Newsletter

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Rural Funds Management

Managing good assets with good people

About Rural Funds Management

Rural Funds Management Limited (RFM) is one of the oldest and most experienced agricultural fund managers in Australia. Established in 1997, RFM employs over 220 staff in fund and asset management activities and manages over $2.0 billion of agricultural assets. The company operates from a head office in Canberra and has additional offices in Sydney and regional Queensland.

RFM has a depth of experience accumulated over 26 years owning, developing and operating Australian farmland, agricultural infrastructure and other assets. Sector experience includes almonds, poultry, macadamias, cattle, cropping, viticulture and water. Assets are located throughout New South Wales, Queensland, South Australia, Western Australia and Victoria.

RFM is the responsible entity for Rural Funds Group (RFF), an ASX-listed real estate investment trust that owns a $1.8 billion portfolio of diversified agricultural assets including almond and macadamia orchards, premium vineyards, water entitlements, cattle and cropping assets.

RFM's company culture is informed by a precision-based approach to asset management and its longstanding motto of "Managing good assets with good people".

Scan the QR code to learn more.

Cover image: Grapevines during fruit set at Geier vineyard, Barossa Valley SA, November 2023.

Image on top: Trees in bloom at Kerarbury almond orchard, Riverina NSW, August 2023.

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Technology, markets and the energy transition

David Bryant, Managing Director

Over the past 200 years, the economic development model that has improved the lives of billions of people, has been powered by fossil fuels. Over the past 40 years, these same fuels have been powering the development of China, India and all other nations seeking prosperity. But due to the increasing concentration of greenhouse gases from burning so much fossil fuel for so many people, it has become imperative that all economies transition their energy systems to zero emission technologies. This article discusses the plan for making that transition and begins with three charts (see page 5) that illustrate just how difficult this will be.

From the Industrial Revolution to cleaner energy options

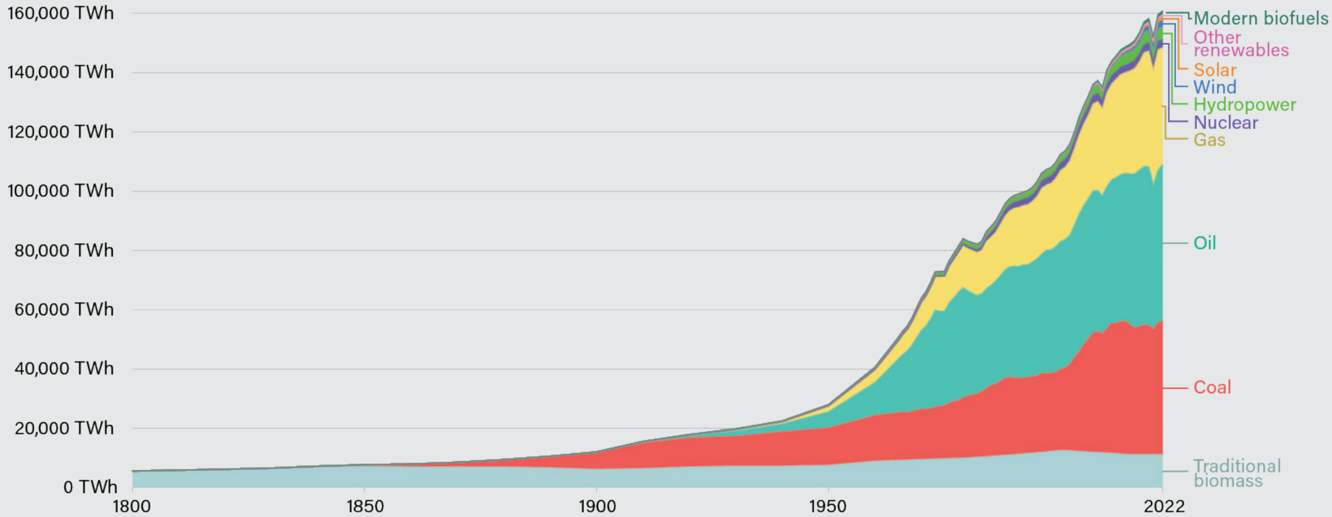
Figure 1 demonstrates the daunting task humanity confronts if it is to reduce its consumption of fossil fuels to net zero. Mankind started shovelling coal into steam engine boilers from around 1800 to power the industrial revolution. By 1900, new drilling techniques and the uptake of the internal combustion engine were driving growth in oil consumption. This was followed by gas, distributed to our front doors by 20th century pipelines.

These three fossil fuels – coal, oil and gas – still dominate the world's energy supply at 82% of 2022 consumption. Renewables, including hydropower, provide 14% and nuclear energy contributes 4%. Given the dominant position of fossil fuels, transitioning to a zero emissions economy by 2050 seems to be a hopeless task.

Figure 2 presents the more recent history of fossil fuel usage for key countries, with China's consumption growing massively and India's appearing to start down the same path. It is encouraging, however, that countries such as Germany and Japan have successfully reduced fossil fuel consumption, demonstrating that growth in fossil fuel emissions is not inextricable.

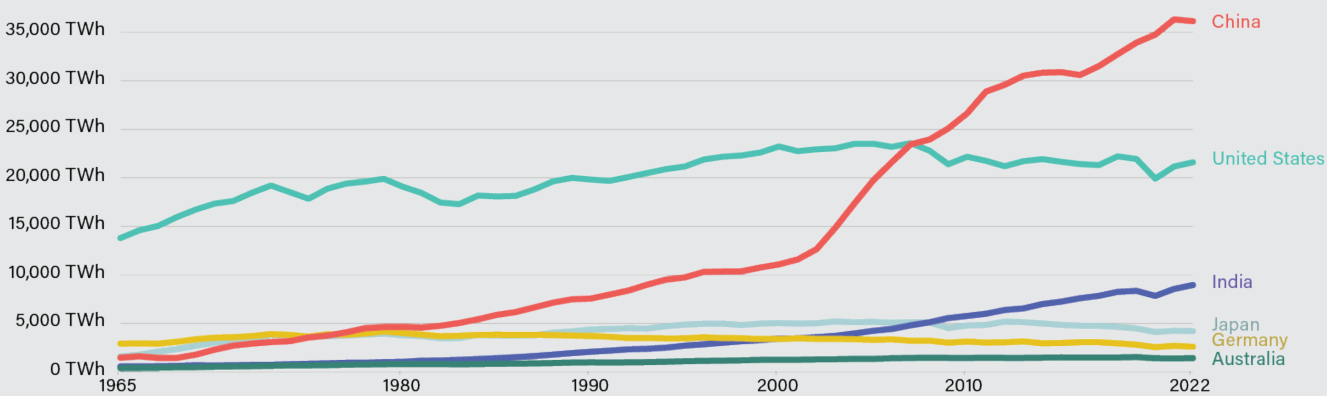
Figure 3 presents the most recent snapshot of the energy mix for several countries, with China the world's largest energy consumer at 27% and the US 16% of total world consumption in that year.

