Reducing Farm Energy Expenses

2017 Northern Michigan Small Farm Conference
Grand Traverse Resort
Traverse City, MI

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Form AD-475A (revised 3-98)

Powering Michigan Agriculture Conference

A day-long conference where farmers will learn about various renewable energy technologies and energy efficiency practices, identify the most suitable technologies and practices that meet their energy management goals, and then obtain the resources and tools necessary to implement those technologies and practices on their farms. This conference is designed to be a one-stop shop for farmers, regardless of the crops grown or livestock raised, who are interested in reducing their energy expenses.

- Date: Thursday, March 9, 2017
- Time: 8:30 a.m. to 4:30 p.m.
- Location: MSU Kellogg Hotel and Conference Center
- Cost: $40/person or $75 for two individuals from the same farm.
- Register by March 5, 2017. For registration information and an agenda go to https://events.anr.msu.edu/PoweringMIAg17/
- Questions? Contact Charles Gould at 616-994-4547 or gouldm@msu.edu.

What is a "farm energy audit"?

- A study of energy usage, conducted for the purpose of saving energy and money[1].
- An essential tool in developing a comprehensive farm energy management plan.

Willow Creek Farm milking parlor. Photo credit: M. Charles Gould

1. Morris, Mike. 2009. Farm Energy Audits: Availability, Usefulness, and Cost. NCAT. Butte, MT.

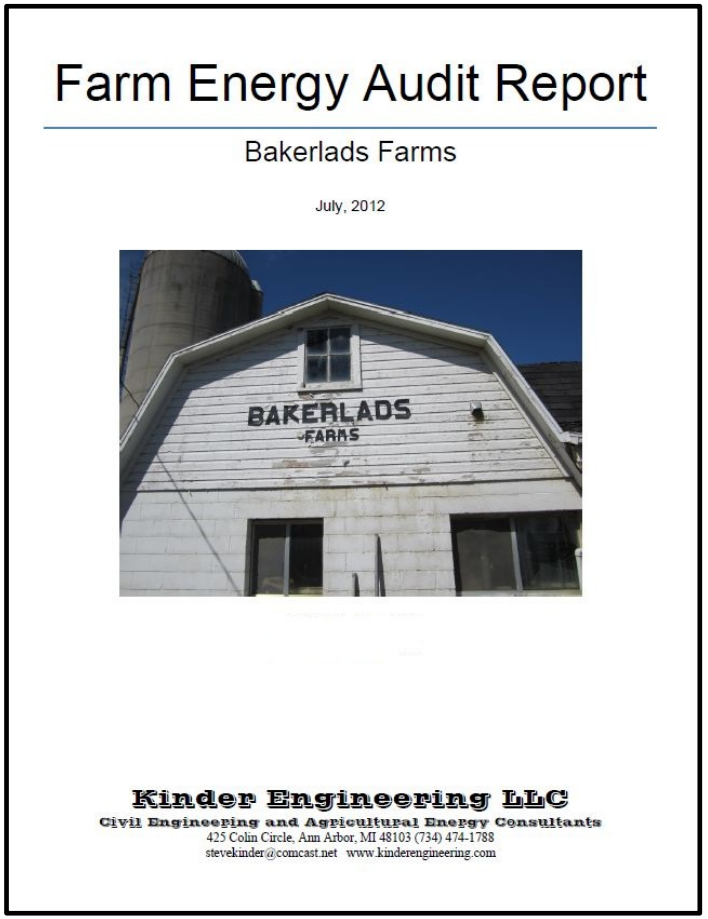
Farm energy audit

- Pinpoint areas for reducing energy costs and energy use.
- Improve operational efficiency as well as identify potential areas for renewable energy application.
- Conducted by a certified farm energy auditor.

Potential areas to reduce energy costs.
Photo credit: Purdue University

Energy audit report

- Recommends changes that could reduce energy consumption or cost.
- Prioritizes implementation projects based on energy efficiency improvements, payback period, capital outlay, or implementation duration and complexity.
- Presents a whole farm approach in developing and implementing energy conservation measures.
- Type 2 audit required for participation in utility, State, and Federal energy efficiency programs.



Energy audit report. Photo credit: Al Go.

