

**ENERGY EFFICIENCY PROGRAMS IN AGRICULTURE:
DESIGN, SUCCESS, AND LESSONS LEARNED**

Elizabeth Brown, R. Neal Elliott, and Steven Nadel

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1001 Connecticut Avenue, NW, Suite 801, Washington, D.C. 20036
(202) 429-8873 phone, (202) 429-2248 fax, <http://aceee.org> Web site**

TABLE OF CONTENTS

ACKNOWLEDGMENTS	III
EXECUTIVE SUMMARY.....	V
INTRODUCTION	1
ACEEE PROGRAM REVIEW METHOD	2
RESULTS	5
Defining Success.....	5
Program Categories.....	6
Results and Discussion	8
Program Focus.....	10
Targeting Programs by Market and Audience.	11
Programs by Type.	13
RECOMMENDATIONS FOR PROGRAM DESIGN AND DEVELOPMENT	18
Recommendation 1: Clearly Define Goals and Objectives	19
Recommendation 2: “Know thy Implementer”	20
Recommendation 3: Agriculture-Focused and Agriculture-Included Programs Work	21
Recommendation 4: Target Your Program Evaluation	22
CONCLUSIONS.....	23
REFERENCES	25
APPENDIX A: MODEL PROGRAMS	27
Introduction.....	27
Program Title: Farm Rewiring, Audit and Timer Project (WI).....	28
Program Title: Pump Efficiency Testing Program (ID)	29
Program Title: LEPA Irrigation Assistance Program (W-Y Well Demonstration).....	30
Program Title: Variable Speed Drive Demonstration (PA).....	32
Program Title: Auburn University	33
Program Title: Minnesota Demonstration Grant Program.....	36
Program Title: Texas PV	37
Program Title: Scientific Irrigation Scheduling (ID).....	38
Program Title: NDSU Education	39
Program Title: FlexTech (NY).....	40
Program Title: Minnesota Whole Farm Planning	41
Program Title: Education and Training Program (Ag Energy, ID)	42
Program Title: Agricultural Efficiency Technical Assistance (ID)	43
Program Title: North Carolina Animal and Poultry Waste Management.....	44
Program Title: Pump Tests and Hydraulic Services Program	45
Program Title: CA Education, Training, and Services Program	47
Program Title: FarmSave Energy Project (WI)	48
Program Title: Southeastern Regional Biomass Energy Program (SERBEP).....	49
Program Title: Agricultural Innovations (NY)	51
Program Title: AM400 Soil Moisture Data Logger (NW)	52
Program Title: Agrimet Weather Station (NW).....	53
Program Title: Smart Equipment Choices (NY).....	54
Program Title: Efficiency Maine Commercial and Industrial	55
Program Title: Variable Speed Drives (CA).....	57

Program Title: Irrigation Water Management Program.....	58
Program Title: Agricultural Pumping Efficiency Program (CA)	59
Program Title: Energy in Agriculture (CA).....	61
Program Title: Georgia Combined Agricultural Programs.....	64
Program Title: Xcel Energy Farm Energy Conservation Improvement Program	66
Program Title: Efficiency Vermont	67
Program Title: Focus on Energy-Agriculture and Rural Business Sector	68
Program Title: Oregon Dairy Waste to Energy	69
Program Title: Michigan Variable Speed Drive Program	72
Program Title: Maine DOA Assistance Grants and Loans.....	73
Program Title: New York Variable Speed Drive Program.....	75
Program Title: Indiana Distributed Generation Program.....	76
Program Title: Minnesota Shared Savings Loan Program	77
Program Title: CA Standard Performance Contract	78
Program Title: EnergySmart Loan Program (NY).....	79
Program Title: Farm Bill Section 9006.....	80
Program Title: Idaho Industries of the Future.....	81
Program Title: Express Efficiency Rebates (CA).....	82
Program Title: Hawaii Energy Performance Contracting Program.....	83
Program Title: Combined Heat and Power (CHP) Program (NY)	85
Program Title: C&I Performance Program (NY)	86
Program Title: New Construction Program (NY).....	87
Program Title: Incentive Program for Idaho Irrigators.....	88
Program Title: Peak Load Reduction Program (NY)	89
Program Title: Farm Load Response Program (VT)	90
Program Title: Agricultural Peak Load Reduction Program (CA)	91
Program Title: National Renewably Production Tax Credit.....	93
Program Title: Montana Energy Efficiency Investment Tax Credit.....	94
APPENDIX B: MODEL PROGRAM DESIGNS	95
Introduction.....	95
State-Funded Model Program	95
Utility/SBC Programs	96

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Executive Summary

The purpose of this report is to review extant programs promoting energy efficiency in the agriculture sector. We identified and reviewed a total of 52 programs nationwide (see Table ES-1). Our review consisted of determining the motivation for the program, obtaining a program description, and evaluating program impact and success (based on informal and formal evaluations). From this information, we were not only able to summarize, to a certain extent, the impact of programs promoting energy efficiency in the agriculture sector, but also cull lessons learned from these programs and provide recommendations for future programs in this sector.

Because of the farm-type and regional diversity in the agriculture sector, the programs were reviewed individually and grouped into a variety of categories, based on the individual reviews. These groups included the program geographic scope, focus (technology, farm-type, or both), energy focus (efficiency or renewable), whether or not there was a focus on the agriculture sector, and program type.

The results of these categorizations are summarized in Table ES-1. Note that the programs often do not fall cleanly into the categories. This is due to the variety of programs, goals, and motivations in the agriculture sector.

Viewing the programs as a group through this variety of lenses, we were able to identify what made programs successful (in terms of program-defined goals, as well as energy and cost savings where available) and form recommendations for designing future programs. These recommendations include the following.

- Clearly define program goals and objectives: Agriculture programs that promote energy efficiency often also have other non-energy goals. Clearly defining the goals for both energy and non-energy factors are the only ways to determine if the program meets its objectives.
- “Know thy implementer”: Agriculture programs that met their goals most often were locally implemented or were designed to appear that way. The agriculture sector is a sector with a rich history, and local community networks are extraordinarily important for program credibility.
- Agriculture-focused and agriculture-included programs work: While it is important for the agriculture community to know and trust the program implementer, programs with a wider breadth than the agriculture sector also accomplished their stated goals. That is, with agriculture-specific marketing and attention, even broad multi-sector programs were able to make progress in the agriculture sector.
- Target program evaluation based on the goals and objectives: Because of the limited financial resources and relative lack of importance to the individual program, evaluation for energy and cost savings was not generally the priority of program implementers. In order for the larger-scale impacts of energy efficiency in the agriculture sector to be quantified, however, evaluation must be a major priority. We recommend that

evaluation be a priority, regardless of the goals of the program, and that quantification of energy and cost benefits be considered very important for the long-term sustainability of programs promoting energy efficiency in the sector.

Table ES-1: Numeric Results by Category

Typology	Categories	Description	Total Programs
geographic scope	national	The program is funded AND implemented at the federal level.	2
	other (regional)	The program is funded AND/OR implemented at the regional level. Includes multi-state regional and intra-state regional programs.	19
	state	The program is funded AND/OR implemented at the state level.	31
program focus	technology	The program is specifically promoting the use of a specific technology or technology type (e.g., energy-efficient motors).	19
	farm-type	The program is specifically targeted at a farm-type (e.g., dairy farms). In order to qualify for the program, you must fall into that specific farm-type. Note: this is based on the program description.	2
	both	The program is specific in terms of the technology being promoted, as well as the specific farm-type qualification for the applicant (e.g., motor efficiency upgrades for dairies).	2
	neither	The program is generalist and promotes multiple measures to multiple farm types.	28
energy focus	energy efficiency	Program covers only energy efficiency	28
	renewable energy	Program covers only renewable energy	2
	both	Program allows for both energy efficiency and renewable energy	22
agriculture focus	primary	The program is only open to agriculture and rural businesses.	32
	included	The agriculture sector may participate in the program.	20
program type	audit only	The program only provides for energy audits. Note: only energy audit programs targeted at or largely used by agriculture are included in the database, and individual utility audit programs are not included.	2
	demonstration	Programs that provide funding for demonstration projects only.	6
	financial incentive	Programs that provide a direct financial incentive such as a grant or a loan for project completion. Note: no demonstration projects in this category	11
	education	Program offers outreach, information, and education to an agricultural market. Also included in this category are help-line programs.	10
	financial incentive and education	These programs combine outreach, information, and follow-up with a direct financial incentive.	18
	tax related	Tax credits and deductions	2
	peak load reduction	These programs are intended to reduce grid stress during high price or demand periods.	3

Introduction

Nationwide, the agricultural sector accounts for about three percent of total electricity use, comparable to the energy used by all residential air conditioners or by the entire hospital or retail food sales sectors (CBECS 1999; RECS 2001). Energy expenses are also a significant portion of the farm budget, accounting for up to 10 percent of total costs (CoA 2004). Since operating margins, especially for small farms, are typically well under 10 percent, energy costs can have an impact on the survival of many farms.

The agriculture sector contributes 1.8 percent to the national gross domestic product (GDP) (BEA 2004). In some states, the agricultural economy is more economically important. In Vermont and Wisconsin, for instance, the sector represents 2.8 percent of the gross state products, and in Kansas, it represents nearly four percent (BEA 2004). This single-sector contribution to the state economy is not only financially but also culturally and politically important. The United States places a high importance on farming and rural lifestyles. In some states, such as Vermont and California, small agriculture is a powerful political force, due to, in part, historical and cultural ties to the land. Programs that promote the economic and environmental sustainability of the agricultural sector are especially important to these states, but are widely prized as positive programs nationwide. Energy efficiency successfully supports both economic and environmental values, and so is a viable and obvious opportunity to be a piece of the suite of programs for stabilizing agriculture energy costs.

Increased energy efficiency has multiple direct effects. The first is decreasing energy costs to the consumer. Efficiency reduces consumption, which reduces bills. Furthermore, because farms are run with small profit margins, and because energy costs can exceed profit margins, cutting energy costs can significantly improve the survival and profit picture for many farmers. Second, by decreasing grid upgrade costs, energy efficiency contributes to a healthy economy. Reduced loads allow the postponement of costly electric grid upgrades. This effect is especially important in rural areas, since grid upgrades for individual farms, not to mention wholesale power purchases, can be expensive for electric cooperatives and other utilities. Third, increased energy efficiency also promotes local economic development. Relative to a business-as-usual scenario, energy efficiency investments promote job creation, increased tax revenue, and new technology sales (Geller, DeCicco, and Laitner 1992). Finally, energy efficiency lays the groundwork for improved renewable energy economics. Energy efficiency can help reduce the high cost of renewable energy by reducing generation needs.

Programs for energy efficiency range from simple tax incentives for individuals as a reward for energy-efficient behavior to large training programs for corporate executives in new energy- and money-saving processes. Different sectors have differing needs, however, and programs are generally targeted within a sector so as to increase their impact while maximizing program resources by not advertising to an uninterested audience. It would make little sense, for instance, to market an energy efficiency program giving a rebate on residential refrigerators to the chemical production industry.

This report identifies sector-specific program challenges by critically viewing extant agriculture energy efficiency programs. To that end, ACEEE completed a review in the fall of 2004

of energy efficiency programs that target the agricultural sector exclusively or as a significant part of their offerings. The purpose of the program review was to identify the most successful strategies for continued programs in the agricultural sector.

ACEEE Program Review Method

The program review was carried out in the summer and fall of 2004. The term “program” was defined as a free-standing entity that encourages energy efficiency in the agriculture sector. This definition gave us the opportunity to compare programs run in different regions and by different implementing agencies. A list of the programs we reviewed is provided in Table 1. While this definition allowed us to identify the strengths and weaknesses of narrowly defined programs, it limited the approach in that it does not reveal the program breadth of some implementing agencies. If the information was available, we note where a program was part of a larger set of programs.¹ Also potentially lost in this type of characterization is the effect of the bundle of programs over the effect of the single program in a bundle. Through identifying a variety of success metrics, we hope to account for the benefits or challenges to programs that are parts of bundled programs.

Program information was collected through Web and literature searches, as well as phone and in-person interviews. For each program, an attempt was made to find a manager or other representative to discuss the program, the energy-saving results (including a review of available evaluations) and potential, and the lessons learned. Table 2 is a list of data fields for which we collected information. Note that not all programs were able to furnish all information for the program review. Generally, we attempted to get a complete picture of the program through anecdotal means if formal evaluations were not readily available.

Table 1: Programs Reviewed

Geographic Region	Program Name
Alabama	Auburn University Demonstrations
Alabama, Arkansas, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Mississippi, Missouri, North Carolina, Puerto Rico, South Carolina, Tennessee, U.S. Virgin Islands, Virginia, West Virginia	Southeastern Regional Biomass Energy Program
California	CA Standard Performance Contract
California	Variable Speed Drives (CA)
California	Peak Load Reduction Program (CA)
California	Energy in Agriculture (CA)
California	Agricultural Pumping Efficiency Program
California	CA Education, Training, and Services Program
California	Express Efficiency Rebates (CA)
Colorado	Low Energy Precision Application (LEPA) Irrigation Assistance Program
Colorado	Irrigation Water Management Program
Georgia	Georgia Combined Agricultural Programs

¹ The Georgia Suite of Programs is the exception to this. That program has many facets with multiple audiences and farm types. The programs are so integrated at the University of Georgia, however, that they are presented as one opportunity.

Geographic Region	Program Name
Hawaii	Energy Performance Contracting Program
Idaho	Scientific Irrigation Scheduling (ID)
Idaho	Pump Efficiency Testing Program (ID)
Idaho	Education and Training Program (Ag Energy, ID)
Idaho	Agricultural Efficiency Technical Assistance (ID)
Idaho	Idaho Industries of the Future
Idaho	Incentive Program for Idaho Irrigators
Idaho, Montana, Oregon, Washington	AM400 Soil Moisture Data Logger (NW)
Idaho, Montana, Oregon, Washington	Agrimet Weather Station (NW)
Indiana	Indiana Distributed Generation Program
Maine	Efficiency Maine Commercial and Industrial
Maine	Maine DOA Assistance Grants and Loans
Michigan	Variable Speed Drives (MI)
Minnesota	Minnesota Demonstration Grant Program
Minnesota	Minnesota Shared Savings Loan Program
Minnesota	Minnesota Whole Farm Planning
Minnesota	Xcel Energy Farm Energy Conservation Improvement
Missouri	Missouri Demonstration Sustainable Agriculture
Montana	Montana Energy Efficiency Investment Tax Credit
New York	EnergySmart Loan Program (NY)
New York	CHP (NY)
New York	New Construction Program (NY)
New York	Peak Load Reduction Program (NY)
New York	C&I Performance Program (NY)
New York	Smart Equipment Choices (NY)
New York	FlexTech (NY)
New York	Agricultural Innovations (NY)
North Carolina	North Carolina Animal and Poultry Waste Management
North Carolina	NC Energy Office Pilot Programs
North Dakota	NDSU Education
Oregon	Oregon Dairy Waste to Energy
Pennsylvania	Variable Speed Drive Demonstration (PA)
Texas	Texas PV
USA	National Renewably Production Tax Credit
USA	Farm Bill Section 9006
Vermont	Farm Load Response Program (VT)
Vermont	Efficiency Vermont Programs
Wisconsin	FOE Renewable Energy Program (WI)
Wisconsin	Farm Rewiring, Audit and Timer Project (WI)
Wisconsin	FarmSave Energy Project (WI)

Table 2: Program Review Data Fields

Category	Field Name
program vitals	contact
	geographical area served
	types of farms targeted/eligible
	number of farms/people within area eligible to participate in program vs. number participating in program
	implementing agency
	years in operation
	ending date/renewal information
funding	funding (source)
	funding (annual)
	most recent year for which spending and savings are available
	funding (cumulative)
program results	program description
	energy and cost savings annually and to date
	estimated free riders (percentage or numbers)
	other important information
program participants and implementers	strengths of program
	weaknesses of program
	ease of program use
program implementers	case studies available?
	program evaluation available?
	next steps for program/energy efficiency in agriculture

Where applicable, we further inquired about the activity of the program regarding Section 9006 of the Farm Bill: the Energy Efficiency and Renewable Energy Grant and Loan Program. The information we attempted to gather from these programs is listed in Table 3.²

Table 3: Section 9006 Specific Program Data Fields

Category	Field Title
program implementers	How many farms in the program applied for the 9006 grant program in 2003 and 2004?
	How many were successful?
	Why did others not elect to apply or were turned down?
	How many are planning to apply?
for applicants	overall experience
	strengths of the process
	weaknesses of the process
	suggested improvements

This program review is not intended to be a comprehensive listing of all programs available encouraging energy efficiency in the agricultural sector. Rather, the review has been limited to include programs that focus on agricultural energy efficiency and energy efficiency programs with substantial agricultural sector participation. It is the intention of this review to cover a wide range of program-types available for the sector, in order to determine approaches that can deliver energy or economic savings while meeting the special needs of the agricultural sector.

² These are the same program inquiry fields used in the 2003 ACEEE 9006 Applicants Review. That review is detailed in December 3, 2002 comments to USDA (ACEEE 2002).

Results

Over the years, a number of programs that encourage energy efficiency have been available to the agricultural sector. Well-planned and -executed energy efficiency programs have been repeatedly shown to effectively promote energy efficiency and all the benefits that accompany it. In the agriculture sector, these programs have been diverse, reflecting the unique needs of the sector both programmatically and technologically.

