environmental farm plan
sustainably farmed

INFOSHEET #14

ENERGY EFFICIENCY

How to address concerns identified in Environmental Farm Plan Worksheet #14

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 energy efficiency.

Note: Before an appliance or piece of equipment is installed, used, sold or advertised for sale in Ontario, it must be approved by an accredited certification or evaluation agency. The item must carry the official mark or label of the agency indicating the product has been independently assessed for safety and performance. The list of accredited certification or evaluation agencies are listed by Standards Council of Canada: **https://scc-ccn.ca/search/accredited-organizations**.

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

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

- **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.
- **Monitoring** is an alternative in special circumstances only. When and how monitoring can be used is explained in the infosheet.

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.

Sustainable Canadian Agricultural Partnership
OSCIA
Ontario
Canada

FIELD OPERATIONS

14-1. Reducing use of fuel during field operations

BACKGROUND

Fuel provides the energy required to propel equipment that prepares the soil for planting, cultivation, spraying, pruning and harvesting. Matching the tractor's horsepower to the implement's power requirements optimizes fuel usage and prolongs the equipment's working life.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Evaluate your tractor's available power and your equipment's power requirement, and do three or more of the following best practices:

- combine field operations to maximize field productivity and minimize fuel use
- keep tires at the recommended inflation pressure to minimize soil compaction and/or maximize traction
- install radial traction tires to maximize field efficiency and reduce fuel consumption
- match tractor used to the power required for specific tasks
- practice gear up/throttle down to the point that the engine is not lugging
- avoid lengthy idling, which may not be necessary on newer tractors
- consider using innovative tractors that operate with alternative fuels (e.g., an electric tractor)
- consider no-till field practices

Ensure the tractor has the right horsepower to perform the task at hand. This will save fuel, money and equipment wear-and-tear.

Preventative maintenance will avoid costly downtime. For specific maintenance programs, see the owner's manuals and consult your equipment dealer.

14-2. Maintenance and lubrication of farm equipment

BACKGROUND

Lack of machinery maintenance may cost you extensive, expensive repairs or critical time lost by component failures. A well-maintained machine will operate at peak efficiency and be dependable.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Establish a sound preventative maintenance program for all your equipment:

- follow the recommended maintenance schedules for each piece of equipment
- study all the operator's manuals to familiarize yourself with correct operation, wear points, fluid change intervals, lubrication schedules, emission control systems, etc.
- have an appropriate supply of replacement parts for high wear components (e.g., belts, hoses, wheel bearings)
- maintain a good supply of motor oils, hydraulic oils, greases, gear case lubricants, filters, coolants, etc.
- recycle used fluids by returning the excess to the source from which it was purchased

14–3. Type of lighting

BACKGROUND

An upgrade to a higher-efficiency lighting system can result in significantly reduced energy usage and cost. Choose the light source that is best suited to the lighting requirement and the environment in which it will be used.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Replace lower-efficiency lighting with high-efficiency lighting:

- T-5 or T-8 fluorescent fixtures are retrofitted with electronic ballasts (less power use than standard ballasts)
- LED tubes: either Type A, Type B or Type C LED lighting (tubes), where conditions allow LED lights and fixtures
- High Intensity Discharge (HID) lamps, e.g., High Pressure Sodium (HPS) or metal halide lights
- HID lamps with electronic dimming
- supplement artificial light with daylight

LED lights in a greenhouse.

14–4. Type of lighting control

BACKGROUND

Lighting controls are available for a variety of situations and needs in various locations in farm buildings.

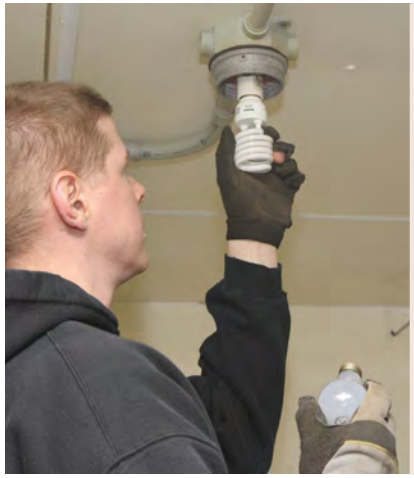
WHAT CAN YOU DO?

