

All about Farm Energy Audits

Mike Morris

**National Center for
Appropriate Technology**

**Energy Training for Agriculture Professionals
October 1, 2009**



National Center
for Appropriate
Technology



ATTRA

National Sustainable Agriculture Information Service

www.attra.ncat.org

This talk will cover

- Farm Energy 101
- The Rural Energy for America Program
- Farm energy audits



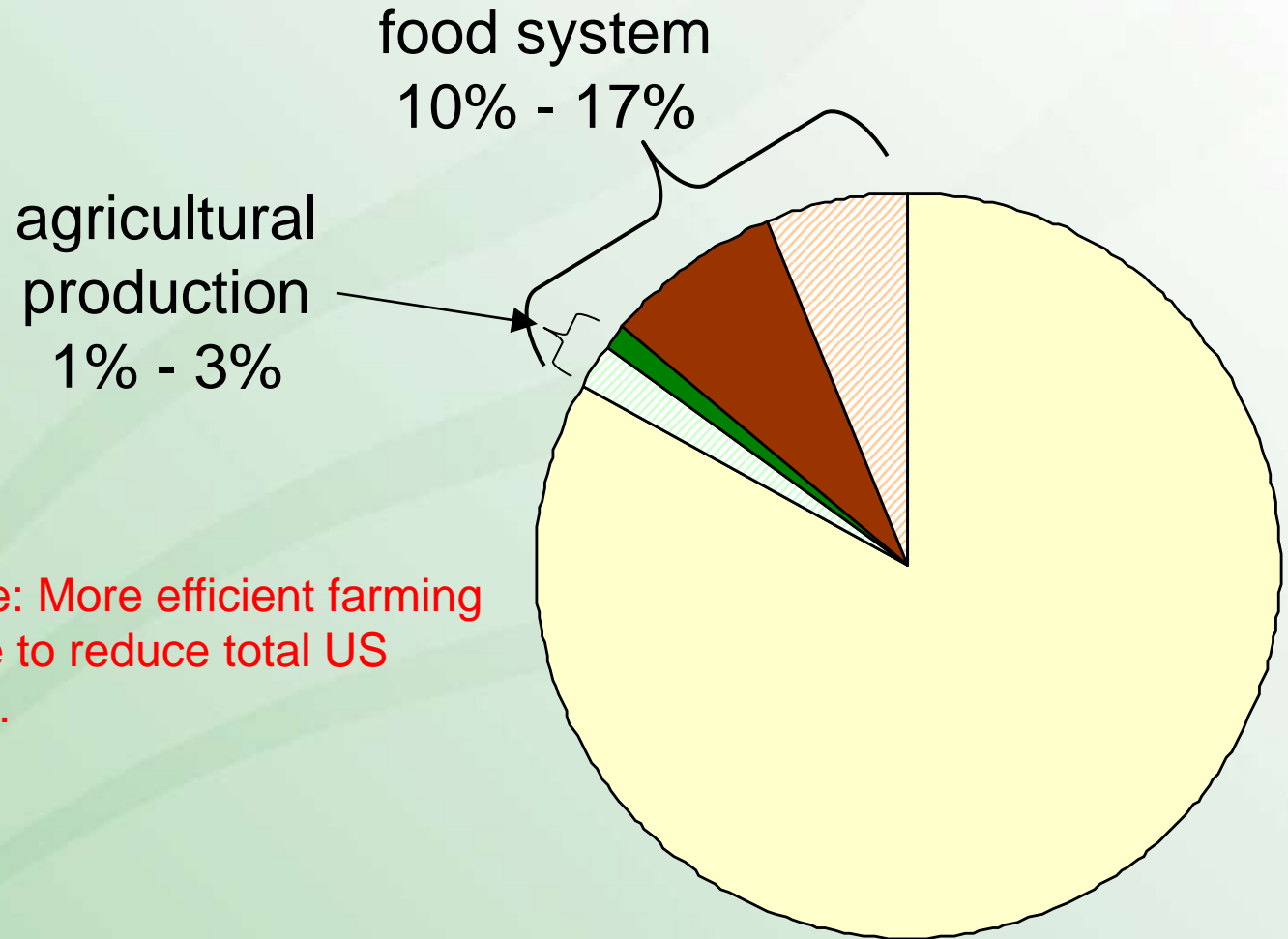
PART 1: Farm Energy 101

Agricultural (on-farm) production accounts for what percentage of total US energy consumption?

