

# Olive oil

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## Introduction

Olive oil is an international commodity. Development of a local industry must therefore be considered in an international context. Australia has the climate, physical resources, horticultural infrastructure and expertise to support a modern olive industry. However, other Southern Hemisphere countries also have the resources and have started developing their own olive industries. In addition, the production resources are in demand by other horticultural industries in Australia.

Despite this, olives, particularly for oil production, have become a substantial horticultural industry based on existing domestic demand and the potential for the development of export markets.

The health benefits of olive oil and the continuing interest in Mediterranean cuisine ensure that it is a popular choice for consumers across the world. Nevertheless, locally produced olive oil must be able to compete against other vegetable oils with similar chemical characteristics,



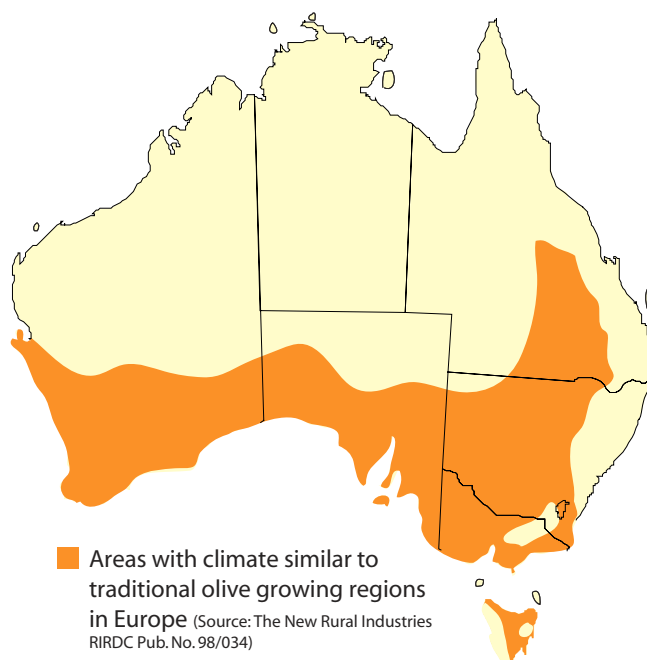
Australian olive oil

as well as alternatives, including imported olive oils, which can be cheaper.

## Markets and marketing

Olive oil markets are dominated by Spain, Italy, Greece and Tunisia which account for approximately 85% of world production and a similar percentage of consumption.

World olive oil consumption has risen by almost 1 million tonnes in the past 12 years. The perceived health benefits, a continuing interest in Mediterranean cuisine and promotion by the controlling body of the industry, the International Olive Oil





National Olive Variety Collection, Roseworthy, South Australia

Council, are all stimulating market demand for olive oil, particularly in countries not traditionally associated with olive oil such as the United States and Japan.

In 2002–03, Australia imported 32,748 t of olive oil (30% extra virgin) valued at \$139 million. The average annual growth rate of olive oil imports has been 17% for the past 10 years in Australia. There are no accurate figures for local production of olive oil but it was estimated at about 1,500 t in 2003 (D. Taylor, pers. comm.). This figure will grow rapidly as the estimated 8 million trees planted in Australia in the last 10 years come into full production.

Strong local demand and the potential for exports have seen a renaissance in the Australian olive industry. It has been estimated that output from recent plantings can provide most of the demand for olive oil on the domestic market within five to 10 years. It is important therefore for the local industry to quickly develop

both the domestic and the export markets for Australian olive oil.

The growth in interest in olive oil production is undoubtedly driven to some extent by the high prices (\$22 to \$65/L) currently being achieved by some locally produced oils. In contrast, lower quality imported oils are retailing at \$8 to \$12/L in supermarkets. This implies that the import price is around \$4/L or less. Australian extra virgin oil needs to either compete with this low import price or differentiate itself sufficiently for consumers to pay a higher price.

A reasonable price, acceptable taste and reliable supply of sufficient volumes of consistent quality oil are all required to gain acceptance and shelf space in supermarkets. This is important in underpinning the growth of the industry.

Economies of scale and modern production techniques based on worlds' best varieties and practices can place Australia in a strong

competitive position. Even so, it must be recognised that there is competition from other Southern Hemisphere producers and from other vegetable oils, such as canola.

## Production requirements

The olive originated in the Mediterranean region and will grow well in areas of Australia with a similar climate—cool, wet winters and warm, dry summers. They will produce in other areas as long as they have the correct chilling requirement (winter temperatures fluctuating between 1.5°C and 18°C) and summers long and warm enough to ripen the fruit. The trees can suffer severe damage at temperatures less than –5°C. Hot, dry winds or rain at pollination in late spring can reduce fruit set. As well, significant rain at harvest-time, can reduce the extractability of oil from the fruit due to the higher water content in the fruit. This appears to be particularly problematic for fruit normally grown for table olive production, such as manzanillo.

The shaded areas on the map show regions in Australia with similar climatic regimes to traditional olive growing areas in Europe. There are other areas not indicated on the map where olives are grown successfully. However, long-term economic viability is yet to be determined. Recent results from the National Olive Variety Assessment Project, funded by RIRDC, show that olives grown in the cooler more southerly latitudes in Australia, produce higher levels of oleic acid in the oil, a positive characteristic, than olives grown in the more northerly latitudes of Australia.

