environmental farm plan
sustainably farmed

INFOSHEET #19

FIELD CROP MANAGEMENT

How to address concerns identified in Environmental Farm Plan Worksheet #19

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 field crop management.

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

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CROP ROTATIONS

19–1. Rotation for soil protection

BACKGROUND

There is a greater risk of erosion when soils are bare, especially over winter. The best defence against erosion is to provide soil surface cover.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Plant more perennial crops (grasses and legumes):

- increase the amount of land in perennial forages, including pastures – the land is covered for a longer time and therefore protected, which is especially important for high-risk situations such as steep slopes or highly erodible soils
- grow perennial crops at least two years out of five

OPTION 2 – ACTION

Plant overwintering cover crops:

- grow overwintering cover crops at least two years out of five
- select cover crops that won't interfere with next year's crop growth
- time planting to allow for sufficient growth, but late enough so that the cover crop does not go to seed
- manage cover crops to use existing equipment as much as possible

OPTION 3 – COMPENSATING FACTOR

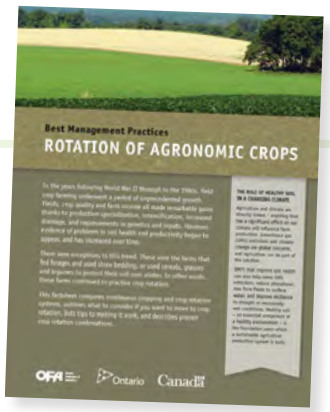
Use residue management systems (no-till, strip till, reduced till) when perennial or cover crops are not a viable option for your type of farming operation:

- aim to leave at least 30% crop residue on the soil surface from the harvest of one crop until after planting the next

An overwintering cover crop would have helped reduce the impact of water erosion on this Harriston loam soil.

The Ontario Crop Protection Hub provides resources to find pest management and crop protection options. It is an excellent reference site covering a range of crop production systems and how to improve long-term sustainability and yields. Whether you're considering a major change or want to fine-tune current practices, this site offers many options, considerations, and tips to help you make the best decisions for your operation.

Also refer to Rotation of Agronomic Crops.



19–2. Rotation for building soil organic matter

BACKGROUND

Some crops return more organic matter to soil than others. Soil-building crops include perennial forages and crops that produce good root systems and are harvested only for their seed.

If organic matter is not replaced by adding crop residues or manure, the soil's organic matter and structure will decline.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Include soil-building crops in your rotation (on at least 50% of land base):

- winter cereals and perennial forages as well as grain corn and spring cereals with the straw/stover spread will help build soil
- rotate soil-building crops in conjunction with soil-depleting ones to maintain soil structure and organic matter

OPTION 2 – COMPENSATING FACTOR

Return organic matter to the soil:

- leave residue in the field
- add manure
- grow cover crops

OPTION 3 – COMPENSATING FACTOR

Use reduced tillage system (e.g., no-till, reduced till and strip till, to slow the breakdown of crop residue):

- note that adding organic matter is still important.

Healthy, fertile soil is productive and resilient. Learning more about your fields' soils and taking measures to protect and improve soil health will be rewarding in the short and long term.

Soil Management BMP is a practical guide to help solve everyday cropland soil problems. It covers the basics on soil properties, diagnostics for soil problems, and best management practices to prevent and correct problem soil conditions.

Controlling Soil Erosion on the Farm is a shorter booklet, designed to help match in-field symptoms with erosion type and BMP options to improve conditions.

Several other **BMP publications** on aspects of crop nutrient management are also available.

19–3. Rotation for pest management (weeds, diseases, insects)

BACKGROUND

Pests are reduced when their host crop is not present in the field.

Weed populations and vigour can be reduced by rotations with more competitive crops.

Weeds are easier to control in fields with crop species that differ from the weed type (grass vs. broadleaf).

WHAT CAN YOU DO?

