Horticulture in the South West

Synopsis for Water and Rivers Commission

July, 2003

Economics
Consulting
Services

THE PURPOSE OF THIS PUBLICATION

This publication provides an overview of the horticulture industry in Western Australia, a review of water use in the south west of the State and the possible expansion of the industry in that region. The study was prepared as part of an assessment of future water needs from the South West Yarragadee Formation.

Economics Consulting Services prepared this report from published information and statistics. In particular, we relied on information and assistance from the Department of Agriculture. While we would like to acknowledge their support, the conclusions drawn in this study are entirely our own.

The report has been prepared to facilitate a long-term decision on water allocation in the South West region. It has not been complied to support business investments in the horticulture sector. More rigours analysis is essential before any decisions on investment in horticulture enterprises are made.

Economics Consulting Services

Royalties, Economic Evaluations and Government Policies
A.C.N. 077 989 550

97 Broadway, Nedlands
PO Box 3003, Broadway, Nedlands, WA 6009, Australia
Telephone: 08 9386 8311, Facsimile: 08 9386 8033, Email: ecs@daa.com.au
http://www.daa.com.au/~ecs

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1. INTRODUCTION

This report has been prepared to assist with the evaluation of an application to draw water from underground sources in the South West of the State for use in the Integrated Water Supply System. It complements studies on the dairy and viticulture sectors and is being used as part of an overall economic and social evaluation.

The report has been reviewed by the Department of Agriculture and Neil Delroy from Wyadup Valley Farm and Capel Farms P/L. Comments made by both organisations have been incorporated into the report. However, these organisations are not responsible for the study findings, which remain the responsibility of Economics Consulting Services.

Horticulture in this report includes vegetables, fruit, flowers, the nursery industry and viticulture. These industries have been one of Western Australia's fastest growing primary production sectors with gross value of production estimated at $555 million in 2000-01[1].

An estimated 1,800 horticulture establishments ranging from Albany to Kununurra make the State largely self sufficient in fresh vegetables and fruit. Imports meet the demand for commodities that are not well suited to the State climate or are out of season in the State.

Nearly half (45%) of the total production is exported with Western Australia the largest vegetable exporting state in Australia. The small population and distance from Eastern States markets means that any future increase in horticulture production will need to be exported.

Studies carried out on the horticulture industry have demonstrated the potential for increased exports to Asian markets in the medium to longer term. Rising populations, increasing per capital incomes, a continuing rural to urban population drift and changing food consumption patterns will create an increased demand for fruit and vegetables in this region. Improvements in storage and handling and variety development for specific market demands will facilitate increased export trade. Western Australia is well placed to service this forecast demand.

Statistics on the horticulture sector are difficult to collect with a large number of small producers and keen competition leading to reluctant disclosure. The Department of Agriculture has noted that the difficulties of collecting statistics for this industry mean that the real value of the industry is often understated[2]. This report has used the best available information but the statistical shortcomings need to be recognised. This report has not been compiled in the rigorous way that would be needed for horticulture investment decisions. More rigorous evaluation is essential before any business decisions are made.

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[1] Australian Bureau of Statistics, Catalogue 7121, Agricultural Commodities December 2002

[2] A snapshot of horticulture, Agriculture Western Australia.

2. OVERVIEW OF HORTICULTURE IN WESTERN AUSTRALIA

2.1 Production

2.1.1 Establishments

In the 2000-01 Agricultural Census, over 1,800 enterprises were listed as horticulture producers with an establishment defined as any enterprise with a value of production in excess of $5,000 per annum. Most small producers should thus be included. A significant proportion of the total number is probably best considered as lifestyle or hobby farms rather than commercial horticulture operations. Fruit producers make up the largest single category followed by vegetables.

2.1.2 Value

The Australian Bureau of Statistics estimated the value of production at $555 million in 2000-01. Vegetables contribute around 40% of the total value with fruit 21% and the nursery, floriculture, turf segment 20%. Grapes for winemaking, table consumption and dried purposes contribute 18% of the total value. In recent years, vegetables and grapes have been the expanding sectors with fruit and the nursery group growing but at a slower rate.

2.1.2.1 Vegetables

There are over 60 varieties of vegetables grown in the State with many planted for local niche markets. Farmers largely meet vegetable consumption in Western Australia with imports accounting for less than 5% of total consumption. The State is a major exporter of fresh vegetables sending products to over 20 countries with the principle markets being Singapore, Malaysia and Hong Kong[3] The composition is however dominated by the export of carrots and cauliflowers to Singapore, Malaysia and Hong Kong.

In the year ending June 2000, vegetable production for the key commodities was about 250,000 tonnes from an area of around 8,100 hectares. This gave an average of over 30 tonnes of product per hectare of land planted.

Potatoes, carrots and lettuces dominated production, with the top five commodities accounting for 80% of the total tonnage produced in that year (Figure 1). Since 2000, potato production has remained static while carrot production has increased rapidly with carrots and potatoes now believed to have similar tonnage levels.

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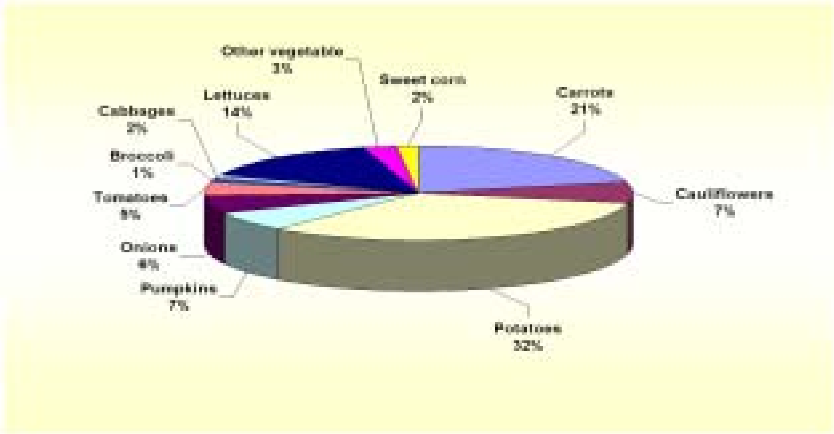
[3] A snapshot of horticulture, Agriculture Western Australia.