- A. 1-3%
- B. 15-18%
- C. 30-33%
- D. More than 99%



Agricultural production: 1-3% of US energy consumption (direct & indirect combined)



Take-home message: More efficient farming practices will do little to reduce total US energy consumption.

Source: John Hendrickson, 1996. *Energy Use in the U.S. Food System: a Summary of Existing Research and Analysis*. Madison, WI: Univ. of Wisconsin, Center for Integrated Agricultural Systems.



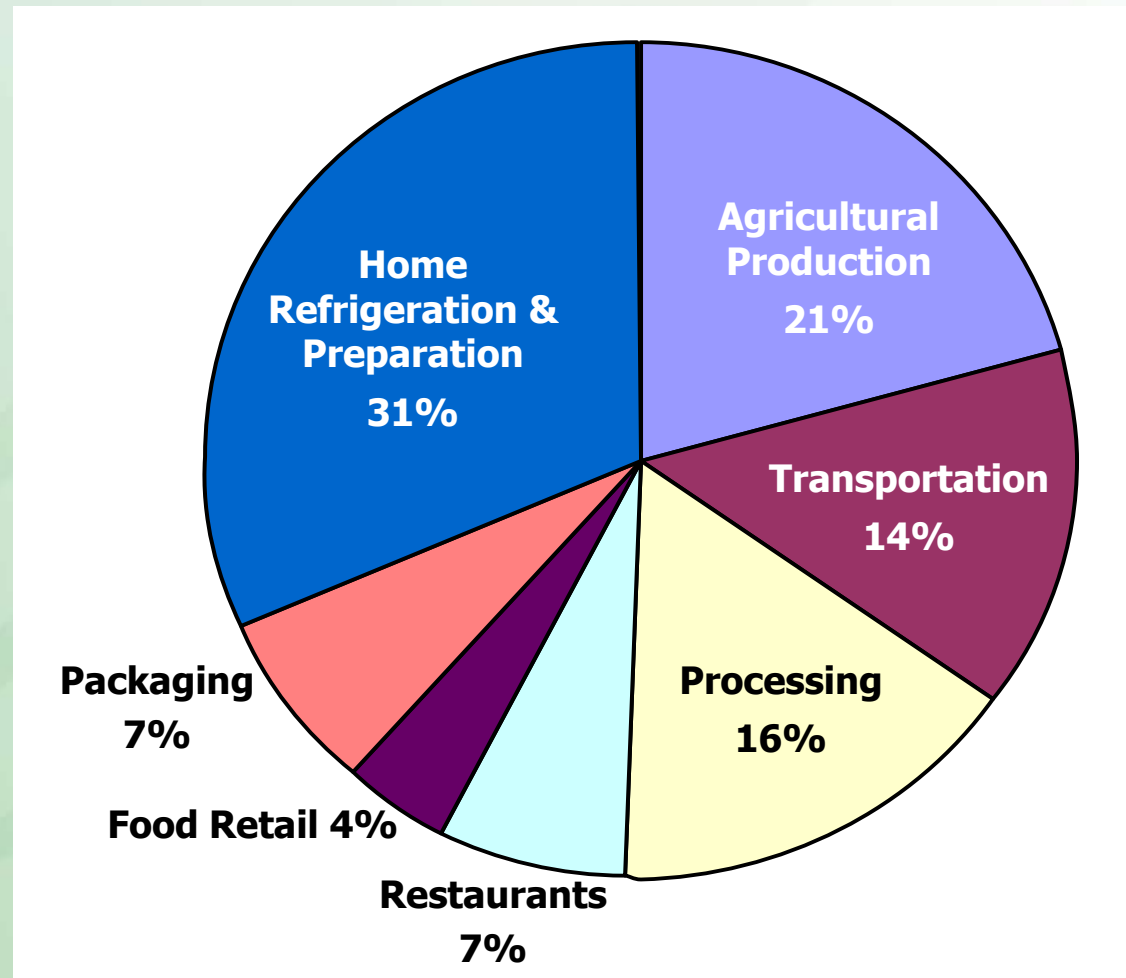
What's the largest energy user in the US food system?

- A. Food packaging
- B. Food processing
- C. Food transportation
- D. Home refrigeration and preparation



Energy usage in the US food system (Btu): mostly for marketing and food preparation

Take-home message:
“Food miles” are
important but
over-emphasized?



