



Australian Government

**Rural Industries Research and
Development Corporation**

Olive Variety Regional Performance Study:

**A qualitative survey of the
views of olive growers,
processors and
harvesters on the
performance of olive
varieties in various
regions of Australia.**

Dr Patricia Murray
Ms Susan Sweeney

**Appendix to Final Report
SAR-47A**

**National Olive Variety Assessment Project –
(NOVA) – Stage 2**

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ISBN 1 74151 223 9
ISSN 1440-6845

National Olive Variety Assessment Project – (NOVA) – Stage 2
Publication No. W05/160
Project No. SAR-47A

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Published in October 2005

Printed on environmentally friendly paper by Canprint

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Acknowledgements:

Thankyou to the following growers, processors and harvesters who gave up their time to be interviewed for this survey.

NSW:

Carolyn Evans, Graham Reid, John Attwood, Les Parsons, Liane Heinke, Mac McCulloch, Marg Kirkby, Mike Wilson, Patrice Newell, Rita Hengeler, Ruth Quigley, Steve Goodchild, Susan Spencer, Warwick Grant

Queensland:

Dan Burnett, Ian Roy, Keith McIntosh, Marilyn Morrissey, Merrilie Forrest,

SA:

Anne Collins, Grant Wylie, John Gorman, Ken Schultz, Augusto Lorenzetti, Louis Marafioti, Mark McClean, Milan Pavlic

Tasmania:

John Fenn-Smith, Anne Ashbolt

Victoria:

Paul McClure, Phil Ward, Andrew Burgess

WA:

Frank Von Altenstadt, Jim Hollingsworth, Shane Ryan, Vincent Tana

Thankyou also to the following people for assisting in developing the questionnaire and identifying suitable growers to interview.

- Karen Butler - Department of Primary Industries, Water and Environment, Tasmania.
- Dick Taylor - Department of Agriculture Western Australia
- Damian Conlan NSW Department of Agriculture

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The views expressed in this publication are those of the persons surveyed and not necessarily those of the authors. The authors shall not be responsible in any way whatsoever to any person who relies in whole or in part on the contents of this report.

Summary of survey and conclusions

This survey was prompted by uncertainty as to the performance of different varieties of olive in different regions of Australia. In late 2004 and early 2005 a survey of thirty-five growers, together with processors and harvesters in nine climatic regions was conducted. Phone interviews by an experienced olive consultant lasting up to one hour, supplemented by email questionnaires, were the principal means of data collection. The data was subjected to qualitative analysis. The objective of the survey was to investigate growers' perceptions of performance of olive varieties in a range of climate regions.

- In total growers had planted or had experience with forty-eight varieties of olive.
- Of varieties grown Frantoio would be planted again by 13 of 29 growers in this survey, 4 of 7 of these growers growing Frantoio on good soils and 5 of 8 on well drained soils. Though the number was smaller in total, half of those growing Coratina or Kalamata would plant those varieties again. Less than 20% of those growing Manzanillo recommended the variety and it was mainly recommended by those growing it for table fruit, not for oil. Indeed Manzanillo together with Hardy's Mammoth were varieties growers would not recommend be planted again or are considered among the worst varieties by growers.
- Fewer than one quarter of growers of any olive variety reported pest or diseases for that variety and no pests or diseases were reported for the majority of varieties.
- Trees are generally three to four years at the time of their first harvest, with a range of from 2 to 10 years. Small harvests were reported at first, building to good production levels when trees are around five to six year old trees.
- Varieties have differing habit and differing pruning requirements. Diversity in grower approach to pruning and training was reported.
- Frost was an issue in all regions except E7 and I3, Manzanillo, Barnea and Frantoio were most frequently noted as frost susceptible. Leccino was reported to be frost tolerant.
- Flowering time seems to vary from one variety to another and from one region to another. Issues of pollination are further complicated by uncertainty regarding varieties.
- The moisture content of the fruit requires careful management to ensure that fruit suitable for processing and yielding high oil percentages is produced. Processing problems as a result of moisture content were reported particularly by Manzanillo, Barnea and Picual growers as well as by processors. Irrigation management prior to harvest was recommended to prevent levels of moisture in the fruit becoming a problem.
- Large fruited varieties were reported to be easier to harvest, while most problems were reported with small fruited varieties such as Corregiola and Frantoio. Fruit left after harvest was commonly reported.
- Manzanillo, while pickling well, was noted for its processing problems; Frantoio was most frequently cited as processing well.
- Kalamata, Coratina and Frantoio are varieties that growers have said they would plant again if they were starting their groves from scratch, seven growers who would plant Picual again. Nearly as many Manzanillo growers said they would not plant Manzanillo again as said they would and half of all Hardy's Mammoth growers ranked the variety as among the worst.

