

Field and Greenhouse Crops Case Study

Through the 2014 Kathleen A.P. Mathias Agriculture Energy Efficiency Program, Maryland farmers implemented the following energy-saving measures for crop harvests:

- Three grain dryer upgrades
- A greenhouse curtain upgrade
- A diesel-to-electric irrigation upgrade



Grain dryers use a lot of fuel, typically propane or natural gas, to dry harvested grain. The amount of energy used depends on the variety of crop, the original moisture level, and the final moisture level. Newer grain dryers are considerably more energy efficient than the older models on many farms, with typical energy savings between 15 and 40%. The three grain dryers in this case study all use propane.

Greenhouse curtains conserve heat and can provide shading. They retain heat by serving as a thermal barrier between the conditioned space and the ceiling. They also reduce the size of the area that is conditioned. Greenhouse curtains typically cut energy use by 20-50%. Additional savings from fan, lighting, and heating upgrades can be achieved in conjunction with new curtains and will substantially reduce the energy costs of a greenhouse.

Conversion from diesel to electric power presents an opportunity for significant energy savings on irrigation pumping systems. Electric power plants are much more efficient than diesel power plants, with energy savings over 50% common for this conversion. Solid state motors have fewer parts, so maintenance costs and labor are often reduced as well. Additional benefits include reduced fuel spills and noise reduction. The cost and savings associated with this upgrade depend on how far electricity must be run.

The table on the next page summarizes the savings and costs associated with these upgrades. Costs and paybacks for similar measures on other farms will differ.

Implemented Crop Harvest Measures	Propane Savings (gal)	Diesel Savings (gal)	Electric Savings (kWh) (increase ¹)	Overall Energy Savings (MMBtu)	Estimated Annual Energy Cost Savings	Installed Cost	Estimated Payback in Years
Grain Dryer #1 Replace existing 22 year old grain dryer with tower-style efficient grain dryer.	7,403			681	\$11,662	\$192,018	16.5
Grain Dryer #2 Replace existing 18 year old grain dryer with top dry efficient grain dryer.	3,970		3,763	377	\$9,627	\$105,495	11.0
Grain Dryer #3 Replace existing grain dryer and install three phase electrical service to replace need for diesel generator.	1,346	4,595	(15,600)	713	\$18,038	\$157,736	8.7
Greenhouse Curtains Replace existing energy curtains in three greenhouses and install a second energy curtain in one of the three greenhouses.	45,573			4,174	\$67,758	\$111,551	1.6
Electric Conversion Replace existing diesel irrigation pump motor with a 60 hp premium efficiency electric motor and install three phase electrical service.		4,241	(53,777)	440	\$9,239	\$56,898	6.2
Totals	58,292	8,836	(65,614)	6,385	\$116,324	\$623,698	5.4

Five farms received grants totaling \$308,831 toward the total project cost of \$623,698. Projects were installed during the summer and fall of 2014.

Many farms can benefit from similar energy efficiency projects. Even without the grant, these upgrades pay for themselves in an average of about 5.4 years—a relatively short time for a farm looking to stay in business for the next generation. Many grain dryers will be in operation for 25-30 years and sometimes even longer. While many farmers will repair and keep an old dryer functioning as long as possible, no matter how inefficient, the savings potential provides a compelling argument for replacement, as lower operating costs help keep Maryland farmers competitive.