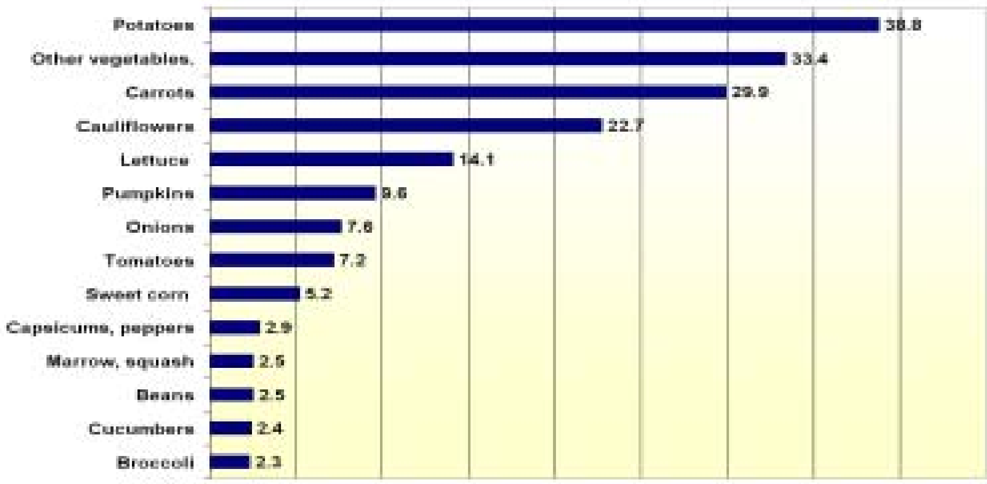
Figure 1: WA vegetable production, 2000 (proportion of tonnage)



Source: ABS Agriculture Australia Catalogue 7113

The value of production reflects production volumes with the top five commodities over $10 million in 2000 (Figure 2). These commodities are predominantly grown in the South West. Carrot production has jumped since these statistics were compiled and now have a value of production in excess of $50 million.

Figure 2: WA vegetable production value, 2000 ($ million)



Source: ABS Agriculture Australia Catalogue 7113

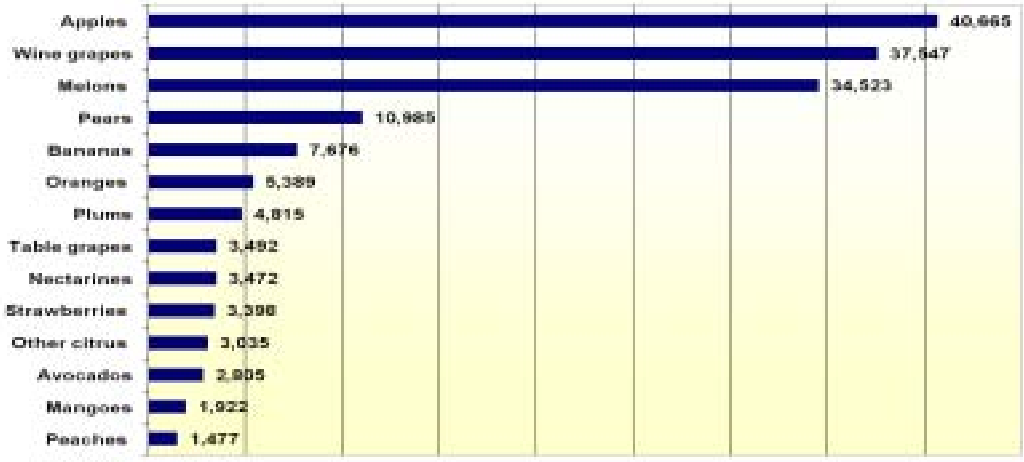
There are promising opportunities for further vegetable exports from Western Australia. The State is well located with advanced supply, cool store and transport systems to provide vegetables to markets in South East Asia. There are potential opportunities in supplying fresh cut vegetables such as broccoli and cauliflower florets and fresh cut carrot products to the growing South East Asian supermarket sector[4]. Processed vegetables also offer potential although competition from the Eastern States and other countries will be strong.

[4] Department of Agriculture, Western Australia's Agricultural, Food and Fisheries Industries, 1999-2000

2.1.2.2 Fruit and Nuts

There are more than twenty fruits and nuts produced in the State in substantial quantities although a relatively small number provide the major share of production valued at about $120 million. The volume of production in 2000 was around 160,000 tonnes with apples, wine grapes and melons dominating (Figure 3). Melons and wine grapes have been included with fruits for convenience. Viticulture is the subject of a more detailed report given its importance in the study area and hence wine grapes have been only be incorporated with fruits in this overview section. More detailed notes follow on the key fruits grown in the region.

Figure 3: WA fruit production, 2000 (tonnes)



Source: ABS Agriculture Australia Catalogue 7113

Apples, grapes and melons account for more than 70% of the total while the top ten varieties provide 95% of the total.

The traditional pome and citrus fruits have fluctuated in production over the last decade while tropical and summer fruits have seen substantial expansion. Consumer tastes are drifting towards tropical and summer fruits and lengthened production durations have assisted this.

The gross value of temperate fruits is estimated at $75 million with pome fruits making up just over half (54%), summer fruits accounting for 32% and citrus the remaining 14%. Apples and pears with small quantities of nashi dominate Pome fruits. Summer fruits include peaches, apricots, nectarines, and table grapes. Citrus production is dominated by oranges and mandarins with some grapefruit and lemons.

The tropical fruit sector is currently valued at more than $60 million, with most varieties grown in the irrigation areas at Carnarvon and the Ord River. Fruits include mangoes, bananas, melons, avocado, papaya, grapefruit, limes, jack fruit, carambola, guava, sapodilla, star apple, custard apple and limes. The three main industries in terms of value and production are melons, mangoes and bananas.

Substantial plantings of pome fruits are found in the Donnybrook and Manjimup districts. New varieties such as Red Gala, Pink Lady, Sundowner and Red Fuji are replacing the traditional Granny Smith, Jonathon and Delicious types. There are also substantial pear plantings in these areas. Nashi production has expanded in recent years with substantial plantings at Donnybrook.

Apple plantings are expanding slowly in Australia, as are production levels although seasonal variation meant that production in 1999-2000 was very similar to the levels achieved in the early 1990's. Pear production has fallen over the last decade.

Avocado plantings boomed in Western Australia in the 1990's but slowed towards the end of the decade. Good seasons and attractive prices in the last three seasons have renewed interest and sales are being made to Eastern States markets. Plantings range from north of Perth to southern areas with most production sold in Australia.

Mango production in Australia has boomed over the last decade expanding from less than 10,000 tonnes to over 38,000 tonnes. Western Australia is a small contributor after Queensland but high quality produce from the Ord River and Carnarvon irrigation areas fetches good prices.

Citrus plantings have existed in the Harvey and Bindoon districts for a very long time supplying Perth markets with oranges, mandarins, lemons and grapefruit. They compete with imported fruit from the Murray River Irrigation districts and some fruit brought in from overseas. The traditional variety, Valencia, has declined in production with trees being removed and replaced with other varieties.

Citrus production fluctuates substantially with season conditions but Australian production has fallen from the peak levels of the early 1990's. Western Australia has moved against the trend with increased plantings. There is interest in plantings in areas with substantial water supplies.

Summer fruits are expanding rapidly with Australian peach production climbing from 40,000 tonnes in 1990 to over 86,000 tonnes in 1999-2000. Apricot production has slowly declined to around 20,000 tonnes. Western Australia has struggled in the past with profitable apricot production due to a short period of winter chill but can produce quality and competitive peaches and nectarines.

For the study area there is potential for expanded fruit plantings in the South West areas. Pome and stone fruit plantings are the most likely but expansion appears likely to be slow and irregular with large plantings unlikely at this stage.