Source: M.C. Heller, G.A. Keoleian. Assessing the sustainability of the US food system: a life cycle perspective, *Agricultural Systems*, 76, (2003).



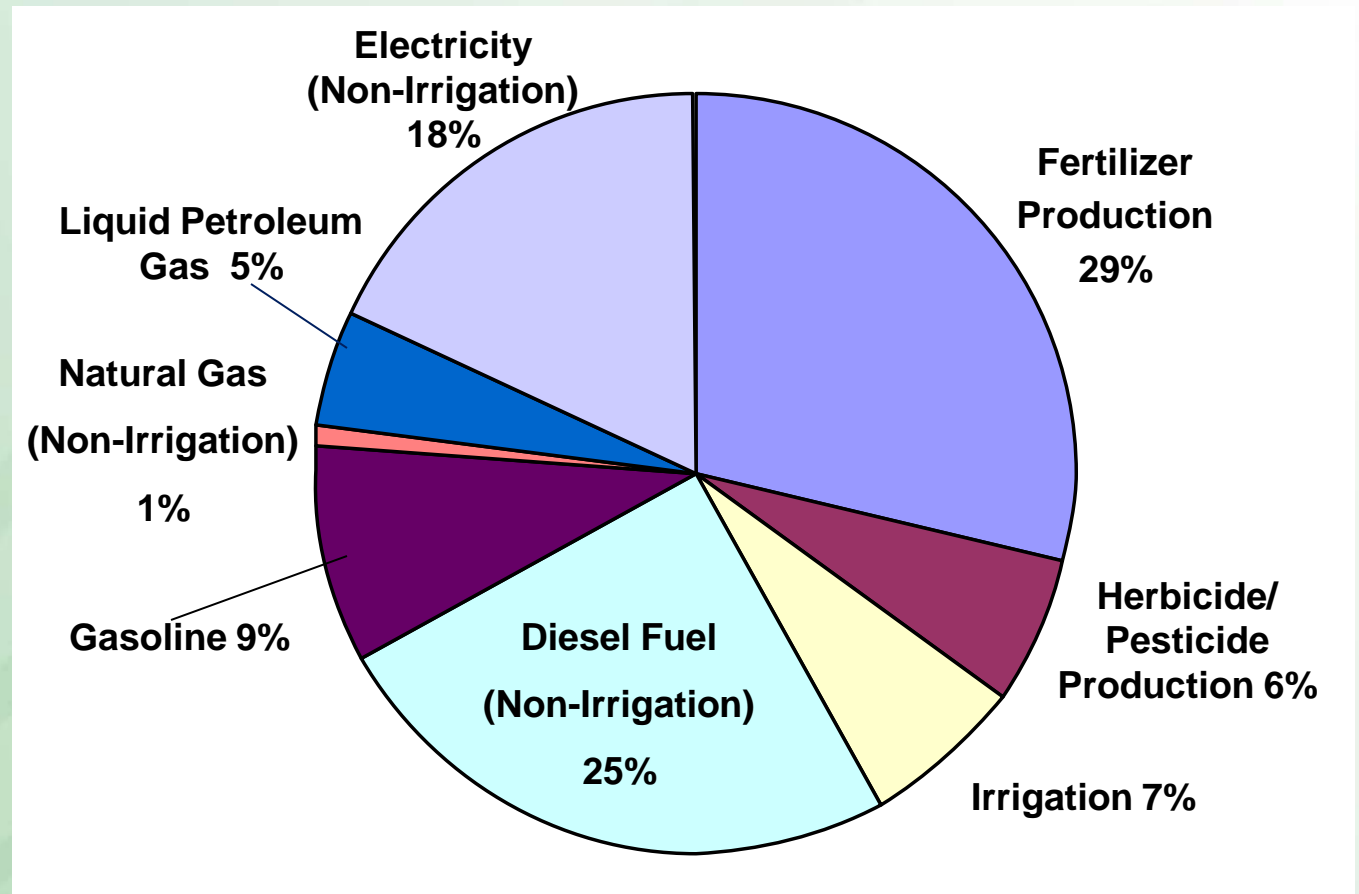
What's the largest energy user (Btu) in US agricultural production?