Farm Energy Audit Process

Farm

Records Needed:

- Utility bills for 3 years prior to audit.
- Production for three years.
- Age and technical information of equipment.
- Management strategies, preferences, plans, insights and ideas.

Certified Farm Energy Audit

Confidential Certified Energy Audit Report

Alternative Energy

- Anaerobic digesters
- Biomass
- Geothermal
- Wind
- CHP

Set priorities & implement suggestions

Certified Energy Audits (ASABE S612)

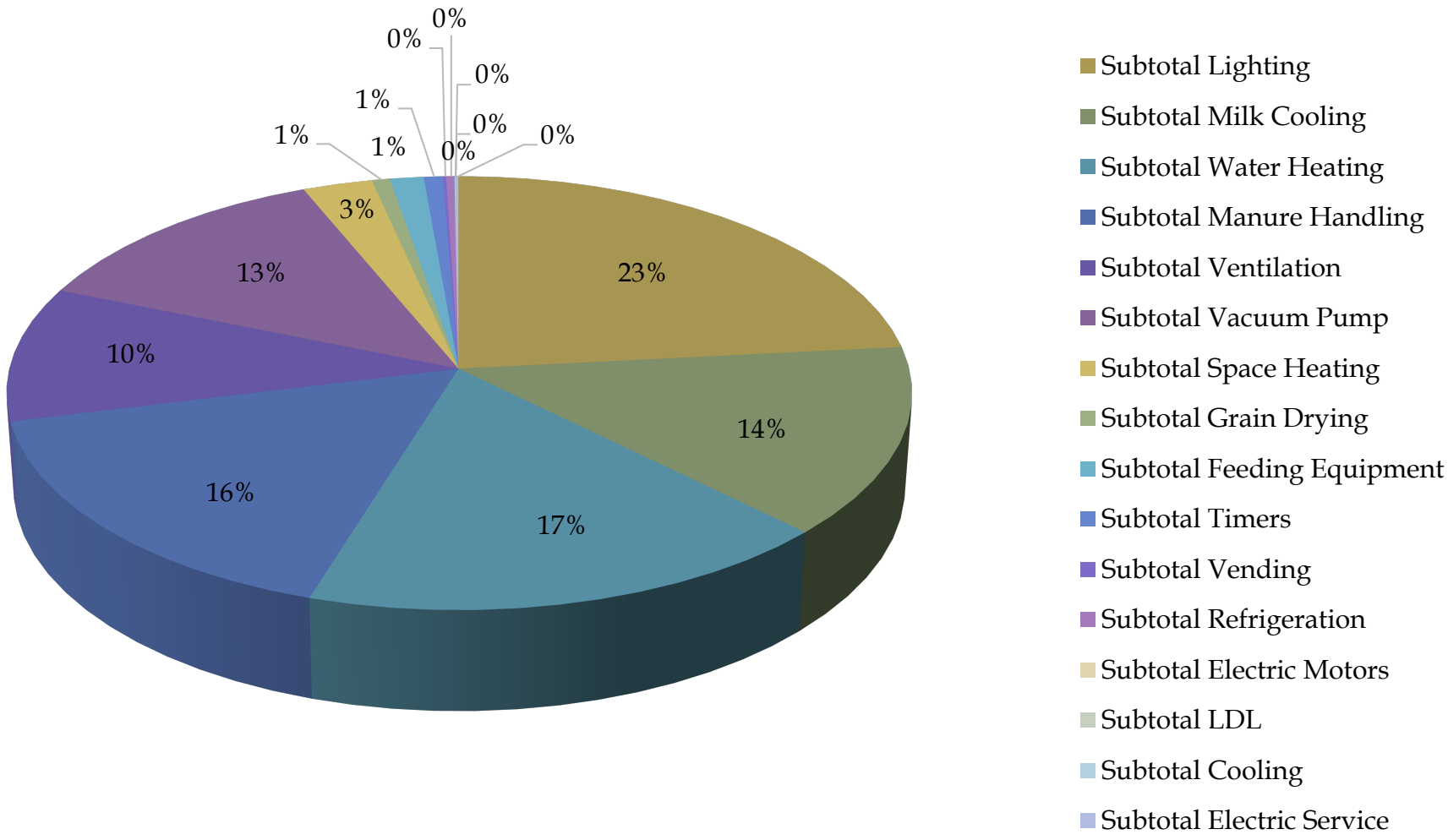
- Professional Engineer (PE)
- Certified Energy Manager (CEM)
- State Certified Farm Energy Auditor
- USDA-NRCS Technical Service Provider

Not all audits are the same!

