



Energy Conservation in Agriculture

Low-Cost Energy Conservation: Indoor and Outdoor Lighting

Scott Sanford

Depending on your farm operation, taking the following actions could reduce your energy consumption. Refer to the references at the end of the bulletin for more information.

Outdoor lighting

1. Ask yourself why am I lighting this area. Is lighting necessary all night? If it's not needed, turn it off and save. A timer, photo sensor or motion sensor can be used to turn the light off when not needed.
2. Change mercury vapor fixtures to metal-halide or high-pressure sodium fixtures when the lamp needs to be replaced. These provide more efficient lighting and reduce the environmental risk posed by the mercury vapor lamp. Retrofit bulbs are available but are very expensive—about the same cost as replacing the fixture. A 100-watt high-pressure sodium or 150-watt metal halide lamp will provide slightly more light than a 175-watt mercury vapor lamp.
3. Use motion sensors on incandescent or halogen flood lamps to turn on the light only when there is activity in the area.
4. Replace incandescent and halogen flood lamps with high-intensity discharge lamps (metal halide or high pressure sodium) in

areas with motion more than 30% of the time during nighttime hours.

5. Install full cut-off reflectors on lights. This reduces light losses to the night sky by more than 20% and can increase the light level of an intended area by up to 70%. A 70w high pressure sodium lamp with a full cutoff reflector will provide the same light as the typical 175w mercury vapor yard lamp—a 60% energy savings!
6. Install a DNP half-night photo sensor on yard lights. It shuts off the light halfway through the night reducing the operating cost by half. Payback is typically 2 years or less.
7. Install a clock timer to shut off lighting that is not needed all night.
8. Install photo sensors to turn lights on/off at sunset and sunrise.
9. Keep tree limbs trimmed away from light fixtures.

Indoor lighting

1. Provide the proper levels and color of light for the most efficient plant or animal production.
2. Install motion sensors where appropriate so lights are on only when there is activity.

3. Turn off lamps that are not needed. This may require adding switches to control smaller groups of lights or using clocks to control lights.
4. In freestall barns, consider using translucent side curtains, installing translucent panels on the building ends and leaving the ridge vent open or covered with a translucent material to take advantage of sunlight.
5. T-8 fluorescent lamps (1" diameter) are 20% more efficient than the popular T-12 fluorescent lamps (1½ diameter). If the current fixtures are dust- and moisture-proof rated (required for animal housing), then the T-12 fluorescent fixtures can be converted to T-8 lamps very cost effectively. This requires replacement of the lamps and ballast. T-8 and T12 bulbs use the same bases or sockets. There are three types of lamp sockets used; be sure to check which is being used. The types are:
 - a) medium bipin base (G13) which is the most common;
 - b) single pin base (Fa8), typical on 8-foot lamps; and
 - c) recessed double contact base (R17d), used on high output lamps.
6. Replace incandescent bulbs with compact fluorescent lamps or linear T-8 fluorescent fixtures wherever possible. Compact fluorescent lamps (CFL) need to be

housed in dust and moisture proof fixtures to achieve adequate service life. Most CFL can be used at temperatures down to 32°F and some will light down to 0°F (check the packaging label) but will require a few minutes to warm up for full illumination.

Freestall barns

1. Use HID fixtures with metal halide or high pressure sodium lamps.
2. Replace mercury vapor fixtures with metal halide or high pressure sodium fixtures.
3. Install clock timers and photo sensors to control lights.
4. Consider daylighting for photosensitive animals to increase production. Research has shown that dairy cattle produce an average of 8% more milk when subjected to light levels of 10–20 foot-candles for 16–18 hour days while lactating. Contact your local Cooperative Extension agent for more information.

Proper lamp disposal

Fluorescent and HID lamps (mercury vapor, metal halide, high pressure sodium, low pressure sodium) all contain some amounts of mercury and are required to be recycled in Wisconsin by businesses. Lamps should not be broken to prevent the release of mercury and are best stored in the packaging the replacement lamps came in. The lamps can be

almost completely recycled; the mercury is distilled from the phosphor powder used in fluorescent lamps and reused in new lamps, the copper, aluminum and brass are smelted and reused for raw material in non-food contact products and the glass is purified and used to make fiberglass. Contact your local waste hauler, recycling center or CleanSweep program coordinator for information on the collection of fluorescent and high-intensity discharge (HID) lamps.

References

- Energy Efficient Lighting for Agriculture* (A3784-14), S.A. Sanford, *Energy Conservation in Agriculture series*, University of Wisconsin-Extension, Cooperative Extension, Madison, WI, 2003.
- Supplemental Lighting for Improved Milk Production*, National Food and Energy Council, Columbia, MO
- Safe Lamp and Bulb Management*, DNR Publication SW 195-03, Wisconsin Department of Natural Resources, Madison, WI, 2003



Author: Scott Sanford is a senior outreach specialist with the Department of Biological Systems Engineering at the University of Wisconsin–Madison.

©2003 by the Board of Regents of the University of Wisconsin System. Direct inquiries about copyright permission to Cooperative Extension Publishing Operations, 103 Extension Building, 432 N. Lake St., Madison, WI 53706 or call 608-262-2655.

This publication is funded in part by the *Wisconsin Focus on Energy* program.

University of Wisconsin–Extension provides equal opportunities in employment and programming, including Title IX and ADA requirements.

To order multiple copies of this publication, call toll free: 1-877-WIS-PUBS (947-7827).

To see more Cooperative Extension publications, visit our web site: www1.uwex.edu/ces/pubs/

Low-Cost Energy Conservation: Indoor and Outdoor Lighting (A3784-12)

I-06/2003