2.1.2.3 Viticulture

An estimated 39,626 tonnes of wine grapes worth over $50 million were processed in Western Australia during the 2000 vintage. This was estimated to represent over $350 million of wine at retail prices. Wine exports increased 50 % in the 12 months to June 2000 to $22.5 million. The industry has been experiencing rapid expansion with tax and lifestyle driven investment. The wine grape crush in 2000-01 was estimated at 60,000 tonnes with 2002 at 65,000 tonnes and 2003 expected to have slipped back to 60,000 tonnes again due to seasonal conditions. The Department of Agriculture has forecast an average rate of growth in the vintage of 3.2% per annum leading to a crush in 2006 of 71,000 tonnes.

Western Australia produces just over 4% of Australian wine from around 7% of the area. The focus on the premium market means the State represents at least 10% of the industry's total value.

A more detailed evaluation of the viticulture sector has been carried out as part of the Yarragadee water evaluation process and is reported separately. Some consideration is given to table grapes in this report.

2.1.2.4 Floriculture

Western Australia has a well-developed floriculture sector producing a range of cut flowers, pot plants and native flowers and foliage. The value of production was estimated at $45 million in 1999-00 of which half was exported. Western Australia has become Australia's leading exporter of wildflower products. Exports include waxflowers, kangaroo paws, banksia species and proteas along with cut flowers and foliage such as smoke bush. The dominant species in the study area is proteas.

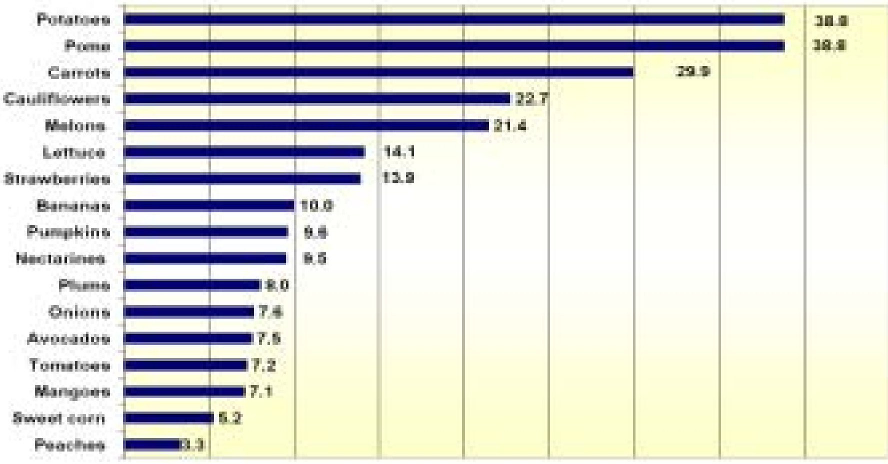
Japan and the Netherlands (a re-export market centre) dominate export markets with Germany and the United States also significant. Floriculture exports have been volatile over the years. Strict quality standards in the more attractive markets such as Japan and irregularity in supply for bush sourced native species have created challenges. A lack of substantial capital has also inhibited some efforts.

There are promising opportunities for native species and Department of Agriculture research is directed at new species and product handling. Potted plants are also being researched. While the South West area is well placed for floriculture production, the uncertainties make forecasting difficult. Floriculture will continue to be an asset in the area, but there is not enough evidence to suggest it will expand in any substantial way.

2.1.2.5 Fruit and Vegetables.

When fruit and vegetables are combined, there are 17 commodities with annual production values estimated to be in excess of $3 million per commodity (Figure 4). This list (excluding grapes) accounts for over 80% of the total value. Thirteen of the fruits accounting for around 60% of the total are well established in the South West of the State. This list excludes melons, strawberries, wine grapes, and mangoes.

Figure 4: Major Fruit and Vegetable Values in Western Australia, 2000 ($million)



Source: ABS Agriculture Australia Catalogue 7113

3. HORTICULTURE PRODUCTION IN THE SOUTH WEST

3.1 Introduction

Horticulture establishments covered an estimated 14,000 hectares in the South West Statistical Division for the financial year to June 2001[5]. This Statistical Division runs from Mandurah to Walpole and includes five subdivisions covering twelve local government areas. The local government areas are the Cities of Mandurah and Bunbury and the Shires of Murray, Waroona, Boddington, Harvey, Collie, Dardanup, Capel, Donnybrook-Balingup, Busselton, and Boyup Brook. Bridgetown-Greenbushes, Nannup, Augusta-Margaret River and Manjimup. This chapter looks at the areas and distribution in that year.

3.2 Planted Areas

The total horticultural area of 14,000 hectares was dominate by the Vasse, Preston and Blackwood statistical subdivisions with Mandurah and Bunbury making up only 2.5% of the total area (Figure 5). Vasse, Preston and Blackwood each contribute around one third of the area.

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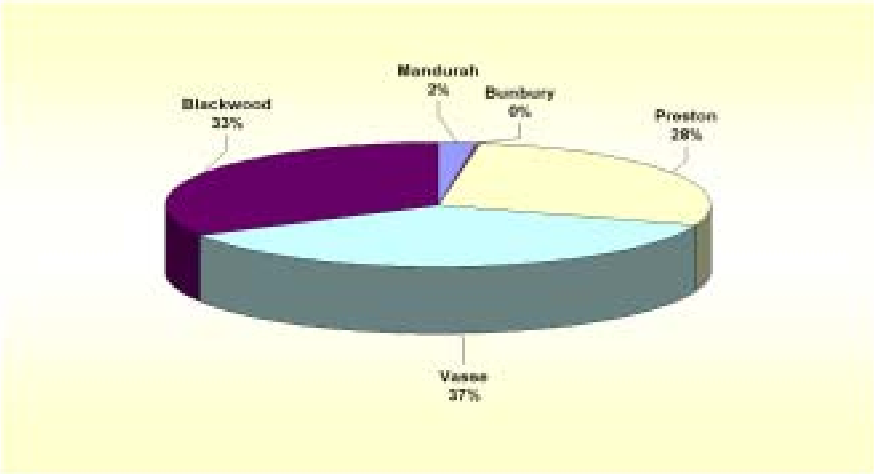
[5] Australian Bureau of Statistics 2001 agricultural census

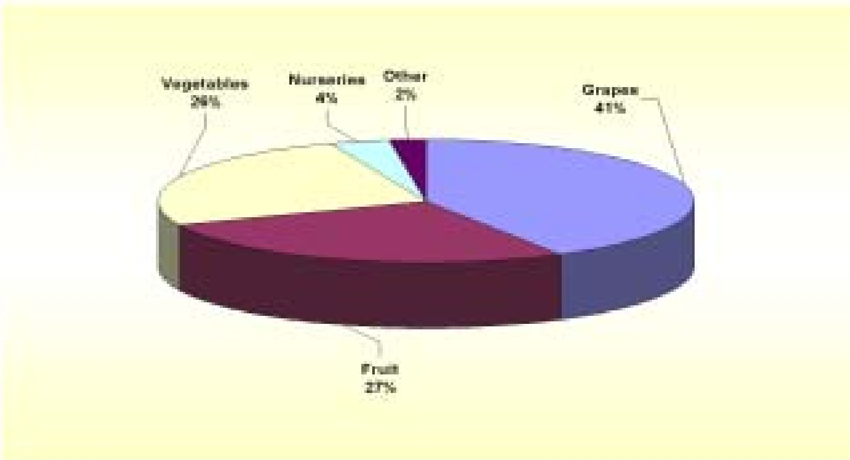
Figure 5: South West planted areas by region



Source: ABS Agricultural commodities, 2000

Grapes made up the largest commodity group accounting for nearly half (41%) of the horticultural area with vegetables and fruit (including nuts and olives) providing over a quarter share each (Figure 6).