OPTION 1 – ACTION

Rotate the crop species planted:

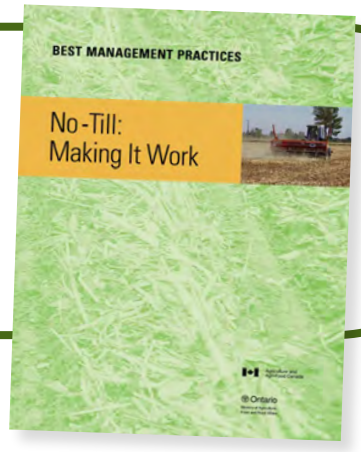
- for every four times the field is planted, select different crop types at least three of the times (e.g., corn, beans, small grains, forages)
- adopt a crop rotation that reduces the chance the same crop species will be planted consecutively

OPTION 2 – COMPENSATING FACTOR FOR PERENNIAL FORAGES

Change the crop environment to keep weeds, insects and diseases in check:

- include timely harvest, clipping and pest monitoring

For more information about equipment modifications, refer to BMP No-Till: Making it Work.



Rotating crop species is one component in a pest management strategy.

OMAFA's Agronomy Guide, Publication 811 offers the latest recommendation for growing field crops. Diagnostic guides and scouting calendars are included.

19–4. Rotation includes legume crops or legume cover crops for N use efficiency

BACKGROUND

Besides sequestering carbon, cover crops take up nitrogen left over from fertilization of the previous crop. This results in nutrients being taken up into the biomass, diverts excess nitrate from leaching below the root zone and prevents soil microorganisms from converting the nitrate to N_2 gas or to nitrous oxide (N_2O).

Cover crops can reduce nitrous oxide emissions by reducing the levels of mineral nitrogen (nitrate) in the soil and by reducing soil moisture. They can also hold large amounts of nitrogen in crop biomass. However, cover crops may increase N_2O emissions by adding organic matter and releasing N during decomposition. For example, cover crops high in N (e.g., red clover, tillage radish) can release N_2O, especially when turned under into anaerobic soil conditions.

N_2O fluxes are sporadic. Much of the nitrous oxide from cropland is released during thawing conditions of late winter and early spring, in soils with high available nitrogen (NO_3). On heavy soils, N_2O emissions are also a risk during warm moist conditions in the summer.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Plant forage legumes, such as clover or alfalfa, as part of the crop rotation.

OPTION 2 – ACTION

Use legume cover crops during the off-season or between main cash crops.

Planting cover crops with manure application can keep organic amendments in place and help build soil health.

For more information refer to Cover Crops and Manure Application and Winter Cover Crops.

CROP RESIDUE MANAGEMENT

19–5. Residue remaining in field over winter (grain corn, winter cereals, spring cereals, or soybeans)

BACKGROUND

Harvesting is the first step in a crop residue management system.

Adjust harvesting equipment to leave a uniform layer of residue cover across the field.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Spread crop residue evenly at harvest time:

- ensure harvest operations spread the crop residue and chaff uniformly across a width equal to that of the combine header ensuring it leaves at least 50% residue cover across the field
- look into factory or after-market straw and chaff spreader options – available for most combines

OPTION 2 – ACTION

Bale and remove crop residue no more than once every three years.

OPTION 3 – COMPENSATING FACTOR

When residue is removed more than once in three years, incorporate manure and grow cover crops to build soil organic matter.

19–6. Residue cover after planting

BACKGROUND

Residue acts as a blanket and must remain to prevent erosion after seeding. At least 30% residue cover is required for a conservation tillage program.

With each tillage pass, more crop residue is incorporated into the soil, leaving more of the surface exposed to erosive forces.

An effective residue management program leaves 30–70% of the soil surface covered with residue after planting throughout the rotation cycle.

Residue Management is a resource for protecting bare soils from erosion.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Modify equipment to handle increased residue levels:

- note existing planters and drills can handle 20–30% residue levels with very little modification
- examine the equipment's ability to allow residue to flow through tillage discs/tines, seed/fertilizer openers or implement frame and wheels and improve the spacing where required

OPTION 2 – ACTION

Purchase new equipment that can handle residue situations:

- when buying replacement equipment, consider its ability to handle residue levels of 30%

OPTION 3 – COMPENSATING FACTOR

Reduce the number of times the field is worked prior to planting:

- reducing the number of passes helps leave the protective residue cover in place

Ensure that harvest operations spread the straw and chaff uniformly across a width equal to that of the combine header.

