ROOKWOOD

ROOKWOOD WEIR
WATER ALLOCATION SALES

INFORMATION MEMORANDUM

MAY | 2020

WEIR

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Receipt and review of this Information Memorandum constitutes an agreement by each recipient to be bound by the terms of this "disclaimer and important information".

This document has been prepared by and for Sunwater Limited ACN 131 034 985 and the Queensland Government (collectively the Parties) for general information purposes only in connection with the potential future sale process as described in this document (Sale Process) in respect of water allocations expected to be created following completion of the Rookwood Weir project (Water Allocations). This document does not purport to contain all the information that a potential purchaser of any Water Allocations or any other interested party may require. It is produced solely as a general guide for potential purchasers considering whether to enter into further due diligence or participate in the Sale Process and should not be relied on for any purposes.

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Descriptions as to the proposed Sales Process in this document, including the way in which the process is to be conducted, the timeframes, key dates, products which may be available as part of the Sale Process and any other aspect of the Sale Process described are provided for indicative purposes only based on the Parties' intentions (and based on information provided to the Parties) at the date this document was prepared. The Parties may amend, vary, suspend or not proceed with the Sale Process at any time without notice.

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If you have received this document directly from the Parties, it is because you have been identified as being someone who may potentially be interested in the purchase of Water Allocations as part of the Sale Process. If you contact or otherwise express interest in the Sale Process to the Parties, the Parties may use your details to communicate with you about the Sale Process. However, if you want to opt out of receiving any further information or material from the Parties at any time, you can ask the Parties not to contact you by emailing rookwood.weir@sunwater.com.au or by telephoning (from within Australia) 1800 423 213.

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Minister's foreword

On behalf of the Queensland Government, it is my pleasure to invite you to participate in a significant water infrastructure development that will deliver extensive benefits for Central Queensland.

Rookwood Weir is a $352 million project that will provide new economic and employment opportunities for the agricultural sector, industry and the broader community. It will also underpin future urban and industrial water security for Rockhampton, the Capricorn Coast and Gladstone.

Accessing fresh water can be a limiting factor for production and growth in Queensland. The pressing issue of water scarcity, coupled with rising demand, is the major economic driver of the Rookwood Weir project.

The Queensland Government wants to maximise the opportunities presented by Rookwood Weir and is eager to provide certainty and a clear picture of the investment options available ahead of its commissioning, which is expected in 2023. Key to this is the commencement of the offer process for water allocations. This process is being managed on behalf of the Queensland Government by Sunwater.

This Information Memorandum contains details about Rookwood Weir, its industrial and investment context, the opportunity available to businesses and the community, and the process and timelines for participation.

This offer process for water allocations is facilitated by the amendment to the Fitzroy Basin Water Plan. For more information about this process, visit www.dnrme.qld.gov.au or call 1800 822 100.

I encourage you to read the memorandum thoroughly ahead of your decision to participate in this exciting opportunity.

Thank you for considering an investment in Rookwood Weir.

Honourable Dr Anthony Lynham
Minister for Natural Resources, Mines and Energy

1.0 The opportunity

1.1 Overview

The purchase of water allocations from Rookwood Weir is an attractive investment opportunity for the following key reasons:

- Water assets in Australia are expected to continue appreciating due to increasing demand and fixed entitlements. Certain permanent Australian water assets, as at 30 June 2019, achieved 19.4 per cent one-year appreciation and 25.7 per cent per annum five-year appreciation[1].
- Based on the experience of other irrigation areas, it is forecast that the price of Rookwood Weir water allocations will increase as land is converted from grazing to higher value crops and the higher value crop industries mature.
- In June 2019, the weighted average price of Murray-Darling Basin permanent water traded at a 39 per cent premium to Queensland water markets, and a 133 per cent premium to the Fitzroy Basin water market. Coupled with the reliability of the Fitzroy Basin rainfall, compared to the Murray-Darling Basin, Rookwood Weir water represents one of the most compelling water investments in Australia.
- Over 45,000 hectares of land has been identified as potentially suitable for irrigated crop production, a significant portion of which is expected to be suitable for macadamias, citrus and table grapes. There are also extensive areas that may be suitable for niche horticulture crops such as pecans and lychees, and broadacre crop production, including soybeans and peanuts.
- In the proposed Rookwood Weir impounded area, potential opportunities for larger scale cropping enterprises at a number of land titles have been identified, 45 of which may have more than 1,000 hectares that are suitable for irrigated cropping of some form.
- Ideally located in Central Queensland, the productive potential of the land may capitalise on:
    - established agriculture domestic and export supply chains
    - necessary transport
    - energy and digital infrastructure
    - skilled labour and support services
    - committed government investment in supporting further infrastructure in the region.

[1]Aither sMDB Water Index Performance to 30 June 2019

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Sunwater is proposing to sell water from Rookwood Weir through a two-step process:

1. **Tender One** water sales process for lots 500 megalitres (ML) and greater will be held in late July 2020.
2. **An Expressions of Interest (EOI)** process to work with Sunwater following Tender One in preparation for a second tender (Tender Two) of smaller lots, which is expected to be held in 2022. Landholders interested in securing smaller water lots are encouraged to complete a *Registration of Interest* form to participate in the EOI process - form available by emailing rookwood.weir@sunwater.com.au or phoning 1800 423 213.

The primary focus of this document is on the Tender One water sales process and providing investors and landholders an overview of the significant potential agricultural opportunities that securing a water allocation from the Rookwood Weir presents.

This Information Memorandum sets out details of:

- Sunwater's role in the sales process
- how the sales process will be conducted
- Australian and Queensland water markets
- the status of the Rookwood Weir project
- potential agricultural opportunities within the Rookwood Weir Assessment Area.

Potential investors and landholders are encouraged to read the Information Memorandum in full and refer to the Sunwater website for updates and further information – www.sunwater.com.au > Dams and infrastructure > Projects > Rookwood Weir Project > Water sales.

This is a unique opportunity for interested parties to participate in the economic development of the Lower Fitzroy region and Sunwater looks forward to engaging with you in this process.

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1.2 Water allocation and availability information

Sunwater is inviting parties interested in purchasing water allocations from Rookwood Weir to participate in this initial Tender One process. Key terms and a summary of the opportunity are set out in Table 1.1.

Table 1.1: The opportunity

Item	Details
Seller	Sunwater Limited, ACN 131 034 985 (subject to change to reflect holder of water allocations at the relevant time).
Product	Water allocations to take supplemented water managed under a resource operations licence (ROL).
Purpose	Any, excluding urban supply.
Volume of water allocations	The expected nominal volume of water allocation for the initial water opportunity (Tender One) is 30,000 ML.
Priority of water allocations	**Medium priority (MP)** It is expected that the amended Water Management Protocol will include a mechanism to allow conversion of nominal volume MP water allocations to high priority (HP) water allocations, likely on a 1.5 MP to 1.0 HP conversion factor basis. Conversion to HP would be subject to the provisions and limits to be determined and specified within future water plan and Water Management Protocol amendments and is not guaranteed.
Location of water allocations / supply	**Water allocations located at and supplied from the Rookwood Weir** It is expected that the amended Water Management Protocol will include a mechanism to allow conversion of nominal volume from the Rookwood Weir pond to water allocations located downstream of the Rookwood Weir on a 1.0 (at the weir) to 0.9 (below the weir) conversion factor basis. Such conversions would be subject to the provisions and limits to be determined and specified within future water plan and Water Management Protocol amendments and is not guaranteed.
Distribution	Not available. Supply from river only.
Trading	To be determined. If available, trading will be subject to the Water Management Protocol (for 'permanent trades') and/or Operations Manual (for seasonal assignments or 'temporary trades').

Item		Details	
Reliability		**MP**	**HP (if available)**
		Target monthly supplemented water sharing index of at least 82 per cent.	Target annual supplemented water sharing index of at least 94 per cent. Target monthly supplemented water sharing index of at least 98 per cent.
		Reliability figures are preliminary and based on current water allocation security objectives in the water plan (Fitzroy Basin) 2011. Final figures will not be available until completion of the amended water plan in 2021.	
Annual charges	**Part A**	Fixed charge per ML allocation held per annum. Charged quarterly in advance. Annual charges will commence post settlement.	
		Price per ML will be made available with the release of the Invitation to Tender (ITT) for Tender One.	
	Part B	Variable (volumetric) charge per ML of water taken. Charged quarterly in arrears. Charges will commence post settlement.	
		Price per ML will be made available with the release of the ITT for Tender One.	
Minimum investment volume (Tender One)		500 ML (or an alternative amount determined by Sunwater as part of the development of the Sale Process documents).	
Maximum investment volume (Tender One)		30,000 ML (or an amount determined at the discretion of Sunwater).	
ROL and ROL holder		A ROL will be established for the water supply scheme. The State of Queensland will be the ROL holder, as the owner of the Rookwood Weir.	

Item	Details
Contract instruments	At a minimum, the following contracts will be required: • contract of Sale for Water Allocation (expected to be entered into with Sunwater (as holder of the water allocation) as counterparty) • contract of Water Supply – River (expected to be entered into with Sunwater as agent for the State of Queensland (the ROL holder) as the counterparty).
Conditions of sale	The conditions of the sale are likely to include, but are not limited to: • modelling and determination or confirmation of reliability and costs, compliance with environmental flow objectives and water allocation security objectives, capacity, environmental conditions, and other operating considerations • amendment of the water plan (Fitzroy Basin) 2011 • amendment of the Fitzroy Basin Water Management Protocol • establishment of an operations manual for the new scheme • establishment of the ROL for the new water supply scheme establishment of water allocations.
Timing of allocations and water availability	Water allocations are expected to be granted to Sunwater subsequent to construction and commissioning of the Rookwood Weir. Water availability will be subject to climatic, seasonal, and environmental considerations and statutory requirements. After the granting of the water allocations, the transfer of water allocations from Sunwater to third parties can be undertaken.
Existing water allocations	Existing water allocation security objectives downstream of Rookwood Weir will not be adversely affected by the granting and management of water allocations upstream.

Note: All preceding details are subject to variation, amendment, or removal and are indicative only.

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1.3 Tender One process

The Tender One process will include:

- media engagement and advertising
- market engagement through this Information Memorandum and consultation with landowners in the region
- a tender based sale process.

Subsequent to the issue of this Information Memorandum, Sunwater intends to issue a public invitation to tender (ITT) via the Sunwater website. Parties interested in making an offer to purchase water allocations in Tender One will be required to submit a formal response to the ITT. Full details of the sale process and the ITT will be made available on the Sunwater website. Interested parties are encouraged to visit the Sunwater website and download the documents when available to inform themselves of the process and requirements.

Unsold water allocations from the initial sales process (Tender One) will be made available in a second tender process (Tender Two), which is expected to be held in 2022.

1.4 Tender One timeline

Table 1.2 outlines the milestones and key dates for the Tender One process. These dates are indicative only, and subject to variation or revocation.

Table 1.2: Tender One timeline

Milestone	Key dates
Publication of Information Memorandum	27 May 2020
Sunwater market engagement	27 May through to mid-July 2020
Release of ITT	23 June 2020
Tender response period	23 June 2020 through to late July 2020
Tender response evaluation period	August 2020
Finalisation of contracts	September 2020
Expected completion date for the construction and commissioning of the weir	2023

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1.5 Eligibility

The two processes (Tender One and an EOI) are open to all, but individuals and organisations will need to satisfy requirements to participate in the sale process. These requirements will be outlined in the ITT documentation.

1.6 Tender One potential outcomes

In circumstances where the nominal volume of water is available to all successful tenderers, those tenderers will receive water allocations, based on the amount requested and price offered. These water allocations provide an entitlement in relation to a nominal volume of water. Allocation holders will be entitled to be supplied with a percentage of this volume each water year, ranging from 0 to 100 per cent. This percentage is subject to determinations made in accordance with the water sharing rules in an operations manual, and other limitations (including climate, water security, and availability factors). There is no guarantee that buyers will be entitled to the full nominal volume in each water year and buyers of water allocations are not guaranteed continuity of water supply.

In circumstances where the nominal volume of water is not available to all tenderers (because of an oversubscription), the process of determining the way in which tenderers may receive water allocations will be set out in the ITT documentation.

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1.7 For more information

The sales process offers a unique opportunity for interested parties to participate in the economic development of the Lower Fitzroy region and Sunwater looks forward to engaging with you.

Tender One (July 2020): large lot (500 ML and greater) enquiries

For more information about the Tender One process to secure a water lot of 500 ML and greater, please contact:

Margaux Beauchamp
BDO Corporate Finance

Phone: +61 7 3173 5552
Email: Margaux.Beauchamp@bdo.com.au

Andrew Carrigg
BDO Corporate Finance

Phone: +61 7 3237 5970
Email: Andrew.Carrigg@bdo.com.au

EOI (2022): smaller lot enquiries

For information about the EOI process to secure smaller lots of less than 500 ML in 2022, please contact:

Steve Dudgeon
Sunwater

Phone: +61 405 460 202
Email: steve.dudgeon@sunwater.com.au

For further information about agricultural opportunities, please contact:

Daniel Culpitt
Synergies

Phone: +61 7 3227 9580
Mobile: +61 430 076 223
Email: d.culpitt@synergies.com.au

Rookwood Weir project enquiries

For more information about the project or any of the related enabling works, please:

Visit: www.sunwater.com.au/projects/rookwoodweir

Email: rookwood.weir@sunwater.com.au

Phone: 1800 423 213 (within Australia)

2.0 Sunwater overview

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2.1 Who we are

We are a Queensland Government-owned water service provider, making the most of the available water supply for our agriculture, urban and industrial customers. We operate 365 days a year to deliver for our customers and the essential role they play in regional growth and prosperity.

2.2 Our services

From Mareeba in the far north, west to Mount Isa, and south to St George and Goondiwindi, we work to capture and deliver around 40 per cent of the water used commercially in Queensland through a network of critical infrastructure including:

- 19 major dams
- 64 weirs and barrages
- 595 kilometres of water channels
- 70 major pumping stations
- 1951 kilometres of pipelines
- five water treatment plants
- more than 400 people working across 33 locations.

2.3 Our customers

We supply water to agriculture, urban and industrial customers throughout regional Queensland. Our strong regional presence helps us understand and adapt to the needs and changing environment of our more than 5,000 customers.

2.4 Our purpose and strategic roadmap

Purpose	**Delivering water** for prosperity			
Four strategic goals	**A safe high performance culture** 'Act on it' safety mindset Our people deliver results, are engaged and capable	**A sustainable business** Innovation and business improvement focus Assets and resources optimised	**Supportive stakeholders** Our customers value us We collaborate with all stakeholders	**Commercially focused operations** Efficient service delivery to our customers Value improvement focused
Measures	• Employee engagement • Zero harm	• Return on assets • Margin growth	• Customer engagement/ advocacy	• $/ML • KPIs delivered
Values The foundation of how we deliver for our customers	TAKE RESPONSIBILITY	WORK TOGETHER	VALUE PEOPLE	

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2.5 How we work

sunwater

We are a registered water service provider under the *Water Act 2000*

We are a Government Owned Corporation established under the *Government Owned Corporations Act 1993 (Qld)*

Provides bulk water to

Irrigation customers

Includes Local Management entities, irrigation consultative groups and individual irrigators

Urban customers

Local Councils of Local Government Association of Queensland

Industrial customers

Includes mines and power stations

Supports safe use

Community

In the communities in which we operate, our stakeholders include recreational dam users, suppliers and contractors, local government bodies and environmental interest groups

Regulates

Queensland Treasury

Regulates Sunwater under legislation including:

Government Owned Corporations Act 1993 (Qld)

Shareholding Ministers

Our shareholding Ministers are:

The Hon Cameron Dick, MP, Treasurer and Minister for Infrastructure and Planning

The Hon Dr Anthony Lynham, MP, Minister for Natural Resources, Mines and Energy

Regulates

Department of Natural Resources, Mines and Energy

Regulates Sunwater under legislation including:

Water Supply (Safety and Reliability) Act 2008

Water Act 2000

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2.6 Sunwater at a glance

We service more than **5000** customers

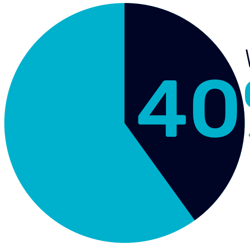
Irrigation

Industrial

Urban

400+ people across 33 locations

We operate **365 days** per year to deliver the **lifeblood** of regional Queensland



We supply around **40%** of the water used commercially in Queensland

On average, we deliver more than 1300 gigalitres of water each year that's enough water to fill **Sydney Harbour 3 times**

Capacity of **6715** gigalitres of water storage in dams, weirs and barrages

19 dams

64 weirs and barrages

595 kilometres of water channels

70 major pumping stations

1951 kilometres of pipelines

5 water treatment plants

3.0 Australian water market

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3.1 Water as an investment

Water is essential for life and a critical input into the food supply required to support global population growth. An underlying driver of water's value is scarcity and the following supply and demand factors:

- water has no economic substitute, at any price
- the combined effects of the growing global population, rising incomes, and expanding cities requires exponentially more water for urban and agricultural purposes
- although water covers 70 per cent of the globe, less than one per cent is suitable for human consumption and irrigation
- the United Nations estimate that the agricultural demand for global water will increase by 60 per cent by 2050
- climate change may potentially intensify water supply issues.

With this anticipated acceleration in increased demand for a fixed water supply, irrespective of the economic conditions, water is a valuable commodity.

3.2 Australian water entitlements as an investment

Australia is the world's driest inhabited continent, and a region where agricultural production isn't limited by suitable fertile land, but by the availability of irrigation water. It is also one of the few countries in the world with a legal and regulatory framework that can allow investment returns to flow from the acquisition and management of water entitlements. With an estimated capitalisation of $27 billion, Australian water entitlements represent a significant investment opportunity.

Some of the benefits of investing in Australian water entitlements are outlined in Table 3.1.

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Table 3.1: Benefits of Australian water investments

Benefit	Description
Scarcity as a value driver	The underlying driver for investing in water is global scarcity. In Australia, given the scarcity of water and the highly variable climate, permanent rights to access allocations of annual irrigation water supplies are extremely valuable.
Key input to agriculture	Water is a key input to Australia's high-value agricultural industries. Water storage capacities reduce the impact of year-to-year variation in seasonal rainfall, allowing for greater reliability of income from agricultural output.
Consistent government policy	For over 30 years, government policy has continued to consistently develop markets to ensure water is appropriately valued and accrues to the bidder with the highest economic value.
Limited access to water entitlements	A finite number of water entitlements are available and are often actively sought for agricultural, mining and urban use.
Secure title	Australian water entitlements are: • legal titles to a share of a defined water resource • able to be traded subject to the conditions of the relevant water plan • mortgage-able instruments.
Non-correlation of return	Returns from water entitlements are influenced by climatic variation and tend not to be correlated to traditional investments in equities, fixed income or property.
Tradability, scale and transparency	The market turnover for Australian water entitlements was approximately $2.4 billion in 2017-18, with farmers actively participating in the market in order to manage their production risk. Water entitlements are divisible, fundable and are able to be bought and sold subject to the conditions of the relevant water plan. Market information is also readily accessible as government registers record traded volumes and prices.

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Under Australia's water trading system, water entitlement investments can either be rented to irrigators, or sold into temporary transfer markets. This water trading system provides a new source of capital, greater liquidity, pricing flexibility, and transparency to the Australian water market.

Water trading is facilitated by water brokers and exchanges that bring buyers and sellers together, reduce search costs, improve the flow of information, and assist in obtaining regulatory approvals. Water funds are also gaining popularity as they allow investors to diversify their water portfolio by state, district, river system, use and users, quality of entitlement, and allocation history.

Consequently, the group of Australian and international investors who are attracted to water as investment is continuing to grow.

Additional information regarding supplemented water as an investment is outlined in Appendix J.

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3.3 Australian water markets

Australia has 13 major water drainage basins, which consist of various river systems. Each basin is split into various catchments (or sub-basins) with clearly defined geographical constraints, water resources and water entitlements issued for each catchment.

The Murray-Darling Basin is the largest river system in Australia, stretching through four states, and supplies water to almost half of the nation's agricultural production. Ninety-five per cent of water trades (by volume) in Australia take place in the Murray-Darling Basin, with a turnover of approximately $2 billion in 2018-19 (compared to the Queensland water market turnover of $169 million in 2018-19). Despite the size of the Murray-Darling Basin, water flow is low and subject to challenges in highly variable rainfall from year to year (e.g. the Darling River at Menidee ceased to flow 48 times between 1885 and 1960).

As a result of low water flow and drought conditions in 2019, water asset prices significantly increased in the Murray-Darling Basin. In June 2019, the weighted average price of water trades in the South Murray-Darling Basin was $3,367/ML, and in the North Murray-Darling Basin was $3,319/ML. The weighted average price of Queensland permanent water trades in June 2019 was $2,419/ML, and the weighted average price of the Fitzroy Basin permanent water trades was $1,447/ML. On this basis, the weighted average price of Murray-Darling Basin permanent water assets traded at a 39 per cent premium to Queensland water markets, and a 133 per cent premium to the Fitzroy Basin water market.

Without the likelihood of significant new water entitlements becoming available in other areas of Australia; and the increasing price and uncertainty of contracting availability of water from the Murray-Darling Basin, many agricultural businesses are now looking at Northern Australia as an opportunity in which to acquire water assets. Water from the Rookwood Weir therefore represents one of the most compelling investment opportunities in Australia.

3.4 Queensland water entitlements overview

Under the *Water Act 2000* (Qld) (Water Act), all the rights to the use, flow and control of all water in Queensland are vested in the State. Under the Water Act, the State manages water resources by:

- planning the allocation of water through water plans and other statutory instruments (such as water management protocols and operations manuals)
- administering entitlements for the access to water by issuing water allocations, licences and permits
- administering licences to operate water infrastructure by issuing resource operating licences.

The Water Act requires that all decisions about water allocation and management are consistent with this framework.

Rookwood Weir will be subject to the soon to be amended Water Plan (Fitzroy Basin) 2011, and a new ROL.

Water allocations

Queensland's water planning framework creates water allocations that enable the holders of those authorities to take a nominal volume of water. Water allocations are separate from land, tradeable, perpetual in tenure and subject to the requirements of the above framework.

Supplemented water refers to water that is supplied under a ROL. A ROL is required to allow the owner of water infrastructure (such as the Rookwood Weir, once constructed) to interfere with the flow of water in a watercourse and operate the infrastructure to deliver on water plan outcomes for both supply and environmental matters.

Supplemented water allocations are specified in terms of:

- a nominal volume
- the location from which water may be taken (generally described in terms of zones)
- the purpose for which water may be taken
- the water plan and operations manual under which it is managed
- the priority group to which it belongs
- other conditions or matters.

Unsupplemented water allocations are not supplied under a ROL (and generally not associated with major instream water infrastructure located in a watercourse). Examples include overland flow, water harvesting (i.e. which allow the taking of water during periods of high flow) and other opportunistic entitlements e.g. that allow taking of water from natural instream water holes.

Key characteristics of water allocations are outlined in Table 3.2.

Table 3.2: Key characteristics of water allocations

Benefit	Description
Record of title	Water allocations must also be recorded on the Water Allocations Register.
Duration	Water allocations exist in perpetuity.
Divisibility and transferability	An entitlement is divisible when it can be subdivided into parts so that users can sell either the whole or only part of their entitlement. Water allocations are fully divisible and may be transferred permanently, leased or transferred temporally (through seasonal water assignment), if permitted by the water plan, water management protocol and operations manual.

Appendix I outlines a summary of water plans, water management protocols, operations manuals, ROL and water supply contracts.

3.5 Fitzroy Basin water supply schemes trading information

Rookwood Weir will be located on the Lower Fitzroy River within the Fitzroy Basin.

Currently, the Fitzroy Basin is comprised of four supply schemes:

1. Dawson Valley WSS
2. Fitzroy Barrage WSS
3. Lower Fitzroy WSS
4. Nogoa Mackenzie WSS.

From July 2017 to February 2020, the three most traded water priorities within the Fitzroy Basin were:

1. MP water in the Nogoa Mackenzie WSS
2. HP water in the Nogoa Mackenzie WSS
3. MP water in the Dawson Valley WSS.

Historical trading of these water priorities from July 2017 to February 2020 are shown in Figure 3.1, 3.2 and 3.3. For the purposes of this analysis, all trades at $0/ML have been excluded.

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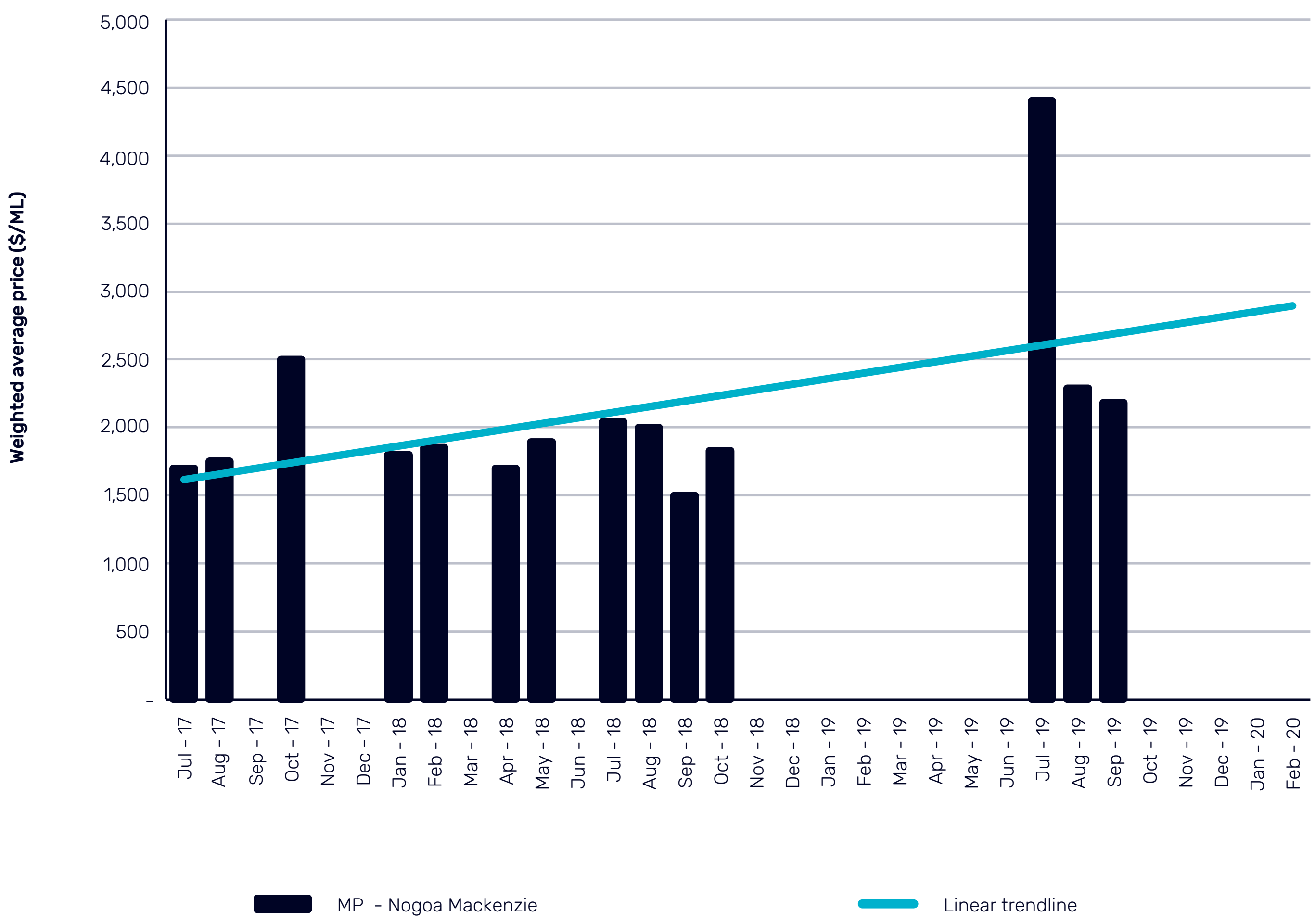
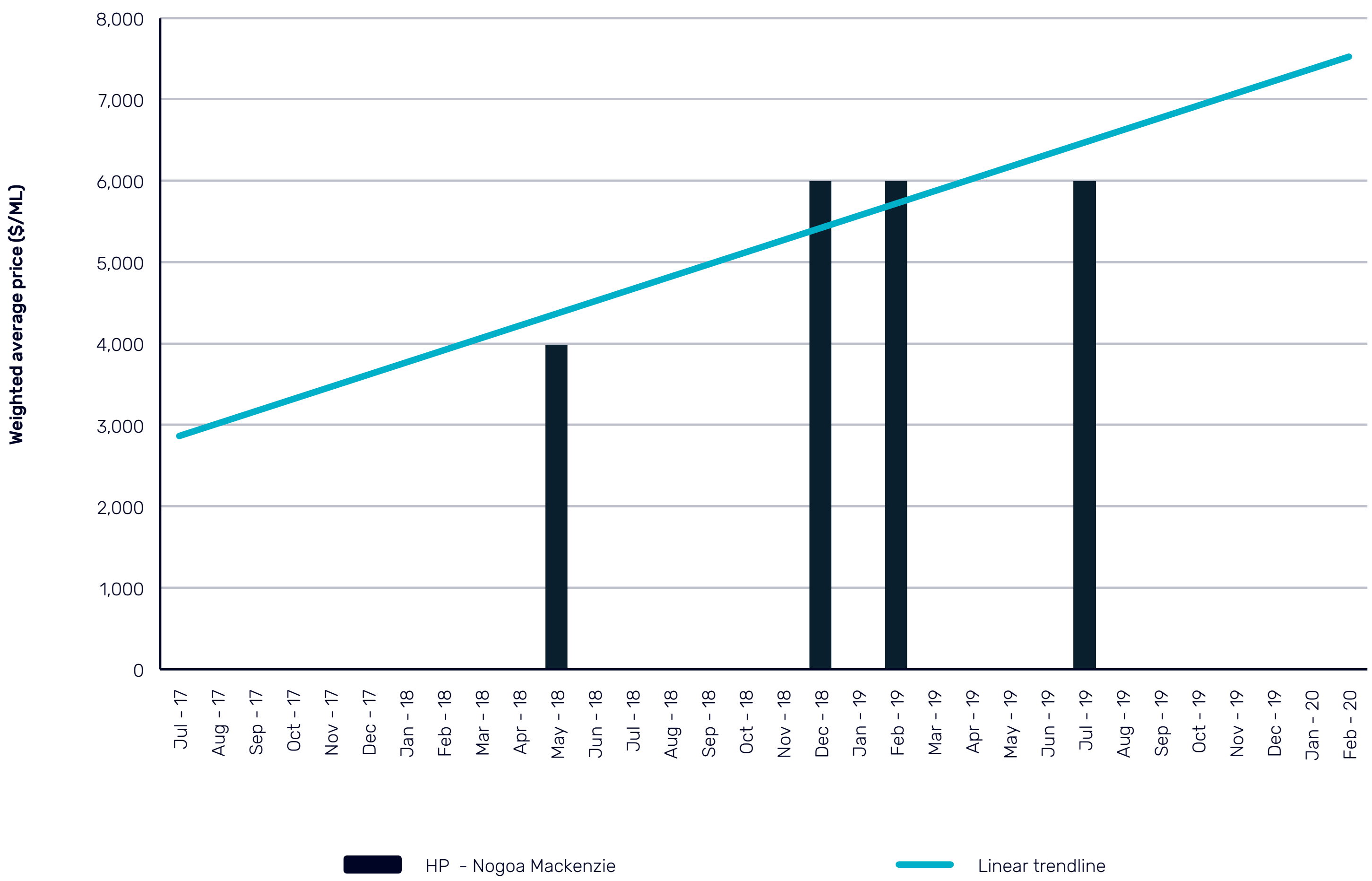
Figure 3.1: MP water trades in the Nogoa Mackenzie WSS



Source: Department of Natural Resources, Mines and Energy

Figure 3.2: HP water trades in the Nogoa Mackenzie WSS



Source: Department of Natural Resources, Mines and Energy

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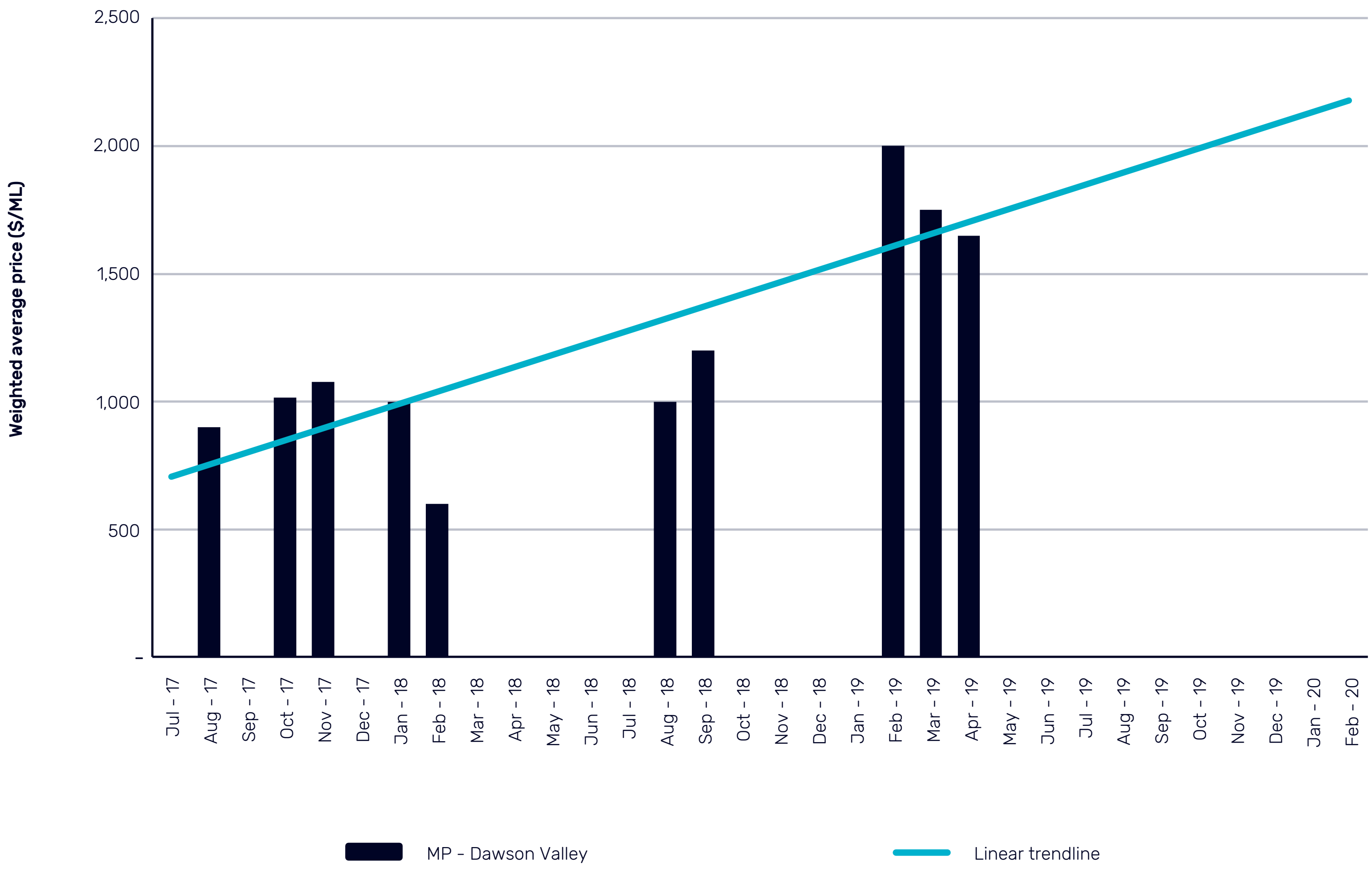
Figure 3.3: MP water trades in the Dawson Valley WSS



Source: Department of Natural Resources, Mines and Energy

Further to the historical trade data provided in Figure 3.1, 3.2 and 3.3, the following factors should also be noted:

- The Nogoa Mackenzie WSS is located near the town of Emerald and irrigates mainly cotton, citrus (mandarins, oranges and lemons) and grapes. Other irrigated crops include wheat, chickpeas, melons and macadamias.
- The Dawson Valley WSS consists of a network of channels and weirs that extend along the Dawson River from Theodore upstream to downstream at Boolburra.
- Increases in the price of water allocation trades may have been impacted by:
  - Fairbairn Dam, which underpins the Nogoa Mackenzie WSS, where volumes sat at the lowest recorded capacity since the construction of the dam in 1972
  - the variation in a customer's capacity to pay for water due to the type of activity engaged in, and for agricultural customers, the age of the crops.

