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# Benchmarking report of direct energy consumption in Australian irrigated cotton production

## Executive Summary

**The Australian Cotton Industry is one of the most highly mechanised sectors of the Australian broad-acre agricultural industries, and in particular, the irrigated component of this industry is subject to high levels of direct energy consumption in the form of diesel fuel and electricity.**

This benchmarking report presents direct energy data (diesel and electricity use) collected on irrigated Australian cotton farms. The outcomes from this benchmarking study clearly highlight that there are opportunities for growers to identify practices where energy consumption is high, and implement strategies to reduce direct energy use on farm.

Key findings from this work for Australian irrigated cotton growers include:

- The median direct energy use per hectare from a total of 198 whole of farm energy assessments in this study is 11.2 GJ per hectare,
- The middle 50% of growers from the total dataset used between 7.4 and 16.4 GJ per hectare of direct energy in fully irrigated cotton production,
- With a median yield across 198 results of 10.7 bales per hectare, the median direct energy use is 1.1 GJ per bale,
- Generally, half of the direct energy consumed is through irrigation, and about 25% is for high load tractor operations during the field prep and post-harvest phases of cotton production,
    - a single pump make and model is used to pump up to 60% of the water volume in the industry, and uses up to 30% of the total direct energy of the industry
    - significant tractor energy savings of up to 20% are possible with correction of tractor and implement setup
- Diesel fuel provides at least 90% of the direct energy used on farm,
- Expenditure on diesel fuel is at least 85% of the total direct energy expenditure,
- The median direct energy expenditure across 198 farm results is $298 per hectare across the two separate data sets, and represents 8.5% of 2013 average cotton production costs reported in industry as $3627 per hectare,
- Median GHG emissions are 920 kg $CO_2$-e per hectare and 91 kg $CO_2$-e per bale across the total of 198 results, with the middle 50% of growers emitting between 575 and 1255 kg $CO_2$-e per hectare,

**Recommendations to reduce energy consumption on irrigated cotton farms:**

1. Smaller quantities of water pumped mean smaller energy bills overall. Every effort should continue to be made to ensure that any water extracted from a water source (e.g. groundwater aquifer or river system) is not lost to seepage and evaporation in the storage, delivery and in-field application systems.

2. Very small amounts of trash can have a large impact on the performance of a pump. A reduction in head and discharge by 30% each was observed during a typical test where cotton root trash had made it through screens to collect on the centre of pump impellers. Care should be taken to ensure that as little trash as possible makes it to the intake of the pump. Screen areas must be large enough to produce minimal water surface drop across them.

3. The tractor and heavy tillage trials confirm that up to 20% fuel saving is possible with the correct and appropriate ballasting, tyre pressures and implement depth control. This component of the whole farm energy use is significant, and can represent up to 50% of some individual farm cases.

4. The irrigation component of the data set highlights three separate groups of high energy users:

    1. Groundwater users pumping a significant proportion of their total water from depth,
    2. High volume water harvesters who lift multiple times to their storages, and
    3. Low water use efficiency growers in the Australian cotton industry.

Common to these three areas of focus is the continuing necessity to measure high energy use elements across irrigated cotton farms with fuel and water flowrate indicators, pressure gauges, tachometers and hour meters.

**For more information** head to:

CottonInfo website www.cottoninfo.net.au

*my*BMP www.mybmp.com.au

Australian Cotton Production Guide www.cottoninfo.net.au

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