PeritusAg

# Hughenden Irrigation Project Stage 2 Agronomy Business Case


**Date: 12 December 2019**

## DISCLAIMER

This report provides an assessment of the crops that could potentially be grown in the proposed Hughenden irrigation scheme. Although this report addresses the market access, productivity and economic viability of specific crops, the conclusions should be considered indicative only. The conclusions are based on the best available data that we have been able to identify. The source of the data is referenced in the report where possible. Additional investigations may need to be undertaken to look at the productivity, market access and economic viability of the crops at the specific location.

## CONTENTS



## TABLES

## 1. OVERVIEW OF AGRONOMIC REPORT

1.1 This is the second agronomy report prepared for the proposed irrigation scheme in Hughenden. The initial report focussed on crop production potential as it relates to climate, soils, water and potential profitability. This report does not cover key topics from the first report and the reports should be read in conjunction with each other.

1.2 The proposed irrigation scheme at Hughenden has reached the second stage of the business case preparation.

1.3 This report will present the research and investigation into the agricultural opportunities that the proposed irrigation scheme will have the potential to create.

1.4 The report has been strategically broken up into sections that address a range of critical considerations as to what opportunities the scheme may hold, but also the critical assessment of the financial viability of the selected crops chosen for the region.

1.5 The report will commence with a brief review of two "greenfield" irrigation schemes with some potential learnings that can be gained, but also the opportunities these schemes brought to the Emerald and Burdekin regions.

1.6 An assessment of the market opportunities of all considered crops was conducted and the results are covered in detail from ***Sections 5 -12***. These sections rely on the fact the crops being assessed are suitable for the region from a soil type and climate position. They focus heavily on production windows, market price return and gross margin analysis as considerations for commercial viability.

1.7 Water allocation values (medium and low security volumes) provided by Engeny Water Management formed the basis for the split between high-value perennial horticulture and annual hay and grain production.

1.8 The market assessment formed the basis for the calculation of area to plant each horticulture crop to ensure that economic viability was maintained with the additional volume of fruit produced.

1.9 The later sections of this report focus on the potential upside for the Hughenden region and township as well as the opportunity for business and population growth in the region.

1.10 The final section considers the potential growers who would be investors in the region when the opportunity to utilise water from a new irrigation scheme for strategic crop production occurs.

## 2. EXECUTIVE SUMMARY

2.1 The review of the cropping history of the Flinders and Gilbert Catchment suggests that the potential to grow a range of crops in the region is significant.

2.2 There is a history of crops, including grain sorghum, chickpeas, cotton, corn, mung beans, adzuki beans, forage sorghum and hay, all being successfully grown either as irrigated or dry land crops.

2.3 There are some challenges to crop production in remote parts of Australia and this region is no different, but the production of irrigated agriculture in other regions has been proven to attract the support businesses and infrastructure that minimise many of these challenges.

2.4 The review of the Emerald and Burdekin Irrigation Schemes provides strong support that a greenfield irrigation project can be successful with the correct approach to design, crop selection, farm layout and appropriate water allocation management.

2.5 A critical component of the report covers the market review and analysis of the proposed crops that are considered suitable for production in the region.

2.6 The final list of opportunity crops was selected based on the following criteria;

i) Regional suitability
ii) Support for regional industries (grazing businesses)
iii) Production window opportunity
iv) Market price return
v) Economic viability
vi) Domestic and export opportunities

2.7 The crops selected to be considered part of the agricultural production strategy and the market value are summarised in ***Table 2.1 and 2.2***.

**Table 2.1: Summary of annual crops and market prices**

| Crop | Domestic Market Price ($/T) | Average Domestic Market Price ($/T) | Long-term Average Domestic Market Price ($/T) |
|---|---|---|---|
| Sorghum | $325 - 425 | $375 | $325 |
| Wheat | $350 - 450 | $400 | $350 |
| Barley | $325 - 425 | $375 | $325 |
| Corn | $300 - 500 | $400 | $350 |
| Domestic Hay | $246 - 411 | $329 | $296 |
| Export Hay | $440 | $220 | $220 |
| Silage | $137 - 228 | $183 | $133 |

**Table 2.2: Summary of perennial crops and market prices**

| Crop | Domestic Market Price ($/KG) | Export Market Price ($/KG) | Average Grade Price ($/Carton or Tray) |
|---|---|---|---|
| Avocados | $4 - 7 | $5 - 6 | $21.06 |
| Mangoes | $3 - 4 | $3 - 4 | $17.85 |
| Lemons | $2 - 4.50 | $2 - 2.50 | $33.15 |
| Mandarins | $2 - 3 | $2 - 2.50 | $23.91 |

2.8 The cropping strategy was presented as two scenarios as follows;

i) Diversified cropping strategy (Scenario One)
   - Perennial horticulture
   - Grazier support lots (grains and hay)

ii) Grazier support only strategy (Scenario Two)
   (1) Grazier support lots (grains and hay)

2.9 The water allocation volumes were supplied by Engeny Water Management with a different allocation strategy for each cropping strategy as follows:

- Diversified cropping strategy
  - Medium security allocation: 30 GL
  - Low security allocation: 40 GL
- Grazier support only strategy
  - Low security: 84 GL

2.10 The total land area under irrigated production under each scenario is as follows:

- Diversified cropping strategy: 7505 HA
- Grazier support only strategy: 11,351 HA

2.11 The gross margins for the selected crops are summarised in ***Table 2.3***.

**Table 2.3: Summary of Gross Margin analysis of selected crops**

| Crop | Total GM Data ($/HA) |
|---|---|
| Avocado | $15,051.92 |
| Mango | $6,045.80 |
| Lemon | $56,055.00 |
| Mandarin | $20,730.00 |
| Sorghum | $1,703.00 |
| Wheat | $1,419.00 |
| Corn | $2,757.00 |
| Rhodes Grass Hay | $2,383.00 |

2.12 In terms of employment opportunities in the region directly linked to the new agricultural operations, each cropping strategy has different outcomes as per ***Table 2.4***. The assessment shows

that the diversified cropping strategy employs a new person for every 149 ML of water supplied, while the grazier support only strategy employs a new person for every 493 ML of water supplied.

**Table 2.4: New employment potential**

| Cropping Strategy | Permanent Employment | Casual Employment | Total Employment | ML of Water/Person |
|---|---|---|---|---|
| Diversified Cropping | 124 | 347 | 471 | 149 |
| Grazier Support Only | 114 | 57 | 170 | 493 |

2.13 The diversified cropping strategy will increase the demand for locally provided support businesses and services. A project of this scale would attract new businesses to operate locally, further building on the growth and economic resilience of the town of Hughenden and the whole region.

2.14 Whichever strategy is settled on, there is no doubt that the impact to the region of the proposed irrigation scheme will be significant and will positively impact on building its resilience against drought and climate change.

## 3. HISTORY OF CROPPING IN THE FLINDERS AND GILBERT RIVER CATCHMENT

3.1 The objective of this section is to gain insight into the successes and lessons learned with regards to cropping and agricultural production in Northern Australia, with emphasis on the Flinders and Gilbert Catchment region.

3.2 The information gathered in this process added to the market analysis research completed on the crops (see ***Sections 5 – 12***) to support the decision of the crop choices made.

3.3 The information in this section has been set out in sections under the following headings:

- Overview of Farming in Northern Australia
- The Practical Experience of Farming in the Flinders and Gilbert Catchment Areas
- Constraints to the Expansion of Farming
- Advantages of Irrigation to the Cattle Industry in the Catchment
- The Hughenden Beef Processing Facility and Feedlot

### ***Overview of Farming in Northern Australia***

3.4 From the 18th century, Northern Australia has been regarded by many in agricultural and political circles as having the potential to be "Australia's Food Bowl" or to grow enough food to "Feed the World".

3.5 In this context, "Northern Australia" refers to the regions north of latitude 19°. This would correspond roughly to the regions north of a line drawn across the Australian map from Townsville (QLD) to Port Headland (WA).

3.6 The rationale underpinning these theories is that in these regions, rainfall is abundant and reliable. The physical location means anything produced is much closer to the large populations and potential consumers in Asian countries than the traditional major agricultural areas of Australia.

3.7 While both these tenets are true and the consequent theories have been expounded for in excess of 120 years, the successful establishment of farming on a large scale in non-coastal locations of Northern Australia is yet to be achieved.

3.8 While many ambitious schemes have been conceived and started, most, for various reasons have failed. Some, such as the Ord River scheme in Western Australia and the Douglas Daly region in the Northern Territory, have been partially successful but even these, to date, have not matched the expectations held at their inception. The Burdekin Irrigation area is one which has been a success.

3.9 While the potential of Northern Australia as an area of large-scale agricultural production is yet to be realised there is no reason why it cannot be achieved. Individual and small groups of growers have demonstrated on a lesser scale that many different crops can be successfully grown. To scale up these isolated examples of agricultural development to a size where they would constitute an industry will require a detailed development strategy be conceived and delivered by a coalition comprising all levels of government, corporates and growers.

## ***The Practical Experience of Farming in the Flinders and Gilbert River Catchments***

3.10 Since the 1950s sporadic efforts have been made to establish broadacre farming in the Flinders and Gilbert River catchments. In 2019 there is a small but increasing number of growers growing irrigated crops on a commercial scale.

3.11 In addition to these growers there are other producers who grow forage crops, both irrigated and dryland, for their own use. These crops are grown for hay or silage.

3.12 Crops that have been successfully grown in the region are as follows:

- Sorghum
- Cotton
- Corn
- Chickpeas
- Mung Beans
- Adzuki Beans

3.13 By "successfully grown", we mean the crop produced a yield that would make it economically viable to grow.

3.14 The FAGARA report commissioned by the CSIRO identifies a wide range of crops that are considered suitable to production in the region, while the agronomic report for the first stage of this project identified a smaller group of crops that were considered the most appropriate based on specific regional suitability relating to production and economic factors.

3.15 It should be noted that the crops listed above in 3.12 were grown under irrigation. While dry land production of some crops is feasible, it is obviously riskier without irrigation and it cannot be guaranteed that a crop will be able to be produced each year.

3.16 That the crops listed above have been grown in the Flinders and Gilbert River Catchment shows that the climate and soils of the region can produce these crops commercially.

3.17 The list of crops that are considered suitable to the climate, soils and topography were covered in-depth in the initial agronomy report, while

3.18 It is probable that several other crops will also be commercially viable in the region. For example, while mango production has not been trialled on a large scale, they are grown successfully in Katherine which has a comparable climate.

3.19 In the same category as mangoes are citrus and avocados which, while not trialled in this region, are commercially grown in other regions with similar climates.

3.20 Some other crops have a wider range of potential uses. For example, it has been established that sorghum grows well in the area. Sorghum can be grown for grain, hay or silage with each of these potential uses having a different gross margin.

3.21 A crop like sorghum has additional attractions in that its availability would provide significant advantages to the local cattle industry. More information will be provided on this topic in a later section.

## ***Constraints to the Expansion of Farming***

3.22 The potential constraints to the expansion of farming can be grouped into two broad categories as follows:

- Local Level Constraints
- Industry Level Constraints

### *Local Constraints*

3.23 Local level constraints are those that influence the actual production of irrigated crops. These would include potential issues with insects and disease, weeds, climatic effects, the incidence of vertebrate pests and so forth.

3.24 Some of these constraints will not be foreseeable and their incidence will be unique to the area. These types of constraints may only become apparent once larger scale production commences.

3.25 Field trials would be necessary to identify many of the potential local constraints that may impact crop production.

3.26 The resolution of these constraints will also need to be achieved at a local level.

### *Industry Level Constraints*

3.27 Industry level constraints are dependent on the industry reaching a minimum size. A lot of these potential constraints will only be dealt with by having a critical mass of growers and production.

3.28 For example, many horticultural crops require packing or some degree of further processing before they can be marketed. It is not commercially viable to build a packing shed or processing facility without a minimum volume of throughput.

3.29 The same principle applies to other services and products likely to be required by irrigation farmers. Services such as those provided by agronomists and other technical specialists as well as machinery and other dealers will only be available when the potential demand warrants it.

3.30 Another type of potential constraint is government regulation particularly as it relates to licensing water harvesting and utilisation. A detailed discussion of these issues is beyond the scope of this section however it is essential to the commercial viability of the scheme that a regulatory regime be established that enables growers to operate commercially.

3.31 None of these local or industry level constraints should prevent the scheme being viable however the ones capable of being identified and mitigated upfront must be dealt with. Other constraints may only be identified as production is scaled up. This underlines the need for trials to be undertaken on a close to commercial scale.

## ***Advantages of Irrigation to the Cattle Industry in the Catchment Areas***

3.32 In terms of value, beef cattle production is the largest agricultural sector in Northern Australia. In 2017/18, the value of beef production in the North West Region, in which the Flinders Shire Council is located, was $1.1 billion. If adjoining regions in northern Queensland are added to this figure, total production was $2.2 billion.

3.33 In terms of numbers, the North West Region carries approximately two million cattle with another two million in adjoining regions.

3.34 The production cycle for the Northern Australian beef industry is intrinsically tied to the climate cycle. The climate is monsoonal with the winter months being dry and summer months bringing the wet season.

3.35 This climate cycle means that pastures grow over the wet season and then must be managed so they last and provide grazing until the following wet season arrives and the cycle recommences.

3.36 This seasonal production pattern has meant that since cattle first arrived in the region in the 1800s, they have been subjected to what is referred to as the seasonal feed gap. During the wet season, pasture grows abundantly and is high in protein.

3.37 With the onset of the dry season pasture quality starts to decline and this deterioration continues until the next wet season. For the last few months of the dry season the quality of the pasture is extremely poor which means cattle grazing it lose weight.

3.38 Cattle are sold once they reach a target weight so the lost weight must be regained before the cattle can be turned off. In general terms, this results in cattle from Northern Australia being older when they are sold than cattle from southern markets and this results in lower prices.

3.39 Weight loss in breeders also results in lower conception rates which is an economic loss to producers.

3.40 A lot of time and money has been expended on trying to eliminate the seasonal feed gap, mainly through various means of supplementary feeding. The results from this work have been variable but it is fair to say that, to date, no economic solution on a large scale has been found.

3.41 A solution to the seasonal feed gap issue for the wider industry could be reach if there was enough quantity available of an economically priced supplementary feed.

3.42 Individual producers have been able to partially mitigate the seasonal weight loss in their cattle by combining a change in management practices and producing their own forage crops which are used as supplementary feed.

3.43 Traditionally in the northern cattle industry, mustering commences with the wane in the wet season which occurs around February/March. Calves are branded and weaned at this time and these will be the animals turned off later in the year when they reach their target weights.

3.44 Some producers have started mustering a month or two earlier where seasonal conditions permit. The weaned calves are then put into smaller paddocks where they are fed forage that has been grown by the producer. This forage is usually sorghum hay, silage or Rhodes grass hay.

3.45 This strategy has several advantages. It arrests the weight loss that lactating cows undergo which makes it easier and more probable that they will get back in calf. It also minimises the weight loss that weaned cattle experience in the weeks after being removed from their mothers. This means that they can be sold at an earlier date than they would have been otherwise.

3.46 This strategy significantly improves the profitability of the producers employing it. Its feasibility depends on the availability of enough quantity of quality fodder.

3.47 The feasibility of growing forage crops under irrigation in the Flinders and Gilbert River Catchment has been successfully demonstrated over many years. If the volume of forage produced locally could be boosted significantly, we believe it would find a receptive market amongst the beef producers of the region.

***The Hughenden Beef Processing Facility and Feed Lot***

3.48 Over the past 10 years, several studies carried out by both government and private organisations identified Hughenden and the surrounding region as having several competitive advantages as a location for a beef processing facility.

3.49 In July 2019, the aspirations of the Flinders Shire Council came to fruition when it signed a Development Deed with a Chinese company to develop and construct a beef processing facility and 50,000 head feed lot.

3.50 This facility is planned for a site approximately 5 KM west of Hughenden. The intention is that the facility will process between 800 and 1500 head per day.

3.51 The project is in the design and approval stage and on current forecasts is scheduled to commence operations in 2022.

3.52 While the processing facility and feed lot will be viable on a standalone basis, its operational efficiency will benefit significantly from a local source of feed as it will require significant volumes.

3.53 This feed requirement is not optional and if the feed is not available locally, it will be necessary to truck it in from elsewhere.

3.54 It has already been demonstrated that the types of grain and forage that a feed lot will require can be grown under irrigation in the North West Region.

3.55 If the feed lot is constructed with a capacity of 50,000 head as planned, the feed requirements for the feedlot alone would be in the vicinity of 37,000 tonnes of hay and 55,000 tonnes of grain per annum. On current planning, all this feed requirement could be grown locally.

3.56 Even without the feedlot, the processing facility will require a constant supply of feed as at any one time it will be holding cattle in the yards.

3.57 While the existence of the Hughenden Beef Processing Facility and Feedlot is not necessary to make growing irrigated crops viable in the Flinders and Gilbert Catchment, it would be a constant consumer of a large volume of the potential production of the irrigated area.

## 4. REVIEW OF SIMILAR GREENFIELD IRRIGATION SCHEMES IN QUEENSLAND

4.1 This section is a review of two "greenfield" irrigation schemes that were designed from the ground up in the Emerald and Burdekin regions.

4.2 The objective of this review was to gain insight into the successes and challenges of these schemes and to highlight the overall benefit a new irrigation scheme makes to both the agricultural and societal segments of a region.

4.3 The Lower Burdekin Irrigation Area and the Emerald Irrigation Distribution Scheme are two examples of successful greenfield irrigation schemes.

### ***The Lower Burdekin Irrigation Area (LBIA)***

4.4 The information in this section has been set out under the following headings:

- Overview and Attributes of the LBIA
- Water Licensing, Allocations and Pricing
- Existing and Emerging Issues for Operators, Users and Other Interested Parties
- Future Direction and Development

#### ***Overview and Attributes of the LBIA***

4.5 The LBIA is the largest water scheme in Northern Australia with 80,000 hectares under irrigation. The system has two components. The original scheme mainly utilised groundwater resources on the sedimentary soils of the Burdekin River delta. In the 1980s and '90s, the construction of the Burdekin Falls Dam allowed the development of a surface water-based scheme on the alluvial flood plains below the dam.

4.6 Basic irrigation farming commenced in the Burdekin region in the 1860s. For the next 120 years the area under irrigation expanded steadily but slowly. This changed dramatically with the construction of the dam which resulted in the irrigable area increasing by more than 100%.

4.7 In terms of infrastructure, the scheme utilises the Burdekin Falls Dam and three weirs, Clare, Val Bird and Giru. Water is distributed a network of channels totally 414 KM.