19–7. Nutrient placement in high residue fields

BACKGROUND

Disturbance of the soil surface can increase the potential for water and wind erosion, moisture loss, weed seed germination, and fuel consumption. In a no-till system, planting and fertilizer applications are the only operations that disturb the soil. To reduce soil and residue disturbance, minimize the band width of original soil surface that is physically worked up by the soil openers to less than 20% of row width.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Apply nutrients in a band or banded with the seed at or ahead of planting time (no till/strip till):

- use ripple or narrow-fluted coulters, which do a better job of cutting through the trash, and generally do not throw as much soil out of the seed slot as the wider versions
- offset the tillage coulters to allow them to be set closer together
- use a single-disk opener with a narrow angle of soil opening
- use a narrow-shank hoe opener
- use a straight-blade coulter of sufficient diameter to cut residue in front of the fertilizer applicator knife

Refer to:

Contour Farming and Strip Cropping

Erosion Control Structures

Modify equipment to minimize the band width of original soil surface worked up by the soil openers. Measures that reduce soil and residue disturbance will protect your fields from erosion, moisture loss and weeds – and save on fuel.

Consult:

- **Ontario Soil Survey Reports for your area. They include a listing of soil erodibility for crops.**
- **AgMaps**
- **AgriSuite AgErosion Tool**

19–8. Mitigating the movement of surface water on long slopes in the field

BACKGROUND

Water erosion can be reduced by alternating less erosion-prone crops with more erosion-prone ones in strips across the slope, or on contour. Up-and-down slope systems increase erosion. Cross-slope systems allow water to move downslope safely with minimal erosion.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Change cropping practices to a strip or a contour cropping system:

- modify cropping by alternating strips of a row crop with a cereal crop or forage crops
- plan strip widths to be multiples of your equipment width
- consider using less erosion-prone perennial crops (e.g., forage, pasture, afforestation)

OPTION 2 – COMPENSATING FACTOR

Select less erosive-prone crops:

- limit the field rotation to those crops that provide sufficient surface coverage to reduce the potential for erosion over the growing season
- move towards including narrow-spaced crops (cereals)
- change to a reduced or no-till cropping system, aim to leave at least 30% crop residue on the soil surface after planting

19–9. Using organic amendments (manure and compost) to increase organic carbon levels in soils

BACKGROUND

Applying organic amendments such as manure and compost not only adds nutrients but also adds significant quantities of carbon to the soil. The majority of the carbon in organic amendments (~80%) provides food for soil organisms. This biological activity provides benefits to soil aggregation, structure and nutrient cycling. Ultimately, this portion of carbon will be respired as CO_2 back into the atmosphere. The remaining carbon (~20%) will provide stable carbon to the soil, contributing to an increase in soil carbon.

The increase of soil carbon is a long-term process. Building soil carbon through additions of organic amendments requires regular and frequent applications over time.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Apply organic matter in the form of livestock manure or other organic amendment (e.g., biosolids, compost):

- regular application, at least once every five years
- application rates are based on soil tests, amendment nutrient tests, crop nutrition requirements and environmental considerations

Refer to **Adding Organic Amendments BMP** for more information.

PASTURE MANAGEMENT

19–10. Managing pastures for soil health and increased soil organic matter

BACKGROUND

Managing perennial pasture to keep plants in a vegetative state for as much of the growing season as possible and allows adequate non-grazing rest time for plant regrowth. This maximizes the amount of carbon being stored in the soil. Ruminant livestock produce less enteric methane if their diet contains highly digestible forage. Keeping pastures vegetative for as much of the grazing season as possible reduces methane emissions.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Increase stocking density to reduce selective grazing behaviour:

- divide the pasture into paddocks and give livestock access to only one paddock at a time
- divide the pasture or paddocks into smaller strips/breaks with temporary fencing
- allow a resting period for pasture plants to recover between grazing events
- plant or overseed non-jointing grasses

OMAFA Publication 30: Guide to Forage Production addresses best practices for establishing forage species

Jointing grass species will attempt to set seed after each cut or grazing event.

