Regional Universities Network

REGIONAL STRENGTH. NATIONAL SUCCESS.

Australia's Clean Energy Transition: Opportunities for research collaboration

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Charles Sturt University

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Yindyamarra Winhanganha

The wisdom of respectfully knowing how to live well in a world worth living in

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Outline

1. Australia's clean energy targets
2. Opportunities for the regions
3. Agriculture's role
4. Charles Sturt University initiatives
    1. Renewables in Agriculture Centre
    2. Cool Soils Initiative
    3. Regional Circularity

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1. Australia's targets

- Australian Government committed reduce emissions by 43 per cent by 2030, and to net zero emissions by 2050
  - Agricultural sector currently accounts for over 16.8 per cent of Australia's net greenhouse gas emissions
- Government investment of $25 billion over this decade to deliver climate change and energy transformation priorities, including:
  - Transforming Australia's electricity supply to run mainly on renewables
  - Supporting the development of new, clean energy industries
  - Supporting the decarbonisation of existing industries and transport network
    - An agriculture and land sector-specific decarbonisation plan to be developed
- Aim to be a major global supplier of renewables
  - solar
  - onshore and offshore wind
  - green hydrogen

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Fast facts

- Renewables production increased 10 per cent in 2021, largely due to the rapid expansion of solar and wind.
- In 2021, renewable energy accounted for 29% of Australia's total electricity generation – the highest on record. Key sources were solar (12% - up 31%), wind (10% - up 19%) and hydro (6%). The 2030 target is 82%
- Australia emissions in the year to June 2022 were 21.6% below emissions in the year to June 2005.
- Most of Australia's energy production is exported. First country to export liquified Hydrogen

Why collaborate with Australia in the clean energy transition and sustainability research?

- Solar
  - highest per capita deployment of rooftop solar in the world, world leader in solar PV research
- Hydrogen
  - more than 100 hydrogen projects in the pipeline
  - world's second highest number of planned electrolyser capacity projects expected to be online by 2030.
- Biofuels
  - abundance of agricultural feedstock (e.g. 3rd largest sugarcane producer, canola, tallow and forestry residue)
  - existing refinery infrastructure that can be repurposed
  - multiple strategies to develop biofuels (e.g. 60% of local jet fuels from biogenic feedstocks by 2025)
- Circularity
  - Target of 80% average resource recovery rate from all waste streams (63% in 2020-21)
- Research strength
  - Australia has a vibrant science base, ranking seventh in the world for its clean energy research, according to the Nature Index 2022.

2. Regional opportunities

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- The A$1.9 billion Powering the Regions Fund (PRF) supports the decarbonisation of existing industries and the creation of new clean energy industries.
- Up to A$3 billion from the National Reconstruction Fund will support renewables manufacturing and the deployment of low-emissions technologies.
- Additional funds for specific clean energy technologies including A$525 million investments in regional hydrogen hubs, and $325m for community solar batteries and banks;
- By 2030, Australia's bioenergy sector could contribute to around $10 B/yr and 26,200 new jobs, and reduce emissions by about 9%

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RUN Universities and Clean Energy

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- Combined, RUN Unis undertake research in most priority areas of the plan
- Our combined research capability is similar to the more well-known Australian Universities – but we are in the regions where the research is needed