As water becomes scarcer, the price tends to increase and move away from low to higher value uses. For example, Figure 3.4 shows academic research on the marginal value of water used for irrigation within the Murray-Darling Basin. In Emerald, for example, several cotton farms have been converted to macadamia farms in the last five years as this crop has a current higher internal rate of return. Consequently, a macadamia farmer's capacity to pay for water is higher. On this basis, in times when water is scarce, this may have contributed to the increase in price of water entitlements within the Nogoa Mackenzie WSS since July 2017.

Additional information about Fitzroy Basin water supply trading is included in Appendix A.

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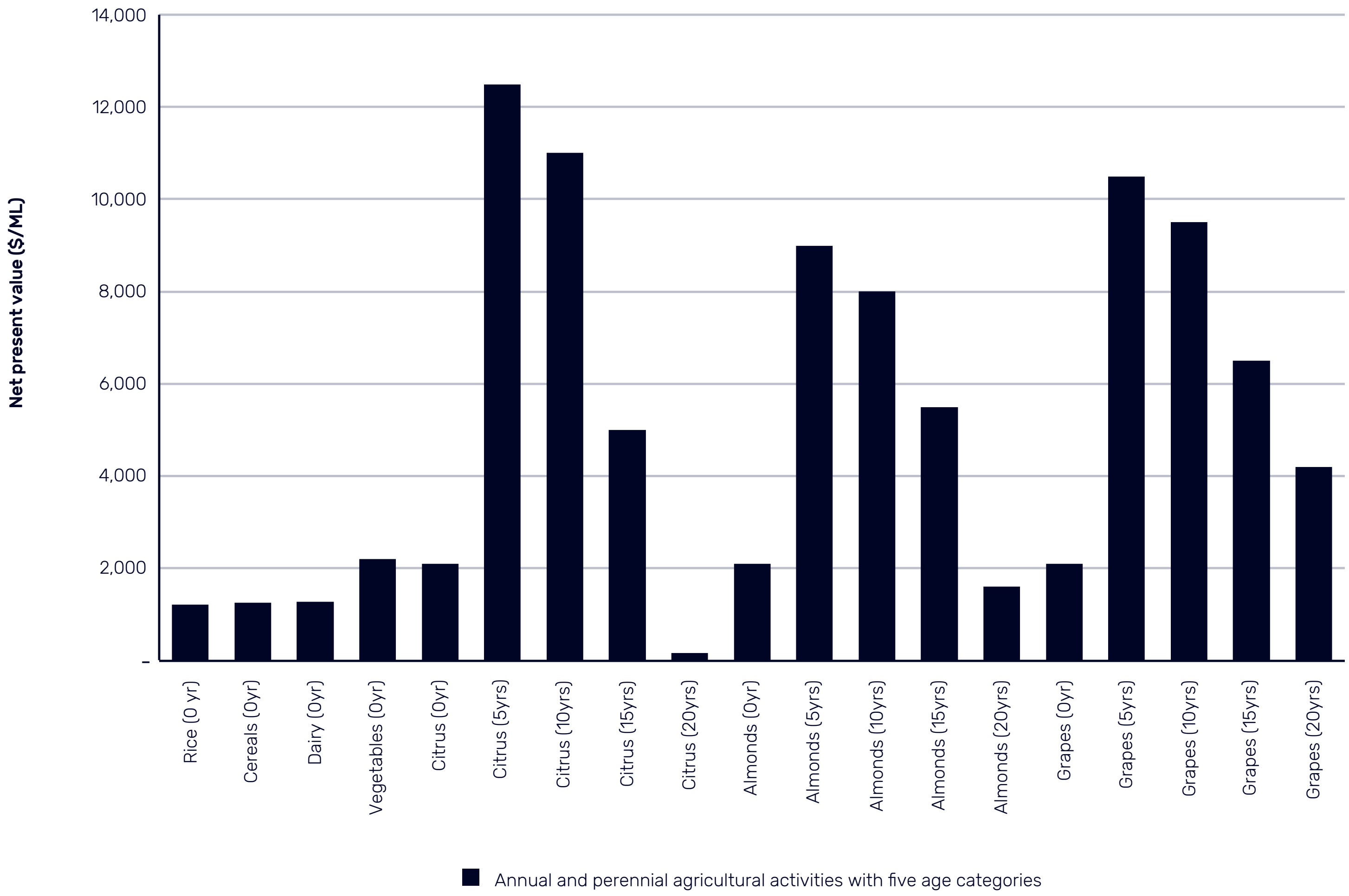
Figure 3.4: Marginal value of water



Source: *Australian Journal of Agricultural and Resource Economics, Volume: 54, Issue: 1*

4.0 Rookwood Weir project

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4.1 Project background

Rookwood Weir aims to provide Central Queensland with an additional source of water for agriculture, urban, and industrial needs. Building Queensland prepared a detailed business case outlining a range of options for investment for the Lower Fitzroy River Infrastructure Project (LFRIP). In February 2017, the Honourable Josh Frydenberg MP, then Minister for the Environment and Energy, approved the LFRIP, with the Rookwood Weir project forming the key element.

There are two key components of the Rookwood Weir project:

1. constructing the weir
2. enabling works that will upgrade existing infrastructure to support both the construction of the weir and its operations, which includes:
   - upgrading and widening 16.2 kilometres (km) of Thirsty Creek Road
   - installing a new intersection on the Capricorn Highway and upgrading Second Street and Third Street at Gogango
   - building a bridge at Riverslea to replace the existing crossing.

4.2 Project and scheme location

The Rookwood Weir site is located north-east of Duaringa, on the Fitzroy River within the Fitzroy Basin in Central Queensland, and is approximately 66km south-west of Rockhampton as shown in Figure 4.1.

The Fitzroy Basin occupies 8.2 per cent of Queensland's total area[2] and is the largest water catchment flowing to the Australian east coast.

The Fitzroy River catchment, also shown in Figure 4.1, stretches from the Carnarvon Gorge National Park in the west to Rockhampton on the Central Queensland coast, encompassing a largely sub-tropical and semi-arid region of Australia. The catchment, at nearly 150,000 km^2, is the second largest river system in Australia after the Murray-Darling River catchment. The major rivers that make up the Fitzroy River catchment include the Nogoa, Mackenzie, Dawson, Isaac, and Connors rivers.

[2]Queensland Government Department of Environment and Science (DES).

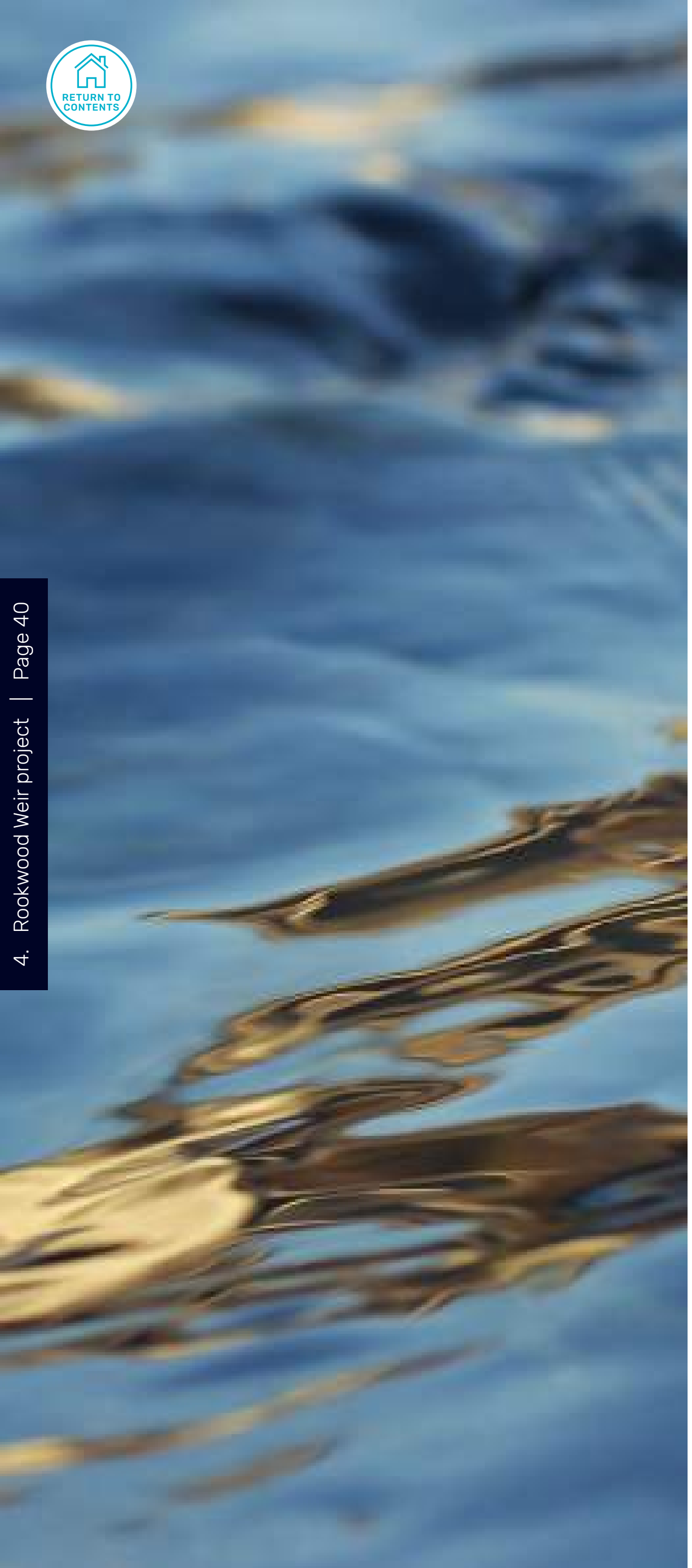
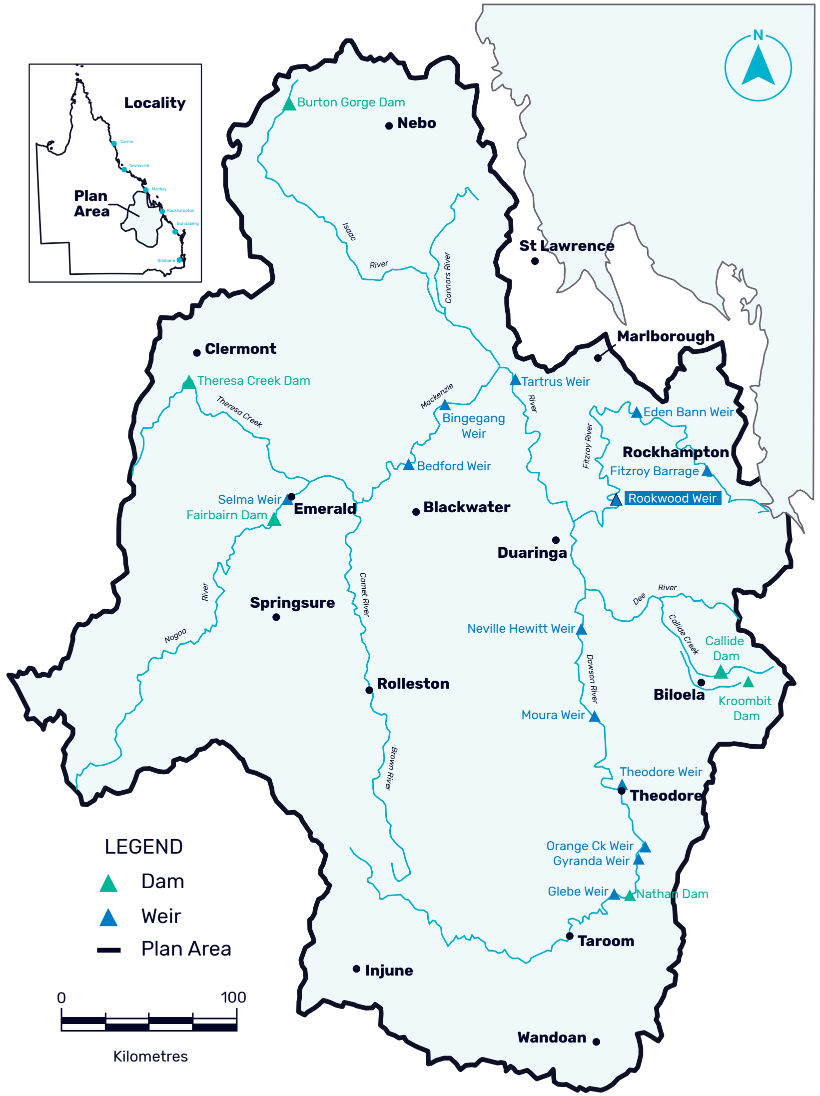


Figure 4.1: Fitzroy River catchment (Fitzroy region) boundary



4.3 Weir specifications

A summary of Rookwood Weir's key specifications are shown in Table 4.1.

Table 4.1: Rookwood Weir's key specifications

Specification	Description
Weir type	An uncontrolled gravity ogee weir constructed using conventional concrete and earth embankment on the left abutment.
Supply level	45.5m Australian Height Datum (AHD)
Storage at full supply level (FSL)	65,402 ML for blended use (MP and HP). Subject to final design.
Yield at FSL	76,000 ML per annum of MP. Subject to final design.
Anticipated allocation	76,000 ML of MP or 50,000ML of HP. Subject to final design.
Impoundment length at FSL	84 km
Minimum operating level	37.0m AHD
Weir length	460m
Height above riverbed	Approximately 15.5m
Design life	100 years
Associated infrastructure	Augmentation to and construction of access roads, construction of low level bridges and installation of culverts.

4.4 Indicative project schedule

The indicative project schedule for the project is outlined in Table 4.2.

Table 4.2: Rookwood Weir indicative project schedule

Project	Alliance members appointed	Expected commencement date	Expected construction completion date
Rookwood Weir	September 2020	April 2021 (major construction)	2023
Thirsty Creek Road upgrade	N/A	Construction has commenced	June 2020
Capricorn Highway Intersection upgrade	N/A	Construction has commenced	June 2020
Riverslea Bridge	N/A	July 2020	June 2021

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5.0 The agricultural opportunity

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Sunwater has engaged agricultural consultants to provide information on the potential uses of water from Rookwood Weir for irrigation purposes.

The information provided in Section 5 is for general information only and should not be relied on in any way as an indication of suitability or otherwise for land to achieve a particular (or any) agricultural outcome. Any person considering a potential purchase of water allocations from Rookwood Weir should make their own enquiries and seek their own advice as to the suitability of any specific land and the use of any water for irrigation purposes to achieve any intended outcome for that land.

5.1 Potential agricultural opportunities

An assessment of the land within five kilometres of either side of the Fitzroy River (Rookwood Weir Assessment Area) identified over 45,000 hectares as being potentially suitable for irrigated crops, a significant portion of which may be highly productive and suitable for macadamias, citrus and table grapes. There are also extensive areas that may be suitable for niche horticulture crops such as pecans and lychees, and broadacre crop production, including soybeans and peanuts.

Macadamias and citrus (mandarins) may be particularly attractive opportunities, as strong growth in export demand has resulted in significant increases in production and profitability of these crops in Central Queensland. Net margin modelling on the production of these crops within the Rookwood Weir Assessment Area estimates net annual returns from the conversion of land from grazing to the production of these crops may achieve around $4,600 per hectare or more. This compares to a typical range for net annual returns from grazing in the Fitzroy region of $60 to $150 per hectare.

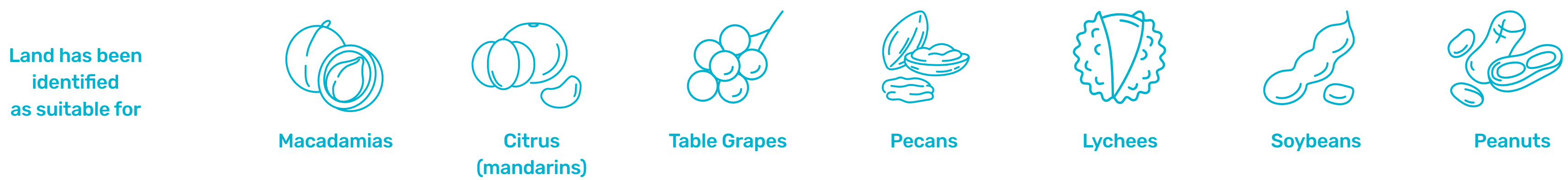
Rookwood Weir boasts several significant advantages over other greenfield agriculture water supply projects under consideration throughout Queensland, such as:

- significant areas of productive land have been identified as potentially suitable for high-value horticultural crops with minimal or no agronomic limitations
- an ideal location to capitalise on the productive potential of the land, with access to established agriculture domestic and export supply chains, necessary transport, energy and digital infrastructure, and skilled labour and support services
- relatively low water supply costs, both in terms of the up-front cost of allocations and ongoing water charges
- committed investment in supporting infrastructure in the region.

The Rookwood Weir project performs strongly relative to other greenfield project proposals, when you consider the key requirement needed to establish a large-scale irrigation district. This is supported by an overriding objective for the project to maximise the economic development in the Lower Fitzroy region through the expansion of irrigated agriculture.

In 2000, the Department of Natural Resources, Mines and Energy (DNRME) assessed land suitability for 10 crops in the Lower Fitzroy region. In 2019, the Department of Agriculture and Fisheries (DAF) provided funding for this list to be extended by an additional six crops, based on information from Rockhampton Regional Council (RCC) regarding contemporary agricultural investor interest.

DAF's analysis assessed the suitability of land five kilometres either site of the Lower Fitzroy



River by cross-matching soil polygons[3] in the study area with a specific crop's agronomical needs, as well as the suitability of the soil for an irrigation methodology.

Every polygon is assigned a numeric suitability rating of 1 to 5 for each specific crop. A suitability rating of 1, 2 or 3 represents soil polygons that are 'suitable for the crop's production', with negligible, minor and moderate limitations respectively. A rating of 4 or 5 means that the crops are unsuitable because of severe to extreme limitations respectively.

It is important to note that the scale of the mapping is 1:100,000, indicating that the data should only be considered as one of many tools that can be used as a guide in the decision-making process. It is expected that interested parties may use this data to help narrow down a search for suitable soils for a crop to one or more areas of interest, and then conduct a more refined analysis of the soils to get a more accurate measure of soil features at the farm level[4].

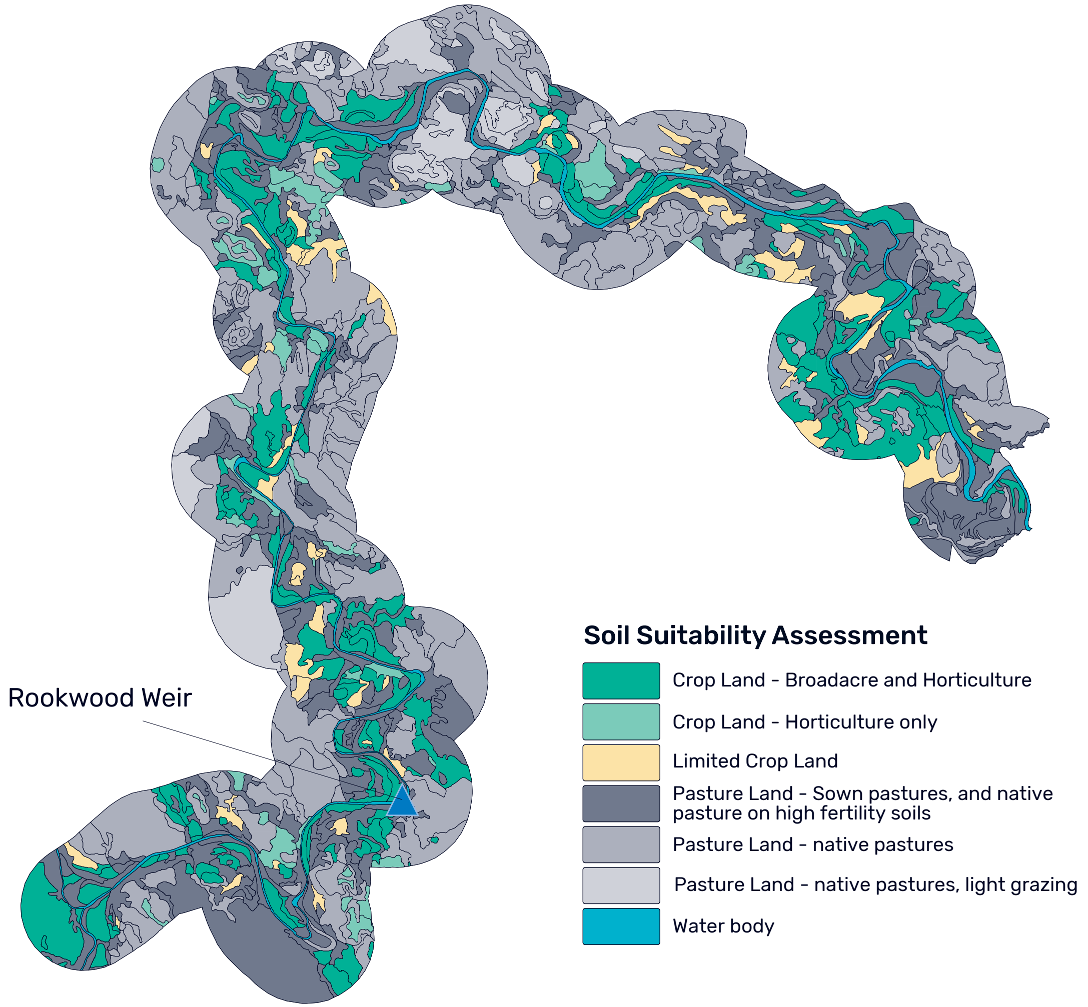
This assessment identified over 45,000 hectares of land potentially suitable for a range of crops, considering soil suitability, the elevation and slope of the land, and the limitation of different crop types. DAF also funded the Department of Environment and Science (DES) to develop an online tool to spatially map the irrigated crop suitability for the assessed crops. For access to this interactive tool to assess the productivity of a range of crops for individual blocks of land visit https://cropsuitabilitytool.daf.qld.gov.au/RookwoodWeir/

The high-level results of the DAF suitability assessment, with the most productive areas of the Rookwood Weir Assessment Area shaded in green, is shown in Figure 5.1.

[3] A soil polygon is a shape that represents an area of soil or soils with specific properties. Soil polygon boundaries are unrelated to Lot Plan boundaries or blocks of land and can fall within or across Lot Plan or block boundaries.

[4] For further information, refer to Queensland Government. (2020). Soil survey of the lower Fitzroy River area, Central Queensland – LFZ

Figure 5.1: Overall results of DAF soil suitability assessment for the Rookwood Weir Assessment Area



Source: DAF

An assessment of selected crops is summarised in Table 5.1.

Table 5.1: Overview of land potentially suitable for crop production in the Rookwood Weir Assessment Area

Class	Macadamias	Citrus (mandarins)	Table grapes	Soybeans	Pecans	Chickpeas	Peanuts	Wheat
Class 1 (ha)	117	2,234	-	486	2,265	486	486	486
Class 2 (ha)	8,537	7,155	8,657	8,638	6,426	8,973	8,683	9,122
Class 3 (ha)	14,981	14,362	15,042	21,801	14,962	26,555	21,801	27,061
Total	23,635	23,751	23,699	30,970	23,653	36,014	30,970	36,669

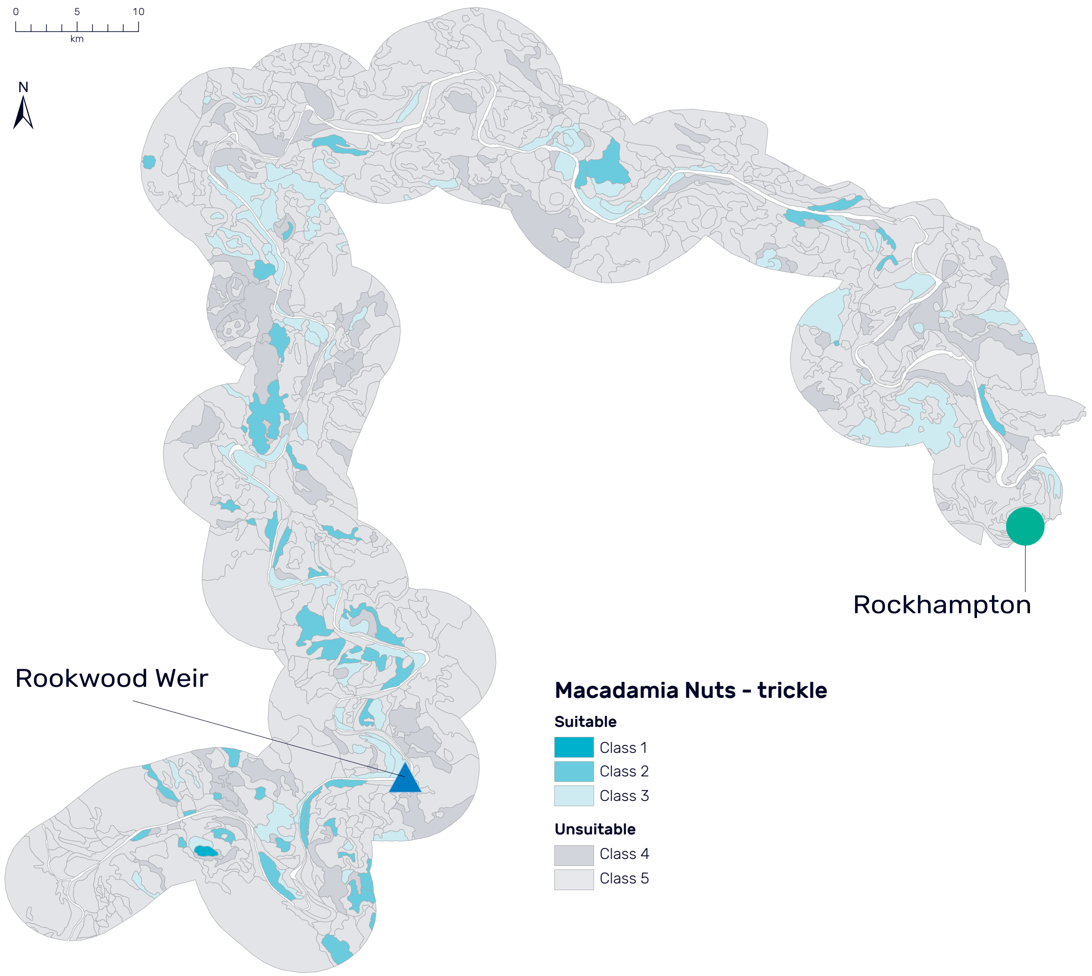
Note: While the class attributed to a parcel of land for a specific crop provides an indication of the productive potential of the land and significance of the limitations on the production of that crop, productivity can still vary significantly both across and within these land classes, depending on the characteristics and limitations of specific land parcels.

Source: DAF land suitability assessment for Rookwood Weir Assessment Area.

Detailed assessments of the potential market outlook and productive potential of the Rookwood Weir Assessment Area for several of these crops is provided in Section 5.4.

While DAF has identified a range of crops as suitable for production within the Rookwood Weir Assessment Area, almost 10,000 hectares of land identified as highly productive (i.e. Class 1 and Class 2) for macadamia and citrus production represents a significant potential opportunity to producers. The areas of land identified as suitable for production of these two crops are shown in Figure 5.2 (macadamia) and 5.3 (citrus) respectively.

Figure 5.2: Land suitable for macadamia production within the Rookwood Weir Assessment Area



Source: DAF

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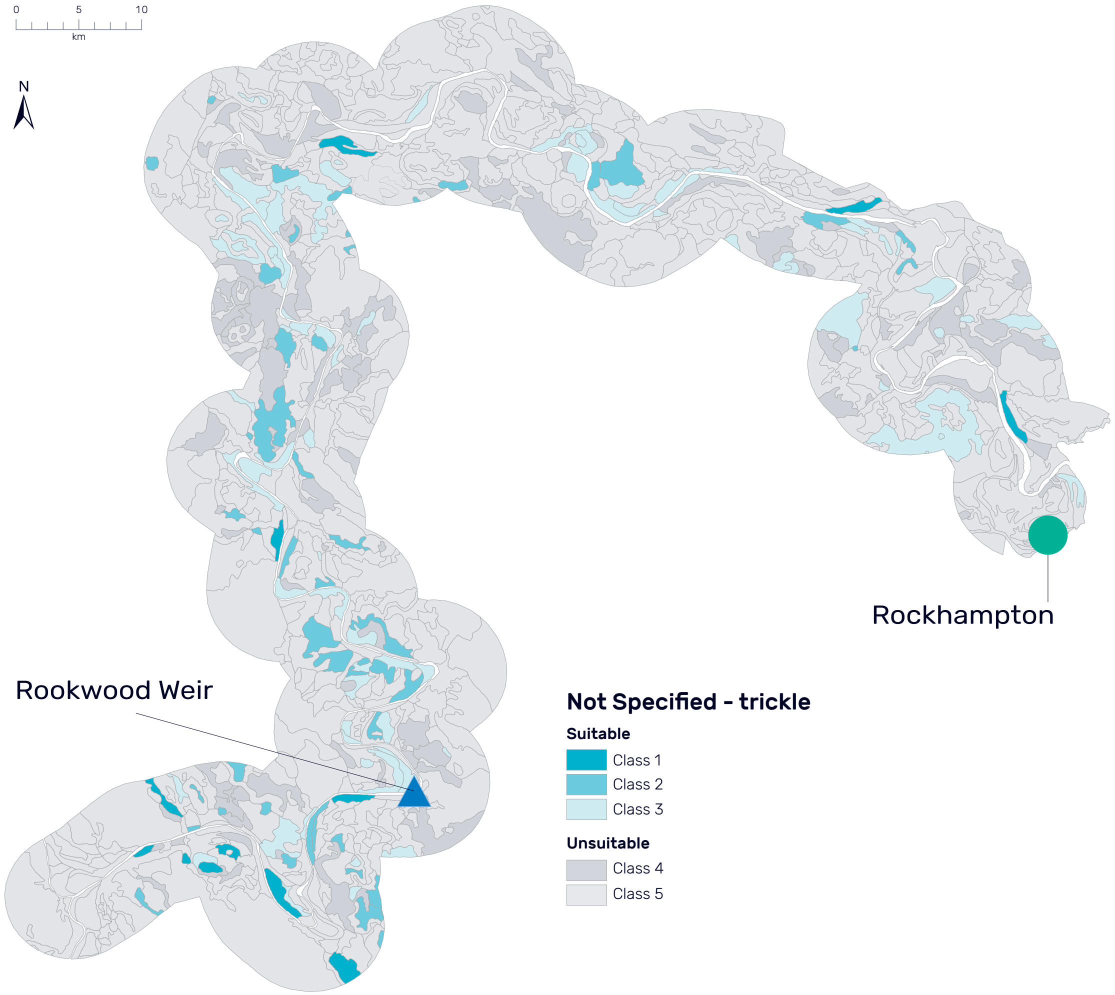
Figure 5.3: Land suitable for citrus production within the Rookwood Weir Assessment Area



Source: DAF

An analysis of the market outlook and productive potential of the land suitable for these crops (summarised in Table 5.2) indicates that significant returns may be generated from investing in macadamia and mandarin crops in the region.