Regions

- Growers in region D5 reported high fruit yields for Manzanillo, but low oil percentage yields. Half of the four Frantoio growers reported oil percentages of 20% or above, on all soil types, however only one has said they would plant this variety again. Manzanillo and Hardy's Mammoth were held to be among the worst varieties by growers in this region.
- Two of the four Nevadillo Blanco growers in region E1 reported the variety suffered with black scale and pollination problems were also reported for this variety. Oil yields of 20% and above for Nevadillo Blanco and Frantoio together with some high fruit yields were reported. All Coratina and Arbequina growers in this region would plant these varieties again, though only two of the five Frantoio growers would plant Frantoio again.
- Manzanillo were noted by two of the four growers in region E2 to be affected by black scale. Oil percentages of 20% or above were reported by Nevadillo Blanco growers on sandy soil in this region. Both Kalamata and Coratina growers in this region would plant these varieties again, as would the only California Queen grower in the survey.
- In region E3 black scale and thrip were noted to affect Frantoio, Kalamata and Manzanillo. Low oil percentages for Manzanillo were reported by five of eight growers but three of eight Frantoio growers reported 20% or above oil percent. Three of eight and three of nine Corregiola and Frantoio growers respectively would plant these varieties again.
- Manzanillo growers in region E6 have reported high fruit yields but low to mid oil percentage yields. All Frantoio growers in this region would plant the variety again.
- Growers in region E4, reported few pests or diseases. Both Coratina growers in this region would plant the variety again, however the only grower with Frantoio would not plant the variety again.
- The Arbequina and Azapa growers in region E7 would plant these varieties again, one Manzanillo grower reporting anthracnose.
- In region F3 two Nevadillo Blanco growers reported black scale and anthracnose as problems, two Manzanillo growers also reported black scale. Two of the three Manzanillo growers reported low fruit yields. Two of three Frantoio growers and both Kalamata growers would plant these varieties again.
- Only one grower was interviewed in I3 region, indicating that it is possible to grow olives there.

Differences in soil type may be influencing varietal performance and this together with regional differences are indicated as being important in explaining differences in performance of olive varieties across Australian olive growing regions. Small numbers have meant that meaningful comparisons were not always possible with this data.

Other issues which have emerged include the importance of preparation and nutrition management for establishing a successful olive enterprise. Small numbers interviewed in some regions, E4, E7, F3 and I3 have meant that no more than an indication of performance of varieties was possible.

Introduction

Though olives have been grown in Australia for almost the entire period of European settlement and much of Australia is climatically suitable for growing olives, an established olive industry has not developed. Australia remains a net importer of olive products. Clearly potential exists for the development of olive oil and table olive production in Australia in the first instance as an import replacement and ultimately for a value added export industry (Sweeny 2002). In recent times, olive product imports have been valued in excess of \$100 million per annum and growing. (International Olive Oil Council, 2001). There is the opportunity in Australia to replace at least some of these imports with a locally manufactured product.

The period since the early to mid 1990s has seen an expansion in the Australian olive industry, possibly stimulated by the interest nutrition and the health benefits of the Mediterranean diet (Sweeney and Davies, 1998). However, high levels of uncertainty exist first in terms of varieties, second in terms of the requirements of the market, both here and elsewhere, for oils and olive products and finally, there is uncertainty in terms of the performance of olive varieties in different regions of the continent.

