Energy Savers Plus Program

targets significant energy savings for a

Queensland horticulture farm

PROPOSED SOLUTION

Potential energy savings 100%*

*Diesel to solar pump conversion

Key facts

Farm / Industry

Horticulture

Product

Pawpaw and beef cattle

Location

Mareeba

Irrigation

Drip and micro irrigation

Pumps

Centrifugal – Diesel

Solution

Proposed:
Electric pump with solar photovoltaic installation

The Energy Savers Plus Program is funded by the Queensland Department of Energy and Water Supply

QFF

ERGON ENERGY NETWORK

Queensland Government

Farm profile

The farm, near Mareeba, grows pawpaw which is packed for the national market. Cattle are a secondary focus. Irrigation is mostly by drippers to the pawpaw trees but there are plans to move to sprinklers in the future. Irrigation continues throughout the dry season for up to 8 months per year depending on rainfall.

The farm operates a single diesel pump for irrigation but future expansion is anticipated with a second pump site under development. These pump systems have been the focus of an energy efficiency audit.

Current energy demand

The site energy consumption consists of:

- One 36 hp centrifugal pump that is belt-driven by a diesel engine used to draw water from the Tinaroo irrigation scheme.
- Estimated future energy requirements for a new paddock and pump installation were estimated for auditing purposes.

Action

An audit of site energy consumption evaluated a number of options, including:

- diesel pump replacement
- electric pump installation (requiring grid connection)
- solar photovoltaic (PV) pump installation.

Results

Each pump location (existing irrigation system and new planned irrigation system) was evaluated separately to identify the optimal solution and associated lifecycle costs.

The baseline case for both pump locations for evaluation purposes was an electric pump installation with grid connection. At the existing pump site, a new diesel powered pump was also assessed for lifecycle comparison purposes due to the existing units remaining serviceable life.

At the existing pump location the recommendation is to install a solar powered 19kW electric pump with a 20kW solar array over an area of 150m^2. The estimated payback occurs around year 5 with an electric grid connected pump only marginally better than the replacement diesel pump over the 15 year life cycle due to estimated network connection cost. Also, upgrading to a solar powered pump eliminates diesel consumption of 8,900 litres and the labour costs associated with ongoing refuelling and maintenance.

Similarly the new pump site recommendation is a solar powered 9.5kW electric pump with a 10kW solar array over an area of 75m^2 with the return on investment being immediate due to the estimated network connection cost of the electric pump similar to the solar PV arrangement.

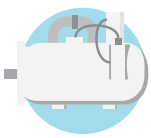
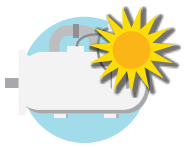
Analysis of the energy consumption per ML of water pumped demonstrates energy used in a diesel pump is significantly higher than the energy consumption for an electric pump. This is because the typical efficiency of a diesel pump is in the order of 30 to 40%, whereas electric centrifugal pumps have a typical efficiency of 70 to 80%. For this farm the MJ/ML/m head reduced from 36 to 12 when adopting an electric pump over the diesel installation.

Recommendations

The energy audit recommendations are summarised below:

Solutions for: **Existing paddock pump site**	Replace existing 36 hp diesel pump	Install mains connected 15kW pump (baseline)	Install solar powered 19kW pump
Energy consumption (p.a.)	8,925 L Diesel (339,150 MJ)	31,343 kWh (112,835 MJ)	-
Annual energy cost	$9,086	$6,610	-
Est. cost to implement	$14,500	$42,215	$69,514
Volume of water pumped (ML p.a.)	360	360	357
Energy consumption (MJ/ML/m head)	36	12	12
Payback period (years)	-	**11**	**6**

Solutions for: **New paddock pump site**	Install mains connected 7.5kW pump (baseline)	Install solar powered 9.5kW pump
Energy consumption (p.a.)	18,437 kWh (66,373 MJ)	-
Annual energy cost	$4,182	-
Est. cost to implement	$39,705	$42,493
Volume of water pumped (ML p.a.)	216	214
Energy consumption (MJ/ML/m head)	12	12
Payback period (years)	-	**<1**

Forecast savings in operating costs	 Mains connected pumps (baseline)	 Solar powered pumps	 Reduction in operating costs
Annual operating cost	$10,792	$0	-
Cost to implement	$81,920	$112,007	($30,087)
Operating costs for first 3 years	$114,296	$112,007	$2,289
Annual operating cost for years 4 to 10	$10,792	$0	$10,792
Total energy costs for 10 years	**$189,840**	**$112,007**	**$77,833**

Farmer feedback

The owner has expressed interest in implementing the audit report recommendations, with timing to be confirmed.

Case studies

To see how other agriculture businesses are saving energy and costs, go to **www.qff.org.au/energysavers**