

Energy productivity in agriculture

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Summary

- Some background on energy in agriculture
- The NSW Farmers energy innovation program and opportunities on farm
- Strategic issues surrounding farm energy productive and regional energy security

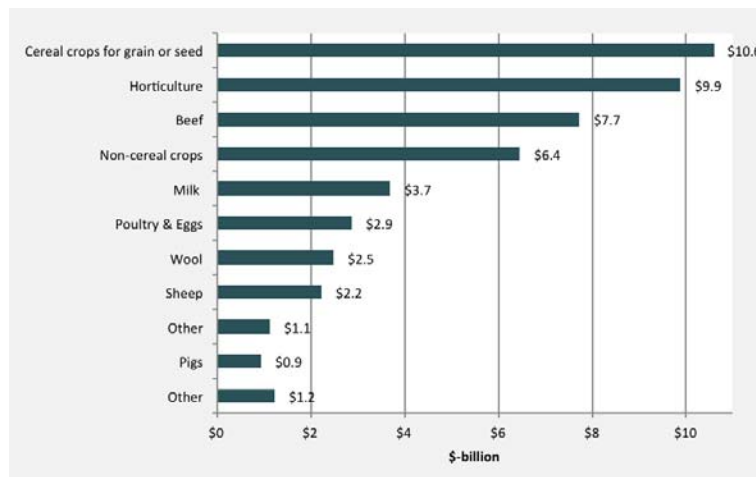
Key message

- Australia must align water and energy policy
- Water efficient irrigation is more energy intensive
- Most pumping is diesel powered
- Electricity is more efficient
- How can irrigators obtain electricity at lower cost?

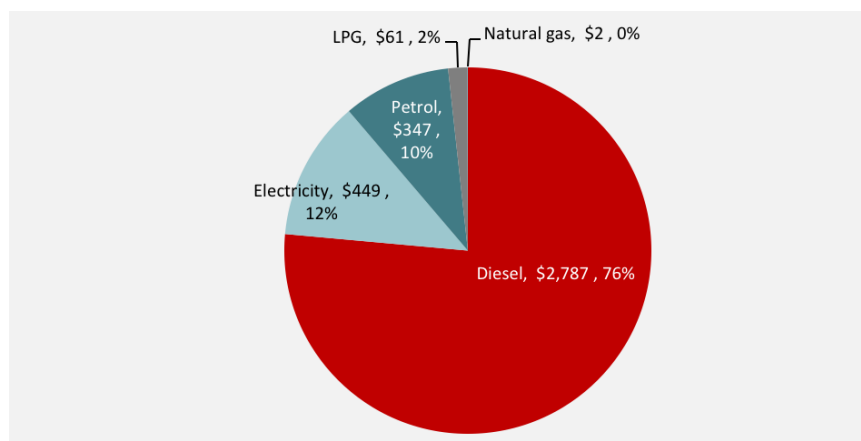
Agricultural energy statistics

- Very limited data available in Australia
- NSW farms consume an estimated 24 petajoules energy per annum
- Est cost \$900 million per annum
- Farms typically at ends of distribution networks (electricity, gas, liquid fuel)
- Higher prices and lower reliability and quality than other sectors

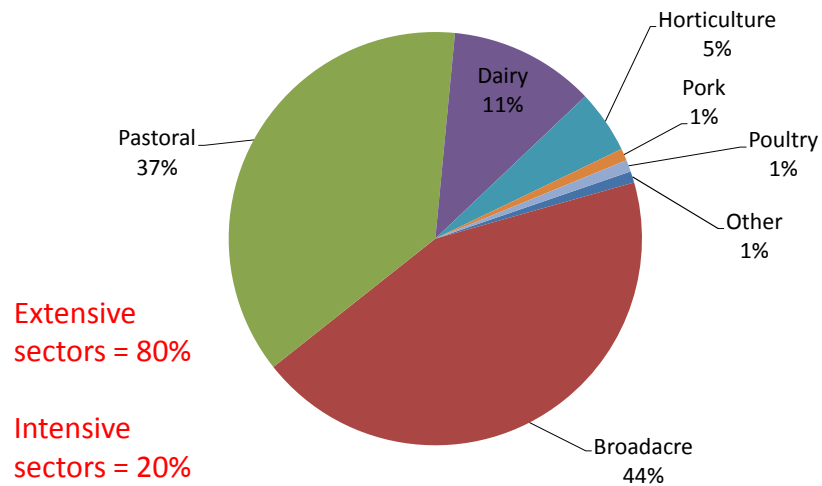
Gross value of agricultural commodities produced, Australia (2012–13)