OPTION 1 – ACTION

Use lights only when necessary.

Install control systems that allow you to optimize use of lighting:

- control timers or dimmers
- motion sensors (turn off when you leave)
- task lighting whenever possible to light only the areas required
- automatic control systems with sensors and timers



Costs to upgrade lighting and controls can be recouped in reduced energy expenses.

14–5. Outdoor lighting

BACKGROUND

Yard lights are used to improve access to buildings and can enhance security.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Use energy-efficient security lights:

- consider replacing mercury vapour lights or high-pressure sodium lights with LED lights
- use of automated controls, including sensors or motion detectors (e.g., dusk-to-down sensors)
- direct lighting only to where it is needed
  - use down-facing deflectors
  - direct lights away from natural areas and field areas where there is no human activity

Read these OMAFA factsheets:

Improving energy efficiency in livestock facilities

Using less energy on dairy farms

14–6. Energy usage

BACKGROUND

Energy costs are often a significant input cost. Conducting an energy audit will allow for a detailed evaluation of current usage. This baseline information can be used to determine energy cost per unit of production and provide an assessment of the potential for energy cost savings using energy-efficiency enhancements.

Energy benchmarking is when you compare your energy use to that of other operators with similar production systems. You need to measure energy use and record this data to be able to benchmark your activities.

Once you have completed an energy audit and reviewed the energy usage data, you can understand your energy use and start to consider what upgrades or improvements to make in your operation to improve efficiency.

Energy monitoring may also help you prioritize whether spending money on energy efficiency activities is worthwhile. **OMAFA's AgriSuite GHG Decision Support Tool** is one example of a tool that can help in this decision making. By reducing energy use you may also reduce GHG emissions from your farm operation.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Complete an energy audit at least once every 5 years to determine how much energy is used for specific applications. You can perform the audit yourself or hire a professional energy auditor. Hiring the professional may save time and money, and there are often funding programs to help cover the cost.

An energy audit or self assessment may include the following activities:

- list the individual energy uses and their hours of operation
- monitor energy use for each part of your operation with separate meters
- record power or energy used by the various operation components
- implement all upgrades/improvements identified in review process
- include GHG emission estimates

Measuring current energy usage is the first step in making energy improvements in your operation.

For an overview of the farm energy auditing process and potential benefits, review Best Management Practices: On-farm Energy: A Primer.

14–7. Heated or cooled farm buildings

BACKGROUND

Properly installed insulation in farm buildings will reduce building envelope heat losses and air infiltration, as well as preventing condensation. An air/vapour barrier is a critical part of a well-insulated building.

Vapour barriers that have been poorly installed, damaged or omitted completely can result in moisture damage to the insulation and building structure. Moisture damage can create risks to animal and human health and shorten the building's lifespan.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Reduce building envelope heat loss and increase air tightness of the building:

- insulate buildings to the recommended R levels (outside walls greater than R20; ceiling greater than R30; perimeter/foundation insulation R5 – R7.5)
- install a continuous air/vapour barrier and ensure any penetrating piping or wiring is sealed
- ensure doors and windows fit tightly with caulking and weather stripping
- caulk all building joints
- use quick closing and automatic doors
- maintain an active rodent control program

Manage building heating and cooling:

- minimize solar heat gain with light-coloured walls and roof
- install a solar wall to preheat incoming ventilation air
- maintain and calibrate your ventilation system
- maintain and calibrate heating and cooling equipment on a regular schedule
- use heat recovery ventilators (HRV) to recapture heat from exhaust air
- evaporative cooling/high pressure misting equipment installed

Quality construction will reduce energy costs while maximizing the useful life of farm buildings.

14-8. Refrigerated storage efficiency

BACKGROUND

Properly sized and maintained cooling systems keep produce in optimum conditions. In addition, properly designed and operated systems will optimize the energy consumed to maintain the desired temperature, resulting in lower energy costs.

