



INFOSHEET #14

ENERGY EFFICIENCY

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



Based on
Environmental Farm
Plan Workbook,
4th ed. 2013

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

All options 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.

FIELD OPERATIONS

14-1. Use of fuel

BACKGROUND	WHAT CAN YOU DO?
<p>Fuel provides the energy required to propel equipment that prepares the soil for planting, cultivation, spraying, pruning, harvesting, etc. Matching the tractor's horsepower to the implement's power requirements optimizes fuel usage and prolongs the equipment's working life.</p>	<p>OPTION 1 – ACTION</p> <p>Evaluate your tractor's available power and your equipment's power requirement, and do three or more of the following best practices:</p> <ul style="list-style-type: none"> • 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 a task • practise Gear up/Throttle down to the point that the engine is not lugging.



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

14-2. Maintenance of machinery and lubrication

BACKGROUND	WHAT CAN YOU DO?
<p>Machinery maintenance may not always be seen to pay, but lack of maintenance will cost you in extensive, expensive repairs or critical time lost by component failures. A well-maintained machine will operate at peak efficiency, and be dependable and a source of personal pride.</p> <div data-bbox="262 1230 682 1339" style="border: 1px solid black; padding: 5px; margin-top: 20px;"> <p>For specific maintenance programs, see the owner's manuals and consult your equipment dealer.</p> </div>	<p>OPTION 1 – ACTION</p> <p>Establish a sound preventative maintenance program for all your equipment:</p> <ul style="list-style-type: none"> • follow the recommended maintenance schedules for each piece of equipment • study all of the operator's manuals to familiarize yourself with correct operation, wear points, fluid change intervals, lubrication schedules, 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.



Preventative maintenance will avoid costly downtime.

BUILDINGS

14-3. Type of lighting

BACKGROUND	WHAT CAN YOU DO?
<p>When the farm operation has high levels of lighting, 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.</p>	<p>OPTION 1 – ACTION</p> <p>Replace lower-efficiency lighting with high-efficiency lighting:</p> <ul style="list-style-type: none"> • T-5 or T-8 fluorescent lighting where conditions allow • electronic ballasts (less power use than standard ballasts) • high-intensity discharge with electronic dimming • high-pressure sodium lights or metal halide (H.I.D.) • LED lights • induction lights.



Costs to upgrade lighting will be recouped in reduced energy expenses.

14-4. Type of lighting control

BACKGROUND	WHAT CAN YOU DO?
<p>Lighting controls are available for a variety of situations and needs in various locations in farm buildings.</p>	<p>OPTION 1 – ACTION</p> <p>Use lights only when necessary:</p> <ul style="list-style-type: none"> • compact fluorescent lights plus dimmers • motion sensors (turn off when you leave) • task lighting whenever possible to light only the areas required • control timers.

See also OMAFRA factsheets:
 Energy-Efficient Dairy Lighting, **Order no. 06-007**
 Improving Energy Efficiency in Livestock Facilities, **Order no. 06-013**

14-5. Security yard lights

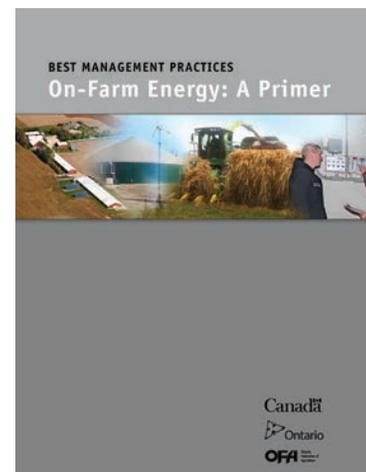
BACKGROUND	WHAT CAN YOU DO?
<p>Yard lights are used to improve access to buildings, and can enhance security.</p>	<p>OPTION 1 – ACTION</p> <p>Use energy-efficient security lights:</p> <ul style="list-style-type: none"> • high-pressure sodium lights for yard lighting <ul style="list-style-type: none"> – consider replacing mercury vapour lights with high-pressure sodium lights • LED lights with dusk-to-dawn sensors to provide light during darkness.

14-6. Energy usage

BACKGROUND	WHAT CAN YOU DO?
<p>Energy costs have risen to a point where they now are a significant input cost. Conducting an audit or assessment of energy use 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 indication of the potential for energy cost savings from energy-efficiency enhancements.</p>	<p>OPTION 1 – ACTION</p> <p>Determine how much energy is used and where:</p> <ul style="list-style-type: none"> • list the energy users and their hours of operation • monitor energy use for each part of your operation with separate meters, and record in log books • calculate power or energy used by the various operation components • carry out an energy audit to determine the amount used and the cost, and compare to industry standards – a professional energy auditor can develop a complete picture • implement all upgrades/improvements identified in review process.



Determining 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, see this BMP booklet.