Figure 1: Global direct primary energy consumption[1]



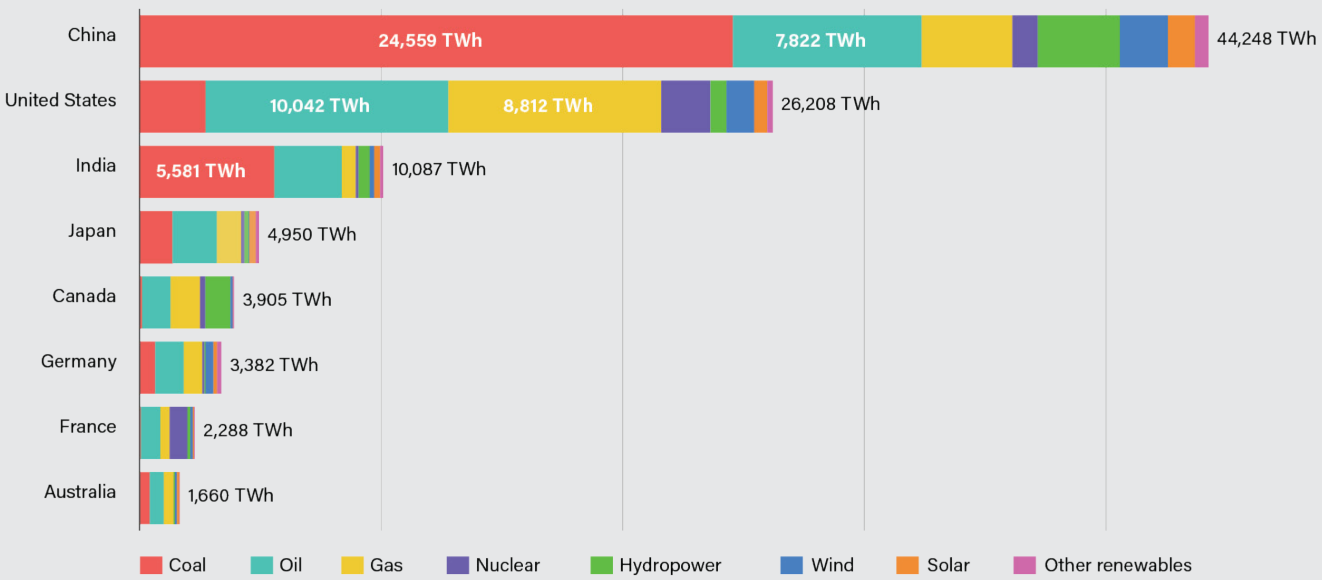
Source: Global direct primary energy consumption (ourworldindata.org)

Figure 2: Fossil fuel consumption



Source: Fossil fuel consumption (ourworldindata.org)

Figure 3: Primary energy consumption by source 2022



Source: Primary energy consumption (ourworldindata.org)

Having looked at how we got to where we are, and where we are, **Figure 4** considers options for our future. At the right of the chart are historical world CO_2 emissions. Essentially, these are the sum of emissions coming from the energy mix presented in Figures 1 to 3. The coloured sections of the chart illustrate how emissions could decline under three scenarios:

- **STEPS** (Stated Policies Scenario) is the sum of what countries are currently doing.
- **APS** (Announced Pledges Scenario) is the sum of the aspirations of all governments, assuming they succeed in full and on time.
- **NZE** (Net Zero Emissions by 2050) is what we should be doing to limit global warming to 1.5°C by 2100.

Scientists advise that limiting global warming to 1.5°C is essential if we are to avoid catastrophic climate change. Unfortunately, the earth's surface temperature today is already 1.2°C greater than preindustrial levels. The pathway painted in blue in Figure 4 illustrates that, based on what is currently being done around the world (STEPS), we are headed for a 1.9°C increase in temperature by 2050 and 2.4°C by 2100. If, however, we could transform our energy systems to the green (NZE) pathway by 2050, then it is probable that global warming will be limited to a tolerable level.

The next section of this article looks at how the world can make this difficult transition, based on the recommendations of the International Energy Agency (IEA) in its 2023 World Energy Outlook. We will first discuss technologies that are already having an impact and then look at new technologies needed to accelerate the transition.

Figure 4: CO_2 emissions and temperature rise[2]

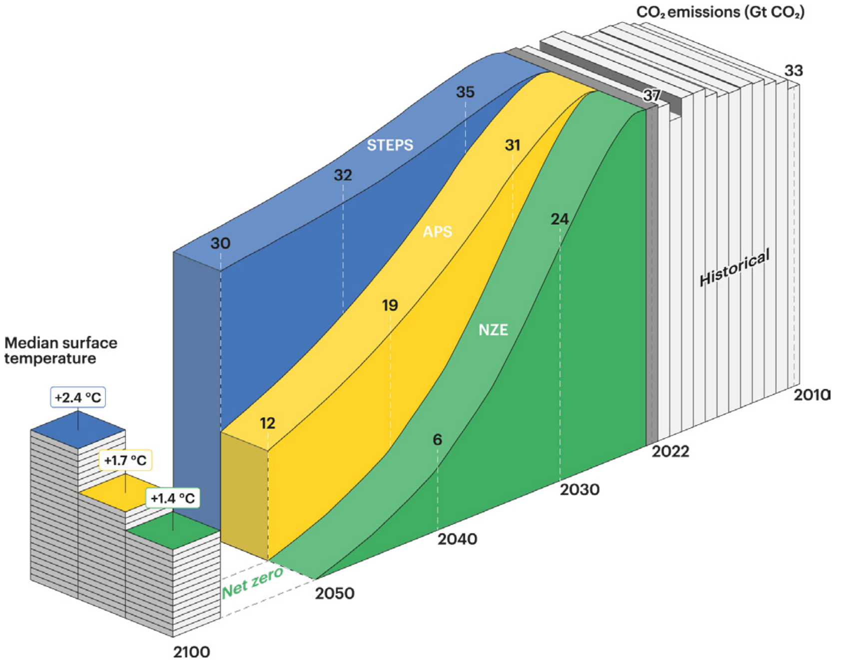
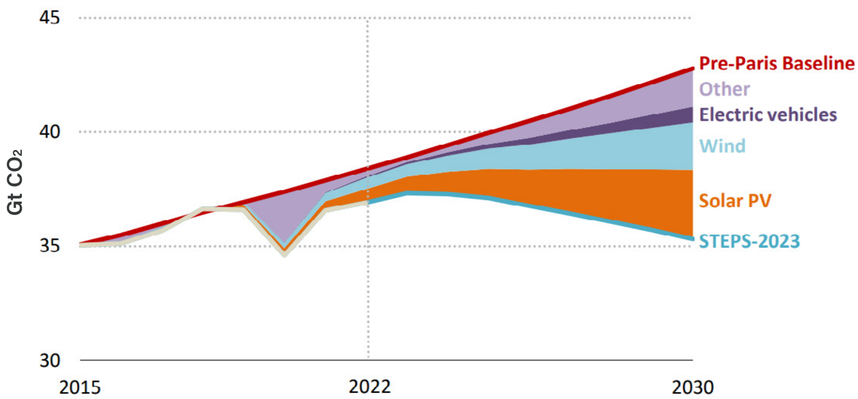