Table 5.2: Macadamia and citrus outlook and suitability summary

	Macadamias	Citrus (mandarins)
Market outlook	• Year-on-year growth in global demand and export prices • Demand expected to continue growing strongly, driven by China and other Asian export markets • Growers seeking new growing areas due to constraints in other macadamia growing regions	• Exports have almost doubled in the last five years and secure price premium of 60 per cent on domestic prices • Access to established citrus export supply chain linking Central Queensland with Asian markets • Significant growth potential in emerging export markets, particularly China and Japan
Rookwood Weir Assessment Area	• 8,654 hectares of Class 1 and 2 agricultural land for macadamia production • Suitable soil profile and climatic conditions, with yields comparable with productive growing regions in Central Queensland and significantly higher than Northern Rivers growing region in New South Wales	• 9,389 hectares of Class 1 and 2 agricultural land for citrus production • Located near Emerald, one of Queensland's main mandarin growing regions, with yields comparable with growers in region with a lower irrigation requirement

While noting that macadamia and mandarin production require significant capital investments with crops taking several years to reach maturity, the net annual return to growers from the production of these crops is estimated to potentially be:

- for macadamias, a range of $2,400 to $4,600 per hectare, taking into account the range of potential outcomes in terms of total orchard development costs and future crop prices
- for mandarins, applying conservative crop price assumptions, annual returns of around $5,000 per hectare, noting that the price premiums available to growers in export markets in recent years correspond with a net annual return of more than double this estimate.

In addition to macadamia and citrus crops, the assessment has also identified a potential range of other crops for which there may be suitable land within the Rookwood Weir Assessment Area. These range from other perennial horticulture crops such as pecans, lychees and mangoes, to broadacre crops, such as soybeans and peanuts. The anticipated suitability of land for horticulture crops provides further opportunities for growers to capitalise on the significant returns available in niche markets while the broadacre crops represent potential opportunities for less capital-intensive investment, noting these crops will generate lower returns to growers.

Two case studies of other regions in Central Queensland where growers have improved their net returns by using reliable supplemented water allocations to increase their agricultural enterprises are as follows:

1. Nogoa Mackenzie WSS: is based around Fairbairn Dam near Emerald, located 270 km west of Rockhampton. Initially established to supply water for broadacre crop production to support the region's beef cattle industry, the scheme has become one of the largest cotton producing areas in Queensland. In recent years, growers have looked to further intensify their land use by transitioning from lower value broadacre crop production (e.g. sorghum, maize and wheat) to perennial horticulture production, particularly citrus and table grapes. This has led to the development of a sophisticated horticulture export logistics chain in the region that provides growers with strong returns on their irrigation water use. Growers are also currently investigating additional means of improving profitability, including planting other perennial horticulture crops such as lemons and limes and innovating with new varieties to target specific export markets.
2. Bundaberg WSS: is based around Fred Haigh and Paradise dam. Sugarcane has been the dominant irrigated crop produced in the scheme for several decades. However, the recent decline in the profitability of sugarcane production due to low world sugar prices has led growers to seek alternative uses for their irrigation water to improve profitability. As a result, a number of growers have transitioned their investment from sugarcane to perennial horticulture crops, in particular avocados and mandarins. A recent study estimated that approximately 400 hectares per annum is transitioned from sugarcane to avocados and macadamias in Bundaberg.

5.2 Competitive strengths of the region

The Rookwood Weir project site is located 66 km south-west of Rockhampton, a region widely acknowledged as a key agriculture producer, with the value of annual production exceeding $200 million.

The Rookwood Weir Assessment Area, as shown in Figure 5.4, is in close proximity to the Capricorn Highway, connecting it with Rockhampton, a major centre with a population of more than 79,000, providing good access to skilled labour and support services.

The Rookwood Weir Assessment Area also benefits from access to established agricultural logistics chains, with livestock, cotton and horticulture products transported from Emerald and surrounding regions to Rockhampton on the Capricorn Highway, before being transported by road or rail on the North Coast Corridor, either to domestic markets or port terminals for export. It is also located near the Emerald Airport, Rockhampton Airport and Port Alma.

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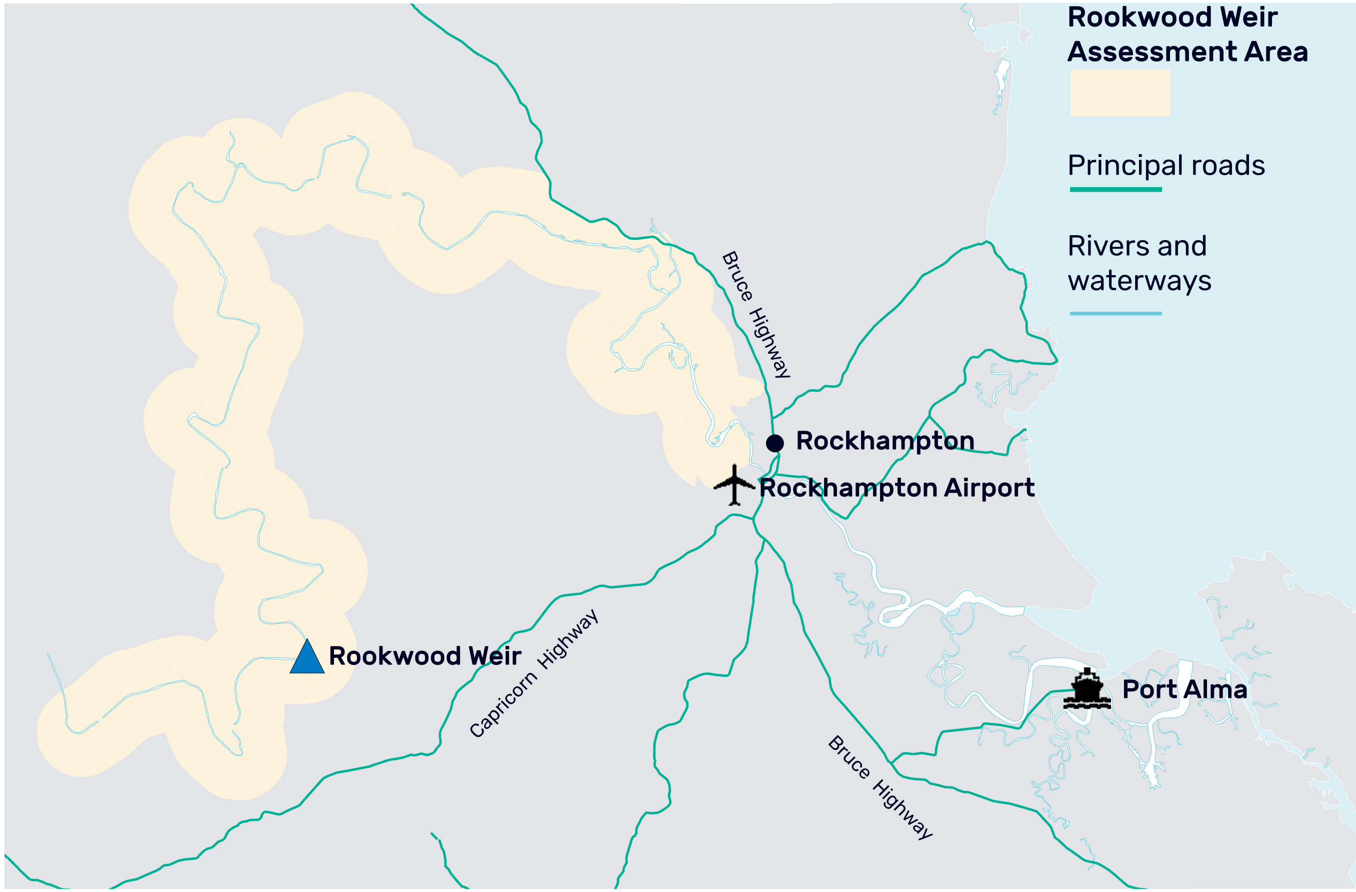
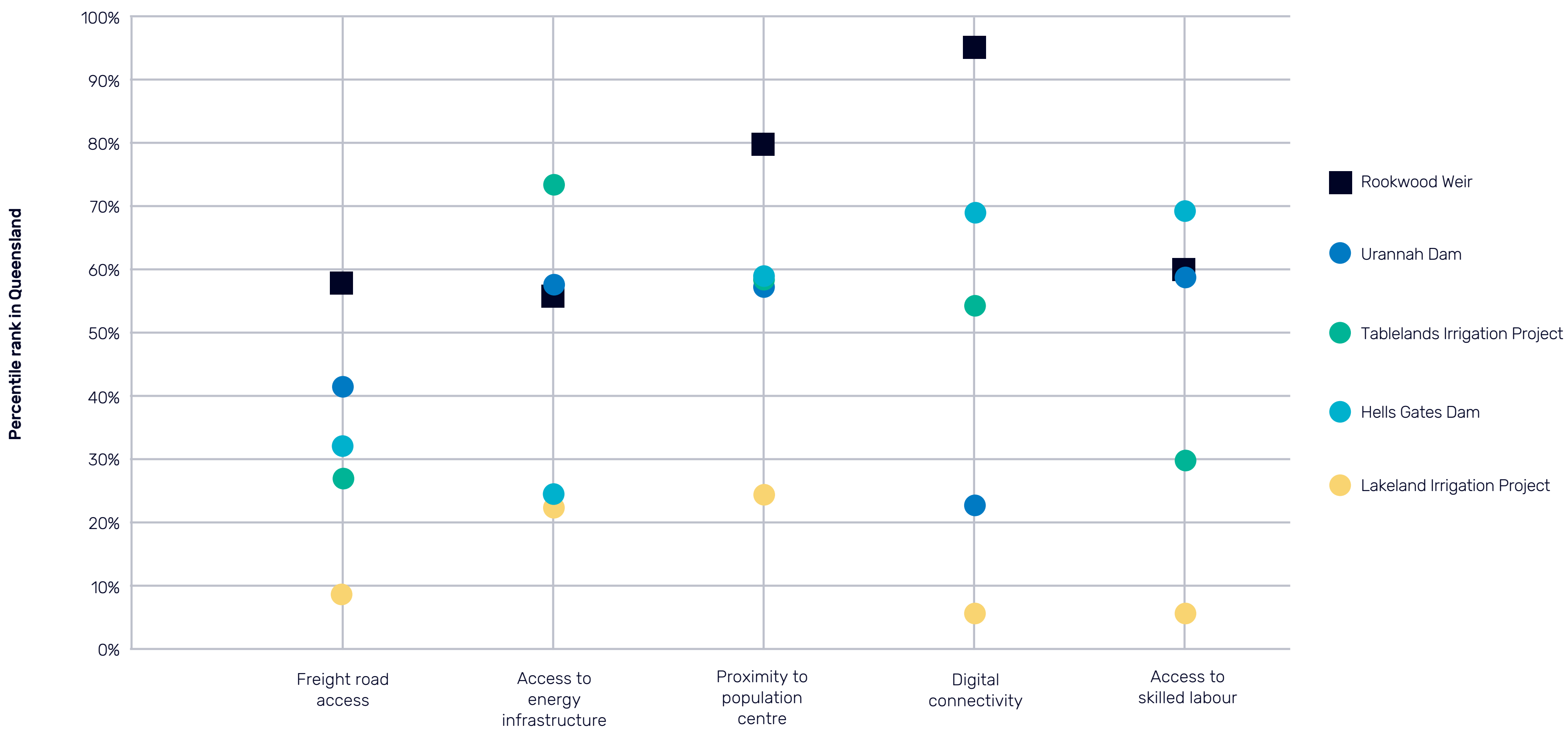
Figure 5.4: Map of key infrastructure



Source: Synergies

A comparative assessment between the Rookwood Weir Assessment Area and other largescale greenfield agricultural water supply proposals in Queensland reveals the area performs strongly in several key requirements for a productive irrigation district (i.e. access to transport and energy, digital connectivity, access to skilled labour and support services). The results of this comparative assessment are summarised in Figure 5.5.

Figure 5.5: Benchmarking of Rookwood Weir Assessment Area against other greenfield irrigation proposals



Note: Hells Gates Dam, Urannah Dam, Tablelands Irrigation project and Lakelands Irrigation project were selected as suitable comparators as, like Rookwood Weir, they represent proposals to establish a largescale, greenfield irrigation district. In doing so, convert a significant area of land from low value land uses (e.g. grazing) to intensive irrigated crop production. The Burdekin Falls Dam Raising project was not included in the benchmarking as this project involves the augmentation of an existing bulk water storage that would increase the volume of irrigation water available to growers in an established irrigation area.

Source: Synergies

The results from the benchmarking exercise indicate that the Rookwood Weir Assessment Area:

- has a potential advantage in relation to freight road access and an established agricultural logistics chain linking the region with major domestic and export markets
- is significantly closer to a major population centre (meaning better access to critical support services), noting that the Gracemere and Parkhurst industrial precincts also provide the land necessary for the establishment of agricultural processing operations
- has an anticipated advantage in terms of digital connectivity, which is a key requirement for intensive irrigation enterprises
- compares favourably in terms of access to skilled labour, based on the proportion of the labour force in the region employed in agriculture.

The Rookwood Weir Assessment Area also benefits from a clear commitment from RCC to facilitate the continued growth and development of the region's agricultural sector. RRC's planning scheme seeks to minimise land use conflicts and urban encroachment with rural land uses. RRC has also historically sought to be proactive in assisting agricultural producers to navigate local and state planning and approval requirements.

5.3 Land

A landholdings analysis, included in Appendix F, outlines the size of land parcels within the Rookwood Weir impoundment area upstream to the Eden Bann Weir. This land analysis also sets out the proportion of land classes for each land parcel. This analysis may be supplemented by:

- DAF Crop Suitability tool – https://cropsuitabilitytool.daf.qld.gov.au/RookwoodWeir/
- DNRME Property Boundaries tool – https://eatlas.org.au/content/qld-dnrm-property-boundaries

5.4 Potential suitable crops

Macadamias

A summary of the macadamia industry, the anticipated market outlook, and other key growing regions are provided in Appendix B.

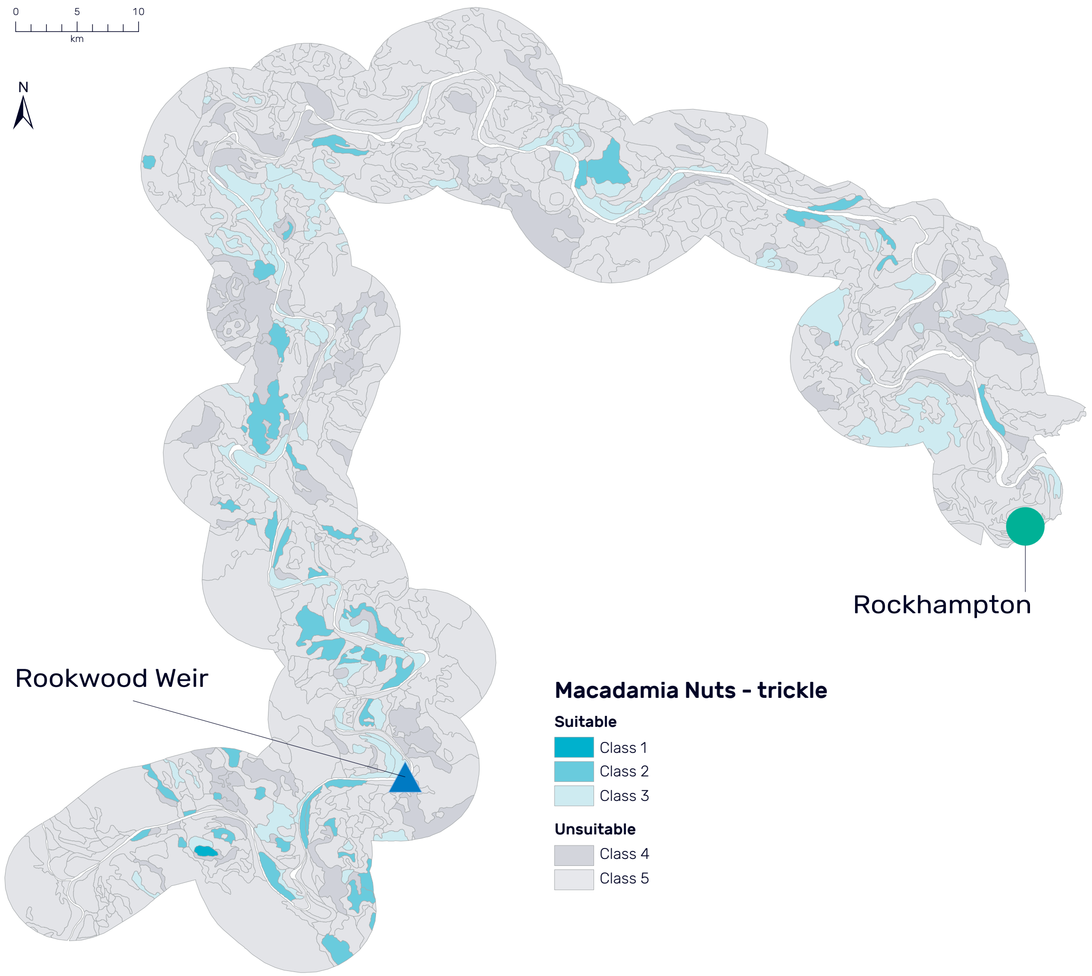
Rookwood Weir Assessment Area suitability

The DAF suitability assessment identified over 23,600 hectares of land within the Rookwood Weir Assessment Area that may be suitable for macadamia production, of which 8,654 hectares was identified as Class 1 or Class 2 agricultural land.

Over 5,000 hectares of this land contains Dermosols and Ferrosols, which is comparable to the soil profile of macadamia growing areas in Bundaberg. Areas of Kandosols, Chromosols and Kurosols are also identified as suitable for macadamia production. Macadamia production on Kandosols soils can be complicated by poor drainage; however, these issues can be overcome with appropriate management practices, such as erosion control measures, irrigation scheduling, increased organic matter and avoiding cultivation of land with slopes exceeding eight per cent.

The land identified as potentially suitable for macadamia production within the Rookwood Weir Assessment Area is shown in Figure 5.6.

Figure 5.6: Land potentially suitable for macadamia production within the Rookwood Weir Assessment Area



Source: DAF

Macadamia crops require a significant up-front commitment from growers. While establishment costs vary based on the production and irrigation system and the scale, industry estimates indicate up-front establishment costs can be as high as $70,000 per hectare, with trees taking between seven and 10 years to reach maturity. However, to date, productive growers have achieved strong financial returns, particularly in the current climate of growing export demand and high farm gate prices.

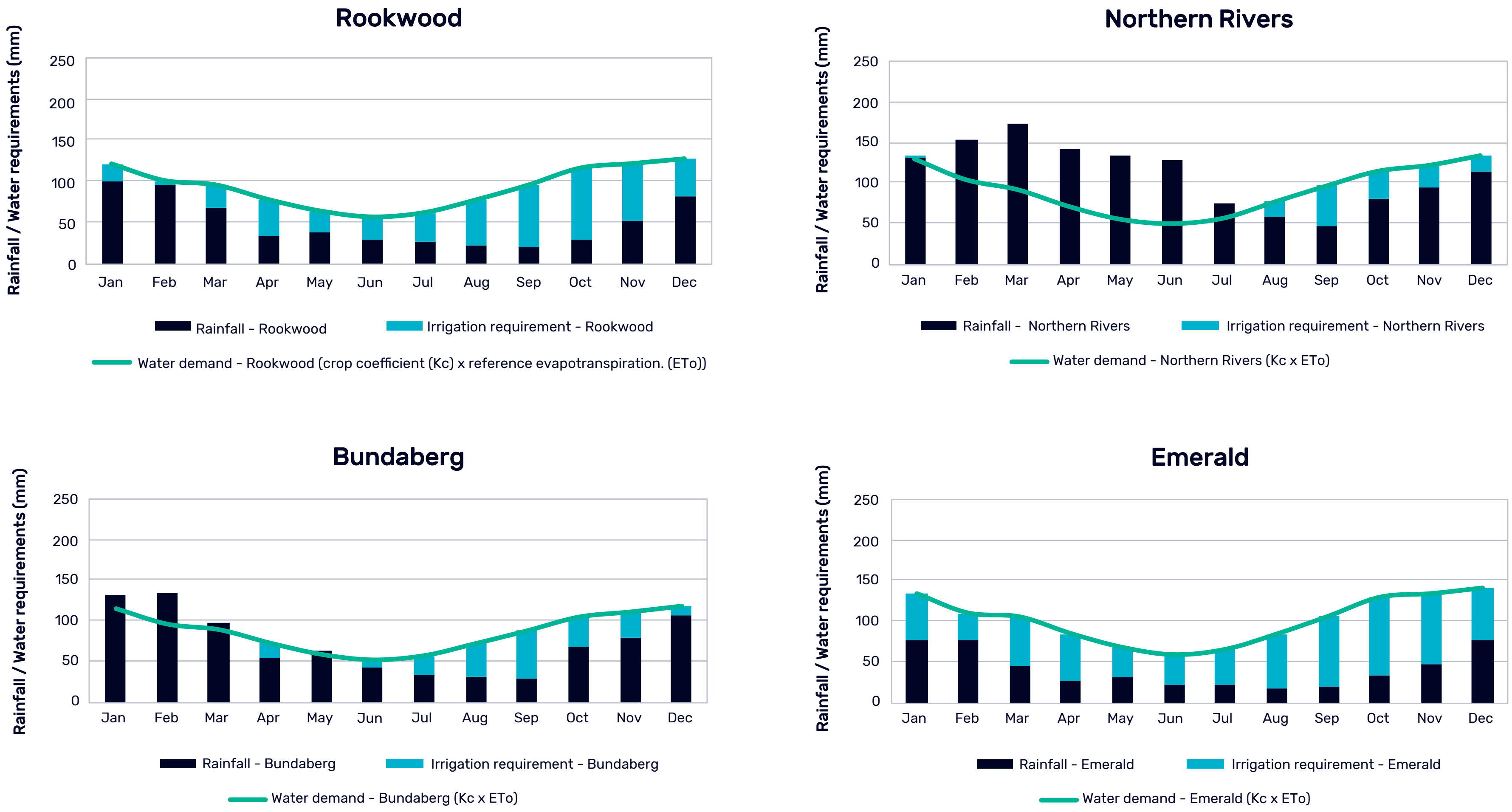
Macadamias are produced on a wide range of soils from the north coast of New South Wales to the Atherton Tablelands in Queensland. Areas with low frost risk and where temperatures do not regularly exceed 35 degrees Celsius (C) are preferred for macadamia production.

A recent benchmarking study of 232 macadamia farms assessed the major factors limiting production by region for the 2018 growing season. In the Central Queensland region, which includes Bundaberg, the major limiting factors were hot and dry weather, followed by soil or tree health. In the Northern Rivers region, storm and hail damage were identified as the most significant limitation, followed by pests.

Figure 5.7 presents an assessment of the climatic conditions for each region using monthly mean climate data and the expected irrigation requirements for the Rookwood Weir Assessment Area relative to the other key macadamia growing regions.

Figure 5.7 also shows that macadamia production has a higher irrigation water requirement in the Rookwood Weir Assessment Area compared to the Northern Rivers and Bundaberg regions and lower compared to Emerald. Noting that annual irrigation requirements vary based on rainfall and temperature, it is estimated that, under a trickle irrigation system, macadamia production in the Rookwood Weir Assessment Area would require 5.7 ML to 6.7 ML of irrigation water per hectare.

Figure 5.7: Comparison of rainfall, crop water demand and irrigation requirements between the Rookwood, Northern Rivers, Bundaberg and Emerald regions

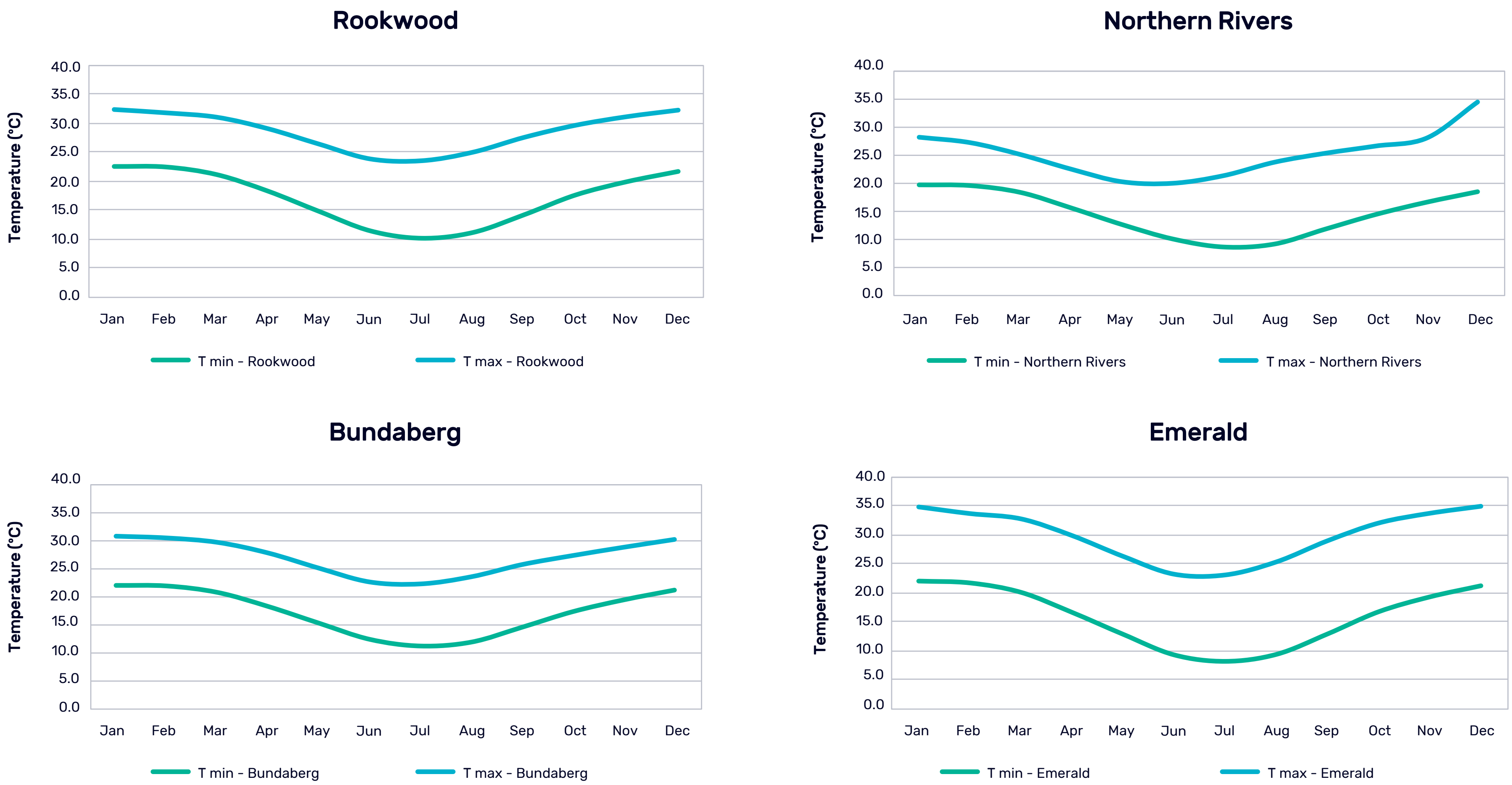


Note: Based on monthly mean climate data for the period 1970 to 2019. Kc = crop coefficient. A coefficient expressing the difference in evapotranspiration between the cropped and reference surface (as used in ETo calculations). ETo = reference evapotranspiration. Calculated from climatic parameters, using the FAO Penman-Monteith formula, evapotranspiration is an overall estimate of the loss of water from crops and soil due to all climatic elements. .

Source: Verterra

A comparison of the minimum and maximum temperatures between growing regions is shown in Figure 5.8.

Figure 5.8: Comparison of temperature conditions for macadamias across the Rookwood, Northern Rivers, Bundaberg and Emerald regions



Note: Based on monthly mean climate data from 1970 to 2019.

Source: Verterra

Figure 5.8 also shows that as with the other growing regions, the Rookwood Weir Assessment Area has relatively low frost risk as minimum temperatures do not typically reach minus 1˚C. In terms of maximum temperatures, crop yields are adversely affected when temperatures regularly exceed 35˚C or where winter maximum temperatures are regularly below 15˚C. The temperature range shown in Figure 5.8 also highlights that the Rookwood Weir Assessment Area is comparable to Bundaberg and is more favourable than Emerald.

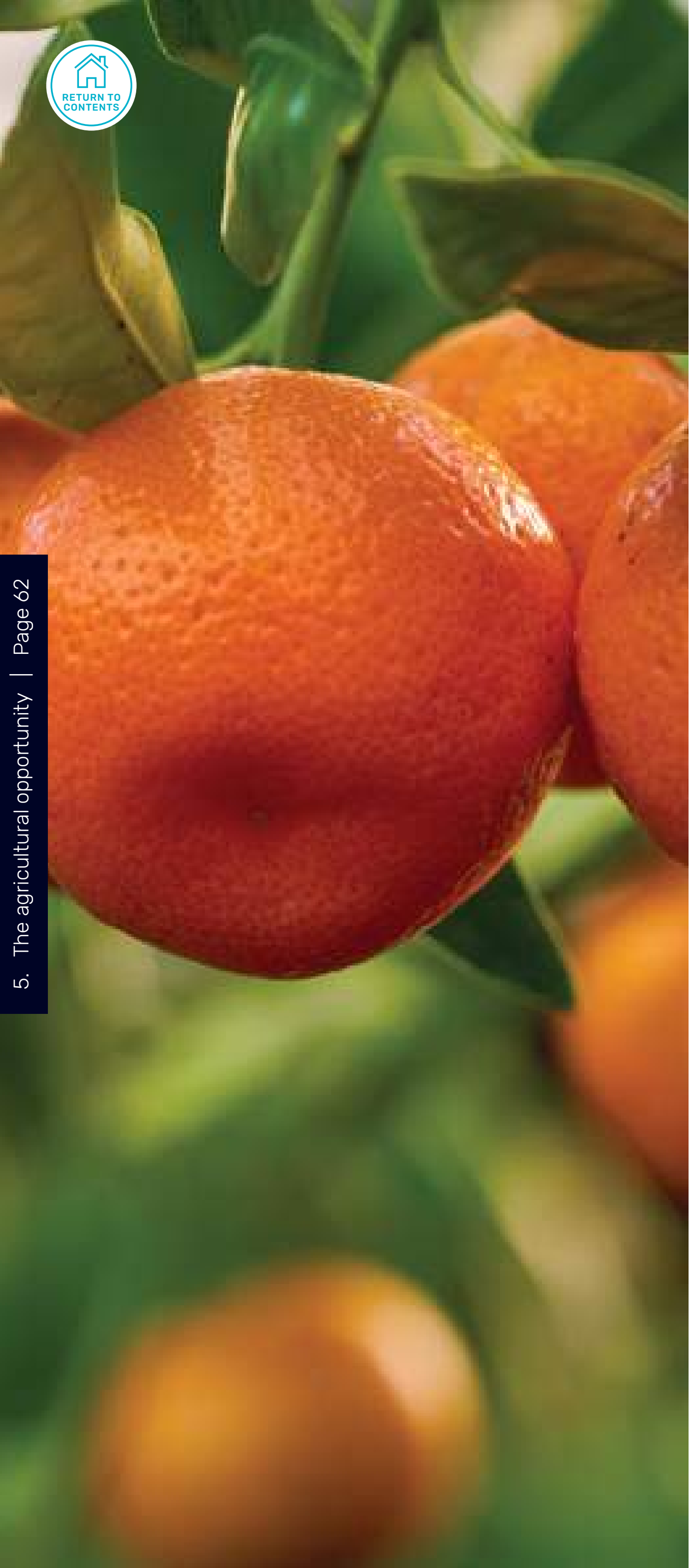
In terms of the productivity in the Rookwood Weir Assessment Area, the analysis of land suitability indicates that growers in the region should expect yields of around 3.3 tonnes nut-in-shell (NIS) per hectare. This is consistent with yields achieved in Bundaberg and significantly higher than the yields achieved in the Northern Rivers region (around 2.3 tonnes per hectare).

In summary, the following conclusions can be drawn regarding the productive potential of the Rookwood Weir Assessment Area for macadamia crops relative to other growing regions:

- lower rainfall means a higher irrigation requirement relative to the Bundaberg and Northern Rivers regions; however, a lower irrigation requirement relative to Emerald
- lower rainfall is partially offset by the higher levels of solar radiation and fewer periods of excess rainfall relative to Bundaberg and the Northern Rivers regions, which reduces the risk of saturated soil conditions
- the temperature range is comparable to Bundaberg and preferable to Emerald and the Northern Rivers region, which experience a higher number of days with maximum temperatures exceeding 35˚C
- growers should expect to achieve a yield that is consistent with those being achieved in Bundaberg and Emerald – around 3.3 tonnes NIS per hectare for mature trees, which is significantly higher than the yields achieved in the Northern Rivers region (around 2.3 tonnes NIS per hectare).