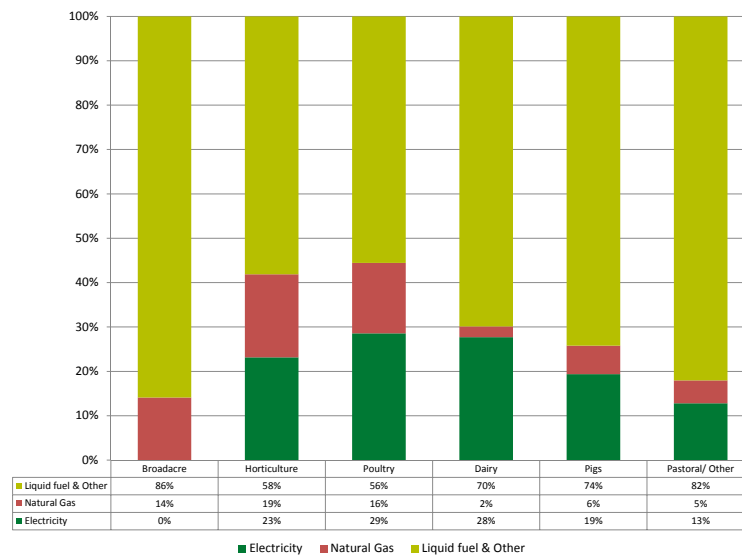
Agriculture energy spend in 2011–12 by fuel type (\$-million)



Energy use by type of farm (%)



Energy use by source



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

Buy Better

Changing Tariffs and Pricing with Origin/Country Energy

Requested 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

Broadacre farms

- 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

Farm energy innovation program

- Funded by Federal department of industry
- Working with farmers across all sectors
- Key themes:
 - Energy planning
 - Energy purchasing
 - Efficient farm vehicles
 - Energy in irrigation
 - Energy in intensive facilities
 - Renewable energy



Energy Planning

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



Adding energy planning to the farmers skill set



Action plan

Plan action & accountabilities to implement or investigate

Opportunities	Next activity	Who/with	by when (savings)
Solar PV (1kW) 3,000 kWh \$1,300 cost \$4,900 benefit	soon to find candidate installers. - find 3 quotes (by end of week) - check quotes	- yellowdot - Butcher & More - Peter or Gerry	June
Adaptive Energy 7,000 L oil \$10,000 cost Independent A/C on tractors \$3,000/week (fuel)	- Find recommendations for: - optimum setup - fuel use key performance indicators - Investigate if there are sales of this technology for agriculture - Draft prototype operator's fuel use template - Print out word version and add fu cabs - Explain process to operators	- John Deere (Westfield) Andrew Gerry (and on t (west version) John	May May
Upgrade to EC Fan 1,000 kWh oil \$300 cost \$500 benefit 2 year	- Aggregate data for benchmarking Call - Bo broken (HVIC supplier) Receive offer from retailer	Sarah Sarah Andrew	April/July



Efficient Farm Vehicles

- Focus mostly on tractors – Diesel
 - Adaptive driving
 - Ballasting
 - Tyre inflation
 - Wheel slip
 - Tractor purchasing



Key fuel saving measures

- | | |
|-------------------------------|-------------|
| • Buying the right tractor | 8% savings |
| • Correct vehicle setup | 8% savings |
| • Efficient vehicle operation | 15% savings |
| • Maintenance | 7% savings |
| • Record keeping and planning | 5% savings |

Possible ~36% savings in fuel use



Energy in Farm Facilities

- Building shell/envelope
- Heating, ventilation and cooling
- Lighting
- Refrigeration/cool room storage
- Hot water
- Power quality
- Motors, pumps and drives



Energy in Irrigation

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



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Farmer Case Studies

If you are a farmer with an Energy Innovation story, we would love to hear about what you are doing and add you to our directory

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Power from pig poo

Outside of Young, NSW, there is a piggy 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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Power from pig poo

24th Sep 2014 By [NSW Farmers](#)

Blantyre farms, owned by Michael & Edwina Beveridge is a pig farm outside of Young, NSW. The Beveridges have a 2000 sow piggy, which means that at any point there are about 20,000 pigs on hand. There are two separate piggy sites, a breeder and a grower site. Blantyre has recently installed a methane digestion system at both piggy sites. Blantyre farms was the first in the Australian pig industry to complete a commercial digestion system.

In piggeries, methane is released into the atmospheres from the anaerobic decomposition of pig manure in settling ponds. A methane digestion system captures this gas under a pond cover and burns the methane. When burned, the methane gas is converted to carbon dioxide. Methane has a Global Warming Potential of 21 versus carbon dioxide at 1, meaning that methane is 21 times worse for the atmosphere than carbon dioxide.