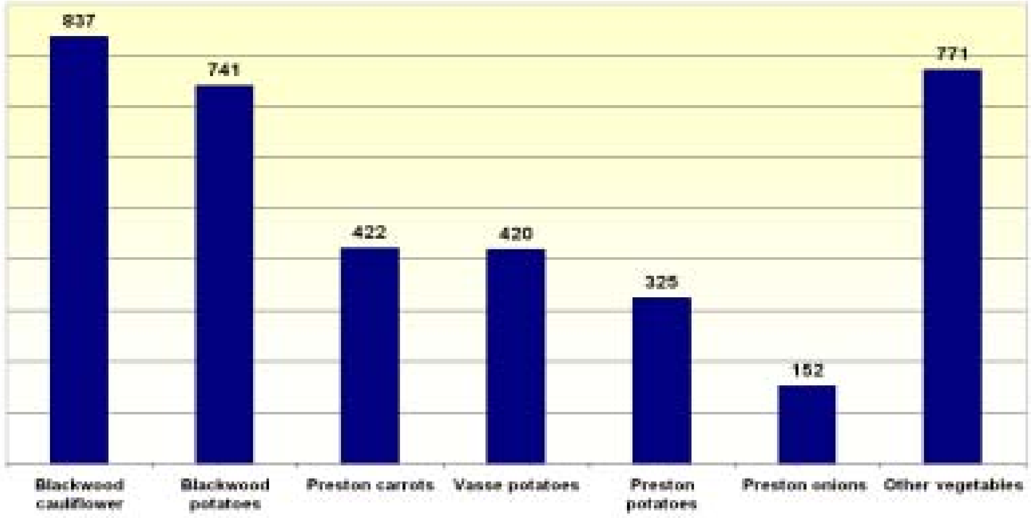
Figure 6: South West planted areas by commodity



Source: ABS Agricultural commodities, 2000

Potatoes, cauliflower, and carrots collectively make up over 75% of the planted area and dominate vegetable production. Nearly 80% of total vegetable plantings come from six combinations of area and commodity (Figure 7). Cauliflower and potatoes from the Manjimup area together account for 1,580 hectares or 43% of the total area. This region lies well outside the Yarragadee Formation. Both cauliflower and potato production appears to have stalled under competition from low international prices.

Figure 7: Key South West vegetable areas and crops

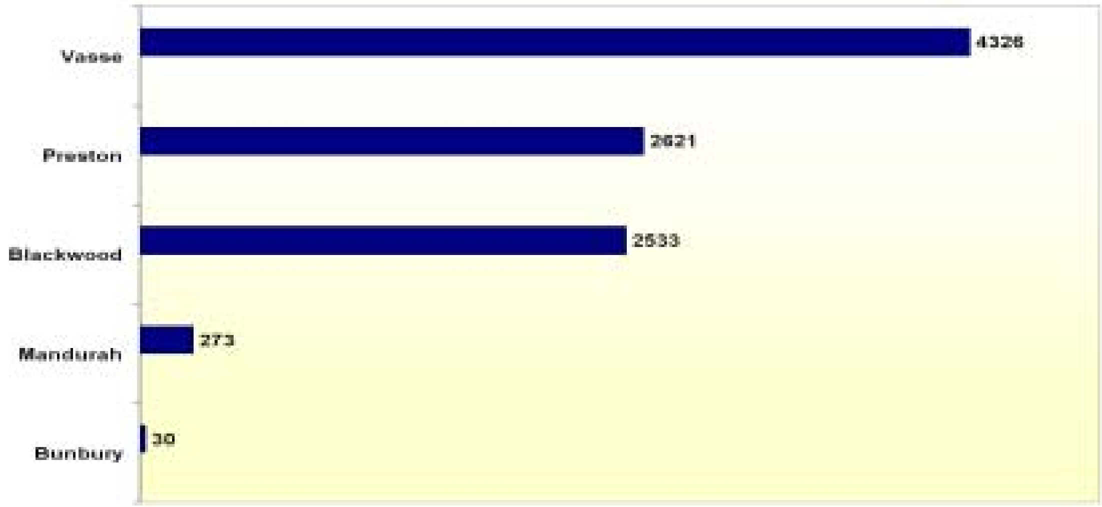


Source: ABS Agricultural commodities, 2000

The key vegetables in terms of water use in the study area thus become potatoes, carrots and onions in the Preston and Vasse areas. These crops are grown close to the Yarragadee Formation with the possible exception of areas in Preston at Myalup that lie to the north of the aquifer.

All fruit plantings including grapes, fruits and nuts make up nearly 9,800 hectares of planted area with the Vasse region by far the largest (44%) followed by Preston (27%) and the Blackwood sub region (26%). Bunbury and Mandurah have small-planted areas (Figure 8).

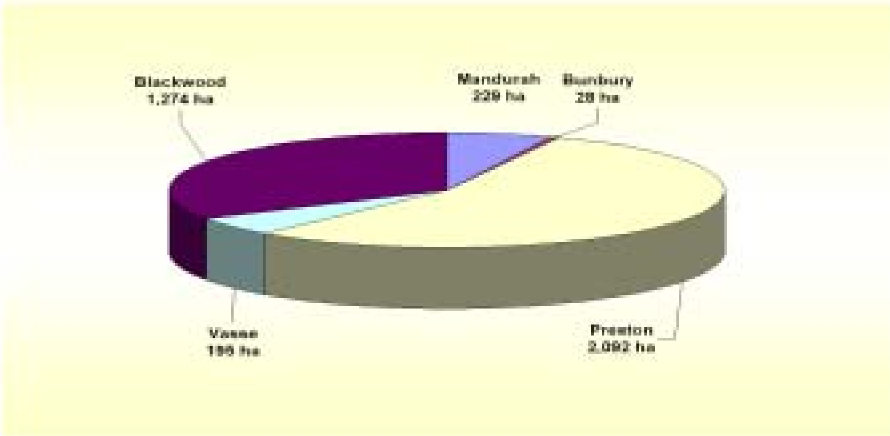
Figure 8: Grape, fruit and nut plantings (hectares)



Source: ABS Agricultural commodities, 2000

Most of the grape plantings are situated in the Vasse and Preston sub-regions and excluding these, fruit and nut plantings are predominantly in the Preston and Blackwood sub-regions (Figure 9).