4.8 As of today, most of the irrigated land is used to grow sugar cane. Smaller areas of other crops such as horticultural and tree crops are also grown. In recent years, the area used to grow fodder crops to be utilised on properties in the pastoral zone to the west of the Burdekin region has been increasing.

4.9 The key attributes and specifications of the LBIA are summarised in ***Table 4.1.***

**Table 4.1: Attributes and Specifications Lower Burdekin Irrigation Area**

| Parameter | Figure |
|---|---|
| Catchment Area (KM2) | 135,000 |
| Population in Catchment | 20,000 |
| Irrigated Area/Potential Area (HA) | 80,000/142,000 |
| Annual Rainfall/Evaporation (MM) | 1000/2080 |
| Water Use | Conjunctive |
| Range - Vol. Water Applied Annually (ML/HA) | 8-30 |
| Dominant Irrigation Method | Furrow |
| Main Crops | Sugar Cane |

***Management and Administration of the LBIA***

4.10 The ownership and management of the LBIA is shared between Sunwater and Lower Burdekin Water.

4.11 Sunwater is a statutory authority owned by the Queensland State Government that, in turn, owns the Burdekin Falls Dam and associated infrastructure. Sunwater is also responsible for water allocations, licensing and facilitating the efficient delivery of water from the LBIA to irrigators and other customers.

4.12 An Irrigator Adviser's Committee, comprising irrigators elected by LBIA water users to represent growers on issues of the operation of the scheme and water supply, also works with Sunwater.

4.13 The groundwater portion of the LBIA is administered by Lower Burdekin Water. This organisation was formed from the amalgamation of the original north and south management authorities which were formed in the mid-1960s.

4.14 Lower Burdekin Water is an autonomous statutory authority that is funded on a user pays/cost recovery basis with the primary objective of ensuring that the underground aquifers under the Burdekin River delta are maintained in optimal condition regarding water levels and quality.

4.15 In the 1960s a detailed drilling program and subsequent study determined that the Burdekin delta aquifer was able to be replenished. Since that determination, Lower Burdekin Water and its precursor entities have managed the sustainability of the aquifer via the following means:

- Direct recharge through artificially constructed soakage pits whereby water is pumped from the river into the pits where it percolates back into the aquifer
- Recharge through the bed and banks of natural watercourses
- Direct supply of water to irrigators which conserves groundwater
- Constant monitoring of aquifer water levels and quality

4.16 The structure and geological characteristics of the Burdekin River aquifer means that it is one of the few systems in Australia that can be artificially recharged. The role of Lower Burdekin Water is to monitor groundwater levels and ensure that, through a mix of natural and artificial means, the aquifer is recharged with the greatest volume of water possible.

***Water Licensing, Allocations and Pricing***

4.17 The LBIA water allocation system has two tiers - High security and Medium security. High security allocation users are towns and industrial users while Medium security allocations apply to agriculture.

4.18 The LBIA scheme is characterised by providing high water allocation reliability. High security allocation users have received 100% of their allocation for the past 18 years. Medium security allocation users have never had less than 63% of their allocation over the same period.

***Existing and Emerging Issues for Operators, Users and Other Interested Parties***

4.19 As one of the oldest and largest irrigation schemes in Australia, the LBIA provides a case study into several issues and lessons for other existing and proposed schemes. These are discussed under separate headings in the following section.

***Management of Tailwater***

4.20 The issue of tailwater management has assumed more importance in recent years. This is particularly the case with the LBIA, as tailwater will potentially be discharged into waters surrounding the Great Barrier Reef.

4.21 Tailwater management wasn't given much consideration in the design of the LBIA. This is because tailwater in the LBIA is discharged into the natural drainage lines provided by the existing creeks and gullies.

4.22 Tailwater can transport salts and nutrients and, in enough volumes, cause erosion or sedimentary build-up where there was none previously. This will, in turn, affect both local eco-systems as well as downstream environments.

4.23 In recent years, an increasing knowledge of the potential effects of tailwater has caused a change in attitude to the point where the objective is to minimise or, if possible, eliminate any discharge of irrigation water.

***Rising Water Tables and Secondary Salinity***

4.24 Ironically, given the principal role of Lower Burdekin Water is to maintain groundwater levels by, amongst other means, recharging aquifers, in some areas of the LBIA's surface water sections, water table levels are rising.

4.25 In the same areas, there is also evidence of the occurrence of secondary salinity.

4.26 There was low importance attached to hydrogeology, that is, the study of groundwater, in planning the LBIA. With adequate studies of groundwater, both the potential for water tables to rise and the incidence of secondary salinity is predictable and, in many cases, able to be mitigated.

4.27 The experience with this aspect of the LBIA suggests that detailed geohydrological studies should be an essential part of the planning of any new irrigation development.

***Future Direction and Development***

4.28 There is significant potential for future development and progress in a number of different aspects of the LBIA:

- The capacity of the dam can be significantly increased by increasing the height of the dam wall
- Diversifying the crops grown
- Identifying additional end users

***Structural Improvements on the Burdekin Falls Dam***

4.29 A significant amount of work on raising the dam wall has already been completed in what is termed Stage 2 of the Burdekin Falls Dam.

4.30 Stage 2 entails raising the dam wall by two metres which would deliver an extra 150,000 ML capacity. Stage 2 has the added benefit of being able to achieve this increase in yield with only a minimal amount of land acquisition being required.

4.31 The extra height of the dam wall also improves the feasibility of a hydroelectric scheme being developed.

4.32 A certain amount of building work is required for the dam to meet the requirements stipulated in the *"Guidelines on Acceptable Flood Capacity for Dams"* which were established by the Queensland State Government in 2013.

4.33 The estimated combined cost of the flood capacity upgrade and raising the dam wall is $550 million. It should be noted that at its current capacity, in an average year, approximately 100,000 ML of the annual yield remains unallocated.

4.34 From an economic point of view, therefore, in the short to medium term, there is unlikely to be any demand from irrigators or miners for additional water stored. The cost of undertaking this structural work therefore would have to be considered a sunk cost.

***Additional Irrigation Area***

4.35 While the potential to expand the current irrigation area exists in a number of different locations around the LBIA, the most immediately feasible is approximately 12,500 HA south of Home Hill.

4.36 The area is currently utilised for dryland farming and grazing, however, research and testing has established that it is suitable for irrigated horticulture and agriculture.

4.37 The Queensland State Government planned to construct a channel, known as the Elliot Channel, to deliver water to this area. A number of iterations of this concept have been proposed but, to date, all have been deemed uneconomical.

4.38 While there are various regulatory hurdles to be overcome, the LBIA does have potential for expansion. All the available water is not being utilised and there is land available that could be developed to do so and realise production higher in terms of $/HA than currently being achieved.

*Diversification of Cropping and Other Uses*

4.39 Currently, sugar cane is responsible for the greatest proportion of economic production from the LBIA. It is likely the total value of economic production from the LBIA will increase by diversifying the types of crop grown.

4.40 In recent years, alternative crops such as rice, cassava and various pulse crops have been trialled.

4.41 A rice mill was established in the area and significantly upgraded in 2016. An increasing number of growers are including rice as part of their cropping mix and the tonnage of rice produced from the area is expected to grow.

4.42 The more intensive use of irrigated land for horticultural crops will also boost the total economic value of the LBIA.

4.43 With the decline of native stock and increasing restrictions and regulation on wild caught marine species, there is likely to be an increase in the number of aquaculture businesses. The LBIA provides a number of advantages for aquaculture and businesses producing prawn, barramundi and cobia are already operating.

4.44 A further advantage of aquaculture businesses is they provide an additional potential market for irrigators growing feed suitable for this stock.

4.45 Local councils as well as business and producer groups are active in working to attract new and alternative production opportunities and growth in these alternative crops is expected to continue.

4.46 Potential sources of growth are companies involved in secondary and tertiary processing of commodities grown in the region. For example, value adding products from sugar cane to produce industrial and pharmaceutical compounds.

## ***The Emerald Irrigation Distribution Scheme (EIDS)***

4.47 The information in this section has been set out under the following headings:

- Overview and Attributes of the EIDS
- Existing and Emerging Issues for Operators, Users and Other Interested Parties
- Future Direction and Development

### ***Overview and Attributes of the EIDS***

4.48 The EIDS is centred on the Fairbairn Dam which impounds the Nagoa River. The catchment for the dam has an area of 16,317 SQ KM which produces a full supply volume of 1,301,000 ML. When construction of the dam was completed in 1972, the dam was the largest in Queensland, however, became the second largest after the completion of the Burdekin Falls Dam.

4.49 Water is distributed to customers by two open channel systems.

4.50 The Selma Channel system is 47 KM long and supplies water to irrigation properties to the west and north of Emerald.

4.51 The second channel is called the Weemah Channel. It is 53 KM long and supplies irrigators on the eastern side of Emerald.

4.52 The total irrigation area serviced by the EIDS is approximately 15,000 hectares which is farmed by 150 separate irrigators. Major crops produced are cotton, citrus, cereals, pulses, forage crops and macadamias.

4.53 Irrigated agriculture accounts for most of the water sourced from the EIDS, however, urban uses and industry, mainly mining, also use water from the scheme.

4.54 The key attributes and specifications for the EIDS have been summarised in ***Table 4.2.***

**Table 4.2: Key Attributes and Specifications of the EIDS.**

| Parameter | Figure |
|---|---|
| Catchment Area (KM2) | 16,317 |
| Population in Catchment | 18,000 (approx.) |
| Volume of Fairbairn Dam/Total Annual Allocation | 1.3M ML/83,000 ML |
| Irrigated Area (HA) | 15,000 |
| Annual Rainfall/Evaporation (MM) | 542/3684 |
| Water Use | Surface |
| Range - Vol. Water Applied Annually (ML/HA) | 8-12 |
| Dominant Irrigation Method | Furrow |
| Main Crops | Cotton, citrus, cereals, pulses |

4.55 The EIDS makes up the majority of what is called the Nagoa McKenzie Scheme which services the water needs of central Queensland communities. This scheme was originally owned and operated by Sunwater, however, as at July 1, 2019, the ownership and operation of the channels and water distribution infrastructure transferred to a new entity called the Fairbairn Irrigation Network ("FIN").

4.56 As at the date of this report, FIN is a special purpose vehicle owned by the Queensland State Government. After the transfer process has been completed, the ownership of FIN will transfer from the State Government to the water allocation customers of the EIDS.

4.57 Sunwater will continue to own and manage the bulk assets of the scheme being the Fairbairn Dam and the Nagoa River weir.

4.58 Sunwater and FIN are required to operate the EIDS in accordance with the Nagoa Mackenzie Water Supply Scheme ROL Operations Manual.

4.59 The Sunwater website describes the purpose of the manual as follows: "The operations manual states rules for the operation of infrastructure associated with the Nagoa Mackenzie scheme as well as water sharing rules and seasonal water assignment (temporary trade) rules".

4.60 Under the EIDS, irrigators access water by placing an order with FIN on a daily basis. The time taken for the water to travel from the dam or weir to the irrigators pump on the supply channel ranges from two to five days.

4.61 FIN is also responsible for invoicing the customer and collecting the fees and charges for water and other services provided.

***Existing and Emerging Issues for Operator, Users and Other Interested Parties***

4.62 The most pressing issue in the short to medium term for the irrigator users of the EIDS is to bed down the ownership and operation of FIN.

4.63 There are a number of issues pertaining to the transfer of the distribution infrastructure to FIN from Sunwater that are still being worked through.

4.64 Many of these relate to the type and quantum of charges that Sunwater will be levying on FIN. FIN does not believe that it should bear charges such as the full amount for works due to upgrading dam safety and flood monitoring. FIN would argue that the benefits that these charges will pay for will accrue to many other parties as well as the actual irrigators and so the charges should be considered a cost to the whole community.

4.65 Sunwater will charge FIN some additional costs it incurs such as electricity and insurance. FIN is keen to establish that Sunwater incurs these charges efficiently and is able to accurately measure them so that FIN is only paying for its proper share of the costs.

4.66 Another major area of focus for FIN will be to develop and deploy the staff and administrative resources necessary to carry out the customer focused aspects of its business. These are being developed from scratch and will take some time to operate at 100% efficiency.

***Future direction and development***

*4.67* There are no current plans to increase the capacity of the Fairbairn Dam which would enable additional irrigation areas to be developed.

4.68 In the short to medium term, the focus will be on bedding down the establishment and operation of FIN. This will be combined with incremental progress on improving efficiencies of parameters such as the distribution of water, energy use, transmission losses and utilisation efficiency.

4.69 The overall level of economic activity generated by the EIDS is likely to occur through continuing to refine the mix of crops produced (e.g. increasing the planted area of macadamia trees) and widening the number of users. For example, the Central Highlands Regional Council is reviewing ways in which the dam could be used for more recreational uses and as a tourist drawcard.

## 5. MARKET ANALYSIS OF GRAIN

5.1 Eastern Australia has seen a major shift in end use of grain over the past 15 years away from bulk export towards domestic consumption in beef cattle feedlot rations. Queensland currently has 650,000 head of cattle in feedlots that consume more than 2.5 million MT of grain annually comprising mainly wheat, barley and sorghum.

5.2 Wheat and barley are directly interchangeable in feedlot rations while sorghum requires additional protein to increase its percentage of inclusion. The long-term price trend for grain in Queensland has been driven by feedlot demand taking over from export parity. Supply of grain in Queensland is dependent on rainfall and water supply.

5.3 With Queensland 2018-19 grain production less than 1.5 million MT, the shortage has been covered by importing grain from interstate by road, rail and bulk vessel. Queensland's subtropical weather allows for both summer and winter crops with summer production usually exceeding winter production due to greater rainfall over summer months.

5.4 For this report, estimated road freight rate for bulk grain is $ 10 / MT per 100 KM for 75 – 100 MT load. Actual bulk road freight rate varies depending on market conditions at the time of delivery.

Data sources: ABARE (Australian Bureau of Agricultural and Resource Economics); ABS (Australian Bureau of Statistics)

***Sorghum***

5.5 Sorghum is the largest summer grain crop planted in Queensland and has a low production cost, wide planting window and very low water requirement. Demand for sorghum comes from feedlots, piggeries, poultry, ethanol production (Dalby) as well as export.

5.6 The largest export market is China where sorghum is fermented into an alcoholic spirit (Baijiu). Chinese prefer Australian sorghum over other origins due to low tannin levels. Both export and domestic demand for sorghum are consistent throughout the year.

5.7 There is an active forward trading market and exchange listed trading options. For most growing areas sorghum has a very wide planting window from September to January. The North Queensland planting window is slightly wider running from August to February. Growing time is four to five months, so the earliest harvest starts at the end of December. Most start harvesting in late January.

5.8 Sorghum is grown as far north as Clermont which would have the same planting and harvest window as Hughenden.

5.9 The closest bulk vessel loading port is Mackay, with the closest cost-effective container loading port in Brisbane.

5.10 From Hughenden, demand markets for sorghum would start with nearby feedlots and piggeries. Bulk vessel exports from Mackay would be possible if there was enough production on central Queensland and domestic price was below export parity.

5.11 ***Table 5.1*** summarises the production of sorghum both nationally and in Queensland over the past seven seasons.

**Table 5.1: Sorghum production**

| Year | National Production (T) | Queensland Production (T) | Queensland Share |
|---|---|---|---|
| 2012-13 | 2,229,000 | 1,475,000 | 66% |
| 2013-14 | 1,282,000 | 860,000 | 67% |
| 2014-15 | 2,210,000 | 1,618,000 | 73% |
| 2015-16 | 1,791,000 | 1,177,000 | 66% |
| 2016-17 | 994,000 | 604,000 | 61% |
| 2017-18 | 1,255,000 | 974,000 | 78% |
| 2018-19 | 1,278,000 | 1,001,000 | 78% |

5.12 ***Table 5.2*** summarises sorghum exports over the past five seasons.

**Table 5.2: Sorghum exports (T/year)**

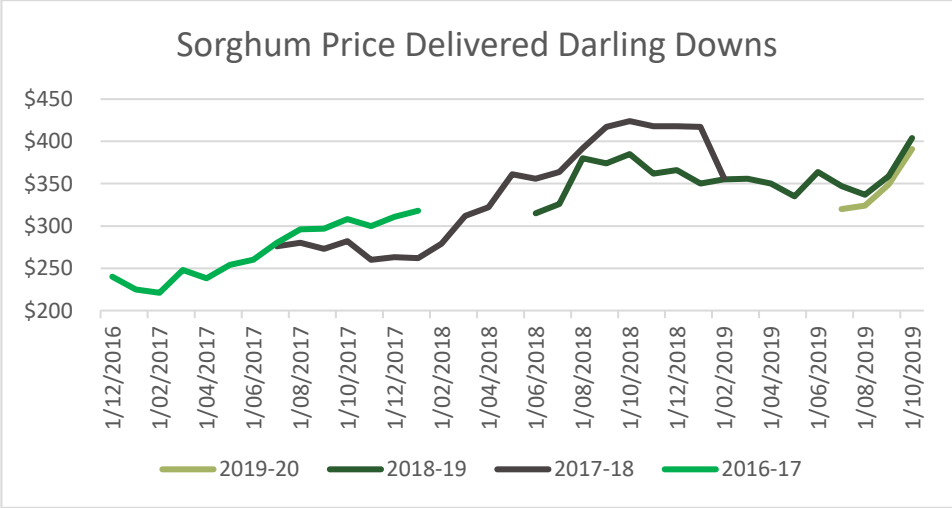
| Year | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|
| **Total Exports** | 349,940 | 1,545,631 | 798,672 | 276,134 | 447,967 |

5.13 The sorghum price chart (***Graph 5.1***) is based on delivered to the Darling Downs, which is the main demand area for feedlots and ethanol production from this grain source.

5.14 Road freight from Hughenden to Darling Downs is approximately $140/T for a road train. Road freight from Hughenden to Mackay is approximately $70/T for delivery to a bulk grain terminal (current estimated export parity price delivered Mackay is $270/T).

5.15 Logistics costs to Delivered Container Terminal (DCT) Brisbane for a packed 20 FT container would be approximately $170/T. This is for transport to Darling Downs or Brisbane and includes a container packer, loading containers and delivery to port.

**Graph 5.1: Sorghum price history**



***Wheat***

5.16 Wheat is a winter crop with a low production cost, a narrow planting window and low water requirement. Harvest in Central Queensland starts in September (about one to two months earlier than New South Wales and southern Queensland).

5.17 Demand for wheat comes from feedlots, piggeries, poultry, flour mills as well as export. Queensland only exports wheat when there is a surplus to domestic demand, and it is usually only high-protein varieties.