According to Sweeney (2002) the confusion in terms of variety identification exists for four principal reasons:

- ‘1) It is not possible in the great majority of cases to distinguish between olive varieties on the basis of the phenotypic characteristics of vegetative growth or fruit. This is due to a natural homogeneity of general appearance and the broad range of minor variability attributable to local climatic and edaphic conditions.
- 2) Much of the planting material being used in Australia at present is sourced from old ‘colonial’ groves or Government collections where records are incomplete, unreliable or no longer exist, leading to confusion about the identity of individual specimens (Burr, 1998). As well, the names of some varieties that occur in early records are no longer known in the industry. These trees may have been ‘re-discovered’ as unknown varieties and subsequently renamed as something else.
- 3) There is no guarantee that the names under which these varieties were introduced into the country, officially and otherwise, were correct in the first instance as synonyms may historically have been used for genetically identical plants. This comment can equally apply to later importations. Until the mid 1960’s olives were usually imported into Australia as ornamental plants and no details of variety or provenance was required by the Australian Quarantine and Inspection Service (AQIS) (Anthony Wicks, pers. comm).
- 4) In addition to the confusion caused by material being mis-named at source is the problem of mistaken identification or labelling occurring within propagation facilities in Australia. This might be due to lack of appreciation of the implications in earlier times or breakdown in control systems in contemporary facilities.’

The second source of uncertainty, the requirements of the market in terms of the taste and quality of product, particularly oils, is crucial to decision making for producers. There appears to be a paucity of information available on consumer preference in this market and in the markets of potential importers of Australian oils. While there have been developments in understanding of the constituents of quality in oils and corresponding developments in terms of understanding the role of processing; the agronomics and varietal influences on producing desirable quality outcomes are less well understood. Moreover, the interaction of the

influences of soil, climate and varieties on the characteristics of the final product is not well understood and little explored.

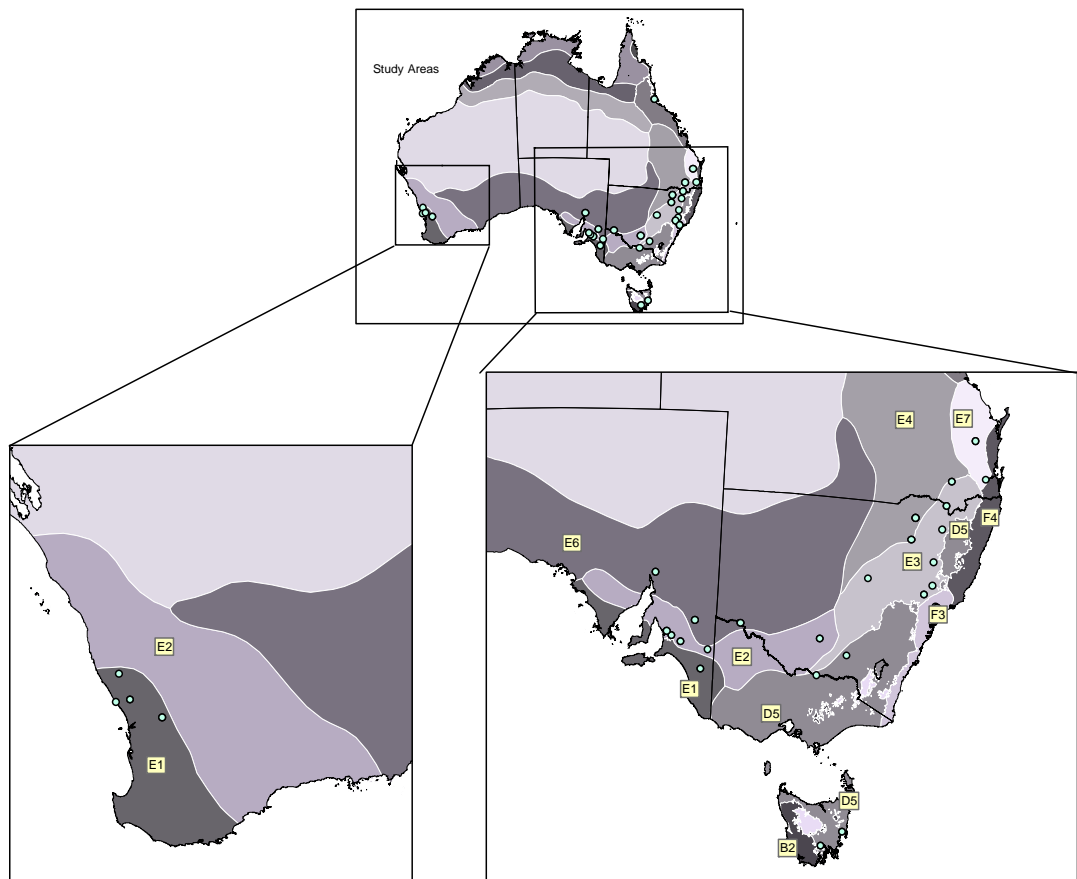
It is the third area of uncertainty, the performance of olives and olive varieties in different regions of Australia, that is the central concern of this study. Though much of the southern part of the Australian continent can be loosely described as having a ‘Mediterranean climate’, that is hot dry summers and cool wet winters, Hutchinson’s et al (2005) discussion demonstrates that for practical purposes the reality is more complex. A range of climatic and indeed soil variations, obtain throughout the regions in which olives are grown in this country. Nine agro-climatic zones in which olives are grown in Australia were included in this study. They were:

