an impermeable secondary containment system that will contain 110% of storage volume.

OPTION 2 – ACTION

Construct a clay-lined secondary containment system that will contain 110% of storage volume.

18–25. Need and timing for pesticide applications

BACKGROUND

Properly done, scouting of crops can reduce pesticide use or at least ensure that pesticides are applied at the specific timing that allows for the greatest control and economic effectiveness.

WHAT CAN YOU DO?

OPTION 1 – ACTION

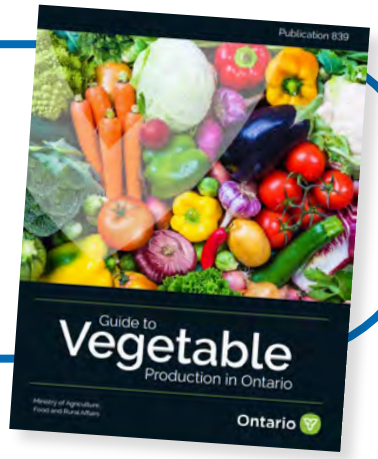
Take training in scouting techniques, pest identification, and biology of the pest:

- monitor for pest activity using techniques such as trapping, scouting, modelling, and weather forecasts to determine the most effective and economic application of control treatments

OPTION 2 – ACTION

Hire a trained scout or a consultant to monitor for pest activity using techniques such as trapping, scouting, modelling and weather forecasts to determine the most effective and economic application of control treatments.

The Guide to Vegetable Production in Ontario, Publication 839 outlines the common pests of each vegetable crop, as well as information on identification, biology and management for each pest.



Scouting of pests provides site-specific information to help make decisions on the need and timing of pesticide application.

Refer to these resources:

Crop Protection Hub

Ontario Crop IPM

18–26. Organic wastes: disposal of prunings, culls, and other waste material

BACKGROUND

Organic wastes such as prunings, crop residues, or culled produce should be properly handled on the farm. This will reduce environmental impacts from burning or stockpiling and help maintain biosecurity.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Consider rental or purchase of chippers and shredders for wood waste.

Spread waste material and incorporate it promptly into the soil.

Send diseased prunings to a waste management facility.

OPTION 2 – ACTION

Temporarily pile organic wastes and manage the pile appropriately. Treat material in compost system or anaerobic digestion facility.

Ensure that any organic wastes spread on land are incorporated promptly and thoroughly.

Avoid spreading diseased material on future production fields. Consider removing diseased prunings to avoid further contamination of the crop.

Organic wastes can be composted and applied to fields based on crop fertility needs.

Also refer to:

Guideline for Production of Compost in Ontario

18–27. On-farm food safety

BACKGROUND

A food safety and traceability program is a formalized process that enables the food industry to follow products through all stages of the agri-food chain – from production to retail.

Benefits to growers include:

- helping you meet your market requirements and access new market opportunities
- effective product recall
- confidence in your products
- protection of your business and your customers

WHAT CAN YOU DO?

OPTION 1 – ACTION

Implement a traceability system. Types of traceability systems range from simple paper-based record-keeping to more sophisticated information management that uses automated components for efficient data capture and secure access to information.

Regardless of the format, a traceability system should:

- document activities
- have an inspection schedule in place
- maintain records of inspections
- show that regular audits are planned

For food safety information, review:

Food safety

18–28. Wind Erosion Mitigation

BACKGROUND

Some soil types are naturally more susceptible to the erosive action of wind, especially when they are dry, bare and unprotected.

There are three main wind erosion prevention strategies: keep it rough, keep it covered, and reduce the "fetch" of the wind (i.e., decrease the length for which wind can traverse the field).

For help with identifying the types of erosion problems and the best strategies to resolve them, review **Controlling Soil Erosion on the Farm BMP**.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Use reduced tillage practices:

- reduce tillage to leave more surface residue cover
- choose tillage system that will leave a rough soil surface

OPTION 2 – ACTION

Plant cover crops:

- plant cover crops immediately after crop harvest
- use cover crops (permanent or annual) for laneways, harvest alleys, and spray rows

OPTION 3 – ACTION

Create windbreaks:

- plant tree or grass windbreaks to reduce the wind speed
- erect snow fence or other wind barrier materials
- interseed a cereal grain as a cover crop into slow-emerging vegetables like carrots to stabilize soil and prevent soil movement before crop canopy development

Windbreaks are an effective way to reduce the soil-eroding action of wind.

Refer to:

Field Windbreaks

Wind Erosion

Wind Strips

18–29. Crop rotations and cover crops

BACKGROUND

Crop rotation and the use of cover crops help reduce soil erosion, build soil structure, and increase the organic matter of soils to improve the productivity of the soil.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Use a good crop rotation, rotating crop families, preferably on a four-year basis or longer.

Plant cover crops and green manure crops:

- plant green manure and/or soil-building cover crops after harvest of early season vegetable crops
- use a drill (no-till if necessary) to establish cover crops immediately after harvest
- plant temporary or permanent grass cover crops in the row middles of orchards, nurseries and small fruit plantings

Soil Management is an excellent reference to help you solve cropland soil problems and build back soil health. This BMP book explains soil properties, diagnostics for soil problems, and BMPs to prevent and correct problem soil conditions.

Rotation of crop families helps to build soil structure.

For more information about cover crops, review:

Cover crops: adaptation and use of cover crops

Winter Cover Crop

18–30. Manure or other organic materials application in field-grown horticultural crops

BACKGROUND

Manure and compost can supply nutrients and organic matter to the soil. To avoid nutrient over application and loss, apply and handle the material carefully to prevent food safety concerns.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Apply manure or compost according to crop recommendations and incorporate immediately:

- based on manure and soil testing, adjust manure and fertilizer applications according to crop recommendations
- apply manure or compost under dry soil conditions to reduce the potential for compaction
- follow food safety guidelines to determine an appropriate amount of time between application and crop harvest
- keep records of manure and compost application

Make the most of this important on-farm nutrient. This BMP book explains what's in manure, how to mitigate concerns regarding storage, odours and runoff, and how best to plan, set up and time its application.