Figure 5: CO_2 reductions from Solar PV, wind and EV's[3]



The emergence of clean energy technologies

Figure 5 illustrates how clean energy technologies have already had an effect on greenhouse gas (GHG) emissions by reducing the consumption of fossil fuels. Solar photovoltaic (PV) is reducing GHG emissions today and is projected to reduce global 2030 emissions by 7%. Wind energy and electric vehicles (EVs) are two other technologies that are being rapidly deployed, and together they will produce an additional 7% reduction in emissions. Collectively, it is expected these technologies will turn back the growth in emissions to the same level as 2015, when emissions totalled 35 gigatonnes (Gt) of CO_2. However, 35 Gt is still a very big number, so additional initiatives will be needed.

The IEA reports that three things are required to speed up the transition between now and 2030. The first initiative – tripling the number of renewables, such as solar PV and wind – would provide the largest benefit. This is possible because the industries that manufacture solar panels have sufficient current capacity to deliver 2.9 times more panels than are actually being installed. By 2030, it is expected that manufacturing capacity will nearly double, which means there is plenty of capacity to supply a big increase in solar PV.[4]

The second initiative involves increasing both electrification and the efficiency of energy generation and consumption to reduce fossil fuel use. Examples of increased electrification include switching to EVs and transitioning from gas-fired heating of buildings to electric heat pumps. With EV sales projected to reach 45% of global vehicle sales by 2030,[5] and heat pumps achieving similar sales rates, there is cause for optimism on this front.

The third initiative involves cutting 75% of the methane (CH_4) emissions from the process of mining fossil fuels. Many operations have leaking infrastructure, while CH_4 is routinely vented or flared from oil and gas wells, causing significant emissions that could be put to more productive use. According to the IEA, around 40% of emissions from oil and gas operations could be eliminated at no net cost, because the savings in leaking gas are just as valuable as the cost of stopping the leaks.

The investment needed to achieve a 75% cut in emissions is estimated to be US$75 billion, which is less than 2% of net income for this industry.[6] Agreement on this initiative was achieved at the 28th meeting of the Conference of Parties (COP28UAE), recently held in Dubai, United Arab Emirates.

Figure 4 shows that if the targets for all three initiatives are met in the six years to 2030, global CO_2 emissions could decline by 35%. Beyond 2030, the measures required to achieve net zero by 2050 become less certain.

There are many reasons for this, not least being the long time period itself. Other challenges include the unpredictability of mankind and geopolitics; the sheer volume of mineral resources required; the level of economic growth driving still further demand for energy; and the need for technologies that can provide energy storage which have not yet been proven commercially.

Australia's transition – 2030 to 2050

Some clarity regarding how our energy mix will look by 2050 is starting to emerge. This mix rests primarily on much more variable renewable energy (VRE) use, which is mainly solar and wind. While Australia is a small economy with a minor share of global emissions, studying our plans is useful for two reasons: the smaller numbers are easier to grasp and it directly affects us.

Australia has two electricity markets: the National Electricity Market (NEM), covering almost the entire country, and the Wholesale Electricity Market, which covers Western Australia. Both markets are managed by the Australian Energy Market Operator (AEMO), which also operates the gas markets across the country.


Wind farm (not an RFF asset) in northern Queensland, Australia.

As a consequence of population growth, economic growth and, importantly, the electrification of your car, your cooktop, home heating and many industrial processes, electricity consumption will increase. By 2050, electricity consumption is expected to double in the NEM, and increase four-fold in Western Australia.[7] Demand for electricity will be much higher still if Australia establishes a hydrogen export industry. However, this export will not occur without first meeting our basic energy needs and is therefore not factored into the following discussion.

Despite the large increase in demand for electricity, supply of renewables is projected to grow to the point where fossil fuels will not be required. Almost all the growth will come from VRE wind and solar PV. Although hydroelectricity is much more reliable than VRE, which supplies electricity intermittently, base load hydroelectricity cannot be expanded.

In 2020, the VRE share of generation in the NEM was 25%; it is projected to be 64% by 2030 and 94% by 2050.[8] There is evidence that these projections are achievable; for example, in the last three months of 2022, 40% of electricity produced then consumed during the period came from renewables, with a peak supply of 69% on 28 October. Based on current growth rates, it is expected that there will be sufficient renewables available to meet 100% of grid demand for small periods of time from 2025.[9]

Providing the infrastructure to deliver such a high component of VRE will be very difficult. Solar farms and wind farms will need to increase at least four-fold; thousands of kilometres of new transmission lines will be needed; and machines will be required to keep power synchronised and stable. Most challenging of all will be the need to store VRE between hours, days and seasons. There is no doubt that VRE can be produced and transmitted very cost effectively. While there will be many arguments over whose backyard the power lines will pass through, it is the storage of VRE that still needs commercially viable solutions.