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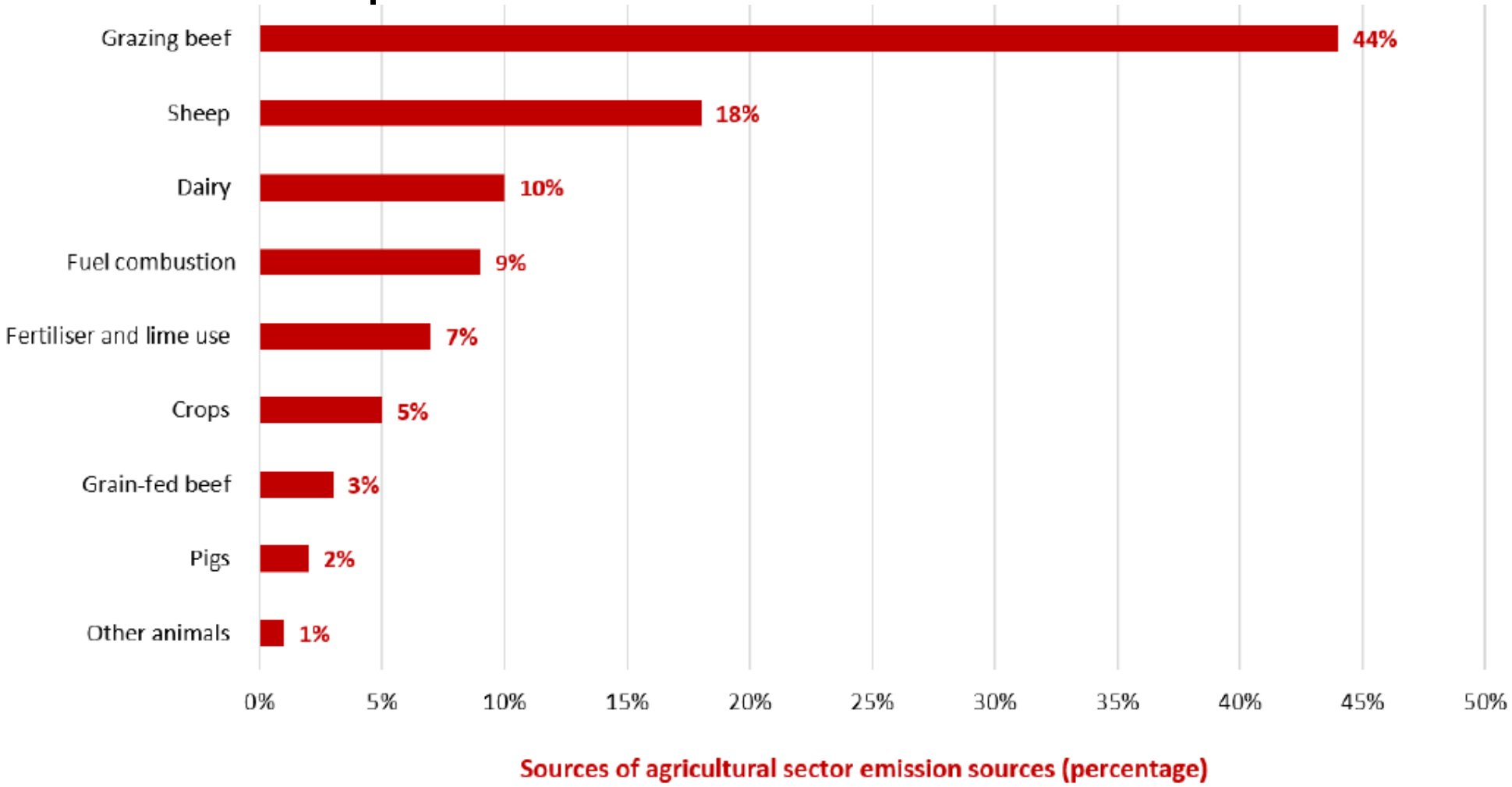
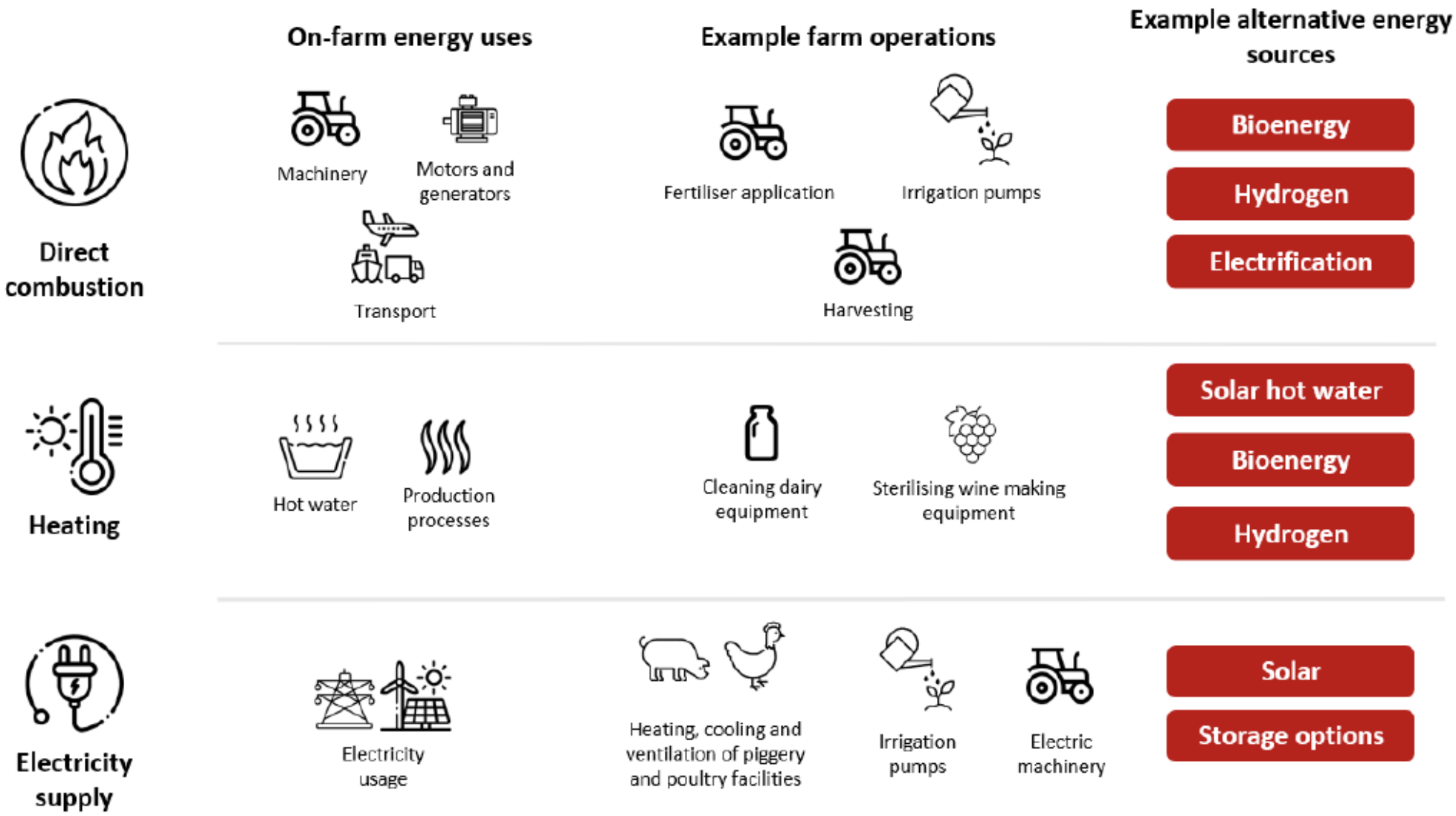
3. Clean energy transition and sustainability for agriculture and the regions

Sources of agricultural emissions, expressed as C02 equivalents at 2020



Grattan Institute (2021)