Code	Agro-climate	Location and Land Use
D5	Cool – wet. Moisture availability high in winter-spring, moderate in summer, most plant growth in spring	Tasmanian lowlands, southern Victoria, southern and northern Tablelands of NSW. Forestry, cropping, horticulture, improved and native pastures
E1	Classic “Mediterranean” climate with peaks of growth in winter and spring and moderate growth in winter.	South-west WA and southern SA. Forestry, horticulture, winter cropping, improved pastures.
E2	“Mediterranean” climate, but with drier cooler winters and less growth than E1.	Inland of E1 in south-west WA, southern SA, north-west Victoria and southern NSW. Horticulture, winter cropping, improved pastures
E3	Most plant growth in summer, although summers are moisture limiting. Temperature limits growth in winter.	Western slopes of NSW and part of the North Western Plains. Winter cereals and summer crops, grazing
E4	Growth is limited by moisture rather than temperature and the winters are mild. Growth is relatively even through the year.	Unique in the World to sub-tropical continental eastern Australia and associated with the Brigalow belt of Queensland and NSW. Winter cereals (after summer fallowing), summer crops (including cotton) and sown pastures
E6	Semi-arid climate that is too dry to support field crops. Soil moisture tends to be greatest in winter	Southern edge of the arid interior in WA, SA, NSW and Queensland. Rangeland
E7	Moisture is the main limit on crop growth. Growth index lowest in spring.	Maritime sub-tropical areas in southern Queensland. Sugar, crops and cattle grazing
F3	Cooler end of the warm, wet sub-tropical climates	The Sydney Basin and the NSW south coast. Cooler temperatures slightly favour temperate crops and sown pastures
I3	Strongly developed wet and dry seasons with plant growth determined by moisture availability. I3 has cooler winters than I1 and I2 with a growing season lasting at least six months.	Occurs in the coastal and hinterland areas of north-east Qld, south of Cape York Peninsula. Sugar, cropping and rangelands

This study does not claim to be definitive. Given the range of variables and uncertainties it was determined that a qualitative study of growers' experiences of olive growing in their region was appropriate.

Figure 1 illustrates the boundaries of these climate zones and also identifies the nearest towns to properties used in this survey.

Fig. 1 – Map of Australia showing survey sites (small circles) and agro-climatic regions



Objectives:

The initial objective of the survey was to investigate growers' perspectives on the performance of different varieties of olives noting in particular regional variation. Additionally, as a qualitative instrument, the survey was planned with a view to identifying a range of potentially significant factors influencing growers' assessments of varieties: for example management practices, differing objectives, whether oiling or pickling olives were being produced as well as the relative weighting of such factors as ease of management and financial return. It was anticipated that other factors such as the size of the operation or the prior horticultural experience of the grower may also emerge as significant influences on performance and grower assessment of performance.

