Doubling agricultural energy productivity what would it take?

David Eyre

General Manager Research & Development NSW Farmers





Summary

- Some key statistics
- Practical opportunities on farm
- Strategic issues surrounding agricultural energy productivity and working group priorities

Agriculture energy productivity vs other industries



Agriculture is the only industry where energy productivity has dropped significantly in last 6 years



From 2008, diesel use up 31% with negligible increase in return



What happened 2006 to 2010?



Breaking out "agriculture"

- ABS lumps in forestry and fisheries
- "farming" comprises many subsectors
 - pastoral, cropping, horticulture, intensive animal, dairy, aquaculture etc
- "Broadacre" extensive farming 80% of the energy use and about 70% of the value

Gross value of agricultural commodities produced, Australia (2012–13)







Facility-based sectors

- Established energy solutions and technology
- Controlled environment
 - Building shell/envelope
 - Heating, ventilation and cooling
 - Lighting
 - Refrigeration/cool room storage
 - Hot water
 - Power quality
 - Motors, pumps and drives
- Clearer role for renewables



Challenges for broad acre

- Most farms are "mixed"
 - cropping plus pastoral
 - opportunistic production strategy
- Huge variation across farms
 - System, rainfall, soil type, proximity to grid etc
- Two uncontrollable variables:
 - Climate
 - Commodity prices

Barriers to energy productivity

- Hard to standardise solutions
- Bespoke analysis require to build and implement energy productivity measures
- No magic bullets
 - many small, interdependent actions required
 - Finance and skills hard to access
- Little support from vendors
 - eg tractors marketed on dollar/horse power

Agriculture energy spend in 2011–12 by fuel type (\$-million)



Broadacre farms in NSW

- Pastoral and cropping. Around 36,000 SMEs, 95% of the 38,000 commercial farms in NSW.
- Energy second or third highest expense, typically exceeding 5% of the cost of production.
- Diesel for vehicles and irrigation pumping generally the biggest cost



Energy Planning

- Identify major energy demands
- Perform farm energy audit
- Create farm energy plan







Action plan

Plan action & accountabilities to implement or investigate

who with Next activity by when. Opportunities savings) sarch to cat candidate -yellowdot # June Solar PV (144) - Butcher C. Morre installers 3,000 KUL Gst: find 3 quotes (by end of week) \$1,200 \$4,800 Entrythis Phitor Gerry - check quotes May -John Deere (chesterfield) Adaptive Driving = Find recommendations for: -optimum setup -fuel use key performance indicators -7.000 L cost: 1 \$11 000 Independent A/L on Vehicles Andrew - Investigate if there are sellers of this technology for agriculture 3,000 / which (tractor) Geving (send on + (writent version) - Draft prototype operator's May track fuel use fuel use template per activity and cross reconfigure JD metrics and cross reconner "poper" montor John - print out word version and add to cabs - explain process to operators Upgale to EC Far - Agregate data for borchmarting. Call Bo brother (HVAC supplier) Sarah 1,000 kuh cost 2.700 \$500 \$ 300 Sarah July Chanifish for Discount from Recieve offer from retailer Andrew 0 HUL Drigin Cost:0 12,000 0,00

Case study – Broadacre dryland/irrigation Buy Better \$500k diesel, \$60k electricity

Changing Tariffs and Pricing with Origin/Country Energy NSW Farmers bulk buying discount: Savings \$8,000 p.a. (13%)

Use less

Improving the efficiency of tractors, mobile equipment and pumping: Optimising tyre pressure and ballasting: Savings ~\$15,000 p.a. (3%) Adaptive Driving and fuel use monitoring: Savings ~\$10,000 p.a. (2%) Low load pump and pumping control: Savings ~\$30,000 p.a. (5%)

Generate their own

Electricity generation to offset purchases from the grid:

Solar PV system of 5 kW near house: Savings ~\$1,500 p.a. (3%)

Total savings: \$64,500



Heavy Farm Vehicles

- Tractors & harvesters
 - Adaptive driving
 - Ballasting
 - Tyre inflation
 - Wheel slip
 - Tractor purchasing





Key fuel saving measures

- Buying the right tractor
- Correct vehicle setup
- Efficient vehicle operation
- Maintenance
- Record keeping and planning

8% savings 8% savings 15% savings 7% savings 5% savings

Possible ~36% savings in fuel use



Energy in Irrigation

- Pump and irrigation sizing
- Diesel vs electric pumping
- Irrigation network setup
- Variable speed drives
- Sensors and smart controls
- Solar powered pumping?



NSW Farmers publications







👫 / Themes / Energy productivity / Topics / Water and Energy

Water and Energy

[Click here to download a PDF version of this information paper]

A central productivity issue for Australian farming

Lifting and distributing water is energy-intensive, particularly in water-efficient, pressurised systems. Approximately 65 percent of all bulk water in Australia is used by farms (ABS, 2010) and a majority of this water is pumped in some way. Generally, the more water efficient an irrigation systems is, the more energy it requires. The presents a dilemma to farmers facing water scarity, high water charges and high energy costs.