Ensure the refrigerated storage facility is insulated and sealed to prevent the entry or escape of air and provide good air distribution within the storage.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Maximize the performance of your refrigerated storage:

- implement a routine maintenance regimen to ensure each component's working life and performance are optimized
- ensure the refrigerated storage facility is insulated and sealed to prevent the entry or escape of air and provide good air distribution within the storage
- have temperature and moisture sensing equipment in the storage to monitor conditions and trigger alarms when conditions warrant action
- recover and reuse the heat generated by the refrigeration system
- install a field heat-removal system before the produce enters the cold storage, e.g., water-cooling system, vacuum-cooling system, etc.
- use a plastic strip door or an air curtain to minimize air exchange when the loading door is open
- use variable frequency drives (VFD) along with VFD compatible motors
- use energy efficient motors e.g., NEMA Premium Efficiency (IEC IE3) or NEMA Super Premium Efficiency (IEC IE4)
- monitor for ice buildup, dirt accumulation and proper air flow on condensers and evaporators

Use energy efficient motors.

Read these OMAFA factsheets:

Troubleshooting cold storage problems

Forced-air cooling systems for fresh Ontario fruits and vegetables

Improving energy efficiency in livestock facilities

14–9. Bulk milk storage

BACKGROUND

On dairy farms, the milking centre is one of the greatest consumers of energy. The primary areas of energy usage are milking equipment, milk cooling, and the heating of washwater.

It is important that vacuum pumps and milk pumps are properly sized for the workload they are given. This will help the equipment to last and consume energy efficiently.

Fresh milk is at body temperature from the udder but needs to be cooled as quickly as possible to ensure quality. One energy conservation measure is combining the milk cooling requirement with a heat-recovery system to conserve energy. For example, the captured heat could be used to heat washwater that sanitizes the milking equipment.

On dairy farms, the milking centre is one of the greatest consumers of energy.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Use the following equipment and practices to reduce energy inputs in the milking centre:

- a water plate pre-cooler to quickly remove most of the heat from the milk, thus reducing the refrigeration energy required to cool the milk in the bulk storage tank
- a heat-recovery unit to capture waste heat from the refrigeration unit and reuse it to heat water for washing
- a variable frequency drive motor on the vacuum pump and milk pump, e.g., NEMA Premium Efficiency (IEC IE3) or NEMA Super Premium Efficiency (IEC IE4)
- regular maintenance for optimal performance and efficiency
- install a solar heating system to pre-heat washwater

14–10. Electric motor efficiency

BACKGROUND

Motors and motor systems account for approximately half of global electricity consumption. A motor can be in service for many years so energy savings will be additive. When selecting an electric motor or discussing with an equipment manufacturer, it's important to understand the classifications that North America (NEMA) uses, as well as Europe (IEC) uses, since equipment in Canada is readily sourced from both geographies.

A comparison of the two classification systems:

North America (NEMA) Classification	Europe (IEC) Classification
NEMA MG-1	IEC 60034-1
Super Premium Efficiency	IE4
Premium Efficiency	IE3
High Efficiency	IE2
Standard Efficiency	IE1

You can determine the efficiency of a motor by referring to the nameplate.

IEC motors usually have the "IEX" descriptor on the nameplate.

NEMA nameplates will have the efficiency percentage, and you may have to reference the NEMA MG-1 table to see what class of efficiency the motor is.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Use energy-efficient motors:

- when replacing an electric motor, consider an IE4 or Super Premium Efficient Motor

Labels on the motors showcasing the classification (IE3) and NEMA.

14-11. High temperature drying

BACKGROUND

The energy required to dry various crops will vary widely when using high temperature drying. Low-cost modifications can reduce fuel requirements without reducing drying capacity.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Improve drying efficiency by changing to a more efficient system or modifying the current system:

- use high efficiency electric motors, e.g., NEMA Premium Efficiency (IEC IE3) or NEMA Super Premium Efficiency (IEC IE4)
- use more efficient dryers, e.g., continuous flow in-bin, deep-bed dryer – install full-floor aeration to allow safe bin storage of “dry” grain
- dry the grain to the recommended levels
- use a reliable moisture tester
- install a continuous-readout moisture tester in the drying system
- install a heat-recovery system to reuse heat from the bottom of the dryer column
- incorporate “dryeration” (where heated grain is transferred to a drying bin to cool and then dried using natural air) or “cooleration” (where heated grain is transferred to a cooling bin, eliminating in-dryer cooling) into your drying system
- convert dryer’s burner to a biomass combustion burner

High-temperature grain dryers can be modified to improve efficiency.