14-7. Heated or cooled farm buildings

BACKGROUND	WHAT CAN YOU DO?
<p>Properly installed insulation in farm buildings will reduce shell heat losses and cold penetration, as well as condensation. An air/vapour barrier is a critical part of a well-insulated building.</p> <p>Vapour barriers that have been poorly installed or omitted completely can result in moisture damage. Moisture damage can create risks to animal and human health, and ultimately shorten a building's lifespan.</p>	<p>OPTION 1 – ACTION</p> <p>Reduce shell heat loss and increase air tightness of the building:</p> <ul style="list-style-type: none"> • insulate buildings to the recommended R levels • install a continuous air/vapour barrier • ensure doors and windows fit tightly • caulk all building joints • maintain an active rodent control program • minimize solar heat gain with light-coloured walls and roof • maintain and calibrate heating and cooling equipment on a regular schedule • make use of heat exchangers to recapture heat from exhaust air.



14-8. Refrigerated storage efficiency

BACKGROUND	WHAT CAN YOU DO?
<p>Refrigerated storage makes possible long-term storage of perishable commodities. Properly sized and maintained cooling systems will be able to remove heat and hold the produce in optimum conditions. In addition, properly designed systems will optimize the energy used to maintain the desired temperature, resulting in lower energy costs.</p>	<p>OPTION 1 – ACTION</p> <p>Maximize the performance of your refrigerated storage:</p> <ul style="list-style-type: none"> • implement a routine maintenance regimen to ensure each component's working life and performance are maximized • 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-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 • consider installing a fast heat-removal system before the produce enters the cold storage, separate from the longer-term refrigerated 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 energy-efficient motors • remove field heat from product before going into storage.



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.

See also these OMAFRA factsheets:

- Sizing and Laying Out a Short-Term (Summer) Refrigerated Storage for Fruits and Vegetables, **Order no. 92-124**
- Troubleshooting Cold Storage Problems, **Order no. 94-083**
- Tunnel Forced-Air Cooler for Fruit and Vegetables, **Order no. 98-031**

14-9. Bulk milk storage

BACKGROUND	WHAT CAN YOU DO?	 <p data-bbox="1524 607 2011 662">On dairy farms, the milking centre is one of the greatest consumers of energy.</p>
<p data-bbox="86 297 732 380">On dairy farms, the milking centre is one of the greatest consumers of energy. The main areas of energy usage are milking equipment, milk cooling, and the heating of washwater.</p> <p data-bbox="86 399 722 482">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.</p> <p data-bbox="86 501 743 644">Fresh milk is at body temperature from the udder but needs to be cooled as quickly as possible to ensure quality. This cooling requirement can be combined with a heat-recovery system to conserve energy. For example, the captured heat could be used to heat washwater that sanitizes the milking equipment.</p>	<p data-bbox="774 297 968 318">OPTION 1 – ACTION</p> <p data-bbox="774 337 1402 393">Use the following equipment and practices to reduce energy inputs in the milking centre:</p> <ul data-bbox="774 407 1472 704" style="list-style-type: none"> • 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-speed drive on the vacuum pump • a variable-speed drive on the milk pump • energy-efficient motors • regular maintenance for optimal performance and efficiency. 	

CROP DRYING

14-10. High-temperature drying

BACKGROUND	WHAT CAN YOU DO?
<p data-bbox="86 943 751 1026">The energy required to dry similar grains will vary widely when using high-temperature drying. Low-cost modifications can reduce fuel requirements without reducing drying capacity.</p> <div data-bbox="218 1078 617 1377">  </div> <p data-bbox="228 1385 585 1440">High-temperature grain dryers can be modified to improve efficiency.</p>	<p data-bbox="774 943 968 964">OPTION 1 – ACTION</p> <p data-bbox="774 984 1793 1011">Improve drying efficiency by changing to a more efficient system or modifying the current system:</p> <ul data-bbox="774 1026 2007 1404" style="list-style-type: none"> • 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 “cool-eration” (where heated grain is transferred to a cooling bin, eliminating in-dryer cooling) into your drying system • use a reliable moisture tester • dry the grain to the recommended levels • install a continuous-readout moisture tester in the drying system • use more efficient dryers, e.g. continuous flow bin, deep-bed dryer – install full-floor aeration to allow safe bin storage of “dry” grain • use a dryer that requires less than 1600 BTU per pound of water removed • convert to biomass fuel • use a heat exchanger. <div data-bbox="1696 1341 2003 1446" style="border: 1px solid black; padding: 5px;"> <p data-bbox="1707 1346 1997 1367">See also OMAFRA factsheet:</p> <p data-bbox="1707 1390 1997 1443">Reclaiming Corn Drying Energy, Order no. 88-003</p> </div>

14-11. Low-temperature natural air drying

BACKGROUND

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



Allowing crops to dry down in the field before harvest can mean less storage and lower drying expenses. Natural air drying in the bin is an accelerated version of what occurs in the field.