Manure applications should be based on laboratory analysis and crop nutrient needs.

Also refer to:

Guide to Vegetable Production in Ontario

- Cover Crops and Manure Application
- Adding Organic Amendments

18–31. Management of fertigation for field grown horticultural crops

BACKGROUND

With fertigation, irrigation water and soluble nutrients are supplied at the same time. If irrigation frequency increases in response to demand (higher evapotranspiration), a correspondingly lower rate of fertilizer is injected into the irrigation system. If the nutrient content of the fertilizer is increased, less fertilizer is needed.

In both cases, the system needs to be calibrated to ensure exact quantities of nutrients are applied with confidence.

Before using fertigation equipment, always check anti backflow devices are installed and operating properly to prevent any backflow into the water system.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Calibrate fertigation equipment each time the fertility program is changed.

Have backflow prevention equipment, such as Double Check Valve Assembly (DCVA) or a Reduced Pressure Principal Device (RPPD), tested annually by a certified technician.

OPTION 2 – ACTION

Recalibrate fertigation equipment at the beginning of each season.

Have backflow prevention equipment (Double Check Valve Assembly [DCVA] or a Reduced Pressure Principle Device [RPPD]) in place.

The Irrigation Management BMP presents the latest information on scheduling strategies, the pros and cons of sprinkler, drip and sub-irrigation systems, water-saving tips, and special applications. Extensive crop-specific charts are included.

Best Management Practices and Self-Assessment: Water and Fertilizer Use for Outdoor Container Production provides tips for growing woody and herbacious crops.

18–32. Equipment noise

BACKGROUND

Some equipment such as harvesters, sprayers and bird bangers may cause noise issues with nearby neighbours. Demonstrating some effort to reduce the impact will go a long way towards good neighbourly relations.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Use practices to reduce noise levels:

- change the location and timing of noise if possible (e.g., move bird bangers)
- conduct regular maintenance of machinery to reduce noise, and use only when necessary
- operate bird bangers to conform with best management practices

OPTION 2 – ACTION

Use netting and other low-noise alternative bird control methods.

For more information, review this OMAFA factsheet:

Noise nuisance from stationary farm equipment

FOR MORE INFORMATION

ONTARIO MINISTRY OF AGRICULTURE, FOOD AND AGRIBUSINESS (OMAFA)

- Agricultural Information Contact Centre (AICC)
  Toll free: 1-877-424-1300 | e-mail: ag.info.omafa@ontario.ca

  Find most of the resources listed below at www.ontario.ca

Publications

- Guide to Vegetable Production in Ontario, Publication 839
- Guide to Greenhouse Floriculture Production, Publication 370
- Guide to Nursery and Landscape Plant Production and IPM, Publication 841
- Integrated Pest Management for Turf, Publication 845

Factsheets

- Cover crops: adaptation and use of cover crops
- Noise nuisance from stationary farm equipment
- Nutrient management
- Irrigation scheduling for fruit crops
- Irrigation management of wine grapes in Ontario
- Nitrogen, phosphorus and potassium fertigation of apples
- Using propane-fired cannons to keep birds away from vineyards

ONTARIO MINISTRY OF AGRICULTURE, FOOD AND AGRIBUSINESS (OMAFA), *continued*

Best Management Practices Series

- Horticultural Crops
- Irrigation Management
- Self-Assessment and Best Management Practices for Water and Fertilizer Use in Greenhouse Vegetable Production
- Best Management Practices and Self-Assessment: Water and Fertilizer Use for Greenhouse Floriculture Production
- Soil Management
- Water and Fertilizer Use for Outdoor Container Production
- A Phosphorus Primer
- Controlling Soil Erosion on the Farm
- Cropland Drainage
- Soil Health
  - Adding Organic Amendments
  - Cold and Wet Soils
  - Cover Crops and Manure Application
  - Droughtiness
  - Winter Cover Crops
  - Low Fertility
  - Soil Erosion by Water
  - Tillage Erosion
  - Wind Erosion
  - Wind Strips
  - Field Windbreaks
  - Subsurface Compaction
  - Surface Crusting
  - Subsidence
  - Subsurface Drainage

Crop Protection Hub

Ontario Crop IPM

FOR MORE INFORMATION, *continued*

CANADIAN FOOD INSPECTION AGENCY

Biosecurity Guides

- Floriculture Sector Biosecurity Guide
- National Voluntary Farm-Level Biosecurity Standard for the Greenhouse, Nursery and Floriculture Sectors
- Nursery Sector Biosecurity Guide
- Greenhouse Vegetable Sector Biosecurity Guide

ONTARIO MINISTRY OF THE ENVIRONMENT, CONSERVATION AND PARKS

- Guideline for the Production of Compost in Ontario

UNIVERSITY OF GUELPH, RIDGETOWN CAMPUS

- The Effects of Soil Compaction on the Production of Processing Vegetables and Field Crops – A Review, 1991

OTHER RESOURCES

- Greenhouse IPM
- Water Treatment Guide for Greenhouses and Nurseries
- BC Agricultural Composting, 2021
- Cornell Composting
- Protected Agricultural Stewardship Standards

LEGISLATION/ACTS

- Ontario Water Resources Act, 1990
- Nutrient Management Act, 2002
- O. Reg. 300/14 Greenhouse Nutrient Feedwater