Irrigation farms typically move hundreds of megalitres (ML) of water, with application rates for different crops ranging from two to 10 ML per hectare (ABS, 2013). Audits of irrigation farms have found that energy used in irrigation can account for upwards of 50 percent of a total farm energy bill. Identifying and implementing energy efficiency measures in large irrigation systems could be regarded as a priority for both individual farmers and the national economy. Perverse outcomes of failing address energy efficiency in irrigation include farmers decommissioning water efficient systems and reverting to open furrow, gravity fed irrigation, or reverting to lower productivity dry land cropping systems.

Worthwhile but far smaller energy efficiency gains can be achieved in relation to stock and domestic water. All farms pump water for stock and domestic needs. While this is likely to be a small component of total farm energy use, there are worthwhile savings achievable and practical applications for renewable energy power sources.

Related resources

Topics



Farm vehicles Fuel used in tractors and other vehicles currently represents over a third of... Updated: 4th Jun 2014



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Farm types



Horticulture Energy use in the horticultural sector varies extensively based on commodity.... Updated: 7th May 2014



Aquaculture Energy in aquaculture is mostly related to running pumps and aerators to... Updated: 30th May 2014

Energy efficiency in irrigation has three key aspects.



A / Themes / Energy productivity / Case Studies

Farm Types Cropping (3) Pork (1)

Dates 2014 (4)

Topics

Energy Planning (3) Energy Purchasing (3) Farm Vehicles (3) Renewable Energy (3) Water and Energy (2) Business models (1)

Type Case Study (4)

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Power from pig poo

Outside of Young, NSW, there is a piggery that turns effluent into electricity through the process of anaerobic digestion.

Author: NSW Farmers, Published 24th Sep 2014 Farm Type: Pork Farm Theme: Business models | Renewable Energy

Fuel switching and backyard ingenuity reduce energy costs in Griffith

Biomass is a fuel source that could replace diesel for farmers prepared to make the investment but the technology is not readily accessible. At Gum Creek the use of biomass is under investigation and with over \$200,000 in pumping costs the incentive to innovate is strong for third generation farmer Ian Blight...

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Fuel switching and backyard ingenuity reduce energy costs in Griffith

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Biomass is a fuel source that could replace diesel for farmers prepared to make the investment but the technology is not readily accessible. At Gum Creek the use of biomass is under investigation and with over \$200,000 in pumping costs the incentive to innovate is strong for third generation farmer lan Blight. Ian typifies the Ag Innovator dedicating time, machinery and effort into developing prototype equipment that will collect and compress biomass into a form that can be readily incinerated to produce gas. He has also modified a 280hp diesel to save over 10 percent in diesel costs. NSW Farmers is supporting this investigation.

There are many ways to reduce energy use on farm, or take advantage of new technological advancements to enhance farming practices. Ian Blight is looking to do all of these things, as well as investigating the use of existing crop waste to provide energy for his own property, and his neighbours.

Ian runs Gum Creek, an 11,000 acre farm in the Riverina area. The farm grows rice and grazes cattle, and utilises irrigation technologies (flood) to aid crop production. Ian is a passionate tinkerer, and has explored a number of options around his existing equipment, including substituting conventional diesel with used-vegetable oil, and re-wiring and replacing pump fans on diesel engines with evaporative cooling pads, salvaged from old air conditioning units. Walking around the property, it is common to see equipment that predates Ian and his time running the farm. Old machinery is reused, or fixed up, and components are used to supplement the current operation.

Gum Creeks energy profile

Table 1: Gum Creek's energy breakdown

Fuel Type	Energy consumption	Units	Conversion to GJ	GJ	Cost	Cost per
	p.a.		factor			unit



Related resources

Topics



Farm vehicles Fuel used in tractors and other vehicles currently represents over a third of... Updated: 4th Jun 2014



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Farm types



A / energy / Events



6 results for Events



Renewable on-farm energy seminar series: Griffith launch

The NSW Office of Environment & Heritage (OEH) and NSW Farmers Association (NSWFA) invite you to the first of a free...

Events: Date 27th May 2015



Renewable on-farm energy seminar series: Deniliquin

The NSW Office of Environment & Heritage (OEH) and NSW Farmers Association (NSWFA) invite...

Events: Date 28th May 2015

Why is energy a key issue for regional Australia?

- New developments increasing demand for energy
- Opportunities for innovation at enterprise and regional scale with multipliers for local communities
- Need for planning and cross-sectoral collaboration
- The "last mile" issue



"Last mile" issue

- Transport, irrigation, energy supply...
- Ends of electricity networks:
 - more expensive to supply
 - harder to service, monitor and manage
 - a source of hazard (heat = fire)
 - = higher charges, lower quality, reliability



Integrated least cost planning

- What is the most sustainable way to supply regional Australia?
- Off grid/Island grids/local generation?
- Portfolio approach
- Incentives for the most efficient solutions on a geographic basis
- D factor analysis should guide incentives



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Strategic opportunities

- Electrification a key to optimisation from what source?
- The role of big data/digital innovation
- Untapped efficiency opportunities in the supply chain (transport logistics, advanced processing)
- Factoring renewables into long term network planning
- Precinct models that make renewable energy effective for intensive production and advanced processing

Policy priorities identified by agsector working group

- Ensuring national energy policy addresses regional needs and opportunities
- Embedding energy objectives in regional development programs/strategy
- Aligning natural resource, planning environmental and energy policy
 - eg the COAG Water Reforms and Murray Darling Basin Plan
- A national heavy vehicle energy efficiency program

