



A U S T R A L I A N  
A L L I A N C E T O  
**SAVE ENERGY**  
*Creating an Energy-Efficient Australia*

# Developing an energy productivity roadmap for Australian agriculture

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Consultation Paper

Draft Version 1.0

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## **Executive Summary Only**

The full text of this paper, including references, is  
available at [2xEP.org.au](http://2xEP.org.au)



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The views expressed in this text are those of A2SE and not necessarily those of our supporters and partners. We have taken all care to ensure that data is correct. All responsibility for the text rests with A2SE.

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## Executive summary

*Modern agricultural operations have become progressively more intensive users of energy (electricity and fuel) in order to secure efficiencies of labour and capital inputs. Electricity prices in Australia are the highest in the world ... farm enterprises operate in a highly competitive market. Increases in expenses, such as electricity, are largely not able to be passed on to consumers.*

*(National Farmers' Federation, 2014c)*

In an increasingly globalised market for agricultural commodities, competitiveness is paramount if Australia is to retain its leadership position as a producer and trader of high-quality food and fibre.

An holistic approach to energy productivity can make a major contribution to Australia's overall productivity and, hence, competitiveness. Rapidly increasing energy prices are just one driver for change. Other major economies are well ahead of Australia in increasing their energy productivity. Australia must act to keep pace so that it avoids entrenching the competitive disadvantage.

Not only is the mean economic value per unit of energy consumed by G20 countries higher than for Australia, so too is the G20 mean growth in energy productivity. The leading regions, such as the European Union and USA, have also set aggressive improvement targets:

- The European Union targets a 20% reduction in energy intensity<sup>1</sup> by 2020 compared to 1990 levels and is now discussing extending that target to 30% by 2030 (European Commission, 2013).
- The USA has adopted a target to double energy productivity by 2030 compared to 2005 levels (Alliance to Save Energy, 2013).
- China, although currently still lagging Australia on energy productivity, improved its energy productivity by 153% between 1990 and 2009. China is targeting a further improvement in energy productivity of 16% between 2011 and 2015 (Institute of Industrial Productivity, 2011; World Bank, n.d.).

In short, G20 peers are accelerating away from Australia at a time when domestic energy prices are increasing, and the prices in Europe and the USA are largely static or declining in real terms (A2SE, 2014a).

Consequently, the potential contribution of energy productivity improvement to Australia's overall economic productivity is now at an historic high. The country is coming from a low productivity base, coupled with relatively high real energy prices. This means that the productive use of energy, as a production input, has a more material impact on the profitability of businesses and Australia's economic growth compared to five or seven years ago.

The Australian Alliance to Save Energy (A2SE) is coordinating the Doubling Energy Productivity (2xEP) Roadmap initiative with support from governments, businesses, industry associations and thought leaders from a range of institutions. "2xEP" (two times energy productivity) refers to the initiative's aim, which is to double Australia's energy productivity by 2030. Improving energy productivity is about increasing the economic value from each unit of energy, as well as from each dollar of energy spend.

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<sup>1</sup> This is the inverse of the energy productivity measure.

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This discussion paper provides an overview of issues and approaches for consideration towards a significant boost in agriculture sector energy productivity. It provides a starting point for discussion with stakeholders in the agriculture sector and development of the Agriculture Sector 2xEP Roadmap.

*Why focus on energy productivity in agriculture?*

The agriculture sector is a significant contributor to the Australian economy and the living standards of the Australian people. Since 1995 the sector's growth in economic productivity outpaced that of other sectors. However, exceptional productivity gains achieved over past decades from innovation in agricultural science are levelling off. Furthermore, Australia's share of the agriculture export market declined between 2005 and 2010, suggesting a drop in the global competitiveness of Australian agricultural production (Lydon, Dyer, & Bradley, 2014). Farmers recognise the need for new ways in which to drive competitiveness and are increasingly focused on measures that reduce input costs.

Given prevailing margins in Australian agriculture, energy cost is equal to about a third of pre-tax profit in the sector. Energy cost is growing, due to the steep escalation of Australian energy prices since 2008 and the historic under-investment in farm energy demand management, use efficiency and self-sufficiency. Energy cost is now regarded by farmers as a priority issue and bodies such as NSW Farmers, Dairy Australia and Apple & Pear Australia have moved to implement farm energy efficiency programs.

Energy savings of 20% or more are achievable in many instances, including farm vehicle fuel efficiency, electricity use in intensive farm operations such as dairy, as well as irrigation systems. There are also significant opportunities for the strategic deployment of renewable energy technologies. Equally important, farm energy efficiency goes hand in hand with the deployment of broader efficiency technologies that enable gains in water, soil, fertiliser and agrichemical productivity. For example, automated sensor-driven irrigation control systems enable optimisation of water application while minimising energy used for pumping.