- A. Diesel fuel
- B. Lighting
- C. Fertilizer production
- D. Irrigation



How energy is used in US agriculture (Btu)

Take-home message:
Nutrient management
has a large indirect
energy component.



Source: John Miranowski, Energy Consumption in US Agriculture. In *Agriculture as a Producer and Consumer of Energy*, CABI Publishing, 2005.



The real issue with farms and energy

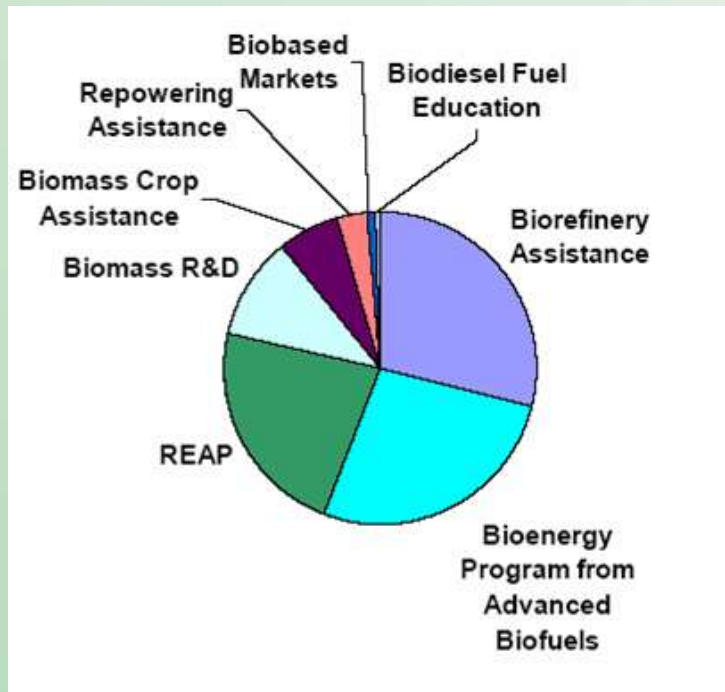


“Most of the problems our food system faces today are because of its reliance on fossil fuels, and to the extent that our policies wring the oil out of the system and replace it with the energy of the sun, those policies will simultaneously improve the state of our health, our environment, and our security.”

- Michael Pollan



PART 2: Rural Energy for America Program



Funding for energy title programs
2008 Farm Bill

- Competitive grant and loan program
- Administered by USDA Rural Development.
- Formerly known as “Section 9006 Program”
- More than doubled in size in 2008: \$60 million in the current fiscal year and \$255 million over 4 years.
- www.farmenergy.org



2002 Farm Bill

- 9 numbered energy sections (9002-9010)
- \$800 million in Energy Title (mandatory)

Food, Conservation, & **Energy** Act of 2008

- 12 numbered energy sections (9002-9013), 6 new
- \$1.1 billion in Energy Title (mandatory)

Beyond the Energy Title

Many USDA agencies have energy programs and funding.
Examples:

- NRCS Conservation Innovation Grant Program (\$37.5 million per year)
- USDA Value-Added Producer Grant Program (\$15 million per year)



Eligible Technologies for REAP

- Energy efficiency
- Solar: thermal & electric (PV)
- Wind: large & small
- Biomass: biofuels, digesters, bioheat, biomass power, pellet plants
- Geothermal: heat pumps, direct geothermal
- Hydrogen
- Hydroelectric
- Algae biodiesel
- Ocean power: wave, current, thermal



Eligible Applicants and Requests



- **All rural small businesses** are eligible – not just farms.
- “Rural” = population < 50,000
- Grants: up to 25% of eligible project costs.
- Loan guarantees: up to 75% of eligible project costs.
- Feasibility studies: up to 25% of study cost, \$50,000 maximum.