2010-2015 Energy Efficiency Saving and Energy Generation Capacity

No.	Operation	Savings (kWh)	2010-2015 energy usage (kWh)	% Savings	Total Annual Savings ($)	Ave Owner Cost to Implement ($)	Potential Ave Ann Savings ($)	Payback time (yrs)
126	Dairy farms	9,437,398	28,036,186	34	1,049,037	21,157	8,325	2.5
49	Grain drying	13,034,275	41,423,860	31	784,804	111,058	16,527	6.9
32	Greenhouse	24,585,938	65,458,980	38	980,138	146,489	30,630	4.8
27	Food/fruit process	2,371,934	6,217,231	38	338,023	49,918	12,497	4.0
18	Irrigation	4,321,539	8,523,874	51	405,747	81,332	22,542	3.6
11	Crops	335,503	9,148,490	4	48,194	10,110	4,381	2.3
4	Beef	65,736	410,850	16	7,454	3,749	1,864	2.0
3	Hogs	161,135	700,587	23	14,235	16,207	4,745	3.4
4	Poultry	6,048,658	12,628,954	48	365,997	262,328	91,474	2.9
31	Rural business	13,546,427	36,765,736	37	756,513	59,393	24,404	2.4
1	Integrated farm	11,358	12,136	94	1,693	3,480	1,693	2.1
306	**Audit Total**	**85,982,205**	**209,326,883**	**41**	**4,837,977**	**61,032**	**15,890**	**3.9**
147	Renewable energy	24,574,391	35,893,424	68	1,797,018	106,368	12,225	8.7
453	**Grand Total**	**110,556,596**	**245,220,307**	**45**	**6,634,996**	**75,744**	**14,700**	**5.2**

Dairy Farm Energy Savings



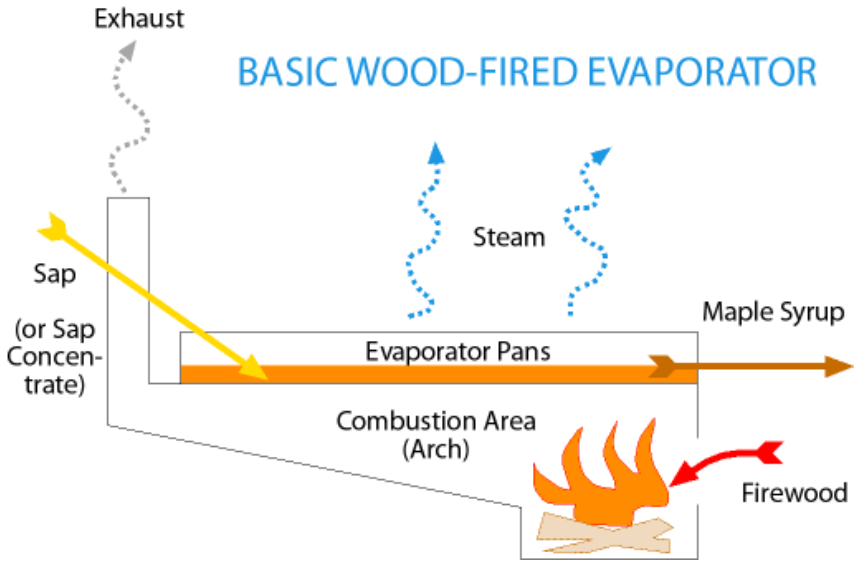
Energy Audit Results (6 acre greenhouse)