Net margin modelling indicates that, based on the above observations regarding irrigation requirements and crop yields, net returns from macadamia production within the Rookwood Weir Assessment Area are likely to range from around $2,400 to $4,600 per hectare per annum. This range reflects uncertainties in relation to capital costs and future farm-gate prices.[5]

[5]It is important to note that the net annual return derived from macadamia production will be subject to enterprise-specific factors and that the estimates produced in this analysis reflect various assumptions in relation to capital costs, crop yield, irrigation requirements, and farm-gate price.



Citrus (mandarins)

A summary of the citrus industry, the anticipated market outlook, and other key growing regions are provided in Appendix C.

Rookwood Weir Assessment Area suitability

Preferred soil types for citrus production are sandy loams, loams and clay loams, which generally have good drainage, with water holding and nutrient storage capacity. At least one metre of well-drained soil is required to support the root system for a mandarin tree's production. Soils with a high-water table, heavy clay soils or soils with impermeable layers should be avoided.

The DAF suitability assessment identified 23,716 hectares of land within the Rookwood Weir Assessment Area that is potentially suitable for crop production using trickle irrigation, of which around 10,052 hectares was identified as Class 1 or Class 2 agricultural land.

Over 5,000 hectares of this land contains Dermosols and Ferrosols, friable non-cracking clay or clay loam soils that are well suited to mandarin production. Just under 1,000 hectares of land with Tenosols and Rudosols, which are deep sandy soils, have also been identified as suitable for mandarin production; however, these will require careful management practices, including drainage, erosion control and irrigation scheduling.

The land identified as potentially suitable for citrus production within the Rookwood Weir Assessment Area is shown in Figure 5.9.

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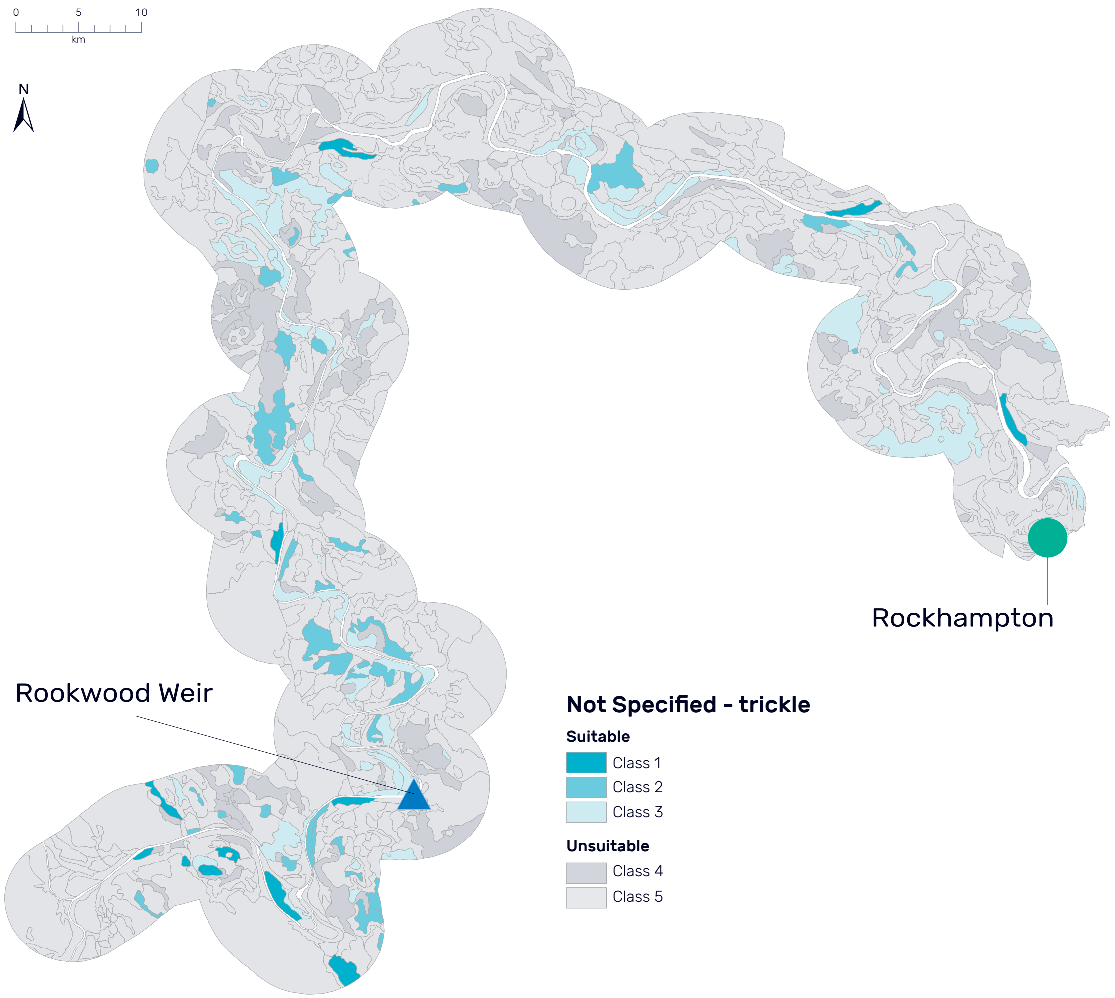
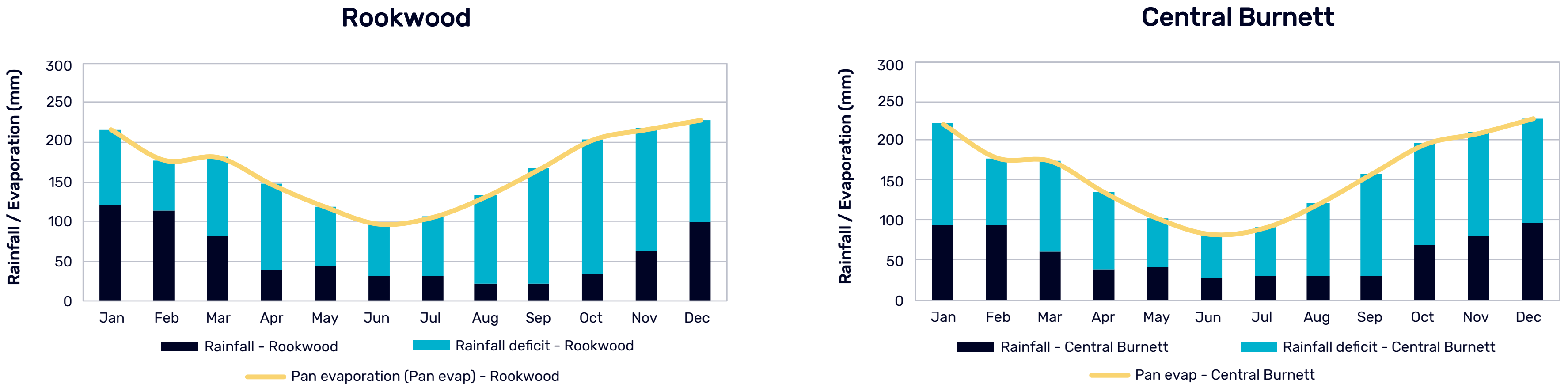
Figure 5.9: Land potentially suitable for citrus production within the Rookwood Weir Assessment Area



Source: DAF

A comparison of rainfall, evaporation levels and rainfall deficit for citrus production in the Rookwood Weir Assessment Area and the Central Burnett region is shown in Figure 5.10.

Figure 5.10: Comparison of rainfall, pan evaporation and rainfall deficit for citrus between the Rookwood and Walkamin regions



Note: Based on monthly mean climate data for the period 1970 to 2019. Pan evaporation is a measure for total evaporation that combines all climatic elements (sunlight, wind, humidity, temperature).

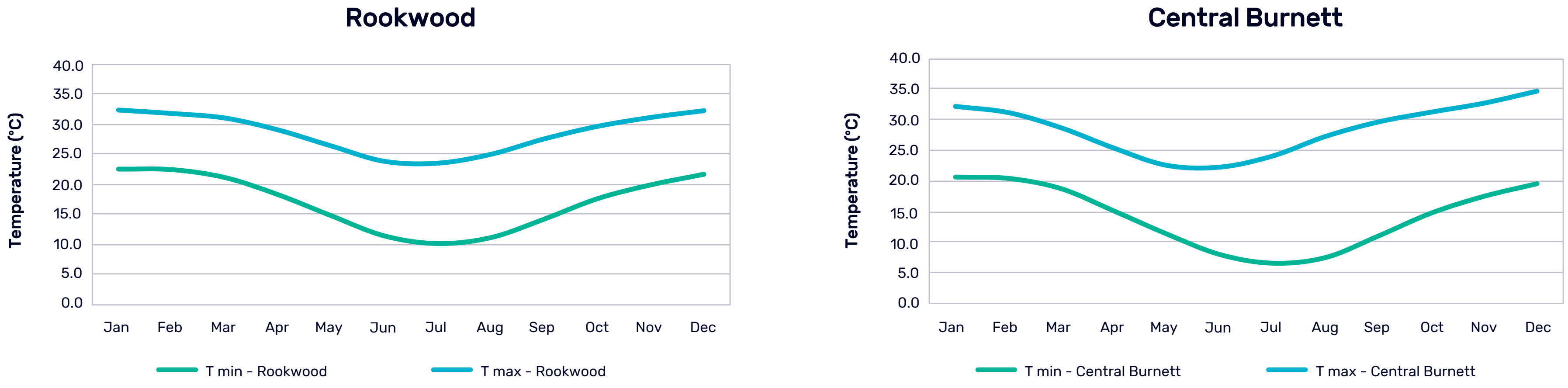
Source: Verterra

Like the Central Burnett region, as shown in Figure 5.10, year-round irrigation is required for mandarin production in the Rookwood Weir Assessment Area. While the regions have similar rainfall patterns, higher levels of evaporation mean irrigation requirements for mandarin production in the Rookwood Weir Assessment Area are higher than in the Central Burnett. It is estimated that using a trickle irrigation system for mandarin production in the Rookwood Weir Assessment Area is likely to require 5.3 ML per hectare at full maturity.

Temperature is a key limiting factor that restricts the geographic distribution of mandarin production. Frost and freezing temperatures can damage fruit and kill mature trees. Minimal growth occurs on citrus trees at temperatures below 13˚C. The optimum temperature range for growth is generally between 13˚C and 35˚C[6]. A comparison of the temperature in the Rookwood Weir Assessment Area with the Central Burnett region is shown in Figure 5.11.

[6]NSW Department of Primary Industries. (2017). Australian mandarin production manual.

Figure 5.11: Comparison of temperature conditions for citrus across the Rookwood and Central Burnett regions



Note: Based on monthly mean climate data for the period 1970 to 2019. Pan evaporation – a measure for total evaporation that combines all climatic elements (sunlight, wind, humidity and temperature)

Source: Verterra

Figure 5.11 shows that the maximum temperatures in the Rookwood Weir Assessment Area are generally comparable to the Central Burnett region. It also shows that there are fewer months in which the minimum temperature falls below 13˚C in the Rookwood Weir Assessment Area.

Based on the soil types and an assessment of rainfall and temperature data, it can be concluded that while having a marginally higher irrigation requirement, the Rookwood Weir Assessment Area is likely to achieve yields that are highly comparable to the Central Burnett region.

Noting the broad opportunities available to Australian citrus producers in emerging export markets, mandarins are considered to represent a significant potential opportunity in terms of citrus production within the Rookwood Weir Assessment Area. Emerald has recently emerged as a major growing region for mandarin exports and is located near the Rookwood Weir Assessment Area. This provides a potential opportunity for growers in the Rookwood Weir Assessment Area to take advantage of the established citrus export supply chain in the region.

Indicative net margin modelling for a mandarin orchard in the Rookwood Weir Assessment Area indicates that net annual returns of around $5,000 per hectare or more may be achievable, particularly if growers are able to take advantage of increasing demand in Asian export markets.[7]

[7]It is important to note that the net annual return derived from mandarin production will be subject to enterprise-specific factors and that the estimates produced in this analysis reflect various assumptions in relation to capital costs, crop yield, irrigation requirements, and farm-gate price.

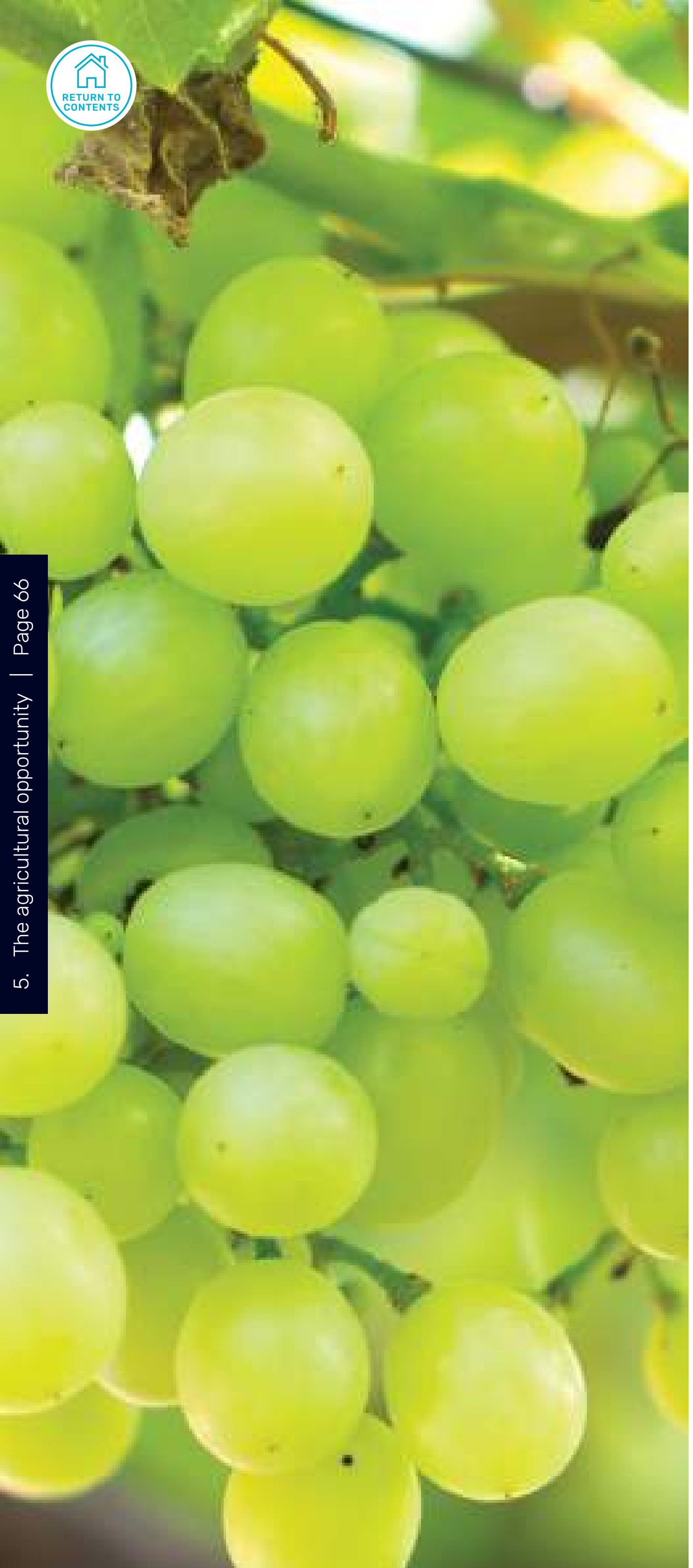


Table grapes

A summary of the table grape industry, the anticipated market outlook, and other key growing regions are provided in Appendix D.

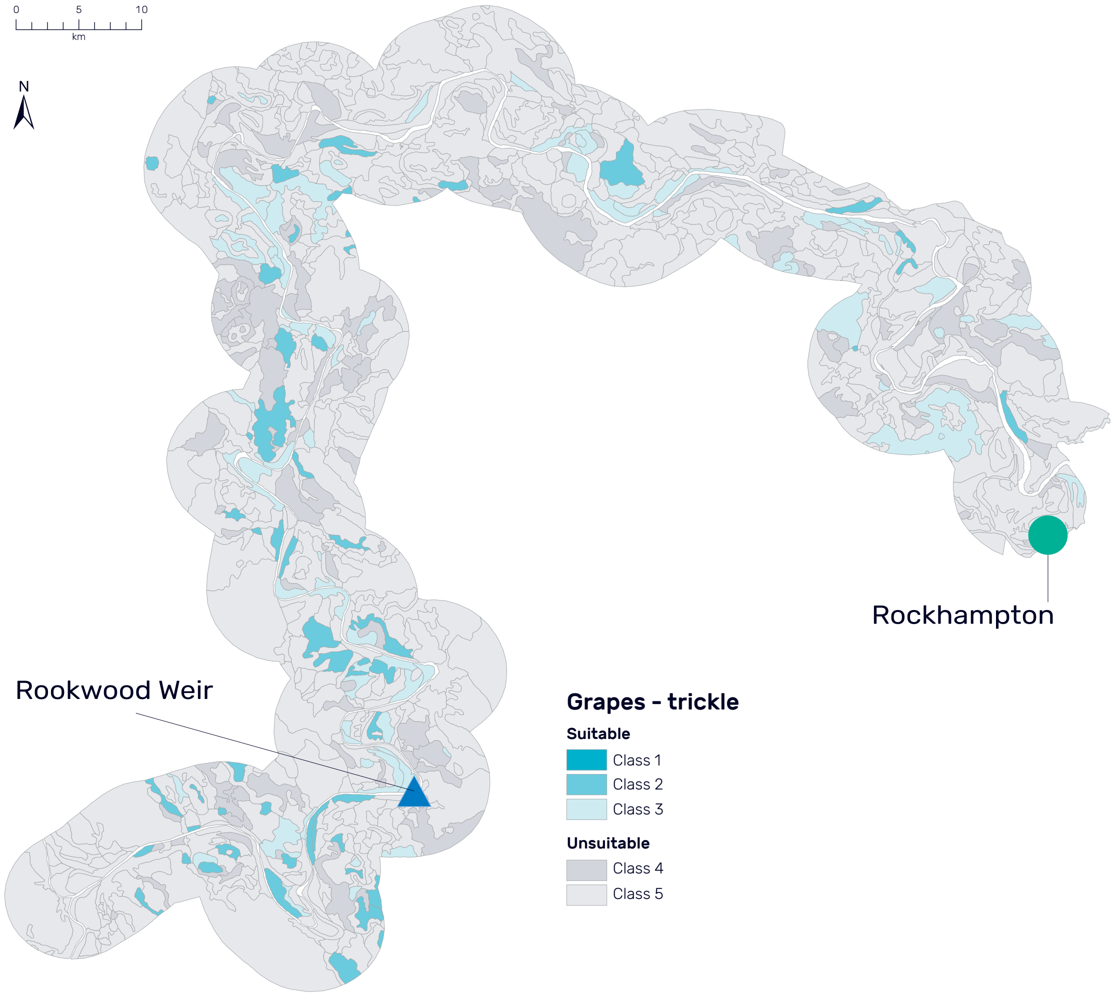
Rookwood Weir Assessment Area suitability

While grape vines are most productive in well-drained soils, table grape vines are known to adapt to a wide range of soil types. Less fertile soils are often favoured for table grapes, as richer soils can produce grapes with excessive vigour. Monitoring of water use and irrigation is important to ensure table grapes do not suffer from a shortage or excess of soil moisture, which can interrupt berry growth.

The DAF suitability assessment identified over 23,600 hectares of land within the Rookwood Weir Assessment Area that is potentially suitable for table grape production, of which around 8,657 hectares was identified as Class 2 agricultural land. Over 5,000 hectares of this land contains Dermosols and Ferrosols, friable non-cracking clay or clay loam soils that are well-suited to table grape production.

The land identified as potentially suitable for table grape production within the Rookwood Weir Assessment Area is shown in Figure 5.12.

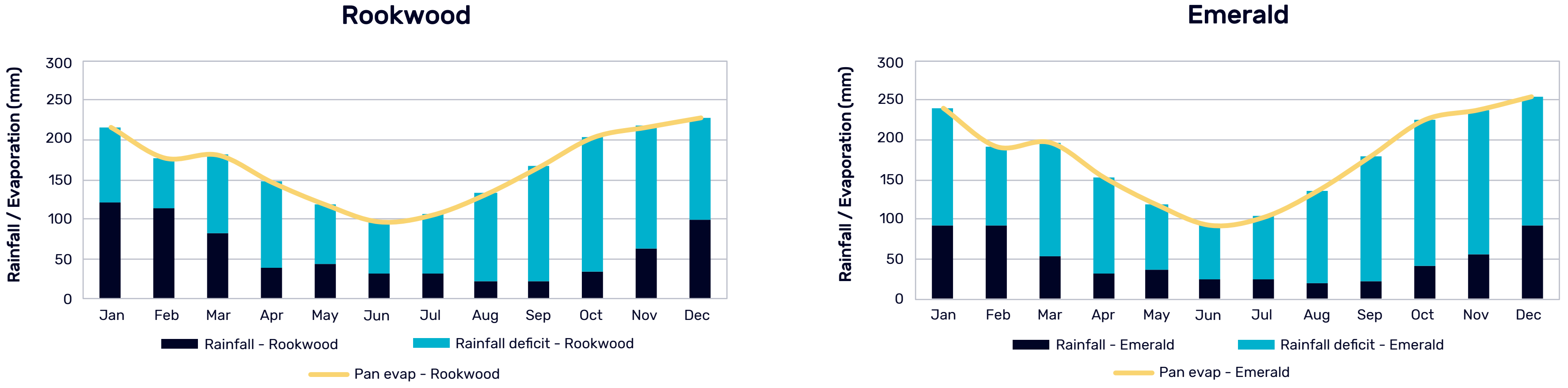
Figure 5.12: Land potentially suitable for table grape production within the Rookwood Weir Assessment Area



Source: DAF

The comparison of rainfall, evaporation levels and rainfall deficit between the Rookwood Weir Assessment Area and Emerald, which is one of Queensland's major table grape growing regions, is shown in Figure 5.13.

Figure 5.13: Comparison of rainfall, pan evaporation and rainfall deficit for table grapes between the Rookwood and Emerald regions



Note: Based on monthly mean climate data for the period 1970 to 2019.

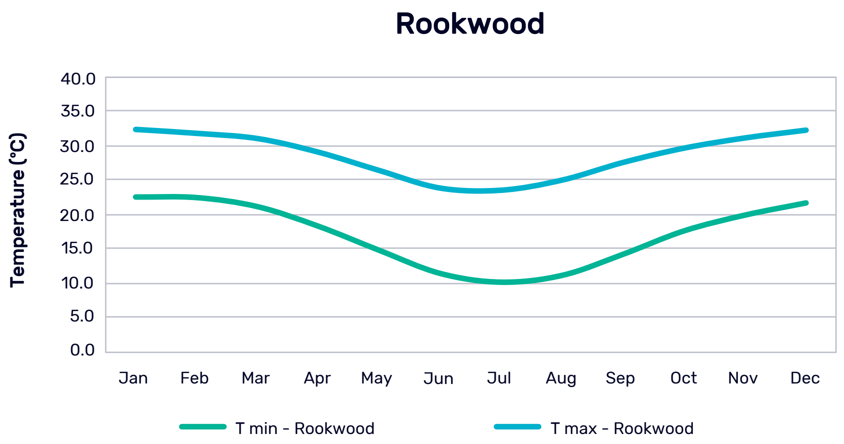
Source: Verterra

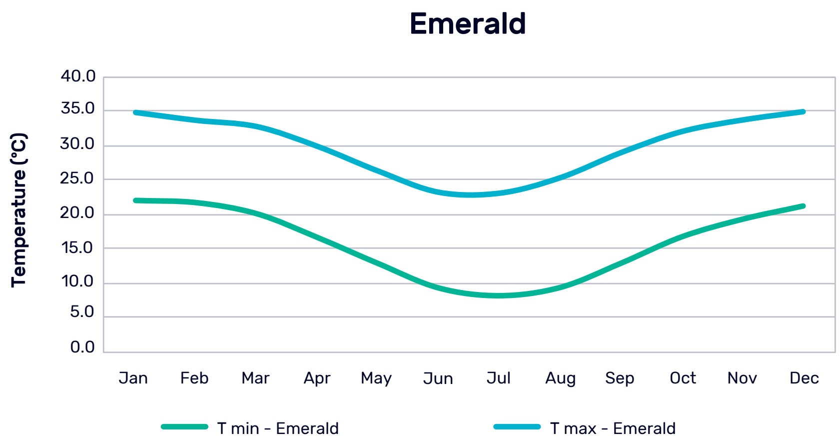
Similar rainfall and evaporation trends for the Rookwood Weir Assessment Area and Emerald are also shown in the Figure 5.13.

As the Rookwood Weir Assessment Area exhibits a slightly lower rainfall deficit relative to Emerald, the irrigation water requirement for table grapes is expected to be marginally lower.

A comparison of monthly mean maximum and minimum temperatures between the regions is shown in Figure 5.14.

Figure 5.14: Comparison of temperature conditions for table grapes across the Rookwood and Emerald regions





Note: Based on monthly mean climate data for the period 1970 to 2019.

Source: Verterra

Figure 5.14 demonstrates that the maximum and minimum temperatures, based on monthly mean climate data, are generally similar in the two growing regions. These ranges are suitable for table grape production.

In summary, the Rookwood Weir Assessment Area is expected to contain significant areas of land with strong potential for highly productive table grape production. The area's soil profile and climatic conditions are well-suited to table grape production and are generally comparable to the Emerald region.

The future profitability of table grape production in the region is likely to be driven by the ability to access the growing demand and price premiums on offer in Asian export markets. While the industry has derived significant benefit from this growing demand in recent years, Queensland table grape farmers are yet to establish a presence in these markets and take advantage of earlier ripening schedules. This may be due to a lack of an export logistics chain connecting table grape farmers to export markets which, noting the significant tonnages of citrus crops exported from Central Queensland, could be overcome. Expanding table grape production for export markets and developing new export markets is a key focus of the Australian Table Grape Association (ATGA).

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Soybeans

A summary of the soybeans industry, the anticipated market outlook, and other key growing regions is provided in Appendix E.

Rookwood Weir Assessment Area suitability

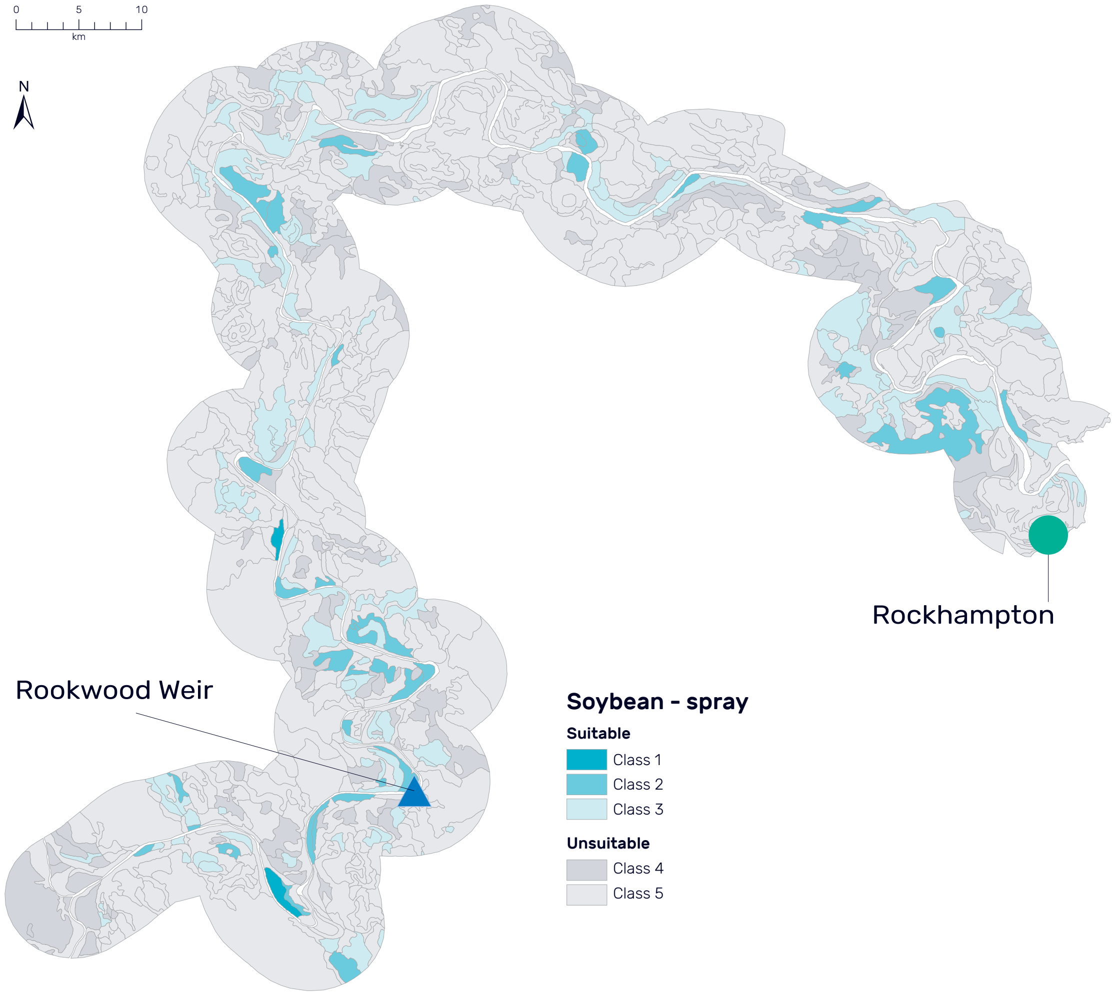
Soybeans are a summer crop best suited to climates with temperatures above 18°C, long summer day lengths, and a minimum summer rainfall of 500 millimetres (mm). Soybeans can be grown on a wide range of well-drained soils from sands to heavy clays and are suited to most irrigation systems, including furrow and spray.

Soybeans are susceptible to both drought and frost, and do not tolerate waterlogging or salinity, which can result in significant yield reductions.

The DAF suitability assessment identified over 30,900 hectares of land within the Rookwood Weir Assessment Area that is potentially suitable for soybean production, of which around 9,169 hectares was identified as Class 1 or Class 2 agricultural land. The majority of this land contains vertosols, cracking clay soils which, as noted above, are suitable for soybean production, with good water holding and nutrient storage capacity.

The land identified as potentially suitable for soybean production within the Rookwood Weir Assessment Area is shown in the Figure 5.15.

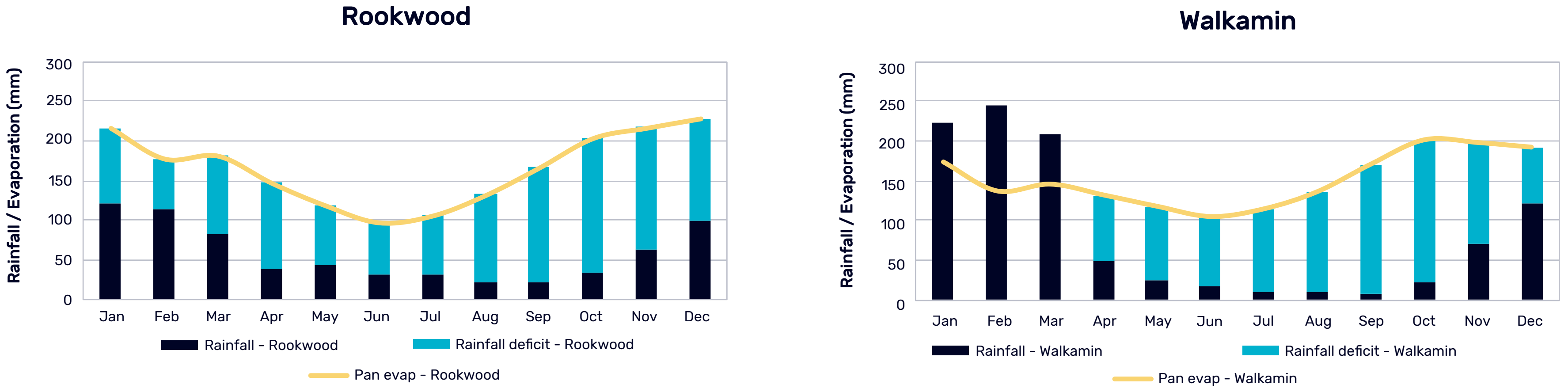
Figure 5.15: Land potentially suitable for soybean production within the Rookwood Weir Assessment Area



Source: DAF

A comparison of the monthly mean rainfall, evaporation and rainfall deficit for soybean production in the Rookwood Weir Assessment Area to Walkamin in the Atherton Tablelands, which is the major soybean growing region in Queensland, is shown in Figure 5.16.

Figure 5.16: Comparison of rainfall, pan evaporation and rainfall deficit for soybeans between the Rookwood and the Atherton Tablelands region



Note: Based on monthly mean climate data for 1970 to 2019 for the Rookwood Weir Assessment Area and 1968 to 2020 for Walkamin.

Source: Verterra

Figure 5.16 demonstrates that, unlike in the Atherton Tablelands, soybean production in the Rookwood Weir Assessment Area has a year-round irrigation water requirement and a lower summer rainfall.