In the course of conducting the survey indications began to emerge that soil type may be as significant if not more significant than region for the performance of different olive varieties. Unfortunately, intra-regional comparisons of soil type were limited by the small size of the sample, none the less, Australia wide and within some regions and for some soil types comparisons are made.

The study

Thirty-five olive growers in nine climatic regions of Australia were. Two harvesters and two processors were interviewed; in addition a number of the growers were also involved in processing and / or harvesting. The interviews were conducted by phone by an experienced olive consultant. The interviews were taped, the tapes were transcribed and then qualitatively analysed using Nvivo software by an independent evaluator. Interviews lasted varying periods up to an hour. Particular attention was paid to grower evaluation of variety performance, yield, and various aspects of the management of varieties. In addition a profile of the grower in terms of their experience in the olive industry, or other similar industry, was sought together with a brief description of the location, climate and soils of their property or properties and of the district in general; this was to establish the extent to which the properties were representative of the districts.

The growers.

Thirty-five growers were selected for inclusion in the survey on the basis that they were known to government olive agronomists as reliable or leading growers in the region. Of these, thirty were interviewed by phone and five provided email responses to an emailed questionnaire. The operations varied in size from a few hundred trees to tens of thousands on more than one property. Growers' experience in the olive industry also varied from 5 years to over 30 years in one case. For 17 of the growers it was their first tree crop, however for only six was it their first experience of agriculture. Of the others, 14 had backgrounds in horticulture or viticulture and some experience with irrigation. While the remainder came from general farming background.

The harvesters were contacted by phone, both were contract harvesters who had diversified from vine harvesting. The processors interviewed by phone were also olive growers.

Outline

This report begins by considering varieties Australia wide in terms of general management and performance issues such as growth rates, irrigation, harvesting and processing. The performance of varieties on various broadly characterised soil types is then considered. Finally the detail of performance of varieties in terms of yield and grower evaluation of varieties region by region and where available by soil type and region is considered.

Interpreting the tables

The numbers appearing in the following tables are a guide only. Growers did not always provide information on all aspects of all varieties grown, the numbers can be read for what they do say, not for what they do not. Thus, in table A-1 one Manzanillo grower has found the variety free of problems but that does not mean the other 32 growers have pest or disease problems, as only 14 have actually reported problems with particular pests or diseases, the remaining growers have not reported one way or the other.

Olive varieties grown by participants

A-1 - Varieties planted all regions																	
n=35	planted	Don't bear	removed	no pest/	tolerance	N0 fruit	anthracnose	lace bug	black scale	verticillium	unstable	fruit fly	Thrip	fungal	pythium rot	soft nose	grasshopper
Arbequina	7																
Azapa	7				1			1				1					
Barnea	16						1				1						
Barouni	2																
Blanquette	1																
Bouquettier	1																
Buchine	1																
Californian Queen	1																
Katsouliera	1																
Coratina	10									1	1						
Corregiola	29		1	2	1			1	3								
Frantoio	29		2	2	1				4	1			1		1		1
FS17	3																
Hardy's Mammoth	8	1											1				
Helena	1																
Hojiblanca	2																
Jumbo Kalamata	3																
Kalamata	16								2				2				
Koroneiki	17							1	1								
Leccino	15			1					2		1						
Manzanillo	33		3	1	2	1	1	1	7			1	2			1	1
Minerva	1																
Mission	10		1	1					1								
Mission Californian	5																
Mission WA	4			1													
Nab Tamri	2																
Nevadillo Blanco	17		1				3		4							1	1
Olive a Prugno	1																
Paragon	16		1						1								1
Pendolino	13								1								
Pendulina	7																
Picholine	2																
Picual	17								2	1				1			
Queen of Spain	2																
Sevillano	2																
Signore	1																
UC13A6	11		1						1			1	1				
UC22A11	1																
UC23A9	2																
UC6A7	2																
UCLA	1											1					
Uncertain	21																
Verdale	3																
Verdale Qld	1																
Verdale SA	6																
Verdale Wagga	2																
177	1																

Table A-1 shows all varieties planted in all regions together with reports of pests or diseases.