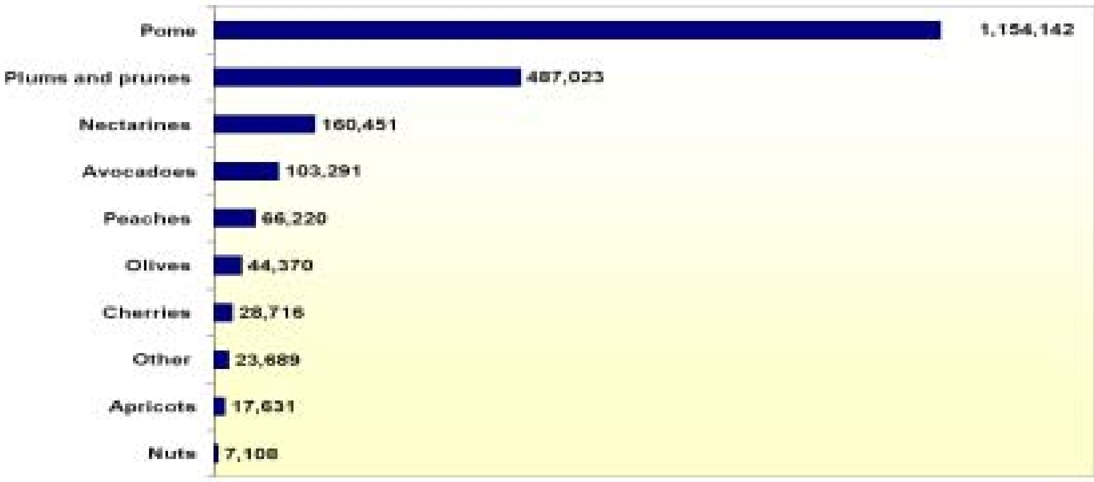
Figure 9: Fruit tree plantings in the South West



Source: ABS Agricultural commodities, 2000

Fruit tree numbers are dominated by the Pome varieties (primarily apples and pears) and plums and prune species, together making up around 1.6 million or nearly 80% of all trees (Figure 10). These varieties are predominantly planted in the Blackwood statistical sub-region at Donnybrook and Manjimup with some plantings in between these towns. The Donnybrook orchards on the west of the town lie close to the Yarragadee Formation but most of these species are planted away from the Yarragadee.

Figure 10: South West planted areas by region, tree numbers



Source: ABS Agricultural commodities, 2000

Fruit trees are planted at a wide range of densities depending on species, management practices, varieties and water availability. To compare the scale of fruit tree plantings to vegetables in the study area, tree numbers have been converted to hectares using the average density for the trees in each statistical sub-region. The densities thus reflect the main varieties in the area and are:

- Mandurah – 540 trees/ha
- Bunbury – 250 trees/ha
- Preston – 600 trees/ha
- Vasse – 150 trees/ha
- Blackwood – 525 trees/ha.

Combining fruit and vegetable areas, the top fifteen commodities and areas together account for just under 80% of the estimated area covered by horticulture activities in the South West (excluding grapes). The ranking is set out in Table 1.

Table 1: Key commodities and sub-region in the South West

Commodity and sub-region	Area (hectares)
Preston Pome	1,171
Blackwood cauliflower	837
Blackwood pome	756
Blackwood potatoes	741
Preston plums	639
Preston carrots	422
Vasse potatoes	420
Preston potatoes	325
Vasse nurseries	200
Blackwood avocados	188
Preston nectarines	177
Vasse flowers	169
Blackwood plums	161
Preston onions	152
Blackwood nurseries	150
Total area	**6,508**

The estimated area of horticulture excluding grapes in the south west of the State is 7,500 hectares. In the study sub region, the Blackwood and Preston areas each account for about 45% of the total with the Vasse area the remainder. Virtually all of the Blackwood region plantings lie outside the area covered by the Yarragadee Formation suggesting that about 4,000 hectares of horticulture (excluding grapes) are planted in the area from Jindong to Donnybrook.

4. HORTICULTURE POTENTIAL IN THE SOUTH WEST

4.1 Past Trends

Over the last twenty years, the horticulture sector has seen significant changes.

New export markets and diversification in the varieties demanded by a more food 'aware' community has led to new varieties, new regions and increased production.

The export market has encouraged investment by larger enterprises with more mechanised production and sophisticated marketing systems. Increased use of refrigeration and airfreight and better market intelligence has enabled production to be better targeted at market opportunities.

The outlook is for greater investment by corporate growers with horticulture facilities spread across the climatic areas of the State to allow continuous production and facilitate promotion activities.

The history of development suggests that planted areas and production will increase in the future. Vegetables appear the most likely expansion sector with slower growth in fruit and limited expansion in floriculture and nursery sectors.

4.2 Markets

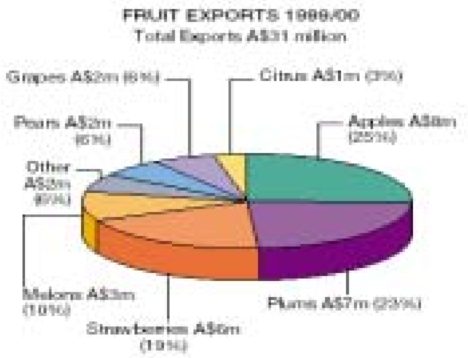
Horticulture has traditionally been a small-scale industry dominated by new migrants who have been prepared to work long hours in the field for volatile returns. The Chinese were an early success, followed by Greeks and Italians. Areas such as Carnarvon had a majority workforce from Slavic countries while many new entrants in the last ten years have come from Asian countries such as Vietnam. Each fruit and vegetable tends to develop its own culture and industry structure reflecting the commodities produced, availability of water, packing requirements etc.

The development of export markets has created opportunities for a larger scale and more corporate approaches. Major export markets have now been developed for carrots, cauliflowers, native flowers, apples, pears and plums and some new fruits including red globe grapes and mangoes. Melons have also been a significant export at times. More details on fruit and vegetable exports follow.

4.2.1 Fruits

Fruit exports in 1999-2000 totaled $31 million with apples, pears and plums from the South West providing 54% of the total value (Figure 11).

Figure 11: Fruit Exports

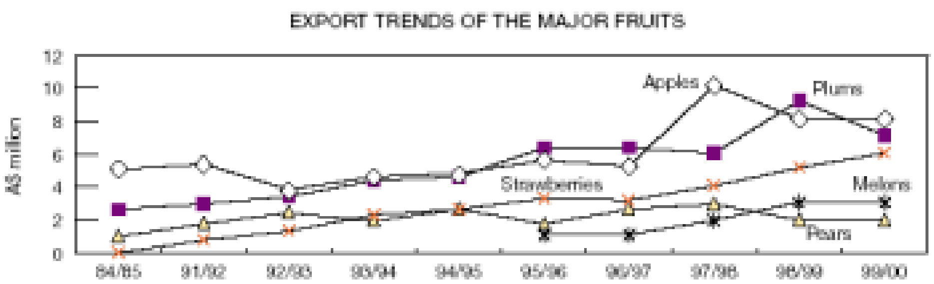


Source: Department of Agriculture:

Red Globe table grapes have grown significantly in recent years. Prices have fallen in domestic and export markets and growers are looking for new varieties. New varieties have been introduced and there are hopes for increased exports. Plantings will be limited in viticulture areas.