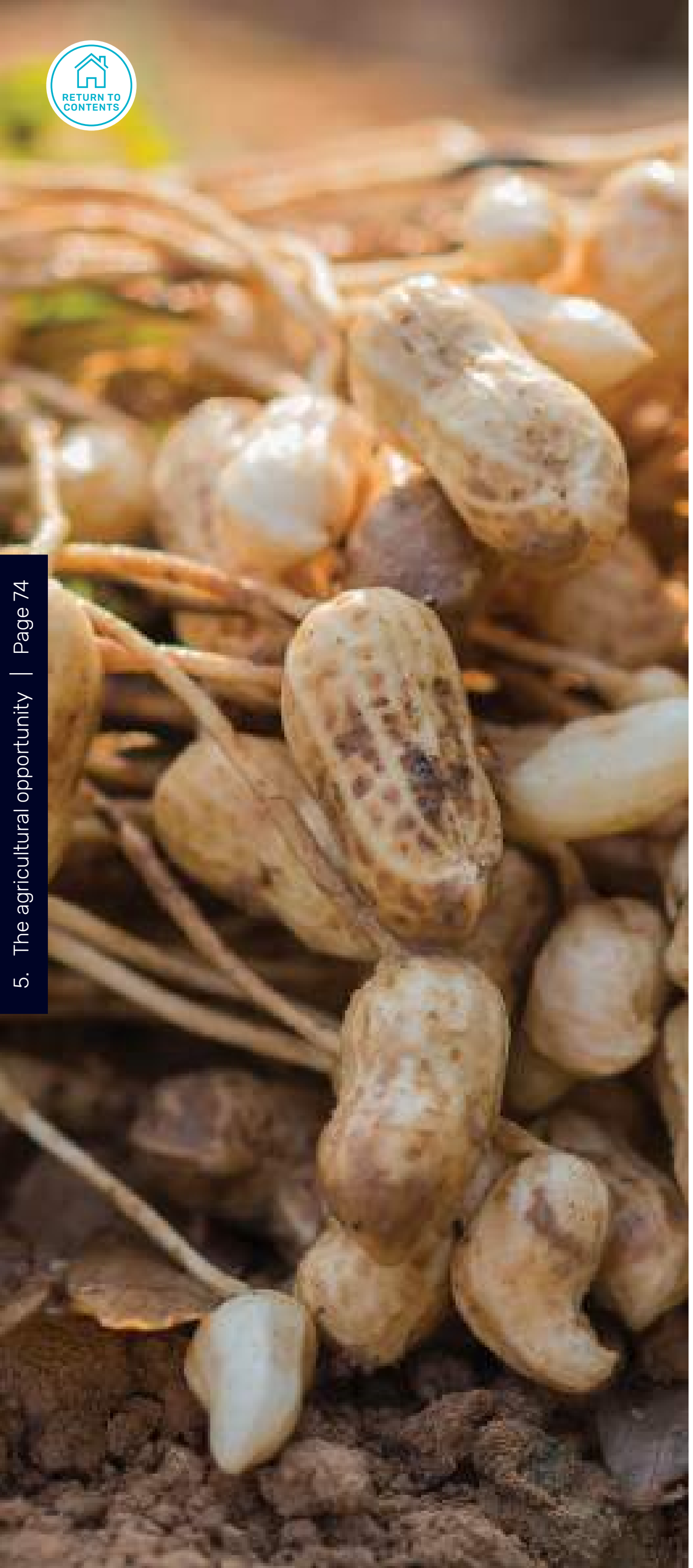
A comparison of the temperature conditions between the two regions is shown in Figure 5.17, demonstrating a relatively similar profile.

Figure 5.17: Comparison of average temperature conditions for soybeans between the Rookwood and Walkamin region.

Note: Based on monthly mean climate data for 1970 to 2019 for the Rookwood Weir Assessment Area and 1968 to 2020 for Walkamin.

Source: Verterra

Recent developments in domestic and export markets indicate there may be opportunities for considerable returns from increasing the area of soybean production in Queensland. However, while significant areas of land have been identified as potentially suitable for soybean production in the Rookwood Weir Assessment Area, achievable yields are likely to be lower than in other growing regions. This is primarily attributable to the low levels of summer rainfall in the region.



Peanuts

A summary of the peanut industry, the anticipated market outlook, and other key growing regions is provided in Appendix F.

Rookwood Weir Assessment Area suitability

Peanuts can be grown on a wide range of soils provided the top 15-20 centimetres (cm) is reasonably friable. As such, peanuts grow most productively on sands, sandy loams and light clay loams in regions with reliable rainfall or under intensive irrigation, and in rotation with a grass or cereal crop.

DAF identified over 17,900 hectares of land within the Rookwood Weir Assessment Area that is potentially suitable for peanut production, of which 6,651 hectares was identified as Class 1 or Class 2 agricultural land. Over 5,000 hectares of this land contains Dermosols and Ferrosols, friable, non-cracking clay or clay loam soils. The land identified as potentially suitable for peanut production within the Rookwood Weir Assessment Area is shown in Figure 5.18.

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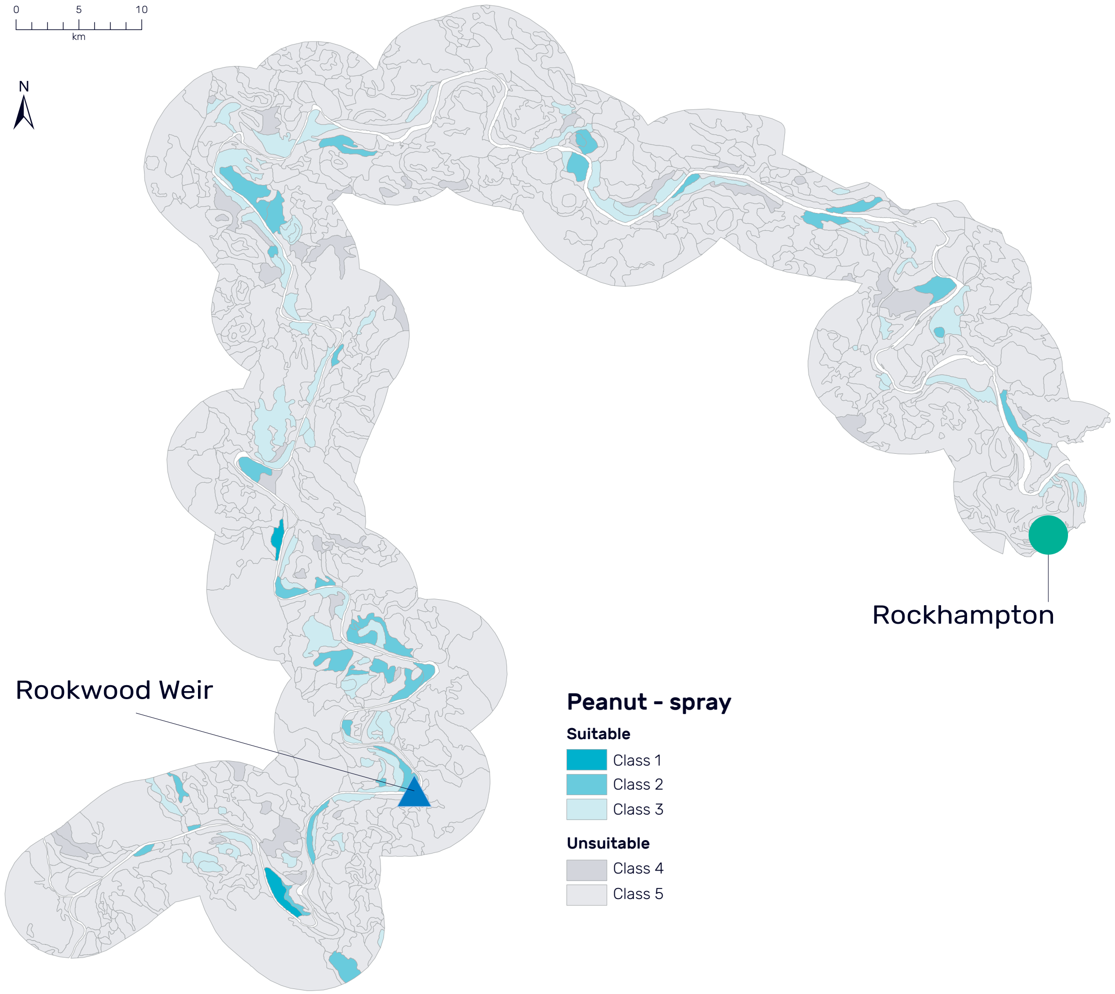
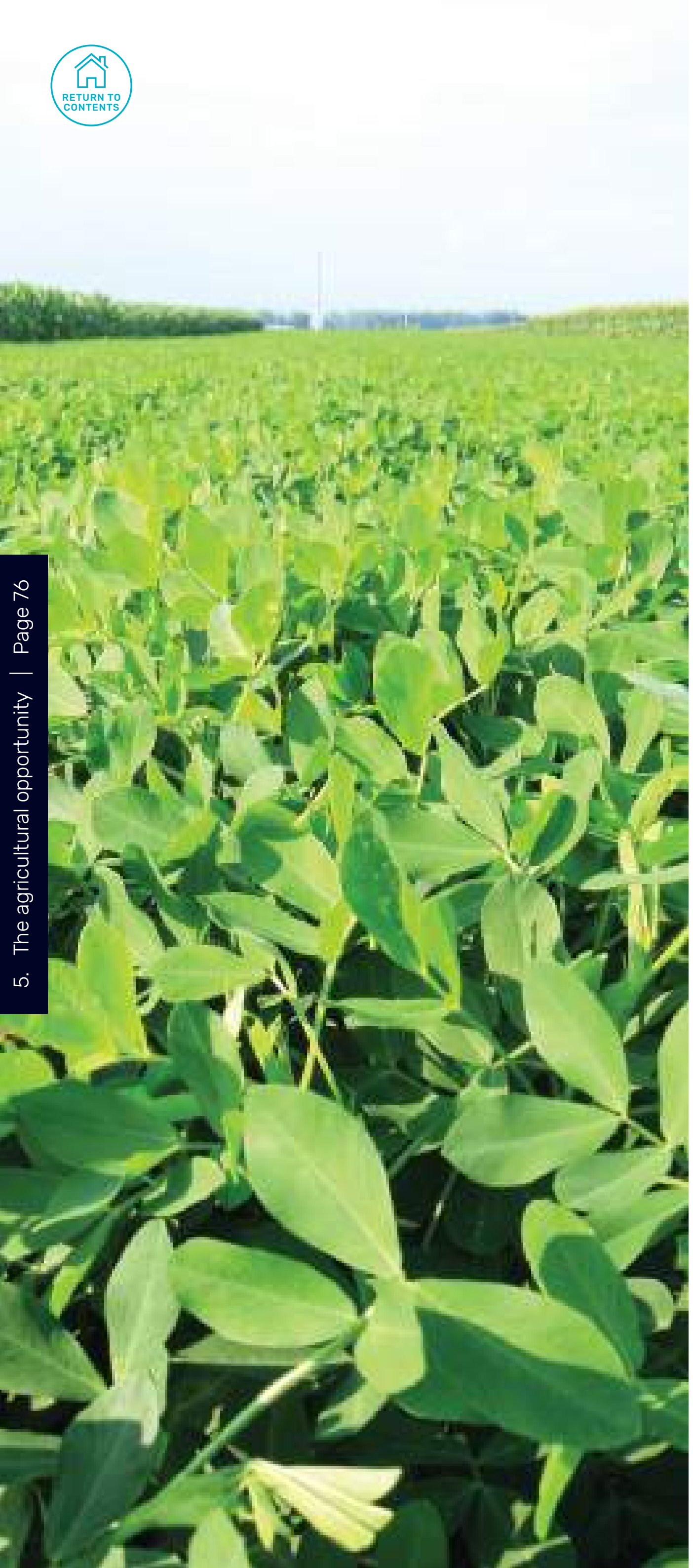
Figure 5.18: Land potentially suitable for peanut production within the Rookwood Weir Assessment Area



Source: DAF



While peanuts are a moderately drought-tolerant crop, readily available moisture throughout the season is necessary to produce high yields. The total annual water requirement for optimal yields is estimated at around 600 mm. Areas with high rainfall (i.e. over 900 mm) or consistently high humidity can encounter issues with leaf disease.

A comparison of rainfall, evaporation and rainfall deficit for peanuts between the Rookwood Weir Assessment Area and three other peanut growing regions – the Central Burnett, Bundaberg, and Walkamin is shown in Figure 5.19.

Figure 5.19 indicates a higher irrigation requirement for the Rookwood Weir Assessment Area relative to other peanut growing regions.

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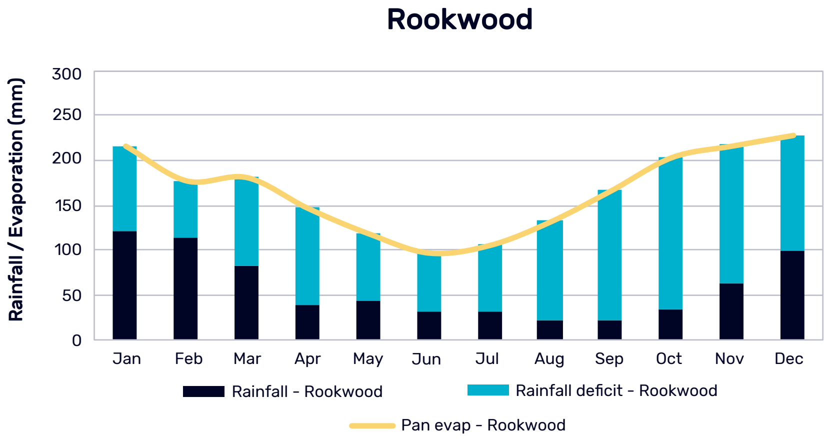
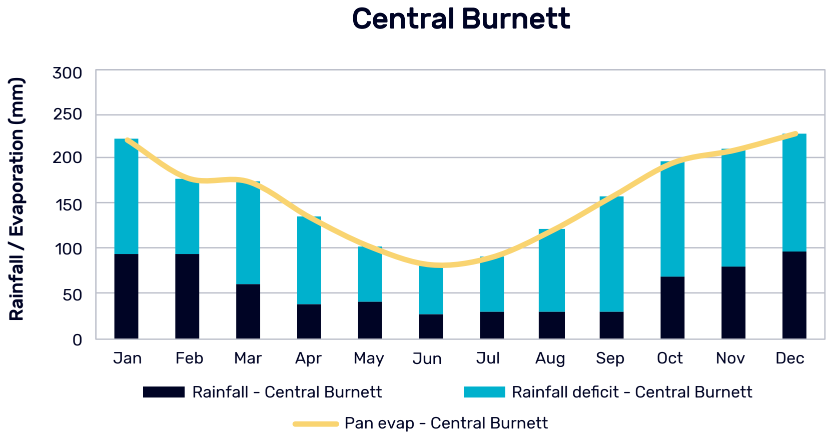
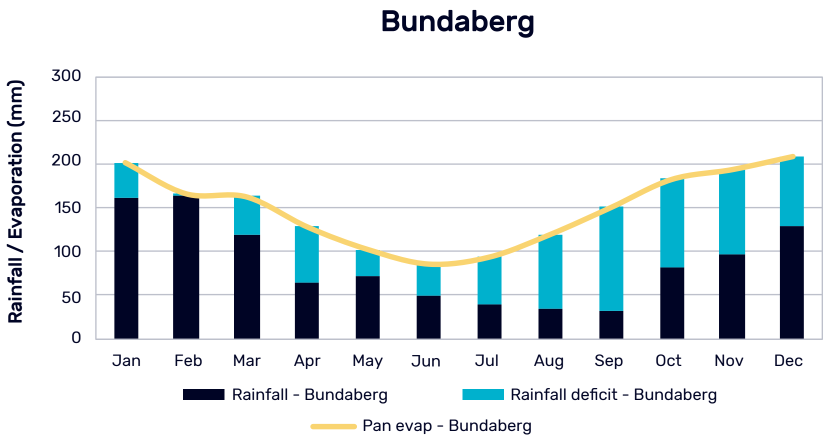
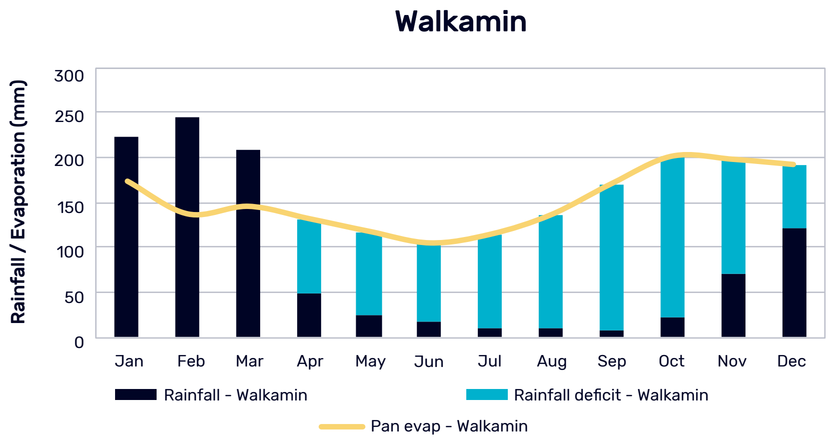
Figure 5.19: Comparison of rainfall, pan evaporation and rainfall deficit for peanuts between the Rookwood, Central Burnett, Bundaberg and Walkamin regions







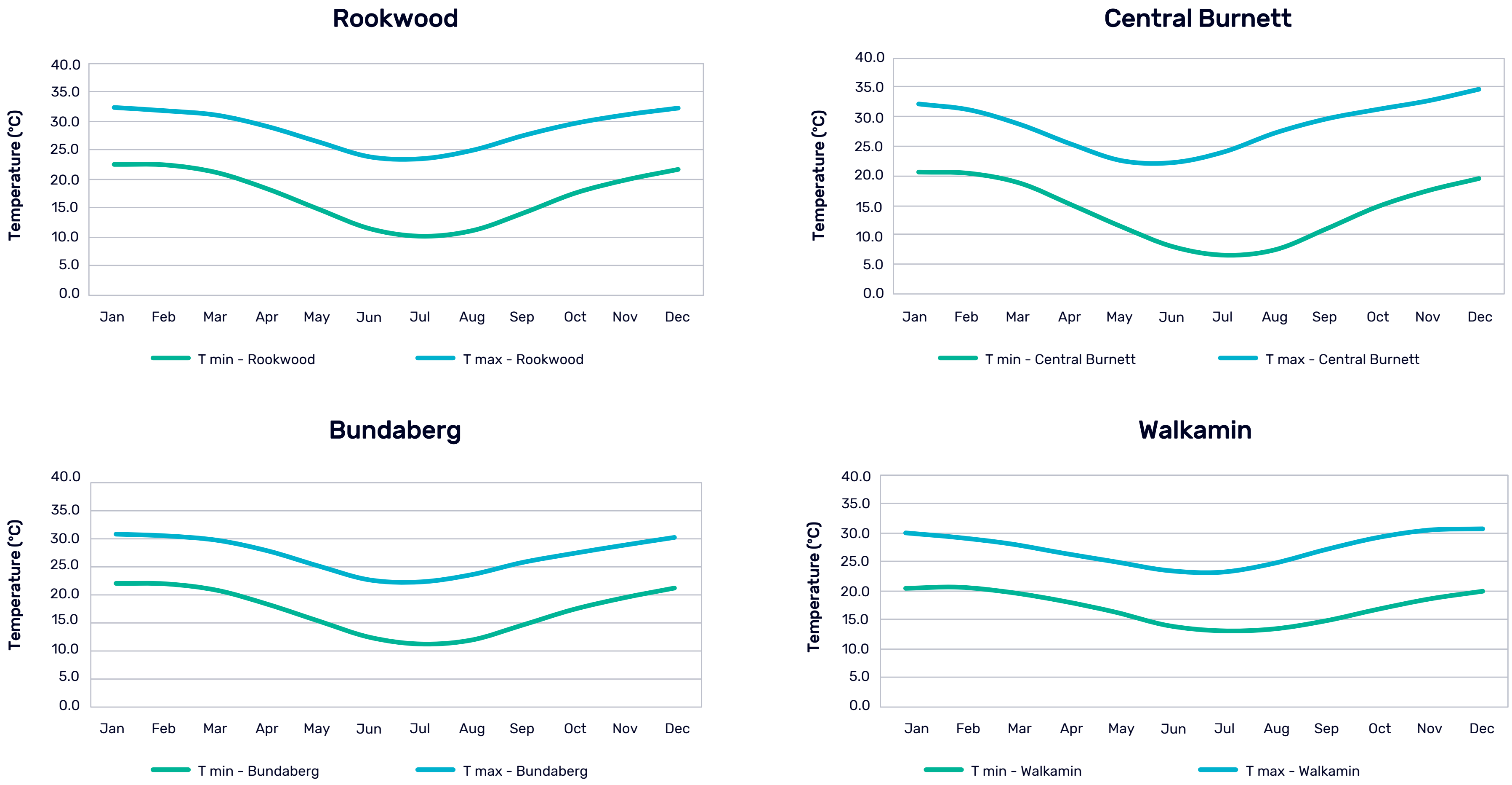


Note: Based on monthly mean climate data from 1970 to 2019 for the Rookwood Weir Assessment Area, and the Central Burnett and Bundaberg from 1968 to 2020 for Walkamin.

Source: Verterra

A comparison between temperature conditions across the growing regions is shown in Figure 5.20.

Figure 5.20: Comparison of average temperature conditions for peanuts between the Rookwood, Central Burnett, Bundaberg and Walkamin regions



Note: Based on monthly mean climate data from 1970 to 2019 for the Rookwood Weir Assessment Area, and the Central Burnett and Bundaberg from 1968 to 2020 for Walkamin.

Source: Verterra

Figure 5.20 demonstrates that the Rookwood Weir Assessment Area may enjoy an advantage over cooler growing regions (i.e. the Central Burnett and Bundaberg) in relation to crop yields and the length of the crop cycle, with higher temperatures more conducive to vegetative growth.

Well managed peanut crops can generate significant gross margin returns and, as a legume, provide soil health and economic benefits when grown in rotation with other crops. Soils and climate in the Rookwood Weir Assessment Area are well suited to peanut production, provided crops are planted to meet appropriate temperature windows. Yield is largely a function of management practices, though higher yields are achieved in northern regions, which include the Rookwood Weir Assessment Area, compared to southern regions.

Wheat

A summary of the wheat industry, the anticipated market outlook, and other key growing regions is provided in Appendix G.

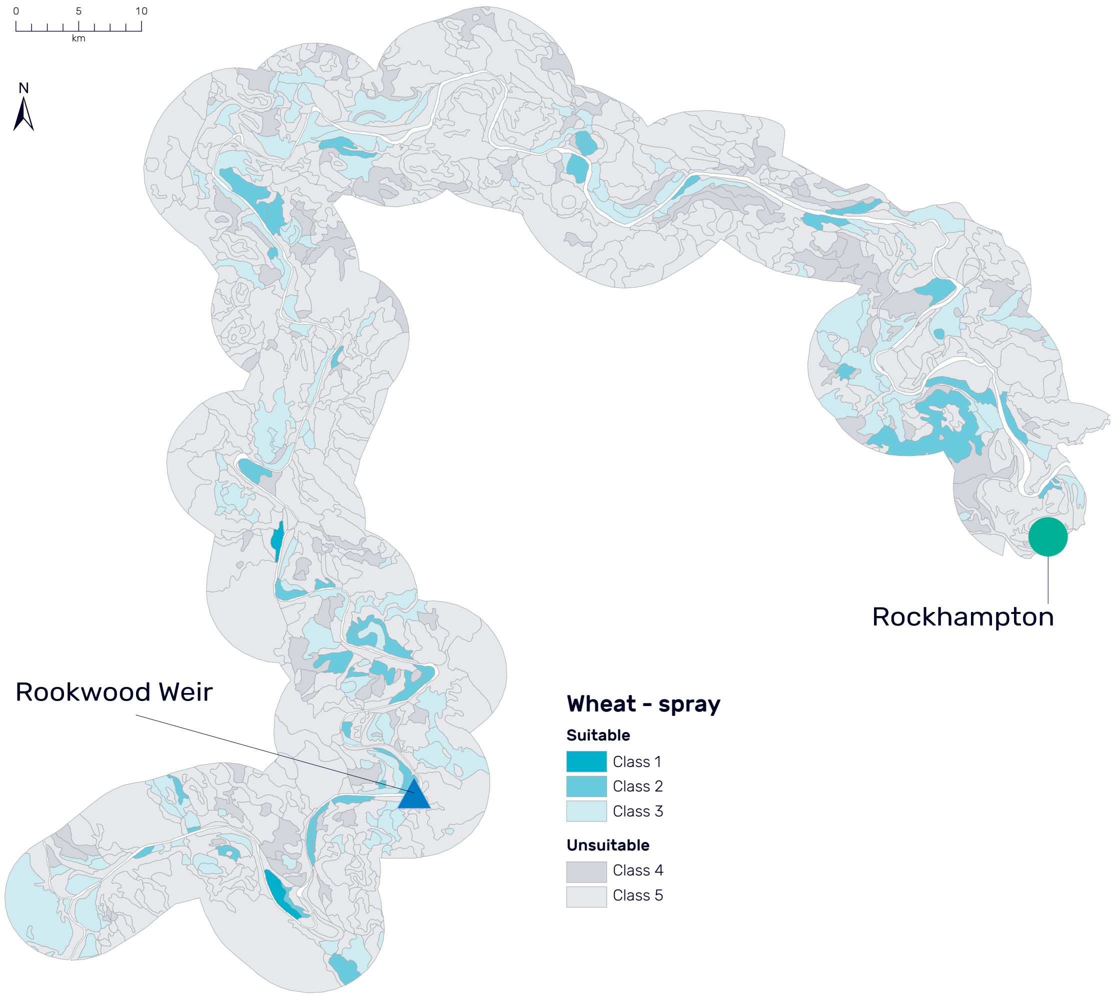
Rookwood Weir Assessment Area suitability

Wheat can be grown on a wide range of soil types with the highest yields achieved on well-drained soils. Crops sown early can develop roots down to a depth of two metres, meaning moisture and quality of the sub-soil can materially impact crop yields. While some wheat varieties can tolerate short periods of waterlogging, this can reduce productivity.

The DAF suitability assessment identified over 36,600 hectares of land within the Rookwood Weir Assessment Area that is potentially suitable for wheat production (with spray irrigation), of which 9,608 hectares was identified as Class 1 or Class 2 agricultural land. The main soil types include Dermosols and Ferrosols, friable non-cracking clay or clay loam soils, and Tenosols and Rudosols, deep sandy soils.

The land identified as potentially suitable for wheat production within the Rookwood Weir Assessment Area is shown in Figure 5.21.

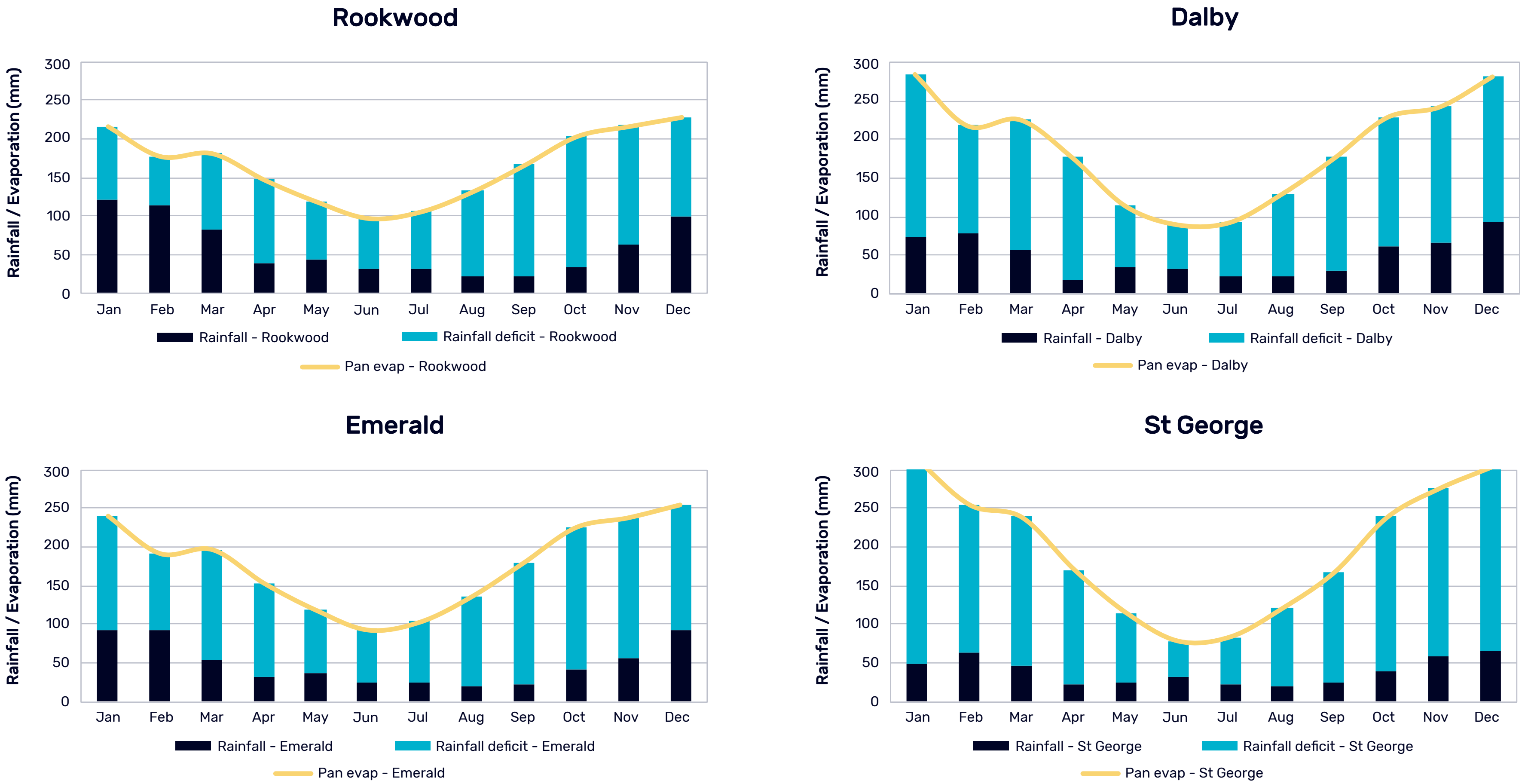
Figure 5.21: Land potentially suitable for wheat production within the Rookwood Weir Assessment Area



Source: DAF

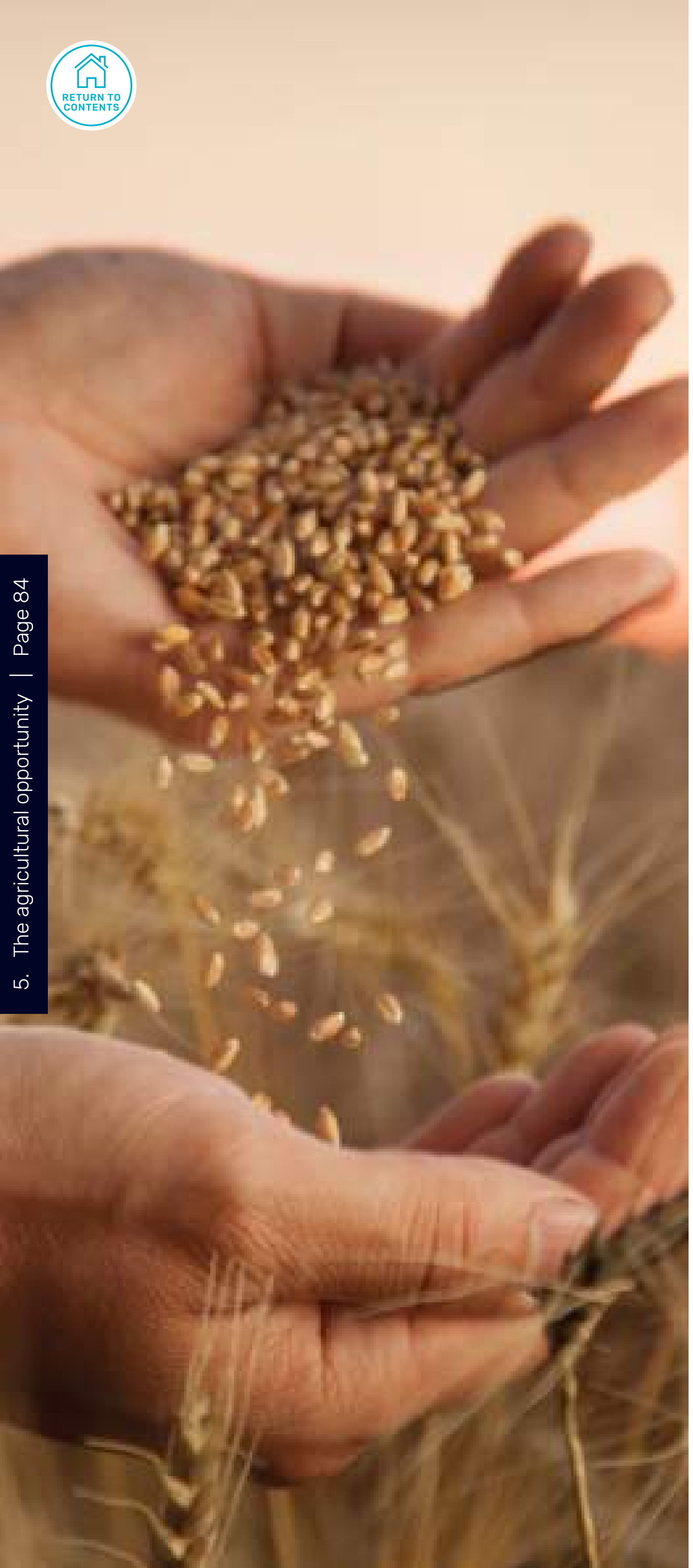
Figure 5.22 compares rainfall, evaporation and rainfall deficit for the Rookwood Weir Assessment Area to three other wheat growing regions in Southern and Central Queensland – Dalby, Emerald, and St George.