Request Size Limits

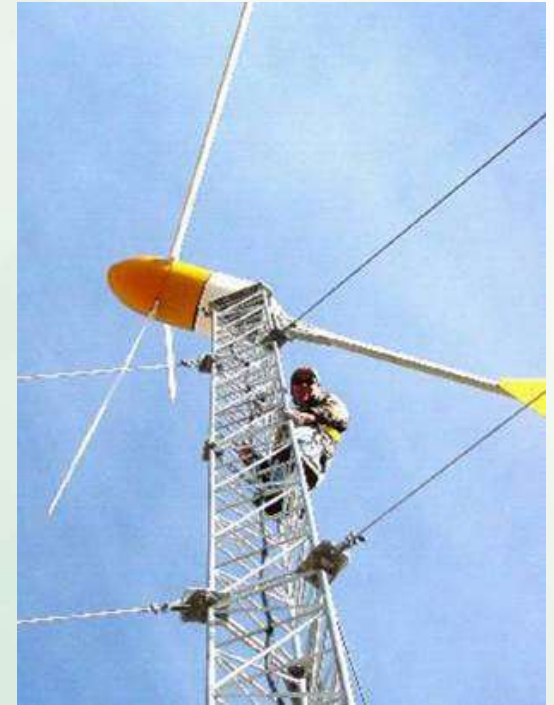
Renewable Energy

- Grant requests \$2,500 to \$500,000
- Request over \$50,000 requires a feasibility study by a qualified independent consultant.

Energy Efficiency

- Grant requests \$1,500 to \$2,500,000
- Total project cost over \$50,000 requires an **energy audit**.

Loan Guarantees \$5,000 to \$25 million. (Renewable energy or energy efficiency.)



REAP projects funded (grant or loan guarantee)

	2003	2004	2005	2006	2007	2008	Total
Alabama	0	1	0	2	0	3	6
Arkansas	0	0	0	0	1	4	5
Florida	0	0	0	1	0	0	1
Georgia	0	0	1	0	3	44	48
Iowa	9	7	37	51	55	86	245
Kentucky	0	0	0	0	0	5	5
Louisiana	0	0	1	0	1	5	7
Minnesota	22	25	18	32	21	53	171
Mississippi	5	42	3	21	26	18	115
Nebraska	6	15	37	151	102	170	481
North Carolina	1	0	3	1	18	37	60
South Carolina	1	0	1	4	1	6	13
Tennessee	0	0	1	5	1	10	17
Texas	2	1	0	0	2	1	6
Virginia	1	2	0	0	2	1	6



Barriers to REAP success

- Limited access to energy audits.
- Limited access to grant writers.
- Extremely difficult application process.

New (2009) steps to address these concerns

- New (separate) grant program to pay for energy audits.
- Block grants to states.
- 20% of funds set aside for small projects (grant < \$20,000).



Winning REAP funds: how Iowa does it.

- Utilities have audit staffs.
- Utility auditors work directly with REAP grant writers.
- Alliant Energy: Close to 200 REAP proposals (through 2008); 97% success rate.
- Aggressive Iowa office of USDA Rural Development: workshops, lists of auditors and grant writers, explanations of rules, application templates, etc.
- State ag organizations understand REAP and work together to promote the program.
- “Cookie cutter” proposals, especially grain dryers.



PART 3: Energy Audits



NCAT Research 2008-9

- Published data (where available) from energy efficiency programs.
- Interviews with
 1. Energy audit providers (about 20)
 2. Agricultural producers (about 100)
 3. Agencies, utilities, energy advocacy organizations, grassroots farming organizations (about 10)
- Separate study of do-it-yourself farm energy audits (calculators).
- Research funded by the USDA Risk Management Agency.



What is an energy audit?

A study of energy usage, conducted for the purpose of saving energy and money.

Normally includes:

1. A description of current (baseline) energy usage, based on an inspection, survey, or inventory of existing energy-consuming processes and equipment, and
2. A description of possible changes or measures that could reduce energy consumption and/or cost.



What Extension staff should know about farm energy audits:

1. Auditing a farm is different from auditing a home.

- Farms are more diverse than residential buildings.
- Farms are more “holistic” than homes in their use of energy.
- Farms are business enterprises. People depend on them to make a living.



2. Energy audits are not rocket science.

- Group energy use into categories, e.g. lighting, fans/ventilation, water heating, space heating, well pumps, irrigation pumps, refrigeration.
- Beginning with the category likely to account for the most energy use, list on-farm equipment. Include nameplate horsepower size or watt rating.
- Identify “low-hanging fruit”: simple, low-cost measures likely to produce significant energy savings.
- Further analysis to identify more complicated or risky measures, or those with long paybacks.



3. Farm energy audits are mostly paid for by utilities, although REAP is changing this.

- Most utilities contract with third parties.
- Very few companies offering energy assessment services specialize in agriculture.
- EnSave, GDS Associates, and other companies send trained but lower-paid ***data-gatherers*** to the farm.
- Recently, many state and non-profit organizations have created and funded farm energy audit programs.