This being the first survey in recent years of this kind in the agriculture sector, important data availability gaps were expected and identified. First, the program review, although as comprehensive as possible, may be lacking small or unpublicized agricultural energy efficiency programs. Second, not all inquiry fields have been completed for all projects. This means that the results for the program review do not include specific data such as the total amount of money spent on and saved by energy efficiency programs in agriculture. Wherever possible, programs with similar goals or aligned savings metrics are compiled to show savings.

Defining Success

In subsequent sections of this report, we identify a variety of programs and program attributes that appear to be most successful. These programs and attributes were identified using a mixture of quantitative data and qualitative assessments.

First, as noted above, many programs did not have quantitative data available. Still, where such data was available, we used them. In particular, we looked for high participation rates (a large percentage of eligible customers were participating) and high energy savings relative to the other programs for which data were available.

Second, finding that a majority of the programs did not report specific energy or cost savings, but knowing that the programs had been of assistance to farmers, we defined another form of success. We found through reviewing the programs that energy and cost savings are far from the only measure for success of programs in this sector. Program implementers largely valued program participation, information transfer, and incentive output as measures of success for programs. These measures, while not as quantitatively strong, serve the needs of the programs according to the program implementers and allow more of the program funding to be delivered to the agriculture community.

For example, this review found that a major goal for education programs was to encourage information transfer of appropriate material. There is a lack of information transfer in the agriculture sector due to high sector diversity regionally and by farm-type. For instance, while there are multiple ways to irrigate crops, and preference and need lead to differences between how that is done in California and Florida, the California Education, Training and Services program provides information on techniques used in Florida, in the event that the same system will work for some farms in California. In this way, education programs raise awareness of best practices and energy efficiency as a resource for production cost stabilization. Although there is not a measurement of specific energy or cost savings, the informal ability to lower information transfer barriers contributes to making the program a success.

A limitation of specific programs goals and informal evaluation based on those is an inability to prepare cumulative savings across multiple programs and compare programs to each other based on quantitative measures. It is because of this difficulty that the program characterization typology was drawn up to compare programs. Where data was available, and programs were similar enough to warrant it, cumulative cost and energy savings data is calculated. For other programs, the goals and measurements of success are based on the goals of the program, as stated by the program implementer.

Further, findings indicate that the diversity and uniqueness of the agriculture sector may not demand such a specific savings number from all programs to reflect successful programs unless a national role for energy efficiency in the sector is to be undertaken. Energy efficiency gains in this sector are rarely the primary objective of programs. Instead, energy efficiency is part of a suite of benefits that programs offer to farmers. Even the programs targeting energy efficiency directly tout non-energy benefits³ in concert with energy efficiency benefits.

While we have determined a way to define success that prioritizes the local impacts of the program and its goals, the longer-term and national implications for this informal evaluation structure is problematic. On the national scale, energy efficiency in agriculture has the potential not only to help stabilize agriculture production expenses, but also decrease stress on the grid and reduce pollution produced in electricity production. In order to make the case for national support of energy efficiency in agriculture, evaluation of actual cost and energy savings will be a major goal and is an area for further research.

The following section outlines the characterization scheme and categorizes and reviews the success of extant programs in an effort to assist program implementers to improve current program and design and carry out future programs for the agriculture sector. For a detailed look at individual programs, please see Appendix A.

Program Categories

Each program has been categorized by four different metrics: energy focus, scope, program focus, and program type. Table 4 provides brief descriptions of the typology system. These separate typologies allow program implementers to choose their priorities for their program and see previous examples of program implementation.

The first categorization is geographic. There are three geographic categories: national, state, and other. Generally, this categorization refers not only to the program funding agency, but also to the primary implementer of the program. For instance, a program that is funded through the federal government, but designed and implemented through a state or other entity, is not a federal program (i.e., the Georgia suite of programs). “Other” refers to both multi-state efforts and programs that are offered regionally within states. For example, programs offered by utilities often cover partial areas within states, and regional program im-

³ Non-energy benefits represent the side effects of increased energy efficiency projects. These include increased comfort, productivity, lower costs, etc.

plementers often cover multiple states with single programs. Both are included in this definition of “other.”

Table 4: Category Descriptions for Program Typologies

Typology	Categories	Description
geographic scope	national	The program is funded AND implemented at the federal level.
	other (regional)	The program is funded AND/OR implemented at the regional level. Includes multi-state regional and intra-state regional programs.
	state	The program is funded AND/OR implemented at the state level.
program focus	technology	The program is specifically promoting the use of a specific technology or technology type (e.g., energy-efficient motors).
	farm-type	The program is specifically targeted at a farm-type (e.g., dairy farms). In order to qualify for the program, you must fall into that specific farm-type. Note: this is based on the program description.
	both	The program is specific in terms of the technology being promoted, as well as the specific farm-type qualification for the applicant (e.g., motor efficiency upgrades for dairies).
	neither	The program is generalist and promotes multiple measures to multiple farm types.
energy focus	energy efficiency	Program covers only energy efficiency.
	renewable energy	Program covers only renewable energy.
	both	Program allows for both energy efficiency and renewable energy.
agriculture focus	primary	The program is only open to agriculture and rural businesses.
	included	The agriculture sector may participate in the program.
program type	audit only	The program only provides for energy audits. Note: only energy audit programs targeted or largely used by agriculture are included in the database, and individual utility audit programs are not included.
	demonstration	Programs that provide funding for demonstration projects only.
	financial incentive	Programs that provide a direct financial incentive such as a grant or a loan for project completion. Note: no demonstration projects in this category.
	education	Program offers outreach, information, and education to an agricultural market. Also included in this category are help-line programs.
	financial incentive and education	These programs combine outreach, information, and follow-up with a direct financial incentive.
	tax related	Tax credits and deductions
	peak load reduction	These programs are intended to reduce grid stress during high price or demand periods.

The second category, program focus, is based on farm-types eligible and has two categories: technology-based and farm-type based. A technology-based program includes multiple farm types and frequently involves a specific technology that can be applied to multiple farm-types. For instance, a program that promotes the use of more efficient motors may be targeted at both the dairy farm-type and any farm-type that irrigates. Alternatively, a farm-type-focused program focuses strictly on one farm type, such as a program that focuses on increasing all aspects of energy efficiency on the dairy farm. These categories are eligibility based. That is, even if only a single efficiency measure is implemented by a program and only one type of farm is eligible to participate, it is still a farm-type, not technology-based program. The final two subcategories in this group are “both” and “general.” “Both” programs are the

narrowest in this category and indicate that a program is not only specific to a technology type, but also specific to the type of farm that is eligible for the program. “General” programs are generalists and do not focus on a specific technology nor farm-type.

The third type of categorization depends on whether the program is restricted to energy efficiency, renewable energy, or not restricted (“both”). These three subcategories are used to assess if the leveraging of larger amounts of funds for programs that cover both energy efficiency and renewable energy allows for a larger program success in energy savings through energy efficiency. Because this is not a review specifically of renewable energy programs, the renewable programs listed do not represent a full listing of those programs, but instead offer a broad overview of available renewable program types. The renewable-only programs included in the database are included because: (1) they are independent programs, integrated with energy efficiency programs, or (2) because they are exemplary programs that include potential lessons learned for current and future energy efficiency programs.

The fourth categorization serves to delineate between programs that are targeting the agriculture sector specifically and those that allow for the inclusion of the agriculture sector, but do not solely focus on agriculture. The purpose of this category is to identify differences in program success when the program is directed specifically at the sector, or if there is opportunity for success in more broad-based programs.

The final categorization is the very traditional separation by program type. In the agriculture sector, there are six primary types of programs: audits only; demonstration; financial incentive; education; financial incentive AND education; and tax related. Many programs covered in the review could have fallen into multiple categories, but were placed in the subcategory that most closely matched their primary action. For instance, a program that promotes demonstration projects through financial incentives (a grant program) has the primary outcome of creating demonstrations and is therefore categorized accordingly. A seventh subcategory of program, peak load reduction, was added to the list of subcategories because of the close association between energy efficiency and peak shaving programs in implementation. These programs emerged from the California energy crisis and the August 14, 2003 East Coast and Midwestern region blackout. Although not specifically energy efficiency programs, nor with the objective of saving energy, these programs are important because they may offer useful lessons learned for reaching the farm audience.

Results and Discussion

Judging from the programs collected in this review, quantitative evaluations for agriculture energy efficiency programs are limited. However, there are simple evaluations (cost, number of projects implemented, number of participants, participation rate, energy savings, etc.) that can reflect the success of a program, even in the absence of complete data. Below we summarize the limited data available. We provide these data in order to summarize what is known quantitatively about agriculture sector programs and also to indicate the data gaps. Furthermore, data were provided by program operators and have not been independently checked. There are inconsistencies in the ways different program operators compile data. Due to these limitations in the data, these figures should be considered indicative rather than

definitive. Available data on individual programs are summarized in Appendix A. Table 5 summarizes trends across programs. As can be seen, for most of the different variables, less than a quarter of the programs report data. In general, larger programs appear to be more likely to report data, which is not surprising since these programs have larger budgets. Overall, the programs available serve nearly half a million farms and 11% of these have participated to date. A few programs are notable in having high participation rates of 30 to 88%. These programs are discussed in Box 1. Annual funding in the most recent year totals \$37 million, with an average of \$3.7 million per program and a median of only \$565,000 per program (a few large programs bring up the average). In some cases, these figures include funding for other sectors because program managers could not separate out agriculture sector funding. In total, the programs for which data are available report savings

of about 1.7 billion kWh in the most recent year. Just six programs report cumulative savings of \$151 million (including some of the largest programs and those that do not separate the agriculture sector), which is greater than the cumulative expenditures of \$81 million re-

Box 1. High Participation and High Savings Success: Efficiency Vermont’s Agriculture Programs, Wisconsin’s Farm-Save Energy Program, and Xcel Energy’s Farm Energy Conservation Improvement Program

These three programs are notable for their high participation and high energy savings results, both evident through each program’s extensive evaluation process. The FarmSave Program is an education-only program and the other two programs include both education and financial incentives to the agriculture sector. The FarmSave Program is implemented through public benefits funding by the EnSave Energy consulting group (see Box 3 below). The outreach and education program attempts to reach out to all farm types and has a broad array of experts to assist farmers with increasing energy efficiency. Participants in this program are also educated about possible financial incentives to perform upgrades, so in this way, the program contributes to even more savings.

The Efficiency Vermont programs also target all farm types, and working in tandem with the other programs in Vermont has nearly a 100 percent contact rate with farmers in the state. The program is a full-service one, including farm energy audits, and education, technical, and financial assistance to carry out recommendations from the audit.

The Xcel Program is also implemented by EnSave Energy, and is comprised of an education and outreach program both through workshops and through direct contact with farmers. The program follows up on the education program by offering cash incentives to the participants to assist in the purchase and installation of energy-efficient equipment.

Because of their focus on evaluation, these programs are able to show that high participation often leads to high savings, indicating that programs with little evaluation funding can track participation as a useful metric for success. Table 1.1 shows the participation and savings results for the three programs.

Table 1.1: Program Evaluation Summary for Three High Participation Programs

Program	Years in Operation	Participation Rate	Total Savings (mill. kWh)
Efficiency Vermont	4	35%	3,000
FarmSave	4	30%	31
Xcel Energy	1	53%	4.1

Sources: program implementers. For more information on specific programs, see Appendix 1.

ported by 16 programs, indicating that the programs likely have positive benefit-cost ratios on average.

Table 5. Summary of Available Data from Programs

Variable	Number Programs Reporting	Minimum Value Reported	Maximum Value Reported	Average of Values Reported	Median of Values Reported	Sum of Values Reported
years program has been in operation	24	0	20	4.8	4	N/A
number of farms eligible for program	17	660	107,000	26,023	35,000	442,393
number of farms participating to date	21	0	35,000	2,258	68	47,423
participation rate	16	0%	88%	14%	2%	11%
funding in most recent year (million \$)	10	0.03	21.0	3.7	0.6	37.1
average annual funding since program inception (million \$)	16	0.04	23.0	5.0	1.4	80.5
estimated savings in most recent year (includes participants from previous years)						
kWh (millions)	8	0.45	792.0	207.2	7.2	1657.2
dollars (millions)	6	0.07	3.5	1.1	0.5	6.8
estimated cumulative savings since inception (includes savings over multiple years)						
kWh (millions)	8	0.50	1,400,000	175,381	5.2	1,403,045
dollars (millions)	5	0.09	79.0	30.2	1.7	151.1

Given the limited data available, the characterization defined above reveals further indicators regarding the relative success and challenges of programs. From the way programs fit into the characterizations, conclusions can be drawn about the most important aspects of programs, including how the programs are rolled out, what type of program is rolled out, and whether or not agriculture and/or energy efficiency is the focus of the program. The following results section reflects both the evaluations presented by the programs and those revealed by the typology.

Program Focus. Table 6 shows the results of programs as broken down by program focus. Energy efficiency and combination renewable energy and energy efficiency are split evenly. Of programs reporting energy savings evaluations specifically for the agriculture sector (seven), four of those were energy efficiency programs with a cumulative savings of 45 million kWh. The fifth program, the NYSERDA Energy Smart Loan program, reported 1.8 million kWh in savings across all sectors, but did not evaluate for sector-specific data. The final program, the Georgia Suite of Energy Efficiency Programs (see Box 2) for agriculture has been running for over a decade longer than any of the other reporting programs and has a track record that is not comparable to the other programs, including 1.7 trillion kWh in savings since its inception in 1984.

Table 6: Agriculture Energy Efficiency Program Breakdown by Program Focus

	National	Other	State	Total	Ag Focused?
energy efficiency	0	11	17	28	21
renewable energy	1	0	1	2	0
both	1	8	13	22	12
total	2	19	31	52	33

More generally, although data limitations do not allow a statistical analysis, we found no difference in available savings numbers for programs that focus on energy efficiency and those that split their focus between energy efficiency and renewable energy. This indicates that independent programs are not required to achieve program goals, including energy savings.

Box 2. The Benefits of Coordination: Georgia Suite of Energy Efficiency Programs

The state of Georgia has a unique and effective approach to promoting energy efficiency in the agriculture sector. In 1984, the state consolidated all of the energy efficiency and renewable energy programs available to the sector under one heading. Today, this broad suite of programs includes irrigation, fertilizer efficiency, ventilation of poultry houses, dairies, precision agriculture, crop drying, and rural housing. Along with a wide variety of services offered, the unified programs create a communication network for program implementers and lower the marginal cost of program evaluation.

Programs are implemented through the University of Georgia and used as a teaching tool for agro economics, environmental studies, and energy engineering students. The University also implements a host of other USDA programs targeted at the agriculture sector and has substantial standing in the community.

The benefits of the program are clear: 1.7 trillion kWh saved based on a \$1.4 million investment since 1984. Under one umbrella, the programs have saved on measurement costs. The unified program is also adept at identifying and eliminating cross incentives.

Source: Miller (2004)

Finally, Table 6 shows that the bulk of programs are run on the state level (regardless of federal- or state-level funding origins). The state-run programs reporting energy savings (13 percent of them) saved a total of 78 million kWh according to their evaluations. Program implementers indicated during their interviews that the prevalence of state programs can be attributed to increased participation in the program if the audience is familiar with the implementer. Our data reflects general trends of more participation in state-run programs than national programs as well. Although only 6 of the 31 state programs reported participation numbers as an evaluation metric, the mean participation was 20 percent and median was 30 percent of total eligible farms in the geographic area. More national and regional programs reported participation as an evaluation metric (nine) but the effectiveness of the programs (in terms of participation) was much smaller with a mean of 5 percent and median of 0.85 percent.

Targeting Programs by Market and Audience. Table 7 summarizes the results from the program focus categorization. First, all but four of the programs are either generalists or tech-

nology based. Farm-type programs that might be expected to be a large number of programs because of the diversity of needs within the farm sector represent less than 5 percent of the total programs in the database. The data reflect another outcome, showing that generalist programs are the primary type, followed by technology-focused programs. Corroborating with our findings, program implementers reported that program guidelines are a reflection of the available funding and not a program direction decision or a factor linked with success.

**Table 7: Agriculture Energy Efficiency Program Breakdown
by Target Market/Audience**

	National	Other	State	Total	Ag Focused?
general	1	9	18	28	14
farm-type	0	0	2	2	2
technology	1	9	9	19	14
both	0	1	1	2	2
total	2	19	31	52	32

The limited farm-type specific programs do show a unique form of success, albeit on a smaller scale, but also with smaller funding. Most of these focused programs are dairy farm related. Dairy farm programs tend to succeed with farm-type specific programs because the dairy industry is energy intensive relative to many other farm-types and in many states, the dairy industry has exceptionally thin margins, such that energy efficiency has an impact on farm survival. All four specifically dairy programs reported energy savings numbers, totaling more than 47 million kWh. The programs reported participation numbers at 12,500 dairy farmers served, and three reported cost savings for a total of \$3.4 million. Programs serving dairy farms are often specific to motor improvements as dairies also qualify for generalist agriculture programs for other efficiency improvements (see Box 3).

Table 7 also shows that the general programs are far more heavily weighted toward the state level than are the technology programs. Interviewees offered several possible reasons for this effect, the primary being that state funding is extremely limited and competition is very tight, especially for the relatively small impact that energy and cost savings have in the agriculture sector in most states. Because of the funding restrictions, programs at the state level must be generalists in order to serve a larger population.

A third and final note on the market and audience breakdown is that technology programs are 20 percent more likely to be focused specifically on agriculture than the general programs. Technologies can be, and often are, specific to the sector or even the farm-type, because of the diverse needs of farmers. For instance, a cattle ranch in Kansas would have little use for milk pre-coolers that could save a Vermont dairy farmer a large percentage of their energy bill.

