Agricultural Energy Management Plan
Criteria
Conservation Activity Plan Practice Code (128) (No.)

I. Definition of an AgEMP

An Agricultural Energy Management Plan (AgEMP) is a detailed documentation and inventory of the energy consuming activities and components of the current agricultural operation. The plan will document a typical prior year of on-farm energy consumption, and the strategy by which the producer will explore and prioritize their on-farm energy conservation concerns, objectives, and opportunities.

II. Definition of Terms

Component (as used in the ASABE Standard) —Individual parts of a major activity. For example, a lighting activity would include lamps, timers, and sensors.

Energy—for the purposes of these criteria, energy is the resource used to power equipment to do mechanical work such as heat, light, ventilation, irrigation or cooling.

Energy Resource—source from which energy is obtained, including gasoline, diesel fuel, biofuel, propane, natural gas, electricity, solar, wind, wood, biomass, geothermal, etc.

Farm Enterprise—the production category or categories of a farm. For example, a farm may include a field crop enterprise and a swine enterprise. (See ASABE S612 Table 1, appended to this document)

- Dairy
- Swine
- Poultry
- Beef/veal
- Field Crops
- Fruit/Vegetables
- Aquaculture
- Nursery/Greenhouse

Major Activity—a discrete activity associated with a farm enterprise that utilizes an energy resource or that controls energy resource use. For example, a poultry enterprise may include heating, ventilation; a dairy enterprise may include lighting (see ASABE S612 Table 1).

Prior Year Energy Consumption—the energy consumption for the previous 12 months, or another recent 12 month period typical to that enterprise. Where weather or other extreme events alter the typical energy use in the previous 12 months, use alternate years for the evaluation and include complete documentation and reasoning in the final report. This typical 12 month energy consumption becomes the baseline against which any contemplated improvements are compared.

III. AgEMP-Criteria

A. General Criteria

- A certified Technical Service Provider (TSP) develops the AgEMP addressing the energy resource concerns on the entire associated farm operating enterprise. Funding support from the Environmental Quality Incentives Program (EQIP) is provided through contracts with eligible producers. Producers in turn obtain services from certified TSPs for development of an AgEMP. The TSP proficiency criteria required to develop an AgEMP for an EQIP eligible producer is located on the TSP web site at: http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/technical/tsp. The **AgEMP** will meet the "Type 2 Audit" minimum criteria established in the ***ANSI/ASABE S612 (July2009) Performing On-farm Energy Audits*** standard.

B. Criteria for Specific Elements of an AgEMP

1. Cover Page

The AgEMP must have a cover page providing the following:

a) Farm identification
   (1) Farm name, owner name, street address, and county/state.
   (2) Primary phone number of producer.
   (3) All enterprises of the farm.

b) TSP identification
   (1) Name, mail address, and primary phone number. Staff involved in site visit, analysis, report writing.

c) Date that the AgEMP field visit was completed and date of plan delivery to the producer.

2. Summary Report of Energy Practices

Present the findings of the AgEMP in the 'Summary' section using the tables below. Table 1 will contain each of the various recommended improvement measures, sorted by priority of installation. Table 1 also documents estimates of energy use reduction, energy savings by both cost and energy unit, and installation cost. Present energy savings by energy type, as a percent of total energy usage, as shown in Table 2 below. Provide estimated reduction in greenhouse gas emissions and air pollutants for each recommended energy improvement measure as shown in Table 3.

Table 1: Summary of Energy Improvements (Examples of recommended measures shown.)

	Estimated Annual Reduction in Energy Use					Estimated Costs, Savings, Payback, and Prioritization for Implementation			
Recommended Measure	**Electric Savings (kWh)**	**Natural Gas Savings (ccf)**	**Propane Savings (gal)**	**Other[1]**	**Energy Savings (MMBtu)**	**Installed Cost [a]**	**Annual Cost Savings [b]**	**Payback in Years [a/b]**	**Est. Life in Years[2]**
Lighting	25,210				86	$1,740	$2,094	0.8	7
Seal Air Leaks			477		44	$1,500	$809	1.9	8
Insulate Brood Curtain			98		9	$450	$167	2.7	10
Exposed Foundation Wall Insulation			383		35	$5,621	$651	8.6	20
Curtain to Solid Insulated Sidewalls			442		41	$7,168	$754	9.5	20
Totals:	**25,210**		**1,400**		**215**	**$16,479**	**$4,475**	**3.7**	**---**

Table 1 Notes
1) Use the *Other* column to aggregate any miscellaneous sources of energy.
2) Estimated Life is expected useful life of the equipment recommended with standard O&M activities.