Short-term storage is developing rapidly with new battery technologies likely to deliver many improvements, such as higher energy densities (that is, more energy, less weight), reduced flammability and faster charging times. Many companies are working towards the mass production of solid-state lithium-ion batteries, which are more efficient than current batteries that rely on a liquid electrolyte. For example, Toyota has announced plans to reach mass production of its solid-state battery that would increase the driving range of EVs to 1,200 km by 2027. Advances in battery production will meet the needs of EV drivers and enable electrical storage over hours, but it is for seasonal storage that answers are still required.

Numerous technologies for solving the problem of intermittency for renewables are under consideration globally, although developing them to the point of commercialisation will take decades. The most favoured storage technology in Australia is the production of hydrogen gas (H_2) from renewable wind and solar. There are numerous technical challenges associated with hydrogen, not least being its small molecular size, which makes it very difficult, and hence expensive, to store and transport.

One solution to this problem is to combine H_2 (hydrogen gas) with CO_2 (carbon dioxide) to create CH_4 (methane gas), a gas that is eight times heavier than H_2. Since methane is the main ingredient of natural gas, it could be injected into the existing gas networks without the risk of troublesome leaks. These networks include thousands of kilometres of pipelines and underground storage in gas fields and salt caverns. Even though the commercialisation of this technology is some time off, harnessing two of the most ubiquitous GHG emissions – CO_2 and CH_4 – for storing energy between seasons would be an elegant solution to this problem.

There are several industrial processes that support development and modernity, but require massive amounts of fossil fuel that is difficult to replace. The annual production of steel, cement, ammonia and plastics emit about 20% of global GHG emissions each year.[10] Although a range of technologies to replace incumbent production processes are in development, their arrival will take decades of time, trillions of dollars and gigawatts of energy. Given the demand for electrification and the large footprint and consequent environmental impact of intermittent wind and solar, the energy transition cannot be achieved with these two technologies alone.

On 2 December 2023, at the COP28UAE Summit, 22 countries, including the USA, Japan and others with sizeable economies, pledged to triple nuclear energy capacity by 2050. Australia is not party to this initiative because nuclear energy has been banned since 1999 and because, we are told, the technology is too expensive.

At least two recent reports compare the costs of electricity generation for a range of technologies, including nuclear. The 2020 joint report by the IEA and the OECD Nuclear Energy Agency (NEA) found that the levelised cost of electricity generation (essentially its cost per kilowatt of electricity averaged over a plant's operating life) for nuclear was about 20% higher than for onshore wind and roughly equal to the cost of solar PV.[11] This finding contrasts with the CSIRO's *GenCost 2022–23* report, which found that a small modular nuclear reactor by 2030 to be around three times more expensive than wind and solar PV.[12] The difference in the findings relates to assumptions: the Australian report assumed nuclear capital costs more than four times higher, and zero operating costs for solar and wind.

The conflicting findings of these two reports are just a small measure of the uncertainty that the future holds for the cost of energy. Balancing uncertainty regarding cost with certainty regarding need, would lead a rational decision maker to keep all energy generation options open.

Conclusion

The exponential increase in EV sales and heat pumps are evidence that mankind has found economic ways of consuming cleaner energy. The impressive increase in deployment of solar farms and wind farms demonstrates that we are finding economically viable ways to generate cleaner energy. Combined, the trajectory of these economically driven behavioural changes are evidence that projections of the energy transition to 2030 are achievable.

As intermittent renewables begin to crowd out old but reliable fossil fuel systems, seasonal energy storage will become critical to success. While there is a range of technologies that are theoretically possible, winners will need to emerge that can return stored energy for consumption at economically viable prices. The role of government in this process is not to select winners, but to foster an agnostic market to allow the winners to emerge. The role of consumers is to voluntarily minimise their energy expenditure and to elect governments that assist this.

Solar panels at cattle property Rewan, central Queensland, August 2023.

Notes

1. 'Primary energy' is the gross amount of energy before its transformation into power, such as electricity. It is expressed in terawatt hours, including an allowance for conversion losses based on efficiency factors for power plants.
2. International Energy Agency, *World Energy Outlook 2023*, https://www.iea.org/reports/world-energy-outlook-2023, p. 156
3. Solar PV, wind power and EVs reduce emissions by 6 Gt in 2030 in the STEPS relative to the pre-Paris Baseline Scenario. International Energy Agency, *World Energy Outlook 2023*, https://www.iea.org/reports/world-energy-outlook-2023, p. 43
4. International Energy Agency, *World Energy Outlook 2023*, www.iea.org, p. 36
5. APS scenario, International Energy Agency, *World Energy Outlook 2023*, www.iea.org, p. 60
6. International Energy Agency, *World Energy Outlook 2023,* www.iea.org, p. 163
7. Commonwealth Scientific and Industrial Research Organisation (CSIRO), *Renewable Energy Storage Road Map*, p. 3
8. CSIRO, *Renewable Energy Storage Road Map*, p. 1
9. CSIRO, *Renewable Energy Storage Road Map*, p. 8
10. Smil, V., *Energy Transitions: Global and National Perspectives*, Praeger, Santa Barbara USA p. 281
11. *Projecting Costs of Generating Electricity*, International Energy Agency, Nuclear Energy Agency Organisation for Economic Cooperation and Development, Paris, France, 2020
12. Graham P., et al, *Gen Cost 2022–23*, CSIRO, July 2023, p. 74

Rural Funds Group emissions strategies

Agriculture puts food on tables around the world but is also a source of greenhouse gas (GHG) emissions. Tracking and managing emissions from agriculture is a key element in improving the sector's sustainability.

Rural Funds Management (RFM) committed to quantify the emissions from assets which Rural Funds Group (RFF) operated for the 2023 full financial year (FY23).

The results provide valuable insights towards RFM's aim of producing more with less, as described in the RFM Sustainability Policy.

The process also positions RFF favourably for the anticipated future requirement of mandatory emissions disclosures for ASX-listed entities.

The following article outlines the assets for which emissions have been quantified, the results of this process and how RFM actions may improve emissions intensity (see **Figure 1**).