Programs by Type. Table 8 describes the results of the program review by program type. This categorization is at once the simplest and most complex of the divisions. Program purpose is clearly laid out by most programs, but the best means of accomplishing goals will depend on goals and the specific audience being served. As a result, uniform programs across farm-types and technologies are unrealistic. Given the diversity of the sector, there are no simple answers as to which program types are best, but identifying general trends within the sector regarding which types of programs succeed is helpful for recognizing how the needs of the community are met and where future programs will be able to have the most impact on energy savings in the sector.

Audit only and demonstration programs represent a relatively small portion of programs in this sector. Program reviewers reported few tangible savings resulting from these programs on their own. The two audit programs in the program review are the Wisconsin Program (farmers served by the Wisconsin PSC) and the Idaho Program. The two programs together have provided 1,500 farm energy or pump audits, supplying education and no- and low-cost efficiency upgrades to those farms. It is interesting to note, however, that states with suites of programs to serve the agriculture sector (California Energy Commission programs in California and the Georgia suite of programs) include a cradle-to-grave approach, including R&D (outside the scope of this review) and light demonstrations (those overarching programs include the audit portion of the program in the education component).

Box 3. EnSave Energy and Improving Motor Efficiency on Dairy Farms

Program designers and implementers EnSave Energy have developed a program model that has helped to improve the efficiency of dairy farmers in at least five states, and growing. The company has implemented variable speed drive (VSD) programs for California, Michigan, and New York, and a demonstration program in Pennsylvania. These programs involve both an education and financial incentive component. Cumulatively, the programs have educated and given financial incentives to over 2,800 farms, saving 20.2 million kWh and \$3.5 million cumulatively with an overall investment by the funding mechanisms (generally systems benefits charges) of \$2.3 million. Because EnSave is a private company, evaluation is an important aspect of its work and it has verified savings numbers for all the projects listed here. The EnSave programs exemplify the importance and potential of savings for a well-designed, well-implemented program, as well as identify areas of common potential in different regions of the country.

For more details on EnSave programs, see Appendix B.

Source: Metz (2004)

Table 8: Agriculture Energy Efficiency Programs Breakdown by Program Type

	National	Other	State	Total	Ag Focused?
audit only	0	1	1	2	2
demonstration	0	2	4	6	5
financial incentive	1	5	5	11	6
Education	0	1	9	10	7
financial incentive and education	0	8	10	18	13
tax related	1	0	1	2	0
peak load reduction	0	2	1	3	1
total	2	19	31	52	32

Although farm audits offer a lot of opportunity, an audit program without structured follow-up and/or financial incentives will not make its value clear to farmers. This finding is consistent with similar program review findings in other sectors (Nadel 1990; Elliott, Pye and Nadel 1996). Note that the only measured success metric for both audit-only programs found in the agriculture sector is the number of audits performed. In other sectors, audit programs can be evaluated by surveying audit program recipients on measures they have implemented (Shipley, Elliott and Hinge 2002). In the agriculture sector, that type of evaluation was not reported, but could be carried out in the future if program evaluation increases in value for the program implementers.

Box 4. The Y-W Well Demonstration Project

The Colorado State Natural Resources Board funded a demonstration project to increase efficiency with center pivot irrigation systems. A typical center pivot irrigation machine irrigates approximately 128 acres and, in Colorado, carries a seasonal energy cost (using pre-2001 electricity rates) of \$8,400. To convert a typical center pivot to Low Energy Precision Application (LEPA) hardware costs about \$15,000. Twelve years of record-keeping on conversions to LEPA by Y-W Well Testing of Yuma, Colorado, and the State Natural Resources Conservation Board has shown a typical payback period based on energy savings alone of 3 to 4 years.

Although they calculated a short payback time, the technology had not been adopted by the market. The Board determined that the success of such projects had not been publicized appropriately, and a well-placed demonstration could trigger market transformation. The hope was that the demonstration would show the benefits of energy efficiency, without the state having to invest a lot of money. The Board invited farmers from all over the state to study the demonstration. Anecdotal evidence from attending farmers indicates that the demonstration was interesting and useful and several farmers reported that they were considering similar projects.

Source: Yuma Conservation District 2004

For many states, a demonstration program is the only option because of resource scarcity; however, if publicized well, it can have a lasting impact (see Box 4). The five demonstration projects in this review range from designing and showcasing sustainable farming techniques and practices, including energy efficiency (Missouri Demonstration in Sustainable Agriculture program), to a small-scale motor upgrade program to show communities the benefit of energy efficiency (Variable Speed Drive Demonstration, Pennsylvania). Of the five demonstration projects outlined in the program review, only the Pennsylvania Variable Speed Drive Demonstration project (implemented by Ensave Energy) evaluated energy savings. Other metrics for success of demonstration projects include: number of people contacted, number of projects completed, and number of inquiries to program implementer. Table 9 shows the diversity of demonstration projects in different regions and how their success has been evaluated.

Table 9. Agriculture Demonstration Projects

Project	Description*	Evaluation	
		Method	Outcome
Auburn University	Eight demonstration projects involving agriculture; one targets energy efficiency, renewable energy, and onsite energy production.	none given	none given
Demonstration Grant Project (MN)	The Demonstration Grant Program provides funds for farmers, agricultural researchers, educators, and nonprofit groups to explore innovative and creative ways to enhance the sustainability of a wide range of farming systems, including energy efficiency.	amount of money distributed	Grants are up to \$25,000, but total not reported.
Energy Office Pilot Programs (NC)	The office runs a variety of pilot projects for cogeneration, ethanol, and bioremediation, as well as post-energy production energy efficiency.	none for energy efficiency projects	
LEPA Irrigation Assistance Program (CO)**	Improved irrigation technologies and management practices, collectively known as Low Energy Precision Application (LEPA) irrigation; the Denver Regional Office installed a NICE3 (DOE industrial program) project in eastern Colorado to help demonstrate and further commercialize these and other precision agricultural techniques and management practices.	energy savings, non-energy benefits, market transformation	40% for both energy and water, market transformation not measured.
Demonstration in Sustainable Agriculture (MO)	This program sponsors competitive grants that help farmers test, evaluate, and adopt sustainable agriculture practices on their own farms. Participants share their experience and information with others through field days, published reports, and conference presentations.	impacts on the farmer from project, amount of grants distributed	case studies (none with energy savings), \$700,000 in grants to 230 farms
Variable Speed Drive Demonstration (PA)	This EnSave Energy-implemented program educates a 12-county demonstration region about the benefits of installing VSDs on milking vacuum pumps. The purpose of the program is to show the value of VSDs on energy savings, and the value of a large-scale program for the state.	number of participants in the education and installation process	education program participants: 660 installations (as of September 2004): 13

* Descriptions are abbreviated. For full descriptions, please refer to Appendix B.

** See Box 4 for details on the LEPA Demonstration Project.

Education programs ranged from light technical support when requested by the farmer to intensive educational workshops and individual outreach at the farm level. Education programs can evaluate their success through the amount of output they create by counting attendees at workshops, the number of workshops provided, and the amount of outreach to the community. The education programs for energy efficiency in the agriculture sector did not report these input-based evaluations on the whole. Almost 90 percent of the education programs are implemented from the state level. This is likely also a response to limited funding at the state level. Education programs are far reaching and can be designed to be low cost. Despite the difficulty in calculating the savings associated with a specific educational or informational campaign, the programs do have an impact on farmer choices and are often low cost. Many education programs reviewed are derivatives of former Agriculture Industries of

the Future⁴ programs, which used to be run at the national level, but are now being carried out by the states. These programs began with a canon of literature and information, and were already based on a network of experts within the states, but lacked the funding to continue full-fledged. Keeping the education and information pathways open allows farmers to get the most up-to-date information as well as maintain energy efficiency as a relative priority for the sector.

Combined education and financial incentive programs seemed to be both popular and successful. Part of the success compared to solely education programs can be attributed to relative ease of measuring the success of financial incentive programs and increased willingness to do so. Of the 13 combined programs found in the program review, seven reported a cumulative 1.5 trillion kWh in energy savings and six reported \$75 million in cost savings.

Interviews and commentary on these programs revealed many factors indicating the usefulness of these programs in the sector. Farmers and implementers alike praised the combination programs because they encouraged information transfer in the sector, followed by giving farmers a chance to follow-up and install the technology or implement the practice intended to increase energy efficiency. In the case of some programs, the financial incentive was the primary draw, and education was secondary. Combination programs seem to work well when the technology being installed is unfamiliar to the sector or the process is complicated. The education program then serves to further understanding and ensure the correct implementation of the project. For example, the Northwest Energy Efficiency Alliance's past project transforming the market for the AM400 Soil Moisture Data Logger initially provided a door-to-door education campaign to irrigating farmers regarding the benefits of appropriately watering crops, and described the technology and gave instructions. This education prepared the farmers for both the concept and the technology when they received the meter (distributed by the Alliance as part of the incentive for use).⁵

Combined programs also received praise because of their replicability in other subsectors or technologies. The education portion of the programs results in a network of farmers, trainers, program implementers, utilities, and equipment distributors, which work together to leverage the financial incentive. This working group can then be called upon again and is better prepared to implement the next generation of technologies and practices. Program implementers appreciated this because subsequent programs have a lower marginal cost in this model.

Although these programs all share the common elements of integration of financial incentives and education, the programs are manifested in a variety of ways, including a difference in program audience (as shown in Table 10). For four of the programs, agriculture is just one part of a larger audience for program implementation. These program implementers indicated that the benefits to this system include a broader funding base and uniformity for the agricul-

⁴ The Industries of the Future (IOF) federal program included funding for programs encouraging agricultural energy efficiency until a restructuring in the late 1990's shifted the full Industries of the Future agriculture program to a biomass focus. Since then, the state IOF programs have begun funding some of the prior agriculture energy efficiency programs.

⁵ For more information on this program, see Appendix B.

ture sector with other sectors, but noted that the larger audience makes it difficult to give individual attention, which is important to the agriculture community.

Table 10. Combination Programs by Primary Target

Program Name	Agriculture Primary Target?
Efficiency Maine Commercial and Industrial	no
Maine DOA Assistance Grants and Loans	yes
Oregon Dairy Waste to Energy	yes
Southeastern Regional Biomass Energy Program	yes
Variable Speed Drives (CA)	yes
AM400 Soil Moisture Data Logger (NW)	yes
Agrimet Weather Station (NW)	yes
C&I Performance Program (NY)	no
Smart Equipment Choices (NY)	no
Agricultural Innovations (NY)	yes
Energy in Agriculture (CA)	yes
Agricultural Pumping Efficiency Program	yes
Irrigation Water Management Program	no
Georgia Combined Agricultural Programs	yes
Xcel Energy Farm Energy Conservation Improvement Program	yes
Variable Speed Drives (MI)	yes
Efficiency Vermont Programs	yes

Tax-related programs are specific forms of financial incentives, and the similarity is not lost in terms of success. The separation, however, is the result of anecdotal evidence that the tax incentive programs (especially those offered at the state level) are used by larger farmers. Generally, according to implementers, the incentive offered by the state is not large enough for farmers to devote a large amount of time to project administration, and small farmers prioritize larger financial opportunities over these incentives.

Clearly, the delineation of programs by type of program is strong in that it aligns some of the available savings data in a way useful for identifying overall program savings. The weakness of this system stems from the diversity of the programs. That is, the needs of the agriculture sector, as evidenced by the numbers of state-run programs, are finding the most traction (repetition being the best indicator of success) at the local level.

This can be seen through agencies that have been working long term with the sector, such as the U.S. Department of Agriculture (USDA), developing ways of making even large programs (such as the nationally funded 9006, see Box 5) seem like small community-based programs by implementing them through the state and local offices.

Historically, programs targeting this sector have been narrowly focused on a small geographic area or on a narrow farm-type. Another implication of differing target audiences is the large number of varied program implementers. That is, unlike other sectors, energy efficiency programs in agriculture are often implemented by a variety of agencies at the state and national levels. Instead of being the responsibility of the state energy offices, energy efficiency programs for the agricultural sector are often spread among different agricultural agencies in the state, and federal dollars for programs are distributed through extension programs and other agencies.

With the diversity of the sector, the need for locally implemented programs, and the differing needs of the region, farm-type, and individual farmer, the extant programs in the agriculture sector create a patchwork, difficult to fit into pre-defined categories. Dividing and characterizing the programs is important, however, to get a good picture of what is working and what is not working for programs in this sector. Taken together, the typology used here allows us to look at the programs from different angles to identify their strengths and weaknesses, even if programs do not fit the categories perfectly or align with other programs in the groupings. The following section describes the best aspects of the programs given their diverse designs and functions and provides general recommendations for putting together a functioning and useful program for energy efficiency in the agriculture sector.

Recommendations for Program Design and Development

Drawing the results of the data collection and typology, we were able to generalize about what is necessary for a program to successfully promote energy efficiency in the agriculture sector. The following four suggestions are drawn from the experiences and results of these programs and recommended for future programs in the sector. Appendix A, following the report, provides examples of implementing these recommendations in model programs.

Box 5. Section 9006 of the 2002 Farm Bill

In 2002, the first energy title was included in the National Farm Bill. The bill included a provision for the design and implementation of a grant and loan program to promote energy efficiency and renewable energy projects in rural areas of agriculture.

On a very limited budget, the USDA began encouraging the state Rural Business Services (RBS) offices to promote the program. The RBS already implemented incentive programs for the headquarters office, and has been able to assist the national USDA office with implementing the program by publicizing the program, distributing applications, and assisting applicants. The local connection has made successful implementation possible. To date, over 300 grants have been awarded out of almost 500 applications. The upcoming regulations from USDA transfer more of the program implementation to the state offices.

Sources: Environmental and Energy Studies Institute (2004); U.S. Department of Agriculture (2004)

Recommendation 1: Clearly Define Goals and Objectives

An aspect of program planning especially important to the agriculture sector is that of clearly defined goals and objectives regarding the definition of success. Traditionally for energy efficiency programs, the bulk of the program success is determined by energy savings, and non-energy benefits are secondary. In the agriculture sector, because the structure, priorities, and understanding of energy prices are different from other sectors, energy savings is often lower on the priority list of benefits of programs, falling behind such other issues as resource scarcity (water savings) and cost savings. As a result, there are few uniform metrics for measuring the success of a program in this sector.

Generally, programs define their success based on their goals, and often in this sector, the primary goal for the program is not energy savings. For Vermont dairies, for example, programs are structured primarily to maintain the cultural institution of family dairy farming. These non-energy benefits of agricultural energy efficiency programs are often critical to the success of the energy-saving aspects of the program. This adds a second layer of complication to the review, since the motivations of individual programs are not easily translated between technologies or farm-types, but points to the importance of quality program design and clear goals for the success of agricultural programs.

This is not to belay the importance of program cost-effectiveness. Part of clearly defining the goals of the program is to be able to show that the goals have been accomplished. Traditionally, for energy efficiency programs, this accomplishment is done through evaluation of energy and cost savings. In searching through the available programs and speaking to program implementers of the programs represented in this survey, it became clear that the need for delivering as much funding as possible to the farmer has outstripped the need for formal evaluation in general. While formal evaluation is still important on the large scale because it reflects the nationwide progress on energy efficiency in the sector and would certainly be helpful in identifying areas for further work, on the small scale, a minimal amount of evaluation has not been a barrier to continued programs, in general.

In cases where there is a financial possibility of performing an evaluation, we recommend it, because evaluation allows for implementers to not only quantify the savings of the program, but also show those savings to potential future funding institutions. In the resource-restricted agriculture sector, however, barring formal evaluation, we recommend informal evaluation for each program, to be designed and included from the beginning.

Informal evaluation of well-defined goals includes a record of program participants, or the amount of money devoted to grants to the farmer. Although these do not translate directly or easily into energy savings, they do represent an effect on the community and also create an awareness and interest in energy efficiency and its benefits (the latter is especially important to the national agriculture and energy efficiency communities).

Recommendation 2: “Know thy Implementer”

Farmers and ranchers have a long and varied relationship with the government and community organizations. It is clear from the program review that the most successful programs are implemented by or through organizations trusted by the community. For some communities, this means the Agricultural Extension Service (see Box 4) or the utility (see Box 5).

A program delivery mechanism that was notably absent from the program review is that of product distributors. Both the industrial and residential sectors have had success with energy efficiency programs based on training equipment distributors to implement incentive programs and to sell more energy-efficient products. Whether the current agriculture programs experienced trouble with this paradigm in the past cannot be gathered from the information gathered during the program review, but, given the absence of anecdotal evidence that there are reasons the agriculture sector is not using this strategy, it is most likely an untapped market for programs.

We received anecdotal and program evaluation evidence that programs were more successful when program implementers were familiar with the agricultural sector, and more specifically were already integral to the community. That is not to say, however, that we found any evidence that large-scale programs, or programs run, implemented, or aggregated at the national or regional level, were always less effective than local programs. At issue regarding the success of programs was the way the program was presented to the farmer, not the mechanisms at play in the background. Although it is outside the scope of this study, we neither saw nor heard anecdotal evidence that programs appropriately framed to the farmer (following the

Box 6. Know the Implementer: The Role of Utilities in Agriculture Energy Efficiency Programs

Utility-funded and -implemented programs can be identified most easily through this categorization. Of all the programs, 21 are implemented through utilities. Of the 19 programs in the “other” category, 10 are run by utilities, making them the largest implementer of agricultural energy efficiency programs. When asked about the importance of utility programs, most farmer and program implementer interviewees cited the benefit of having a dependable, trustworthy, and knowledgeable point of contact. The importance of person-to-person networking and demonstrable financial savings or production improvements for the individual farmers are two key elements of programs found to be successful in this review. Utility programs are more likely to have both and therefore represent a large portion of the population of traditionally “successful” agricultural programs for energy efficiency. In other words, from the perspective of energy and cost saving quantification, utility programs are among the best programs.