5.18 During recent drought years, no wheat has been exported and substantial volumes have been imported from South Australia and Western Australia.

5.19 The closest bulk vessel loading port is Mackay, with the closest cost-effective container loading port in Brisbane.

5.20 From Hughenden demand markets for wheat would start with nearby feedlots and piggeries.

5.21 ***Table 5.3*** summarises the production of wheat both nationally and in Queensland over the past seven seasons.

**Table 5.3: Wheat production**

| Year | National Production (T) | Queensland Production (T) | Queensland Share |
|---|---|---|---|
| 2012-13 | 22,855,000 | 1,614,000 | 7% |
| 2013-14 | 25,303,000 | 1,036,000 | 4% |
| 2014-15 | 23,743,000 | 987,000 | 4% |
| 2015-16 | 22,275,000 | 1,316,000 | 6% |
| 2016-17 | 31,819,000 | 1,502,000 | 5% |
| 2017-18 | 20,941,000 | 765,000 | 4% |
| 2018-19 | 17,298,000 | 400,000 | 2% |

5.22 ***Table 5.4*** summarises wheat exports over the past five seasons.

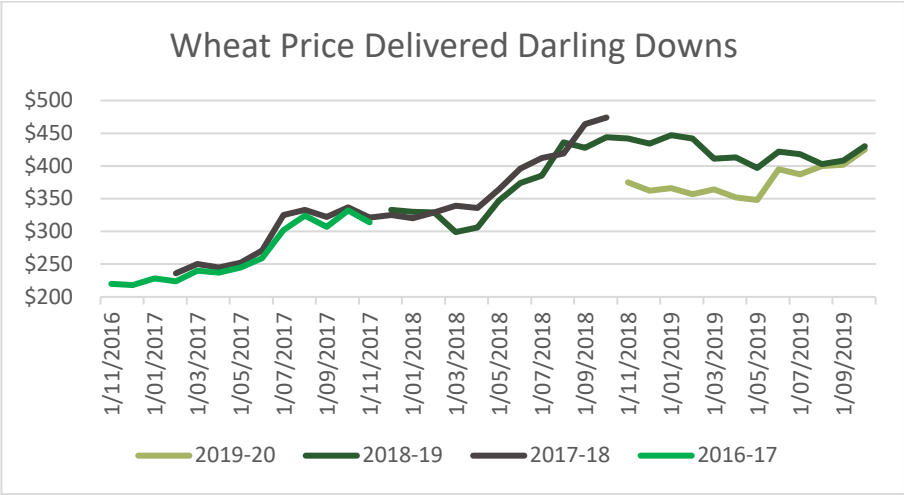
**Table 5.4: Wheat exports (T/year)**

| Year | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|
| **Total Exports** | 18,044,858 | 17,047,173 | 15,986,453 | 21,692,329 | 12,332,819 |

5.23 The wheat price chart (***Graph 5.2***) is based on grain delivered to Darling Downs, which is the main demand area for feedlots.

5.24 Road freight from Hughenden to Darling Downs is approximately $140/T for a road train. Road freight from Hughenden to Mackay is approximately $70/T for delivery to the bulk grain terminal. Logistics cost to Delivered Container Terminal (DCT) Brisbane for a packed 20 FT container would be approximately $170/T. This is for transport to Darling Downs or Brisbane and includes a container packer, loading containers and delivery to port.

**Graph 5.2: Wheat price history**




***Barley***

5.25 Barley is a winter crop with a low production cost, narrow planting window and low water requirement.

5.26 Harvest in central Queensland starts in September (about one to two months earlier than New South Wales and southern Queensland).

5.27 Demand for barley comes from feedlots, piggeries, poultry and brewing.

5.28 The Queensland barley crop is not large enough to provide an export surplus, so all production is consumed domestically.

5.29 During recent drought years, there have been limited volumes imported from Victoria and South Australia.

5.30 From Hughenden demand markets for barley would start with nearby feedlots and piggeries.

5.31 ***Table 5.5*** summarises the production of barley both nationally and in Queensland over the past seven seasons.

**Table 5.5: Barley production**

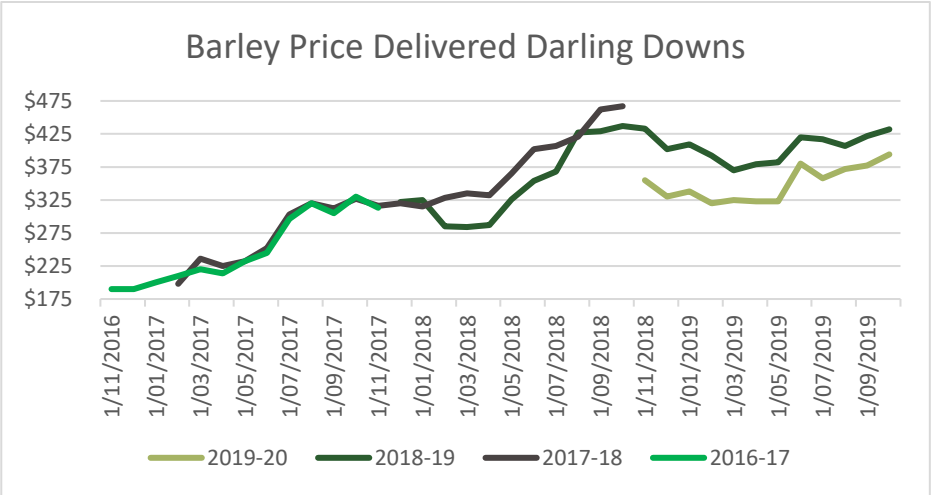
| Year | National Production (T) | Queensland Production (T) | Queensland Share |
|---|---|---|---|
| 2012-13 | 7,471,000 | 1,952,000 | 26% |
| 2013-14 | 9,174,000 | 150,000 | 2% |
| 2014-15 | 8,646,000 | 253,000 | 3% |
| 2015-16 | 8,992,000 | 372,000 | 4% |
| 2016-17 | 13,506,000 | 436,000 | 3% |
| 2017-18 | 9,254,000 | 188,000 | 2% |
| 2018-19 | 8,310,000 | 95,000 | 1% |

5.32 The barley price chart (***Graph 5.3***) is based on grain delivered to Darling Downs, which is the main demand area for feedlots. Road freight from Hughenden to Darling Downs is approximately $140/T for a road train.

5.33 Road freight from Hughenden to Mackay is approximately $70/T for delivery to the bulk grain terminal.

5.34 Logistics cost to Delivered Container Terminal (DCT) Brisbane for a packed 20 FT container would be approximately $170/T. This is for transport to Darling Downs or Brisbane and includes a container packer, loading containers and delivery to port.

**Graph 5.3: Barley price history**




***Corn***

5.35 Corn is a summer crop with a low production cost, wide planting window but medium water requirement.

5.36 Corn is grown in Queensland mostly to supply local animal feed markets, as corn plants provide substantial fibre for silage as well as corn kernels.

5.37 Corn has been exported from Queensland when overall feed grain supply is in surplus. The attraction of Australian corn is that it is free from genetic modification (GM) especially as the major

corn exporting countries carry the risk of GM grain contamination. The main export market for corn from Queensland recently has been the Korean snack food industry.

5.38 ***Table 5.6*** summarises the production of corn both nationally and in Queensland over the past seven seasons.

**Table 5.6: Corn production**

| Year | National Production (T) | Queensland Production (T) | Queensland Share |
|---|---|---|---|
| 2012-13 | 506,000 | 213,000 | 42% |
| 2013-14 | 390,000 | 137,000 | 35% |
| 2014-15 | 495,000 | 183,000 | 37% |
| 2015-16 | 400,000 | 164,000 | 41% |
| 2016-17 | 436,000 | 146,000 | 33% |
| 2017-18 | 387,000 | 115,000 | 30% |
| 2018-19 | 392,000 | 159,000 | 41% |

5.39 ***Table 5.7*** summarises corn exports over the past five seasons.

**Table 5.7: Corn exports (T/year)**

| Year | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|
| **Total Exports** | 52,543 | 41,359 | 39,286 | 65,279 | 32,751 |

5.40 The price feed corn has traded over the past five years is between $300/T and $500/T, free on truck from central Queensland. Delivered Container Terminal (DCT) Brisbane for a packed 20FT would be approximately $170/T. This is for transport to Darling Downs or Brisbane and includes a container packer, loading containers and delivery to port.

***Chickpeas***

5.41 Chickpeas are a winter crop with a low production cost, positive soil conditioning properties but narrow planting window.

5.42 Harvest in central Queensland would start at a similar time to New South Wales which is in September. The South Queensland harvest starts in mid-to-late October at the earliest.

5.43 Almost all Australian chickpea production is exported with major destination markets being sub-continent countries (India, Bangladesh and Pakistan).

5.44 The chickpea market is very volatile due to changing demand conditions. Australia's export opportunities are enhanced when Indian domestic production falls but is frustrated when the Indian Government imposes short-term import restrictions.

5.45 ***Table 5.8*** summarises the production of chickpeas both nationally and in Queensland over the past seven seasons.

**Table 5.8: Chickpea production**

| Year | National Production (T) | Queensland Production (T) | Queensland Share |
|---|---|---|---|
| 2012-13 | 813,000 | 357,000 | 44% |
| 2013-14 | 629,000 | 296,000 | 47% |
| 2014-15 | 555,000 | 201,000 | 36% |
| 2015-16 | 875,000 | 371,000 | 42% |
| 2016-17 | 2,004,000 | 1,150,000 | 57% |
| 2017-18 | 998,000 | 467,000 | 47% |
| 2018-19 | 282,000 | 190,000 | 67% |

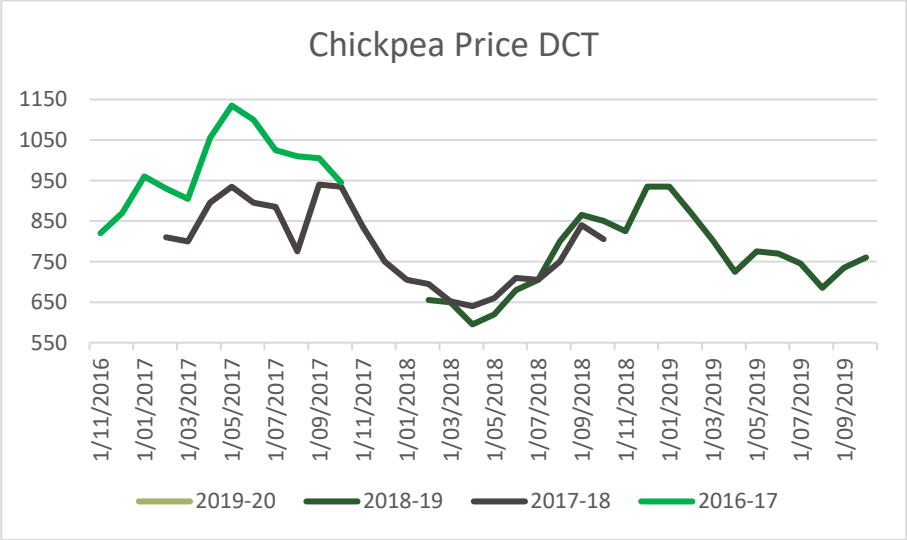
5.46 ***Table 5.9*** summarises chickpea exports over the past five seasons.

**Table 5.9: Chickpea exports (T/year)**

| Year | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|
| **Total Exports** | 612,225 | 1,287,537 | 1,332,939 | 1,878,329 | 511,565 |

5.47 The chickpea price chart (***Graph 5.4***) is based on Delivered Container Terminal (DCT) Brisbane for a packed 20 FT and approximately $170/T. This is for transport to Darling Downs or Brisbane and includes a container packer, loading containers and delivery to port.

**Graph 5.4: Chickpea price history**




***Sunflower***

5.48 Sunflower is a summer crop with a low production cost, wide planting window and medium water requirement.

5.49 Queensland traditionally has been the largest growing state of sunflower, but production has declined over the past 10 years due to drought and lower returns.

5.50 Sunflower is mostly consumed domestically for bird seed, while in the past, sunflower seeds were crushed for vegetable oil and exported. Canola has mostly replaced sunflower in domestic vegetable oil seed production.

5.51 ***Table 5.10*** summarises the production of sunflower both nationally and in Queensland over the past seven seasons.

**Table 5.10: Sunflower production**

| Year | National Production (T) | Queensland Production (T) | Queensland Share |
|---|---|---|---|
| 2012-13 | 44,000 | 12,000 | 27% |
| 2013-14 | 18,000 | 4,000 | 22% |
| 2014-15 | 30,000 | 9,000 | 30% |
| 2015-16 | 25,000 | 9,000 | 26% |
| 2016-17 | 17,000 | 4,000 | 24% |
| 2017-18 | 26,000 | 5,000 | 19% |
| 2018-19 | 23,000 | 9,000 | 39% |

5.52 ***Table 5.11*** summarises sunflower exports over the past five seasons.

**Table 5.11: Sunflower exports (T/year)**

| Year | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|
| **Total Exports** | 296 | 275 | 235 | 132 | 220 |

5.53 The sunflower price has traded over the past five years at prices between $ 700 - 2000/T, free on truck from central Queensland.

5.54 Logistics to Delivered Container Terminal (DCT) Brisbane for a packed 20 FT would be approximately $170/T. This is for transport to Darling Downs or Brisbane and includes a container packer, loading containers and delivery to port.

***Mung Beans***

5.55 Mung Beans are a summer crop with a low production cost, wide planting window, short growth cycle and low water requirement.

5.56 Queensland is the largest production state of mung beans with the majority exported to many Asian countries. However, China and Myanmar also have large crops and compete with Australia.

5.57 Queensland's harvest starts in January to February, with the best export potential from March to June.

5.58 Myanmar has two crops per year with a large harvest window from August to April while China harvests from September onwards.

5.59 Mung beans for export are packed in registered facilities, most of which are located in the Darling Downs and South Burnett districts. Cost-effective container export is through Brisbane.

5.60 ***Table 5.12*** summarises the production of mung beans nationally over the past seven seasons.

**Table 5.12: Mung bean production**

| Year | National Production (T) |
|---|---|
| 2012-13 | 40,000 |
| 2013-14 | 40,000 |
| 2014-15 | 100,000 |
| 2015-16 | 160,000 |
| 2016-17 | 120,000 |
| 2017-18 | 95,000 |
| 2018-19 | 40,000 |

5.61 ***Table 5.13*** summarises mung bean exports over the past five seasons.

**Table 5.13: Mung bean exports (T/year)**

| Year | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|
| **Total Exports** | 29,586 | 116,945 | 153,154 | 113,042 | 108,737 |

5.62 Mung beans have traded over the past five years at prices between $750 - 1,400/T.

5.63 Logistics to Delivered Container Terminal (DCT) Brisbane for a packed 20 FT container would be approximately $170/T. This is for transport to a registered Darling Downs container packer and includes loading containers and delivery to port.

***Soybeans***

5.64 Soybeans are a summer crop with a low production cost, wide planting window, short growth cycle and medium water requirement.

5.65 Soybean production in Australia is relatively small compared to other major producing countries, with most soybeans grown in northern New South Wales and smaller areas in central Queensland.

5.66 With only a small production almost all Australian grown soybeans are consumed in domestic markets by food manufacturers. Australia is a net importer of soybeans and soybean by-products.

5.67 ***Table 5.14*** summarises the production of soybeans both nationally and in Queensland over the past seven seasons.

**Table 5.14: Soybean production**

| Year | National Production (T) | Queensland Production (T) | Queensland Share |
|---|---|---|---|
| 2012-13 | 63,000 | 25,000 | 40% |
| 2013-14 | 32,000 | 7,000 | 22% |
| 2014-15 | 37,000 | 11,000 | 30% |
| 2015-16 | 25,000 | 12,000 | 48% |
| 2016-17 | 31,000 | 8,000 | 26% |
| 2017-18 | 51,000 | 10,000 | 20% |
| 2018-19 | 42,000 | 14,000 | 33% |

5.68 ***Table 5.15*** summarises soybean exports over the past five seasons.

**Table 5.15: Soybean exports (T/year)**

| Year | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|
| **Total Exports** | 3,380 | 3,046 | 3,576 | 3,585 | 2,841 |

5.69 Soybeans have traded over the past five years at prices between $650 - 1,600/T.

5.70 Logistics to Delivered Container Terminal (DCT) Brisbane for a packed 20 FT container would be approximately $170/T. This is for transport to a registered Darling Downs container packer and includes loading containers and delivery to port.

## 6. MARKET ANALYSIS OF OATEN HAY

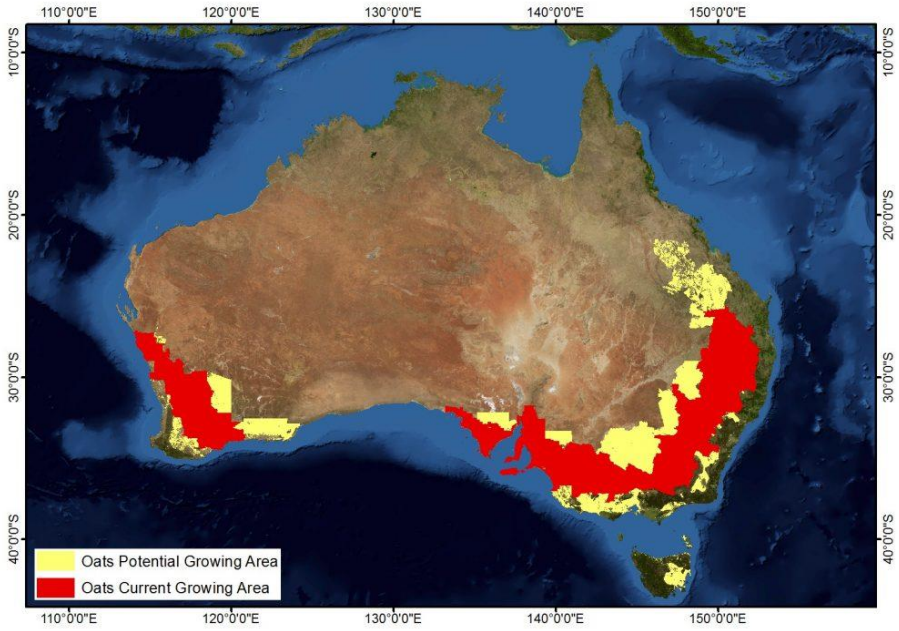
6.1 Cereal hay production in Australia has primarily been driven by the seasonal conditions in terms of failed/frost-affected crops that are bailed for hay and fed domestically to stock. Dependent upon seasonal conditions, there can either be an excess of supply or a deficiency each year.