Figure 5.22: Comparison of rainfall, pan evaporation and rainfall deficit for wheat between the Rookwood, Dalby, Emerald and St George regions



Note: Based on monthly mean climate data from 1970 to 2019 for the Rookwood Weir Assessment Area and Emerald; 1992 to 2019 for Dalby; and 1997 to 2020 for St George.

Source: Verterra



The Rookwood Weir Assessment Area receives higher rainfall during the wheat sowing season (March to June) compared to the other growing areas with comparable rainfall during the harvest season (September to November). This may indicate an advantage for wheat production in the Rookwood Weir Assessment Area, potentially allowing larger cropping areas to be produced with irrigation supplementing rainfall to meet overall water requirements.[8]

In relation to temperature, wheat germination requires temperatures ideally between 12˚C and 25˚C; however, germination does still occur at temperatures ranging from 4˚C to 37˚C. Figure 5.23 provides a comparison between the maximum and minimum temperature conditions based on monthly mean climate data.

Figure 5.23 shows that the Rookwood Weir Assessment Area has lower maximum summer temperatures compared with Emerald and St George, and is relatively comparable to Dalby, with slightly warmer winter maximum temperatures. The average minimum temperature is also similar to Dalby in summer and warmer than all growing regions during the winter months.

The yields derived from wheat crops vary significantly, depending on specific soil profile of an area and the irrigation system. While average wheat yields are estimated at around 1.5 tonnes per hectare, crop yields of eight tonnes per hectare and above are achievable if produced on suitable, well-drained soils with appropriate irrigation systems.

The soils and climatic conditions in the Rookwood Weir Assessment Area are favourable to irrigated wheat production and compare favourably with major wheat growing areas in Queensland. However, given the lack of wheat exports from Queensland, growers are constrained to the domestic market, which limits the returns that can be derived from wheat.

[8]Grains Research and Development Corporation. (February 2013). Irrigated Wheat Fact Sheet.

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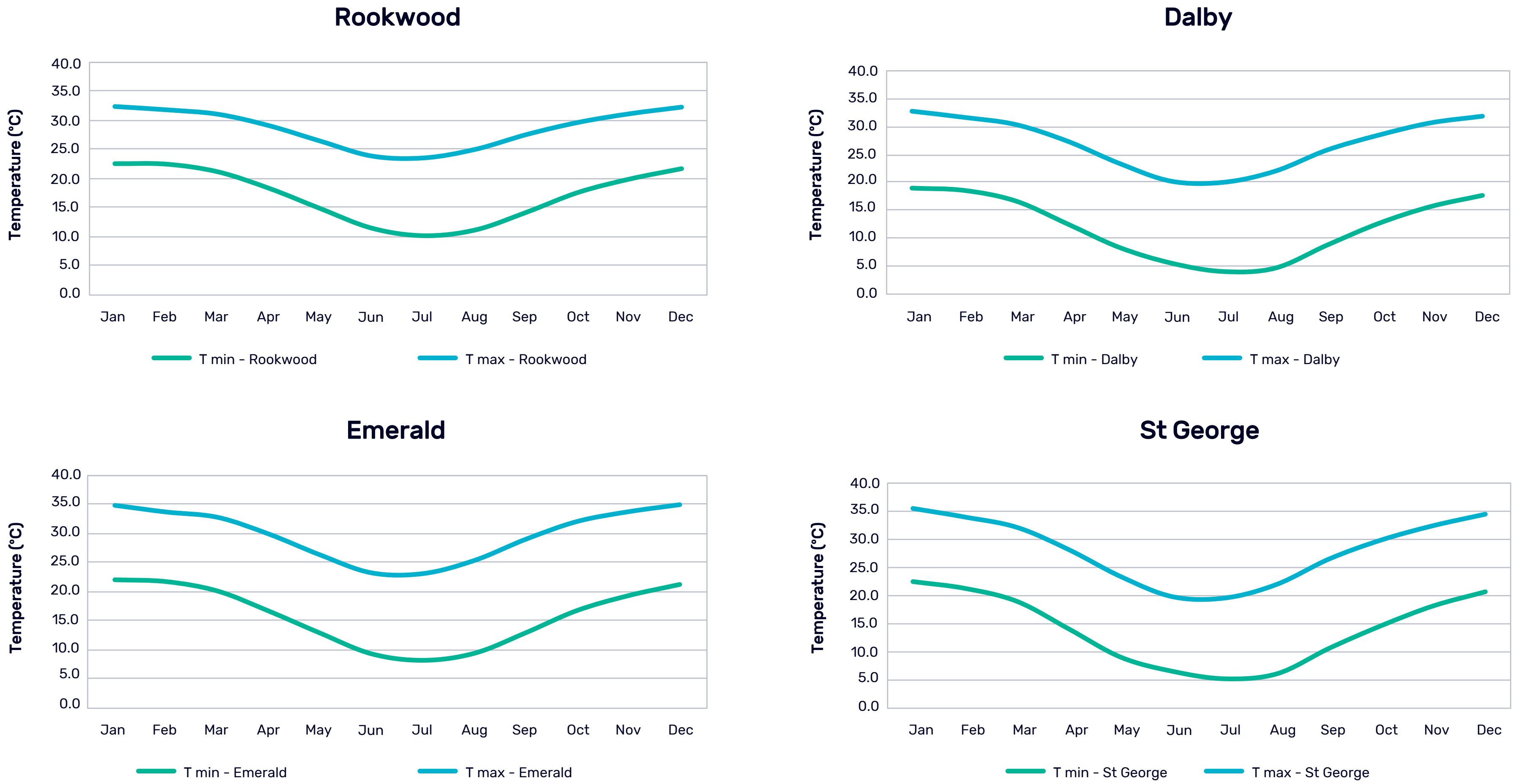
Figure 5.23: Comparison of average temperature conditions for wheat between the Rookwood, Dalby, Emerald and St George regions



Note: Based on monthly mean climate data from 1970 to 2019 for the Rookwood Weir Assessment Area and Emerald; 1992 to 2019 for Dalby; and 1997 to 2020 for St George.

Source: Verterra

6.0 Glossary

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Term	Definition
Annual supplemented water sharing index	Defined in the Fitzroy Basin Water Plan to mean "for water allocations to take supplemented water in a particular priority group, means the percentage of years in the simulation period in which the allocations are fully supplied".
ABARES	Australian Bureau of Agriculture and Resource Economics and Sciences
ATGA	Australian Table Grape Association
DAF	Department of Agriculture and Fisheries
DNRME	Department of Natural Resources, Mines and Energy
HIA	Horticulture Innovation Australia
HP	High priority
ITT	Invitation to Tender
LFRIP	Lower Fitzroy River Infrastructure Project
ML	megalitre
Monthly supplemented water sharing index	Defined in the Fitzroy Basin Water Plan to mean "for water allocations to take supplemented surface water in a particular priority group, means the percentage of months in the simulation period in which the allocations are fully supplied".
MP	Medium priority
NIS	Nut-in-shell

Term	Definition
ROL	Resource Operating Licence
Rookwood Weir Assessment Area	Land within five kilometres (kms) of either side of the Fitzroy River, for 250kms - from the junction of the Dawson River and the Mackenzie River, east of Duaringa, downstream to the Rockhampton City boundary.
RRC	Rockhampton Regional Council
Simulation period	Defined in the Fitzroy Basin Water Plan to mean "the period from 1 January 1900 to 31 December 2007".
WAP	Weighted average price
Water Act	*Water Act 2000* (Qld)
WMA	Water Management Area

Appendix A:

Fitzroy Basin water supply schemes trading information

The information in Appendix A is for information purposes only and should not be relied on in any way. Any person considering a potential purchase of water allocations from the Rookwood Weir should make their own enquiries and seek their own advice regarding any water trading activities undertaken in Queensland or Australia.

A summary of the weighted average price (WAP) of MP water allocation permanent trades within the Fitzroy Basin is outlined in Table A.1. Please note that this analysis includes permanent trades for $0/ML.

Table A.1: MP trades

Water Supply Scheme	Priority group	WAP ($/ML) FY18	WAP ($/ML) FY19	WAP ($/ML) FY20 YTD
Water Plan (Fitzroy Basin) 2011				
Dawson Valley	Medium	937	1,883	N/A
Fitzroy Barrage	Medium	2,000	1,207	1,325
Nogoa Mackenzie	Medium	1,842	1,328	2,290

Source: Department of Natural Resources, Mines and Energy

A summary of the WAP of HP water allocation trades within the Fitzroy Basin is outlined in Table A.2.

Table A.2: HP trades

Water Supply Scheme	Priority group	WAP ($/ML) FY18	WAP ($/ML) FY19	WAP ($/ML) FY20 YTD
Water Plan (Fitzroy Basin) 2011				
Dawson Valley	High	N/A	2,000	N/A
Lower Fitzroy	High	N/A	2,000	2,000
Nogoa Mackenzie	High	3,983	6,000	6,000

Source: Department of Natural Resources, Mines and Energy.

A summary of the WAP of other priority water allocation trades in different schemes is outlined in Table A.3.

Table A.3: Other priority trades

Water Supply Scheme	Priority group	WAP ($/ML) FY18	WAP ($/ML) FY19	WAP ($/ML) FY20 YTD
Water Plan (Fitzroy Basin) 2011				
Dawson Valley	Medium-A	1,200	904	N/A

Source: Department of Natural Resources, Mines and Energy.

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Appendix B:

Macadamia industry overview

Overview

Macadamias are a tree crop that are native to Australia. The nuts produced by macadamia trees can be marketed either as an in-shell product or in kernel form. There is also a growing market for the use of macadamia in oils, processed foods, and health and beauty products.

Australia is a major producer and exporter of macadamias, with production totalling 42,900 tonnes (over 30 per cent of global production) in 2018/19, with around 80 per cent supplied into export markets.[9]

There are currently two major macadamia growing areas in Australia – Bundaberg in Queensland and the Northern Rivers region in New South Wales. Queensland accounts for 54 per cent of Australia's total macadamia production. This has increased significantly in recent years, driven primarily by the expansion of macadamia farmers in the Bundaberg region.

Market outlook

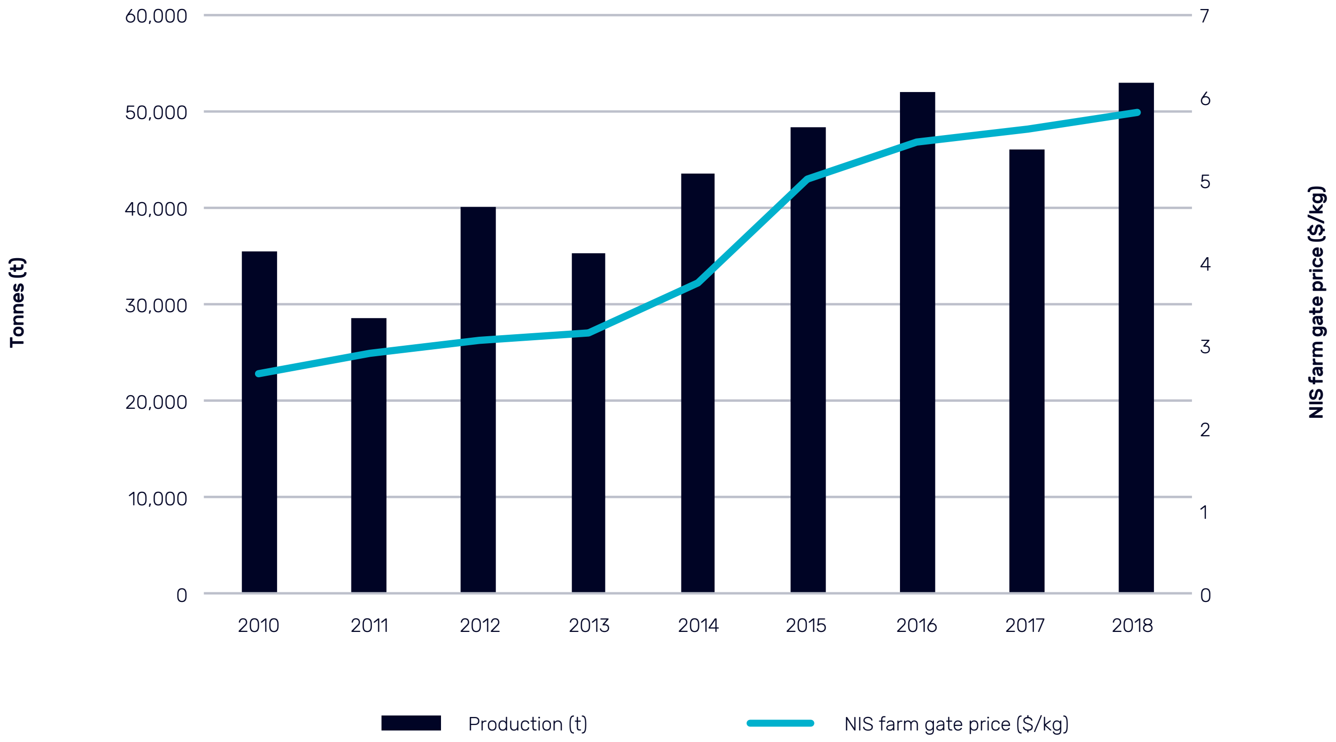
Australian macadamia production has increased significantly over the past decade. While initially driven by growth in domestic consumption and import substitution, more recently it has been the result of increasing demand in Asian export markets, with the total value increasing from $215 million in 2014/15 to $297 million in 2017/18.

China is Australia's largest market for macadamia products, accounting for 42 per cent of total exports and 40 per cent of global demand. China, Vietnam and Japan combined account for almost 70 per cent of total macadamia exports.[10] Despite significant expansions in the macadamia plantings by major producers, including in Australia, South Africa, and China, prices have continued to increase as global supply struggles to meet demand.

The strong growth in Australian macadamia production and farm gate prices from 2010 to 2018 is shown in Figure B.1.

[9] Hort Innovation. (2019). Australian Horticulture Statistics Handbook 2018/19 (Nuts).
[10] Hort Innovation. (2019). Australian Horticulture Statistics Handbook 2018/19. (Nuts).

Figure B.1: Growth in Australian macadamia production and NIS farm gate prices (2010-2018)



Source: Australian Macadamia Society.

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Future Market Insights project that this trend will continue, forecasting a compound annual growth rate of 7.5 per cent for the global macadamia market out to 2028.[11] A key driver of future growth is the increased use of macadamias in processed foods (e.g. ingredients in snacks, ice creams, etc.). These higher value uses are particularly relevant for Australia's largest export market and most significant growth opportunity – China.

Currently, almost all macadamia exports to China are supplied in-shell. While the significant reduction in horticulture tariffs agreed under the Australia-China Free Trade Agreement (FTA) provides an expansion opportunity into this market, there is also scope to pursue growth opportunities in high-value market segments, including kernels, processed foods, oils, and health and beauty products. Expanding into these markets will increase both the total tonnage and per unit value of Australia's macadamia exports to China, meaning increased returns to growers.

In addition to China, there are also significant opportunities for growth in other export markets, particularly throughout Asia. The macadamia industry is investing heavily in market development campaigns in several Asian countries, including Taiwan and South Korea.

Other macadamia growing regions

There are two major macadamia growing regions in Australia – Bundaberg in Queensland and the Northern Rivers region in New South Wales.

The recent growth in demand, particularly from China and other Asian export markets, has resulted in a significant expansion in macadamia plantings, particularly in the Bundaberg region, where growers have transitioned land from sugarcane. As such, there has been a five-fold increase in macadamia production over the past 20 years, a trend accentuated by the declining profitability of sugarcane.

Soil conditions for macadamia production are described in the *Department of Agriculture Macadamia grower's handbook*[12] as requiring a minimum of 0.5 metres of free-drained soil without impermeable clay or rock layers, with one metre preferred. Data obtained from Horticulture Innovation Australia's (HIA) mapping project[13] indicate that of the 5,400 hectares of macadamia production in Bundaberg, predominant soil types include Dermosols, Ferrosols

[11] Global Finance Review. (2019). In terms of value, the Global Macadamia Market is anticipated to expand at a CAGR of 7.5% during 2018-2028.

[12] Queensland Department of Employment, Economic Development and Innovation. (2004). *Department of Agriculture Macadamia grower's handbook.*

[13] University of New England. (2020). National Tree Project.

and Kandosols. Production exists to a smaller extent on Hydrosols, Sodosols, Kurosols and Chromosols.

A recent assessment conducted for the Paradise Dam Improvement project estimated that the conversion of land from sugarcane to macadamia production in the Bundaberg region would continue at a rate of 337 hectares per annum.[14] Recent site investigations have revealed that some new plantations in the Bundaberg region are now moving on to sandy soils that have been transitioned from sugarcane production.

The Northern Rivers region is constrained in its scope to expand macadamia production. The region is comprised of a large number of much smaller scale growers than the Bundaberg region, with a typical macadamia orchard in the Northern Rivers containing 3,000 trees compared to 50,000 trees in Bundaberg. Some growers have responded to the land constraints by expanding into other nearby regions such as the Clarence Valley and the coastal floodplain near Ballina.[15] Typical soil conditions in the Northern Rivers region include red basaltic (Krasnozem) soil and shallow podzolic soils. Krasnozems are the soils that macadamia occur on naturally and are the traditional soil type used in macadamia production in this region.

While macadamia plantings and production have continued to grow strongly in recent years, additional supply is still required to meet growing global demand. This is evidenced by farmers seeking new growing regions in which to establish macadamia orchards and the increasing market price of established orchards, with sale prices reaching $100,000 per hectare during 2019 (up from $85,000 per hectare in 2018).[16]

In recent years, Emerald has also emerged as a macadamia producing region. Development of a 600-hectare macadamia orchard is currently underway in the region, with irrigation water requirements to be met by the Nogoa Mackenzie WSS. The emergence of Emerald as a macadamia growing region is significant given its proximity and climatic similarities to the Rookwood Weir Assessment Area.

[14]NCEconomics. (2020). *Paradise Dam Improvement Project: service needs, demand estimates and options assessment.*
[15]Australian Macadamia Society. (2020). About the Macadamia Industry.
[16]Australian Financial Review. (2019). Macadamia farms in demand as consumers go nuts.

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Appendix C:

Citrus (mandarins) industry overview

Overview

Citrus is one of Australia's primary horticulture exports, with oranges and mandarins the key commodities. Mandarin is the dominant citrus crop grown in Queensland, accounting for 54 per cent of Australia's total production. The 2018 citrus tree census reported that 3,533 hectares of mandarins planted in Australia were in Queensland.[17] The main varieties of mandarins grown in Australia are Imperial (24 per cent), Murcott (29 per cent), and Afourer (23 per cent).[18]

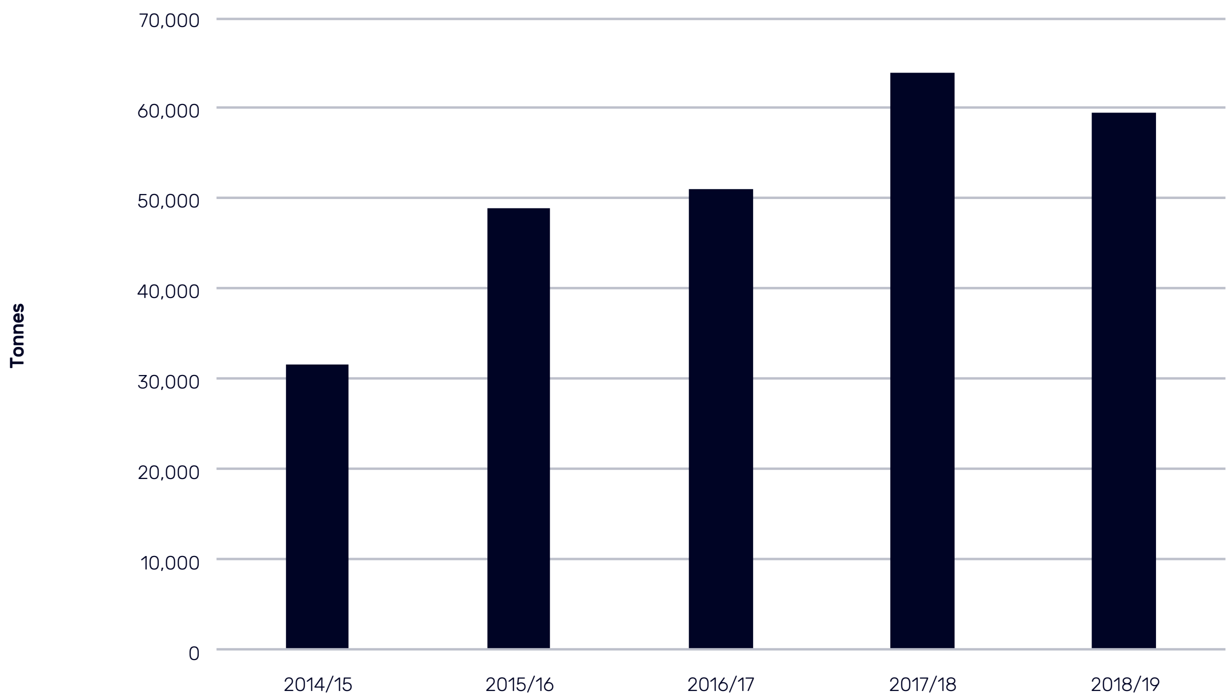
While Queensland's most established mandarin growing regions are located in the Central Burnett region (Gayndah and Mundubbera), mandarin plantings in Emerald and Bundaberg have increased significantly in recent years. This has been driven by farmers in these regions transitioning from lower value land uses, such as sugarcane and cereal crop production and established citrus farmers expanding into other growing regions. There has also been strong growth in lemon and lime plantings in both Emerald and Mareeba. While over 60 per cent of mandarin production is supplied to domestic markets, export tonnages are the primary driver of industry growth.

Market outlook

Consistent with overall trends in the Australian citrus industry, the past five years have seen unprecedented growth in mandarin exports, as shown Figure C.1.

[17]Citrus Australia. (2020). Growers & Industry – Queensland.
[18]Hort Innovation. (2019). *Australian Horticulture Statistics Handbook 2018/19.*

Figure C.1: Australian mandarin export tonnages (2014/15 to 2018/19)



Source: *2018/19 Australian Horticulture Statistics Handbook (Hort Innovation, 2020).*

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While Australian mandarins are exported to a large number of countries, China and Thailand have emerged as the key drivers of recent growth, accounting for 27 per cent and 12 per cent of 2018/19 mandarin exports respectively. The growth in these markets, particularly Thailand, has been achieved as a result of initiatives led by the Queensland Citrus Exporters' Group.[19] Other key markets include Hong Kong, United Arab Emirates, and the United States.

Returns from the export of mandarins has also exhibited strong growth. Since 2017, the growth in total value of mandarin exports has more than doubled the growth in tonnages (approximately 40 per cent compared to 16 per cent). Pricing data indicates farmers have been able to secure a price premium of 60 per cent on domestic prices from supplying into export markets.[20] This trend can be attributed to strong growth in mandarin demand in China and other Asian markets and the price premium afforded to Australian citrus products in these markets, relative to other citrus exporting countries, such as South Africa.

The strong growth in export tonnages and returns is critical to the citrus industry in Queensland, accounting for around 62 per cent of Australia's total mandarin exports. The profitability of these growing export markets has alleviated the impact of competitive pressure in the domestic market, as increased mandarin production in the southern states, particularly Imperial mandarins, has reduced returns supplying the domestic market.[21]

Queensland mandarin growers are responding to this environment by seeking to innovate and expand production of export-friendly varieties. The areas where Murcott mandarins are being planted in Queensland has increased significantly in recent years, as the skin texture and taste profile of the early-maturing variety means it is popular with Chinese consumers. BGP International, a Melbourne-based produce company, estimates that currently, Chinese demand for Murcott mandarins (particularly Royal Honey Murcott) is two to three times the available supply.[22]

Producers are also seeking to innovate by targeting emerging export markets. For example, Shepherd Citrus, a major mandarin producer in Gayndah, have allocated significant areas of land to new plantings of the seedless Tango mandarin to meet growing demand for seedless mandarins in Asian markets, particularly Japan.

[19] Citrus Australia. (2019). Australian citrus exports pass $500m mark.
[20] Rural Bank (2018). *Australian Horticulture Annual Review 2018*.
[21] Australian Horticultural Exporters' and Importers' Association. (2018). Mandarin growers switching their focus to more export-based production.
[22] The Produce Report. (2018). Early Murcott Mandarin Variety Key to BGP's Good Start in China.

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In addition to the potential growth in established and emerging export markets (i.e. China, Thailand and Japan), Citrus Australis has also identified countries in the sub-continent (i.e. India, Sri Lanka, Bangladesh and Pakistan) as significant potential opportunities for citrus growers. Indonesia also represents a significant growth opportunity, with tariffs having been cut from 25 per cent to 10 per cent, which will eventually be reduced to zero under the recent Australia-Indonesia Free Trade Agreement.

Current mandarin growing regions

The Central Burnett region, particularly the Gayndah and Mundubbera districts, has traditionally been the primary citrus growing area in Queensland. The subtropical climate in this region means that mandarins mature early and usually have good sugar and low acid levels. Peel colour is generally good, particularly for late varieties that mature during the colder winter months.[23]

In recent years, there has been strong growth in mandarin production in Emerald. This has resulted in the Central Burnett and Emerald regions accounting for over 50 per cent of Australia's total mandarin production.[24] The transition of land from low value broadacre crop production to mandarin production in Emerald, supported by the Nogoa Mackenzie WSS, has resulted in the development of a sophisticated export supply chain, linking citrus growers in Central Queensland to key export infrastructure.

[23]NSW Department of Primary Industries. (2017). *Australian mandarin production manual.*
[24]Citrus Australia. (2020). Growers & Industry - Queensland.

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Appendix D:

Table grape industry overview

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Overview

Australian table grape production totalled over 208,000 tonnes in 2018/19, with an estimated value of $693 million. There are around 1,000 table grape growers in Australia, with the major growing regions located in Victoria – Sunraysia and the Murray Valley. Victoria accounts for over 70 per cent of total table grape production and over 90 per cent of exports.[25] Approximately 65 per cent of Australia's total table grape production is supplied to export markets, predominantly in Asia.[26]

Queensland accounts for around five per cent of total production (around 10,400 tonnes), the majority of which is supplied to the domestic market. Queensland's table grape growing regions are located in Emerald, St George and Mundubbera.[27]

Approximately 85 per cent of Australia's table grape production is accounted for by three varieties – Crimson Seedless, Thomson Seedless, and Red Globe.

Market outlook

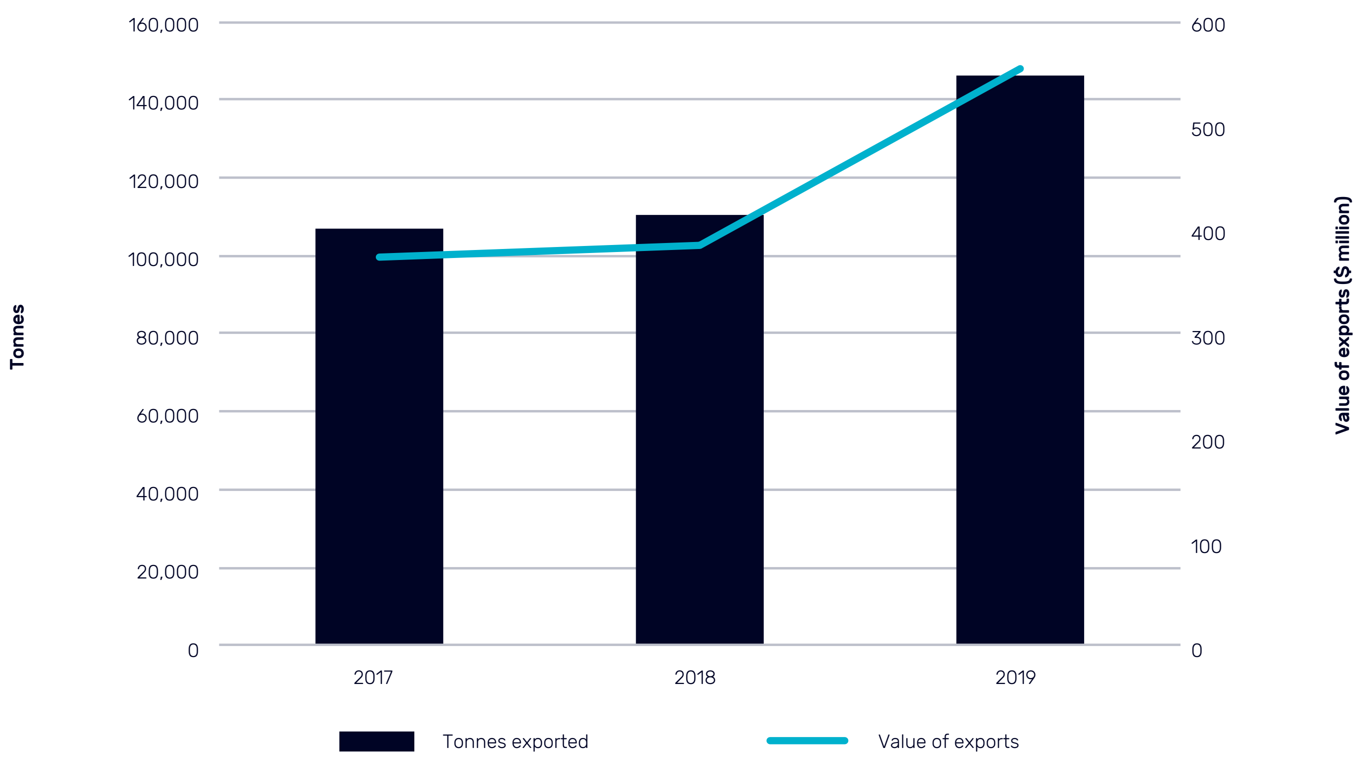
The Australian table grape industry is currently undergoing a period of strong growth in production and market prices. Annual table grape production has grown from 171,637 tonnes in 2017 to 208,276 tonnes in 2019, representing growth of over 21 per cent. The ATGA previously reported 20 per cent year-on-year growth in plantings over the five-year period to the start of 2018 and stated that it anticipated this growth trend would continue.[28] Hort Innovation projects a total table grape production for the 2020 season of 224,000 tonnes, which would represent a 7.5 per cent increase from 2019.[29]

This growth is expected to be through increases in the production of the Crimson Seedless variety, with ATGA projecting production of the variety to increase from around 70,000 tonnes in 2018 to 119,000 tonnes in 2028. Material growth is also projected for the Thomson Seedless variety, while production quantities of the Red Globe variety are expected to remain relatively stable.[30]

[25]Hort Innovation (2020). *Australian Horticulture Statistics Handbook 2018/19.*
[26]Australian Table Grape Association Inc. (2020). Information.
[27]Hort Innovation. (2020). *Australian Horticulture Statistics Handbook 2018/19.*
[28]Australian Table Grape Association (2018). Table Grapes – International Trade Seminars.
[29]Hort Innovation. (2019). Australian Table Grapes – Taste Australia Trade Seminar.
[30]Australian Table Grape Association. (2018).

The growth in the quantity and value of Australian table grape exports from 2017 to 2019 is shown in Figure D.1.

Figure D.1: Recent growth in table grape export tonnages and value (2017 to 2019)



Source: *2018/19 Australian Horticulture Statistics Handbook.* (Hort Innovation, 2020).

Table grape exports have increased by 39,427 tonnes from 2017 to 2019. This compares to growth in total industry production of 36,639 tonnes over the same period, attributable to increased supply to export markets.

This recent export growth was preceded by a period of over-supply in the domestic market due to the development of new growing areas such as Emerald in Queensland. Declining returns to farmers during this period prompted the industry to pursue opportunities in export markets. This has led to the establishment of new markets and the development of sophisticated export supply chains between the major growing regions in Victoria and Asian markets, including China, Indonesia and Japan. These markets account for 39 per cent, 16 per cent and nine per cent of Australian table grape exports respectively.[31]

Australia's reputation as a supplier of consistently high quality, fresh, sweet table grapes means the industry is well-placed to take advantage of further growth opportunities in key export markets. Australian farmers also benefit from shorter shipping times to Asian markets relative to competing exporting countries, such as the United States.

Declining tariffs on horticulture products (agreed under free trade agreements) with major trade partners in Asia, including China and Japan, account for almost 50 per cent of total table grape exports. They also provide an opportunity for Australian table grape farmers to increase their presence in these export markets.

As noted above, the export market is currently dominated by Victorian growing regions, which are benefiting from a well-established supply chain to Asia.