Agriculture stands to gain significantly from an energy productivity agenda. This is further evident when considering the food and fibre value chain. Whilst many farm enterprises already include processing, packing, distribution and marketing functions, a more pro-active approach by the agriculture sector can unlock further business opportunities along the value chain, up- and downstream in areas such as waste management, transport logistics and demand side response.

Consequently, the extent to which the agriculture sector embraces productivity improvement, including energy productivity, will shape both its future international competitiveness and the extent to which it remains the anchor of Australia's rural economy.

*The 2xEP initiative*

Against this background, the A2SE 2xEP initiative asserts that agriculture can make a major contribution to the general aim of doubling Australia's energy productivity by 2030.

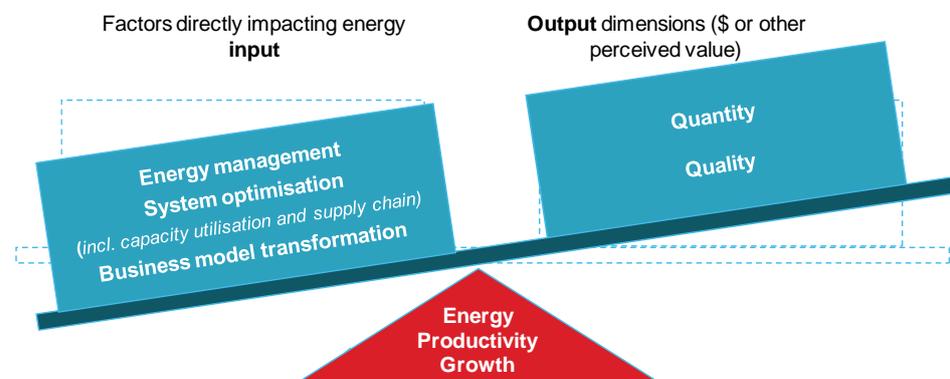
An appropriate and practical 2030 energy productivity target for agriculture could focus investment by the sector and individual farm businesses on economically efficient opportunities. A2SE proposes to consult with a diverse range of stakeholders about what this target should be, the optimal pathways to follow for

different sub-sectors within agriculture, as well as how improvement in the energy productivity of the agriculture sector could be tracked.

Consultation will canvass collaborative action that the industry could take to support a significant improvement in energy productivity and recommend actions required by governments to reduce or remove barriers to achieving such a target.

*Potential strategies for improving energy productivity.*

Energy productivity is typically expressed as the real economic output per unit of energy (usually primary energy). Consequently, the potential to achieve a voluntary energy productivity target could be influenced by adopting complementary strategies that could either increase economic output or reduce the relative energy consumption per dollar output. Energy productivity is not energy efficiency by a different name. Energy efficiency, which generally focuses on using less energy to deliver the same service is, however, an important part of one the four key strategies, as illustrated below.



The key strategies to enhance energy productivity are summarised below:

- ‘Traditional’ energy management – e.g. improving energy efficiency through better management of energy use including the implementation of innovative technologies and practices, demand-management initiatives, data-management and benchmarking to facilitate decision making.
- Systems optimisation – e.g. focusing on energy aspects of infrastructure design, production processes and extended value chain, including capacity optimisation strategies and the impact on water and waste streams. These changes may be implemented for reasons of broader productivity improvement, but greater value can be realised by bringing to them a deliberate energy competency and focus.
- Business model transformation – e.g. focussing on the energy aspects of fundamental longer term change in the business of agriculture – the design, development and operation of farms and related systems, as well as trading and asset management.
- Value creation or preservation – e.g. focussing on increased production, yield and value add to products.

*Opportunities to improve energy productivity in the*

Parts of the agriculture sector have made significant investments in energy efficiency in recent years. Leading-edge research is underway that will assist Australia in maintaining its position as a leader in agricultural production. Notably,

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*agriculture  
industry*

the agriculture sector stands to benefit from advances in precision agriculture and robotics, exploiting the wealth of data available for sustainable gains in productivity with considerations of yield, water, electricity and chemicals (Eyre et al 2004).

Farmers are also realising the benefits of upstream and downstream collaboration, including the sharing of infrastructure at regional level, such as community bore pumps and solar photovoltaic (PV) installations, thus increasing the utilisation of assets, which influences the return on investment in equipment.