There is some potential for increased pome fruit production in future years as new varieties attract greater interest in Asian markets. However, returns in recent years have not encouraged growers to increase plantings and the industry is showing limited interest in expansion. The average age in the industry is high with less interest from the next generation. Lower prices will drive the demand for lower costs of production and the necessity to reduce labour for pruning and harvesting. Counterbalancing these negative forces will be new varieties and improved handling into retail stores that will lead to increased domestic consumption and export opportunities. Most expansion will come from the Pemberton, Manjimup and Donnybrook areas.

Long term trends in fruit exports indicate a rising trend for apples and plums but little growth for pears. Expansion is likely to be in the cooler areas from Donnybrook to Manjimup.



Source: Department of Agriculture,

Increases in production for some fruits are predicted. Plantings in the pome, summer fruit, and table grape industries are heavily focused on high value export varieties, and it is inevitable that the proportion of product being exported will increase given the slowly rising Australian population. Predictions on future sales thus depend on forecasts of the willingness of South East Asian countries to purchase Western Australian produce. This will be a function of price, the exchange rate for the Australian dollar and the ability of local producers to match the rising quality constraints imposed by consumers and other international competitors. Substantial increases in fruit exports will remain challenging.

There is limited fruit plantings in the study area with only 222 hectares licensed from groundwater at present. This includes orchards in the Donnybrook area, some distance from the Yarragadee water source.

Fruit plantings closer to the coast in the South West corner are less attractive at this stage than in the higher rainfall areas of Donnybrook, Manjimup and Pemberton. Avocados are well established and slowly expanding but significant growth will depend on export sales. Soils closer to the coast are perceived as less suited to most species than traditional areas and soft varieties such as stone fruit suffer increased wind damage.

The citrus industry has been expanding in recent years after a prolonged period of little growth. There are significant plantings north of the study area at Harvey and there is some potential for plantings in the study area. However, there is limited interest at this stage and it is difficult to forecast any substantial investment without a large investor keen to develop a long term project for export sales.

Olive plantings have boomed in Western Australia over the last decade. High quality oil is being produced at boutique prices. Western Australia imports substantial volumes of olive oil and local production can displace the more expensive end of the market. The cheaper “bulk” end of the market will be less attractive to local producers.

Olive plantings are still increasing but the rate of expansion has slowed. Attention is shifting to the challenges of harvesting and processing and marketing issues.

This study assumes a gradual expansion in fruit plantings in the study area, but no significant plantings that will have a marked effect on water demand. Avocado plantings may increase after a few good years but the expansion is more likely to be in the Manjimup-Pemberton area.

4.2.2 Vegetables

The majority of vegetables produced in Western Australia are consumed in the State as fresh product. Processing is expanding but still accounts for less than 5% of production. Export markets take around 30% of production with carrots and cauliflower dominating (Table 2).

Significant expansion in carrot exports has taken place since 2000 and further increases are forecast. Cauliflower production faces keen competition and potatoes are substantial but showing limited expansion.

Singapore, Malaysia and Hong Kong have dominated export markets taking over 75% by value in 2000. Reliable freight links and the long-term decline in value of the Australian dollar have assisted these exports.

Table 2: Main Vegetable Exports, 2000 (tonnes)

Crop	Tonnes
Carrots	55,836
Cauliflower	20,177
Potatoes	11,255
Strawberry	2,382
Celery	1,964
Chinese Cabbage	1,812
Cabbage	826
Lettuce	286
Broccoli	178
Tomatoes	158

Source: Department of Agriculture, Myalup Horticulture Precinct Study, and June 2002.

Carrot exports grew rapidly in 2001 reaching an estimated 66,000 tonnes with a value of $43 million. A further increase is expected in 2003.

As part of the Myalup Horticulture Precinct Study, the Department of Agriculture reviewed five vegetable crops thought to have potential for that area. The potential markets for these commodities could be met by production from the study area. Given the water supply limitations at Myalup in terms of both quantity and quality, groundwater from the Yarragadee may be a better long-term option. The following notes review each vegetable in the Myalup study and project potential long-term demand. In this case, long term is taken to mean at least ten years, which is as far out as a volatile industry such as vegetable production could be reasonably forecast.

Carrots were thought to offer the most promise for profitability and export potential. Estimated world production is 19 million tonnes with around one million tonnes traded annually. Australia produces around 0.25 million tonnes and exports around 60,000 tonnes or 6% of trade.

World consumption of carrots is rising by around 2% per annum and the demand for fresh prepared carrots is increasing.

Over the last 10 years, Western Australian production has steadily climbed and exports have expanded. Malaysia. Singapore and Hong Kong dominate our export markets. Indications from the Myalup study suggested market opportunities for another 5 to 6,000 tonnes in the medium term (three to five years). No forecast was made beyond that period. This level of production would require **120** hectares of plantings or **60** hectares if double cropping were used.

Given that growth from 2000 to 2001 was 13,000 tonnes, this appears to be a very conservative estimate. Two large producers in the industry are expanding operations and increased plantings and production is expected. Some of this will come from plantings in the Capel area, some from Myalup and some from Gingin. This study assumes an increase in State production of a further 25,000 tonnes with 50% to come from the South West. With double cropping under centre pivot irrigation systems, around **250** hectares appears adequate.

World production of *onions* is around 45 million tonnes with Australia producing less than 1% of the total. Australia is more significant as an exporter providing nearly 8% of the total traded volume or 65,000 tonnes.

Onion exports have declined dramatically from Western Australia over the last decade although processed onions (sliced, diced and packaged) have been increasing with current markets in Japan and other South East Asian countries. The Myalup study does not provide any forecast of potential quantities other than to indicate that 3,000 to 4,000 tonnes appears to being processed now. On this basis, an optimistic scenario would be to assume a three-fold increase in production to 10,000 tonnes. This would require planted areas of around **200** hectares.

World production of cauliflower is 14 million tonnes with Australia providing less than 1% of the total. Australia provides closer to 4% of world trade, which is increasing.

Most cauliflower production is from the South West of the State with production rising at a rate of 8.5% over the last decade. Malaysia and Singapore dominate exports but sales have been made to at least 11 other countries.

The Myalup study indicated the potential for a further 750 to 1,000 tonnes of production a year in the medium term. Assuming that the industry could increase exports by 50% in the longer term, an additional **800** hectares might be planted.

Broccoli production internationally is estimated at 4 million tonnes with Australia producing 1% of the total. Western Australia produces about 5% of the national total with only 8% exported. Production has remained fairly static for some years.

Substantial export development is hard to forecast although traded quantities are increasing.

