

Water Conservation and Efficiency Committee Recommendation

Pilot Program: Michigan Agricultural Irrigation Water and Energy Efficiency Program.

Synopsis: Irrigation plays an important role in Michigan agriculture, supporting various crops such as corn, soybean, potato, fruits, vegetables, and orchards. High-value crops including potatoes, vegetables, fruits, and seed crops, are almost 100 percent produced under irrigation and require an irrigation system upon contract. In 2019, Michigan produced \$579M in fruit, nut, and vegetable crops. Agricultural irrigation accounted for 39% of Michigan's consumptive water use, with 106 billion gallons of water withdrawn in 2019. In addition, the energy consumption of center pivot systems, which accounts for approximately 90% of Michigan's irrigation system, is estimated at 3.7 million MWh/year, contributing to 4% of Michigan's total energy consumption.

There are over 8,000 center pivot irrigation systems in Michigan, and at least one-third of the center pivots are more than 20 years old. About 10% of irrigation systems still use high-pressure sprinkler packages, which are not as energy efficient as low-pressure sprinkler packages. In addition, more than 2,000 irrigation systems are powered by diesel engines, which are less energy-efficient and produce more greenhouse gas emissions than electric engines. The Michigan Department of Environment, Great Lakes, and Energy (EGLE) Pollution Prevention Unit, through its Cleaner Fuels Program funded by the Diesel Emissions Reduction Act (DERA), will be offering grants in FY23 for agricultural irrigation pump diesel engine replacement with electric equipment, however, grant funding is limited.

Therefore, evaluation and retrofitting of the existing irrigation systems are needed to improve irrigation water and energy efficiency, reduce greenhouse gas emissions, and ultimately contribute to the state's carbon-neutral goal by 2050.

Recommended Action: The Water Conservation and Efficiency Committee recommends developing Michigan Agricultural Irrigation Water and Energy Efficiency Program as a pilot program to evaluate and retrofit the existing irrigation systems to improve water and energy efficiency. The goal of this pilot program is to develop Irrigation Best Management Practices (BMPs) through on-farm demonstrations, including evaluating and retrofitting the existing irrigation systems, measuring the improved water and energy use efficiency, and estimating the potential reduction of GHG emission and cost savings. This program entails assessing and retrofitting at least 10 center pivot irrigation systems per year. The development of the Irrigation BMPs allows making improvements in Irrigation Water Use Generally Accepted Agricultural and Management Practices (GAAMPs), Michigan Agriculture Environmental Assurance Program (MAEAP), and irrigation outreach program.

Possible retrofits or upgrades to the irrigation systems include, but are not limited to:

- 1) Replace high pressure with low-pressure sprinkler packages.

- 2) Upgrade the existing sprinkler packages (e.g., over 7-year-old) to improved and more efficient sprinkler packages.
- 3) Repair any leaks in the system.
- 4) Investigate options to improve energy efficiency (e.g., installing a Variable Frequency Drive, converting diesel to electric power for irrigation pump, etc.).
- 5) Explore the improved design options for irrigation systems and specific crop types.

This pilot program should also include irrigation scheduling to improve farmer’s irrigation practice during the growing season. Improvements in water and energy use efficiency and greenhouse gas reductions should be estimated throughout the project. Moreover, this new initiative should inspect irrigation systems to ensure proper installation, operating safety, and provide safety training. At the end of the pilot program, the committee will evaluate the pilot program’s outcomes and determine next steps for industry wide implementation.

Implementing Organization: Michigan State University Extension (MSUE) would be the primary organization responsible for pilot program implementation. This pilot program is an ideal fit within MSUE’s mission of bringing educational programs directly to individuals, communities, and businesses. MSUE operates numerous programs that complement this pilot program on irrigation, such as programs in agricultural bioenergy and energy conservation, water management and soil health. MSUE can build on its presence in all Michigan counties, recognition among the agricultural community and extensive experience delivering educational programs in the agricultural field in Michigan to make the pilot program successful. EGLE would use existing contractual agreements between EGLE and MSUE or between MDARD and MSUE to award funding to MSUE to support the pilot program.

Cost Analysis: Requesting a total of \$600,027 to cover the costs of one FTE position, part-time assistants, equipment, and supplies to implement the pilot program.

| Budget | Year 1 | Year 2 | Year 3 | Total |
|--|------------------|------------------|------------------|------------------|
| A. Salary and Fringe | | | | |
| A1) Research Assistant ¹ | \$77,000 | \$79,310 | \$81,689 | \$237,999 |
| A2) Undergraduate Students | \$9,645 | \$9,935 | \$10,233 | \$29,813 |
| B. Equipment/Materials/Supplies | | | | |
| B1) Irrigation Mobile Lab ² | \$50,000 | | | \$50,000 |
| C. Travel | | | | |
| C1) Domestic Travel | \$2,800 | \$2,800 | \$2,800 | \$8,400 |
| D. Other Costs | | | | |
| D1) Retrofit Cost-Share Program ³ | \$50,000 | \$50,000 | \$50,000 | \$150,000 |
| | | | | |
| Total Direct Cost | \$189,445 | \$142,045 | \$144,722 | \$476,212 |
| Indirect Cost (26%) | \$49,256 | \$36,932 | \$37,628 | \$123,815 |
| TOTAL | \$238,701 | \$178,977 | \$182,350 | \$600,027 |

¹ One FTE research assistant and hourly undergraduate students are requested. The research assistant is responsible for coordinating the meetings, evaluating the irrigation systems, preparing reports for the pilot program, and promoting the pilot program to stakeholders.

² The fund for developing an Irrigation Mobile Lab is requested. This includes purchasing a trailer, ultrasonic flow meters, catch cans, pressure gauges, measuring devices, water quality analysis materials, and sensor monitoring systems for measuring water pressure, soil moisture levels, and environmental conditions.

³ The retrofit cost-share program will cover up to \$5,000 per participant.

Timeframe: Three years to develop, implement, and evaluate the pilot program.

Legislative changes: None