6.2 Currently a drought is impacting much of Eastern Australia and this has pushed prices up domestically. Prices have increased due to the low fodder reserves and the high demand from animal producers requiring fodder.

6.3 Export tonnes of cereal hay have continued to grow and maintain market share despite the increased competition domestically, driven by tough seasonal conditions. Growers of export hay will continue to focus on the export hay market, rather than the grain market, in order to maintain current and future trading relationships.

6.4 Below is a picture of Australia that indicates where oats are traditionally grown. Due to the hotter conditions in the north, oaten hay is better suited to a cooler climate. Cereal production requires a period of vernalisation (cool temperatures and short-day length) that enables the plant to grow vegetatively for a period before stem elongation and seed set. If unable to achieve this, the plant tends to run to head before generating any real vegetative mass.

**Image 6.1: Current and potential growing regions**




***National supply figures/month***

6.5 There are no real known/documented tonnes of what has been produced or traded between producers domestically. All that can be gauged is that tonnage can fluctuate greatly between seasons due to the reasons explained above.

***National domestic price figures/month***

6.6 The domestic price for hay has been summarised in ***Table 6.1***.

**Table 6.1: Domestic price of hay**

| Month | National | QLD | NSW | VIC |
|---|---|---|---|---|
| Jan-18 | **$182** | $300 | $230 | $136 |
| Feb-18 | **$186** | $307 | $234 | $135 |
| Mar-18 | **$191** | $320 | $243 | $138 |
| Apr-18 | **$196** | $320 | $247 | $139 |
| May-18 | **$211** | $340 | $277 | $142 |
| Jun-18 | **$249** | $365 | $302 | $204 |
| Jul-18 | **$288** | $395 | $341 | $254 |
| Aug-18 | **$368** | $488 | $440 | $313 |
| Sep-18 | **$421** | $550 | $563 | $388 |
| Oct-18 | **$400** | $550 | $516 | $380 |
| Nov-18 | **$383** | $513 | $465 | $375 |
| Dec-18 | **$366** | $483 | $415 | $350 |
| **Average** | **$287** | **$411** | **$356** | **$246** |
| Jan-19 | **$365** | $480 | $424 | $347 |
| Feb-19 | **$361** | $500 | $432 | $340 |
| Mar-19 | **$383** | $556 | $463 | $344 |
| Apr-19 | **$402** | $563 | $483 | $375 |
| May-19 | **$417** | $581 | $498 | $404 |
| Jun-19 | **$437** | $600 | $517 | $421 |
| Jul-19 | **$454** | $630 | $536 | $439 |
| Aug-19 | **$457** | $598 | $562 | $438 |
| Sep-19 | **$397** | $475 | $492 | $394 |
| **Average** | **$408** | **$554** | **$490** | **$389** |

6.7 Domestically, the price is currently quite high due to drought pressures. As a comparison (2017) averaged the following: National - $205, QLD - $296, NSW - $286, VIC - $262

***Export Value & Volume of Australian Hay Exports 18/19***

6.8 Domestic demand has meant that the price per tonne has increased by over more than $100/T to nearly $500/T in recent months (see ***Table 6.2***).

**Table 6.2: Export volumes and price return**

| Month | Total Volume (T) | Total Value | Price/T |
|---|---|---|---|
| Jul-18 | 97,842.00 | $36,655,262.00 | $374.64 |
| Aug-18 | 97,108.58 | $37,420,084.00 | $385.34 |
| Sep-18 | 94,662.74 | $36,428,707.00 | $384.83 |
| Oct-18 | 99,911.12 | $40,564,649.00 | $406.01 |
| Nov-18 | 106,890.83 | $45,700,972.00 | $427.55 |
| Dec-18 | 98,228.28 | $45,814,085.00 | $466.40 |
| Jan-19 | 92,619.45 | $43,667,829.00 | $471.48 |
| Feb-19 | 92,366.62 | $42,956,037.00 | $465.06 |
| Mar-19 | 98,567.37 | $45,915,491.00 | $465.83 |
| Apr-19 | 101,950.49 | $47,663,500.00 | $467.52 |
| May-19 | 91,857.78 | $44,635,717.00 | $485.92 |
| Jun-19 | 91,677.22 | $44,441,568.00 | $484.76 |
| **Total** | **1,163,682.49** | **$511,863,901.00** | **$439.87** |

6.9 For hay export, the main production states are Western Australia (50%), South Australia (25%) and Victoria (22%). Oaten hay production in Queensland for export in effectively non-existent (see ***Table 6.3***).

**Table 6.3: Export hay by state**

| State Production | Tonnes | % |
|---|---|---|
| NSW | 12,980 | 1.1% |
| NT | 16,974 | 1.5% |
| QLD | 4,570 | 0.4% |
| SA | 296,549 | 25.5% |
| VIC | 263,366 | 22.6% |
| WA | 569,243 | 48.9% |
| **Total** | **1,163,682** | **100.0%** |

6.10 The main hay export destinations are China, Japan, Korea and Taiwan. Growth in the dairy industries of these countries are driving the requirement for quality fodder (see ***Table 6.4***).

**Table 6.4: Export hay by major destination**

| Country | Tonnes | % |
|---|---|---|
| China | 265,064 | 23% |
| Japan | 543,256 | 47% |
| Republic of Korea | 170,215 | 15% |
| Taiwan | 87,981 | 8% |
| Other | 97,166 | 8% |
| **Total** | 1,163,682 | **100.0%** |

### ***Supply gap***

6.11 The aim would be to produce oaten hay for the export market to ensure a premium price and stable supply. Any adverse domestic seasonal conditions would ensure a high level of domestic demand, supported by strong prices to match.

6.12 Due to Hughenden's location high up in Northern Queensland, and consistently experiencing warm temperatures, it is unrealistic to consider oaten hay as a viable option for production due to the vernalisation requirements of the plant. Oaten hay is more suited to cooler climates.

6.13 Crops that may suit the warmer conditions that Hughenden experiences and thrive in this type of climate are typically sorghum, corn, soybeans etc. These are crops that would make good quality fodder or grain to supply the surrounding beef industry for intensive feedlots, back grounding or live export shipments.

6.14 Currently, fodder in this area is a scarce commodity due to the ongoing dry conditions.

### ***Logistics/freight costs***

6.15 Local transport (trucks) would need to be sourced to carry the crop to surrounding feedlots or beef producers.

## 7. MARKET ANALYSIS OF FORAGE SORGHUM

7.1 Sorghum can be grown at warmer times of the year and, with adequate water, can generate large tonnages of good quality fodder. It is quite a flexible crop that can either be grazed, made into silage or bailed for hay, if the conditions allow. Again, there is no real documentation of the trade of sorghum forage between growers. Sorghum grain, however, comprises a far larger proportion of the sorghum market for which there is an abundance of trading data.

7.2 Sorghum hay is typically lower quality to that of oaten hay. Sorghum tends to have a higher fibre component (NDF) and lower energy content than oaten hay. As a grazed forage it does, however, have a better nutritional value than that of hay. As the plant matures, the quality deteriorates. Certain varieties do also produce anti-nutritional factors (prussic acid) that can cause animal health issues if not grazed correctly.

7.3 Sorghum does, however, produce high yields under irrigation and does well in hot humid conditions whilst tolerating dry periods. Rather than taking only one cut, sorghum can be grazed/cut a number of times.

7.4 ***Table 7.1*** provides a comparison of sorghum hay versus oaten hay production potential.

**Table 7.1: Sorghum hay compared to oaten hay**

| | Sorghum hay | Range | Oaten hay | Range |
|---|---|---|---|---|
| DM | 90% | | 90% | |
| CP% | 9.40% | (5.5-13%) | 8% | (5.5-11%) |
| Lignin | 5% | | 4.5% | |
| NDF | 61% | (53-68%) | 58% | (52-65%) |
| CF | 31% | | 29% | |
| WSC | 11.50% | (4.5-18%) | 18% | (10-25%) |
| NFC | 19% | (12-27%) | 25% | (19-31%) |
| Ash | 11% | | 7% | |
| **MJME/kg DM** | **7.5** | **6.5-8.5** | **8.5** | **7.5-9.5** |

### ***Domestic Supply/ Pricing***

7.5 Trading would exist between growers, however, potentially at a slightly discounted rate to that of oaten hay under normal seasonal conditions. Currently any available sorghum hay would be priced in the order of $400/T plus due to the seasonal conditions and low fodder reserves. In a normal season, sorghum hay is more likely to be priced around the $200/T mark.

7.6 Please refer to the cereal hay domestic pricing as an indicator of sorghum hay pricing in Queensland.

### ***Export supply/pricing***

7.7 There are no known exports for forage sorghum hay.

### ***Supply gaps***

7.8 If there is the security of water supply and the ability to produce sorghum fodder when there are very little other forage sources available on the market, there will be high (inflated) prices for that product.

7.9 The target market would be the beef feedlots or back grounders that are growing out cattle for the feedlots. Alternatively, forage sorghum could also be used to feed animals prior to export while they are adapting to a pelletised ration.

7.10 In future, certain forage sorghum varieties may have the potential to be grown for the sole purpose of ethanol production rather than being used as a forage for stock.

***Transport logistics***

7.11 Local transport would need to be sourced to move the sorghum hay to the beef feedlots. Transport costs would depend on their locality.

## 8. MARKET ANALYSIS OF COTTON

8.1 World production of cotton averages 26 Million tonnes (114 million bales) annually from 100 countries. Australia produces 700 thousand tonnes (3.2 million bales). China, Bangladesh, Indonesia and Turkey are the world's major importers.

8.2 99% of Australia's raw cotton is exported with 63% going to China, 11% to Indonesia, 8% to Thailand, 5% to Bangladesh and the rest mainly to other Asian countries. Australian cotton is generally regarded as very high quality with low contamination which, therefore, commands a premium in the market.

### ***National Production***

8.3 ***Table 8.1*** summarises the national production of cotton.

**Table 8.1: National cotton production**

| Year | Total Bales | Hectares (HA) | Bales per HA | kg lint/HA |
|---|---|---|---|---|
| 2018/19* | 2,628,638 | 282,000 | 9.3 | 2115 |
| 2017/18 | 4,658,740 | 452,190 | 10.3 | 2337 |
| 2016/17 | 3,874,675 | 472,941 | 8.2 | 1861 |
| 2015/16 | 2,742,700 | 263,339 | 10.4 | 2360 |
| 2014/15 | 2,200,000 | 196,689 | 11.5 | 2610 |

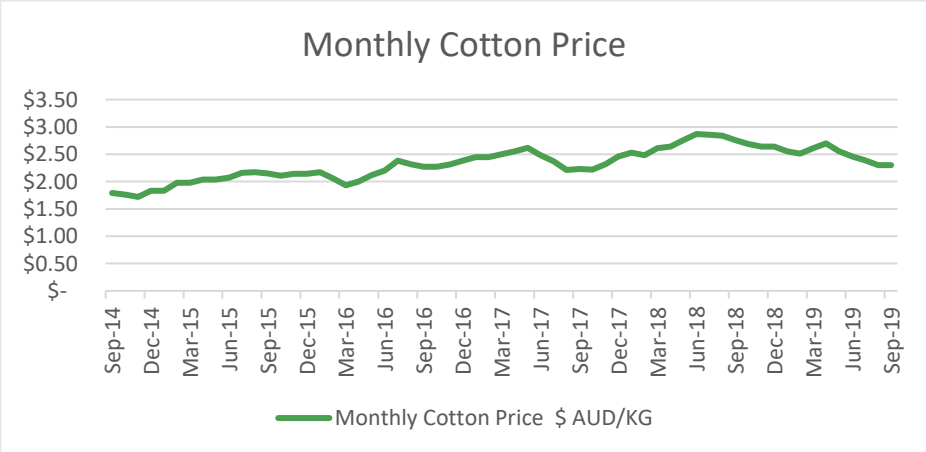
8.4 The industry has developed and evolved significantly over the past 30 years with average production increasing from 6.4 bales/HA in the 1990s to current yields of 9.5 bales/HA in the 2000s.

8.5 This yield increase has come about from improved crop management and varietal advancements while also enabling the industry to expand production outside the traditional region of central western New South Wales to now cover the gulf in the north through to Swan Hill Victoria in the south.

### ***Historic Price***

8.6 The historical cotton price is presented in ***Graph 8.1***, showing and increase in lint price from $1.78/KG up to the current price of $2.49/KG over a five-year period.

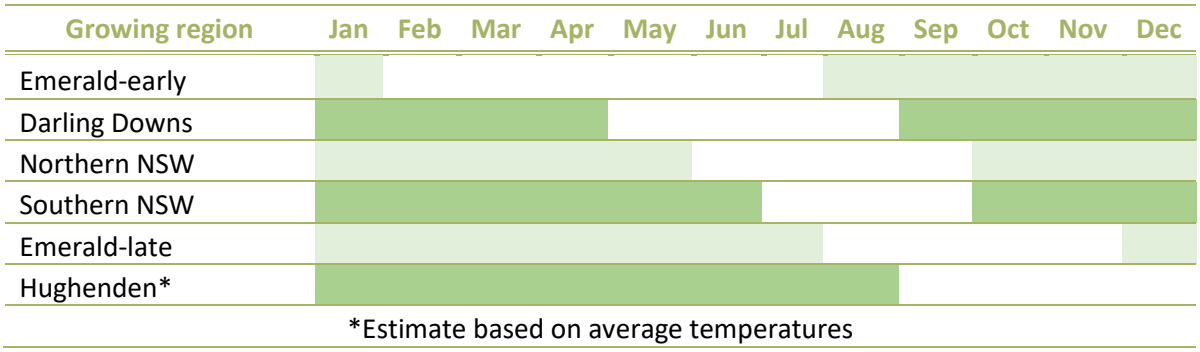
**Graph 8.1: Cotton lint price**



### ***Production Timing***

8.7 With the broad spread of production regions, cotton is potentially produced somewhere in Australia 12 months of the year. ***Image 8.2*** outlines the production regions of Australia.

**Image 8.2: Cotton growing regions and production windows**




*Estimate based on average temperatures

8.8 If cotton were to be grown in the Hughenden region, the expected harvest would be between June and September depending on planting date.

### ***Freight Costs***

8.9 The cost of freight for cotton production where a cotton gin is not nearby can result in additional costs that have a significant impact on profitability. ***Table 8.2*** summarises the cost of freight for round modules on a per bale cost (223 KG).

**Table 8.2: Freight rates for cotton round modules from Hughenden to Emerald**

| | Configuration | Modules | $/km | Distance (KM)** | $/Module | $/Ginned Bale* |
|---|---|---|---|---|---|---|
| **Standard** | Single trailer | 6 | $3.45 | 716 | $411.70 | $96.87 |
| **Standard** | Road train | 12 | $4.51 | 716 | $269.10 | $63.32 |
| **Cotton cartage custom drop deck** | Single trailer | 9 | $3.45 | 716 | $274.47 | $64.58 |
| **Cotton cartage custom drop deck** | Road train | 18 | $4.51 | 716 | $179.40 | $42.21 |
| * based on 4.25 Ginned bales/Module | | | | | | |
| ** based on cartage distance to Emerald Gin | | | | | | |

8.10 The reality is that the cost of freight will reduce the net profit by $45-100/bale, which is likely to make growing cotton in this region uneconomical.

## 9. MARKET ANALYSIS OF AVOCADOS

9.1 The avocado industry has been riding on the back of historic growth and financial prosperity for the past 10 years. A unique combination of industry collaboration, individual grower investment, consumer demand driven by careful investment in social media and traditional TV advertising has seen the twin success of per capita consumption growth (almost double over the decade) and significant growth in dollar returns to the grower.

9.2 Alongside this incredible growth has been investment in research and development to ensure the plantations are maximising their potential and the consumer is rewarded with high-quality fruit that delivers the promise of healthy, nutritious food and a well-accepted "value for money" proposition.

### ***Industry Overview***

9.3 Avocado production occurs mainly in Queensland and Northern New South Wales during the winter, and Western Australia during the summer. The most common varieties of avocado in Australia are Hass and Sheppard.

9.4 The most significant national statistics of the avocado industry for 2018 are summarised in ***Table 9.1***

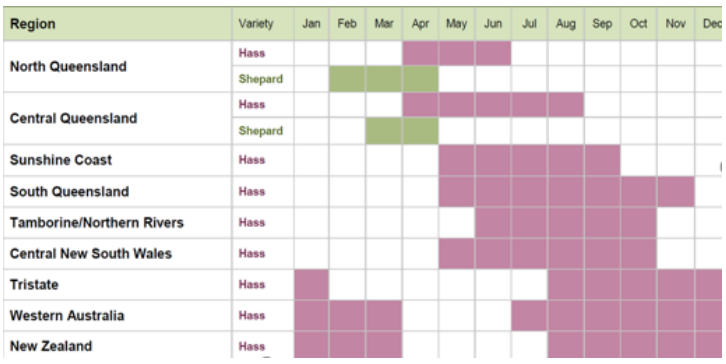
**Table 9.1: National avocado industry statistics**

| Item | Detail |
|---|---|
| Total production | 77,032T |
| Farm gate value | $543.0M |
| Wholesale value | $650.90M |
| Household consumptions (annual) | 3.3KG |

9.5 A consensus is forming throughout the avocado industry that diversification is needed to supplement retail sales and move more fruit into food service, value add and export markets. A high level of confidence exists that these goals will be achieved over the next three to five years by harnessing existing cohesion and maintaining clear communication strategies amongst growers about the opportunities available to market their entire crop.

9.6 Australia has a 365-day supply of avocados with three major regions harvesting in succession to ensure year-round availability. The Atherton Tablelands starts in February, followed by Bundaberg in April and finally South West Western Australia in September. See the matrix below in ***Image 9.1***.