Alternative energy sources for on-farm



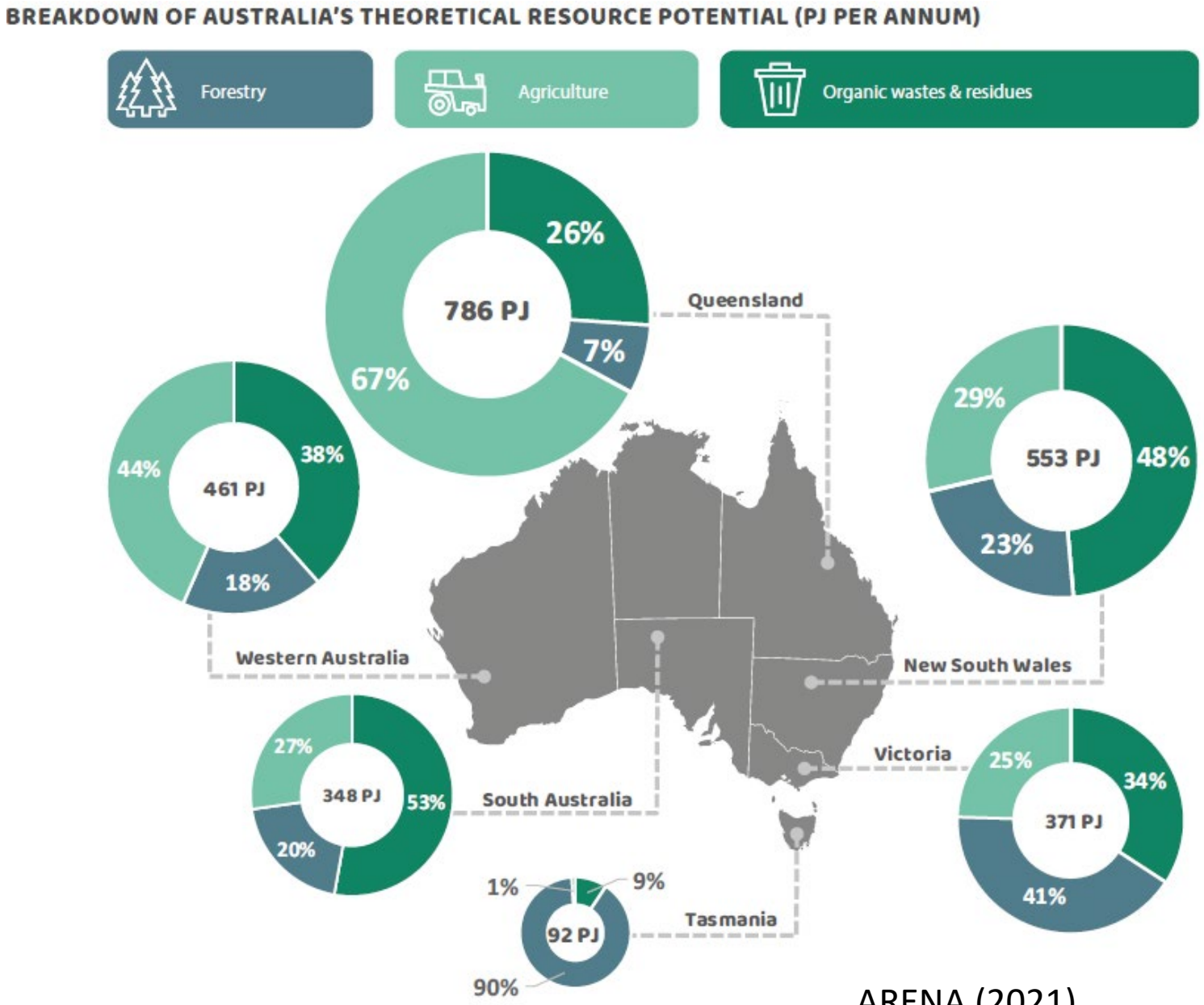
KPMG (2023)

Relative adoption of renewable sources in Australia

Technology[5]	Indicative adoption of alternative energy technology	
	Australia	International comparisons
Solar	The adoption of solar energy technologies is relatively high among Australian primary producers. In the dairy industry, it is estimated that 40 per cent of farms have installed a form of solar energy technology. Australia also has one of the highest penetrations of rooftop solar in the world.	• **Netherlands** – 43 per cent of primary producers have adopted solar technologies • **Germany** – one of the highest levels of contributions of solar to national energy mix (23 per cent; Australia is ~12 per cent). Approximately 30 per cent of solar output is produced by small-scale installations.
Anaerobic digestor	Anaerobic treatment of agricultural waste is still in its early stages of adoption across Australian rural industries. Despite a strong potential for anaerobic digesters, there are few commercial examples with a total of 22 digesters installed on agricultural properties.	• **USA** – adoption is increasing steadily from a low base due to provision of subsidies. There are over 300 systems installed on farms. • **Germany** – more than 9,000 digesters are installed on-farm.
Biofuel	Biofuels, such as biodiesel and bioethanol, appear to have relatively low rates of adoption in Australia. Currently, biodiesel and bioethanol account for 0.2 per cent and 1.1 per cent of the nation's fuel consumption respectively.	• **Brazil** – as of 2021, biofuels represent 25 per cent of transportation fuel consumption • **United States** – biodiesel and ethanol represent 3-4 per cent and 8 per cent of the nation's fuel consumption respectively
Small-scale wind	Wind energy technologies appears to have low levels of adoption at small-scale, with the majority of wind energy production occurring at utility scale. The rates of adoption in agriculture are unknown. Overall, there are less than 400 small-scale wind installation in Australia.	• **United Kingdom** – 84 per cent of small-medium scale wind turbines are owned by farmers, with approximately 10 per cent of farms operating a wind turbine.