Farmers are adopting innovative business models. These models typically focus on reducing costs through vertical integration, increased specialisation and scale or enhancing the resilience of the business to climate variability and natural resource constraints. For example, Sundrop Farms is effectively decoupling tomato production from weather variability, fresh water availability and soil quality. Sundrop uses solar technology to generate power that is used to desalinate seawater for irrigation and for heating and cooling hydroponic greenhouses (Sundrop Farms, 2014).

Finally, as a sophisticated but relatively high-cost producer with a reputation for 'safe, sustainable and healthy food' (Australian Trade Commission, 2013), Australia can exploit opportunities presented by high-value, fast growing global niche markets. These markets increasingly subject the food supply chain to scrutiny, demanding traceability to verify how food is produced (e.g. employment practices, animal welfare and environmental footprint) (KPMG, 2013).

Clearly, there is no 'silver bullet' that will address the economic and energy productivity challenges facing Australia generally and the agriculture sector particularly. Rather, a consistent and sustained productivity agenda is required; one that has energy productivity as a central tenet in the design and operation of primary food production systems.

However, the highly variable nature of environmental (climate) and economic (commodity prices) conditions in farm production, coupled with government intervention in the management of key inputs (land, water) may constrain the ability of farmers to prioritise energy productivity.

It is essential, therefore, that industry associations and governments become active partners in farm energy strategy. Priority areas, from a policy perspective include alignment of energy and water policy, cost effective energy supply solutions, particularly with regard to natural resource allocation policy and energy network regulation. Better alignment of energy and natural resource policy to remove unintended conflicts could achieve net savings in public expenditure.

*Benefits from 2xEP  
for agriculture*

Many producers of agricultural commodities are price takers, with limited options for value added or product differentiation. The key strategies for optimising operating income are to minimise production costs and maximise yield.

Energy is a significant cost to many agricultural producers. The convergence of high input costs, the [until recently] strong Australian dollar and increasingly variable climatic conditions has resulted in a decline in the growth of Australia's export share (Lydon et al., 2014) and placed pressure on profit margins across

many Australian agriculture sub-sectors.

*Saving one dollar in energy cost is equal to an additional \$6 at the farm gate*

Across ANZSIC Division A: Agriculture, Forestry and Fisheries, energy spend is equal to about a third of pre-tax profit. Given prevailing margins of approximately 17%, saving one dollar in energy cost is equal to an additional \$6 at the farm gate (Australian Bureau of Statistics, 2014a). Optimising energy productivity will, therefore, contribute to the increased resilience of Australian agricultural producers, helping farmers to better withstand the cyclical nature of the industry.

The benefits of a significant improvement in energy productivity in agriculture will depend on the voluntary target and actions agreed by the sector and by parties external to the sector who control factors that influence energy outcomes in agriculture. Priority areas for increasing energy productivity could include:

- On-farm energy efficiency improvements and cost savings for agricultural producers
- Improved utilisation of resources and equipment (i.e. capacity utilisation) at individual farms and more generally; for example, via local energy generation and load shifting
- Multiple dividends in terms of reduced maintenance and downtime, as well as reduced waste and improved water management.
- Identification and removal of barriers to on-farm energy innovation that are imposed by upstream and downstream participants in the food and fibre value chain.
- Policy reforms in areas such as farm machinery standards, national energy markets regulation including network tariffs, and arrangements for feed in tariffs for on-farm generation.
- Strategic support and incentives for regional energy innovation such as community solar, demand management collaboration, and energy efficient industry precincts for food and fibre value adding.

*Agriculture program objectives*

A successful outcome from the A2SE 2xEP Roadmap process will be a realistic but challenging energy productivity target and a plan developed by the sector, supported by a broad spectrum of industry constituents, to lead changes in the sector and their individual businesses to achieve the target. It is envisaged that outcomes of the A2SE 2xEP Roadmap may include:

- Definition of pathways to significantly enhance energy productivity, with reference to the different sub-sectors and scales of operations.
- Identification of energy-related opportunities to collaborate upstream and downstream in the food and fibre value chain and within regional economies to enhance Australia's leadership position in agriculture.
- Efficient communication mechanisms to accelerate awareness and understanding of emerging energy solutions, such as the recently launched AgInnovators.org.au website and its related social media network.
- Strategies for identifying and overcoming barriers to adoption of new, more

efficient technologies and practices.

- Strategic support for demonstrating and proving the business case for advanced solutions.
- Recommendations proposed to federal, state and territory governments for policy changes to facilitate these activities.

Such outcomes to be achieved through a collaborative process, involving agricultural enterprises, their value chain partners, industry associations, the research community, and the many government agencies involved in different aspects of policy-making and implementation.

*Notes:*

*All dollars (\$) are Australian dollars unless otherwise stated*