The agricultural industry and emissions

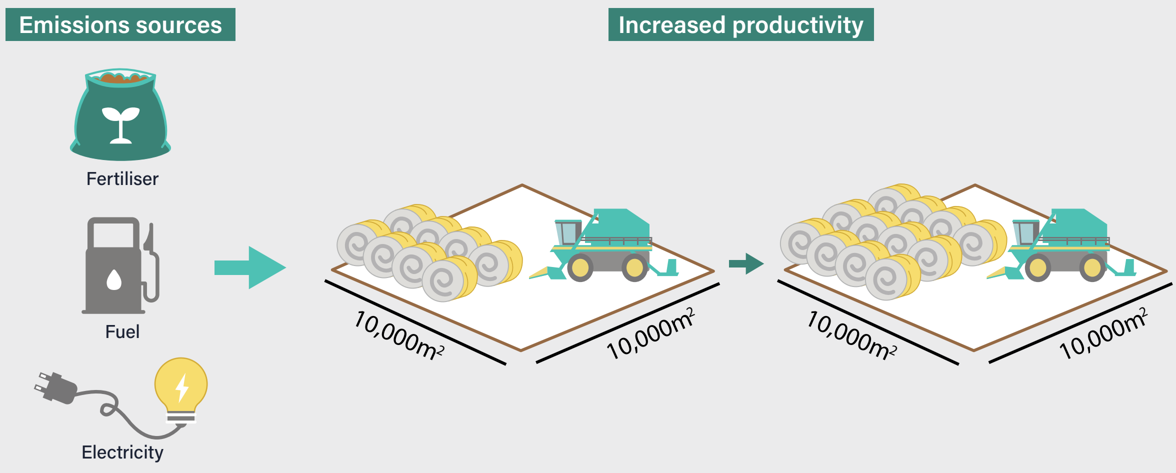
Globally, the agricultural industry contributes 12% of total GHG emissions.[1] Similarly, in Australia the agricultural industry is responsible for 13% of emissions per annum.[2]

Figure 2 shows the main GHGs emitted from agriculture that contribute to global warming, being methane (CH_4), nitrous oxide (N_2O) and carbon dioxide (CO_2). These GHGs have varying radiative power, or global warming potential (GWP), which is reflective of their differing properties, potencies and lifetimes.

A commonly used time period for GWPs is 100 years. GWPs provide a common unit of measure by converting GHGs into carbon dioxide equivalent (CO_2-e). Carbon dioxide equivalent translates the impact of GHGs in terms of the amount of CO_2 that would create the same amount of warming.

Using this method, many different GHGs can be expressed as a

Figure 1: Emissions intensity explained



Emissions intensity, rather than total emissions, is a metric commonly used for assessing farming enterprises as it compares to GHG emissions generated per unit of farm product produced, such as kilograms of beef or bales of cotton.

Improved emissions intensity may be a result of increased farm production (depicted above) and/or avoided emissions that would otherwise have been produced for the same level of output.

single number. This approach comes with certain limitations in that it does not necessarily account for the complex nature of the differing rates of breakdown and, therefore, lifetimes. This is particularly pertinent when considering the short lived nature of methane. However, it is a widely accepted approach that aligns with GHG Protocol Standards and is a useful metric for tracking and comparing emissions.

Quantifying emissions from RFF-operated assets

RFF consists of a portfolio of 67 farms, totalling $1.8 billion worth of assets. Despite the size of the portfolio the emissions quantified remain relatively modest. This is because the majority of assets are leased and therefore not under the operational control of RFF. The emissions of leased assets form part of the lessees Scope 1 and Scope 2 emissions in accordance with the National Greenhouse and Energy Reporting (NGER) Scheme.

It is worth noting a substantial portion of RFF lessees are corporate entities, several of which already quantify and disclose their emissions. In addition, most of these lessees are making incremental improvements to their operations and some lessees have emissions targets. To read more please see the June 2022 Newsletter.

However, a relatively small number of assets, approximately 10% by value, are operated by RFF. Usually this occurs while assets are being developed, prior to seeking long term leasing arrangements. These developments commonly focus on productivity increases and conversion to higher and better use. Both development methods may provide benefits in the form of reducing emissions intensity or capturing carbon which will be discussed later in this article.

During FY23 RFF operated two cattle properties, two established macadamia orchards, one cropping and 12 sugar cane properties.[3]

Figure 2: Main agricultural GHG emissions sources

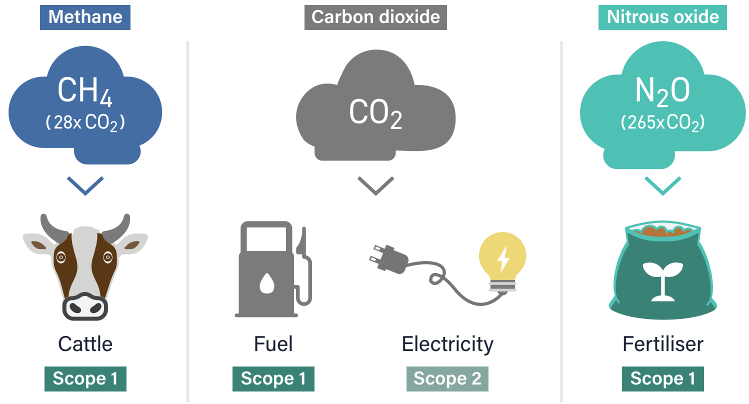
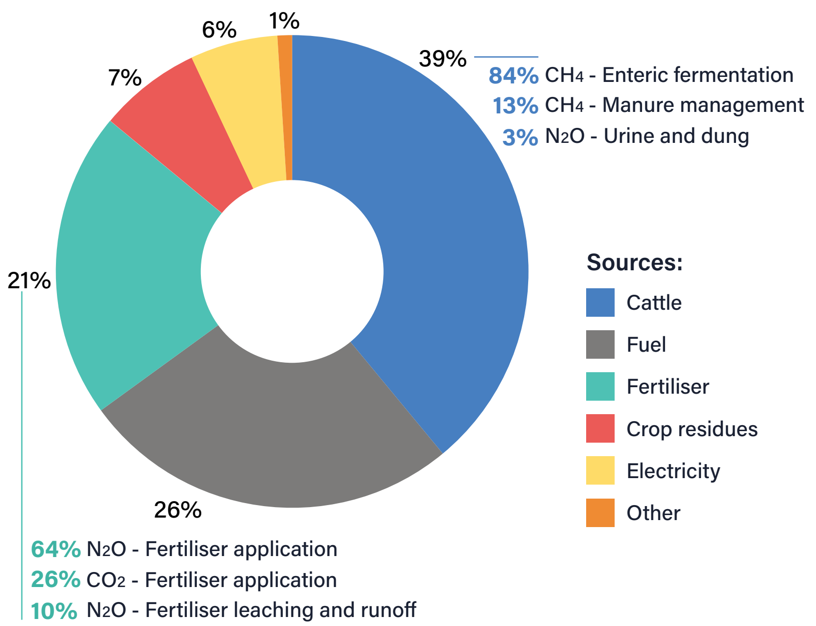


Figure 3: Overview of RFF Scope 1 and Scope 2 emissions sources



Scope 1 and Scope 2 emissions were derived in line with the GHG Protocol Standards (see **Figure 3**) using industry tools which align with the Australian National Greenhouse Gas Inventory (NGGI) method.[4,5]

Scope 1 emissions are direct GHG emissions that occur from sources that are controlled by an organisation. Whilst Scope 2 emissions are indirect GHG emissions associated with the purchase of electricity. Figure 2 illustrates the sources of Scope 1 and Scope 2 agricultural emissions. Using industry tools, it is estimated that RFF emitted approximately 11,808 t CO_2-e in FY23. This consisted of 11,084 t CO_2-e of Scope 1 emissions and 724 t CO_2-e of Scope 2.