KPMG (2023)

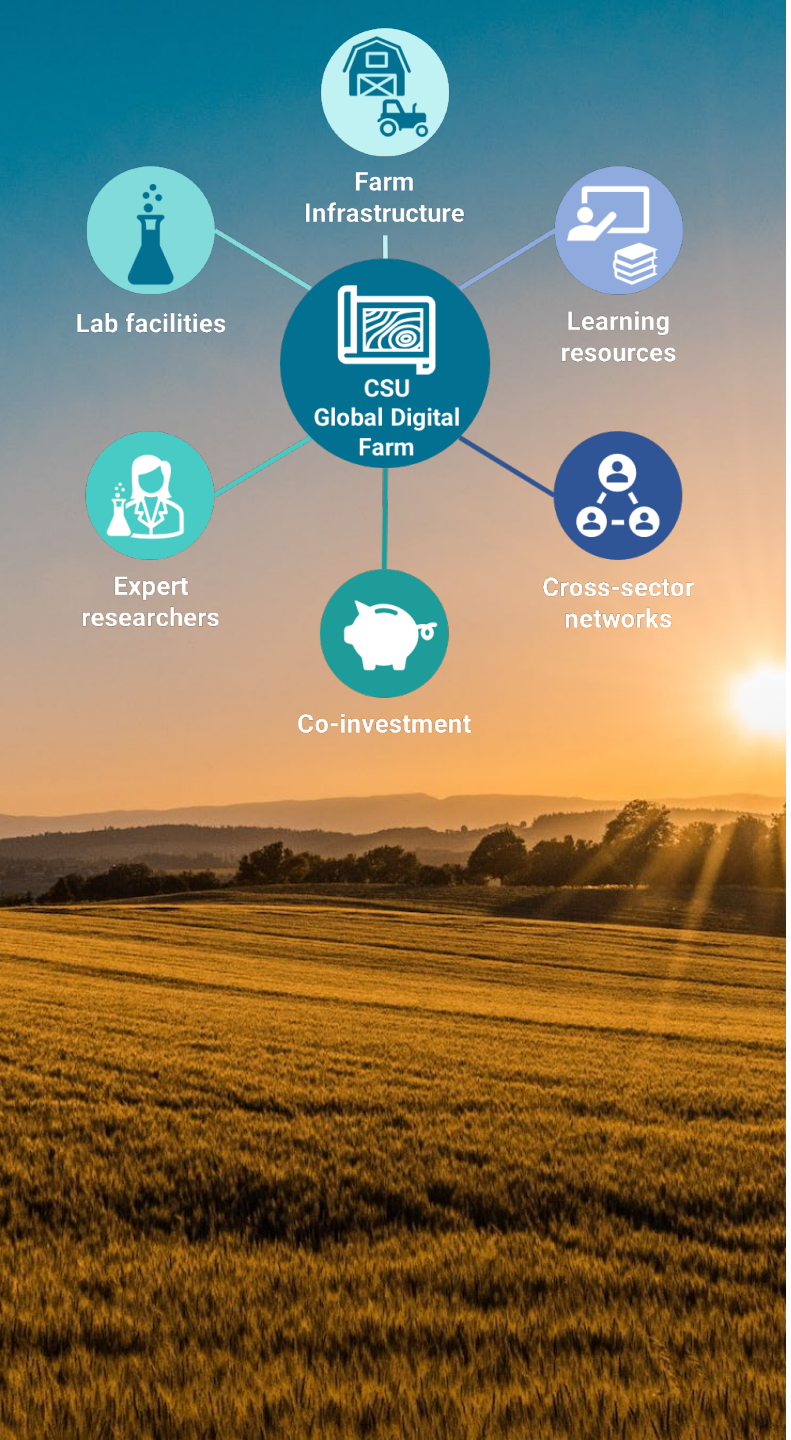
Enormous resource potential for bioenergy



ARENA (2021)

- Bioenergy accounts for approx. 3% of Australia's energy use
- By 2050, this could be 20%

- up to 33% of industrial heat market
- 18%of aviation fuel market
- 23 % of pipeline gas market
- 7% road fuel market
- 9% electricity generation for grid



4a. Renewables in Agriculture Centre of Excellence

Empowering sustainable and productive regions through agriculture-focussed renewable energy research, innovation, demonstration and capability building

Response mechanism		Barriers addressed
A national framework	**Improved data on alternative energy use in Australian agriculture** to provide the baseline for tracking adoption overtime.	
	Alternative energy in agriculture national target to set the ambition for alternative energy adoption in agriculture.	
	Alternative energy in agriculture roadmap to provide a strategic framework for policies, programs and investment.	
Technology development and deployment	**Sponsored commercial trials** to test and refine innovative technologies in an agricultural context.	
	Regional and rural demonstration sites to showcase use of alternative energy technologies in different agricultural industries and operating conditions.	
	R&D centres of excellence to underpin innovation and trialling of new technologies in different agricultural production systems.	
Training and skills	**Build alternative energy technology installation and upkeep capacity** through dedicated capacity building programs.	
	Easing supply chain constraints and building Australia's clean energy capability through the prioritisation of alternative energy in regional manufacturing initiatives and programs.	
Enabling regulatory environment	Development of **fit-for-purpose planning permissions and approvals** to support accelerate uptake of alternative energy technologies.	
	Explore **existing distribution network capacity, connection and utilisation** to support the adoption of integrated alternative energy solutions.	

