Michigan Farm Energy Program

Background of the program

The Michigan Farm Energy Program (MFEP) operations started in Fall of 2009, in response to the low numbers of USDA-REAP funded energy efficiency projects (tied for 50th in two of the initial USDA program's 7 years, no higher than 46th). The activities of the MFEP and partner organizations resulted in a dramatic rise to 5th by 2012. Michigan has maintained a top 10 ranking ever since and now has the highest USDA-REAP energy efficiency and renewable energy budget allocation in the Midwest.

Since then, the MFEP has expanded over the years beyond certified ASABE/ABSI S612 farm energy audits to renewable energy assessments and their subsidized funding acquisition, working with Utilities in developing agricultural energy waste reduction programs, inclusion of over 45 agriculture specific energy efficiency options (from IR and anti-condensation poly-film for greenhouses, heating pads for sows, grain dryers, control systems, low pressure center pivot irrigation, dairy plate coolers and many others unique to agricultural operations) for the Michigan Public Service Commission's (MPSC) Michigan Energy Measures Database. It also is an advocate and resource for Michigan Agricultural operators regarding energy issues. To date, all the major Michigan Utilities have Agricultural measures included in their their program, which was not the case before. Over 463 energy audits and 154 renewable energy assessments and counting have been completed and the MFEP is the only State certified training program for farm energy auditors.

Goals, timeframe, scale, and reaching the target outreach group

The Michigan Farm Energy Program (MFEP) is a fully grant-funded outreach activity of the Department of Biosystems and Agricultural Engineering Department at Michigan State University. It is supported by the Michigan Agricultural Energy Council (MAEC) and other grants sought by the Program. It was initiated through the efforts of the Michigan Department of Environment, Great Lakes, and Energy; Michigan Department of Agriculture; Michigan State University Extension; and USDA-Michigan (NRCS and REAP) to tackle the abysmal results regarding USDA-REAP energy efficiency projects awarded to Michigan agricultural operators. Its original three-month goal was to develop a training program for farm energy auditors and renewable energy assessors with a $15,000 grant. A certified farm energy audit shows farmers and rural business owners' ways to become more energy efficient and save money within its operational goals/strategies, which in turn benefits consumers and the environment. Both a certified farm energy audit or renewable energy assessment are required when applying for a USDA-REAP grant in Michigan.

This is a replicable model for those outside of Michigan. In fact, several MFEP trained and certified auditors have been contracted by clients outside of the state. Several other Midwestern states have requested technical assistance in their efforts to develop a similar activity.

Distinguishing factors and evolution in efforts to increase the impact of the program

The level of detail of the energy audits, agricultural knowledge of auditors, on-site aspects of the audits and required participation of the clients sets the MFEP apart from other energy efficiency efforts. Each agricultural operation, despite producing the same product, is different and does things in a different way. No two farms are alike. Given that agricultural operations observe USDA, FDA, EPA and State regulations (residential and commercial/industrial operations usually only observe EPA and State), agricultural operational knowledge is important as an energy conservation measure normally used in residential or commercial/industrial scenarios may not be appropriate for an ag operation. The farmer will not give the auditor the time of day if they sense that the auditor doesn't know anything about his operational process. For example: FDA regulation covering how fast you need to cool raw milk to a set temperature determines the compressor options; or sealing all building air leaks may wipe out the entire flock of birds or endanger workers due to ammonia poisoning.

No two operations are the same. This is also a point of pride for the MFEP - every audit is tailor-made for the farmer, with operation-specific warnings and considerations taken with calculations. An example is the quality of light bulb necessary for a messy, dusty dairy operation, versus a cool and dry onion storage operation.

Importantly, MFEP auditors are not looking to tell operators what's wrong with their operation. Instead, they conduct audits 'with eyes on-site' to identify ways to improve energy efficiency and reduce costs by upgrading or replacing current equipment or processes. No stone is left unturned during the initial site visit, and auditors strive to present every possible avenue of energy savings for the farmer - even if they are unlikely to utilize them for any reason.

Michigan is the only state to have a State certified farm energy audit training and certification program recognized by USDA-REAP, USDA-NRCS, State agencies, Utility programs and peer institutions. MFEP energy audit guides and calculators are referred to in the ASABE/ ANSI S612 National Standards for farm energy audits.

The MFEP operates within the state of Michigan, but technical assistance is provided to other Midwest states as our trained auditors are sought by neighboring states like Wisconsin, Ohio, Indiana and Illinois. Technical expertise has been shared and collaboration in developing educational energy materials for the Ag Sector with other Universities namely, Ohio State, Purdue, Illinois, Penn State, Rutgers and Wisconsin is a continuing activity. All Michigan farmers and rural business owners are welcome to avail of the program's assistance: anything from dairy farms, maple syrup operations, fish hatcheries, backyard organic broiler/egg operations, thousand-acre cash crop operations, fruit/vegetable packing facilities, rural grocery/hardware stores, rural movie theaters, automotive parts fabricator and may others have been assisted by the program.