A breakdown of RFF's emissions by source is presented in Figure 3. As shown, the most significant contributor was CH_4 emissions from ruminant enteric fermentation (the digestion process of cattle). The second largest contributor was CO_2 emissions from fuel use and the third largest contributor was N_2O from the application of nitrogen fertilisers in cropping operations. The following section discusses each of these emissions sources.

CH_4: Methane emissions from cattle

Over a third of RFF's emissions in FY23 were as a result of cattle emissions.

Enteric fermentation occurs during the digestive process of livestock. Microbes present in a ruminant's (cattle) digestive system ferment the feed consumed by the animal. This enteric fermentation process produces CH_4 as a by-product.

The global warming potential of CH_4 is approximately 28 times that of CO_2 over a 100-year period. Methane emitted today lasts on average about a decade, which is far less time than CO_2, however CH_4 absorbs much more energy, hence its greater warming potential.

Methane emissions intensity may be reduced in a cattle production system through productivity improvements and herd management practices. Productivity improvements, such as the development of cultivation and pasture areas, seek to achieve higher daily weight gains, which may lower the emissions per kilo of beef produced (see Figure 1). Other management practices, such as animal health management and supplementation to optimise feed utilisation, also may reduce emissions intensity.

The efficacy of these strategies were reinforced in 2020, when RFM worked with Meat and Livestock Australia (MLA) to develop an industry case study for emissions intensity reduction across a number of RFF grazing properties.[6]

The report calculated that of the RFF properties analysed, from 2016-17 to 2018-19 GHG emissions intensity declined between 17% and 43%. The report identified productivity improvements such as increased feed quality, as well as improved animal management practices, as contributing factors to the results.

Therefore, developing cattle properties for higher productivity not only enhances overall efficiency of these assets but also has the potential to decrease emissions intensity.

CO_2: Carbon dioxide emissions from diesel

The second highest emission source for RFF in FY23 was from fuel use, specifically diesel. The majority of fuel use generally occurs during an asset's development. As highlighted in the prior section, developments such as productivity improvements may have an emissions intensity benefit – in the case of cattle, higher average daily weight gains from cultivation and pasture areas. These improvements may be undertaken while RFF still retains operational control of the asset, ie prior to leasing, and in this circumstance forms part of RFF's Scope 1 emissions analysis.

Cropping is another sector in which productivity developments occur. During the development phase, asset improvements are carried out with heavy machinery fuelled by diesel. For FY23, this is largely due to the construction of two cropping water storages and irrigation area. Stored irrigation water can be used as part of a program to plant cotton earlier in the season, extending the growing period and thereby promoting higher yields. The benefit of these productivity improvements in the longer term will be realised by lessees through greater productivity and potential improvements in emissions intensity.

Alongside productivity improvements, RFM also seeks to make incremental improvements to diesel efficiency and convert diesel operated equipment to renewable energy where practicable.


Pivot irrigated forage crop (background) seeking higher daily average animal weight gains and may achieve lower emissions intensity, Rockhampton, central Queensland, May 2021.

Fertiliser application as part of site-specific precision agricultural practices to improve Nitrogen Use Efficiency (NUE) at Lynora Downs, central Queensland, August 2022. The fertiliser spreader enables variable rate applications to improve efficiency and features a swath control which prevents the overlapping of fertiliser being applied.

N_2O: Nitrous oxide emissions from fertiliser

The third largest form of GHG emissions from the agricultural sector are N_2O emissions. The main cause of these emissions is the application of fertilisers. Nitrogen fertilisers have been key to sustaining the growing global population and has spared millions of hectares that would have been required for agricultural use. Emissions from nitrogen fertiliser application represent 21% of RFF's calculated emissions.

Nitrogen fertiliser is applied largely in the form of the organic compound urea, with some application of ammoniated phosphates (such as mono-ammonium phosphate and diammonium phosphate). Emissions from nitrogen fertiliser occur when nitrogen is exposed to wet soil, triggering microbial reactions that release N_2O emissions. Over a 100-year period, N_2O is a GHG 265 times more potent than CO_2.

To optimise production from a unit of nitrogen fertiliser, Nitrogen Use Efficiency (NUE) is calculated. RFM calculates NUE through mapping soil to understand the physical, chemical, and biological properties of the various soils types. This process enables informed decision-making regarding the selection of planting areas and fertiliser requirements.

To further optimise NUE, fertiliser applications can be split into two or more treatments and spread at variable rates based on specific needs (see above picture). This approach aims to increase yields and minimise nitrogen loss.

To reduce overall application rates of synthetic nitrogen fertilisers, RFM has used green manure legume crops, such as woolly pod vetch as well as crop rotation to increase residual soil nitrogen levels. Soil samples are analysed before sowing a green manure crop and then again after turning the green manure crop into the soil. The crop's nitrogen requirements are then calculated based on the residual soil nitrogen levels. This approach reduces the application rates of synthetic nitrogen fertilisers.