Legend:

Technology · Information · Commercial feasibility · Suitability · Complexity · Skills and capacity

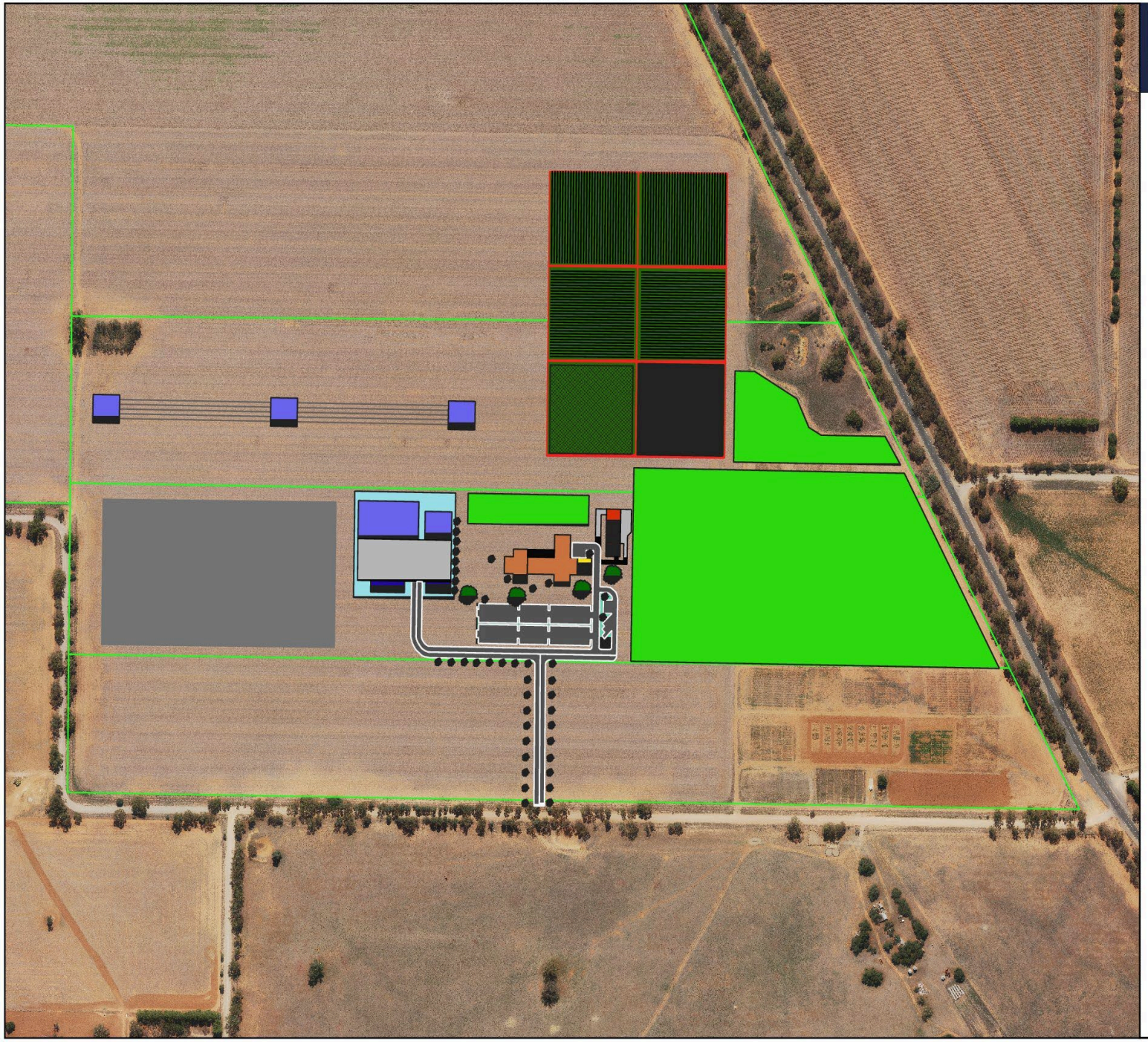
Barriers to adoption of renewables in agriculture

KPMG (2023)

Charles Sturt University

Vision – the Why

Unlock the significant unrealised potential of renewables in agricultural value chains to power regional economies and support a sustainable, resilient, productive and circular food system



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CSU Wagga ACRA

- GRDC Netted Area
- Vineyard of the Future
- no-trellis
- Solar Panels
- vines-3m-EW
- vines-3m-NS
- Vegetation
- Agronomy Area
- Transgrid Area
- CSU_WW_Cadastral_2019

Infrastructure

- CSU Training
- GDF HQ
- GRDC Shed
- Hardstand
- Pavement
- Transgrid Infrastructure
- Transgrid sheds

0 100 200 m

Map : 240309a
Printed March 2024
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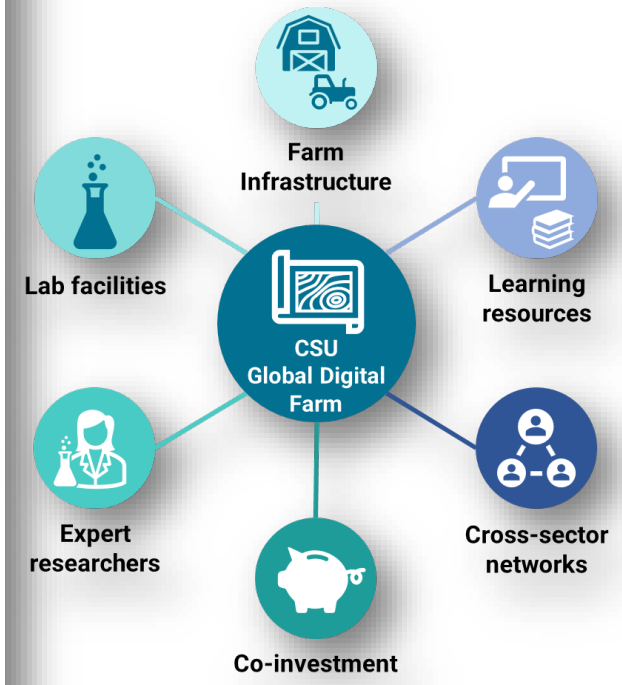
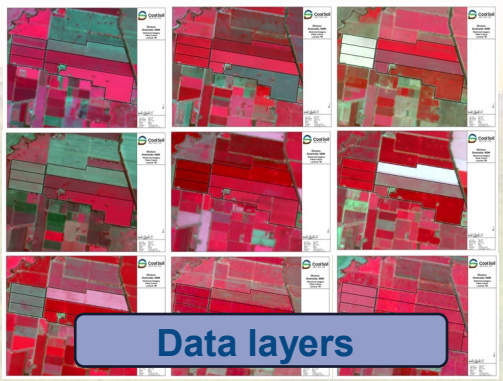
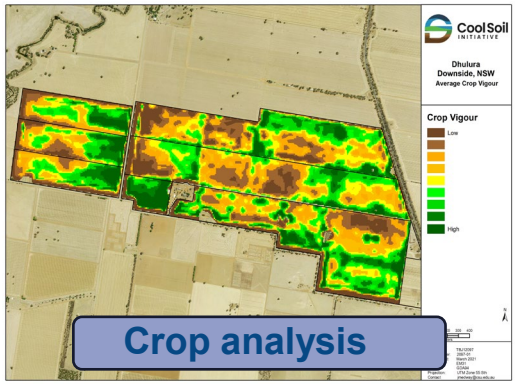
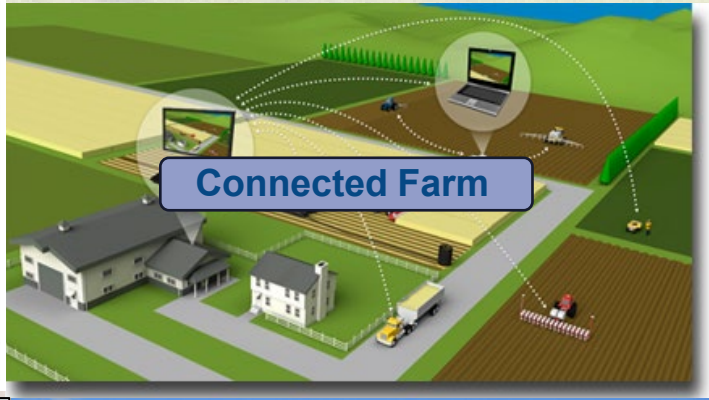