Table 2: Annual Energy Savings if Recommendations are Fully Implemented

Fuel	Current Usage	MMBtu Usage	Savings	MMBtu Savings	% Savings
Electricity (kWh)	135,920	464	25,210	86	18.5%

Propane (gal)	4,214	386	1,400	129	33.2%
Natural Gas (ccf)	NA				
Diesel Fuel (gal)	NA				
Other	NA				
Totals	-----	850		215	25.2%

Table 3: Estimated Annual Reduction of Pollutants. (Examples of environmental benefits for recommended measures from Table 1 shown.)

Environmental Benefits						
		Greenhouse Gases			Air Pollutant Co-Benefits	
Recommended Measure	**Energy Savings (MMBtu)**	**Estimated CO_2 (lbs)**	**Estimated N_2O (lbs)**	**Estimated CH_4 (lbs)**	**Estimated SO_2 (lbs)**	**Estimated NOx (lbs)**
Lighting	86	37,902.5	0.62	0.46	125.42	35.12
Seal Air Leaks	44	6,036.2	0.19	0.95	0.05	4.77
Insulate Brood Curtain	9	1,240.1	0.04	0.20	0.00	0.98
Exposed Foundation Wall Insulation	35	4,846.7	0.15	0.77	0.04	3.83
Curtain to Solid Insulated Sidewalls	41	5,593.3	0.18	0.88	0.04	4.42
Totals:	**215**	**55,618.8**	**1.18**	**3.26**	**125.56**	**49.12**

3. Background and Site Information

Provide a narrative in the AgEMP that includes:

a) Facility location(s).

b) Type, size, and overall management scheme of the operation. Include in the narrative a description of the enterprise(s), (e.g., poultry, dairy, field crop, etc.) along with production levels, and any unusual factors that affect energy use.

c) Include producer concerns and objectives for the enterprise(s). This is a description of why the producer wants an on-farm energy audit and their specific objectives.

d) An aerial map or equivalent drawing indicating the farm operation including all the structures relevant to the AgEMP, such as animal housing, shops, grain storage, processing facilities and locations of the headquarters and the fields that were evaluated in the farming operation.

4. Current Equipment and Baseline Energy Use

The AgEMP will provide comprehensive documentation of a typical prior year's energy consumption for all relevant enterprises, as a minimum. Separate the evaluation of energy usage by the major activities listed in, but not limited to, the ASABE S612 production category for the primary farm enterprise, and any other relevant farm enterprises. Address the major activities that are shown in ASABE S612 Table 1 with an "X" next to them in the column for the enterprises. The report must address all major activities for all of the relevant enterprises. The **only exception is that cultural practices are an optional activity for CAP 128.** For example: a field crop enterprise must address the following major activities: Any motors or pumps; Drying; Crop/Feed Storage; Water Management; Material Handling; and Irrigation at a minimum.

The report must provide:

a) The usage and costs for the prior year energy consumption separated by energy resource.

b) A baseline energy use from a prior, typical 12 month period. The AgEMP must document all major activities associated with all enterprises being audited by:

(1) Describing the components, primary equipment, and/or details of the activity, as appropriate according to the amount of energy used, such as:
   (a) Type and size of equipment;
   (b) Component equipment ratings such as Hp., Btu input, Btu output, efficiency;
   (c) Auxiliary items to enhance management such as thermostats, timers, and manual overrides of automatic systems.

(2) Provide an estimate of the annual energy usage, by energy type for each activity.

(3) Provide an estimate of hours of use per year for each component evaluated.

5. Energy Improvement Measures

The AgEMP will identify potential energy improvement practices that will reduce energy use and address the energy management concerns of the entire agricultural operation. The AgEMP must provide appropriate estimated energy savings relative to the baseline energy use for each examined improvement practice.

a) For each measure examined, the report must present:

(1) The estimated energy savings—first in the common sale units (kWh, gallons, etc.) and then converted to energy units of millions of British thermal units (MMBtu).

(2) The estimated annual energy cost savings in dollars per year as a departure from the baseline.

(3) The estimated installed cost in dollars.

(4) The estimated reductions in emissions for CO_2, N_2O, CH_4, SO_2, and NOx. Guidance on how to calculate greenhouse gas emission reductions and air pollutant co-benefits is provided in Appendix A.

(5) The simple payback period in years (installation cost divided by estimated annual cost saving, in years).