Ongoing review of emission related technologies

In addition to the practices outlined already, RFM continues to monitor industry developments and scientific advances for practical solutions to reduce emissions across operations. Some examples of areas RFM is investigating include:

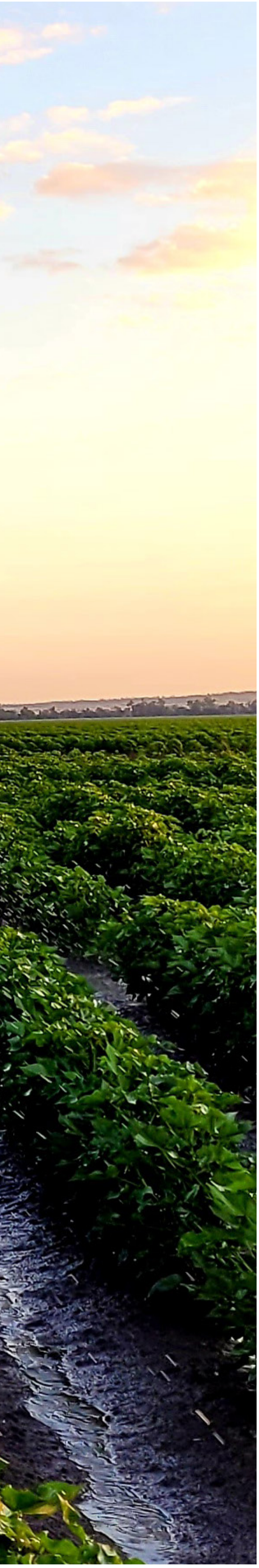
- methane: scalable methane inhibitor solutions for livestock grazing systems aimed at suppressing enzymes in the rumen, which subsequently reduce the production of CH_4 during the digestion process
- nitrous oxide: nitrification inhibitor technology to reduce N_2O emissions from fertiliser application, and
- carbon dioxide: viable low-emissions alternatives to heavy machinery.

On-farm carbon sinks

While establishing the emissions from various assets is an important step to better understand ways in which emissions intensity may be reduced, the calculations do not take into account on-farm carbon sequestration and storage, or "carbon sinks". For example, carbon sequestration and storage occurs through the growth of existing and planted vegetation as well as improvements in soil health.

Vegetation removes carbon dioxide from the atmosphere as they grow and stores it as carbon in plants. For RFF assets, this additional sequestration would

Cotton grown under pivot irrigation at Lynora Downs in February 2022.



occur through native vegetation and permanent plantings across unleased assets.

An example of other permanent plantings include the 3,000 ha of macadamia orchards under development leased to TRG.[7] Approximately one million trees will be planted which have a productive life of between 50-60 years, contributing significantly to carbon sequestration during their lifespan. These plantings form a carbon sink for RFF's lessee.

Other strategies to increase on-farm sequestration and storage include soil health improvements, including developing improved perennial pastures with legume mixes (on cattle properties) and green manure crops (on cropping properties). This would result in soil carbon sequestration in which carbon is removed from the atmosphere and stored in soil.

On-farm carbon sinks are not included in the emissions quantification. However, it is estimated that these sinks make a material impact.

Conclusion

RFF maintains a relatively small emissions footprint for its $1.8 billion portfolio. This is because most assets are leased and are therefore not under the operational control of RFF. Rather, the emissions of leased assets lie with lessees.

Many of the developments undertaken by RFF prior to leasing seek to improve productivity. Productivity gains, in turn, may reduce emissions intensity. This aligns with a key principle in RFM's Sustainability Policy, to produce more with less.

Other developments, such as higher and better use, generally include planting trees such as almond and macadamia orchards. These activities, by their nature, result in long-term carbon sinks.

Notwithstanding, the monitoring of emissions and identification of ways to grow more with less underscores RFM's commitment to environmental stewardship. As mandatory emissions reporting becomes commonplace, RFF remains well placed in understanding and addressing its emissions profile and how developments and management practises can contribute to more sustainable agricultural production systems.

Notes

1. James Fell, Liangyue Cao, Kevin Burns, Jared Greenville, 2022, Emissions, agricultural support, and food security, https://www.agriculture.gov.au/abares/products/insights/emissions_agsupport_and_foodsecurity
2. Climate Council, 2023, Australia's Agriculture and Climate Change: Emissions from Methane, https://www.climatecouncil.org.au/resources/australia-agriculture-climate-change-emissions-methane/
3. RFF emissions analysis includes: Grazing properties - Yarra, Cerberus; Macadamia properties - Beerwah, Bauple; Cropping properties - Baamba Plains and Maryborough sugar cane. Properties that have not been included in this analysis as they were not operated for the full year include Kaiuroo (grazing and cropping) and Teddington (sugar cane).
4. Sheep and Beef (SB-GAF Sheep & Beef GHG Accounting tool V2.1), Cropping (G-GAF Cropping GHG Accounting tool V10.8) and Horticulture (H-GAF Horticulture GHG Accounting tool V1.46), https://piccc.org.au/resources/Tools.html
5. World Resources Institute (WRI) and World Business Council for Sustainable Development (WBCSD), 2004, *Greenhouse Gas Protocol: Corporate Accounting and Reporting Standard*, https://ghgprotocol.org/sites/default/files/standards/ghg-protocol-revised.pdf
6. Meat & Livestock Australia, *Analysis of the carbon footprint of Rural Funds Management's livestock production*, 2020, https://www.mla.com.au/research-and-development/reports/2020/analysis-of-the-carbon-footprint-of-rural-funds-managements-livestock-production/
7. Lessee is a company managed by The Rohatyn Group (TRG) on behalf of a joint venture between TRG and a global institutional investor. Second stage of lease (1,800 ha) subject to completion of water supply infrastructure.





Rural Funds Group: 10 years on

December 2023 marks 10 years since the formation of the Rural Funds Group – Australia's first diversified agricultural real estate investment trust.

Rural Funds Group (RFF, the Fund) was established in December 2013 through the merger of three existing funds managed by Rural Funds Management (RFM).

A decade later, many of the Unitholders that participated in the merger still remain invested in RFF. However the overall number of Unitholders has increased from approximately 2,800 to over 18,000.

One of the key objectives of RFF is to provide ongoing liquidity to investors. To achieve this aim, shortly after forming, the Fund listed on the Australian Securities Exchange (ASX). Units traded for the first time on 14 February 2014.

Another objective of RFF is to provide regular income to investors by leasing agricultural assets. RFF's first distribution was paid to Unitholders in 2014. The most recent distribution paid in October 2023, represents the 40th consecutive distribution paid by the Fund. An investor for this period has received a total of $1.03 per unit in distributions.

To generate additional income RFF has acquired appropriate agricultural assets. Since inception RFF has grown from $0.2 billion in assets to $1.8 billion at FY23. This growth has been achieved through the support of investors in six equity raises providing approximately $0.4 billion of new equity – a significant portion of which was from existing Unitholders.

Another source of growth has been the appreciation in value of many of the agricultural assets that have been acquired. This has contributed to an increase of adjusted net asset value from $1.00 per unit in 2013 to $2.93 at end of FY23.