**Image 9.1: Avocado supply by region**

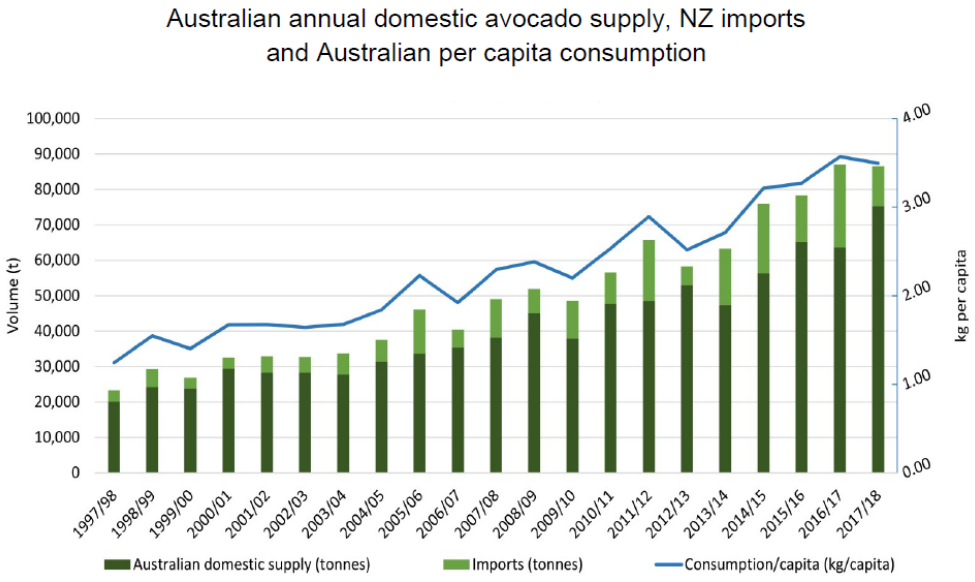


9.7 Hughenden is expected to stradle the North Queensland and Central Queensland supply with harvest estimated to commence in March and continue until August. This positions potential supply quite well for the Northern Hemisphere summer season particularly if access to Japan is granted (currently in negotiations). This period of supply promises significant export trading opportunities.

***Commodity Price Review***

9.8 While the avocado category has performed exceptionally well to date, production growth as per the cropping statistics provided by AAL below (see ***Graph 9.1***) has identified that renewed focus on per capita consumption growth and diversification in value add and export opportunities is now required.

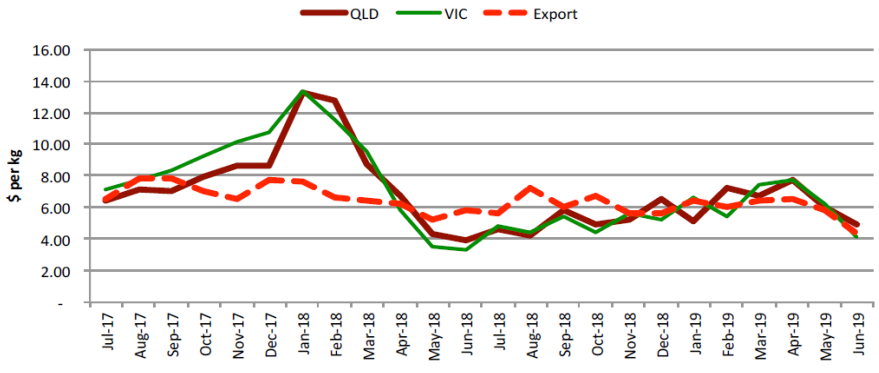
**Graph 9.1: Avocado industry growth statistics**




*Sources: Infocado, IHS Global Trade Atlas (2017) and population based on ABS data*

9.9 Values at wholesale markets, as outlined below in ***Graph 9.2***, show the effect of growth in harvest volumes, however, it also highlights the "value for money" perception by the consumer who demand avocados be part of their fruit bowl, despite persistent high values.

**Graph 9.2: Avocado market price**




**Source: AUSMARKET CONSULTANTS, ITC Trademap; Fresh Intelligence analysis**

9.10 Export price returns generally don't match domestic figures but exported fruit acts as a pressure valve on domestic supply by moving excess fruit to offshore consumers. Export strategies will need to align with global market values which still present attractive ROIs.

***Logistics***

9.11 Cool chain disciplines are fundamental to the success of all horticultural products. This fact is taken for granted by consumers, but those stakeholders committed to the successful supply do so by managing the "cool chain". Cool storage infrastructure investment in any horticultural enterprise forms a critical part of the pathway to success. Multiple temperature zones may be required if a mix of fruit or vegetable crops are being produced in the same region. Forced air cooling for immediate temperature control after harvest begins the journey. Storage capacity consistent with projected volumes and temperature-controlled loading areas form a secure chain from paddock to plate.

9.12 Hughenden is 382KM west of Townsville on the A6 Flinders Highway. This is four hours from the A1 Pacific Highway. Primary Connect currently quote $220 per pallet for chiller freight from Hughenden to Brisbane which compares to $190/$200 from Mareeba to Brisbane.

9.13 Logistical linkages that maintain optimum temperature in road transport from the Hughenden region to the markets, chain store distribution centres or port of export, are readily available and several companies can deliver these services including GPS tracking and live temperature monitoring in transit.

***Summary and recommendations***

9.14 With exponential growth being recorded in Asia, India and the Middle East, conditions are right for investment in further expansion of Australian avocado production with a primary focus on international markets. On October 9, 2019, Fresh Plaza reported an increase of 72% year on year on the sale of avocados to China retailers.

9.15 All the elements for success such as land, water, growing expertise, industry support and a wholesome product, whose demand is far from being satisfied, could be assembled to put the investment proposition within reach.

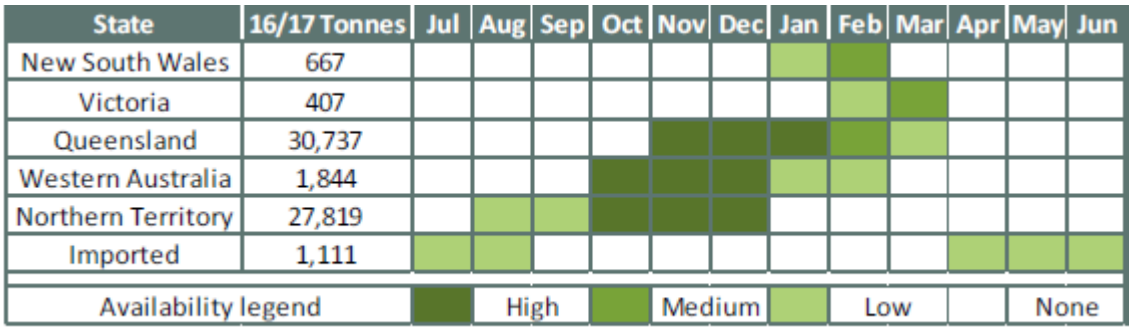
## 10. MARKET ANALYSIS OF MANGOES

10.1 The Australian mango category is breaking new ground as we witness the rise of PVR varieties with closed loop contracts for growing and marketing. Calypso and Honey Gold have in recent years changed the traditional marketing paradigm. This certainly applies to the Calypso variety, which has overtaken Kensington Pride (KP) as the top seller in supermarkets. The attributes of the Calypso tree such as smaller frames, consistent heavy yields and consistent medium sizing makes the "Calypso package" attractive to growers.

***Industry Overview***

10.2 Mango production occurs mainly in the Northern Territory and Queensland, with limited production in New South Wales, Western Australia and Victoria (see ***Image 10.1***). The most common varieties of mango in Australia are the Calypso, Kensington Pride (KP), Honey Gold and R2E2.

**Image 10.1: National mango supply**




*Source: AMIA*

10.3 The most significant national statistics of the mango industry for 2018 are summarised in ***Table 10.1***

**Table 10.1: National avocado industry statistics**

| Item | Detail |
|---|---|
| Total production | 83,351T |
| Farm gate value | $204.0M |
| Wholesale value | $209.8M |
| Household consumptions (annual) | 2.9KG |

10.4 The good news about the mango industry is that it is growing both domestically and internationally. Scan data shows solid penetration into Australian households and export sales are on the rise. The R2E2 variety has enjoyed solid growth in export.

10.5 The smaller Calypso, KP and Honey Gold varieties have a more attractive price per mango in the Australian marketplace compared to the much larger R2E2 which is becoming the focus for export markets.

10.6 Australia has eight months domestic supply of mangoes with four major regions harvesting in succession to ensure full season availability. Darwin commences in July, followed by Katherine in October, Bowen/Burdekin in November and the Atherton Tablelands in December.

10.7 ***Table 10.2*** outlines the Atherton Tablelands season which is estimated to mirror the Hughenden region for supply by variety.

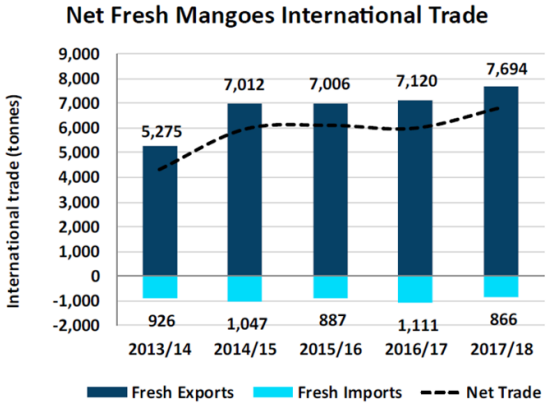
**Table 10.2: Expected mango supply from the Hughenden region**

| Week Ending (Fri) | 15-Nov | 22-Nov | 29-Nov | 06-Dec | 13-Dec | 20-Dec | 27-Dec | 03-Jan | 10-Jan | 17-Jan | 24-Jan | 31-Jan | 07-Feb | 14-Feb | 21-Feb | 28-Feb | 06-Mar | 13-Mar | 20-Mar |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KP Class 1 | 0.4% | 0.5% | 2.4% | 9.0% | 16.7% | 22.2% | 23.4% | 19.6% | 5.7% | 0.2% | | | | | | | | | |
| R2E2 Class 1 | | 2% | 0% | 3% | 3% | 30% | 40% | 10% | 12% | 1% | | | | | | | | | |
| Calypso Class 1 | | | | | | 13.3% | 16.7% | 20.0% | 20.0% | 16.7% | 13.3% | | | | | | | | |
| Honey G Class 1 | | | | | | | 25.2% | 10.3% | 0.0% | 9.7% | 25.8% | 19.4% | 9.6% | | | | | | |
| Keitt Class 1 | | | | | | | | | 8.0% | 9.1% | 15.8% | 10.2% | 6.1% | 18.8% | 0.0% | 0.0% | 0.9% | | |
| other Class 1 | | | | | | | 3.0% | 0.0% | 0.0% | 1.7% | 0.0% | 0.0% | 10.0% | 23.4% | 26.8% | 15.1% | 10.0% | 10.0% | |

## ***Commodity Price Review***

10.8 Australia is a net exporter of fresh mangoes with exports growing in recent years. For the year ending June 2018, Australia exported 7694 tonnes. The exports and imports over the past five financial years are profiled in ***Graph 10.1*** below, where imports are counted as negative tonnes.

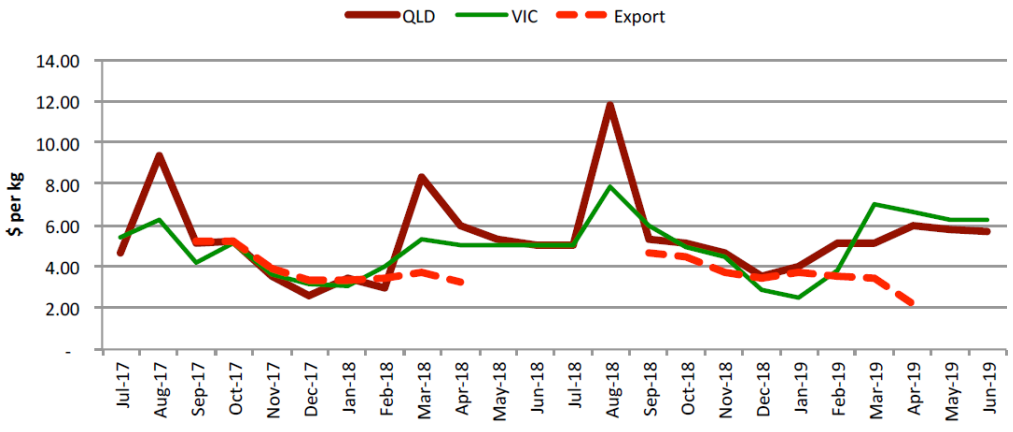
**Graph 10.1 Export and import mango trade**




*Source: GTA*

10.9 Domestic values are driven by seasonal factors in local supply. As seen in ***Graph 10.2***, consistent low prices in Dec/Jan are related to reduced demand as well as supply. Winter price spikes are the result of very small volumes of imports selling at high prices.

**Graph 10.2: Mango market price**




**Source: AUSMARKET CONSULTANTS, ITC Trademap; Fresh Intelligence analysis**

10.10 Export values generally follow domestic trends, except for high blush fruit destined for China. With the approval of Vapour Heat Treatment as an acceptable treatment for mangoes into China, Japan and South Korea, further plantings are taking place to meet growing demand.

10.11 Cool chain disciplines are fundamental to the success of all horticultural products. This fact is taken for granted by consumers, but those stakeholders committed to successful supply do so by managing the "cool chain". Cool storage infrastructure investment in any horticultural enterprise forms a critical part of success. Multiple temperature zones may be required if a mix of fruit or vegetable crops are being produced in the same region. Forced air cooling for immediate temperature control after harvest begins the journey, storage capacity consistent with projected volumes and temperature-controlled loading areas form a secure chain from paddock to plate.

10.12 Hughenden is 382 KM west of Townsville on the A6 Flinders Highway. This is four hours from the A1 Pacific Highway. Primary Connect currently quote $220 per pallet for chiller freight from Hughenden to Brisbane which compares to $190/$200 from Mareeba to Brisbane.

***Summary and recommendations***

10.13 With a similar anticipated production to the Atherton Tablelands, the Hughenden region may have a part to play in the domestic market, however, the growth in mango sales into Japan, Korea and China are undeniable, with strong demand for the R2E2 variety.

10.14 Further plantings for export supply are under way and if the Hughenden region aligns with the required conditions for mangoes, the export markets provide promising potential.

## 11. MARKET ANALYSIS OF CITRUS

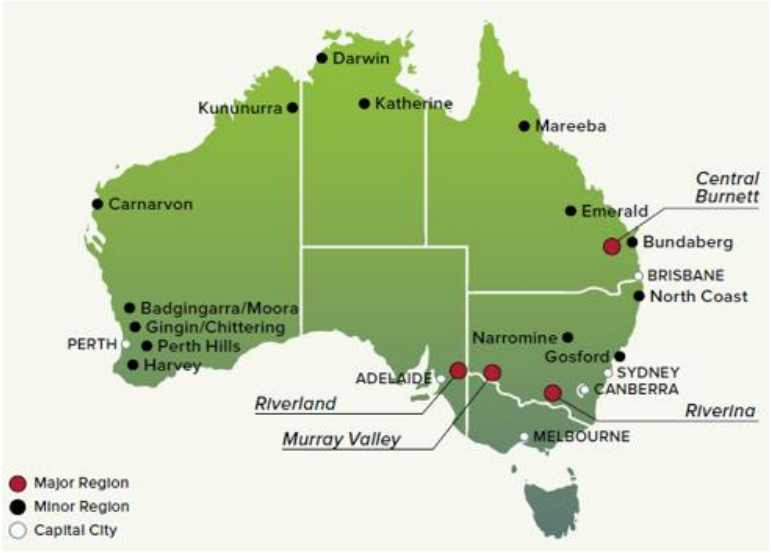
11.1 The Australian citrus industry is a small player in the global citrus market but is a major horticulture industry for Australia. The Australian production of citrus in the 2017/2018 season is summarised in ***Table 11.1***. These figures include oranges, mandarins, lemons, limes and grapefruit. Citrus juice products, juice in particular, are a major produce for many citrus growers.

**Table 11.1: National citrus production**

| Item | Detail |
|---|---|
| Total production | 746,297T |
| Farm gate value | $797.8M |
| Wholesale value | $533.0M |
| Household consumptions (annual) | 12KG |

11.2 Citrus is grown by about 1500 growers all over mainland Australia on more than 25,000 HA of orchards. It is noteworthy that Queensland and Western Australia are expected to produce 34% and 71% more fruit respectively by 2025. However, orange production in Queensland is very limited due to climatic conditions. ***Image 11.1*** identifies where citrus is currently grown in Australia.

**Image 11.1: Citrus production regions in Australia**




***<u>Mandarin, Lemon & Lime focus</u>***

11.3 The national production of mandarins, lemons and limes is summarised in ***Table 11.2***.

**Table 11.2: National production in 2018**

| Item | Production (T) | Value ($) |
|---|---|---|
| Mandarin | 159,598 | $305.8M |
| Lemon & Limes | 47,950 | $102.3M |

11.4 Lemon and lime production has been rising in Australia over the past few years. Further production increases are predicted with 47% for lemons and 67% for limes by 2025. The citrus industry remains the third largest exporter of horticulture products behind nuts and table grapes.

11.5 The two citrus categories favouring the Hughenden region would be lemons and mandarins. Both are in expansion due to export and domestic demand (in that order). Mandarins, in particular, are Plant Variety Right driven which opens marketing channels into overseas and domestic arrangements.

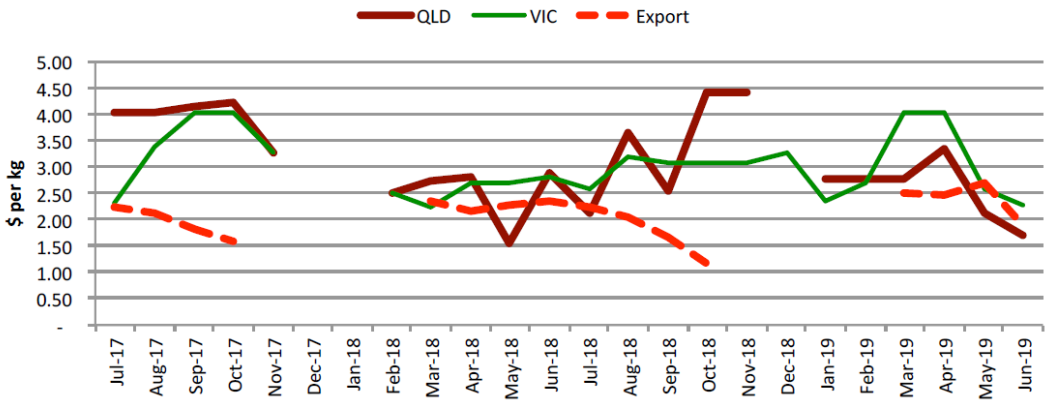
11.6 Cool chain disciplines are fundamental to the success of all horticultural products. This fact is taken for granted by consumers, but those stakeholders committed to successful supply do so by managing the "cool chain". Cool storage infrastructure investment in any horticultural enterprise forms a critical part of success. Multiple temperature zones may be required if a mix of fruit or vegetable crops are being produced in the same region. Forced air cooling for immediate temperature control after harvest begins the journey, storage capacity consistent with projected volumes and temperature-controlled loading areas form a secure chain from paddock to plate.

11.7 Hughenden is 382 KM west of Townsville on the A6 Flinders Highway. This is four hours from the A1 Pacific Highway. Primary Connect currently quote $220 per pallet for chiller freight from Hughenden to Brisbane which compares to $190/$200 from Mareeba to Brisbane.