Over the years, the quality of the audits and assessments offered have rapidly evolved. Audits from the very first year in 2009 have markedly less “bonus” calculations than those in 2024. Over the years, more data is provided for farmers, giving them more options for savings. Some examples are field operation calculations, process efficiency for grain dryers, and return on investment calculations for NRCS grants. Relevant informational explanations are now inserted before harder-to-understand data charts, making technical details easier to grasp for farmers.

Positive impacts on health, emissions reductions, energy burden, and societal justice

The greatest improvement was seen in the initial years of the MFEP program. From 2010-2012, USDA-REAP energy efficiency projects jumped by 757% and by 1,928% in funding while USDA renewable energy projects numbers jumped by 803% and 554% in funding, resulting in millions of dollars annually now impacting the Michigan economy. Recently in 2023, Michigan’s USDA-REAP funding allocation jumped 7-fold and for the first time ever was awarded the highest allocation among Midwest States.

Given the nature of production agriculture, any interruption of energy supply or spike in fossil fuel costs would have a substantial impact on commodity prices as well as increase production costs (fertilizer, chemicals, transportation, post-harvest, etc.). A typical reaction by agricultural producers is to cut-back production as a result of a significant increase in energy costs. This results in a rise in food prices and endangers major components of food security, namely accessibility and availability. A doubling in fossil fuel costs would result in a 13 percent increase in commodity prices. If fossil fuel costs increase four fold, commodity prices would increase by 60% (Dvoskin and Heady) resulting in a significant cost burden on the economy. The potential impact of a 30% reduction in energy costs in production agriculture could result in huge food security benefits. Energy efficiency audits of approximately 463 Michigan producers/processors average about 33% potential energy.

All these energy savings have a marked impact on reducing greenhouse gas emissions, benefiting the environment. Additionally, several International ASABE Conference papers (peer reviewed) have been published using the data and results tabulated by the MFEP.

The cost of the energy audits and renewable assessments are greatly or fully subsidized by the MFEP, meaning that they are provided at minimal or no cost to the farmer or rural business owner. This ensures that no matter the economic background or underprivileged status, all can take advantage of the program’s services. In addition, MFEP strives to assist agricultural operators and small businesses in the State’s undeserved designated areas.

Lastly, the MAEC website is one of the few fully-accessible MSU-affiliated websites based on the web content accessibility guidelines at the WCAG 2.0 standards. This ensures that those of all seeing or other sensory ability-impaired individuals are able to browse and utilize the content of the website.

Efforts to support scholarly community engagement by faculty, staff, and students, and advancing community-engaged scholarship and university outreach

As previously mentioned, the auditors trained by the MFEP are in high demand from even out-of-state entities. As a result, the MFEP has strove to employ and include student researchers from MSU to learn about energy efficiency and renewable energy, furthering their agricultural careers. Students receive highly hands-on experience, traveling to farms and rural business across Michigan right off the bat under the mentorship of program heads Aluel Go and Truman Surbrook. These excursions foster the student's communication, critical thinking, and problem solving skills, as well as teaching invaluable knowledge unable to be gleaned from sitting in a classroom. The student researchers are given ample opportunity to practice their skills, as well as to network with the wider Michigan agricultural energy community at events such as conferences and presentations.

Not only does the program allow students to become engaged with agricultural energy, but other MSU faculty as well. MFEP seeks the advice and knowledge of groups such as MSU Extension to collaborate on specialty projects such as greenhouse energy index calculators and milk cooling calculators, bringing in other departments to engage in the field.

The open availability of the tools the program develops is a testament to the advancement of community-engaged scholarship and university outreach, both at Michigan State University and beyond. The MFEP's official website, hosted on the website for the MAEC, has received thousands of unique hits from not only all over the country, but from other countries across the world: China, Canada, Australia, and the Philippines, just to name a few. This provides concrete evidence that other institutions of learning look to the MFEP for accurate, up-to-date information about energy use in Michigan and how it relates to the wider world of agriculture. Students at the Colleges of Agriculture and Natural Resources as well as the College of Engineering can find good use of the variety of energy efficiency calculators and tools freely available from the MAEC website.

Opinions on the MFEP

1. *"The MI Farm Energy Audit Program has been an asset to growing the USDA-REAP Program in Michigan. In FY2012, Michigan was in the top five nationally"* – Rick Vanderbeek, Business Program Specialist, Rural Development, U.S. Department of Agriculture.

State	2003-2009 Highest Ranking	2012-2013 Highest Ranking	2014 – 2023 Highest Ranking
Iowa	1st	1st	1st
Nebraska	2nd	2nd	2nd
Minnesota	3rd	4th	3rd
Illinois	4th	7th	4th
North	5th	3rd	5th
Michigan	46th	**5th**	**8th**