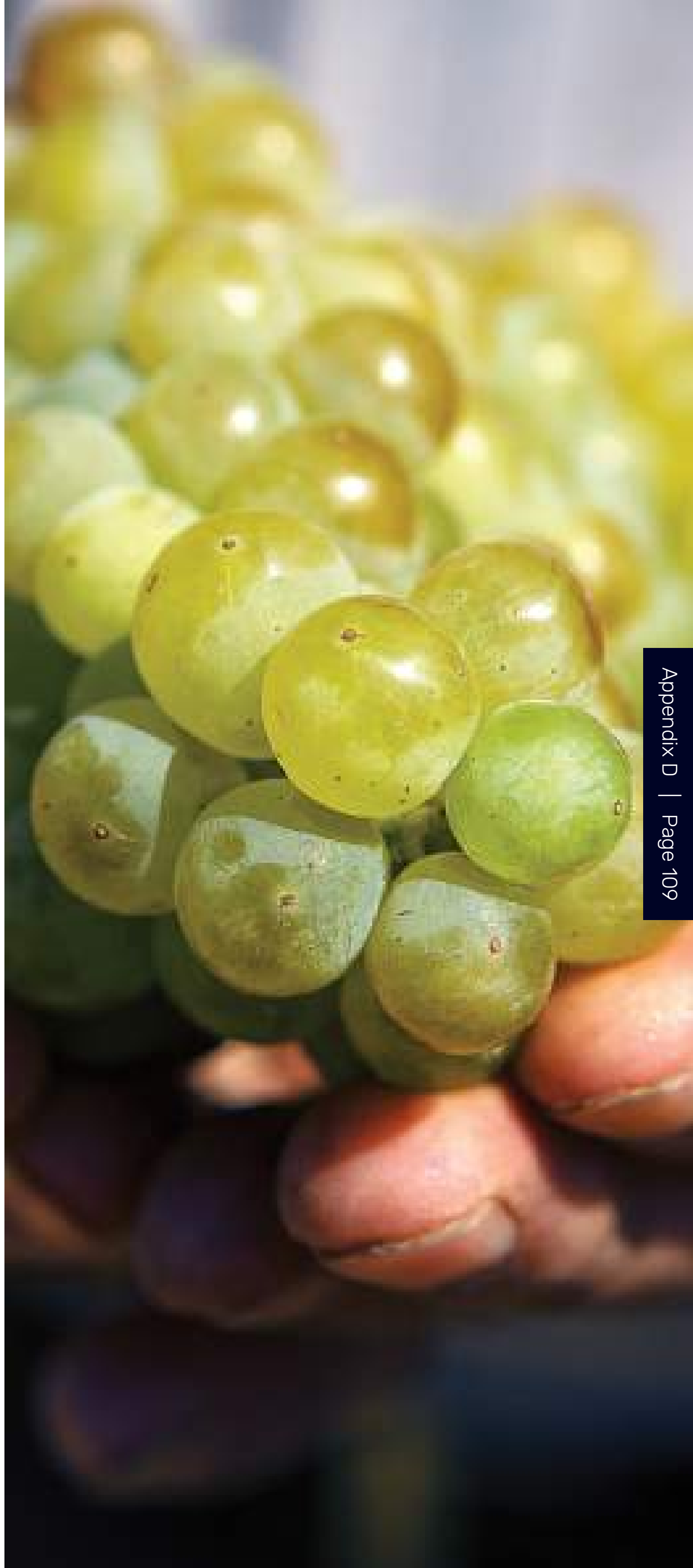
Queensland table grapes are ready earlier due to warmer temperatures in central and southern regions, allowing these farmers to target the domestic market ahead of other states. To date, Queensland farmers have supplied small tonnages to export markets. In 2018/19, only 213 tonnes of table grapes were exported, around two per cent of total Queensland production.[32]

However, competition from imported table grapes and the strong prices on offer in growing Asian markets has increased Queensland's interest in establishing export supply chains. An opportunity has been identified for Queensland farmers to take advantage of the high demand for table grapes in China leading up to Chinese New Year.[33]

[31]Hort Innovation. (2020). *Australian Horticulture Statistics Handbook 2018/19.*

[32]Hort Innovation. (2020). *Australian Horticulture Statistics Handbook 2018/19.*

[33]Horticulture Innovation Australia. (2016). An Insight to the Chinese Table Grape Industry - part 3 (TG14700).



Other table grape growing regions

The other key table grape growing regions targeting the early season domestic market are Emerald, Mundubbera and St George in Queensland, and Ti Tree in the Northern Territory.

Production of table grapes in Emerald has exhibited strong growth in recent years as producers seek to transition from lower value broadacre cropping to perennial crop production and capitalise on the price premiums on offer in the early season market. This expansion has been underpinned by the supply of reliable irrigation water from the Nogoa Mackenzie WSS. It is estimated that around 1,300 hectares of table grapes are now grown in the region,[34] which accounts for around 70 per cent of Queensland's production. Despite significant tonnages of citrus being exported to Asian markets from the region, exports account for a small proportion of the region's table grape production.[35]

In St George, the supplemented water allocations on which table grape producers rely are fully allocated. Strong demand for supplemented allocations from cotton and horticulture producers has pushed the price of permanent water allocations up to nearly $4,000 per ML in 2018/19. Expansion of table grape production in the Ti Tree region is constrained by access to reliable irrigation water, with industry stakeholders expressing concerns that the recently declared water plan does not allocate sufficient water resources.[36]

[34] Central Highlands Development Corporation (2018). Agribusiness Capability Statement 2019.
[35] Queensland Government Department of Agriculture and Fisheries. (2020). Queensland AgTrends 2019.
[36] Brann, M. (2019). Is there enough water for agricultural expansion at Ti Tree or not? NT Farmers 'drowning in bureaucracy.

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Appendix E:

Soybean industry overview

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Overview

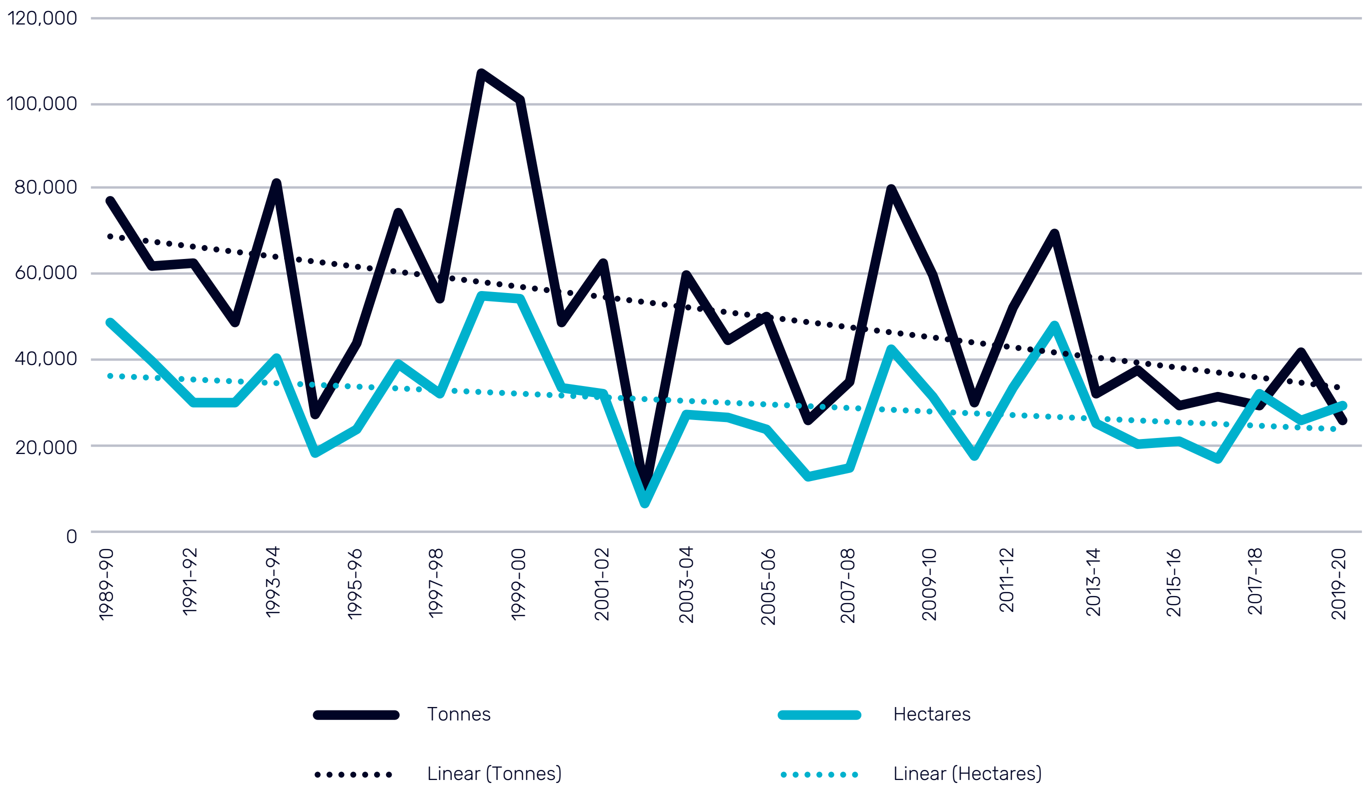
Soybeans are a legume crop that is produced in the summer under both dryland and irrigation farming systems, often in rotation with cereal crops or sugarcane. Soybeans are typically processed, or 'crushed', for their oil (for human consumption) and meal (used by the animal feed industry). Recent expanded uses of Australian-grown soybeans include culinary products, such as soymilk, soy flour, soy sauce, tofu and noodles.

While Australian soybeans are typically supplied for domestic use, recent growth in demand for soybean products in Asian markets, particularly premium-priced non-genetically modified (GM) products, represents a significant opportunity for Australian farmers.

Market outlook

The decline in soybean production across Australia over the last 30 years, with total production projected to decrease to around 26,000 tonnes in 2019/20, is shown in Figure E.1. The figure also demonstrates the volatility in terms of the area and tonnages of soybean production over this period. This variability is the result of opportunistic behaviour by broadacre crop producers seeking to capitalise on periods of high returns and recent drought conditions in major soybean growing areas.

Figure E.1: Soybean production in Australia from 1989/90 to 2019/20



Source: Australian Bureau of Agriculture and Resource Economics and Sciences (ABARES) (2020). Agricultural Commodities and Trade Data – Australian Crop Report Data - State Crop Data Underpinning: Australian Crop Report: February 2020.

This decline in production has resulted in Australia becoming a net importer of soybeans, with significant quantities of soymeal imported for use in intensive livestock production. In 2019, the Australian Department of Agriculture issued eight permits for soybean imports, compared to three in 2018 and 2017. Shortages in the domestic soybean market and strong demand from oilseed and soybean processors have also led to an increase in prices from $500 per tonne to around $1,500 per tonne.[37] Given recent production trends, this is expected to remain the case for the foreseeable future.[38]

In addition to the increased returns on offer in the domestic market, there is also growing demand for Australian soybeans in Asian markets. As noted above, the non-GM status of Australian soybeans enables farmers to obtain a premium price for their products, particularly in Japan, Hong Kong and Thailand. Australia's proximity to these markets and ability to produce soybeans counter-seasonally to producers in the northern hemisphere also represent competitive advantages for Australian farmers.

A recent assessment of the soybean exports revealed significant opportunities in niche segments of Asian markets. The analysis estimated export demand for Australian soybeans at $8.8 million per annum (approximately 25,000 tonnes), with around $6.5 million[39] of unmet demand across the 10 leading export markets, including South Korea, Singapore and Malaysia.[40]

Other soybean growing regions

The primary soybean growing regions are located on the Atherton Tablelands in North Queensland and the inland cropping areas of Southern New South Wales and Victoria.[41] Figure E.2 presents time-series data on soybean production for two major regions, including a breakdown of production between Queensland and New South Wales from 2014/15 to 2019/20. Figure E.2 also shows significant variability for both regions with soybean production in New South Wales exceeding Queensland from 2014 to 2020.

[37] Jasper, C. (2019). Drought Slashes Soybean Production Prompting Fierce Competition for the Small Crop, Warnings of Price Hikes.
[38] AgriFutures (2017). Soybeans.
[39] This was noted to be an under-representation of the true value, since it did not account for the non-GM status of Australian soybeans.
[40] KPMG led-Consortium. (2019). *North Queensland Market and Agricultural Supply Chain Study - Final Report, May 2019.*
[41] AgriFutures. (2017). Soybeans.

Figure E.2: Soybean production volumes in New South Wales and Queensland (2014/15 to 2019/20)

Source: ABARES (2020). Agricultural Commodities and Trade Data – Australian Crop Report Data - State Crop Data Underpinning: Australian Crop Report: February 2020. Department of Agriculture, Water and the Environment, Australian Government, Canberra.

The lack of soybean handling and storage infrastructure, variable returns and lack of sufficient irrigation water throughout Central and Northern Queensland represents a constraint on production.

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Appendix F:

Peanut industry overview

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Overview

Peanuts are an annual legume crop that take four to six months to grow. The peanut is robust, grows in a wide range of tropical and sub-tropical environments and can be produced under both dryland and irrigated cropping systems. Peanuts can also be grown on rotation with several broadacre crops, including cotton, sugarcane and cereal crops.

Australia produces around 40,000 tonnes of peanuts per annum, with around 90 per cent of production coming from Queensland. The Burnett region is the largest, with smaller growing areas located in the Atherton Tablelands and in Southern and Central Queensland.

Peanuts are marketed through a wide range of products, including raw NIS, in kernel form, oil, for stock feed, and as a key input to manufactured foods (e.g. peanut butter and confectionery). Queensland peanut farmers typically target the domestic market, with only a small proportion of total production sold into export markets.

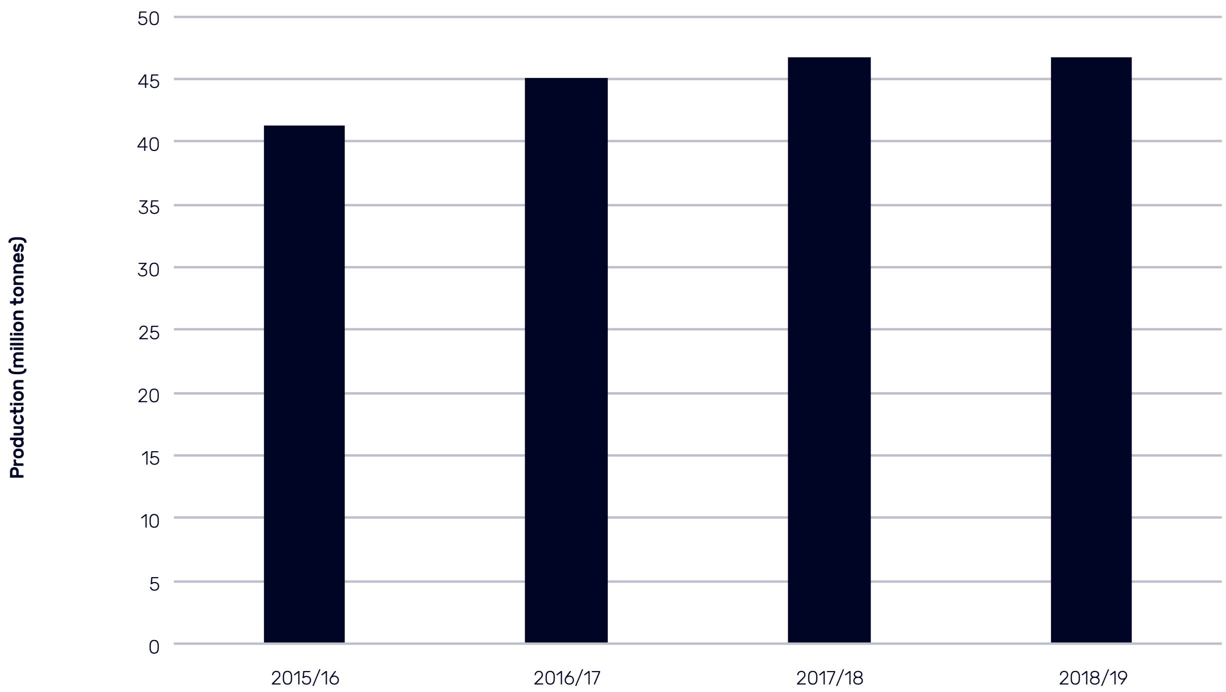
Market outlook

The domestic market for peanuts is estimated at around 50,000 tonnes. In recent years, Australia has imported peanuts from Argentina and Nicaragua (around 5,000 to 8,000 tonnes per annum) to supplement domestic supply. The Grains Research and Development Corporation expects domestic demand for peanuts to grow at around two to three per cent per annum.[42] Similarly, global peanut consumption has grown at a compound rate of 2.53 per cent per annum in recent years, a trend that is expected to continue based on current industry projections, driven largely by demand for nut-based snacks, nut butter and protein-rich foods.[43]

Australia accounts for a very small proportion of the global industry. Global peanut production in 2018/19 was estimated at around 46 million tonnes, with a total value of around $US46.9 billion. The global peanut production from 2015/16 to 2018/19 is shown in Figure F.1.

[42] Australian Government Grains Research and Development Corporation. (2017). Grow Notes – Peanuts.
[43] Modor Intelligence. (2019). *Peanuts Market - Segmented By Geography - Growth, Trends, And Forecast (2020-2025).*

Figure F.1: Global peanut production (2015/16 to 2018/19)



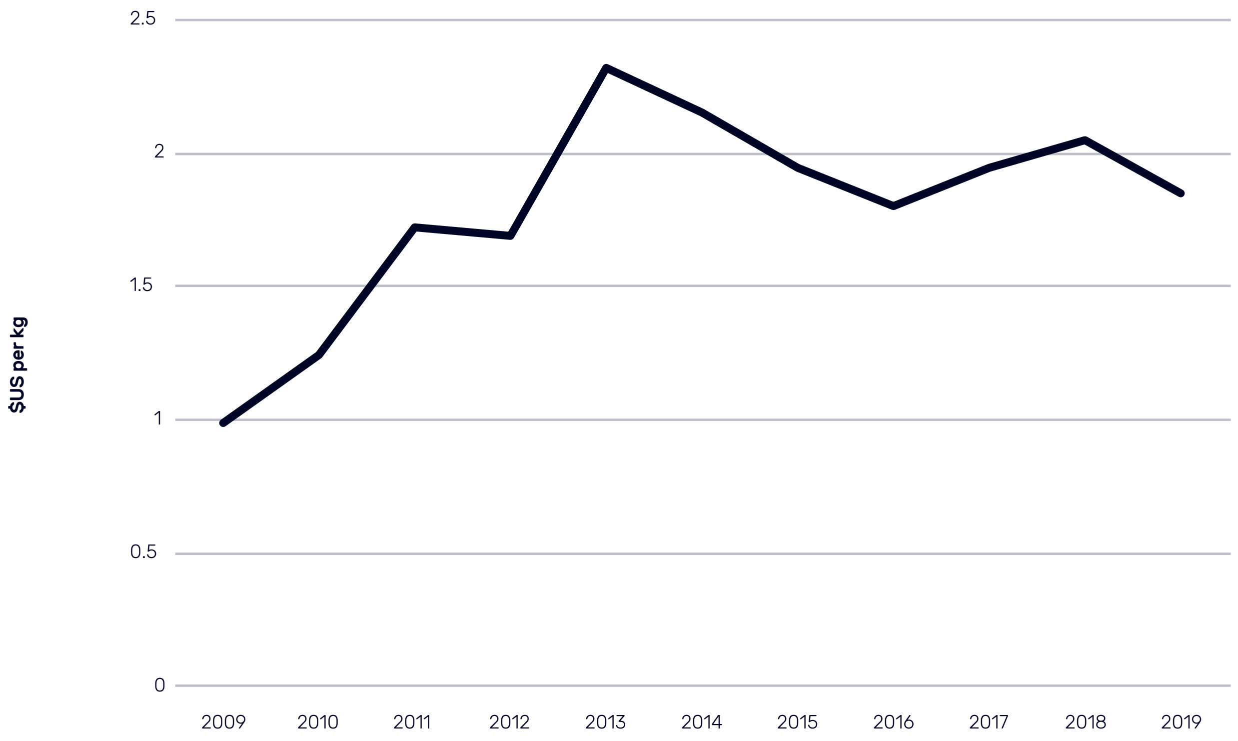
Source: United States Department of Agriculture. (2020).

Australia's current shortfall in meeting domestic peanut demand and the projected growth in consumption represents an opportunity for Australian peanut farmers to expand production. There is scope for Australian farmers to substitute imports currently being sourced from Argentina and Nicaragua in addition to capitalising on projected growth in domestic demand. Upon acquiring 93 per cent of the shares in the Kingaroy-based Peanut Company of Australia, Bega, Executive Chairman, Barry Irvin, signaled Bega's intention to increase the domestic supply of peanuts by working with farmers to expand plantings and production.[44]

As noted above, Australia does not currently export material quantities of peanuts. However, the industry has recently started to identify and develop export markets. While global trade of peanuts is low as a proportion of global production (around five per cent), the recent trend in peanut prices indicates growth in the profitability of export markets. The movement in the price of peanuts on the world market from 2009 to 2019 is shown in Figure F.2. There was significant growth in peanut prices between 2009 and 2013, before stabilising between $1.85 and $2.30 per kg.

[44]Marshall, A. (2017). Bega spreads into Queensland with $12m peanut acquisition.

Figure F.2: World peanut prices (2009 to 2019)



Source: Federal Reserve Economic Data. (2020).

The recent growth in exports to Japan provides an example of the potential value of export opportunities to peanut growers. In 2017, Trade and Investment Queensland assisted the Peanut Company of Australia in setting up an export supply chain with Plaza retail stores in Japan. Demand in Japan grew significantly over the following 12 months, with the peanuts being sold in over 5,000 stores throughout the country.[45]

Other peanut growing regions

Queensland accounts for around 95 per cent of Australia's total peanut production. The area surrounding Kingaroy in the Burnett region and the Atherton Tablelands have been the main centres of peanut production historically; however, there has been strong growth around Bundaberg and Emerald in recent years. In Bundaberg, this has been driven by the strong gross margin performance of the crop and the farming system benefits when grown as a rotational crop with sugarcane.[46]

[45]Queensland Government. (2018). Japanese market presents fresh opportunities for Queensland Farmers.

[46]Benefits include alleviating the impact of root lesion and root knot, improving available soil nitrogen, and improving weed management effectiveness.

Appendix G:

Wheat industry overview

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Overview

Wheat is a winter crop and one of Australia's most commonly produced cereals, grown in Western Australia, New South Wales, South Australia, Victoria and Queensland. Primary uses are for food production (e.g. breads, cereals, etc.) and stockfeed for livestock production. Australia is a major exporter of wheat, supplying between 65 and 75 per cent of production to Asian and Middle East markets.[47] Western Australia accounts for the majority of Australia's exports, with most wheat produced in the eastern states supplied to the domestic market.

Market outlook

Wheat production in Australia over the last 30 years is shown in Figure G.1, and highlights the periods of significant volatility in terms of the quantity and area of production, likely attributable to broadacre crop producers responding to market forces and water availability. For example, the significant drops in production in 2007/08 and over the last two years occurred during periods of extreme drought. Furthermore, Figure G.1 also shows that, despite significant year-on-year volatility, the overall trend in both area and quantity of wheat production has been increasing over this period.

[47]Australian Export Grains Innovation Centre (2018). *Australian Wheat – Quality, Versatility and Reliability.*

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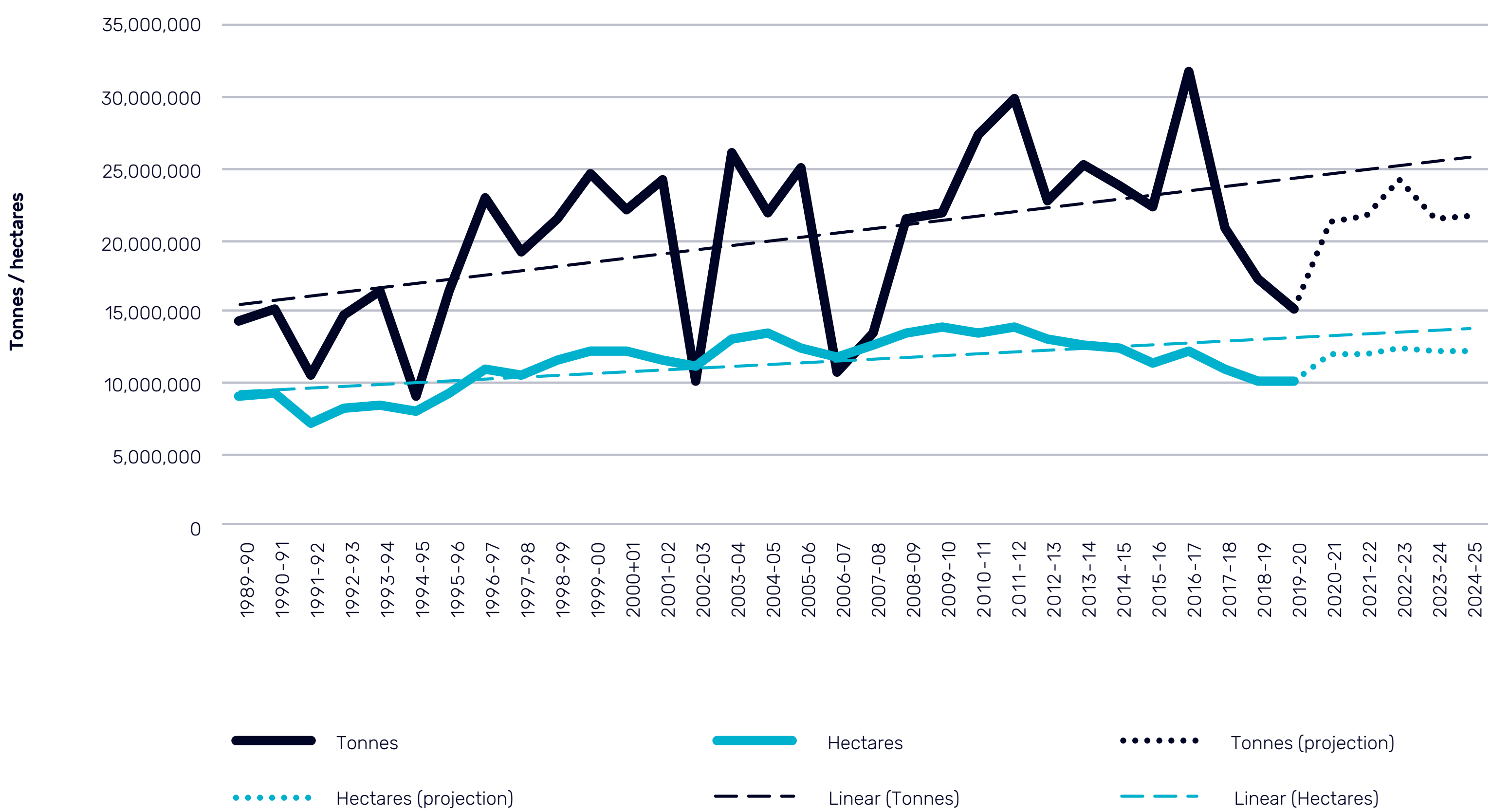
Figure G.1: Wheat production in Australia (1989/90 to 2024/25)



Source: ABARES (2020). Agricultural Commodities and Trade Data – Australian Crop Report Data - State Crop Data Underpinning: Australian Crop Report: February 2020.

Despite recent drought conditions, ABARES forecasts an increase in Australia's total wheat production from around 15.2 million tonnes in 2019/20 to 21.4 million tonnes in 2020/21.[48]

Around 610,000 hectares of wheat is grown in Queensland, predominantly in southern and central regions, accounting for around five per cent of total Australian production.[49] The gross value of Queensland wheat production for 2019/20 is estimated at $205 million. This represents a 32 per cent reduction compared to the average over the past five years, primarily attributable to the impact of recent drought conditions.[50]

While most of the wheat produced in Queensland is supplied to the stockfeed market, the recent decline across the state has resulted in consumers relying on interstate supply or imports.[51] In 2019, import permits were issued by the Australian Department of Agriculture for around 360,000 tonnes of Canadian wheat and significant tonnages were shipped from Western Australia to the East Coast.[52]

This shortfall in domestic wheat supply for the stockfeed market represents a potential opportunity for Queensland wheat farmers to expand production (including substituting for imports), particularly where there is access to reliable irrigation water.

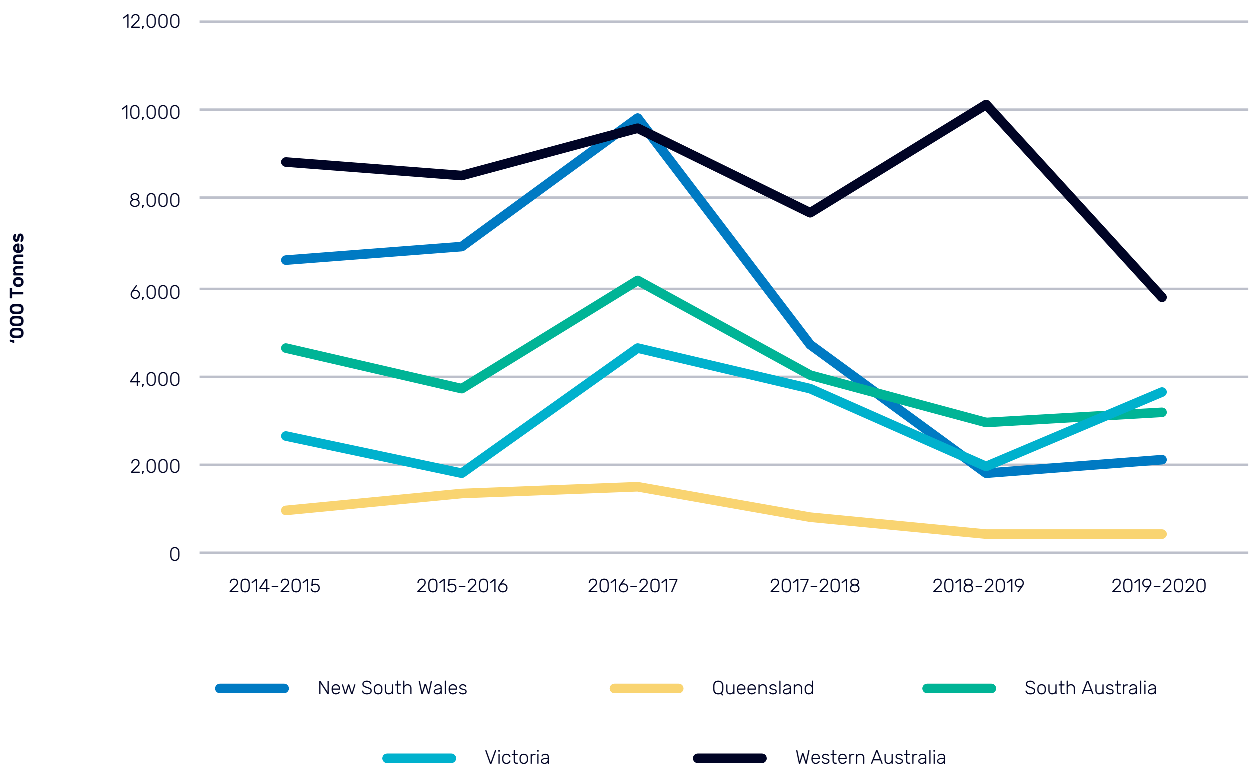
There is also scope for growth in the export market for wheat, with ABARES projecting demand for wheat exports over the medium term,[53] with key drivers including population increases and the expansion of the intensive livestock industry in South East Asia. However, as noted above, Queensland wheat farmers lack access to established wheat export supply chains.

[48] ABARES (2020). Agricultural Commodities: March quarter 2020.
[49] AgriFutures. (2018). Wheat.
[50] Queensland Government. (2019). *Queensland AgTrends 2019-2020.*
[51] George, L. (2019). Variable Harvest Across Australia.
[52] United States Department of Agriculture. (2018). Wheat Outlook.
[53] ABARES. (2020). Wheat: March Quarter 2020.

Other wheat growing regions

The changes in wheat production by state from 2014/15 to 2019/20 is shown in Figure G.2. Western Australia is the largest producer of wheat, with almost all production supplied to export markets (around 85 per cent),[54] while Queensland accounts for the lowest proportion.

Figure G.2: Wheat production by State (2014/15 to 2019/20)



Source: ABARES (2020). Agricultural Commodities and Trade Data – Australian Crop Report Data - State Crop Data Underpinning: Australian Crop Report: February 2020. Department of Agriculture, Water and the Environment, Australian Government, Canberra.

[54]Grain Research and Developing Corporation. (2020). Growing Regions.

The two major wheat growing areas in Queensland are the South West, which includes the Central and Darling Downs and the Balonne region, and the Central Highlands region, around Emerald. A significant proportion of wheat crops grown in these regions are produced under dryland cropping systems, resulting in yields significantly below what are achievable with intensive irrigation. For example, average yields of 1.8 tonnes per hectare have been estimated for the Central Highlands region, while yields of up to 8 tonnes per hectare can be achieved under irrigation.[55]

Wheat production in these regions is heavily dependent on rainfall and climatic conditions. For example, while 175,000 hectares of wheat was planted in Southern Queensland in 2019, a lack of rainfall during the autumn and winter months has resulted in production being abandoned on 90,000 hectares.[56]

[55]Australian Government Grains Research and Development Corporation. (2017). Irrigated wheat cropping in the northern region.
[56]Queensland Government Department of Agriculture and Fisheries. (2020). *Queensland AgTrends 2019-20.*

Appendix H:

Landholding analysis

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The landholdings within the Rookwood Weir impoundment area upstream to Eden Bann Weir is outlined in Table H.1. This land analysis also sets out the amount of agricultural land classes for each land parcel, categorised as follows:

- A1 – Suitable for a wide range of current and potential broadacre and horticultural crops
- A2 – Suitable for a wide range of current and horticultural crops only
- B – Suitable for a narrow range of crops. The land is suitable for down pastures and may be suitable for a wider range of crops with changes to knowledge, economies or technology
- C1 - Suitable for grazing sown pastures requiring ground disturbance for establishment or native pastures on higher fertility soils
- C2 - Suitable for grazing native pastures, with or without the introduction of pasture, and with lower fertility soils than C1
- C3 - Suitable for light grazing of native pastures in accessible areas and includes steep land more suited to forestry or catchment protection.