Utility programs can take a variety of forms. Many states are similar to California, where some of the programs are mandated through the California Public Utility Commission (CPUC) and the three major investor-owned utilities carry out mirrored programs within their service territories through their own implementation or through outsourcing to universities and private implementers. These CPUC programs are required to evaluate, and the program implementers are often in communication to discuss ideas regarding the programs and program improvements.

That is certainly not to indicate that utility programs are the only successful programs, nor that every utility program was an unprecedented success. It is to say that the lessons learned from their experience can be emulated to form more successful programs within and outside the utilities. For more information on successful utility programs:
<http://www.aceee.org/utility/index.htm>

suggestions below) were any more or less effective than single, locally run programs. It has long been the perspective of ACEEE that programs should always be implemented by those that are best equipped to effectively deliver the program.

In the agriculture sector, the ideal program delivery method appears to have three distinct parts:

- **Familiarity.** The program review shows that many successful projects were run by implementers that were very familiar with the community. The agriculture sector has a very integrated infrastructure of communication for technology transfer and policy implementation, including the Cooperative Extension Services and the rural business development offices in each state. These offices also have a network among them provided by the USDA headquarters office, providing a multi-tiered infrastructure for program delivery that is already in place. In many states, the systems benefit charge implementation agency has partnered with one of these offices to implement extant energy efficiency programs.
- **Knowledgeable and realistic ideas about the costs and benefits of the project.** According to implementers, the agriculture community in general is skeptical regarding people they perceive to be salesmen, and a very knowledgeable and honest program implementer can combat the skepticism.
- **Identification and replication of the savings for other farmers in the community.** The largest impetus for technology and practice uptake in the agriculture sector is word of mouth, and successful program implementers will foster an environment where program participants can communicate their successes to potential participants. For example, workshops (a feature prominent in education programs but also a tool for other types of programs) create a venue where the program implementer can gather the community and display knowledge of the technology, the benefits, and the drawbacks, and also allow for previous participants to impart their experiences to the audience.

Recommendation 3: Agriculture-Focused and Agriculture-Included Programs Work

In many sectors, the most successful programs are targeted at one sector and focused directly on energy efficiency. The summary programs and the anecdotal evidence presented here show that in the agriculture sector, partnering with cross-sector programs and programs that also incorporate renewable energy does not necessarily affect whether or not the program accomplishes its goals.

In general, the summary results indicate that programs are not more likely to succeed dependent on whether or not they are targeted at the agriculture sector or if agriculture is just included in the program scope. Table 4 shows that the majority of the programs are focused on agriculture, while 19 are more generally focused. The results are similar, as shown in Tables 5 and 6. This evidence supports that programs that are agriculture-focused and agriculture-inclusive have equal chances of accomplishing their goals.

This observation does not negate Recommendation 2, however. Program implementers and programs with the most energy-saving success are still those that are run by people familiar with the agriculture community. Although this presents a larger challenge for programs not focused specifically on agriculture, these programs are generally larger than agriculture-only programs and should be able to devote resources to appropriately marketing a program in the agriculture sector.

The program summary also indicated very little difference in the replicability and relative successes of programs that focused specifically on energy efficiency and those that focused on both efficiency and renewable energy. It is possible that the increased visibility of combined programs allows for more success, or that the increased infrastructure works to benefit both efficiency and renewable energy. Although the program review is not capable of determining causation, the empirical evidence does suggest that partnering reaps positive effects for energy efficiency in this sector.

Recommendation 4: Target Your Program Evaluation

As Recommendation 1 indicates, where the resources are available, we recommend that evaluation of energy or cost savings be measured. The benefits of evaluation include proof of success of the program for future funding purposes, identification of untapped opportunities for energy savings, program replicability, and the ability for review of programs to revise the program strategy and improve the program. Although some of these issues are approached differently by program implementers in the agriculture sector, as national support (through the energy efficiency community) for energy efficiency in this sector matures, the need for the sector to conform to the evaluation methods of other sectors will become more important.

When asked, program implementers acknowledged the importance of evaluation, though they often stressed that informal evaluation saves them program resources and is adequate for program continuation and improvement purposes. The evaluation community is quick to point out, however, that this is a fairly shortsighted philosophy for the sector, as without evaluation to prove program success, it is difficult to secure future funding. While the agriculture implementers interviewed for this program review acknowledged this, they noted that often agriculture programs are funded due to the political importance of agriculture in the area or for stabilization of individual farmers, and therefore evaluation would not be necessary for continued funding.

Evaluation is critical, however, to show cumulative savings of all programs, encourage national policies that support these programs, and identify potential areas of saving opportunity. In the case of this program review, one of the largest challenges was estimating total savings from groups of programs for these purposes.

Another barrier to formal evaluation mentioned by program implementers and identified by published reports (Brown and Elliott 2005) is the lack of baseline information in energy use on the farm. Specific data on energy use is not currently collected by the USDA nor the U.S. Census Bureau, and there is not an individual breakout for agriculture energy use in the U.S. Department of Energy/Energy Information Administration's *Residential Energy Consump-*

tion Survey (RECS) nor the *Commercial Building Energy Consumption Survey* (CBECS) data. Data on energy use is primarily collected by these programs, and the sector lacks an information clearinghouse where the data can be compiled and shared with program implementers. That is to say, that although the audit and energy efficiency programs listed in this program review have knowledge regarding their specific expertise, there is no established network for data sharing.

Motivation for programs may not be energy savings based, but where significant energy savings can be identified, it lends support to programs being refunded and enlarged. Further, if energy savings can be quantified, it benefits energy efficiency program implementers in all sectors, as overall savings to the nation could then be quantified. ACEEE is in the process of defining the specific challenges with data collection and availability in this sector and will release a companion report regarding the national energy efficiency potential for the agriculture sector in 2005.

Conclusions

The recommendations presented here could be drawn broadly from any sector, and indeed the agriculture sector is closely related to other sectors. Farm houses and very small farms have energy use profiles akin to the residential sector. Large farms and their relatively intense energy needs use energy more like the industrial sector. The lighting needs reflect the commercial side of agriculture. In order to be successful, agriculture energy efficiency programs must have the best of each of the other sectors.

The agriculture sector also has unique aspects that present challenges to the energy efficiency community in designing programs for the sector. First and foremost, this review shows that locally run programs with an implementer familiar to the agricultural community gain more program participation than do programs that appear to be run from a distance. Second, the agriculture sector energy efficiency programs are lacking in formal evaluation. While the current programs have found ways to deal with the lack of resources to provide for administration, if the sector becomes a major focus of the energy efficiency community, formalized evaluation will be a high priority. Third, the agriculture programs identified here reflected flexibility and a mixture of benefits resulting from them. This seems to indicate that in the agriculture sector, energy efficiency is often presented as part of a group of benefits that benefit the farmer.

Using the extant programs and the lessons learned from them in the form of the recommendations for program development, in Appendix A we outline ideal programs as models stemming from differing funding sources. These models are intended to bring the recommendations together into a cogent model for program design use.

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Appendix A: Model Programs

Introduction

The program profiles presented below are current as of late 2004. Each profile is based on responses offered by program administrators or evaluators, and is sometimes a direct quotation from questionnaires received. The appendix is not a stand-alone document. That is, the programs, en masse, serve to identify general trends in successes and challenges to programs promoting energy efficiency in the agriculture sector. Those results can be found in the body of the report. For more information on participating in the programs listed in this appendix, please contact the program implementers directly.

Program Type: Audit Only

Program Title: Farm Rewiring, Audit and Timer Project (WI)

Program Overview/Program Performance Summary:

The three distinct objectives of this Ensave Energy implemented project are to look for antiquated wiring situations that might lead to stray voltage problems, recommend energy efficient measures, and install timers on engine block heaters. EnSave's role is to use computer assisted auditing tools to evaluate the efficacy of installing more efficient equipment, perform the analysis of the data, and make recommendations for investment in new equipment. If appropriate, EnSave also provides an engine block heater timer to the farm at the conclusion of the audit and upon completion of the farm report. Simultaneously, the Wisconsin Public Service Commission may refer the farm to its grant or loan fund for monies for rewiring and energy efficient measure installation.

No performance metrics reported.

Pairing energy efficiency education with farm rewiring is useful in agriculture. While rewiring is more of a safety issue than an efficiency one, carrying the messages together extends the life of the new wiring. Also, the program directs farmers to available incentives and further education programs for energy efficiency.

Program Information At-A-Glance

Program Primary Contact	Craig Metz EnSave Energy Development 65 Millet Street Richmond, Vermont 05477
Implementing Agency	
Program Start Date	1/1/99
Funding Sources	PBF
Total Funding to Date	
Target Type of Farms	All
Geographic Area Served	Wisconsin, Those served by the Wisconsin PSC.
Total Participants to Date	500, Unknown participants
Energy Savings	
Cost Savings	
Other Success Metrics	

Program Type: Audit Only

Program Title: Pump Efficiency Testing Program (ID)

Program Overview:

Free energy audits and pump efficiency tests are completed by the staff of the Idaho Energy Division. All requests for audits are met based on staffing availability, and priority is given to participants in the SIS program and the loan program. For more information: <http://www.idwr.state.id.us/energy/aim/pump.htm>

No performance information given

Program Information At-A-Glance

Program Contact	Primary	Gerry Galinato Idaho Department of Water Resources
Implementing Agency		IDWR- http://www.idwr.state.id.us/energy/aim/aim.htm
Program Start Date		1984
Funding Sources		
Total Funding to Date		
Target Type of Farms		
Geographic Area Served		Idaho
Total Participants to Date		1,000
Energy Savings		
Cost Savings		
Other Success Metrics		

Program Type: Demonstration

Program Title: LEPA Irrigation Assistance Program (W-Y Well Demonstration)

Program Overview:

Improved irrigation technologies and management practices, collectively known as Low Energy Precision Application (LEPA) irrigation, have consistently provided up to 40% savings of both electricity and water. This is significant because in many Western states, agriculture accounts for 75 to 85 percent of all water usage. Also, irrigators demand electricity during the summer when loads are greatest within the Western Interconnection. Irrigation demand characteristically has a high load factor. For these reasons, irrigators are extremely vulnerable to potential price increases that could be caused by electricity supply shortages and the move to competitive electricity markets.

Energy savings from LEPA result from lower required pumping pressure and precision application of water, both spatially and over time. The Denver Regional Office currently has a NICE3 (DOE industrial program) project in eastern Colorado to help demonstrate and further commercialize these and other precision agricultural techniques and management practices. The program goal is to lead commercial farmers to switch to the newer, energy efficient technologies and management practices.

The NICE3 demonstration project could be expanded to other states through a below-market interest rate loan program or a revolving loan program. These programs would assist farmers and ranchers to finance and economically capitalize their transition to more efficient, lower-energy irrigation systems. The up-front costs of converting existing irrigation systems to more efficient ones is the primary barrier most farmers confront.

States could employ Universal Systems Benefits Funds, Petroleum Violation Escrow Account monies, government bond proceeds or appropriations to underwrite the programs costs. States might want to review other public policies, such as declining cost block rates for irrigators and existing water rights laws, to determine whether they discourage energy and water efficiency and may consider appropriate changes to them.

Program Information At-A-Glance

Program Primary Contact	Jack Jenkins NREL - Denver Regional Office
Implementing Agency	The U.S. Department of Energy's Denver Regional Office, the Colorado Office of Energy Conservation, and a partnership comprised of Valmont International, the world's largest manufacturer of mechanical-move irrigation systems, and the Colorado Corn Growers Administrative Committee are prepared to assist any state in replicating this program.
Program Start Date	Our current demonstration project has been funded for 3 years. In 2000, the hardware was installed and tested under operational conditions. Production demonstration, data-gathering and integrated software development will begin in Spring 2001. A below market interest rate loan program or revolving loan program could be designed and operated within 12 to 18 months. Equipment installation could be completed within 3 to 4 months of financing.
Funding Sources	
Total Funding to Date	
Target Type of Farms	Any that irrigate
Geographic Area Served	Colorado
Total Participants to Date	1 (demonstration) Similar existing programs: The Bonneville Power Administration, the states of Washington, Oregon, Idaho and Montana and various electricity cooperatives in the Pacific Northwest have operated energy efficient irrigation assistance programs. All were, however, much more limited in scope and were not designed to integrate overall management and technologies into precision agriculture.
Energy Savings	
Cost Savings	
Other Success Metrics	

Program Type: Demonstration

Program Title: Variable Speed Drive Demonstration (PA)

Program Overview:

Implemented by EnSave Energy. This program educates 660 dairy farmers in the 12-county region about the benefits of installing variable speed drives on their milking vacuum pumps. EnSave developed marketing materials, promoted the technical aspects of the program, and delivered educational materials to the 660 farmers. EnSave offered cash incentives towards the purchase of variable speed drives on milking vacuum pumps. As of September 2004, 13 farmers have installed VSDs, with more expected in the future.

Program Information At-A-Glance

Program Primary Contact	Craig Metz
Implementing Agency	Ensave Energy
Program Start Date	12/31/03,
Funding Sources	PennDEP
Total Funding to Date	
Target Type of Farms	Diary
Geographic Area Served	Pennsylvania, Only Butler, Clarion, Crawford, Elk, Erie, Forest, Jefferson, Lawrence, McKean, Mercer, Venango, and Warren Counties.
Total Participants to Date	12
Energy Savings	500,000 kWh
Cost Savings	
Other Success Metrics	None

Program Type: Demonstration

Program Title: Auburn University

Program Overview:

Eight grants, totaling \$350,489, were awarded to Auburn University to fund projects designed to save energy, encourage conservation, promote recycling and improve agricultural production. Projects range from converting waste into a fuel for heating to using global positioning system devices to improve farm production and reduce costs.

Program Information At-A-Glance

Program Primary Contact	Jim Plott Auburn University
Implementing Agency	Alabama Department of Economic and Community Affairs through its Science, Technology and Energy Division.
Program Start Date	
Funding Sources	U.S. Department of EnergyGov. Bob Riley awarded the grants through funds made available to the state through the U.S. Department of Energy's Oil Overcharge Restitution program.
Total Funding to Date	
Target Type of Farms	Eight grants, totaling \$350,489, were awarded to the university to fund projects that range from converting waste into a fuel for heating to using global positioning system devices to improve farm production and reduce costs.
Geographic Area Served	Alabama
Total Participants to Date	None Reported
Energy Savings	None Reported
Cost Savings	None Reported
Other Success Metrics	None Reported

Program Type: Demonstration

Program Title: Missouri Sustainable Agriculture Demonstration

Program Overview:

<http://agebb.missouri.edu/sustain/index.htm>

This program sponsors competitive grants that help farmers test, evaluate, and adopt sustainable agriculture practices on their own farms. Participants share their experience and information with others through field days, published reports, and conference presentations.

The program was designed to help producers find ways to reduce their use of non-renewable resources, so energy-savings plays a big role, whether through reduced use of transportation (direct marketing), reduced use of pesticides and chemical fertilizers, or using alternative energy to supply on-farm energy needs.

This competitive grant program provides grants to Missouri farmers to help them test, evaluate, and adopt sustainable agriculture practices on their own farms. The grants encourage producers to reduce their dependence on non-renewable resources such as petroleum and minerals, and promote the preservation of natural resources such as soil, water, and air. They help farmers experiment with techniques that will make their farms ecologically sound, economically viable, and socially responsible.

A main objective of the program is to provide the opportunity for Missouri growers to demonstrate innovative techniques in sustainable agriculture. Growers are encouraged to share their experiences and information through field days, articles, reports, and poster sessions. The project results are summarized in a published report that is available in print, or on the Internet.

Applications and additional sustainable agriculture information are also available on the Agriculture Electronic Bulletin Board (AgEBB) web site: <http://agebb.missouri.edu/sustain>. Applications for 2005 grants will be available in July 2004 and are due by 5 pm on November 30, 2004.

The Demonstration Award Program is sponsored by the Missouri Department of Agriculture with support from the Community Food Systems and Sustainable Agriculture Program of the University of Missouri and Lincoln University. The program started in 1995 with the support of the Missouri legislature. From 1995 through 2000, 23 grants of up to \$3,000 were awarded each year to farmers across the state.

Successful project results and support from farmers convinced Missouri legislators to increase the size of the program to 30 grants of \$4,500 each for 2001. Unfortunately, state budget withholding reduced the awards to 23 grants of up to \$3,000 each for 2002 and 2003. Additional state budget cuts reduced the awards to 11 grants of \$3,000 each for 2004, but program supporters stepped forward with additional grants.

Thanks to the generosity of the University of Missouri Center for Agroforestry and the Thomas Jefferson Agricultural Institute, the Demonstration Award Program added three agroforestry grants and two alternative crop grants to the program for 2004, bringing the total number of grants available to 16. For 2005, the University of Missouri Center for Agroforestry is again sponsoring three agroforestry grants, which means there will be a total of 14 grants available for 2005.