Transgrid

Global Digital Farm (1600ha, $22m investment)







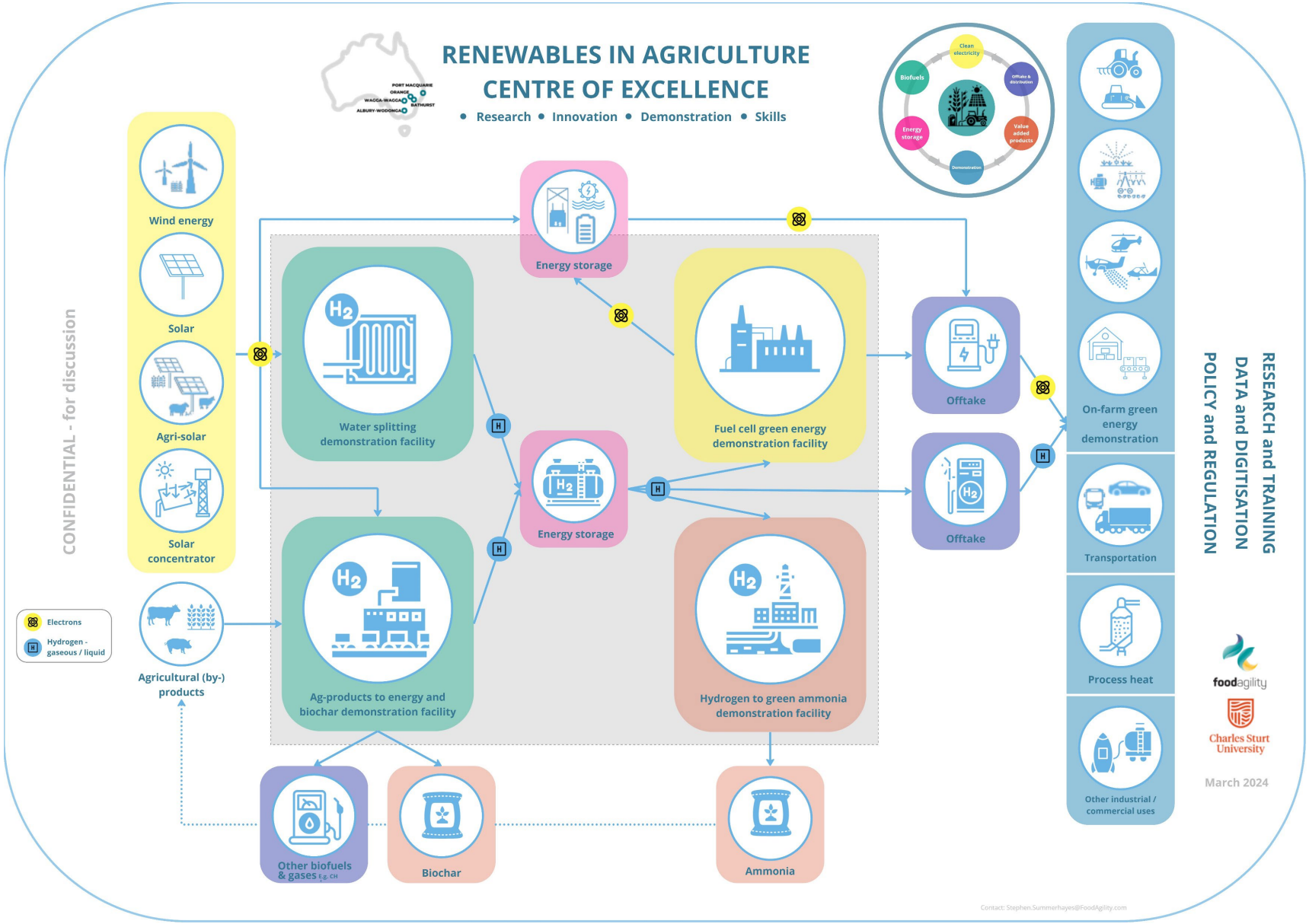
Try, test and learn

Thinking Bigger

We need an interconnected approach.