In contrast, non-jointing species will head out in the spring, but after being cut or grazed once will only put out leafy vegetative growth for the rest of the year.

Non-jointing species include orchard grass, meadow fescue, tall fescue, perennial ryegrass, and Kentucky bluegrass.

The surplus forage can be fed out during the non-grazing season. This is often most effective for first cut when grass growth rates exceed animal intake rates.

OPTION 2 – ACTION

Mow the pasture (where terrain allows):

- divide the pasture into paddocks and give livestock access to only one paddock at a time
- mow immediately after a grazing event to prevent ungrazed plants from maturing during the rest period
- set aside some paddocks with surplus forage for mechanical harvest (hay, baleage, or haylage)

WEED MANAGEMENT

19–11. Seed used

BACKGROUND

Crop seed planted is a potential source of weed seeds. Certified seed has met certain standards to minimize the presence of weed seeds.

The Seeds Act, 1985 and associated Regulations specify the weed seed standards for certified seed sources as well as for common seed sources. The Weed Control Act outlines the responsibilities and duties related to the control and destruction of noxious weeds in Ontario including the appointment of inspectors, and the obligations of landowners and authorities to manage weed growth. Both acts play an important role in weed management.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Reduce the opportunity for weed seed to come onto the farm:

- use weed-free seed and transplants to reduce potential concerns regarding weed control
- use certified seed wherever possible
- otherwise use seed that has been tested and cleaned to Common No. 1 standard – unless the use of the seed is not legal because seed use is restricted by a technology use agreement or other legal restriction

Consult OMAFA's comprehensive Ontario Crop Protection Hub.

Some weeds such as Bull thistle are classified in provincial legislation as noxious and must be controlled according to the Weed Control Act.

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

- Agronomy Guide for Field Crops, Publication 811
- Soil Fertility Handbook, Publication 611
- Guide to Forage Production, Publication 30
- Pasture Production, Publication 19

Factsheets

- Introduction to organic farming in Ontario
- Transition to organic crop production
- Soil erosion – causes and effects

AgriSuite

- AgErosion
- Crop Nutrient Calculator
- Organic Amendment Calculator
- Fertilizer Calculator
- Phosphorus Loss Assessment (PLATO)
- Field Management Planner
- Greenhouse Gas Calculator

Other OMAFA Resources

- Ontario Crop Protection Hub
- Ontario Soil Survey Reports

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

Best Management Practices Series

- Soil Health
  - Adding Organic Amendments
  - Cold and Wet Soils
  - Contour Farming and Strip Cropping
  - Cover Crops and Manure Application
  - Cropland Retirement
  - Droughtiness
  - Erosion Control Structures
  - Inter-Seeding Cover Crops
  - Winter Cover Crops
  - Low Fertility
  - Mulch Tillage
  - No-Till for Soil Health
  - Perennial Systems
  - Residue Management
  - Rotation of Agronomic Crops
  - Soil Erosion by Water
  - Tillage Erosion
  - Strip-Tillage in Ontario – The Basics
  - Strip-Tillage in Ontario – Making it Work

FOR MORE INFORMATION, *continued*

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

Best Management Practices Series, *continued*

- A Phosphorus Primer
- Buffer Strips
- Establishing Tree Cover
- Irrigation Management
- Streamside Grazing
- Water Management
- Field Crop Production
- Integrated Pest Management
- Managing Crop Nutrients
- Manure Management
- Nutrient Management Planning
- Soil Management
- Pesticide Storage, Handling and Application
- No-Till – Making it Work
- Cropland Drainage
- Best Management Practices for Phosphorus
- Field Crop Production
- Controlling Soil Erosion on the Farm

LEGISLATION/ACTS

- Seeds Act, 1985
- Seeds Regulations, C.R.C., c.1400
- Weed Control Act, 1990