Item	Energy Savings (MMBTU)	Savings ($/year)	Cost to Implement	Payback (years)
Hi. Eff. Unit Htrs	2,797.7	$19,530	$152,600	7.8
Weatherization	4,046.3	$28,245	$69,751	2.5
IR Film Covering	1,931.8	$13,485	$5,580	0.4
Energy Curtains	1,000.1	$6,982	$62,124	8.9
LED Lighting	290.1	$10,372	$32,407	3.1
Water Heaters	1.5	$53	$400	7.6
Pipe Insulation	2.4	$87	$25	0.3
Wtr Htr Blankets	8.8	$313	$60	0.2
New Refrigerator	5.0	$177	$450	2.5
Vending Miser	14.3	$513	$400	0.8
Occupancy Sensors	159.7	$5,709	$1,200	0.2
Totals	10,257.7	$85,466	$324,997	3.8

Source: Dan Schrauben, Schrauben Associates LLC

Maple Syrup Production

- Reverse Osmosis Filters
  - Reduce sap water content 50% to 75%
  - 40 gal of sap to produce 1 gallon syrup
- Vacuum Assist Collection
  - 30 day season
  - Double sap/tree production
  - Common collection point, reduced tractor collection
- $32,000 project, 4.2 year payback, >80% energy savings
- Michigan is ranked 5th nationally.



Source: Dan Schrauben, Schrauben Associates LLC

Sheep Dairy, Cheese Making, Farm Market

- Family farm since 1841
- Milking 100 sheep/day
- Only sheep dairy in MI
- Cheese making facilities
- Lighting
- Occupancy Sensors
- Coolers
- Water heating
- Dairy equipment

Source: Dan Schrauben, Schrauben Associates LLC

GDW Turkey Farms, Ottawa County, MI

- Brooder house project
  - 100 T-12 lights were replaced with LED lights at a cost of $21,000.
  - The farm received a $4,900 rebate from Consumers Energy to offset the replacement costs.
  - Annual savings from replacing the lights was $4,000 in reduced electric expense and $2,000 in maintenance expenses.
  - The payback period for this project was 2.7 years.

GDW Turkey Farms brooder barn. Photo credit: Jon Van Der Kolk.

GDW Turkey Farms, Ottawa County, MI

- Four finishing barns
  - Installing double ply energy efficient curtains to replace 15 year old single ply curtains, tightening up the ends of the barns to reduce heat loss, installing eight destratification fans, replacing existing lighting with LED lights, and replacing standard forced air heaters with infrared heaters.
  - Heater replacement reduced BTU usage from 1,800,000 to 1,400,000 BTUs.
  - The cost for these improvements was approximately $100,000.
  - The farm received a Michigan Farm Energy Program grant for $25,000 and received rebates from Consumers Energy for $6,000.
  - The total cost to the farm was $69,000.
  - Cost savings are estimated to be $12,000 per year and are being measured at this time.
  - It is worth noting that part of what is being measured is the frequency of replacing lights. Most LED bulbs are rated at 60,000 to 100,000 hours compared to T8 bulbs rated at 20,000 hours.

GDW Turkey Farms, Ottawa County, MI

- Besides saving the farm money, changing the lights in the brooder house improved:
  - Animal welfare (cleaner birds, less cannibalism, and calmer dispositions).
  - Increased the weight of the turkeys leaving the brooder.
  - Lowered the brooder mortality rate.
  - Created safer working conditions for employees.
- Implementing energy conservation measures in the finishing barns has resulted in:
  - Better litter conditions.
  - Lower condemnations on birds shipped to slaughter.
  - Increased bird comfort.
- Labor and bulb costs were also reduced due to less frequent bulb replacement.

Energy Efficiency/Renewable Energy Funding

- USDA-REAP
- USDA-NRCS
- DOE/State energy agencies
- Utility companies and electric co-ops
- State agencies

Examples of Fundable Projects

- Energy efficiency improvements
  - Freezers & coolers
  - Lighting improvements, window and plumbing upgrades, insulation
  - Replacement grain dryers
  - Replacement irrigation units (diesel to electric, high pressure to low pressure, traveler to pivots)
  - Greenhouse heating, lighting, and cooling improvements
  - High efficiency motors, pumps, fans, blowers, compressors
  - Upgrading/replacing HVAC equipment

- Renewable energy
  - Wind
  - Solar
  - Biomass / Biofuel
  - Anaerobic digester
  - Geothermal
  - Hydropower

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