The information in Table H.1 may be supplemented by:

- DAF Crop Suitability tool – https://cropsuitabilitytool.daf.qld.gov.au/RookwoodWeir/
- DNRME Property Boundaries tool – https://eatlas.org.au/content/qld-dnrm-property-boundaries

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Table H.1: Landholdings analysis

Lot on plan	A1 land (ha)	A2 land (ha)	B land (ha)	C1 land (ha)	C2 land (ha)	C3 land (ha)	Total agricultural land size (ha)
27PN258	9,255	986	190	23,162	16,636	-	50,228
3LR37	5,269	-	2,106	9,481	22,572	-	39,427
6PN141	312	686	-	4,415	33,104	-	38,517
36PN409	2,948	-	810	20,560	2,006	-	26,325
25PN188	1,426	-	-	21,963	1,943	-	25,332
3SP132038	1,594	2,361	2,366	7,107	8,319	-	21,747
1LR137	5,197	3,636	339	7,924	1,963	-	19,059
39KM148	12,663	-	-	3,619	-	-	16,282
3PN106	6,914	-	-	7,538	958	-	15,410
5SP215971	10,268	-	-	4,082	-	-	14,351
1SP132038	2,859	-	-	597	9,064	-	12,520
10SP167118	216	-	-	11,619	-	-	11,835
2SP132038	3,048	277	-	3,468	4,631	-	11,424

Source: Pricefinder

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Table H.1: Landholdings analysis *(continued)*

Lot on plan	A1 land (ha)	A2 land (ha)	B land (ha)	C1 land (ha)	C2 land (ha)	C3 land (ha)	Total agricultural land size (ha)
7PN807942	-	628	-	319	8,567	-	9,513
20PN254	-	-	-	9	9,267	-	9,276
81PN111	135	1,014	287	859	6,870	-	9,166
7PAK40219	1,096	30	-	226	5,572	-	6,924
1PN4	-	-	755	2,465	2,018	-	5,238
26PN257	1,577	-	-	2,060	1,576	-	5,213
21PN81	233	-	-	-	4,165	-	4,398
92PN211	384	412	-	150	3,181	-	4,128
1SP158491	858	-	-	1,640	1,481	-	3,979
89PN387	3,073	-	-	888	-	-	3,961
75PN112	1,092	-	1,201	1,638	-	-	3,932
100SP224446	-	1,855	-	-	1,999	-	3,854
77PN112	1,198	-	7	2,566	-	-	3,771

Source: Pricefinder

Table H.1: Landholdings analysis *(continued)*

Lot on plan	A1 land (ha)	A2 land (ha)	B land (ha)	C1 land (ha)	C2 land (ha)	C3 land (ha)	Total agricultural land size (ha)
70PN111	69	236	–	2,915	550	–	3,770
3SP230297	2,543	–	–	1,031	46	–	3,620
13SP167118	–	–	–	3,537	–	–	3,537
2RP614103	1,299	–	–	2,125	–	–	3,425
2SP158491	1,120	–	–	1,503	–	–	2,623
14PN39	–	–	–	442	2,105	–	2,547
93PN161	1,141	–	–	845	418	–	2,405
3RP908640	1,052	–	–	634	487	–	2,174
2RP908640	752	–	–	1,111	254	–	2,118
1SP166189	180	–	75	1,839	13	–	2,107
58PN110	–	1,291	–	–	326	–	1,617
88PN346	1,582	–	–	–	–	–	1,582
1711PAK4069	24	–	–	848	454	–	1,326

Source: Pricefinder

Table H.1: Landholdings analysis *(continued)*

Lot on plan	A1 land (ha)	A2 land (ha)	B land (ha)	C1 land (ha)	C2 land (ha)	C3 land (ha)	Total agricultural land size (ha)
101SP224446	-	604	-	-	715	-	1,319
1857PAK4091	-	-	-	567	744	-	1,311
16PN39	-	-	-	101	1,197	-	1,298
1284PAK4057	1	907	-	-	351	-	1,259
037PN536	-	-	-	220	807	-	1,027
37PN536	-	-	-	220	807	-	1,027
36PN458	326	261	-	175	0	-	761
91PN161	324	-	-	-	413	-	737
1285PAK4057	38	-	-	-	611	-	648
2181PAK40115	24	494	-	0	109	-	627
04PN434	-	-	-	558	10	-	568
4PN434	-	-	-	558	10	-	568
AAP14023	-	-	-	387	20	-	407

Source: Pricefinder

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Table H.1: Landholdings analysis *(continued)*

Lot on plan	A1 land (ha)	A2 land (ha)	B land (ha)	C1 land (ha)	C2 land (ha)	C3 land (ha)	Total agricultural land size (ha)
3PN258	39	-	-	229	-	-	268
010PN141	-	136	-	123	-	-	259
10PN141	-	136	-	123	-	-	259
09PN405	18	-	-	170	-	-	188
9PN405	18	-	-	170	-	-	188
1PER6738	83	-	-	91	-	-	174
020PN112	131	-	-	-	-	-	131
20PN112	131	-	-	-	-	-	131
85PN209	32	-	-	-	26	-	58
38KM148	58	-	-	-	-	-	58
87PN161	25	-	-	-	-	-	25
4KM73	-	-	-	18	-	-	18
1RP605561	-	15	-	-	-	-	15

Source: Pricefinder

Appendix I:

Queensland water entitlement information

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A summary of Queensland water entitlement information including water plans, water management protocols, operations manuals, ROL and water supply contracts is outlined below.

Water plans

Water plans define the long-term availability of water for different purposes including environmental and consumptive uses. Water plans include:

- outcomes or aspirational targets that represent what government and the community want to achieve over time
- strategies and requirements to guide the management of environmental flows
- environmental flow objectives, water allocation security objectives and associated performance indicators to be considered when making water allocation and management decisions
- strategies that specify the groups, types and volumes of water allocations (authorities to take water) that may exist within the plan area
- strategic, general and indigenous water reserves that establish volumes, locations and allowable uses of unallocated water available in the plan area and which may be issued as new water allocations.

The Water Plan (Fitzroy Basin) 2011 outlines that decisions about the allocation or management of water in the basin (other than decisions about water permits) must be consistent with its environmental flow objectives and water allocation security objectives. The water plan also states that the DNRME Integrated Quality and Quantity Model computer program is to be used to assess consistency of these objectives over a specific historical simulation period (defined in the water plan to mean the period from 1 January 1900 to 31 December 2007).

Water management protocols

Water management protocols generally include specific rules and requirements in order to achieve the outcomes stated in the water plan. A protocol is developed by the DNRME and approved by its Chief Executive.

Key matters included within a water management protocol include:

- where applicable, the processes for releasing specified water volumes of unallocated unsupplemented water for stated purposes and locations
- water sharing rules for unsupplemented water in order to provide equitable sharing of water between water users
- permanent water trading rules and seasonal (temporary) water assignment rules for unsupplemented water allocations
- permanent water trading rules water assignment rules for supplemented water allocations
- other water dealing rules.

Operations manual

An operations manual is prepared under the Water Act where required as a condition of a ROL or distribution operations licence.

A manual is developed by the operator of a scheme in consultation with stakeholders and approved by the DNRME Chief Executive. It includes the day-to-day operation rules for supplemented water schemes such as:

- water releases from dams to ensure that infrastructure is operated efficiently providing flows for industry, agriculture and town water supply
- water sharing rules for supplemented water in order to provide equitable sharing of water between water users supplied by the scheme
- seasonal (temporary) water assignment rules for supplemented water allocations.

ROL

A ROL allows a holder to take, or interfere with the flow of, water to distribute it to water allocation holders (typically through systems of channels or pipelines). The owner of an instream dam or weir is therefore likely to require a ROL. A ROL typically includes conditions related to operating arrangements and water supply requirements. A ROL holder is also required to comply with the provisions of the relevant water plan and operations manual.

Water supply contract

In the case of a supplemented water allocation (i.e. one managed under a ROL), the Water Act requires there to be a water supply contract between the ROL holder and the holder of the water allocation. A supply contract sets out the arrangements by which water is to be stored and supplied as well as the financial obligations.

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Appendix J:

The value of supplemented water allocations

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Rookwood Weir will create supplemented water allocations for agricultural and other non-urban uses within the Rookwood Weir Assessment Area. Supplemented water allocations are managed under a ROL and represent an entitlement to access a nominal volume of water that is supplied by bulk water infrastructure.

Supplemented water allocations are a valuable and transferable asset in their own right. Not dissimilar to land, and subject to the conditions of the relevant water plan, supplemented water allocations can be traded, leased, mortgaged and subdivided, separate to land assets.

Underpinning investment in intensive agriculture

Cattle grazing is currently the dominant land use within the Rookwood Weir Assessment Area. A number of cattle producers hold unsupplemented surface water allocations for the Fitzroy Water Management Area (WMA).

Unsupplemented allocations are reliant on natural river flows that are not supported by a dam or weir. Holders of these types of water allocations within the Rookwood Weir Assessment Area can only harvest water when flows in the Fitzroy River reach a certain level (defined as the flow conditions of the unsupplemented water allocations). Unsupplemented water allocation holders are also required to comply with other conditions, including a maximum rate at which water can be pumped out of the river and daily and volumetric limits on the volumes that can be extracted.

While there are some regions where unsupplemented surface water allocations support intensive irrigated crop production (e.g. Stanthorpe, Border Rivers region), in most regions, including the Fitzroy, the conditions attached to the uptake of unsupplemented allocations mean they fail to provide the level of reliability necessary to support investment in intensive irrigation enterprises.

In addition to the significant capital requirements associated with land development and crop establishment (particularly for perennial horticulture crops such as macadamias and citrus), irrigated crop production using unsupplemented allocations requires landholders to invest in on-farm water storage infrastructure. Previous consultation with landholders and stakeholders in the Lower Fitzroy region revealed that the lack of reliability of unsupplemented allocations meant that investing in on-farm water storage infrastructure and the other infrastructure necessary for irrigated crop production was not feasible.

As a result, the use of unsupplemented water allocations for crop production and overall uptake within the Fitzroy WMA is low, with use as a proportion of nominal volume ranging from 0 to 1.3 per cent between 2012/13 and 2017/18.[57] Figure J.1 compares historical use of unsupplemented water allocations within the Fitzroy WMA with WMAs in which unsupplemented water allocations underpin largescale irrigated crop production.

Image: Rockhampton Regional Council.

[57]DNRME. (2019). Water metering data.

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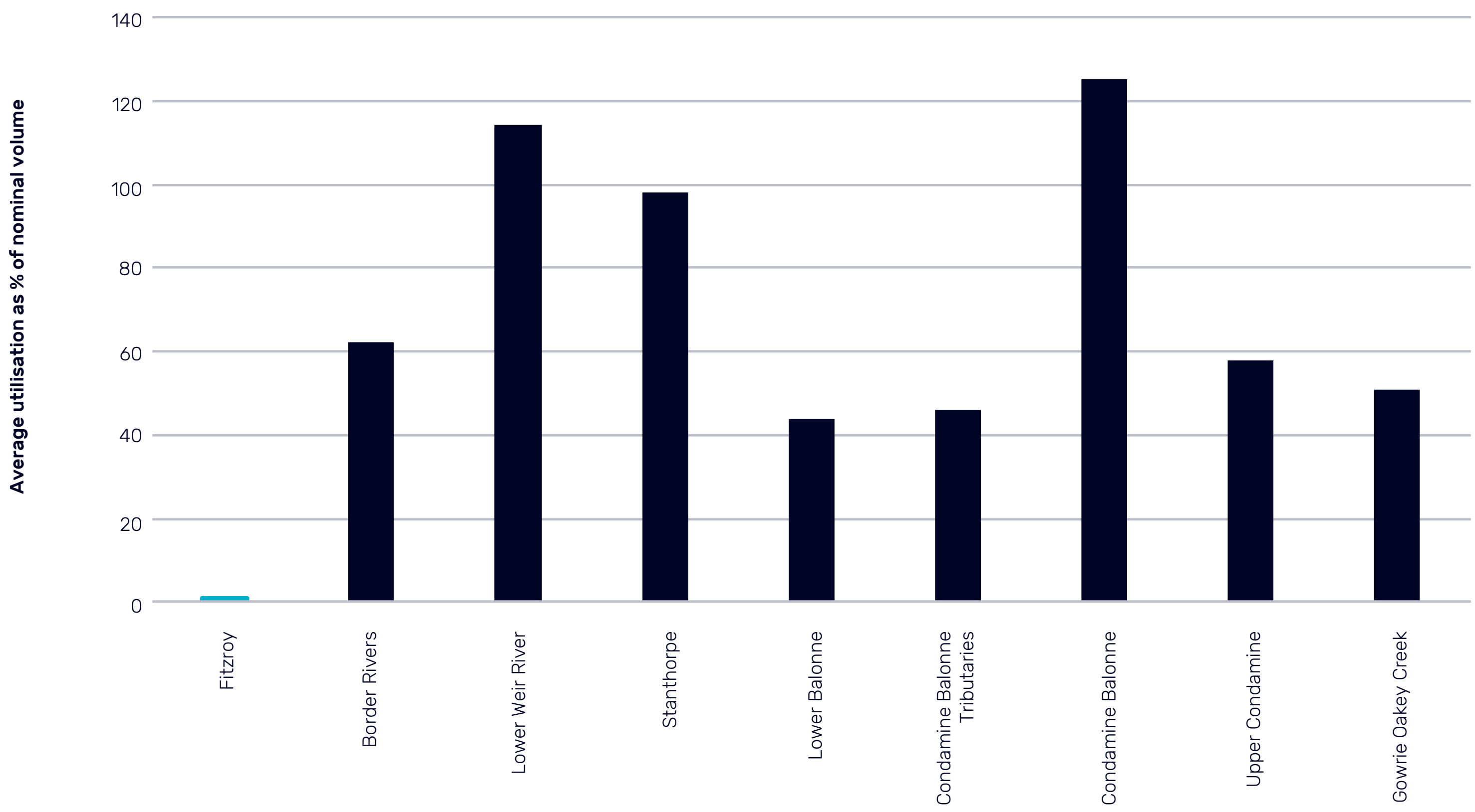
Figure J.1: Average utilisation of unsupplemented surface water allocations in selected WMA (2012/13 to 2017/18)

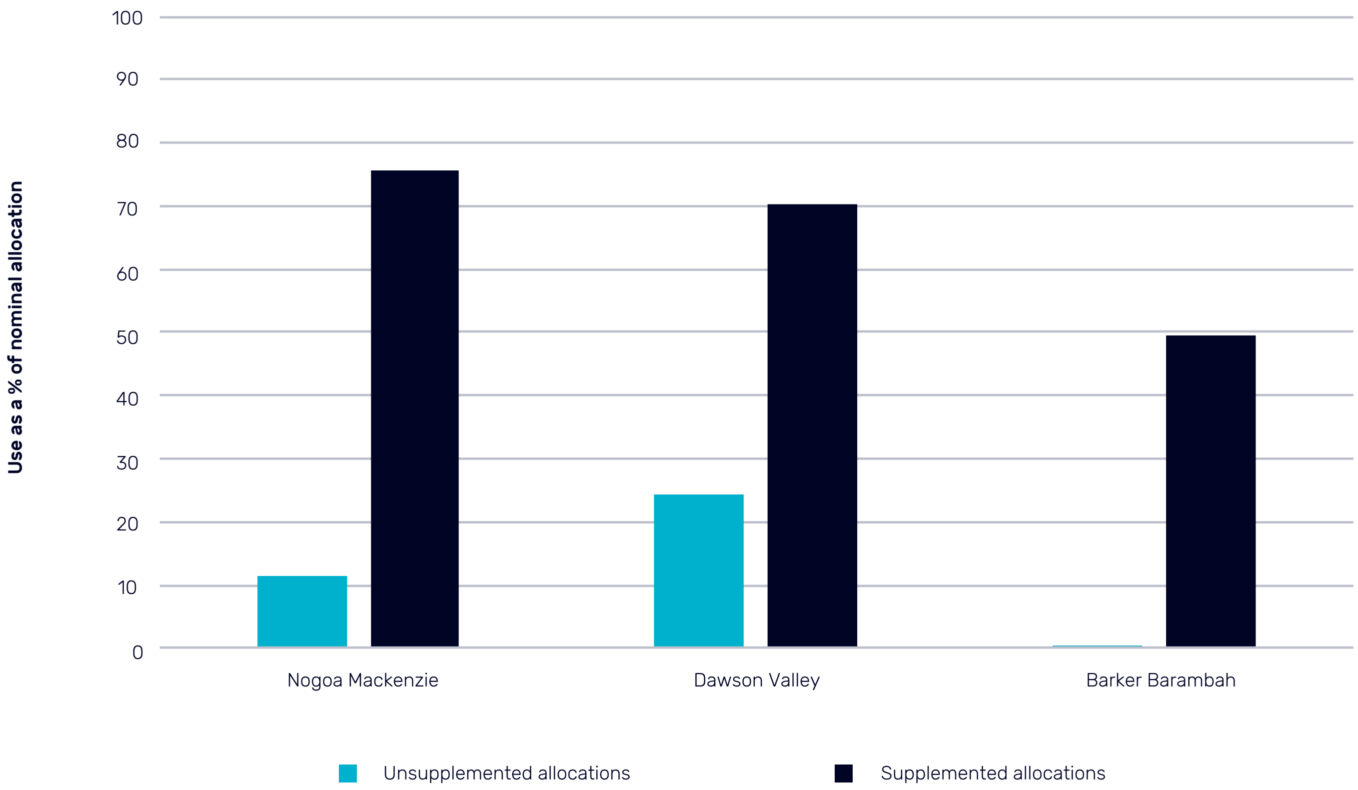


Note: Nominal volume is the share of the water resource in the WMA that has been allocated to the unsupplemented allocation holders, noting there is significant variability in availability across WMAs on an annual basis. Usage levels in the Fitzroy WMA is based on aggregated information sourced from metering records held by DNRME Water Services Central Region.

Source: DNRME. (2019). WMA Water Metering Data.

The lack of benefit derived from unsupplemented water allocations in the Fitzroy region is further evidenced by contrasting it with supplemented water allocations in areas where growers have access to both allocation types. Figure J.2 contrasts the use of unsupplemented and supplemented water allocations in three areas in which both are available for irrigation use, two of which are located in the Fitzroy region.

Figure J.2: Uptake of unsupplemented and supplemented water allocations in selected regions (2012-2018)



Note: This chart is based on aggregated information sourced from metering records held by DNRME Water Services Central Region.

Source: DNRME. (2019). WMA Water Metering Data.

As is the case in other regions where producers have access to both water allocation types, the supplemented water allocations to be created and made available from Rookwood Weir are a materially different water product to the currently available unsupplemented water allocations. Rather than being reliant upon natural flows, supplemented water allocations represent an entitlement to access a water supply that is supplemented by bulk water infrastructure.

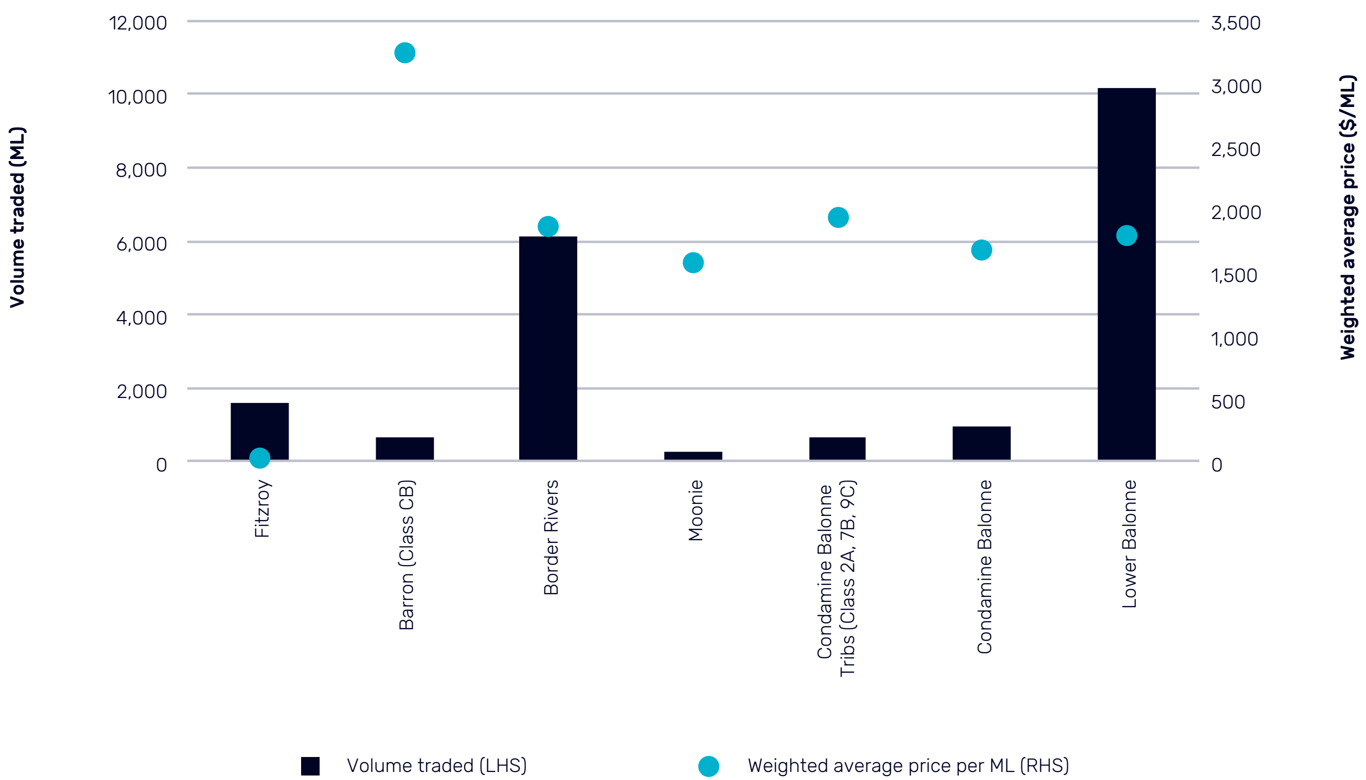
The impact of supplementation on the benefit that can be derived from water allocations is demonstrated in Figure J.3. For example, while the Nogoa Mackenzie WSS is established as one of the most productive irrigation districts in Queensland, the uptake of unsupplemented water allocations (relative to nominal volume) in this region remains very low (less than 12 per cent), while average annual uptake of supplemented water allocations for irrigation use exceeds 140,000 ML.

This demonstrates the potential for the development of bulk water infrastructure and creation of supplemented water allocations to transform agricultural land use in the region and provide producers with the reliability and certainty necessary to maximise the productive potential of their land.

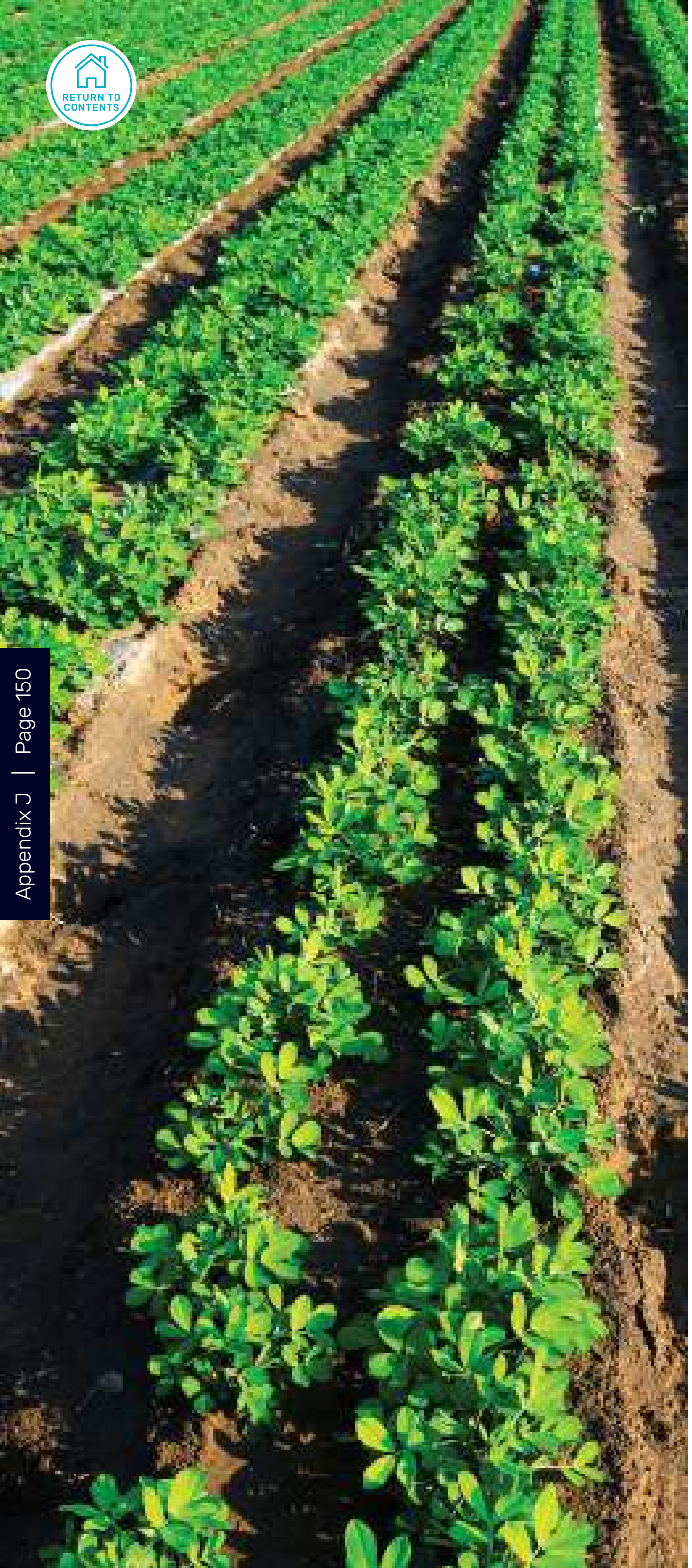
The low value that landholders place on the right to use unsupplemented water allocations in the Fitzroy is further evidenced by an analysis of trading data for unsupplemented surface water allocations in 2018/19. This data shows that 1,586 ML of unsupplemented water allocations were traded in the Fitzroy WMA at a weighted average price of $41 per ML.[58] Figure J.3 shows how this compares to trading data in other WMAs.

[58] DNRME. (2019). Permanent Water Trading Annual Report – Surface water unsupplemented supply – Period: 1 Jul 2018 to 30 Jun 2019.

Figure J.3: Trading volumes and weighted average prices for selected WMA (2018/19)



Source: DNRME (2019). Permanent Water Trading Annual Report – Surface water, unsupplemented supply, 1 Jul 2018 to 30 Jun 2019.



Most of Queensland's productive irrigation areas, particularly those based around horticulture, are underpinned by supplemented water allocations supported by bulk water infrastructure. While access to supplemented water allocations (i.e. the announced water allocation) is dependent upon the supply in the relevant storage, the level of reliability in most Queensland irrigation schemes has been historically high.

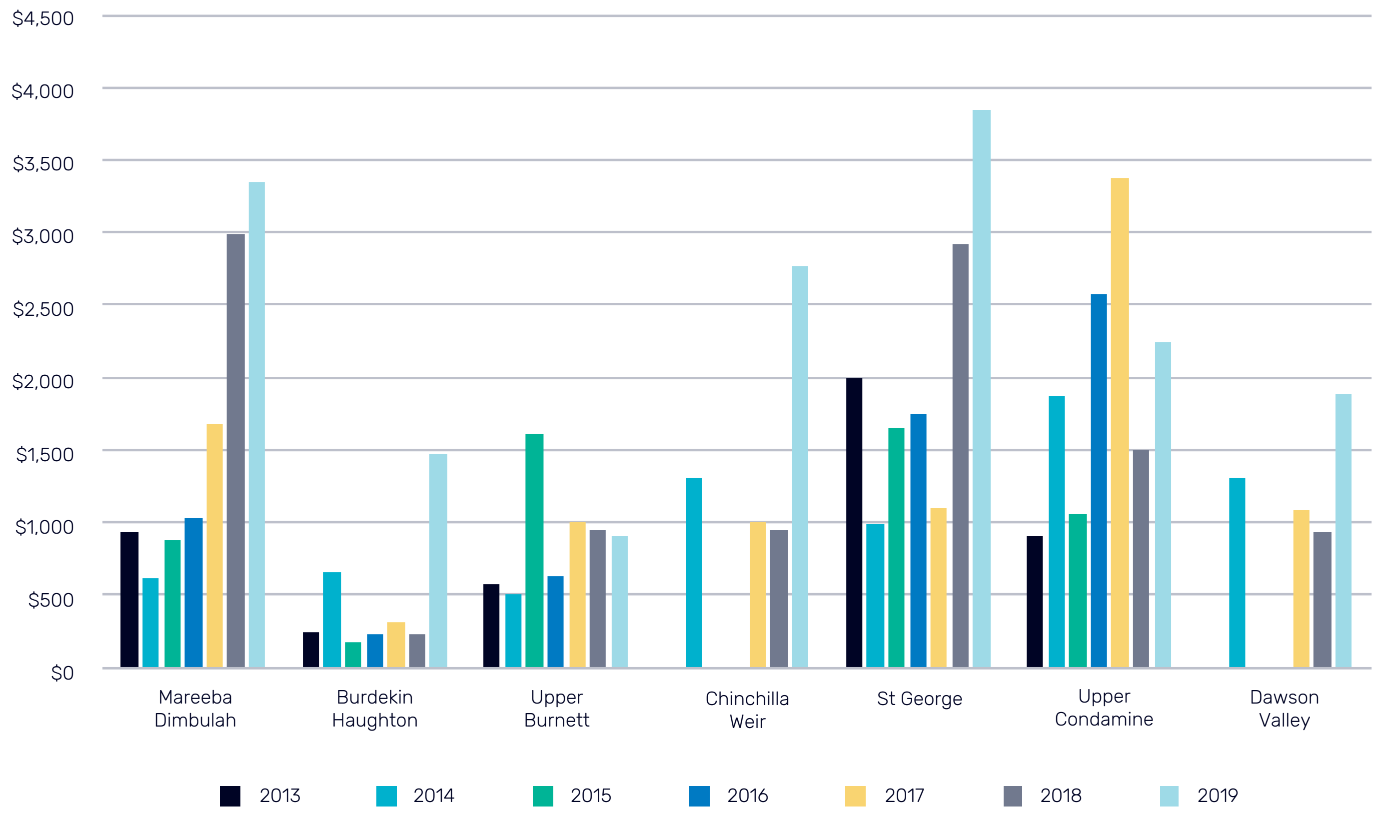
Schedule 7 of the Water Plan (Fitzroy Basin) 2011 sets out the water allocation security objectives for the Fitzroy Basin. This schedule states that the monthly supplemented water sharing index for MP water allocations should be at least 82 per cent. This is the anticipated reliability of the MP water allocations to be made available by Rookwood Weir.

Value as an appreciating asset

In addition to holding significant value for productive use, historical experience has seen supplemented water allocations also perform strongly as a standalone financial asset. Water markets in each water supply scheme throughout Queensland enable water allocation holders to trade, either in the temporary (i.e. the seasonal assignment or water allocation) or the permanent market (i.e. sale/purchase of the water allocation).

A review of water trading data for the period 2014 to 2019, as shown in the Figure J.4, reveals that in water supply schemes with similar crop profiles to the Rookwood Weir Assessment Area, the value of MP supplemented water allocations has exhibited strong growth. While Rookwood Weir will supply water to a greenfield irrigation area, the water supply schemes included in Figure J.4 are established and have been operational for several years. The prices at which unsupplemented water is traded, is impacted by how long the water supply scheme has been established and other factors within the future water supply-demand balance.

Figure J.4: Growth in the value of supplemented allocations in selected water supply schemes (2014 to 2019)



Source: Queensland Government, DNRME: Business Queensland Marketing Information.

The average increase in the value of supplemented water allocations in the seven water supply schemes, shown in Figure J.4, is 160 per cent. While the market value of supplemented allocations in individual schemes is driven by a range of scheme-specific factors (e.g. crop mix, farm-gate prices, production trends, rainfall levels, land available for expansion), this does provide an indication of the potential gains to allocation holders over time.[59]

Growth in the market value of supplemented allocations is most significant in water supply schemes where there is a trend away from broadacre cropping to higher value horticulture production. For example, in Mareeba Dimbulah, where land is being transitioned from sugarcane to perennial horticultural crops such as avocados and citrus, the market value of a 100 ML holding of supplemented allocations has increased from $93,100 in 2013 to $335,000 (260 per cent growth) in 2019.

Similarly, in St George, where there has been increasing demand for water for citrus and table grapes, the market value of a 100 ML holding of supplemented allocations has increased from $200,000 to $385,600 over the same period (93 per cent growth).

The initial sale of water allocations to be made available from Rookwood Weir provides landholders with a potential opportunity to secure ownership of a valuable asset – supplemented water allocations have many of the characteristics to become a highly productive irrigation region. Furthermore, there are a range of factors that indicate the market value of supplemented water allocations in Central Queensland may continue to increase in the long term, including increasing demand for crop production, improved efficiency of agricultural export supply chains and increasing scarcity of supplemented water allocations.

[59]Noting that the level of returns to allocation holders over time will be largely determined by the initial price at which the allocations are purchased.