To set up the anaerobic digester, a new dam was constructed at each of the piggy sites. Each dam holds 50 days worth of effluent. The dam at the grower site holds 15ML, is over 100m in length, 40m wide & 5m deep. The breeder site dam is about a third the size. Each dam has been covered with 2mm LDPE (Low density poly ethylene - a type of plastic) covers. A trench was used to anchor the cover, which was then backfilled. Large PVC pipe capped at the ends & filled with water also help anchor the cover.

Related resources

Information papers

Solar hot water

Solar hot water works well in buildings that have significant roof area on...

Updated: 16th Jun 2014

Solar photovoltaic energy on farm

Solar photovoltaic (PV) electricity generation has wide application in rural...

Updated: 23rd Jun 2014

Insulating farm buildings

Insulation can result in efficiency gains of between 20 and 30 percent in some...

Updated: 16th Jun 2014

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Fuel switching and backyard ingenuity reduce energy costs in Griffith

[\[Click here to download a PDF version of this case study\]](#)

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. 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 p.a.	Units	Conversion to GJ factor	GJ	Cost	Cost per unit

Related resources

Topics



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



Water and Energy
Farmers can achieve significant energy savings through reviewing and modifying...
Updated: 5th Jun 2014



Renewable Energy
Renewable-energy technologies promise energy at a lower prices than those of...
Updated: 23rd Jun 2014

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Farm types

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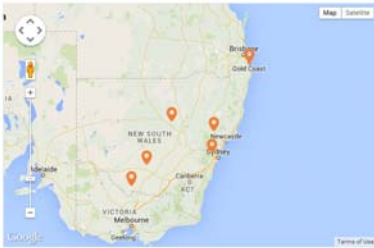
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Renewable on-farm energy seminar series: Griffith launch
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Events: Date 27th May 2015



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

- 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



countryenergy

TAX INVOICE

please pay
\$3,989.36
by 21 August 2012

Origin Energy Electricity Limited
ABN 33 071 052 287

invoice no. 4 date issued 01/08/12
charges for this bill period 30/06/2012 to 31/07/2012

ENERGY

	Quantity	Units	Unit price c	TLF	DLF	Amount \$
Peak Energy	2104	kWh	7.7351	0.9578	1.0996	171.40
Shoulder Energy	5161	kWh	7.7351	0.9578	1.0996	420.45
Off Peak Energy	7032	kWh	4.9089	0.9578	1.0996	363.56

Total 14297 \$955.41

MARKET PARTICIPATION

Fee	Quantity	Units	Unit price c	TLF	DLF	Amount \$
End User Advocacy	14296	kWh	0.0012		1.0996	0.19
Ancillary Services	14296	kWh	0.0450		1.0996	7.07
NSW Energy Saving Scheme	14296	kWh	0.1230		1.0996	19.34
AEMO	14296	kWh	0.0382		1.0996	6.00
Large Renewable Energy Target	14296	kWh	0.4810		1.0996	75.61
Small Renewable Energy Scheme					6	150.60

Total \$258.81

NETWORK (Tariff BL)

	Quantity	Units	Unit price c	TLF	DLF	Amount \$
Peak Energy						420.67
Shoulder Energy	5161	kWh	19.9938			1,031.88
Off Peak Energy	7032	kWh	9.3473			657.30
Network Access Charge	31	days	626.2000			194.12

Total \$2,303.97

Charges continued on next page. Please see over >

NMI 40011747766

monthly maximum demand at:

25/07/2012 1430 HRS
58.988856 kVa
Power Factor 0.646000

average cost (c/kWh):

25.37

greenhouse gas emissions produced
by your electricity usage for this
period is: 15.15 ton CO₂

Greenhouse gas emissions are up
2.02 tonnes from last year.

Visit www.climatechange.gov.au to
find out more on climate change and
greenhouse emissions.

Network charge
64% of total bill!

Network charge
64% of total bill!

Network 64% of Monthly Bill!

Network	\$2303.97		64%
Energy	\$955.41		26%
Market participation	\$258.81		
NSW Energy Saving Scheme		19.34	
Large Renewable Energy Target		75.61	
Small Renewable Energy Target		150.6	
		\$245.55	7%
Metering & Other charges	\$108.5		3%
Total	\$3626.69		
+GST	\$3989.36		

Tamworth case study

- Strong local economy around agriculture, food and fibre processing and mining
 - New food processing factories
 - 180 new poultry meat sheds
 - New coal mines
 - = increased demand for electricity
- How to supply it – from the grid or from renewables?
- Transgrid planning new substation & 66,000 volt line



Policy and planning challenges

- Lack of clarity around aims of national energy market with regard to regional stakeholders
- Dissonance between fiscal, social and environmental policy objectives
- Need to align water and energy reforms
(water efficient irrigation uses more energy)