Program Information At-A-Glance

Program Primary Contact	Joan Benjamin Mo DOA Missouri
Implementing Agency	Missouri Department of Agriculture
Program Start Date	1/1/95,
Funding Sources	State (and University of Missouri)
Total Funding to Date	Approx 690,000
Target Type of Farms	All
Geographic Area Served	Missouri
Total Participants to Date	230, This is a demonstration grant program with v. limited funding. The number of grants is dependant on the amount of funding available
Energy Savings	Unknown
Cost Savings	Unknown
Other Success Metrics	Unknown

Program Type: Demonstration

Program Title: Minnesota Demonstration Grant Program

Program Overview:

The Demonstration Grant Program provides funds for farmers, agricultural researchers, educators and non-profit groups to explore innovative and creative ways to enhance the sustainability of a wide range of farming systems. Grants of up to \$25,000 are awarded on a competitive basis for up to 3-year demonstration projects. Projects have demonstrated management intensive grazing, diversified cropping systems, soil fertility and manure management, alternative weed management, low-capital beginning farmer strategies, marketing and specialty crop opportunities.

Program Information At-A-Glance

Program Primary Contact	No Contact
Implementing Agency	Program Minnesota Department of Agriculture
Program Start Date	
Funding Sources	
Total Funding to Date	
Target Type of Farms	All
Geographic Area Served	Minnesota
Total Participants to Date	
Energy Savings	
Cost Savings	
Other Success Metrics	

Program Type: Education**Program Title: Texas PV****Program Overview:**

The State of Texas, the Texas Electric Cooperatives, and CSG Services, Inc. implemented a program to promote the use of stand-alone PV in rural areas in lieu of costly utility distribution line extensions. The program provides training, technical assistance and marketing assistance for rural utilities to be able to offer photovoltaics (PV) to their customers as a service option. As a result of the program four (4) rural electric cooperatives are now offering complete PV systems as an alternative to line extensions. The utilities lease the systems to the customers and include a monthly charge in the billing. The program is easily transferable to other states with many rural utility customers. State funds were matched by utilities, customers and the USDOE. New funding sources are needed to restart the highly successful program.

Program Information At-A-Glance

Program Primary Contact	John Hoffner Conservation Services Group 1515 S. Capital of Texas Highway, Suite 210 Austin, Texas 78746
Implementing Agency	State of Texas, Texas Electric Cooperatives and CSG Services, Inc
Program Start Date	1/1/96,
Funding Sources	State of Texas, USDOE (last year was 2000)
Total Funding to Date	\$150,000
Target Type of Farms	All types of rural applications served by rural coops
Geographic Area Served	Texas, All Rural Electric Cooperatives, service territories
Total Participants to Date	Unreported, All farms in rural electric cooperatives are allowed to participate, there are 78 such cooperatives in Texas
Energy Savings	None Reported
Cost Savings	None Reported
Other Success Metrics	None Reported

Program Type: Education

Program Title: Scientific Irrigation Scheduling (ID)

Program Overview:

The Energy Division conducts scientific irrigation scheduling (SIS) demonstrations to help Idaho irrigators understand the benefits of this management technique. SIS uses readings of soil moisture and crop water use or evapo-transpiration (ET) calculated from weather data. The voluntary programs are used to reduce uncertainty and educate irrigators in appropriate and effective irrigation management techniques. These techniques can vary from complex computer programs with full automation capacity to ET or simple checkbook scheduling approach. For more information: <http://www.idwr.state.id.us/energy/aim/irrigation.htm>

Program Information At-A-Glance

Program Contact	Primary	Gerry Galinato Idaho Department of Water Resources
Implementing Agency		IDWR- http://www.idwr.state.id.us/energy/aim/aim.htm
Program Start Date		
Funding Sources		
Total Funding to Date		
Target Type of Farms		
Geographic Area Served		Idaho
Total Participants to Date		
Energy Savings		
Cost Savings		
Other Success Metrics		

Program Type: Education

Program Title: NDSU Education

Program Overview:

The NDSU Agriculture Extension Service delivers energy efficiency and renewable energy information to farmers and ranchers through workshops, seminars, and individual consultations. Topics include site-specific farming, reduced tillage, grain drying, irrigation, and agricultural building.

Program Information At-A-Glance

Program Primary Contact	No Contact
Implementing Agency	North Dakota State University
Program Start Date	
Funding Sources	
Total Funding to Date	
Target Type of Farms	
Geographic Area Served	North Dakota
Total Participants to Date	
Energy Savings	
Cost Savings	
Other Success Metrics	

Program Type: Education

Program Title: FlexTech (NY)

Program Overview:

Farms and other agricultural facilities are provided detailed, on-site engineering studies. The types of studies include technical and cost-benefit analyses of: electrical energy-saving capital improvements, electric-load management, and operational improvements that will save money. Further technical assistance can be used to help prepare groups of farms to cooperatively negotiate commodity energy prices. NYSERDA will cost share these programs using consultants already under contract with NYSERDA or a consultant chosen by the farmer.

Program Information At-A-Glance

Program Primary Contact	Jessica Zweig NYSERDA 17 Columbia Circle Albany, New York 12203
Implementing Agency	
Program Start Date	1/1/93,
Funding Sources	PBF
Total Funding to Date	\$3.2 million for all sectors
Target Type of Farms	All
Geographic Area Served	New York, NYSERDA
Total Participants to Date	67
Energy Savings	844,000 Kwh
Cost Savings	\$87,000
Other Success Metrics	

Program Type: Education

Program Title: Minnesota Whole Farm Planning

Program Overview:

ESAP staff members are working with individual farmers, groups of farmers, and rural communities in the planning process. Staff members are also involved with the MN WFP Working Group, a statewide group of farmers, agencies, researchers, extension educators, consultants, and non-profit organizations that discusses and implements the concepts of whole farm planning.

Program Information At-A-Glance

Program Primary Contact	No Contact
Implementing Agency	
Program Start Date	
Funding Sources	
Total Funding to Date	
Target Type of Farms	
Geographic Area Served	Minnesota
Total Participants to Date	
Energy Savings	
Cost Savings	
Other Success Metrics	

Program Type: Education

Program Title: Education and Training Program (Ag Energy, ID)

Program Overview:

Program Information At-A-Glance

Program Contact	Primary	Gerry Galinato Idaho Department of Water Resources
Implementing Agency		IDWR-IDWR- http://www.idwr.state.id.us/energy/aim/aim.htm
Program Start Date		
Funding Sources		
Total Funding to Date		
Target Type of Farms		
Geographic Area Served		Idaho
Total Participants to Date		
Energy Savings		
Cost Savings		
Other Success Metrics		

Program Type: Education

Program Title: Agricultural Efficiency Technical Assistance (ID)

Program Overview:

Program Information At-A-Glance

Program Primary Contact	Gerry Galinato Idaho Department of Water Resources
Implementing Agency	IDWR
Program Start Date	
Funding Sources	
Total Funding to Date	
Target Type of Farms	
Geographic Area Served	Idaho
Total Participants to Date	
Energy Savings	
Cost Savings	
Other Success Metrics	

Program Type: Education

Program Title: North Carolina Animal and Poultry Waste Management

Program Overview:

Program Information At-A-Glance

Program Primary Contact	No Contact
Implementing Agency	
Program Start Date	
Funding Sources	
Total Funding to Date	
Target Type of Farms	
Geographic Area Served	North Carolina
Total Participants to Date	
Energy Savings	
Cost Savings	
Other Success Metrics	

Program Type: Education

Program Title: Pump Tests and Hydraulic Services Program⁶

Program Overview:

Southern California Edison's (SCE) Pump Test and Hydraulic Services (PT&HS) Program represents an energy information and management services program. The program is delivered to agricultural and water customers throughout SCE's service territory.

The PT&HS program is designed to influence a customer's awareness of energy efficiency options for the pumping systems and thereby increase the customer's rate of adoption and implementation of energy efficiency recommendations. These goals are achieved by testing customers' potable water pumping systems, delivering a customer and site specific energy efficiency report with cost analysis that the customer can easily understand and act upon.

SCE has performed energy efficiency tests of customers' water pumping systems since 1911. Testing continues today as a no cost service of SCE's energy efficiency program portfolio.

For more information visit:

http://www.sce.com/sc3/002_save_energy/002h_hydraulic_pump/002h1_test_facts.htm.

A recent 2002 program evaluation found the PT&HS program to be a solidly-managed and well-run program. The evaluation found that 41 percent of program participants made changes to improve their pumping system operating efficiency and the majority of improvements (69 percent) were to the shaft, impeller, or pump bowls. Motor improvements represent 17 percent of the total. The free riders are represented by the 27 percent of the customers who said they would have made an improvement to their pumping system in the absence of the SCE pump test information. Awareness of the Program has diffused through a large portion of the market. Sixty-three percent of pump test customers have told an average 6.3 friends, neighbors or colleagues about the benefits of pump.

A strong correlation exists between customer dissatisfaction and the time they have to wait for the test report. While most customers are satisfied with the pump efficiency report turnaround time, average customer satisfaction can still be improved by setting, as a target, turnaround times no longer than 2 weeks. This observation points to the need for more pump testers.

⁶ This program included a detailed description, so it is included here. All California Pump efficiency programs run through the CPUC and public benefits charge funding are counted as one program in the narrative report for which this is the second appendix.

Program Information At-A-Glance

Program Primary Contact	Gary Suzuki Southern California Edison 2131 Walnut Grove, 3 rd Floor Rosemead, CA 91770
Implementing Agency	Southern California Edison Company
Program Start Date	January 2004
Funding Sources	Public Goods Charge
Total Funding to Date	\$1.3 million for 2004
Target Type of Farms	All agricultural or water agency customers with potable water systems.
Geographic Area Served	Southern California Edison service territory
Total Participants to Date	Over 3,900 pumping system tests performed in 2004
Energy Savings	N/A
Cost Savings	
Other Success Metrics	Reduction in Information Barriers, Achieved level of Energy Savings

Program Type: Education

Program Title: CA Education, Training, and Services Program

Program Overview:

The Statewide Education, Training, and Services Program is designed to collect, transfer, research, evaluate, demonstrate, and showcase energy-efficiency concepts, technologies, and products for manufacturers, businesses, researchers, educational institutions, and the general public. The program promotes energy efficiency to a variety of customer segments through energy centers (physical and virtual) and other informational programs. Three of the four utilities possess physical energy centers: PG&E’s Energy Training Center (ETC); SCE’s Customer Technology Application Center (CTAC) and Agricultural Technology Application Center (AGTAC); and SCG’s Energy Resource Center (ERC).¹ SDG&E offers energyefficiency classes to its customers using other utility facilities or non-utility sites.

The 2002 program offered its core seminars and workshops, on which it has consistently relied to educate its target markets. The program also disseminated information about energy-efficiency technologies and practices at the center facilities with displays, demonstrations, technical consultants, facility presentations, fact sheets, and brochures. The utilities continued to leverage community organizations and local government and trade associations to gain access to a wider audience. The 2002 program placed a special emphasis on increasing the participation of hard-to-reach² (HTR) customers by targeting a specific number of HTR seminars/events or a certain percentage of HTR seminar attendees. Prior statewide collaborative efforts were also expanded in 2002.

Program Information At-A-Glance

Program Primary Contact	no contact
Implementing Agency	Utilities
Program Start Date	1/1/02,
Funding Sources	The budgeted amount was originally 7.9 million dollars, but the project was underbudget.
Total Funding to Date	6.9 million dollars
Target Type of Farms	All
Geographic Area Served	CEC
Total Participants to Date	0,
Energy Savings	
Cost Savings	
Other Success Metrics	

Program Type: Education, Financial Incentive

Program Title: FarmSave Energy Project (WI)

Program Overview:

The Wisconsin FarmSave Project, operated exclusively by EnSave has reduced energy use on more than 7,000 Wisconsin farms and saved more than 30 million kWh. EnSave developed materials, promoted the technical aspects of the program, marketed energy conservation opportunities, and delivered educational information to thousands of farmers. EnSave offered Wisconsin Electric farm customers compressor heat recovery units, variable speed drives for milking vacuum pumps, engine block heater timers, high pressure sodium lights, and milk precoolers. EnSave also provided the necessary oversight to assure the successful delivery and installation of these five different energy efficient measures.

Program Information At-A-Glance

Program Primary Contact	Craig Metz EnSave Energy Development 65 Millet Street Richmond, Vermont 05477
Implementing Agency	
Program Start Date	12/30/00
Funding Sources	PBF
Total Funding to Date	
Target Type of Farms	All
Geographic Area Served	Wisconsin, Southeast Corner of Wisconsin
Total Participants to Date	7000
Energy Savings	Annual: 10,300,000 kWh, Cumulative: 31,000,000 kWh
Cost Savings	Annual: \$588,000, Cumulative: \$1,721,000
Other Success Metrics	

Program Type: Education, Financial Incentive

Program Title: Southeastern Regional Biomass Energy Program (SERBEP)

Program Overview:

The objectives of SERBEP are:

- *To improve government and industry capabilities and effectiveness in the production and use of biomass resources,
- *To support planning efforts that make these resources available,
- *To encourage economic development through private and public investment in biomass technologies, and
- *To engage in research projects that demonstrate biomass technology applications.

During the past 15 years of its existence, the Southeastern Regional Biomass Energy Program has had a very positive effect on the development of technologies that use renewable energy resources. Over \$176 million in new technology applications exist in our region today because of this program. SSEB will manage the program with the goal to accelerate the development of new technologies, and then transfer them to the private sector where they can improve our production capabilities and strengthen the competitive advantage of the southeast.

The southeast stands to benefit from the responsible development of bioenergy, perhaps more than any region in the country. In the southeast, bioenergy use was reported to be 1.59 quadrillion Btus (quads) in 1995. This represents about 56% of the 2.85 quads of biomass used nationally. The region's bioenergy resource potential is estimated to be between 4 and 7 quads, from sources such as waste wood products, bagasse, animal wastes, biogas from landfills and sewage treatment facilities, and biomass crops. These biofuels are a valuable supplement to more conventional forms of energy and eliminate wastes while energizing the economy of the region.

Program Information At-A-Glance

Program Primary Contact	Kathy Baskin Southeastern Regional Biomass Energy Program
Implementing Agency	Southern States Energy Board (SSEB)
Program Start Date	12:00:00 AM,
Funding Sources	Funded through the DOE's Atlanta regional office
Total Funding to Date	\$1 million in 1999-2000
Target Type of Farms	
Geographic Area Served	Alabama, Arkansas, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Mississippi, Missouri, North Carolina, Puerto Rico, South Carolina, Tennessee, US Virgin Islands, Virginia, West Virginia,,
Total Participants to Date	0, Through the use of small, cost-shared grants, the Program encourages economic development through public/private partnerships that demonstrate bioenergy technology applications. http://www.serbep.org/
Energy Savings	
Cost Savings	
Other Success Metrics	\$176 million in projects have been installed in the geographic area

Program Type: Education, Financial Incentive

Program Title: Agricultural Innovations (NY)

Program Overview:

The Innovation in Agriculture Program Opportunity Notice has been issued for 5 years to solicit cost-sharing proposals for innovative and underutilized technologies that will yield energy-efficient improvements in farm productivity, waste management, and development of value-added products. Future issuance of solicitation subject to management approval. Proposals needed to cost-share evaluation work, technology transfer, and training. It is a competitive solicitation.

Program Information At-A-Glance

Program Primary Contact	Tom Fiesinger NYSERDA 17 Columbia Circle Albany, New York 12203
Implementing Agency	NYSERDA
Program Start Date	1/1/99,
Funding Sources	PBF
Total Funding to Date	1,250,000
Target Type of Farms	All
Geographic Area Served	NYSERDA
Total Participants to Date	68, 15 annually on average
Energy Savings	None Reported
Cost Savings	None Reported
Other Success Metrics	None Reported

Program Type: Education, Financial Incentive

Program Title: AM400 Soil Moisture Data Logger (NW)

Program Overview:

The AM400 is a low-cost data logging device that measures soil moisture in up to six locations and displays stored results on a built-in LCD screen. The Alliance is providing funding to support marketing efforts, primarily directed at growers of low-value crops.

Project Web site: <http://www.mkhansen.com>

Alliance Project Information: <http://www.nwalliance.org/projects/projectdetail.asp?PID=68>

Program Information At-A-Glance

Program Primary Contact	Andy Ekman Northwest Energy Efficiency Alliance 529 SW Third Avenue, Suite 600 Portland, Oregon 97204
Implementing Agency	Northwest Energy Efficiency Alliance
Program Start Date	6/30/03, 2 years in existence
Funding Sources	PBF
Total Funding to Date	In 2004: \$40,000 Cumulative: \$75,000
Target Type of Farms	All
Geographic Area Served	Idaho, Montana, Oregon, Washington,
Total Participants to Date	530 in region, 840 outside region cumulative and 200, and 330 respectively annually.
Energy Savings	Annual 2,400,000 kWh, Cumulative: 7,800,000 kWh
Cost Savings	None reported
Other Success Metrics	

Program Type: Education, Financial Incentive

Program Title: Agrimet Weather Station (NW)

Program Overview:

The AgriMet Weather Station Network, a joint project of the U.S. Bureau of Reclamation and the Northwest Energy Efficiency Alliance, provides Internet-based weather data to farmers from more than 85 remote sites in the four Northwest states. These data are translated into crop-specific water use information, to promote effective irrigation management.