11.8 Logistical linkages that maintain optimum temperature in road transport from the Hughenden region to the markets, chain store distribution centres or port of export, are readily available and several companies can deliver these services including GPS tracking and live temperature monitoring in transit.

11.9 The market price profiles in ***Graph 11.1*** indicate mandarins being represented by a number of varieties over the season with more consistent supplies from Victoria. Low values in winter reflect the heavy supply of Queensland Imperials.

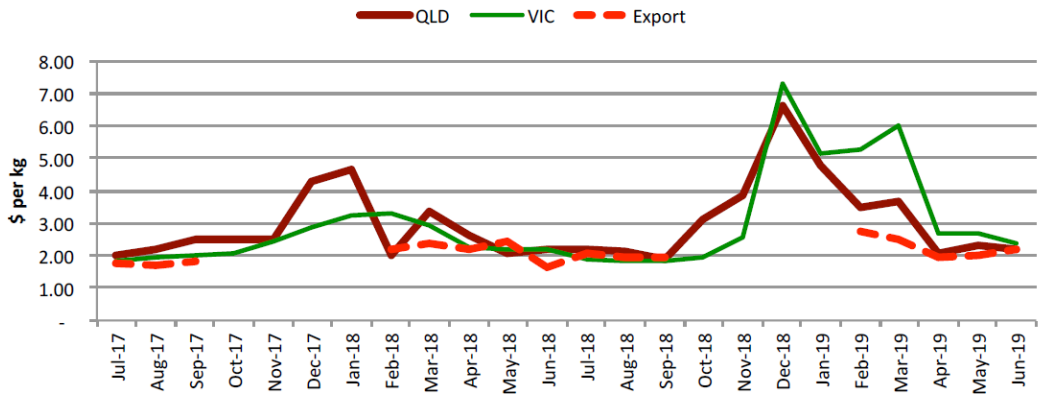
**Graph 11.1: Mandarin market price**




**Source: AUSMARKET CONSULTANTS; Fresh Intelligence analysis**

11.10 ***Graph 11.2*** clearly demonstrates that lemons are a consistent performer with a 365-day supply. Export growth opportunity is also evident where export values mirror domestic values but present greater opportunities for production growth.

**Graph 11.2: Lemon market price**




**Source: AUSMARKET CONSULTANTS; Fresh Intelligence analysis**

## ***Summary and recommendations***

11.11 Growth in mandarin and lemon demand in our export market provides a solid platform for potential supply of these categories in the Hughenden region.

11.12 There appears little doubt Australia is well positioned to supply demand from the Middle East to India and on to the wider Asian markets. Greenacre investment is a challenge and an experienced partner is required to get the fundamentals right both in terms of farm set-up, infrastructure investment and to drive export development hopefully in an established network.

## 12. MARKET ANALYSIS OF TABLE GRAPES

12.1 Table grapes are produced in all Australian states with the majority being supplied from Victoria. Other regions that produce grapes are mostly focused on extending the season by producing earlier or finishing later.

12.2 Yield performance for northern table grapes tends to be lower per hectare than in more traditional regions but the additional market price typically makes up the difference.

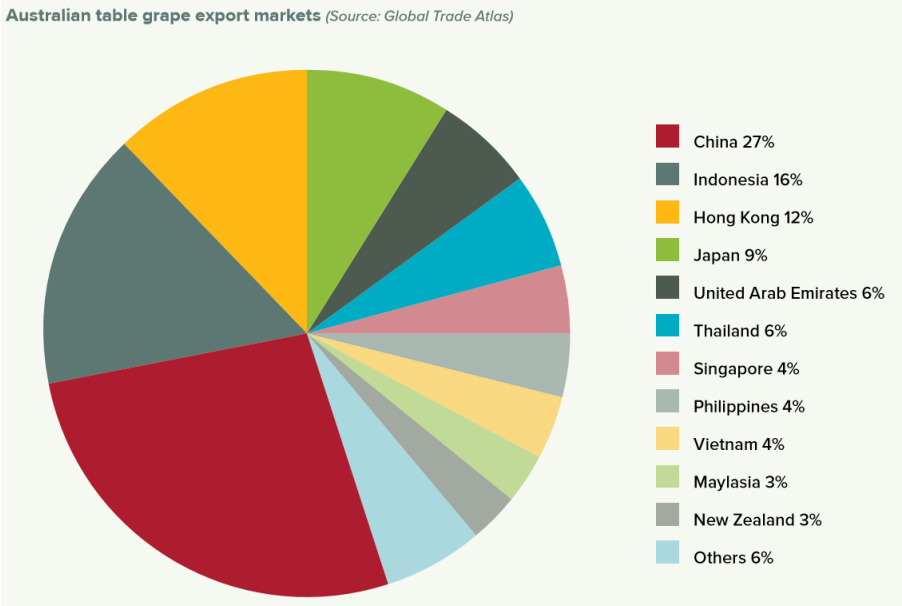
12.3 The national production data for 2018 are summarised in ***Table 12.1.***

**Table 12.1: National table grape supply**

| Item | Detail |
|---|---|
| Total production | 177,416T |
| Farm gate value | $543.7M |
| Wholesale value | $313.7M |
| Household consumptions (annual) | 3.3KG |

12.4 The growth in exports is attributed to new markets such as China, Japan and the Philippines, as well as increased trade in existing markets such as Indonesia and the United Arab Emirates (see ***Chart 12.1***).

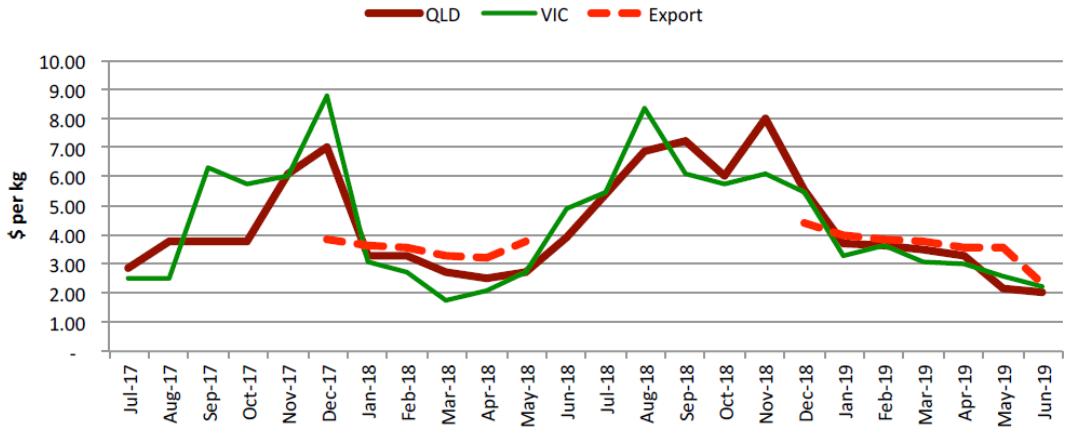
**Chart 12.1: Export market opportunities**




***<u>Review of domestic and export values</u>***

12.5 Production in Victoria starts in late December and runs to late April/early May and this is reflected in the market price in ***Graph 12.1***. The shoulder months in this region present the opportunity for additional production with variety selection the largest challenge.

**Graph 12.1: Table grape market price**




**Source: AUSMARKET CONSULTANTS; Fresh Intelligence analysis**

12.6 The uptake for exports among Queensland growers has yet to be realised as they face the following export disadvantages:

- Menindee Seedless, a major variety in this region, is not commonly exported and has not been extensively trialled in export markets.
- Menindee Seedless shelf-life is shorter than other varieties and is understood not to travel well by sea. Vine yield varies depending on the growing region.
- In Sunraysia and Western Australia, growers harvest an average yield of 20 to 25 KG per vine, while Queensland has a yield of 5 to 10 KG.
- Queensland would need high-value markets to provide comparable returns to the prices they enjoy in the domestic market.

## 13. STAGE TWO CROP OPPORTUNITY LISTS

13.1 The first agronomic report for this proposed irrigation scheme considered a wide range of cropping opportunities with a focus on identifying those that would be suitable based on the following criteria:

- Climatic conditions
- Soil types
- Gross margin analysis
- Proximity to markets
- General suitability to the region

13.2 The second stage to refining this list further was to assess the region-suitable crops with respect to:

- Fit to regional requirements (support for other industries)
- Production window fitting consumer demand
- Domestic demand and price return
- Export opportunity and price return
- Logistics management

### ***Crops considered in the market and logistics review***

13.3 The following crops were considered in the review with a focus on production supply fitting a demand window, price return opportunity and logistics review:

- Avocados
- Mangoes
- Citrus
- Table grapes
- Cotton
- Irrigated grains
- Hay production
- Forage crops

### ***Final crop selection***

13.4 The following crops are considered viable options for the proposed irrigation scheme.

***Avocados***

- Expected production window: March – August
- Premium grade
    - Expected domestic market price: $4 – 7/KG
    - Export market price: $5 – 6/KG

***Mangoes***

- Expected production window: Mid-November – Mid-February (variety specific)
- Premium grade
    - Expected domestic market price: $3 – 4/KG
    - Export market price: $3 – 4/KG

***Citrus (Lemons)***

- Expected production window: January – March
- Premium grade
    - Expected domestic market price: $2 – 4.50/KG
    - Export market price: $2 – 2.50/KG

***Citrus (Mandarins)***

- Expected production window: March – April
- Premium grade
    - Expected domestic market price: $2 – 3/KG
    - Export market price: $2 – 2.50/KG

***Cereal Grains***

- Grains would be mostly used locally for livestock feed
- Sorghum: $325 - 425/T
- Wheat: $350 - 450/T
- Barley: $325 – 425/T
- Corn: $300 – 500/T

***Hay and Fodder***

- Domestic hay: $246 – 411/T
- Export hay: $440/T
- Fodder crops for silage: $100 – 200/T

13.5 The following crops are not considered viable options for the proposed irrigation scheme:

***Cotton***

- Cotton can be produced in the region
- Cost of freight with no local gin will be significant
- If considered a crop as part of the cropping strategy, scale of operation is unlikely to interest a significant grower or the development of a local gin

***Table Grapes***

- Table grapes can grow in the region
- Suitable varieties only suit domestic market
- Domestic market opportunity for the region is 50-100 HA total
- The 15 Mile Irrigated Agricultural Development project is expected to be completed well before the HIPCo Irrigation project and will meet current domestic market demands. Additional table grape plantings would flood this market dropping the price return and therefore viability. If the 15 Mile project does not proceed, then consideration could be given to including table grapes into the cropping strategy.

***Grains and Oil Seeds***

- Other crops considered in the market and crop potential list but not considered in the final crop selection include:
    - Chickpeas
    - Sunflower
    - Mung beans
    - Soybeans
- These crops will grow in the region with proven success.
- Prioritising locally consumed livestock feed grains, which excludes these crops, was a deciding factor in these crops being removed from the final list.

## 14. PRODUCTION PROGRAMS BASED ON WATER VOLUMES

### ***Water Volumes***

14.1 All specific data and allocation details have been provided by Engeny Water Management.

14.2 Engeny is a specialist engineering consultancy firm providing water management and water infrastructure design services.

14.3 Engeny have provided both annual water supply data as well as modelling of total scheme volumes for 121 years (1890 – 2011).

14.4 ***Table 14.1*** summarises the total available water based on an 80% reliability factor and only supplying low security water allocations.

**Table 14.1: Available water volumes for 80% reliability**

| FSV | Diversion Rate | Environmental Flow | Monthly Reliability | Nominal Yield | Avg Annual Yield |
|---|---|---|---|---|---|
| GL | M3/S | M3/S | % | GL/YR | GL/YR |
| 190 | 250 | 8 | 80 | 84 | 70 |

14.5 For an irrigation scheme to provide water to both perennial and annual crops, a supply model that supports different allocation security for water volumes is necessary.

14.6 ***Table 14.2*** summarises the total available water based on a supply model that provides both medium and low security allocations.

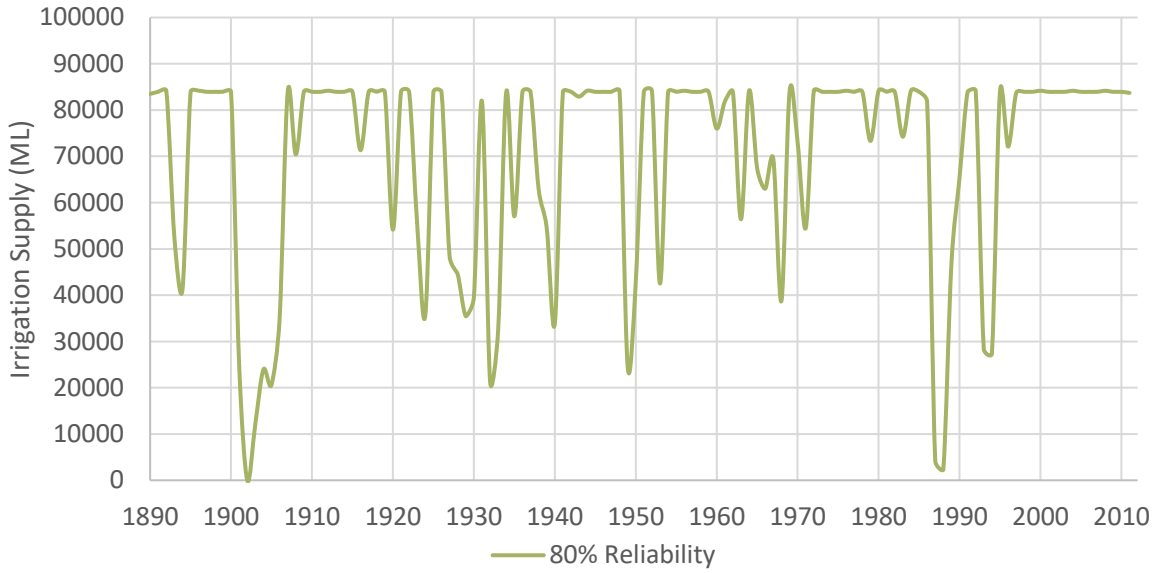
**Table 14.2: Available water volumes for medium and low security allocations**

| | Total Irrigation Supply | Medium Security Supply | Low Security Supply |
|---|---|---|---|
| Max Supply (GL/YR) | 70 | 30 | 40 |
| Annual supply reliability | 48% | 86% | 48% |
| Average supply volume | 57.5 | 28.4 | 29.1 |
| average supply reliability | 82% | 95% | 73% |

*Allocation Volumes*

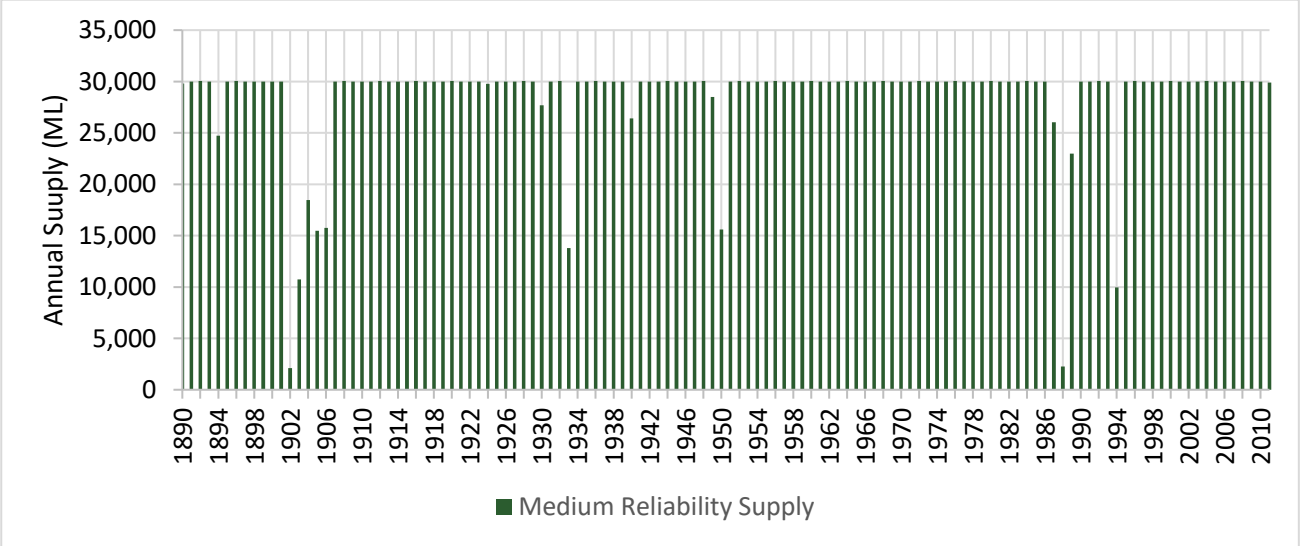
14.7 ***Graph 14.1*** demonstrates the available water for the 80% reliability of supply providing a maximum allocation of 84GL/YR, as modelled over 121 years.

**Graph 14.1: 80% reliability graph from 1890 – 2011**

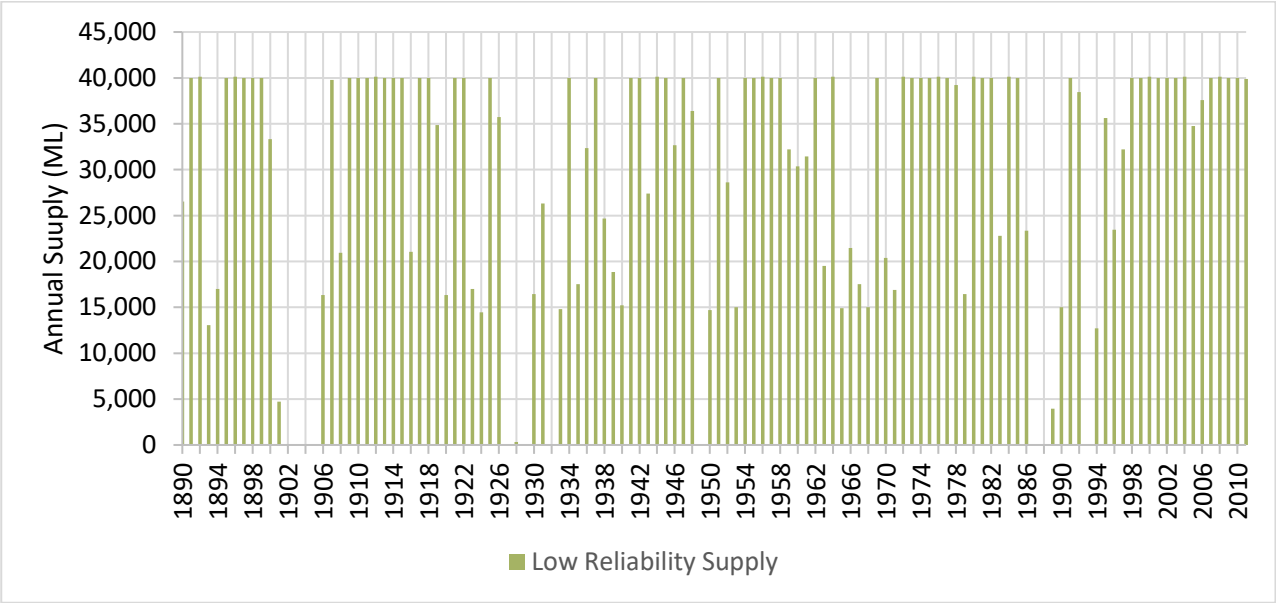



14.8 ***Graph 14.2 and 14.3*** demonstrate the available water for the medium and low priority allocation model, providing a maximum allocation of 70GL/YR, as modelled over 121 years.