4. Farm energy audits are not cheap.

- A simple pump test commonly costs a few hundred dollars.
- A basic audit (suitable for REAP) commonly costs \$1,000 to \$2,000.
- Cost of auditing a large farm or rural business typically much higher, as much as tens of thousands of dollars



5. Outside of REAP, qualifications and training are not clearly defined.

- REAP audits must be “conducted” by a P.E. or Certified Energy Manager.
- Until recently, no standard procedures or protocols existed.
- In summer of 2009, the American Society of Agricultural & Biological Engineers (ASABE) developed and published a standard.



6. Availability of farm energy audits remains poor in most states.

- NCAT identified 27 states with current or recent programs that (a) are exclusively or primarily focused on providing energy audits to agricultural producers and (b) appear to be suitable for the REAP program.
- The availability of audits in most of these states is limited to a few counties or nonexistent.
- Most states have limited capacity of their own to perform farm energy audits. Many contract with the Vermont-based company EnSave, Inc.
- As of January 2009, EnSave reported present or pending activities and programs in 13 states and past programs in an additional 11 states.



7. Many energy professionals and utilities see agriculture as difficult.

“Expense is the barrier. The energy savings are generally meager [and] it doesn’t make sense to bother with it...There’s not much [energy] there, and it’s hard to get to...There’s also tremendous diversity in the operations themselves. They’re all ‘first ones’.”

- Experienced industrial and residential auditor



8. The demand for farm energy audits is modest, driven largely by interest in REAP.

- A small survey of 24 Montana farmers found only three willing to pay over \$300 for an energy audit. 6 marked “Zero” and 4 marked “less than \$100.”
- California utility representative: “For our agricultural customers, energy efficiency is not a big deal to them...absolutely not a priority.”
- From another California utility: “Ag is a hard market to reach....Energy efficiency is not a high priority for these customers. Markets are everything. Unless you are very energy intensive (such as a winery with extensive refrigeration or a tomato processor), energy is a secondary concern.”



9. Energy audits alone have a weak reputation for saving energy.

- Many anecdotal reports of low rates of implementation.
- Energy researcher: “The audit is great but telling people what they could do has very little impact...An audit by itself is not particularly useful, but audits are a useful part of a comprehensive program.”
- Energy efficiency organization (Northeastern state): “We used to do farm energy audits but we finally came to our senses and put a stop to it. When I started here we had boxes of audit reports that were completely worthless...They resulted in hardly any measures being implemented at all.”



10. REAP is, first and foremost, a business development program.

- Energy savings count for just 15 out of 130 possible points in an energy efficiency proposal.

11. Within REAP, energy audits are part of the applicant's burden of proof.

- Very different from utility programs and NRCS programs.



12. Misconceptions about REAP

- Every REAP applicant needs to have a professional energy audit.
- A professional engineer must visit the farm.
- The audit must be a “comprehensive” or “whole farm” energy study.
- REAP is mainly an agricultural (as opposed to a rural small business) program.



Hallmarks of successful energy efficiency programs in rural areas

1. Delivering consistently excellent services over a period of years.
2. An appreciation for how rural people learn—including the importance of word-of-mouth information and trusted relationships.
3. Strongly involving established and trusted agricultural organizations, e.g. equipment dealers, installers, commodity groups, and **the Extension system**.



Hallmarks of successful energy efficiency programs in rural areas

5. Rebates and other targeted “prescriptive” incentives that are inexpensive to administer, known to save energy, and do not involve any guesswork about whether the energy saving measure will be installed.
6. Flexible approaches, phone assistance, “walk-through audits,” and other cost-effective alternatives to full-blown audit with a written report.



Take-Home Messages for Energy Educators

- Using energy audits to save energy is like having doctors make house calls to promote public health.
- Energy audits should be viewed mainly as important for gaining access to REAP.
- Extension's help on energy efficiency is badly needed. The opportunities and the need are great.
- Equipment dealers, installers, and manufacturers also need to be much more involved.





ATTRA

National Sustainable Agriculture Information Service

www.attra.ncat.org

1-800-346-9140 (English) 7 a.m. to 7 p.m. Central time

1-800-411-3222 (Español) 8 a.m. to 5 p.m. Pacific time