Crisping potatoes are used in potato chip production for fast food outlets and packaged products. Processing in Western Australia has had a traumatic history and continues to be volatile. Export markets are promising. Production will come from the South West and from areas around Manjimup, Pemberton and West Gingin. Production from the South West has been constrained by competing land uses including viticulture (Vasse region) and plantation forestry (Manjimup etc). The Myalup study did not make any specific forecast on expansion. An expansion of **400** hectares for additional production of 20,000 tonnes would appear optimistic.

Forecasting long term production for the horticulture industry is very difficult. The industry has always faced volatile market prices and difficulties with consistent export sales. Production plans for vegetables tend to short term and flexible. The Myalup study did not make specific forecasts for most of the commodities but on the basis of the numbers presented here, an expansion in the region of **1,770** additional hectares of land over the next ten years appears optimistic. Any forecast beyond that time would be meaningless as this is already an optimistic outlook and performance against this level is needed before any further forecast can be made.

The Myalup study demonstrates the potential for increased vegetable plantings. It provides an order of magnitude that could be supplied from the region. It is outside the South West Yarragadee Formation, and hence the assumption is made that a similar area could be planted in the study area. Large plantings at Myalup would preclude expansion in the study area.

4.2.3 Floriculture

While floriculture remains a promising growth sector, for the reasons outlined in section 2.1.2.4, no substantial change in planted areas is assumed in this study. An increase is included, as part of a general expansion in horticulture but it is not ascribed to any particular variety given the difficulty of forecasting such a change at this stage.

4.3 Profitability

The profitability of horticulture production depends on a wide range of variables. Soil fertility, climatic variability, weed and disease controls are all significant factors affecting the cost of production. More importantly, market prices and variability are fundamental. Most horticultural products are highly seasonal with a corresponding flush of production followed by lower productivity and quality. Increasingly, profitability is being seen as dependent on quality control and marketing ability. While it may appear simplistic, quality produce marketed out of season or during the shoulder periods is generally profitable while average quality marketed domestically during the peak of a season is generally marginal.

Growers are quick to follow price signals and hence a crop fetching high prices in a period this year will be frequently over-planted next year. For many horticultural products, the actual cash costs of production are fairly low and hence larger areas are often planted than appears essential given the opportunity for reasonable prices should the supply from other producers fail to fully satisfy market demand. This is not true for most tree crops where establishment costs are high and replanting expensive. Tree crops and grapes thus face longer production cycles.

Statistics on farm profitability for horticulture enterprises are not collected in Western Australia. Trends in planted areas are clearly one indication of perceived profitability. The last ten years have seen large areas planted of carrots, cauliflowers, pink apples, avocados, red globe table grapes, wine grapes, mangoes and melons. Waxflowers, plums, and nashi pears were also popular and strawberries boomed.

The Department of Agriculture Myalup study reviewed five crops suited to the area in detail in 2002. They all provided estimated **net** profit margins of more than $2,000 per hectare (Table 3).

Table 3: Selected Vegetable Crop Net Margins ($ per hectare).

Crop	Net Margin ($/ha)
Carrots	6,500
Processing onions	3,100
Cauliflowers	2,300
Broccoli	2,300
Crisping Potato	2,000

Source: Department of Agriculture, Myalup Horticulture Precinct, and June 2003.

While desktop financial studies consistently show horticulture enterprises as profitable the challenges in producing and marketing fresh fruit and vegetables mean that commercial profitability has been more challenging. Smaller producers in the South West are thus looking at niche opportunities. Specialist lines such as organic foods and baby foods are being considered along with more direct producer to consumer supply chains. Such niche developments often come from the initiative of small entrepreneurs. Such effort will continue to provide a catalyst for regional development but will not have a major impact on water demand.

4.4 Forecast Plantings

This study is required to make a long term forecast of plantings in the study area that could use South West Yarragadee Formation water. It has shown potential for increased plantings of pome and stone fruit and a range of vegetables. The forecast assumes the following increase in areas over a 20 to 30 year period in the South West region as a whole:

- Pome fruit – 50% expansion;
- Vegetables – 100% expansion;
- Avocados – 100%
- Floriculture and nurseries – 100% increase;
- Other fruit – 100% increase; and
- New and unspecified plantings of fruit and vegetables – 500% growth.

Forecast plantings have been based on this growth potential for each statistical subdivision that overlies the Yarragadee Formation. It is not possible to be more prescriptive in the areas or time frame given the shortcomings of the statistics and the difficulties faced with forecasting volatile commodities such as vegetables. The estimated areas do not take into account basalt sub-surface rock and hence overstate the actual farm area that might readily source Yarragadee water. The proportion for each statistical area based on the Yarragadee Formation map (Figure 12) is:

- Preston subdivision for fruit – 30%;
- Preston subdivision for vegetables – 50%;
- Vasse subdivision – 100%;
- Unspecified fruit and vegetables – 50%; and
- Unspecified other horticulture – 50%.

Figure 12: Yarragadee Formation

Source: Water and Rivers Commission, June 2003

The increase in area planted by 2015 is 2,515 hectares (Table 4). The increase in vegetable plantings is around 1,375 hectares if half of the "other" category is included. This is not too different from the 1,500 hectares postulated in the Myalup study. Fruit plantings in the study area are forecast to increase by 770 hectares (including half the other category) with flowers and nursery areas up by 370 hectares.

Table 4: Forecast Horticulture Expansion

Crop and area	Existing area (ha)	Potential expansion	Yarragadee cover	Potential area (ha)
Preston Pome	1,171	50%	30%	175
Blackwood cauliflower	837	100%	0	
Blackwood pome	756	50%	0	
Blackwood potatoes	741	100%	0	
Preston plums	639	30%	50%	95
Preston carrots	422	100%	50%	210
Vasse potatoes	420	100%	100%	420
Preston potatoes	325	100%	50%	165
Vasse nurseries	200	100%	100%	200
Blackwood avocados	188	50%	0	
Preston nectarines	177	50%	30%	25
Vasse flowers	169	100%	100%	170
Blackwood plums	161	50%	0	
Preston onions	152	100%	50%	75
Blackwood nurseries	150	100%	0	
Other vegetables	760	100%	50%	380
Other fruit	700	100%	50%	350
Other	100	500%	50%	250
Total area	**7,968**			**2,515**

4.5 Land

There is an estimated 28,000 hectares of Class II and I land suitable for horticulture between Perth and Augusta on the Swan Coastal Plain[6]. Some of this land will never be used for horticulture due to other land uses, town planning or environmental constraints. About 11,000 hectares of this land is being used for horticulture.

Over 17,000 hectares of the total is found in the Shires of Harvey and Waroona leaving 11,000 hectares in the more southern areas forming part of the Yarragadee study. An approximate estimate is that 4,000 hectares is being used leaving potential areas for expansion of about 7,000 hectares. Most of this area appears suitable for fruit and vegetables.