**Graph 14.2: Medium priority allocation model reliability graph from 1890 – 2011**



**Graph 14.3: Low priority allocation model reliability graph from 1890 – 2011**




***Water Consumption and Crop Demands***

14.9 Based on the crop selection in ***Section 13***, following are the annual water volume requirements (See ***Table 14.3***).

**Table 14.3: Summary of annual water use by selected crop**

| Crop | Annual Water Use (ML/HA) |
|---|---|
| Avocados | 16 |
| Mangoes | 10 |
| Citrus | 16 |
| Sorghum | 7 |
| Wheat | 6 |
| Barley | 6 |
| Corn | 7 |
| Hay Forage Sorghum | 8 |

***Diversified Agricultural Strategy (Scenario One)***

14.10 The diversified crop strategy relies on a range of crops and agricultural industries to be supported or created in the region to provide a diversity of agricultural output and market access. This approach will assist in reducing market volatility in any single category having a significant impact on the region in any given year.

***Crop Areas***

14.11 The annual water use for each crop was researched using the following resources:

- Government department data
- Industry specific data
- Grower current data

14.12 The consultants used to provide the information relating to crop water use in the first report were chosen based on their industry knowledge as well as being actively engaged with growers to ensure that the broad data sets used were grounded in real crop requirements.

14.13 The water use figures would be considered slightly conservative (on the high side of crop demand) to ensure that water demand is not the limiting factor to crop performance.

14.14 The water demand figures consider the following scenarios:

- Ability to achieving maximum yield potential for each crop
- Average or less annual rainfall
- A situation where the dam fills from a single rain event and minimal rain throughout the year
- The potential need for cooling/misting for avocados and citrus
- The latest technology in irrigation design, delivery system, monitoring and management

14.15 ***Table 14.4*** summarises the planted area and annual water volumes required for the perennial horticulture crops.

**Table 14.4: Summary of perennial horticulture crops**

| Crop | Total Planted Area (HA) | Annual Water Use (ML/HA) | Total Water Requirement (GL) |
|---|---|---|---|
| Avocados | 900 | 16 | 14 |
| Mangoes | 600 | 10 | 6 |
| Lemons | 300 | 16 | 5 |
| Mandarin | 300 | 16 | 5 |
| **Total** | **2100** | | **30** |

14.16 The region has a dominant grazing industry that is challenged by dry wet seasons or significant droughts on an irregular basis that creates livestock management and managing stocking levels challenging. Some graziers in the Flinders Catchment are utilising or working on strategies for producing hay or grains from either local or coastal irrigation operations to enable greater resilience during tough climatic conditions.

14.17 Graziers would use the hay/grain/forage production to either feed directly to cattle in open grazing or in intensive feedlots where daily feed rations can be calculated and delivered to achieve a desired daily live weight gain.

14.18 The critical factor in being able to implement this practice is to have access to irrigated land to more reliably produce hay and grains.

14.19 Forage crops used to produce silage are more suited to being produced near the feedlot and can be grown reliably in most years in a dryland situation and stored until required. Since silage can be stored for more than 10 years, higher production in wet years can be effectively stored for use in dry years where dryland crop production may be limited.

14.20 If considering an average grazier's requirements for irrigated hay and grain production, we have assumed an irrigated area of 200 HA would be an ideal lot size. Within each lot, approximately 70% could be under-irrigated pasture for hay production with the remaining 30% growing either summer or winter grains. The full 30% of land allocated to grain crops could be grown under a summer grain crop.

14.21 With average rainfall, the summer grain crops would not use the 30% water allocated. The remaining allocation (will vary from year to year based on rain received) could be used to grow an area of winter cereal that could also be used for animal feed. A conservative estimate of one-third of the grain production area could be expected to grow a winter cereal in a normal year.

14.22 This strategy of grain production results in the potential for 220 HA of cropping to occur each year on each 200 HA property, assuming full water allocation and average rainfall.

14.23 ***Table 14.5*** summarises a grazier support lot for hay and grain production with area and annual water volumes required.

**Table 14.5: Summary of grazier support lot**

| Crop | Total Planted Area/YR (HA) | Annual Water Use (ML/HA) | Total Water Requirement (GL) |
|---|---|---|---|
| Hay | 140 | 8 | 1.1 |
| Sorghum Grain | 30 | 7 | 0.2 |
| Wheat/Barley Grain | 20 | 0 | 0.0 |
| Corn | 30 | 5 | 0.2 |
| **Total** | **220** | | **1.5** |

14.24 With a total of 40 GL of potential available water as low security, ***Table 14.6*** summarises the total opportunity for grazier lots for hay and grain production.

**Table 14.6: Summary of grazier support lots**

| Total Low Priority Water (GL) | Water Requirement/Lot (GL) | Total Lots | Area/Lot (HA) | Total Area (HA) |
|---|---|---|---|---|
| 40 | 1.5 | 27 | 200 | 5,405 |

14.25 ***Table 14.7*** summarises total area developed into irrigated agricultural production covering both the perennial horticulture and grazier support lots.

**Table 14.7: Total developed agricultural production**

| Operation | No Lots | Area of Lot (HA) | Total Area (HA) |
|---|---|---|---|
| Avocados | 1 | 900 | 900 |
| Mangoes | 1 | 600 | 600 |
| Lemons | 1 | 300 | 300 |
| Mandarin | 1 | 300 | 300 |
| Grazier Support Lot | 27 | 200 | 5,405 |
| **Total** | | | **7,505** |

### ***Grazier Support Agricultural Strategy (Scenario Two)***

14.26 As an alternative to the diversified agricultural cropping model in Scenario One, we were requested by the HIPCo Board to provide a strategy that was more closely aligned with the original concept for the dam and irrigation scheme, being focused on the local grazing industry.

14.27 The individual grazier support lots are still the foundational concept for this strategy, as it allows for the greatest number of local graziers (Flinders Shire and potentially including Richmond Shire) to have access to irrigated land for hay and grain production.

14.28 Each lot is still being designed around multi-crop use with both hay and grain production being considered desirable for feedlot input production.

14.29 With average rainfall, the summer grain crops would not use the 30% of water allocated. The remaining allocation (will vary from year to year based on rain received) could be used to grow an area of winter cereal that could also be used for animal feed. A conservative estimate of one-third of the grain production area could be expected to grow a winter cereal in a normal year.

14.30 In this strategy, there would only likely to be low priority water as the gross margins of these crops is not conducive to being able to justify large upfront payments for water allocation.

14.31 This results in all the available dam water initially being sold as low priority water.

### ***Crop Areas***

*14.32* ***Table 14.8*** summarises a grazier support lot for hay and grain production with area and annual water volumes required.

**Table 14.8: Summary of grazier support lot**

| Crop | Total Planted Area/yr (Ha) | Annual Water Use (ML/Ha) | Total Water Requirement (GL) |
|---|---|---|---|
| Hay | 140 | 8 | 1.1 |
| Sorghum Grain | 30 | 7 | 0.2 |
| Wheat/Barley Grain | 20 | 0 | 0.0 |
| Corn | 30 | 5 | 0.2 |
| **Total** | **220** | | **1.48** |

14.33 With a total of 84 GL of potential available water as low security, ***Table 14.9*** summarises the total opportunity for grazier lots for hay and grain production.

**Table 14.9: Summary of grazier support lots**

| Total Low Priority Water (GL) | Water Requirement/Lot (GL) | Total Lots | Area/Lot (Ha) | Total Area (Ha) |
|---|---|---|---|---|
| 84 | 1.48 | 56.76 | 200 | 11,351 |

***Irrigation Scheme Layout***

14.34 For the diversified agricultural strategy (Scenario One), the objective when laying out the specific crops or farming units was to use the following guidelines:

- Grazier support lots on gravity fed water supply to minimise cost of pumping water
- Perennial horticulture fields above potential flood plains
- Perennial horticulture on the 5 M and 10 M lift areas
- Additional cost of pumping water is less significant to horticulture compared to hay and grain production
- Every lot is adjacent to the water delivery network

14.35 For the grazier support lot only strategy (Scenario Two), the design layout would not need to consider prioritisation of crops to specific elevation or regions within the scheme as was necessary for the diversified model.

## 15. GROSS MARGINS ON SELECTED CROPS

15.1 The first agronomic assessment report for stage one of this project reviewed a wide range of potential crops that were considered suitable to the region and potentially profitable to grow and market.

15.2 The data used for the initial gross margin analysis was sourced from industry research and government department reports.

15.3 The second stage of the review process has gone into greater detail on a reduced number of crops, based on a defined complete irrigation scheme strategy. This intensive review included:

- Targeted domestic and export market price review
- Influence of quality grades on final market price (horticulture crops)
- Market window and production window considerations
- Grower sourced production and cost comparisons against published data
- Regional demands for product (hay and grains)

### ***Market Pricing Data for Perennial Horticulture, Hay and Grain***

15.4 ***Tables 15.1*** summarise the market information data for the selected crops that is used for the detailed gross margin analysis.

**Table 15.1: Perennial horticulture market pricing**

| Crop | Domestic Market Price ($/KG) | Export Market Price ($/KG) | Average Grade Price ($/Carton or Tray) |
|---|---|---|---|
| Avocados | $4 - 7 | $5 - 6 | $21.06 |
| Mangoes | $3 - 4 | $3 - 4 | $17.85 |
| Lemons | $2 - 4.50 | $2 - 2.50 | $33.15 |
| Mandarins | $2 - 3 | $2 - 2.50 | $23.91 |

15.5 For the horticulture crops, the average grade market price has incorporated the following considerations:

- Domestic market price only
- Ratio of premium to second-grade pack-out
- Second-grade fruit receiving half the price return of premium grade
- Agent fee of 15% removed to calculate farm gate price

15.6 ***Table 15.2*** summarises the market information data for the hay and grain crops used in the gross margin analysis.

**Table 15.2: Hay and grain market pricing**

| Crop | Domestic Market Price ($/T) | Average Domestic Market Price ($/T) | Long-term Average Domestic Market Price ($/T) |
|---|---|---|---|
| Sorghum | $325 - 425 | $375 | $325 |
| Wheat | $350 - 450 | $400 | $350 |
| Barley | $325 - 425 | $375 | $325 |
| Corn | $300 - 500 | $400 | $350 |
| Domestic Hay | $246 - 411 | $329 | $296 |
| Export Hay | $440 | $220 | $220 |
| Silage | $137 - 228 | $183 | $133 |

***Gross Margin Analysis***

15.7 The horticulture market price data for each crop was applied to the expected average yield potential for each crop type as well as the impact of the difference in price return based on differing grades.

15.8 The cost of production values for horticulture were researched for both industry and grower-based data to enable as realistic a value as possible. Cost of production in horticulture can vary significantly depending on grower scale, sophistication and operational management. The values used are conservative by being at the higher end of the industry range.

15.9 The projected yield for the horticulture crops is based on industry average data from northern Australia production. Mango orchards in similar climatic regions and better-than-average crop management have a history of performing better than the yield values used.

15.10 The cost of production values and projected yields for the grains and hay production were reviewed and updated accordingly based on the latest industry data.

15.11 The original choice of oaten hay was replaced by rhodes grass hay for several reasons including:

- Oaten hay will not perform well in the northern region
- Rhodes grass hay has high yield potential
- Rhodes grass hay has performed well commercially in the region

15.12 All values used for the gross margin analysis are assuming a reasonable level of scale and efficiency, a better than average business sophistication and operational management, and the ability to achieve industry average quality standards of production output.

15.13 ***Table 15.3*** summarises the gross margin analysis on the selected crops, with all values being a gross price return on a per hectare basis.

15.14 For the hay and grain crops, the gross margin analysis does not take into consideration any costs associated with the operation, from initial land preparation through to the point of planting.

15.15 For the horticulture crops, the gross margin analysis assumes the crop is achieving full average yield potential. The analysis does not take into consideration any costs associated with the operation from initial land preparation through to crop establishment and the progression up to reaching full yield potential.

**Table 15.3: Gross margin analysis**

| Crop | Area (HA) | Unit Output Type | Total Variable Costs ($/Unit) | Output/HA (trays, cartons or T/HA) | Farm Gate Return/HA ($/Unit) | Total Cost/HA ($) | Total Revenue/HA ($) | Total Gross Margin ($/HA) |
|---|---|---|---|---|---|---|---|---|
| Avocado | 1 | 5.3KG tray | $14.00 | 2,132.00 | $21.06 | $29,848.00 | $44,899.92 | $15,051.92 |
| Mango | 1 | 8KG tray | $15.70 | 2,812.00 | $17.85 | $44,148.40 | $50,194.20 | $6,045.80 |
| Lemon | 1 | 15KG carton | $18.00 | 3,700.00 | $33.15 | $66,600.00 | $122,655.00 | $56,055.00 |
| Mandarin | 1 | 15KG carton | $17.00 | 3,000.00 | $23.91 | $51,000.00 | $71,730.00 | $20,730.00 |
| Sorghum | 1 | HA | $897.00 | 8.00 | $325.00 | $897.00 | $2,600.00 | $1,703.00 |
| Wheat | 1 | HA | $856.00 | 6.50 | $350.00 | $856.00 | $2,275.00 | $1,419.00 |
| Corn | 1 | HA | $1,443.00 | 12.00 | $350.00 | $1,443.00 | $4,200.00 | $2,757.00 |
| Rhodes Grass Hay | 1 | HA | $3,537.00 | 20.00 | $296.00 | $3,537.00 | $5,920.00 | $2,383.00 |

15.16 The strategy of creating each 200 HA grazier support lot would enable the owners of these lots to produce hay and grain for their own internal use. In these situations, cartage would be significantly less than the cost of freight for these commodities from southern regions.

15.17 The gross margins for lemons appear high on a per hectare basis but this is mostly due to the market window opportunity. The market opportunity is also not large and oversupply within the window could cause significant erosion in the farm gate return price based on domestic market supply only. Lemons are an export commodity which could lead to the consideration of larger plantings over time as these export markets open and develop further.

15.18 In relation to the calculated gross margin values, there are some assumptions that need to be considered with regards to costs and price returns;

- Regional crop trials will confirm yield potential for hay and grain crops
- Regional crop trials will confirm cost of production values for hay and grain crops
- Horticulture crop gross margins can be influenced by
  - Ability to achieve mature orchard yields
  - Scale and operational management influencing cost of production
  - Unforeseen operational issues influencing cost of production
  - Market forces impacting price return values

15.19 As an example, ***Table 15.4*** summarises the impact on the gross margins when assuming the following scenarios:

- a 10% increase in the cost of production due to the location
- a 10% increase in farm gate price return
- a 10% yield reduction due to non-tested crops in the region
- a 20% yield reduction due to non-tested crops in the region
- a combined 10% increase in cost and a 10% reduction in yield

15.20 ***Table 15.4*** provides a sensitivity analysis of gross margins based on increased costs or market price.

15.21 Both mangoes and rhodes grass hay are well tested in the region or similar locations and the projected yields are already considered conservative based on industry and grower sourced production data. For these reasons it was decided to not take into consideration any negative impacts to yield for these crops. There is always a risk that cost of production can increase so this calculation is included in the table for these two commodities.

**Table 15.4: Cost of production and yield sensitivity on gross margins**

| Crop | Total GM Data ($/HA) | GM @ 10% Incr Costs ($/HA) | GM @ 10% Incr Farm Gate Return ($/HA) | GM @ 10% Less Yield ($/HA) | GM @ 20% Less Yield ($/HA) | GM @ 10% Incr Costs & 10% Less Yield ($/HA) |
|---|---|---|---|---|---|---|
| Avocado | $15,051.92 | $12,067.12 | $19,541.91 | $10,561.93 | $6,071.94 | $7,577.13 |
| Mango | $6,045.80 | $1,630.96 | $11,065.22 | NA | NA | NA |
| Lemon | $56,055.00 | $49,395.00 | $68,320.50 | $43,789.50 | $31,524.00 | $37,129.50 |
| Mandarin | $20,730.00 | $15,630.00 | $27,903.00 | $13,557.00 | $6,384.00 | $8,457.00 |
| Sorghum | $1,703.00 | $1,613.30 | $1,963.00 | $1,443.00 | $1,183.00 | $1,353.30 |
| Wheat | $1,419.00 | $1,333.40 | $1,646.50 | $1,191.50 | $964.00 | $1,105.90 |
| Corn | $2,757.00 | $2,612.70 | $3,177.00 | $2,337.00 | $1,917.00 | $2,192.70 |
| Rhodes Grass Hay | $2,383.00 | $2,029.30 | $2,975.00 | NA | NA | NA |

15.22 ***Table 15.4*** indicates that there is a larger impact on gross margin with a 10% yield reduction compared to a 10% increase in costs, which is consistent with industry knowledge that yield (and quality) and price return are the largest drivers of profitability in agriculture.

15.23 Both mangoes and rhodes grass hay are still profitable in a situation where there is an increased cost of production, but mangoes are significantly more profitable with a 10% increase in farm gate price return.

15.24 Even with the combined 10% increase in cost and 10% reduction in yield, the selected but untested crops are still showing strongly positive gross margin values. This provides additional support for the crop selection to be strong candidates for the proposed irrigation scheme.

## 16. EMPLOYMENT CREATION AND PRODUCTIVITY OF WATER ASSETS

16.1 The irrigation scheme proposal has the potential for growth in the economy, building resilience in the region to climatic and economic drivers as well as increase population.

16.2 This section looks at some of the drivers of population growth and what each proposed new industry could generate in relation to new employment for the region. This section only concentrates on the farming enterprises and does not consider the flow-on jobs created in the district.