This is how that might look…

We need partners!



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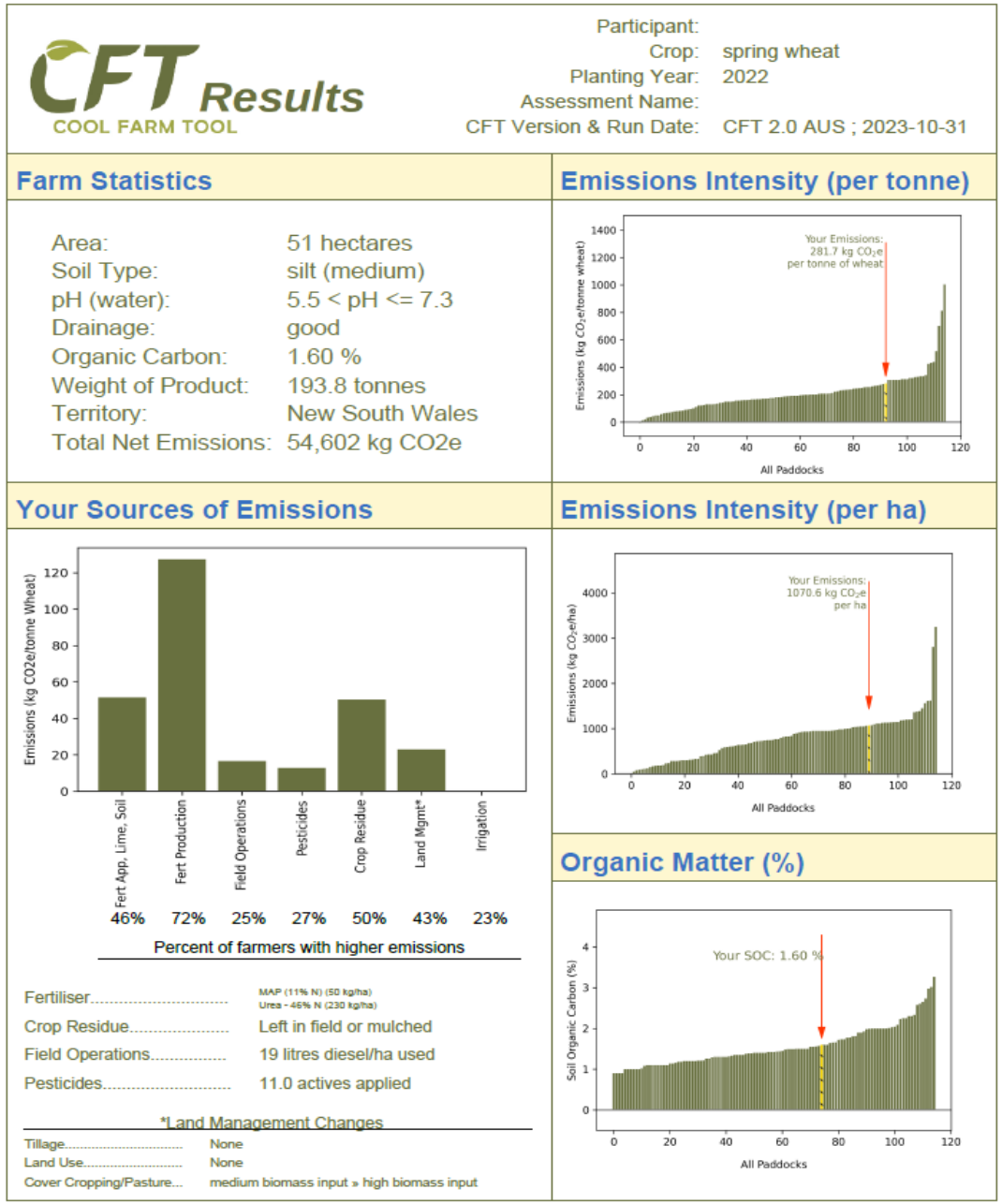
4b. Cool Soils initiative

Every farmer receives a benchmarked report showing:

- Sources of emissions
  - % farmers with higher emissions
- Emissions intensity (per tonne)
  - For commodity reporting
- Emissions intensity (per ha)
  - For farm input assessment
- Organic matter – SOC% values
- Summary of practices / land management



CFT Results
COOL FARM TOOL

Participant:
Crop: spring wheat
Planting Year: 2022
Assessment Name:
CFT Version & Run Date: CFT 2.0 AUS ; 2023-10-31

Farm Statistics

Area:	51 hectares
Soil Type:	silt (medium)
pH (water):	5.5 < pH <= 7.3
Drainage:	good
Organic Carbon:	1.60 %
Weight of Product:	193.8 tonnes
Territory:	New South Wales
Total Net Emissions:	54,602 kg CO2e

Emissions Intensity (per tonne)

Your Sources of Emissions

Fertiliser	MAP (11% N) (50 kg/ha) Urea - 46% N (230 kg/ha)
Crop Residue	Left in field or mulched
Field Operations	19 litres diesel/ha used
Pesticides	11.0 actives applied

*Land Management Changes

Tillage	None
Land Use	None
Cover Cropping/Pasture	medium biomass input » high biomass input

Emissions Intensity (per ha)

Organic Matter (%)

4c. The role of Circular Economies

Circularity changes the way products are produced, assembled, sold, used and reused to minimise waste and to reduce environmental impact.

Resources are kept in use for as long as possible, before recovering and regenerating products and materials at the end of their life.