[6] Department of Agriculture, Myalup Horticulture Precinct, June 2002

4.6 Water Use

The Water and Rivers Commission database includes 335 licenses that are attributable to horticulture operations in the area from Australind to Augusta. All licenses record the amount of water to be used but a few large ones have not specified the area to be reticulated. The total volume of water licensed is 18.34 GL and the total nominated area for irrigation is 2,084 hectares of land (Table 5). With table grapes excluded (these are covered in the viticulture study0, the licensed area is 1,972 hectares.

The average allocation works out at 8.8 ML per hectare of land to be irrigated. The average would be less if the areas were included for a few large licenses.

Table 5: Water Licenses in Study Area

Commodity	Licenses	Area Ha	Water ML	Range ML
Orchards	62	222	1,426	0.1-112
Citrus	12	12	97	1-18
Stone fruit	4	13	63	6-40
Nuts	4	22	69	2-60
Strawberries	3	7	90	5-24
Passionfruit	2	2	16	8-8
Melons	1	13	79	0-45
Fruit and nuts	**88**	**291**	**1,840**	
Vegetables	49	491	5,995	1-2640
Potatoes	41	523	3,540	4-247
Horticulture	17	118	2,872	0-300
Avocado	21	129	1,842	7-340
Market gardens	1	3	45	45
Asparagus	3	47	360	110-130
Pumpkins	14	55	460	10-64
Herbs	3	5	11	17-30
Total vegetables	**149**	**1,371**	**15,125**	
Nurseries	25	17	170	0.1-24
Olives	29	180	497	0.2-110
Proteas	6	92	292	7-90
Flowers	4	21	71	1-18
All Flowers	**10**	**113**	**363**	
Table grapes	34	112	339	4-247
Horticulture	**335**	**2,084**	**18,334**	

Source: Water and Rivers Commission, June 2003

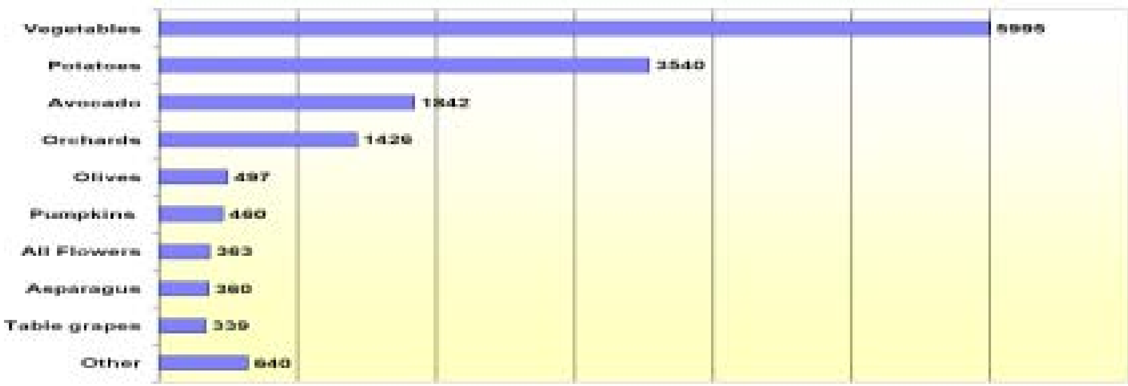
The largest single category of licenses is for orchards (62 licenses) followed by vegetables, potatoes and table grapes. However, in terms of area to be irrigated, potatoes and vegetables dominate accounting for just under 50% of the total area (Figure 13). The relative scale of the enterprises also differs with an average area per license of potatoes and vegetables in excess of 11 hectares compared with only 3 hectares for the orchards. The newest crop in the State to experience rapid plantings, olives, has grown to 180 hectares with an average area of 6 hectares.

Figure 13: Water License Listed Areas (hectares)

Vegetable production dominates water use accounting for over 80% of the total. Fruit and nuts have an allocation of 10% with the other 10% made up from olives, table grapes, flowers and nursery use.

The largest allocation of water in terms of defined crops (excluding the general horticulture category is vegetables followed by potatoes (Figure 14). Combined with avocados they collectively account for just over 60% of the water allocated.

Figure 14: Water License Listed Areas (M Litres)



Water use by different crops varies with soil type, location, weather conditions and management practices. The average allocation across the licenses issued varies enormously from a low of 2.2 ML per hectare for the two herb licenses to 24 ML per hectare for the general horticulture category. The latter average is inflated by the inclusion of water volumes without listed areas. The highest specific crop (avocados) has an average use of 14.3 Ml per licensed hectare. Olives, flowers and table grapes all average less than 3.5 ML per hectare of licensed area.

4.7 Summary

This report has been prepared to assist with the economic evaluation of an application to draw water from underground sources in the South West of the State for use in the Integrated Water Supply System. It complements studies on the dairy and viticulture sectors.

The horticulture industry has been one of Western Australia's fastest growing primary production sectors in Western Australia. Most growth has been in vegetables, tropical and summer fruit and table grapes.

Statistics on the horticulture sector are notoriously unreliable and volatility in the industry makes forecasting challenging. This study is no different. The conclusions rest on a limited number of previous studies, dated statistics and industry comment. A ten-year projection for land and water demand is included but this is indicative only. Any forecast beyond that would be pure speculation. The forecast represents a long-term view of the sector.

Excluding grapes, official agricultural census statistics suggest that there is around 4,600 hectares of horticulture in the Preston and Vasse statistical sub-divisions. Assuming that half of the Donnybrook fruit plantings lie outside the area covered by the Yarragadee Formation would reduce the area that might cover the Formation to around 3,500 hectares.

A study of the potential for horticulture at Myalup by the Department of Agriculture has been used to hypothesize increased vegetable plantings in the region of around 1,750 hectares.

An examination of current water allocations indicates that a total of 1,370 hectares of vegetables are licensed with less than 300 hectares of fruit.

Forecast increases based on the outlook for each sector and the region suggests a total increase in horticulture enterprises in areas overlying the Yarragadee Formation of 2,515 hectares made up from 1,375 hectares of vegetable plantings, 770 hectares of fruit plantings and 370 hectares of flowers and nursery areas.

Given the growth in carrot production since the statistics were last collected and the plans of major producers, this study assumes a more optimistic outlook for vegetables with a proposed 1,800 hectares. Around 770 hectares of fruit is forecast with 370 hectares of flowers and nurseries. The total of 2,940 hectare is 1,000 hectares greater than the current licensed area or an increase of 50%. It also represents about 80% of the estimated current area.

Using an average water consumption level for fruit and nurseries of 5ML per hectare and 9ML per hectare for vegetables, the demand for water from another 2,940 hectares of horticulture would be about **22 GL** of water.

The actual location of these plantings will depend upon land and water availability. A substantial proportion could be around Myalup but this study takes a conservative approach by assuming that it is all planted in the study region as the following table summarises.

Region	Commodity	Area (hectares)	Water demand (GL)
Jindong through Boyanup	Vegetables	1,500	13.5
	Fruit	620	3.1
	Nurseries/flowers	300	1.5
Augusta – Margaret River	Vegetables	0	0
	Fruit	150	0.7
	Nurseries/flowers	70	0.3
Scott Coastal Plain	Vegetables	300	2.7