### ***Irrigation Scheme Concept***

16.3 The proposed irrigation scheme promotes diversified agricultural industries that require differing levels of additional labour to manage and operate the new enterprises.

16.4 ***Table 16.1*** summaries the new agricultural enterprises projected to be created on completion of the irrigation scheme.

**Table 16.1: Diversified agricultural crop production concept**

| Operation | No Lots | Area of Lot (HA) | Total Area (HA) |
|---|---|---|---|
| Avocados | 1 | 900 | 900 |
| Mangoes | 1 | 600 | 600 |
| Lemons | 1 | 300 | 300 |
| Mandarin | 1 | 300 | 300 |
| Grazier Support Lot | 27 | 200 | 5,405 |
| **Total** | | | **7,505** |

### ***Job Creation***

16.5 The creation of new employment positions varies according to each crop or business type and the level of capability and intensity the work demands.

16.6 For horticultural operations, there is a requirement for a higher level of business and staff management acumen due to the size and scale of the operations, while a hay and grain operation requires a different style of operational staff.

16.7 The diversity of staff skills required will also have a positive impact on the Hughenden community. There will be a broad spectrum of new positions that will demand a wide range of skills and experience. There will be a requirement for higher skilled and higher paid positions as well as operational roles and casual roles, ensuring the creation of opportunities at all skill levels and employment ambitions for people within the community.

16.8 ***Table 16.2*** summarises the expected employment created by the irrigation scheme at the point where all businesses are fully operational and at full crop production potential.

**Table 16.2: Employment created from new agricultural businesses**

| Operation | No Lots | Management Staff | Permanent Staff | Casual Staff | Total Staff |
|---|---|---|---|---|---|
| Avocados | 1 | 3 | 18 | 60 | 81 |
| Mangoes | 1 | 3 | 20 | 100 | 123 |
| Lemons | 1 | 3 | 10 | 80 | 93 |
| Mandarin | 1 | 3 | 10 | 80 | 93 |
| Grazier Support Lot | 27 | 27 | 27 | 27 | 81 |
| **Total** | | **39** | **85** | **347** | **471** |

16.9 The numbers used in ***Table 16.2*** have been collated from commercial farming operations of similar size and scale and from Northern Australian regions. The actual employment numbers may differ from these based on operational sophistication, size, level of automation and business scale.

16.10 It is anticipated there will be approximately 124 full-time roles created along with more than 340 casual roles to fill.

16.11 It is unlikely that all these positions will be filled by Hughenden locals, resulting in the demand for an influx of new permanent residents as well as others to fill the casual workforce requirements.

16.12 The employment analysis only considered the requirements of the new farming operations and does not consider;

- Irrigation scheme management and operation
- Support business employment opportunities
- Additional staff required on grazier properties for feedlot management or silage production
- Other community businesses (government offices, cafes, hospitals, schools etc)

***Water Use Calculations***

16.13 With an irrigation scheme capable, at full allocation, of delivering 70 GL of water to the region, the physical value created by this scheme is summarised in ***Table 16.3.***

**Table 16.3: Irrigation Scheme Water Use Factors**

| Item | Unit | Number | Water Use/Person (ML/No) | Water Use/Ha (ML/Ha) |
|---|---|---|---|---|
| Medium Security Water | ML | 30,000 | | |
| Low Security Water | ML | 40,000 | | |
| Horticulture Area | Ha | 2,100 | | 14 |
| Grazier Lot Area | Ha | 5,405 | | 7 |
| Horticulture Employment | People | 390 | 77 | |
| Grazier Lot Employment | People | 81 | 493 | |

16.14 In respect to the horticulture operations, there would be an average of just over 14ML/HA used and one person employed for every 77ML of water delivered by the scheme.

16.15 With regards to the grazier lots, there would be an average of 7ML/HA used and one person employed for every 493ML of water delivered by the scheme.

## 17. BUILDING CLIMATIC AND ECONOMIC RESILIENCE IN THE HUGHENDEN REGION

17.1 There has been a lot of discussion around assisting northern and regional communities in Australia to become more resilient in the face of climate change and drought and the direct impact this has on the economies of rural and regional communities.

17.2 The proposed irrigation scheme for the Hughenden region can have a significant impact on the resilience of the town and the Flinders region with a diversified strategy that simultaneously supports current industries whilst creating and attracting new industries to the region.

### ***Hughenden Region***

17.3 The dominant industry in the Hughenden region is agriculture where there are 204 grazing operations in the Flinders Shire and a town population of approximately 1200 residents.

17.4 The town of Hughenden is also supported by tourist attractions and regional services such as hospitals, government services and schools.

17.5 Due to its location, the region is heavily influenced by monsoonal rain events and the dominant industry of cattle. Rainfall is essential for growing native pastures to sustain a viable cattle breeding and fattening industry.

17.6 The most significant opportunity for the region to grow and become more resilient is to support its agricultural base and the cattle industry.

### ***Hughenden Irrigation Scheme***

17.7 The Hughenden Irrigation Scheme was originally devised to create the opportunity to grow grass or hay year-round to support the local graziers, especially in years of drought. The concept being that a grazing industry more resilient to drought would also result in a more resilient and economically sustainable and stable Hughenden community.

17.8 The proposed irrigation dam has the potential to deliver on sustainable growth in the current industry as well as to diversify the region and provide direct growth for the town of Hughenden.

17.9 Diversification of agricultural industries would reduce the reliance of the region on the highs and lows of a single commodity, as well as provide demand for new types of businesses that would be required to support these agricultural industries.

17.10 This diversification will potentially lead to an increase in support businesses as well the need for staff, adding a needed boost to the local population.

### ***Irrigated Grazier Support Lots***

17.11 There is a move by some graziers in the region to commence feedlot operations to maintain and fatten weaners using a combination of hay, grain and silage. These feed inputs all need to be grown or imported to run the feedlot operation.

17.12 One local grazier has taken the step of purchasing an irrigated property in the Burdekin region to ensure they have a constant supply of hay. This grazier is planning on producing dryland forage sorghum to produce silage and is also considering growing grain at the Burdekin property. This strategy would enable the grazier to be mostly self-sufficient with regards to the feed input demands of their feedlot.

17.13 The irrigation scheme proposal is for 27 individual, 200 HA lots to be created totalling 5405 HA. This will allow local graziers to engage in irrigated hay and grain production in a region close to their grazing operation.

17.14 The Flinders region has approximately 204 grazing operations which means that 13% of the graziers would have the opportunity to purchase an irrigated lot. These graziers could then consider developing a feedlot system or simply to produce hay and grain to sustain their herd during periods of drought or poor native pasture.

17.15 If a grazier did want to develop a feedlot system, then it is likely that they would also develop additional dry land forage sorghum for silage production close to the feedlot. The area required for this additional crop production would be in the range of 300-500 HA. This cropping would be outside the proposed irrigation scheme.

17.16 The grazier support lot component of this irrigation scheme will aid the strategy to build drought and climatic resilience in the regional grazing industry.

***Perennial Horticulture Production***

17.17 The irrigation scheme proposal has 2100 HA set aside for growing high-value perennial horticulture crops.

17.18 These types of crops have a high cost of operation, significant staff requirements and elevated levels of high-value output.

17.19 Including these types of crops in the scheme will support the strategy to increase the diversity of agriculture in the region, as well as create a significant number of new jobs. This will provide opportunity for residents and encourage others to move to the area for work.

17.20 The horticulture component of this project will have a significant impact on building the local town in terms of population growth, business growth and economic resilience (not reliant on a single major industry).

***Summary***

17.21 The opportunity for the region to build both climatic and economic resilience from this project is significant, however, a single strategy will not be as effective as a diversified strategy.

17.22 The proposed strategy will support:

- Local graziers and the livestock industry
- Diversified agricultural sector
- Growth of current local businesses
- Attract new businesses to set up locally
- Creation of new industry support businesses
- Population growth
- Economic stability of the town and region

## 18. IRRIGATION SCHEME SUPPORT BUSINESS REVIEW

18.1 An aspect of the impact of creating an irrigation scheme in a region becomes not just about the new or increased agricultural output but also the increase requirements for support businesses to enable the farming operations to function effectively and efficiently.

18.2 To understand what an influx of farming support businesses would look like, this section will overview the types of support necessary to enable a high-output farming region to prosper as well as individual businesses that are likely to want to set up an office or dealership in the region. For this review, only businesses directly relating to farm operation and agricultural output have been considered.

### ***Farming Operational Business Support Requirements***

18.3 The following list are the type of support that high-output farming operations typically require to maintain a functioning, productive and profitable irrigated farming operation:

- Agronomy
- Seasonal labour
- Financial, accounting
- Machinery supply and maintenance
- Irrigation design and maintenance
- Contract farm equipment

### ***Business Types***

18.4 The following list are the type of agribusiness support businesses that would be required to support the farming operational requirements:

- Ag-chem, seed and fertiliser
- Financial services accounting etc
- Machinery service and support
- Engineering workshops
- Aftermarket parts
- Labour hire
- Electrical services
- Irrigation services
- Contract farming/earthmoving services

### ***Support Business Overview***

18.5 Many of the businesses below are either located in Hughenden, have a satellite office or service the area remotely from Townsville or from further afield.

18.6 The opportunity that would arise with the development of a purpose-designed irrigation scheme would be the demand for locally based businesses to grow and for remotely based businesses to establish a local presence based on increased demand for products and services.

18.7 The jobs created by this support business demand have not been considered in ***Section 16*** where newly created jobs are discussed based on on-farm operational requirements only.

- Ag-chem, seed and fertiliser:

- Landmark
    - Business already established in Hughenden. National franchise for supply of seed, fertiliser and chemicals. Also provides basic agronomy services.
    - Provide crop insurance and have finance offerings
    - Livestock marketing services
- Elders Rural
    - Has retail outlet in Richmond that could service the Hughenden region
- Lindsay Rural
    - Business that is well established in Queensland with nearest locations in Bowen and Tully
    - National supplier of agricultural inputs, freight, domestic and export logistics management and packaging

- Financial services accounting etc:
    - Hunter Partners
        - Accountants, tax agents and financial planners
        - Based in Townsville with a service office in Hughenden
        - Established in 1993
    - Findex Hughenden
        - Accounting, insurance, wealth management, tax performance consulting and superannuation management
        - Located in Hughenden
        - 110+ locations across Australia and New Zealand
        - Founder of SproutX accelerator program
        - Fifth largest accounting operation in Australia
- Machinery service and support:
    - Honeycombes Sales & Service (John Deere)
        - Locations in Townsville, Ingham, Innisfail, Ayr and Tolga
        - John Deere franchises selling and servicing equipment, also have JCB, Hino, Iveco, Scania along with Mazda cars
        - Initial machinery volumes may not be high enough to warrant a permanent sales location in Hughenden, however, may justify a parts and service location or at least a technician based in Hughenden
    - SNG Machinery Sales (CaseIH)
        - Located in Ingham
        - CaseIH franchise selling and servicing a range of farm machinery and associated equipment
        - Increased demand may necessitate a local parts and service support location in Hughenden
- Engineering workshops:
    - JS Welding Service Townsville
        - Mobile boilermaker based in Townsville
        - Currently services the Hughenden area

- Aftermarket parts:
    - CBC Townsville
        - Multiple locations throughout Australia
        - The largest bearing supplier in Australia

        - Supplies bearings, fasteners, transmissions, tools and maintenance, seals, lubricants and adhesives
        - Also has a team of 60 engineers to help provide custom design
- Labour hire:
    - Labour Solutions Australia
        - National franchise with locations in Townsville and Charter Towers
        - Workforce management and labour hire.
        - Extensive experience in food, logistics and warehousing, agribusiness, construction and mining and resources sectors
        - Provides reliable, flexible and scalable solutions for all workforce needs
- Electrical services:
    - BonTech Pty Ltd
        - Electrician and electrical contractor
        - Family business located in both Hughenden and Townsville
        - Supply and install solar pumping and monitoring systems
- Irrigation services:
    - Total Eden
        - National franchise providing irrigation products to horticulture and broadacre markets
        - Providing drip systems through to pivots and laterals
        - Also provide irrigation design services
- Contract farming/earthmoving services:
    - Bowmans Earthmoving
        - Based in Mackay servicing out to Emerald and Charters Towers
        - Laser bucket and GPS levelling services
        - Dam building and road construction, drainage work
        - Run approx. four tractors and buckets along with excavators, dozers and graders
        - Undertake both civil and agricultural projects

## 19. POTENTIAL CANDIDATE GROWERS FOR IRRIGATION SCHEME

19.1 The proposed irrigation scheme aims to support both the regional grazing businesses as well as the creation of new agricultural enterprises from the ground up.

19.2 New agricultural opportunities are often a strong drawcard for growers, either nationally or internationally, to consider a geographic expansion of their business footprint.

19.3 Most large corporate or corporatised farming operations (family or multi-owner/investor) have geographic spread in their production and supply strategy as a key method of business risk mitigation. A new region with an opportunity to access either a domestic or export market in a slightly different window is a stronger drawcard again.

19.4 With the project having a mix of crop and cropping opportunities, there is also a significant opportunity for local grazing businesses to invest in their business and the region.

### ***Grazier Support Lots***

19.5 The irrigation scheme concept has a total of 27 grazier support lots (see ***Table 19.1***), where it is anticipated that these cropping lots will be used primarily for hay and grain production and local use of the production output.

**Table 19.1: Diversified agriculture concept grazier support lots summary**

| Total Low Priority Water (GL) | Water Requirement/Lot (GL) | Total Lots | Area/Lot (HA) | Total Area (HA) |
|---|---|---|---|---|
| 40 | 1.5 | 27 | 200 | 5405 |

19.6 There are 204 grazing businesses in the Flinders Shire and 120 grazing businesses in the Richmond Shire.

19.7 All available lots would be taken up if 13% of the Flinders Shire graziers saw the opportunity to have local production of hay and grains to support their grazing operation.

19.8 If both shires were considered, then only 8% of all grazier businesses across the combined shires would need to invest in the newly created irrigation lots for all of them to be taken up.

19.9 What these graziers do with the land and water opportunity is ultimately up to their direct business requirements. Graziers that are very close to the lots may choose to conduct a combination of hay and grain production as well as free grazing for weaners or breeding stock. While graziers further away may decide that a cut-and-carry model is more suitable to their whole of business requirements.

19.10 It would be expected that all these lots would be taken up by local or regional grazing businesses.

### ***Perennial Horticulture Blocks***

19.11 The investigation of horticultural cropping opportunities for the Hughenden region has identified several perennial orchard crops that would be suitable for the region for the following reasons:

- Climatic suitability
- Production window
- Market access and price return

19.12 ***Table 19.2*** is a summary of the perennial horticulture crop strategy based on the above criteria.

**Table 19.2: Perennial horticulture crop strategy**

| Crop | Total Planted Area (HA) | Annual Water Use (ML/HA) | Total Water Requirement (GL) |
|---|---|---|---|
| Avocados | 900 | 16 | 14 |
| Mangoes | 1200 | 10 | 12 |
| Lemons | 300 | 16 | 5 |
| Mandarin | 300 | 16 | 5 |
| **Total** | **2700** | | **36** |

19.13 The selection criteria will be an attractive drawcard to potential investors in the horticulture industry. The highest selection criteria is likely to be a production window opportunity, as this would allow for geographic spread of supply, especially for a national year-round producer whose focus is on both domestic and export markets.

19.14 There is a long list of potential growers of scale in the Australian horticulture industry that would be considered large and sophisticated enough to consider an expansion into the Hughenden region.

19.15 Some of the larger horticultural businesses would be considered potential candidates for two or more of the categories of fruit while others are more single industry focused.

19.16 ***Table 19.3*** summarises the identified horticultural producers and the fruit categories that they specialise in.

**Table 19.3: Potential horticultural producers to invest in production blocks**

| Horticultural Producer | Avocado | Mango | Lemon | Mandarin |
|---|---|---|---|---|
| Costa Group | ✓ | | ✓ | ✓ |
| Perfection Fresh | ✓ | ✓ | | |
| Manbulloo Orchards | ✓ | ✓ | | |
| Simpson Farms | ✓ | ✓ | | |
| Fresh Produce Group | | | ✓ | ✓ |
| Pinata Farms | | ✓ | | |
| Mackays | ✓ | ✓ | ✓ | ✓ |
| Delroy Orchards | ✓ | | | |
| Southern Cross Farms | ✓ | ✓ | ✓ | ✓ |

19.17 A brief overview of each potential grower from ***Table 19.3*** is covered below.

Costa Group

- The largest horticulture business in Australia
- Specialises in a wide range of key fresh produce categories
  - Berries
  - Mushrooms
  - Tomatoes
  - Citrus

- Bananas
- Avocados
- Grapes

Perfection Fresh

- A large and diverse category horticulture business in Australia
- Their range of key fresh produce categories include:
  - Berries
  - Tropical fruits (figs, pomegranate)
  - Mangoes (Calypso variety)
  - Brassicas (broccolini, etc)
  - Salad vegetables (cucumbers, eggplant)
  - Leafy vegetables (lettuce, shallots etc)
  - Tomatoes
  - Mushrooms
  - Avocado (growth ambition)

Manbulloo Orchards

- National horticultural producer
- Specialises in key categories including;
  - Mangoes (KP and R2E2 varieties)
  - Avocados

Simpson Farms

- Horticultural business centred in the Bundaberg region
- Australia's largest supplier of avocados
- Extensive mango production operation (Calypso variety)

Fresh Produce Group

- National horticultural business that has farming operations as well as extensive domestic and export marketing services for growers across a wide range of categories
- Farmed fresh produce lines include:
  - Berries (raspberries and blueberries)
  - Table grapes
  - Citrus

Pinata Farms

- National horticultural business that has farming operations and collaborative growing arrangements across six states of Australia
- The key categories they specialise in include:
  - Pineapples
  - Mangoes (Honey Gold variety)
  - Berries (raspberry and strawberry)

Mackays

- Large Queensland-based horticultural business
- Largest banana grower and marketer in Australia
- Although they are renowned for their bananas, the farming enterprises they are engaged in include:

- *Bananas*
- *Sugar cane*
- *Cocoa trees*
- *Avocados*

- With their recent expansion focus in North Queensland, they would be a potential grower across all categories considered for the Hughenden irrigation scheme.

Delroy Orchards

- Large orchard business in Pemberton, Western Australia
- Categories of fresh produce they grow include:
  - Avocados
  - Kiwifruit
  - Tamarillos

Southern Cross Farms

- National farm management business providing service for agriculture and horticulture investment companies who own but do not want to operate agricultural operations
- The range of crop categories managed include:
  - Citrus
  - Winegrapes
  - Avocados
  - Almonds

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