For more information: <http://www.usbr.gov/pn/agrimet/index.html>

Program Information At-A-Glance

Program Primary Contact	Andy Ekman Northwest Energy Efficiency Alliance 529 SW Third Avenue, Suite 600 Portland, Oregon 97204
Implementing Agency	Northwest Energy Efficiency Alliance
Program Start Date	12/31/00,
Funding Sources	PBF
Total Funding to Date	Most recent year: \$80,750, Cumulative \$363,000
Target Type of Farms	All
Geographic Area Served	Idaho, Montana, Oregon, Washington,
Total Participants to Date	
Energy Savings	
Cost Savings	
Other Success Metrics	

Program Type: Education, Financial Incentive

Program Title: Smart Equipment Choices (NY)

Program Overview:

This program is an equipment replacement program that provides pre-set incentives for installing eligible energy-efficient equipment. This program is an equipment replacement program that provides pre-set incentives for installing eligible energy-efficient equipment, and other equipment.

Program Information At-A-Glance

Program Primary Contact	Marcia Chandler 17 Columbia Circle Albany, New York 12203
Implementing Agency	
Program Start Date	
Funding Sources	PBF
Total Funding to Date	\$1,500,000 For all sectors
Target Type of Farms	All
Geographic Area Served	NYSERDA
Total Participants to Date	540
Energy Savings	
Cost Savings	
Other Success Metrics	

Program Type: Education, Financial Incentive

Program Title: Efficiency Maine Commercial and Industrial

Program Overview:

<http://www.energymaine.com/C&I.htm>

The Efficiency Maine Business Program works with businesses just like yours to save energy and save money. The program offers information and cash incentives to all Maine businesses that install qualified energy efficient electric products. Act now to take advantage of these incentives.

Energy efficiency offers short- and long-term benefits to all businesses in Maine. By increasing the energy efficiency of your business, you strengthen your bottom line and help ensure that Maine will remain a desirable place for future generations to live and work.

Pre-established Cash Incentives

Efficiency Maine has established cash incentives on qualified lighting, HVAC equipment, NEMA Premium™ energy efficient motors, and system controls. Certain pre-established incentives, such as energy efficient exit lights, controls for vending machines, and selected lighting measures are available only to small businesses.

Custom Cash Incentives

Custom incentives are available for a variety of products that save electric energy. Custom incentives must be pre-approved by Efficiency Maine. Custom incentive applications are available directly from Efficiency Maine Business Program Allies. Allies include manufacturers, wholesalers, retailers, and contractors that work with Efficiency Maine to promote, install, and service energy efficient equipment. You may also download applications directly from this site.

Program Information At-A-Glance

Program Primary Contact	Efficiency Maine
Implementing Agency	Efficiency Maine (Maine PUC)
Program Start Date	
Funding Sources	PBF
Total Funding to Date	
Target Type of Farms	All
Geographic Area Served	Maine
Total Participants to Date	
Energy Savings	
Cost Savings	
Other Success Metrics	

Program Type: Education, Financial Incentive

Program Title: Variable Speed Drives (CA)

Program Overview:

This program is funded through the California rate payer surcharge (PBF), directed by the CPUC, and implemented by EnSave Energy.

From EnSave Energy:

Program Implemented and information provided by Ensave Energy. The California Variable Speed Drive Farm Program educated over 1,800 PG&E, SCE and SDG&E dairy producers about the benefits of installing a variable speed drive on the milking vacuum pump, and helped 51 dairy producers install VSDs. EnSave developed marketing materials, promoted the technical aspects of the program and delivered educational information to 1,800 dairy producers. EnSave offered cash incentives to California farm customers for the purchase of VSDs. EnSave also provided the necessary oversight to assure the successful delivery and installation of the measure. Results of the program are 2.6 million kWh saved in the first year of the program, and over \$390,000 in first-year energy savings realized by participating producers.

Program Information At-A-Glance

Program Primary Contact	Craig Metz EnSave Energy Development 65 Millet Street Richmond, Vermont 05477
Implementing Agency	EnSave Energy, Inc
Program Start Date	1/1/03,
Funding Sources	PBF
Total Funding to Date	484977
Target Type of Farms	Dairy
Geographic Area Served	California,
Total Participants to Date	51
Energy Savings	Cumulative: 2,609,486 kWh
Cost Savings	2003: \$391,423
Other Success Metrics	

Program Type: Education, Financial Incentive

Program Title: Irrigation Water Management Program

Program Overview:

The Irrigation Water Management Program helps users of irrigation wells in eastern Colorado’s Ogallala Aquifer to conserve two precious resources: water and energy. Savings have been substantial: 66,613,000 kilowatts of electricity and 135,000 acre-feet of water. Services such as well testing and irrigation water scheduling help landowners reduce water and energy use.

The Irrigation Water Management Program provides technical assistance to users of irrigation wells on eastern Colorado’s Ogallala Aquifer to help them save both energy and water. There are more than 700,000 acres of irrigated land in this area with about 5,600 operating wells. At a farmer’s request, technicians will measure overall pumping system efficiency and provide recommendations for improving the energy performance and water efficiency of their systems. Funds are also available for the purchase of energy and water efficient pumping systems.

For more information: <http://www.ag.state.co.us/soils/programs.html>

Program Information At-A-Glance

Program Primary Contact	Colorado Department of Agriculture 700 Kipling Street, Suite 4000 Lakewood, Colorado 80215
Implementing Agency	The Western Area Power Administration began the Irrigation Water Management Program in 1986. The program is now administered by the Colorado State Conservation Board. The irrigation system improvements recommended by the program have generated an estimated 67 megawatts of power savings and 135,000 acre-feet of water savings since the program’s inception.
Program Start Date	
Funding Sources	
Total Funding to Date	
Target Type of Farms	
Geographic Area Served	Colorado, Users of irrigation wells in eastern Colorado’s Ogallala Aquifer
Total Participants to Date	
Energy Savings	66,613,000 kW
Cost Savings	
Other Success Metrics	

Program Type: Education, Financial Incentive

Program Title: Agricultural Pumping Efficiency Program (CA)

Program Overview:

This program is funded out of the California rate payer surcharge (public benefits fund, PBF) through the California Public Utilities Commission, and implemented by the utilities in their service territories. The program is implemented outside utility service areas by the Center for Irrigation Technology.

The Program has four parts:

1. Education—educational seminars concerning pumping plant specification and maintenance, crop water requirements, and water measurement will be given throughout the state. The educational message has four parts:
 - o Know how to specify an efficient pumping plant
 - o Know how to maintain an efficient pumping plant
 - o Know how much water needs to be pumped
 - o Know how much water has been pumped
2. Technical Assistance—Program personnel are available to help in locating pump efficiency testers, completing a pump retrofit/repair incentive rebate application form, or answer general questions as to pumping plant design and use. Note that site-specific engineering services are not available (for example, we would not be able to specify the exact pump design for a specific location.)
3. Pump Efficiency Tests—rebates are paid directly to participating pump test companies for efficiency tests. Tests are available for working, electric or natural gas-powered, agricultural water pumps.
4. Incentive Rebates for Pump Retrofits/Repairs—incentive rebates are available to encourage individuals to retrofit/repair working, electric or natural gas-powered, agricultural water pumps to improve overall pumping plant efficiency.

Rebate amounts are determined by actual amount of energy saved or through predicted savings.

For more information: <http://www.pumpefficiency.org/>

Program Information At-A-Glance

Program Primary Contact	Peter Canessa Center for Irrigation Technology California State University, Fresno, 5370 North Chestnut Avenue—MS OF 18 Fresno, California 93740-8021	Utility contacts: SCE: Gary Suzuki ⁷
Implementing Agency	Center for Irrigation Technology for CPUC	
Program Start Date	10/1/02, The Program started October 1, 2002.	
Funding Sources	Public Goods Charge	
Total Funding to Date		
Target Type of Farms		
Geographic Area Served	California,	
Total Participants to Date	0, All owners or users of agricultural electric or natural gas utility accounts that are paying the Public Goods Charge are eligible to participate in the Program. The term “agriculture” means that account billing is governed by an agricultural tariff and that the account has been classified as to primary use as production agriculture.	
Energy Savings		
Cost Savings		
Other Success Metrics		

⁷ See SCE specific program information in the “Education” section of this appendix.

Program Type: Education, Financial Incentive

Program Title: Energy in Agriculture (CA)

Program Overview:

The Energy in Agriculture Program provides financial assistance and technology transfer resources to promote energy efficiency in California's agriculture and food processing industries. Program resources are available to all farmers in the state, including dairy farms, greenhouses, and nurseries; food processors, refrigerated warehouses, and other food industry related businesses in the state.

The program is designed to participate in cooperative efforts to:

- Fund research, development and demonstration projects to advance emerging energy efficiency technologies.
- Sponsor training and education programs to advance field knowledge related to pump testing, motors, compressed air systems, and thermal heating systems.
- Produce and update technology transfer materials utilizing Web based resources.
- Conduct and publish industry specific market research and road map studies.
- Provide expert opinion to industry end-users, associations, suppliers and manufacturers.
-

Demonstration Projects—The program has granted funds for the demonstration of on-farm efficient water pumping plant performance; on-farm irrigation water conservation; irrigation district water delivery system efficiencies; field machinery fuel use reduction; petrochemical pesticide use reduction; fertilizer management; harvest and post-harvest energy cost savings; food processing energy and water management; and alternative energy sources.

The goal of each demonstration projects is to document project results and assess benefits to the farmer, such as improved cash flows and greater revenues. Projects demonstrate technologies to: 1) encourage proven technologies in areas where they have not yet been adopted or 2) document energy savings in technologies which the agricultural community has accepted, but for which the savings have not been validated; that are now commercially available but are either very new to the market or are accepted technologies that are now being used in a new agricultural application.

Demonstration projects are grant funded projects due to the higher risk. Demonstration projects are documented through monitoring and evaluation, to assess costs and benefits. Most of the cooperators benefit from direct cost savings and become the early adopters of a successful new technology or management practice.

Loan Projects/Technical Assistance - The program has offered low-interest loans for the purchase of energy efficiency technologies to greenhouses (shading curtains, double-glazed roofing, drip irrigation); on farm irrigation (micro-irrigation systems for row crops, trees and vines); farm equipment (low-volume sprayers, one-pass tillage); dairy farms (vacuum and

milking pump variable frequency drives); biogas production (anaerobic digesters in dairy farms); irrigation districts (system controls and variable frequency drive installations).

The objective of the loan program is to accelerate the use of innovative technologies which promote energy efficiency and cost savings. Successful demonstration projects are now advanced to the next step and are promoted through a low-interest loan program. Low-interest loans provide the needed incentive to accelerate the use of innovative technologies among farmers at a reduced risk. Technical assistance services are provided at no cost to loan recipients for project design, installation, monitoring and evaluation.

Education and Technical Transfer - Education outreach activities are provided for demonstration and loan project results. Education and technical transfer have included; project reports, books, pamphlets, instructional video tapes, slide presentations, field days, training sessions, and educational meetings.

The program incorporates **Market Research** efforts to determine potential for energy efficiency gains. Market studies are used to develop baseline market conditions and establish industry needs to guide targeted program design and implementation.

The program relies on **Project Monitoring and Evaluation** to assess project performance, evaluate projected versus actual energy and dollar savings, evaluate cost effectiveness of energy efficient projects, provide recommendations for improvement and expand user participation. Technical assistance is also provided to loan projects to ensure proper project design and installation in addition to the data collection, analysis and project evaluation.

Program Evaluation and Assessments of specific program components are conducted to evaluate and assess effectiveness of market transformation strategy. Performance indicators are established and effectiveness is measured through various methods such as surveys of participants, observations from 3rd party evaluators, and adoption rates of technologies and management practices.

Program Information At-A-Glance

Program Contact	Primary	Ricardo Amón California Energy Commission 1516 9 th . St. MS -42 Sacramento, CA 95814 http://www.energy.ca.gov/process/agriculture
Implementing Agencies		The University of California Cooperative Extension Service California Polytechnic State University Foundation, San Luis Obispo, Irrigation Training and Research Center.
Program Start Date		10/1/1989
Funding Sources		State of California General Funds U.S. DOE Petroleum Violation Escrow Account U.S. DOE State Technologies Advancement Collaborative
Total Funding to Date		\$12,500,000
Target Type of Farms		All agricultural energy end-users
Geographic Area Served		State wide
Total Participants to Date		350
Energy Savings		Approximately 60 million kilowatt hour savings.
Cost Savings		\$18,750,000
Other Success Metrics		Energy efficiency improvements result from adoption of water saving technologies. Other benefits include higher crop yields, reduced weed populations and reduced fertilizer as well as lower pesticide use. Reduced tillage practices result in lower air pollution from dust particulates. Improved knowledge leads to optimized operations, lower production costs and higher returns on investment.

Program Type: Education, Financial Incentive

Program Title: Georgia Combined Agricultural Programs

Program Overview:

The Agricultural Energy Program is really a combination of several programs that are directed by several faculty members and serve different segments of the industry. They include an emphasis on irrigation efficiency (both agricultural and residential), fertilizer and pesticide application efficiency, poultry housing ventilation and heating efficiency, dairy efficiency, efficiencies due to "precision agriculture" and low-input agricultural practices, efficiencies in post-harvest processing (drying) of agricultural crops, and efficiency for rural housing (water and energy.)

Energy program funds are used as a supplement to state allocated funds to help pay for the expenses of delivering this programming. Expenses include travel, supplies for presentations, expenses for demonstration of new technologies, and some salary expense for employees. In the past, some funds were used as cost-share funds to help pay for investments in energy saving equipment, but that has not been done for the last several years since not enough funding was available to provide significant incentives.

Depending on the segment of the industry and the situation, educational efforts are directed in different ways. Programs are presented to farmer groups showing them how to improve the efficiency of their irrigation systems, application equipment, etc. Educational meetings are held for poultry company personnel who then use this knowledge to improve efficiency in poultry and egg production. Demonstrations are held to show energy efficient equipment. County agricultural extension agents are trained so that they can help farmers one-on-one. Publications are generated and distributed through meetings and county extension offices.

The following are a few Web sites that illustrate some of the programs we are involved with.

<http://froggy.engr.uga.edu/service/extension/ventilation/index.html>

http://www.engr.uga.edu/Extension.php?active=Public%20Service&sub_active=Extension

<http://nespal.cpes.peachnet.edu/PA/home/>

http://www.engr.uga.edu/Extension.php?active=Public%20Service&sub_active=Extension

<http://www.fcs.uga.edu/pubs/PDF/HACE-E-48.pdf>

The results of these programs are extremely difficult to measure, especially since much of the effort is directed toward training people who in turn educate and help others. It is difficult to tell how many people actually adopt energy saving practices and to what extent they are adopted. We have, however, been making, and will continue to make, efforts at quantifying the impacts of our programs.

Program Information At-A-Glance

Program Primary Contact	Julia Miller Georgia Environmental Facilities Authority 100 Peachtree Street NW Atlanta, Georgia 30303-1911
Implementing Agency	University of Georgia
Program Start Date	1/1/84,
Funding Sources	Federal Funding
Total Funding to Date	70000
Target Type of Farms	all
Geographic Area Served	Georgia,
Total Participants to Date	0—unknown participants: approximately 3000 people attend meetings and 1000 one-on-one contacts are made annually encouraging energy-saving practices
Energy Savings	Annual: 70 million kWh, Cumulative: 1.4 trillion kWh
Cost Savings	Annual: 3.5 million dollars, Cumulative: 70 million dollars
Other Success Metrics	

Program Type: Education, Financial Incentive

Program Title: Xcel Energy Farm Energy Conservation Improvement Program

Program Overview:

The Xcel Energy Farm Energy Conservation Improvement Project educated 7,555 Minnesota farmers about the benefits of installing energy efficient equipment. EnSave Energy implemented the program and offered cash incentives towards the purchase of variable speed drives on milking vacuum pumps, scroll compressors for bulk tanks, milk precoolers, compressor heat recovery units, engine block heater timers, and energy efficient stock waterers. EnSave also educated producers about the Energy Star label and the advantages of CFLs when compared to incandescent bulbs by giving away CFLs that bore the Energy Star label.

100 farm customers from all sectors of agriculture received farm energy audits that analyzed current energy usage and identified opportunities for future energy savings. These audit recipients were also educated about the hazards of mercury on the farm. Results of the program are 4 million kWh saved, and over \$270,000 in first-year energy savings realized by participating producers.

Program Information At-A-Glance

Program Primary Contact	Craig Metz
Implementing Agency	Ensave for Xcel
Program Start Date	12/31/03,
Funding Sources	CIP Prop
Total Funding to Date	
Target Type of Farms	All
Geographic Area Served	Xcel's service territory in Minnesota
Total Participants to Date	Annual: 2,237
Energy Savings	4,095,835 kWh
Cost Savings	Annual: \$271,554
Other Success Metrics	7,555 Minnesotans educated

Program Type: Education, Financial Incentive

Program Title: Efficiency Vermont

Program Overview:

Begun in 3/00, as part of Vermont’s statewide Efficiency Utility, the Efficiency Vermont Farm Program was designed to streamline and consolidate the varied utility programs in place since 1991. Initially the program targeted farms located in areas of the state identified as having been less than satisfactorily served through utility programs. For these farms, comprehensive energy audits were performed; recommendations for efficiency improvements identified, and contract management (installation coordination) services provided. Simultaneous with the audit/contract management approach described above, Efficiency Vermont aggressively marketed its services to all Vermont farms. Efficiency Vermont continues to offer no-cost “targeted audits,” contract management services, and a generous rebate structure.