   a) USDA-RD (REAP) adopted our energy audit protocols as part of their technical advisory guide for 2014. Developed a renewable energy assessment format and content standard for Michigan.
   b) 2010, 2011, & 2012 MFEP USDA projects were selected for evaluation/audit and attained a 100% equivalent rating by USDA Washington.
   c) In 2014 USDA-RD (REAP) adopted several of MFEP audit protocols in their farm energy audit guidelines.
2. *"I believe MI Farm Energy Auditor Certification meets the intent of statements in (ASABE/ANSI) S612 regarding certification"* – Russell H. Hahn, P.E, former Director of Standards Development for ASABE and was brought in to facilitate/oversee ASABE S612 (Farm Energy Audit Standards) developed in 2009.
   a) MFEP technical guide and on-line energy calculators referred to in standards document. Only farm energy audit program cited.
   b) MFEP is the only State certified farm energy audit training program recognized by USDA-REAP, USDA-NRCS, State agencies, Utility programs and peer institutions. Energy auditors in Wisconsin, Indiana, and Nebraska have been certified through our program. Advised and collaborated with others States as well.
3. *"I strongly endorse the MFEP as a farm energy audit model that should be adopted nationally by the board of directors of the Dairy Management Institute"* – Ken Nobis, President, Michigan Milk Producers Association (MMPA), 2010.
4. *"The MSU Farm Energy Program provided the leadership for the development of the Michigan Energy Priority Issues put forward for implementation by the major farm organizations (Farm Bureau, Ag Leaders of Michigan, Michigan Agribusiness Association, and commodity groups)"* – Dianne Byrum, Chairperson, Ag. Leaders of Michigan. This Issues list was the basis for the current energy-based legislation being endorsed by agriculture. 2014.

a) Convinced and assisted all major Michigan Utility energy optimization programs to develop an agriculture component that is uniform for all utilities and removes the barriers placed on “residential” classified farms.
b) Worked with the Michigan Energy Office in funding and establishing 15 Energy Pilot Farms to serve as educational and technology operations accessible by MSU Extension and other farmers.

Recognitions

1. Acknowledgements
    a) 2025 Inspiring Energy Efficiency Awards: Best of the Midwest - Impact Award
    b) Honorable Recognition Award at the first Governor’s Energy Excellence Awards in 2015 & 2016 for the Michigan Farm Energy Program.
    c) Finalist for the Best Farm Energy Project at the 2016 Governor’s Energy Excellence Awards was a Program Energy Pilot farm.
    d) The winner and another finalist for the Best Farm Energy Project at the 2015 Governor’s Energy Excellence Awards were Program Energy Pilot farms.
    e) Recognition by State Representative Sam Singh (East Lansing) for “an organization that has overcome the barrier of communicating the benefits of energy efficiency by developing effective communication tools, marketing campaigns, and customer or behavioral engagement programs”
    f) Recognized by USDA-RD director for impact of our program in elevating Michigan’s USDA energy efficiency project numbers ranking from a range of 46 th to 50th during 2003-2009 a top 10 ranking from 2012-2014.
    g) 2014 Outstanding Academic Specialist Award by the MSU Association of Extension Agents.

Technical Guides

1. Grain Drying Energy Audit Technical Guide, Go, A., Surbrook, T., Baker-Arkema, F., & Martin, C., Michigan State University and Purdue University, 2014
2. Greenhouse Energy Audit Technical Guide, Go, A., Surbrook, T., & Althouse, J., Michigan State University, 2014.
3. Irrigation Energy Audit Technical Guide, Go, A., Surbrook, T., Althouse, J., Kranz, W., Werner, H., Michigan State University and University of Nebraska (Lincoln), 2013.
4. Dairy Farm Energy Audit Technical Guide, Go, A., Surbrook, T., & Althouse, J., Michigan State University, 2012.

Calculators (https://www.maec.msu.edu/educational-materials/calculators

1. On-line calculators: Vacuum Pump & Variable Speed/Frequency Drives; Milk Cooling; Lighting; Air Circulation & Ventilation; Efficient Motors; Tractor Heater Timers; Net Present Value; Water Heater Analysis; Pipe Insulation.

Case Studies (https://www.maec.msu.edu/mi-fep/case-studies)

1. Solar Energy Implementation Case Study - Pork Chop Hill Farm LLC

2. Solar Energy Implementation Case Study - King Orchards Fruit Co. LLC
3. Solar Energy Implementation Case Study - GDW Turkey Farms
4. Farm Energy Efficiency Case Study - Kloosterman Greenhouses
5. Farm Energy Efficiency Case Study - Zone 5 Perennials
6. Farm Energy Efficiency Case Study - Elite Apple
7. Farming for Efficiency A Case Study - Grand Valley Farm
8. Farm Energy Efficiency Case Study - GDW Turkey Farms
9. Energy Efficiency Case Study - Car Min Vu Dairy Farm
10. Greenhouse Energy Efficiency Case Study - Plymouth Orchards
11. Greenhouse Energy Efficiency Case Study - Bloemenberg Growers, Inc.
12. Michigan Fishery Energy Audits
13. A Gloomy El Nino Period for Solar Energy

UTube Videos

1. How to select LED Lights for Agriculture? - Video
2. Energy efficient LEDs and Long Day Lighting for Dairy - Video
3. Why do an Energy Audit on Your Farm? - Video
4. What is it like to apply for farm energy incentive programs like REAP? - Video
5. How to Use Less Energy to heat a Greenhouse? - Video
6. What are some basics about solar lease agreements? - Video