Read the OMAFA factsheet:

Reducing energy use in grain dryers

14-12. Low-temperature or natural air drying

BACKGROUND

Low-temperature or natural air drying of crops is slow but will maintain quality. This drying system has application across various parts of Ontario.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Allow crops to dry down in the field or the corn crib:

- select varieties that dry down to safe storage moisture contents in the field

OPTION 2 – ACTION

Use natural air to dry crops:

- select varieties that will dry down quickly before harvest in the field
- use energy-efficient aeration fans and motors
- use automatic moisture monitoring to make dying more energy efficient

More airflow per bushel may be more effective than adding supplementary heat.

Read the OMAFA factsheet:

Natural-air grain drying

Allowing crops to dry down in the field before harvest can mean less storage and lower drying expenses.

14–13. Generation of renewable energy on the farm

BACKGROUND

Farms can generate electricity and heat from renewable sources (e.g., solar, biomass heat, biogas, wind, etc.). This may reduce energy consumption from other sources (e.g., fossil fuels), or potentially generate revenue from surplus energy sales.

Farms may have different energy generation opportunities depending on farm location:

- access to the energy grid (e.g., electrical wires or natural gas pipelines)
- energy resource availability (e.g., manure for biogas production)

Renewable energy that is generated has a low carbon footprint. When it replaces an energy source with a high carbon footprint, there can be greenhouse gas emissions reductions for the farm.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Install and operate a renewable energy project on your farm.

Consult with technical experts, local farmers who have developed similar projects and talk to your neighbours about the project. Projects often have long development timelines and involve many technical and financial partners.

There are many tools, calculators and information sources to help a farmer consider options and make decisions about the type of renewable energy generation they could consider.

OPTION 2 – ACTION

Partner with a developer on a renewable energy project located on your farm. Project developers often have technical expertise and may bring financial resources to make projects move forward successfully.

Read these OMAFA factsheets:

Rooftop solar installations on rural buildings

Using biomass for heating greenhouses in Ontario

Anaerobic digestion basics

Electricity generation using small wind turbines for home or farm use

A biomass furnace generates heat from renewable sources. Generating heat from renewable sources can potentially reduce energy consumption from fossil fuels, generate revenue from surplus energy sales and reduce greenhouse gas emissions for the farm.

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

Factsheets

- Reducing energy use in grain dryers
- Tips to reduce fuel consumption on farm
- Farm buildings, equipment and environment
- Using less energy on dairy farms
- Improving energy efficiency in livestock facilities
- Natural-air grain drying
- Ventilation heat exchangers in livestock barns
- Lighting options for free stall housing
- Solar energy on farms
- Troubleshooting cold storage problems
- Forced-air cooling systems for fresh Ontario fruits and vegetables
- Rooftop solar installations on rural buildings
- Using biomass for heating greenhouses in Ontario
- Anaerobic digestion basics
- Electricity generation using small wind turbines for home or farm use

Best Management Practices Series

- Controlling Soil Erosion on the Farm
- Irrigation Management
- On-Farm Energy: A Primer
- Water Management
- Water Wells

AgriSuite

- Greenhouse Gas Decision Support Tool

OTHER RESOURCES

- Ontario Ministry of Energy and Mines
- Agriculture and Agri-Food Canada
- Natural Resources Canada
- Independent Electricity System Operator (IESO)
- Hydro One
- Enbridge Gas Inc.
- Local distribution company or fuel distributor

EMERGENCY PREPAREDNESS AND PLANNING

- On-Farm Generators for Emergency Use
- Ontario Soil and Crop Improvement Association – EFP Emergency Plan
- Canadian Agricultural Safety Association (CASA): Developing a Basic Emergency Preparedness Plan

CANADIAN AGRICULTURAL SAFETY ASSOCIATION (CASA)

- Canada FarmSafe Plan – sample form: The Farm's Emergency Preparedness Plan