Program Information At-A-Glance

Program Primary Contact	Jennifer Cram/Mike Raker, Project Managers Efficiency Vermont
Implementing Agency	Efficiency Vermont
Program Start Date	3/00
Funding Sources	PBF
Total Funding to Date	Annual: \$250,000, Cumulative: \$850,000
Target Type of Farms	All, Dairy targeted
Geographic Area Served	Vermont
Total Participants to Date	500 of 1400 dairy farms, but including other utilities the program covers 100% of market
Energy Savings	3 billion kWh
Cost Savings	
Other Success Metrics	

Program Type: Education, Financial Incentive

Program Title: Focus on Energy-Agriculture and Rural Business Sector

Program Overview:

The objectives of this program are to reduce agriculture customer energy costs. GDS Associates designed and is implementing the program as part of Wisconsin's Focus on Energy Program. Focus is Wisconsin's public benefits program administered through the State. Focus offers financial incentives for verified installation of energy saving technologies for dairy and livestock operation, irrigation systems, crop storage and handling facilities, and other agriculture support businesses.

Focus works in coordination with numerous State and Federal agencies including the Department of Commerce, Department of Agriculture Trade and Consumer Protection, the University of Wisconsin, University of Wisconsin-Extension Service, Wisconsin Technical College System, and USDA, among others.

The keys to program success have been the cooperation and coordination among the various parties who have an interest in modernizing Wisconsin agriculture operations.

Program Information At-A-Glance

Program Primary Contact	Rich Hackner GDS Associates 437 South Yellowstone Drive, Suite #212 Madison, WI 53719 608-273-0182
Implementing Agency	GDS Associates
Program Start Date	11/1/2001
Funding Sources	Public Benefits Funds
Total Funding to Date	\$4.2 million
Target Type of Farms	All
Geographic Area Served	Wisconsin
Total Participants to Date	1230
Energy Savings	28,440,522 kWh 6,600 kW 280,467 therms Annually
Cost Savings	\$2.8 million annual and \$16.5 million lifetime
Other Success Metrics	The number of distributors for certain products has been increased

Program Type: Education, Financial Incentive

Program Title: Oregon Dairy Waste to Energy

Program Overview:

From Web site:

Waste management from dairy herds is a growing environmental concern. States are seeking innovative solutions for dairy waste management and new programs for greater development of renewable energy resources. In 1997, Portland General Electric (PGE) initiated a program to generate "green power" from dairy waste on Oregon farms. The state of Oregon, through its Office of Energy, offers two incentive programs to support the projects. PGE implemented the first project in this program in March 2002 at Cal-Gon Farms. PGE built and now coordinates the operation of an anaerobic digester and engine generator set on a dairy farm to produce electricity. The system converts manure to methane through an anaerobic digester. The captured methane is then used to fuel a 6-cylinder industrial engine generator, currently producing 35 kW of energy, which is tied to PGE's grid. Presently, the system produces the 35 kW of electricity from the waste of 300 dairy cows, but when operating at full capacity (beginning in 2003), 100 kW will be produced from 500 cows. The second project will be located at the Three Mile Canyon Farm in eastern Oregon, a 20,000-cow dairy enterprise. Once operable, this will be the largest agricultural digester gas system in the United States. The digester will produce enough methane to generate 4 MW of electricity, which will be sold in an effort to help meet Oregon's growing demand for green power.

To help fund these ventures, the Oregon Office of Energy manages two programs that provide assistance to new green power projects. One is the Business Energy Tax Credit Program, which provides a 35 percent tax credit for eligible project costs, usually phased in over 5 years. These measures include biomass projects, such as PGE's dairy waste projects. The other is Oregon's Small-Scale Energy Loan Program, which offers low-interest loans for projects that save energy, produce energy from renewable resources, use recycled materials, or use alternative fuel.

Development

In 1997, Craven Farms, a privately-owned, 800-cow dairy farm in Cloverdale Oregon, decided to test the concept of an anaerobic digester gas and electric generation system. Funding for this initial project was provided through a U.S. Department of Energy grant and the state's Small-Scale Energy Loan Program. In 1999, following the Craven Farms experiment, PGE became interested in developing a program that could convert dairy waste into green power.

With passage of Oregon's electric restructuring legislation and the resulting Public Utility Commission regulations, utilities in the state were given a new incentive to explore the emerging market for green energy. In addition to legislation and state mandates, utilities

discovered that the Oregon Energy Office was already implementing complementary programs designed to help offset the costs associated with starting a new green power project. PGE approached the State of Oregon and inquired about the possibility of a joint venture.

PGE worked with the Oregon State University Agricultural Extension Program and the Oregon Dairy Farmers Association to refine the anaerobic digester concept and market it to dairy farmers. In addition to selecting projects for their size, the state and PGE have also selected programs for their location within the state. Currently, PGE makes the final decision on project selection and works with the state to determine whether the project merits state funding.

Lesson Learned

Dairy waste management can be a profitable business. Utilities have found that consumers are willing to pay a premium for energy produced in an environmentally friendly manner. Incorporating additional programs, such as Oregon's Business Energy Tax Credit and Small-Scale Energy Loan programs, can improve project economics. A distribution utility can develop, fund, build, and operate waste management systems that successfully meet multiple objectives, including the utility's desire to generate green power.

Benefits

PGE estimates that about 55,000 tons of manure will be managed per year when the Three Mile Canyon Farm project is added to their program. Each year, the two projects will also eliminate 8,765 metric tons of CO₂-equivalent (in methane).

Once these projects are on-line and plugged into the grid, PGE will have 4MW of green power to add to any renewable generation requirement that it may need to meet. The utility may also profit from the sale of the generated green power. In addition, the dairy farms solve their waste problem and receive the additional benefits of liquid fertilizer and fiber for bedding as by-products from the anaerobic digestion process.

Program Information At-A-Glance

Program Primary Contact	No Contact
Implementing Agency	PGE
Program Start Date	
Funding Sources	Two incentive programs already in place in Oregon: Business Tax Credit and the Small Scale Energy Loan Program
Total Funding to Date	
Target Type of Farms	Dairy
Geographic Area Served	Oregon
Total Participants to Date	2
Energy Savings	
Cost Savings	
Other Success Metrics	4 MW of green power to grid when all projects are connected

Program Type: Education, Financial Incentive

Program Title: Michigan Variable Speed Drive Program

Program Overview:

Implemented by Ensave Energy. The Michigan Variable Speed Drive Farm Program educated over 3,000 Michigan dairy producers about the benefits of installing a variable speed drive on the milking vacuum pump, and helped 107 dairy producers install VSDs. EnSave educated 256 dairy producers about the dangers of mercury manometers on the farm. EnSave developed marketing materials, promoted the technical aspects of the program and delivered educational information to 3,000 farmers. EnSave offered cash incentives to Michigan farm customers for the purchase of VSDs. EnSave also provided the necessary oversight to assure the successful delivery and installation of the measure.

Program Information At-A-Glance

Program Primary Contact	Craig Metz
Implementing Agency	Ensave Energy
Program Start Date	1/1/02
Funding Sources	MPUC
Total Funding to Date	385000
Target Type of Farms	Dairy
Geographic Area Served	Michigan
Total Participants to Date	107
Energy Savings	Annual: 3,000,000 kWh
Cost Savings	Annual: 1,956,000
Other Success Metrics	Educated over 3,000 Michigan farmers educated on benefits of VSDs. Educated 256 farmers on dangers of mercury manometers.

Program Type: Education, Financial Incentive

Program Title: Maine DOA Assistance Grants and Loans

Program Overview:

Exerpts from the Web site. For more information see:
<http://www.state.me.us/agriculture/mpd/business/>

Technical Assistance

The Division staff are available to assist individual agricultural businesses with help based on the knowledge and experience of various staff members. Currently we handle issues regarding irrigation, cranberry production, new crop development, labor, business planning, and market development and promotion. If our staff cannot help you, we will certainly help you find the resource person you may need.

Business Resource Directory

We can help you find information on agricultural subjects through our various contacts and directories. The Division maintains a list of farmers interested in promotional activities, agricultural associations, agencies that regulate or support agriculture, and various other subjects. The Department has developed a directory of cooperatives, various lists of farmers by commodity produced, and is working on a labor regulations directory.

Ag Business Planning Assistance

Need to expand, consolidate, or just better plan for your existing business? Do you need a business plan to go to the bank?

The Division supports business plan development through the use of scholarships for farmers to take business planning courses. The Division can also give grants to farmers to complete a business plan if they are seeking a loan through our loan program.

The Division also supports the FASTTRAC business training program as well as the NxLevel agricultural business planning program. The Division, working with local coalitions, has sponsored courses in Southern and Northern Maine. For further information, contact us at 287-7620.

Ag Business Loans

Need a loan to make capital improvements to your farm, food processing or aquaculture business? The Division manages two loan programs for that purpose, the Agricultural Marketing Loan Fund and the Potato Market Improvement Program.

Agricultural Marketing Loan Fund - This loan program offers a loan for either 75% or 90% of the total cost of a project for capital improvements for the business. At a favorable 5% interest rate, this program can help save money for agricultural enterprises making improvements.

Potato Marketing Improvement Fund—The Potato Marketing Improvement Fund (PMIF) provides financing to potato growers and packers to construct modern storages, modernize existing storages, and purchase packing lines as part of the industry’s plan to improve the quality and marketing of Maine potatoes.

Long-term, fixed-rate loans are available at low interest rates for the construction or improvements to storage and packing facilities. Funds cannot be used for working capital, refinancing, or non-project related equipment. PMIF funds may only be used for permanent financing after a project is completed. PMIF consists of two programs: Storage Retrofit Fund and the New Facilities Fund. Each is tailored to achieve specific industry

Ag Business Grants

The Division has a number of grant programs available to help adopt new technology, promote products or conduct market research. Each program has it's own eligibility criteria and reporting requirements.

Program Information At-A-Glance

Program Primary Contact	John Harker Maine Department of Agriculture
Implementing Agency	Maine DOA
Program Start Date	
Funding Sources	
Total Funding to Date	
Target Type of Farms	
Geographic Area Served	Maine
Total Participants to Date	
Energy Savings	
Cost Savings	
Other Success Metrics	

Program Type: Education, Financial Incentive

Program Title: New York Variable Speed Drive Program

Program Overview:

Program Information At-A-Glance

Program Primary Contact	Craig Metz EnSave Energy Development 65 Millet Street Richmond, Vermont 05477
Implementing Agency	Ensave Energy
Program Start Date	1/1/99,
Funding Sources	PBF
Total Funding to Date	\$850,000
Target Type of Farms	Dairy
Geographic Area Served	New York, NYSERDA
Total Participants to Date	572
Energy Savings	10,025,013 kWh
Cost Savings	\$852,126
Other Success Metrics	

Program Type: Financial Incentive

Program Title: Indiana Distributed Generation Program

Program Overview:

Indiana gives grants between 5 and 30 k for DG projects. It is unknown how many of these are agriculture-based, but programs are eligible.

For more information: <http://www.in.gov/doc/businesses/PDFs/TXTENDGGP.pdf>

Program Information At-A-Glance

Program Primary Contact	Ryan Brown Indiana Energy and Recycling Division (Commerce) 1 N. Capitol, Suite 700 Indianapolis, Indiana 46204
Implementing Agency	Indiana Department of Commerce
Program Start Date	
Funding Sources	State (Stripper-Well Funds)
Total Funding to Date	\$150,000 to-date
Target Type of Farms	All
Geographic Area Served	Indiana
Total Participants to Date	
Energy Savings	
Cost Savings	
Other Success Metrics	

Program Type: Financial Incentive

Program Title: Minnesota Shared Savings Loan Program

Program Overview:

A \$1 million revolving fund provides loans to farmers to support the transition to sustainable practices. Loans of up to \$15,000 per farmer at a 6% interest rate enable farmers to purchase equipment or make other improvements to enhance profitability and the environment. Applications are accepted year-round and are competitively reviewed by a loan review panel three to four times per year.

Program Information At-A-Glance

Program Primary Contact	No Contact
Implementing Agency	Minnesota Department of Agriculture
Program Start Date	
Funding Sources	
Total Funding to Date	
Target Type of Farms	
Geographic Area Served	Minnesota, All
Total Participants to Date	
Energy Savings	
Cost Savings	
Other Success Metrics	

Program Type: Financial Incentive

Program Title: CA Standard Performance Contract

Program Overview:

This program is funded through the California Ratepayer surcharge (Public Benefit Fund, PBF), directed by the California Public Utilities Commission and implemented by the large investor owned utilities in California. It is an extension of the Express Efficiency program and intended for technologies and practices for which there are energy savings, but are not included in the Express rebate program.

Incentives for energy efficiency retrofits paid according to how much energy is actually saved and measured by performance contracting.

Program Information At-A-Glance

Program Primary Contact	Tony Coonce San Diego Gas & Electric 8335 Century Park Court San Diego, California 92123	Other Utility Contacts: None given
Implementing Agency	SDG&E, other CEC members	
Program Start Date	1/1/96,	
Funding Sources	PBF	
Total Funding to Date	\$20,000,000 (all sectors)	
Target Type of Farms	All	
Geographic Area Served	California, CEC Service Areas	
Total Participants to Date		
Energy Savings		
Cost Savings		
Other Success Metrics		

Program Type: Financial Incentive

Program Title: EnergySmart Loan Program (NY)

Program Overview:

Working with participating lenders, The Loan Fund offers interest rate reductions of 4.0% on loans up to \$1,000,000 for energy-efficiency improvements or installations of renewable energy systems. For more information: www.nyserda.org/loanfund

Program Information At-A-Glance

Program Primary Contact	Marcia Chandler NYSERDA 17 Columbia Circle Albany, New York 12203
Implementing Agency	NYSERDA
Program Start Date	1/1/99,
Funding Sources	PBF
Total Funding to Date	\$1,900,000 (all sectors)
Target Type of Farms	All
Geographic Area Served	New York, NYSERDA Project. Electrical distribution customers of: Central Hudson, Con Edison, NYSEG, Niagara Mohawk, Orange and Rockland, and Rochester Gas and Electric Utilities paying into System Benefits Charge
Total Participants to Date	19
Energy Savings	Annual: 450,000 kWh, Cumulative: 1,800,000 kWh (all sectors)
Cost Savings	Annual: \$66,250, Cumulative: \$265,000 (all sectors)
Other Success Metrics	

Program Type: Financial Incentive

Program Title: Farm Bill Section 9006

Program Overview:

Section 9006 calls for a grant and loan program encouraging energy efficiency and renewable energy on small rural farms and businesses.

Program Information At-A-Glance

Program Primary Contact	State Rural Business Cooperatives
Implementing Agency	USDA
Program Start Date	1/1/02
Funding Sources	Fed
Total Funding to Date	Annual: \$23,000,000
Target Type of Farms	All
Geographic Area Served	USA
Total Participants to Date	
Energy Savings	
Cost Savings	
Other Success Metrics	

Program Type: Financial Incentive

Program Title: Idaho Industries of the Future

Program Overview:

This DOE Program accelerates research, development, and deployment of advanced energy efficient technologies in nine energy- and waste-intensive industries. In Idaho, the program is concentrating on three industries: forestry, mining, and agriculture. The Idaho Department of Water Resources, Energy Division has an Agriculture Efficiency Program to assist Idaho's irrigators reduce energy consumption.

Program Information At-A-Glance

Program Contact	Primary	No Contact
Implementing Agency		Idaho DOE
Program Start Date		
Funding Sources		
Total Funding to Date		
Target Type of Farms		
Geographic Area Served		Idaho
Total Participants to Date		http://www.eere.energy.gov/buildings/state_energy/id_nep.html
Energy Savings		
Cost Savings		
Other Success Metrics		

Program Type: Financial Incentive

Program Title: Express Efficiency Rebates (CA)

Program Overview:

This program is funded through the California rate payer surcharge, directed by the CPUC and implemented by the large utilities.

Energy cost rebates provided for small to medium non-residential accounts with a maximum monthly demand of 499 kW. For customers with more than one commercial or industrial account, a rebate demand cannot exceed 499 kW. Commercial and industrial accounts on GS-1 or GS-2 rate schedules. All agriculture rate customers (rate schedules PA-1, PA-2) are eligible.

Example: Rebates for low pressure sprinkler nozzles and sprinkler to drip irrigation. Incentive amount varies depending on measure.

Southern California Gas Greenhouse Heat Curtain and On-Farm Water Saving Measure Programs are included in this umbrella program.

Program Information At-A-Glance

Program Primary Contact	Southern California Edison Business Customer Service (800) 468-4743	Other Utilities: None given
Implementing Agency	Utilities for CPUC	
Program Start Date	April 1, 2002	
Funding Sources	PBF	
Total Funding to Date		
Target Type of Farms	All	
Geographic Area Served	CEC, Carried out by PG&E, SCE, SGD&E, SCG	
Total Participants to Date		
Energy Savings		
Cost Savings		
Other Success Metrics		

Program Type: Financial Incentive

Program Title: Hawaii Energy Performance Contracting Program

Program Overview:

In performance contracting, a building owner contracts with a private energy services company (ESCO), which then designs, purchases, installs, and maintains energy-saving equipment. The ESCO, in turn, guarantees that the energy savings achieved will pay for all project costs. Examples of projects include replacing lighting equipment, modifying or replacing boilers and chillers, installing modern energy management control systems, and replacing motors.

The Energy, Resources, and Technology Division of the Department of Business, Economic Development, and Tourism implements Hawaii's Energy Performance Contracting Program. The program meets the state Energy Program's primary goal of stimulating the economy by increasing the use of more energy-efficient technologies through public-private partnerships.

The Hawaii Legislature authorized creation of the program in 1989, and the State Energy Office began project implementation in 1990. Hawaii was the first state to implement a performance-contracting project. In addition to private-sector buildings and organizations, Hawaii's statutes enable state and county agencies to participate in this method of purchasing and procuring energy-saving improvements in buildings.