(6) Estimated life span, in years, of the recommended measure.

b) Only practices that have a payback period less than the estimated life of the practice should be shown as recommended. Practices with payback periods longer than this may be deemed beneficial and included in the report, but would not be listed as recommended. Include energy and GHG benefits for all recommended practices in Tables 1, 2 and 3 and in the report. Energy savings and cost data for beneficial practices may be include where appropriate for future use by the landowner.

c) The report must include sufficient information in the way of specifications, product information, or comparisons between specific products to support the recommendations. The report must include references to support assumptions, and calculations that support numerical cost or savings values. Organize this information in the Appendix of the report. These details are not a design for installation, but rather a compendium of possibilities, and relative long-term benefits. Documentation for recommended improvement measures must be sufficient to allow a third party to understand and evaluate the recommendations.

d) The audit must reflect non-discounted prices for reporting the installation cost and payback period. Do not factor in incentives such as EQIP payments or state energy rebates in the installation cost.

e) All recommended practices must be closely linked to improvements that optimize energy use. Improvements primarily related to production improvement may be included, but must not be a part of the energy analyses, and should be documented in the Appendix.

f) From the possible energy improvement measures examined, the report must clearly distinguish those measures that have the most benefit. If a practice has very little energy saving benefit, the auditor will note that these improvement measures were considered, but found to be too expensive or that they have an excessively long payback period.

g) The auditor is encouraged to organize the analyses by enterprise and major activity as listed in Table 1 of the ASABE S612 standard.

6. Signature Page

The AgEMP must have a signature page providing the following:

a) Farm identification:
   (1) Farm name, owner name, street address, and county.
   (2) Enterprises of the farm.

b) TSP certification statement:
   (1) A statement to the effect that the auditor possesses the technical expertise and experience to perform on-farm energy audits and that the report meets all the requirements of ASABE S612 (per §6.1) and NRCS CAP 128.
   (2) The signature of the TSP, and date.

   Directly above this statement, or elsewhere on this page, may be an appropriate place for the auditor to make any disclaimers and documentation of the auditor's credentials.

c) Producer acceptance statement:
   (1) A statement to the effect that the Plan correctly lists the farm identifying information, addresses the farm enterprises under the Producer's control, adequately represents the baseline conditions of the farm enterprise(s), adequately represents the Producer's concerns and objectives, and that the Producer has received a final copy of the Plan.
   (2) Spaces for the signature of Producer, and date.

d) The recommended placement of the signature page is immediately behind the last page of the audit report, but preceding any appendices or references.

7. References

The report must include technical documentation of sources used for the AgEMP. The report should include the actual documents or electronic addresses that contain technical information used to estimate energy savings, such as:

a) Fact sheets.

b) Existing component product information or manufacturer product information sheets, etc.

c) Product recommendations and or comparisons of specific products.

d) Journal article citations.

IV. Deliverables and Certification

A. The auditor is encouraged to generate separate sections for separate enterprises of a farm. These sections must be bound together and delivered to the Client with a single cover and signature page.

B. Deliverables from the TSP to the Client include:

   1. A complete hardcopy and/or electronic copy of the finalized AgEMP report, with the TSP signature.

C. Deliverables from the TSP to the NRCS Field Office include:

   1. A complete electronic copy of the finalized AgEMP report. The preferred format is PDF, using software digital conversion rather than scanning, except for the signature page, which should have original signatures from the TSP and Client. The MS Word format is also acceptable.

APPENDIX A

ENVIRONMENTAL BENEFITS

Guidance on how to determine values for greenhouse gases and air pollutant co-benefits environmental benefits.

In order to estimate the environmental benefits associated with estimated energy savings, NRCS has developed a Quick Energy calculator that estimates air emission effects due to energy saving measures for fuels and electricity into atmospheric emission reductions. The Quick Energy Tool relies on the U.S. Energy Information Administration state- level aggregated emission factors for electricity, to generate estimates of emissions savings for electricity, and emission factors for liquid and gaseous fuels, to generate estimates of emissions savings for liquid and gaseous fuels.