Olives will grow in most soil types as long as they are well-drained and have a subsoil pH range of 6.5–8.5. Steep slopes should be avoided if it is intended to use machinery, especially mechanical harvesters which can not operate efficiently at slopes greater than 30%.

Tree spacing is generally around 250–300 trees/ha to optimise yield and light interception at maturity. Some growers are experimenting with higher density hedgerow plantings with the aim of increasing early yields and straddle harvesting the trees, much like wine grapes. These high-density plantings require greater management input and, as mentioned, are still in the experimental stage.

Olives can be grown without irrigation but water stress will significantly reduce yields. Californian research has shown they need approximately 1000 mm of irrigation plus rainfall annually to produce maximum yields. Good yields are possible using less water, but this requires careful irrigation management to ensure minimal water stress during critical growth stages.

## Varieties

There are many different oil varieties available in Australia, although DNA typing is showing that some varieties with different names are actually the same. Some of the more commonly known varieties include arbequina, barnea, Californian mission, coratina, frantoio, FS17, koroneiki, leccino, nevadillo blanco, pendolino and picual. All have their own particular characteristics—such as oil yield, organoleptic (taste and smell) characteristics, resistance to stress, productivity,

tree vigour, time of ripening and ease of harvest—and all of these characteristics should be thoroughly researched before a choice is made. Probably the best advice, though, is to research what your market wants and then determine whether these varieties will grow in your particular environment.

Nearly every olive variety will benefit from some form of cross-fertilisation with another variety to optimise yield. Experimental work is still determining which varieties pollinate other varieties best. In general, it is best to have at least three to four different varieties to optimise cross-pollination. Different olive varieties should be within at least 30 m of each other, preferably closer.

Due to the current confusion in olive variety identification in Australia, planting stock should only be purchased from reputable nurseries with good-quality control and DNA-certified varieties. Any waiting period should be spent developing a business plan and preparing a site.

## Agronomy

Although olive trees are hardy, to yield well they require the same high level of management as other commercial tree crops, particularly in their first few years of growth.

Soils should be tested for their nutrient status before planting, as many corrections are easier to make without trees in the ground. Olive trees will respond to fertilisers and it is important to take regular soil and/or foliar samples for nutrient analysis. As well as ensuring a correct balance of trace elements, a combination of NPK fertiliser should be applied half in autumn and half in spring.

Young trees are vulnerable to strong winds and should be staked or trellised, particularly if a single straight stem is required for mechanical harvesting. Protective paper or foil wrapping around the trunk will protect the young tree from sunburn and herbicides. Competition from weeds can be a major problem for young trees but is easily managed by using herbicide along the tree



Portable catching frame for small scale harvesting of olives

row leaving a strip of pasture in the middle of the row which is regularly slashed.

The young tree will need to be pruned to encourage it into the correct shape (usually vase or conical) to optimise efficient removal of olives by mechanical shaking. Once this is achieved the tree should be pruned every year to maintain shape and tree health by allowing air and light to enter and circulate through the canopy. If the trees have been planted specifically for straddle harvesting, protruding limbs that can obstruct the harvester will need to be controlled. Olive trees are biennial bearers and pruning at the correct time during “on” years will encourage more shoots and subsequent fruit growth in the following “off” year.

The time from planting to first harvest is variety dependent and also dependent on management techniques. Some varieties will come into commercial bearing at only two to three years of age. Most olive varieties though will take at least four to five years, however, and even longer if not cared for properly. Maximum production is generally achieved by years 7–8. Young trees can be induced to yield earlier by correct irrigating, fertilising and pruning.

## Pest and disease control

A major advantage of olives is that they are relatively pest and disease free in Australia. Very few chemicals should be needed for successful olive cultivation and the trees have good potential to be grown organically, particularly in drier areas. If pesticides must be used, the National Registration Authority has information on which chemicals are permitted

for use on olives and under what conditions they can be applied.

The most common pest is black scale, which also affects citrus. Olive lace bug (not to be confused with beneficial lace wings) can also be a problem, particularly in the eastern states. The curculio beetle or weevil is a common pest in new plantings that were formerly pasture.

All of these pests can be controlled, but they should be positively identified and expert advice sought to minimise indiscriminate spraying of broad-spectrum insecticides that will also kill beneficial insects.

The main fungal problem is peacock spot, which results in leaf fall and poor fruit set. It is more common in humid areas and correct pruning to allow adequate air flow through the leaves will help keep it under control. Anthracnose, or fruit rot, can also affect olives. Copper sprays can be used for both of these fungal diseases.

Olives are also harmed by some soil-borne pathogens such as phytophthora, verticillium and nematodes common to other fruit trees. If the site has been previously used as an orchard the soil should be tested for these organisms and fumigated if necessary.

The olive knot bacterium which produces galls on trunks and branches, has recently been identified in Australia on isolated

properties. Sound orchard management and hygiene should keep this disease under control.