Also as a result of acquisitions, the portfolio has increased from three to five agricultural sectors including cattle, almonds, viticulture, cropping and macadamias. The assets, which initially comprised 27 properties in three states, now comprises 67 properties in five states.

Consistent with the initial objective many of the properties are now also leased to some of the largest agribusiness in the country, such as Olam Orchards Australia, JBS Australia, Select Harvests (ASX: SHV), Treasury Wine Estates (ASX: TWE) and Australian Agricultural Company (ASX: AAC).

Images top to bottom:

Mayneland (cropping) central Queensland, the cropping portfolio consists of 15 properties valued at $189.3m. **Cerberus** (cattle) central Queensland, the cattle portfolio consists of 23 cattle properties valued at $666.1m. **Glendorf** (macadamias), Maryborough Queensland, the macadamias portfolio consists of 20 properties valued at $265.7m. **Tocabil** (almonds) Riverina NSW, the almonds portfolio consists of 3 properties valued at $448.7m. **Geier** (vineyards) Barossa Valley SA, the vineyards portfolio consists 6 properties valued at $60.9m. Number of properties and values as at 30 June 2023.

Completion of the Rookwood Weir

Construction of the Rookwood Weir (pictured below) was completed in November 2023. The weir is located on the Fitzroy River west of Rockhampton in Queensland.

Situated in one of the largest water catchments in the country, the weir is 350 meters in length and 16 meters in height. It is projected to yield 86,000 megalitres (ML) of water each year, of which more than 36,000 ML has been allocated to agricultural use.

As part of the initial tender of water allocations, Rural Funds Management (RFM) as responsible entity for Rural Funds Group (RFF) contracted to acquire 21,600 ML of the allocations, primarily to support the development of macadamia orchards.

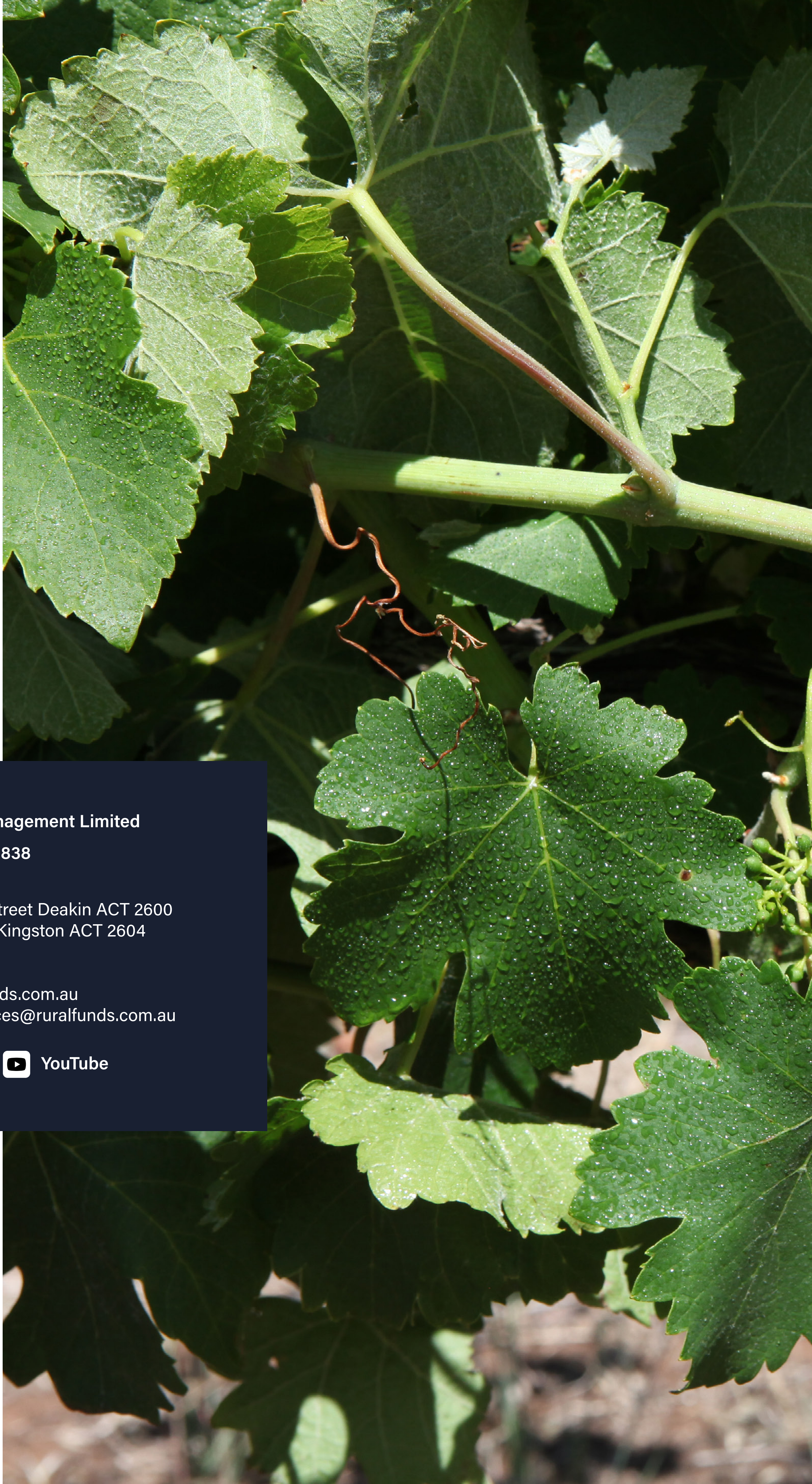
Macadamia trees require ongoing irrigation to achieve higher yields and therefore the ongoing supply of reliable water is critical to the orchards development.

Orchard development is underway at Riverton and Rookwood Farms, located approximately 1km from the weir (see inset). The trees are likely to commence yielding small quantities of macadamia nuts approximately three years after planting but will not reach their peak production, or peak water requirements, until around year ten.

Water will also be supplied to Thirsty Creek, a property located within RFF owned Rookwood Farms. Thirsty Creek is leased to Mort & Co for 20 years. Mort & Co are planning to construct a cattle feedlot on the property.

Water allocations are expected to be issued following final government approvals.

The completed Rookwood Weir which spans 350m, rises 16.2m above the riverbed and features a spillway length of 202m, Fitzroy River, Gogango central Queensland, December 2023.



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