The Web link to the NRCS COMET Quick Energy Calculator for converting Energy Savings into Emissions Reductions is located at: http://cometfarm.nrel.colostate.edu/QuickEnergy

ASABE S612 Table 1

Table 1 – Suggested Components within Major Activities by Farm Enterprises for Audit Assessment

		Farm Enterprises							
Major Activity	Components	Dairy	Swine	Poultry	Beef/ veal	Field crops	Fruit/ vegetables	Aquaculture	Nursery/ Greenhouse
Lighting[1,7,10]	lamps, timers, sensors	X[6]	x	x	x		x	x	X
Ventilation[2,7,10,11]	fans, control system, variable drives, humidity control	x[6]	x	x	x		x	X(aeration)	x[8,9]
Refrigeration[5,7,10]	compressor, evaporator/chiller, motor, insulation	milk, products[6]		eggs			commodity	x	Veg/cut flowers
Milk harvesting[7,10]	pumps, motors, controllers	x[6]							
Controllers[7,10]	master system automation	x	x	x				x	x
Other motors/ pumps[3,4,7,10]	Types, compressors	X[6]	x	x	x	x	x	x	x
Water heating[7,10,12]	heater, energy source, insulation, recovery, waterers	x[6]	x	x	x				
Air Heating/ Bldg environment[10]	heater, energy source, insulation, recovery, variable drives	x	x	x	x		x		x[8,9]
Drying[10]	energy source, airflow (motors/fans), handling equipment					x			
Waste handling	collection and dispersal equipment/methods	x	x	x	x			x	
Air Cooling	energy source, airflow (motors/fans), control systems, evaporative	x	x	x	x				x[8,9]
Cultural Practices	planting, tilling, harvesting, engine driven equipment					x	x		
Crop/feed Storage					x	x	x	x	x
Water management	wells, reservoir, recycled	x	x	x	x	x	x	x	x
Material handling[7,10]	equipment, motors, pumps	x[6]	x	x	x	x	x	x	x
Irrigation[10]	motors/engines, pumps, power source					x	x		x

Evaluation of cultural practices is optional for an NRCS AgEMP

Footnotes:

Listed references are guidance documents or tools useful for assessing the energy use and/or efficiency associated with various major activities and/or farm enterprise. Not included here are the numerous planning guides that address the design of farm enterprise systems and the major activities involved because most do not directly assess energy conservation or efficiency. These planning and design guides provide a reference for understanding elements of efficient production systems, but do not specifically address energy use or efficiency as is the intent of this standard. These are by no means the only guides and tools that can be used in performing these audits.

1. ASABE Standards. 2009. EP344.3: Lighting systems for agricultural facilities. St. Joseph, Mich.: ASABE.
2. ASABE Standards. 2008. EP566.1: Guidelines for selection of energy efficient agricultural ventilation. St. Joseph, Mich.: ASABE.
3. Srivastava, Ajit K., Carroll E. Goering, Roger P. Rohrbach, and Dennis R. Buckmaster. 2006. Chapter 3: Electrical power for agricultural machines. In *Engineering Principles of Agricultural Machines*, 2nd ed., 45–64. St. Joseph, Mich.: ASABE.
4. Gustafson, Robert J., and Mark T. Morgan. 2004. Chapter 8. Electric motors. In *Fundamentals of Electricity for Agriculture*, 3rd edition, 205–248. St. Joseph, Mich.: ASAE.
5. Peebles, R.W., D. J. Reinemann, R. J. Straub. 1994. Analysis, of milking center energy use. *Applied Engineering in Agriculture* 10(6): 831–839.
6. Go, A. and Surbrook, T. 2009. Michigan dairy farm energy audit guide. East Lansing, Mich.: Michigan State University, Departments of Biosystems & Agricultural Engineering, Food & Resource Economics. Available at: http://web5.anr.msu.edu/fa/farm%20energy%20calculators.html.
7. UW-Madison. 2009. Farm energy assessment toolkit. Madison, Wisc.: University of WI-Madison and Wisconsin Focus on Energy. Available at: http://www.soils.wisc.edu/foe/login?resource=%2Ffoe%2Flogin%20.
8. ASABE Standards. 2009. EP460: Commercial greenhouse design and layout. St. Joseph, Mich.: ASABE.
9. ASABE Standards. 2008. EP406.4: Heating, Ventilating, and Cooling Greenhouses. St. Joseph, Mich.: ASABE.
10. Sanford, S., et al. 2009. Energy Self Assessment tools, University of Wisconsin-Madison, Available at: http://www.ruralenergy.wisc.edu/.
11. UI-Urbana-Champaign. 2009. Agricultural Ventilation Fans—Performance and Efficiencies, Bioenvironmental and Structural Systems Laboratory (BESS Lab), University of Illinois-Urbana-Champaign. Available at: http://www.bess.uiuc.edu/.
12. Directory of Certified Product Performance. 2008. Gas Appliance Manufacturers Association, Available at: http://www.ahridirectory.org/ahridirectory/pages/home.aspx.

Table 1 used courtesy of the American Society of Agricultural and Biological Engineers, ASABE S612, July 2009.