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

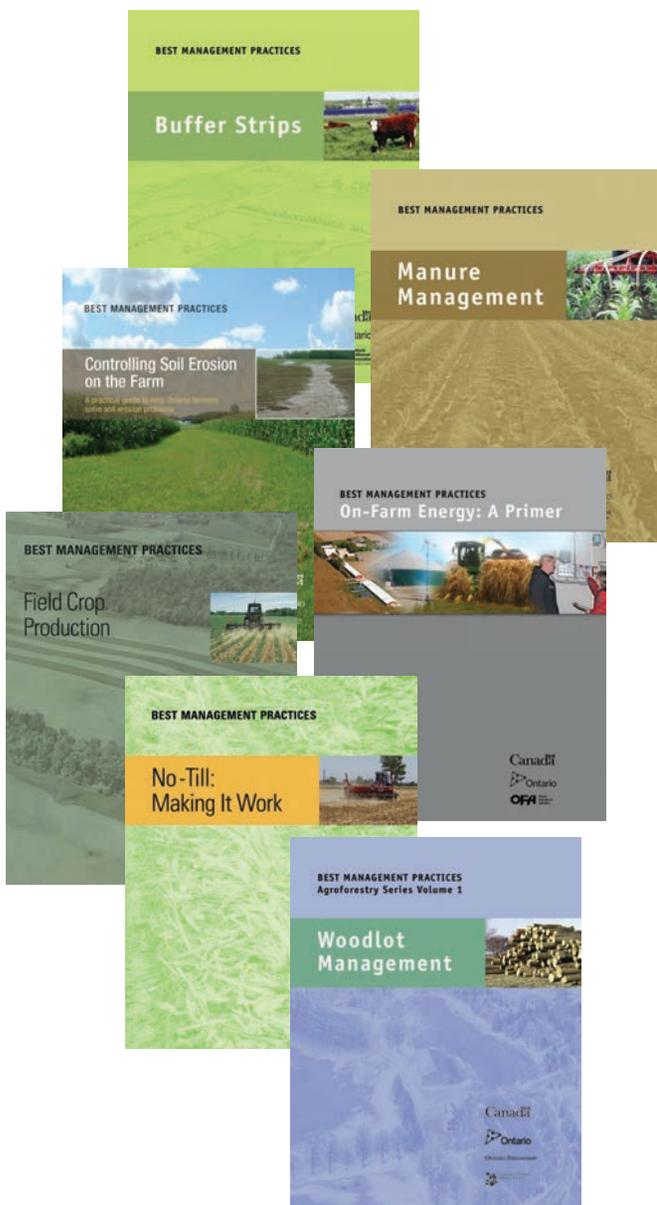
Use natural air to dry crops:

- select varieties that will dry down quickly before harvest in the field
- use energy-efficient aeration fans and motors.

More airflow per bushel is more effective than adding supplementary heat.

See also OMAFRA factsheet:

Natural Air Corn Dry Systems, Order no. 86-066



FOR MORE INFORMATION

Ontario Ministry of Agriculture, Food and Rural Affairs

Many sources of supplementary information are available. Below are some suggestions to get you started. Most can be found online at www.ontario.ca/omafra or ordered through ServiceOntario.

Energy-Efficient Dairy Lighting, Order no. 06-007

Improving Energy Efficiency in Livestock Facilities, Order no. 06-013

Natural Air Corn Drying Systems, Order no. 86-066

Reclaiming Corn Drying Energy, Order no. 88-003

Sizing and Laying Out a Short-Term (Summer) Refrigerated Storage for Fruits and Vegetables, Order no. 92-124

Troubleshooting Cold Storage Problems, Order no. 94-083

Tunnel Forced-Air Cooler for Fruit and Vegetables, Order no. 98-031

BEST MANAGEMENT PRACTICES

BMP publications are excellent sources to better understand on-farm environmental issues and discover a range of proven, practical options to address them. BMP publications are available at no charge to Ontario farmers. Below are a few sample titles. To order, see ServiceOntario information.

Controlling Soil Erosion on the Farm

Irrigation Management

On-Farm Energy: A Primer

Water Management

Water Wells

Inquiries to the Ontario Ministry of Agriculture, Food and Rural Affairs

Agricultural Information Contact Centre

Ph: 1-877-424-1300

Email: ag.info.omafra@ontario.ca

Web: www.ontario.ca/omafra

Order through ServiceOntario

Online at ServiceOntario Publications – www.ontario.ca/publications

By phone through the ServiceOntario Contact Centre

Monday–Friday, 8:30 am–5:00 pm

416-326-5300

416-325-3408 TTY

1-800-668-9938 Toll-free across Ontario

1-800-268-7095 TTY Toll-free across Ontario

Other Resources

- Energy auditors/consultants
- Equipment dealers/suppliers
- Grain storage and component suppliers
- HVAC contractors
- Insulation suppliers and contractors
- Owner's manuals
- Refrigeration system designers

ACKNOWLEDGEMENTS

At the request of the Ontario Farm Environmental Coalition, consisting of Farm & Food Care Ontario, the Ontario Federation of Agriculture, and the Christian Farmers' Federation of Ontario, the following people and organizations contributed to the revision of this infosheet:

Infosheet #14 Contributing Authors: Helmut Spieser (Chair), Steve Clarke – Ontario Ministry of Agriculture, Food and Rural Affairs; Arlene Ross – Ontario Soil and Crop Improvement Association

Infosheet Technical Editing Committee: H.J. Smith (Chair), Kevin McKague, Ted Taylor, Daniel Ward – Ontario Ministry of Agriculture, Food and Rural Affairs; Jim Myslik – Consultant