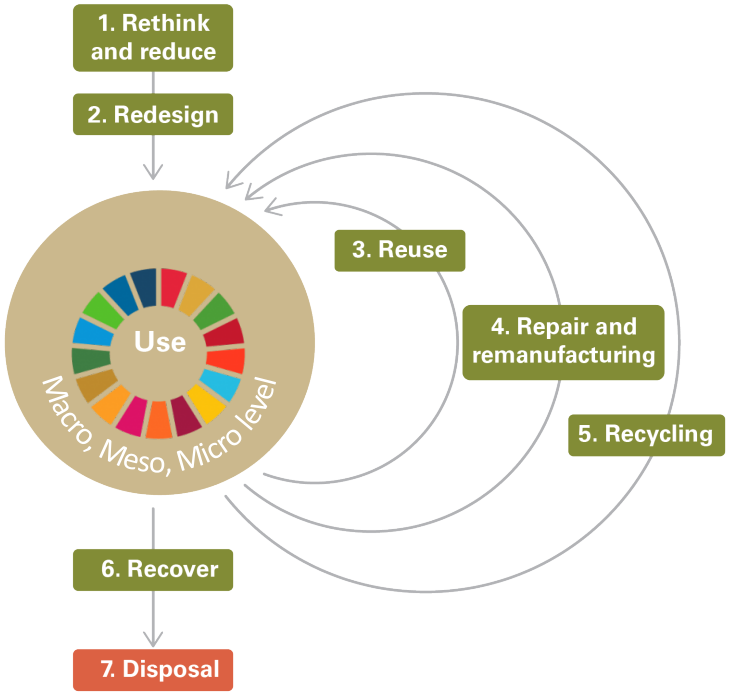
Circular economy interventions can help to tackle climate change.

Reducing waste can prevent emissions throughout the entire lifecycle of a product or material, and help sequester CO_2.

Examples of circular precincts

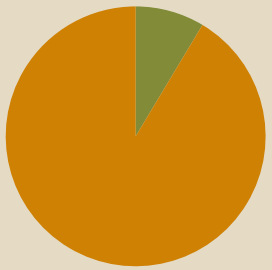
Kalundborg Eco-Industrial Park in Denmark

Händelö Eco Industrial Park in Sweden



The Circularity Gap

According to the 2022 Circularity Gap Report, the world is only 9 per cent circular in its use of resources.



9%

55% of carbon reductions

Will be achieved from the adoption of renewable energy. **45%** will come through the **transition to more circular ways of working with resources**

$210 billion

Uplift in national GDP by transition to circular in food and agriculture, transport and the built environment (KPMG Economics)

PLUS

an **additional 17,000 full-time jobs** by 2047-48.

The Bega Circular Valley Program

A unique partnership of government, industry, community and research

Community

Community interest in the BCV program and particular projects is channelled through the Co-op..

Universities

Universities are critical for driving innovation in circular technologies and knowledge.

Government

Government agencies assist and enable the operations of the Co-op. They also contribute expertise and funding to projects where appropriate, particularly if connected to a market failure.

Other partners

including not for profit organisations, are responsible for driving adoption, research, and support for circular projects.

Regional Circularity Co-op

Local Indigenous groups are fundamental to knowledge extension and indigenous enterprise growth

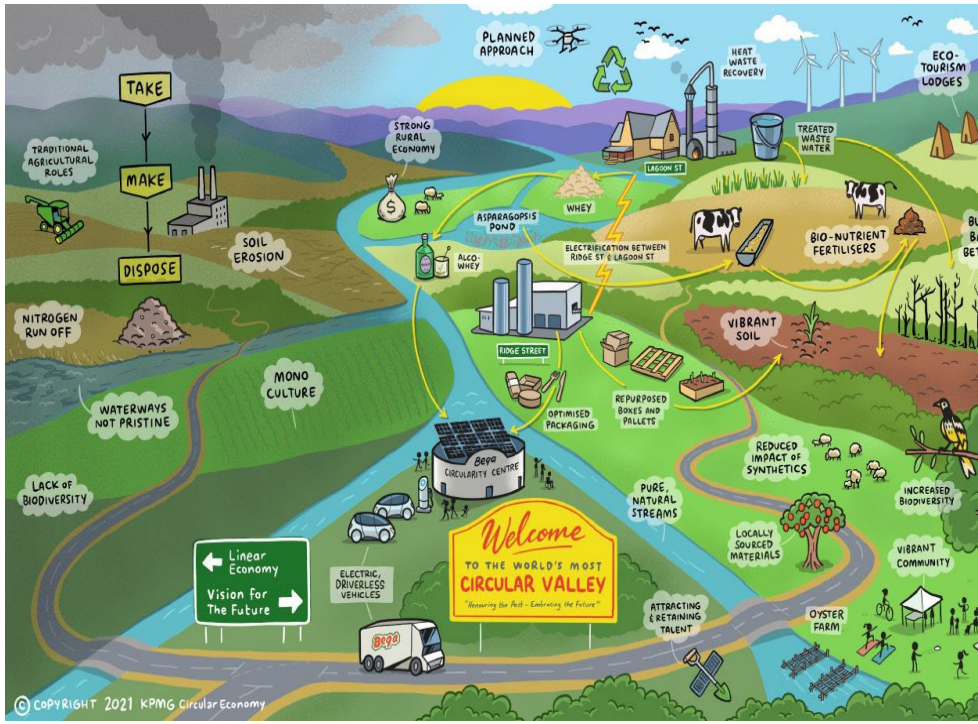
Indigenous groups

Coordinate, support, guide

Industry

Industry supports the direction of the Co-op and provides investment, innovation and use of circular products and services.

BCV 2030 Project	BCV 2030 Project	BCV 2030 Project
BCV 2030 Project	BCV 2030 Project	BCV 2030 Project...



Government

Local companies and industry groups

Industry partners

Research and Develoment

Consulting and advisors

Academia

5. Summary

- Australia has a clear clean energy transition strategy
- Delivering this will require strong regional investment and associated R&D
- The Regional Universities Network and Charles Sturt University have strong capability in the clean energy transition and sustainability and want to partner with international collaborators