## Harvest and post-harvest

Olives have traditionally been harvested by hand, but for an economically viable large-scale operation mechanical harvesters are essential. Mechanical shakers can either shake olives off individual limbs or vibrate the whole trunk.

Over-row harvesters similar to grape straddle harvesters can also be used on small trees. Other mechanical harvesters that comb the foliage are being developed by enterprising local engineers. Correct training and pruning of trees is crucial for mechanical harvesters to be able to operate efficiently.

Fruit should be transported to the processing plant under optimum conditions and processed as soon as possible after harvest to reduce oxidation and fermentation which will produce faulty oil.

Impeccable hygiene is vital at the processing plant to produce a



Mechanical straddle harvester for large scale harvesting of olives (Photo: Boundary Bend Estate)



Washing fruit on a continuous process system

fault-free oil. Modern processing plants that crush the fruit, mix the resulting paste and then separate the oil from the paste in one continuous process are usually employed. Traditional mat presses are generally not recommended as it is extremely difficult to keep the mats scrupulously clean. A continuous process system with a capacity of 1.5 t of fruit per hour will cost around \$500,000, although smaller, cheaper machines suitable for boutique operations are also available.

Olive oil has a quality grading system based on chemical and taste tests. Virgin olive oils (extra virgin, virgin and ordinary virgin) are obtained solely from the fruit by mechanical or physical means without using chemical extractants or excess heat (greater than 28°C) that will alter the characteristics of the oil. Extra virgin olive oil is considered the best-quality grade and is the primary focus of most olive oil producers in Australia.

Refined olive oil is obtained from virgin olive oil by refining methods used to improve the odour, flavour and taste. Olive oil (sometimes labelled pure olive oil) is a blend of refined and virgin olive oil. The olive pomace (solid material left after the first oil extraction) can

be treated with solvents to extract the remaining oil to produce olive pomace oils suitable for human consumption.

Olive oil should be stored in airtight and light-proof containers at a constant temperature below 22°C to slow down the onset of oxidation, which causes the oil to go rancid. Even under ideal storage conditions, though, olive oil quality will deteriorate over time and it should be consumed within one to two years after production.

## Financial information

Establishment costs will vary considerably for each site. To simplify matters, in the following example the prices of land, irrigation headworks and special soil preparations are not considered. These costs, though, particularly irrigation headworks, can be significant. After these, the major establishment costs are the trees and an irrigation system.

Trees cost between \$5–\$10 each depending on age and source. Irrigation reticulation varies from \$1,000 to \$4,000/ha depending on system design and labour costing. Professional soil surveys and irrigation system designs are

highly recommended to optimise irrigation efficiency. With a further \$1,000/ha for ripping and soil amendments, establishment costs lie in the order of \$3,000 to \$7,500/ha (assuming a standard planting density of 250 trees/ha).

Annual gross return for a mature grove (maturity reached by about year 8 for an intensively managed grove) is determined by tonnage, oil percentage and price. Assuming a planting density of 250 trees/ha; 50 kilograms of fruit/tree and 20% oil (specific gravity 0.91):

- 250 trees x 50 kg = 12,500 kg of fruit
- 12,500 kg x 20% = 2,500 kg of oil
- 2,500 kg / 0.91 = 2,750L of oil (about) = 140 drums (20L drums) of oil.

Production costs (pesticide, pruning, fertiliser, irrigation, herbicide picking and processing) are between \$6,000 and \$8,500/ha depending on whether the fruit is hand picked or mechanically harvested.

By substituting the 'world parity' price of \$4/L into the equation above, the gross return is \$11,000 giving a gross margin of between \$2,500 and \$5,000/ha. The gross margin does not include capital costs, which can make the overall venture unprofitable unless a large enough area is planted to achieve economies of scale.

The yield figures just given are reasonably high under Australian conditions and can only be consistently achieved by carefully managed groves. However, niche or speciality marketing can achieve higher prices for the oil. Sensitivity analyses on yield and price should always be done to determine what could be realistically achieved in your situation.

The important issues are to use the best varieties and management practices (such as irrigation) to ensure high fruit and oil yields and design the grove to accommodate mechanical harvesting to reduce costs. Throughout the production and processing system attention to quality is essential.

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## Key statistics

- World olive oil production (2002/03) 2,515,000 t.
- World olive oil consumption (2002/03) 2,641,000 t.
- Australian olive oil imports (2002/03) 32,748 t (\$139 million).

## Key messages

- Maximise productivity by variety selection and management.
- Minimise costs through mechanisation and economies of scale.
- Understand and develop markets.
- Nurture industry growth through coordinated organisation.

## Disclaimer

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The RIRDC website—[www.rirdc.gov.au](http://www.rirdc.gov.au) contains a number of useful olive research reports. Follow the links to 'New Plant Products Research Reports'.

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The Australian Olive Association website has contact details for all regional olive associations.

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Susan Sweeney has an honours degree in Agricultural Science and for 14 years has been working with Primary Industries South Australia, seven of these years on olive projects. Her previous positions were as a research officer evaluating woodlots irrigated with saline water and also as a property management planning officer for horticulturalists.



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