Staff in the State Energy Office implement and monitor the program, and participants enrolling in the program are considered "project partners." Although a majority of these project partners do not provide funding to help support program administration, the state considers the staff time expended by participating state and county agencies to be program cost-sharing. The Energy Office also works with project partners as they implement performance contracts and provides technical assistance during various stages of the projects. Contractors who work on the performance contracts are selected through competitive solicitation and operate with both the project partners and the state.

Program Information At-A-Glance

Program Contact	Primary	Elizabeth Raman Energy Resources and Technology Division P.O. Box 2359 Honolulu, Hawaii 96804
Implementing Agency		The Hawaii Legislature authorized creation of the program in 1989, and the State Energy Office began project implementation in 1990.
Program Start Date		1990
Funding Sources		State Funded (Performance contracting generally reaps a net profit to the farm or ESCO)
Total Funding to Date		\$31,000 plus staff time dedicated to project
Target Type of Farms		All
Geographic Area Served		Hawaii
Total Participants to Date		http://www.pewclimate.org/states.cfm?ID=27
Energy Savings		
Cost Savings		
Other Success Metrics		

Program Type: Financial Incentive

Program Title: Combined Heat and Power (CHP) Program (NY)

Program Overview:

The Combined Heat and Power Program Opportunity Notice has been issued for 3 years to solicit proposals for energy-efficient on-site generation of electric power. Solicitation open to others in addition those farms that will generate power through anaerobic digester systems.

Program Information At-A-Glance

Program Primary Contact	Marcia Chandler NYSERDA 17 Columbia Circle Albany, New York 12203
Implementing Agency	NYSERDA
Program Start Date	
Funding Sources	PBF
Total Funding to Date	10,000,000 for all sectors
Target Type of Farms	All
Geographic Area Served	New York, NYSERDA
Total Participants to Date	11 Farms
Energy Savings	
Cost Savings	
Other Success Metrics	

Program Type: Education, Financial Incentive

Program Title: C&I Performance Program (NY)

Program Overview:

This program provides performance-based incentives for electric-efficiency measures, including lighting, motors, variable speed drives, and refrigeration. Customers work with an energy service company (ESCO) or other contractor of their choice.

The segment of this overarching program that focuses primarily on agriculture is the New York Variable Speed Drive (VSD) program, operated by ENSAVE.

The objectives of this program are to save kWh, reduce dairy producers' energy costs, and lower NOx emissions. EnSave Energy operates the program through NYSERDA (New York State Energy Research and Development Authority). EnSave offers \$500 or \$1,000 incentives (based on kWh savings) to farmers to install the variable speed drives on milking vacuum pumps.

EnSave works directly with local dairy equipment dealers and VSD manufacturers to facilitate the installations. EnSave works with dairy educators from Cooperative Extension, the New York State Farm Bureau, the Grange, National Farmers Organization, USDA Farm Service Agency and many major milk cooperatives to reinforce program opportunity.

Program Information At-A-Glance

Program Primary Contact	NYSERDA Eric Mazzone 17 Columbia Circle Albany, New York 12203	EnSave (VSD portion of program) Craig Metz 65 Millet Street Richmond, VT 05477
Implementing Agency	NYSERDA,	EnSave for NYSERDA
Program Start Date		1/1/1999
Funding Sources	PBF	
Total Funding to Date		\$850,000
Target Type of Farms	All	Dairy
Geographic Area Served	New York, NYSERDA	
Total Participants to Date		572
Energy Savings	792 million kWh	10 million kWh
Cost Savings	Cumulative: \$79 million	\$852,126
Other Success Metrics		

Program Type: Financial Incentive

Program Title: New Construction Program (NY)

Program Overview:

This program provides financial incentives to lower the added cost of energy-efficient machinery in new or renovated buildings by up to 70%.

Program Information At-A-Glance

Program Primary Contact	Marcia Chandler NYSERDA 17 Columbia Circle Albany, New York 12203
Implementing Agency	NYSERDA
Program Start Date	1/1/99
Funding Sources	PBF
Total Funding to Date	\$28 million, all sectors
Target Type of Farms	All
Geographic Area Served	New York, NYSERDA
Total Participants to Date	28
Energy Savings	
Cost Savings	
Other Success Metrics	

Program Type: Financial Incentive

Program Title: Incentive Program for Idaho Irrigators

Program Overview:

In mid-September 2003, Idaho Power launched an Irrigation Efficiency Program. Through this program, irrigation customers located in Idaho can receive up to \$5,000 for improving the energy efficiency of a pump system or installing a new one. Company agriculture representatives will administer incentive funds for qualified, energy-saving projects as long as funds are available.

More information: <http://www.idahopower.com/energycenter/energyefficiency/irrigation.htm>

<http://www.idahopower.com/pdfs/energycenter/AgReps.pdf>

Program Information At-A-Glance

Program Primary Contact	Rex Winn Idaho Power PO Box 70 Boise, Idaho 83707
Implementing Agency	Idaho Power
Program Start Date	mid-September 2003
Funding Sources	PBF (Conservation Charge)
Total Funding to Date	
Target Type of Farms	
Geographic Area Served	Idaho
Total Participants to Date	
Energy Savings	
Cost Savings	
Other Success Metrics	

Program Type: Peak Load Reduction

Program Title: Peak Load Reduction Program (NY)

Program Overview:

This program provides cost-shared incentives to commercial and industrial customers to identify and install measures to reduce electric demand during the summer period and/or to ready their facilities to participate in the New York Independent System Operator's (NYISO) Emergency Demand Response Program (EDRP), or transmission owner demand response programs.

Program Information At-A-Glance

Program Primary Contact	Chris Smith NYSERDA 17 Columbia Circle Albany, New York 12203
Implementing Agency	NYSERDA
Program Start Date	1/1/99,
Funding Sources	PBF
Total Funding to Date	\$11.5 Million for all sectors
Target Type of Farms	All
Geographic Area Served	New York, NYSERDA
Total Participants to Date	3, One farm annually
Energy Savings	
Cost Savings	
Other Success Metrics	

Program Type: Peak Load Reduction

Program Title: Farm Load Response Program (VT)

Program Overview:

The Green Mountain Power Farm Load Response Program offered farmers the opportunity to utilize their back-up power generators or otherwise curtail their electrical usage upon a signal from the utility when the cost of purchased power to the utility is high. Farmers were offered an incentive to sign up for the program and compensation for the hours during which they curtailed. This was a pilot project for Green Mountain Power contracted to EnSave.

Program Information At-A-Glance

Program Primary Contact	Robert Chickering EnSave Energy Performance, Inc 65 Millet Street Richmond, Vermont 05477
Implementing Agency	
Program Start Date	1/1/96
Funding Sources	
Total Funding to Date	
Target Type of Farms	All
Geographic Area Served	Vermont, Green Mountain Power Service
Total Participants to Date	42
Energy Savings	
Cost Savings	
Other Success Metrics	

Program Type: Peak Load Reduction

Program Title: Agricultural Peak Load Reduction Program (CA)

Program Overview:

Funded by the California Energy Commission (Senate Bill 5X, April 2001) in response to the 2001, imbalance in electricity supply and demand in the State, the Energy Commission provided financial incentives to reduce electricity loads in the agricultural sector during the peak load period of 12 noon to 6 PM, from June 1st. through September 31st. Three program administrators were selected to provide technical and administrative services to agricultural production companies, food processors and irrigation districts.

An incentive of \$250 per kilowatt saved or shifted from the peak period was offered for the installation of energy efficient equipment. The incentive was also available for the purchase of hardware as well as software to allow the facilities the ability to respond to demand curtailment programs offered by the California Independent System Operator (CAISO). Additional incentives were offered for the testing of agricultural water pumps and retrofitting or replacing pumps and premium efficiency motors to increase efficiency.

A total of \$15 million were offered in direct incentives. Almost full subscription of funds will be achieved by the end of the program on December 31, 2004. Pump repair projects became the largest group of projects from a numerical and incentive allocation basis, especially after the summer irrigation seasons of 2001 and 2002. Participants with CAISO contracts for demand response projects found an easy way to increase payments for load shifting, and food processors most affected by high natural gas prices were quick to submit applications to help fund installations of equipment allowing them to burn alternative fuels.

Another trend noted from the review of projects and administrator reports is the increasing diversity of project types being submitted for grant funding. Dairies are retrofitting vacuum pumps, replacing milk chillers, and installing pump controls and improving pumping plant efficiencies. Food processors submitted applications for conveyor motor replacements, lighting retrofits and controls, and refrigeration plant improvements of chillers, condensers, and evaporators. Irrigation districts are enlarging or even creating new reservoirs, installing sophisticated telemetry to control pumping and distribution systems.

The program funding was announced in April of 2001 with a target date of June 1st. to announce the program availability to end users. Despite the short time frame the Energy Commission and program administrators were able to design the program and implement rules by the target date however no time was available to properly announce and market the program. The first year participation from agricultural producers was very limited. Irrigation districts were quicker to respond given their homogeneous characteristics, their small number and the targeted nature of the program. Although this was an emergency situation, more lead time is always required to properly design, implement and market programs.

Limiting overhead on programs can limit effectiveness. SB 5x limited program operating costs to 15 percent of program costs (85 percent of funds to direct services). The limit on ex-

penses was a problem in agriculture where each project was small and projects were geographically widespread. With the cost of serving many small, scattered projects, the program had limited resources to properly reach all potential end user participants.

Program Information At-A-Glance

Program Contact	Primary	Ricardo Amón California Energy Commission 1516 9 th . St. MS -42 Sacramento, CA 95814 http://www.energy.ca.gov/process/agriculture/peakload.html
Implementing Agencies		Fresno State University Foundation, Center for Irrigation Technology. California Polytechnic State University Foundation, San Luis Obispo, Irrigation Training and Research Center. Onsite Energy Inc.
Program Start Date		6/1/01
Funding Sources		State of California General Funds
Total Funding to Date		\$18,500,000
Target Type of Farms		All agricultural electricity end-users
Geographic Area Served		State wide
Total Participants to Date		976
Energy Savings		83.6 megawatts of peak load reduction 9,907 pump tests performed with pump repairs providing approximately 20 million kilowatt hour savings.
Cost Savings		Not available
Other Success Metrics		The electricity peak load reduction contributed to reducing demand pressures in the electricity system at a time of supply shortages. Particularly in rural areas where transmission and distribution costs are greater than average system costs.

Program Type: Tax

Program Title: National Renewably Production Tax Credit

Program Overview:

The Economic Security and Recovery Act of 2001 includes a 2-year extension of the production tax credit (PTC) for new wind, closed-loop biomass, and poultry waste facilities. The production tax credit, created originally in the Energy Policy Act of 1992, provided an inflation-adjusted tax credit of 1.5 cents per Kilowatthour for electricity generated from qualifying projects. Under the new law, the production tax credit is now extended retroactively from the end of 2001 to December 31, 2003. For more information: <http://www.eia.doe.gov/cneaf/solar.renewables/page/legislation/impact.html>

Program Information At-A-Glance

Program Primary Contact	No Contact
Implementing Agency	
Program Start Date	
Funding Sources	
Total Funding to Date	
Target Type of Farms	
Geographic Area Served	
Total Participants to Date	
Energy Savings	
Cost Savings	
Other Success Metrics	

Program Type: Tax

Program Title: Montana Energy Efficiency Investment Tax Credit

Program Overview:

Businesses are entitled to a state tax benefit for energy conservation investments in buildings in Montana. A business may claim 5 percent of its investment as a tax credit on state income tax owned, up to a maximum of \$300 for commercial, industrial or agricultural buildings.

Qualifying energy conservation investments include insulation in existing or new buildings in floors, walls and ceilings in excess of established standards of construction. Other examples that also qualify for the credit are storm windows and doors, insulated exterior doors, caulking and weather-stripping, clock regulated thermostats and replacement of incandescent light fixtures with more efficient lamp types. (Please note: this applies only to permanent fixtures, not to efficient light bulbs such as compact fluorescents installed in existing fixtures)

The tax benefit must be claimed in the year the expenditure is made. To determine the amount of tax benefit, calculate the cost of materials and installation of the energy conservation investment, less the value of any public or private grants received and utility contributions, including rebates. In new constructions, only the portion of the work that surpasses any applicable state or federal construction standards may be used.

Program Information At-A-Glance

Program Primary Contact	No Contact
Implementing Agency	Montana Department of Environmental Quality
Program Start Date	
Funding Sources	
Total Funding to Date	
Target Type of Farms	
Geographic Area Served	Montana, All
Total Participants to Date	
Energy Savings	
Cost Savings	
Other Success Metrics	

Appendix B: Model Program Designs

Introduction

This appendix takes the recommendations stemming from the ACEEE program review of available energy efficiency programs for the agriculture sector and turns them into potential model programs. These model programs are intended to be loose models on which to base new programs, and should be tailored to the specific needs of the region, farm-type and technology. Innumerable combinations exist for program development in the agriculture sector. In these two examples, we base the types of program on the funding apparatus. First, we use the recommendations to design a model based on state funding from limited pots of money. Second, we present a model is based on a utility delivering programs supported by a systems benefit charge (SBC). The primary differences between these model programs are the lesser amount of funding by the state, and the less certain nature of continued state funding (due to limited funds to begin with and shifting funding availability and priorities).

State-Funded Model Program

A state funded program is best implemented by the state agency that has the most existing contact with the rural community, in and outside of energy matters. In many states, this is the state Department of Agriculture, or one of the State Land Grant Universities. Because of the current fiscal situation in most states, funding for state-funded programs is always limited and must be targeted to have the largest impact on the rural community while minimizing cost. Depending on the goal of the program, different suggested programs emerge as the most effective program-type (Table 1-1). For examples of specific programs see the body of the report (e.g., Boxes 2 and 4) and Appendix 1.

Table 1-1. Program Types Fitting the Needs of a State-Funded Program

Program Type	Goal of Program
Education	<ul style="list-style-type: none"> • Promotion of general energy efficiency in agriculture • Promotion of multiple energy efficient technologies or practices • Promotion of technologies and practices to a broad array of farm types
Demonstration	<ul style="list-style-type: none"> • Promotion of a non-commercial technology, or an emerging practice • Promotion of a technology with a normally prohibitive initial cost, but low payback period

Critical to both these program types is evaluation of energy savings resulting from the programs. Past ACEEE research has shown that planning evaluation at the beginning of the program design process leads to more effective and less costly results (Kushler, York, and White 2004). The agriculture sector has had limited success with evaluation of the energy impacts of programs (see main report). Most programs did track workshop/class attendance as a success metric. In the model program, we suggest that not only the program participation be tracked, but also that a sample of the participants be surveyed in a follow-up study to track

their progress and energy savings and solicit recommendations for improving the program. While such an approach is not a comprehensive evaluation, it would give insight into the successes and challenges of the program, while allowing extrapolation of overall savings resulting from the program. The evaluation can also be used to support future funding by showing the success of the program, identify possible improvements to the program, and to target the program more appropriately for the region or specific farm-type.

Utility/SBC Programs

A SBC⁸ funded program is different from a state program because it is funded directly from a surcharge assessed on customer energy use. The money collected in SBCs generally must be used to better the energy system and the public's access to energy. Increasingly, energy efficiency and renewable energy have played a big role in the programs offered by SBC administrators. Administrators of these programs vary by state (Kushler, York, and Witte 2004). Sometimes utilities implement SBC efficiency programs because they already have access to the customer, and many of them ran the previous demand side management (DSM) programs of the 1980s and 1990s. SBCs generally provide a more stable program income base than do appropriated funds, and can therefore plan a longer term program, although they can be at risk of raids in times of state budget deficits. The benefits of longer term programs are the potential to build a brand, increased participation, increased complexity in the program, and longer term evaluations to know the benefits and challenges of the program. Program persistence has been shown to be a significant predictor of program success (Elliott, Pye, and Nadel 1996).

Similar to the state program model presented above, the success of the program hinges on the correct type of program selected by the implementer. In the case of SBC funded programs, there is a broader range of successful programs because the funding is often larger or longer-term. Still, there is a heavy importance placed on the program goals in deciding the most appropriate program type. Some examples of goals are provided in Table 2-2. For examples of specific programs see the body of the report (e.g., Boxes 3 and 5) and Appendix A.

Table 2-2. Program Types That Fit the Needs of SBC-Funded Programs

Program Type	Goals of Program
Audit Only	<ul style="list-style-type: none"> • Program promotes financial incentives already in place by performing audits and educating farmers on the existence of funding opportunities for installing energy efficient technologies or adopting energy efficient practices.
Education and Financial Incentive	<ul style="list-style-type: none"> • Program promotes commercially viable but high first cost under-used technologies and practices

⁸ A public benefit fund stems from a ratepayer charge based on consumption of energy for the purpose of promoting energy efficiency, renewable energy, and sometimes other purposes as well. More details can be found in Kushler, York and Witte 2004.

As noted in Table 2-2, these programs tend to take two major forms—audits and technical assistance to help farmers take advantage of financial incentives already in place, and combined education and incentive programs. In the latter case, incentives are most frequently rebates, but loans (sometimes with subsidized interest rates) can also be used. Experience with other sectors indicates that the majority of customers prefer rebates and that these are easier to implement (Nadel 1990). As a technology or practice becomes more common, incentives can be reduced and eventually discontinued or eligibility raised to more stringent levels.

SBC funded programs are also more likely to have follow-up and evaluation attached to them because of the required accountability to utility regulators regarding the success of programs implemented using this money, as well as the fact that these programs frequently have greater funding levels. Most SBC programs are required to produce evaluations, and this serves to benefit the successful programs through propagation while identifying the weaker parts of programs for improvement.