The table A-1 shows all olive varieties discussed in this study, the column headed ‘planted’ shows the number of growers in the study with the variety planted, the following columns indicate numbers of growers of that variety mentioning any susceptibility or resistance to pest or diseases or where absence of pests and diseases is noted.

The principal varieties grown and discussed by growers in this survey included Manzanillo, Corregiola, Frantoio, grown by almost all growers; Koroneiki, Nevadillo Blanco, Picual, Barnea, Kalamata, and Paragon were each grown by almost half the growers interviewed; Mission types by more than half and UC and Verdale types by about one third of those interviewed. Among some of these varieties there was some uncertainty as to variety especially with Manzanillo, Corregiola and Mission and with Frantoio, Corregiola and Paragon as ‘*the fruit itself appears similar and its possibly the same*’ and ‘*Frantoio / Paragon / Corregiola are impossible to separate as nobody knows the difference*’. For the purposes of this survey, the grower’s identification of the variety has been used.

It is clear from table A-1 that by and large growers do not have major pest or disease problems, with eight growers specifically noting an absence of pest or disease. Scale was the most commonly identified problem, effecting twelve varieties of olives, but none the less mentioned by fewer than one quarter of the growers of these varieties. The next most common problem was thrip, mentioned by seven growers of five varieties.

Early performance and growth

A-1.1 Time to first harvest and early growth performance						
n=35	planted	three or four years	more than four years	early yield	slower growing	vigorous early growth
Arbequina	7			2		
Barnea	16	1	1	1		
Coratina	10			2		
Corregiola	29	2	1	1		
Frantoio	29	5	2	2	1	
Hardy’s Mammoth	8	1			4	
Jumbo Kalamata	3					1
Kalamata	16	2	1		1	1
Koroneiki	17	1	1			
Leccino	15	1		1	1	
Manzanillo	33	5	2		1	
Mission	10			1		
Nevadillo Blanco	17	1	2		2	1
Paragon	16	2				2
Pendolino	13	1		1		
Picual	17	1	1	4	1	1
Verdale SA	6			1		
UC13A6	11	1			1	

Table A-1.1 shows growers’ comments on early performance of various varieties

Table A-1.1 shows the ages of trees at which growers report first harvesting the tree or growers assessment of the variety as an ‘early yielder’; it also shows growers’ assessments of the vigour or growth rate of the trees. The column headed ‘planted’ shows the number of growers surveyed with the variety planted Australia wide. Differences between regions in terms of the age of trees at the time of their first harvest and early performance were not marked. Trees were commonly reported to be around four years old at the time of first

harvest, with increasing age yields were reported to increase though this can vary: *'tremendously with the amount of care and attention spent. In groves where I have had involvement from the outset, crops in Frantoio and related varieties at 3 years, building to worthwhile crops by year 5'*. On the other hand growers from various regions noted *'significantly different is the Hardy's Mammoth they are much slower to come into bearing. This year will probably be the first decent crop. Last year I got a few and up to then it was just a few handfuls, so they are two or three years at least behind the other trees'*. Similarly another grower says: *'I had crop on everything except Hardy's Mammoth'*. While another who has had the variety planted for ten years is still without a significant crop from Hardy's Mammoth.

Form, habit and pruning

The form and habit of trees affect their pruning requirements as well as the ease or otherwise of pruning are important considerations for growers. Comments on common varieties included:

'For [Manzanillo] the actual tree shape and growing and fruit set are really good.'

'Corregiola tends to be a very dense tree, can take a lot of pruning.'

'Frantoio grow more vigorously, more tall. I think you can definitely see the difference in the trees in our grove and some of it is to do with pruning but the trees that had very heavy crops.'

'The Barnea is a more upright tree, the fruit is easier to get at, but they can grow very tall, so you have to keep the tops cut out of them.'

'The UCs are quite good shape, prune them, they come back quite well.'

'The general shape of Leccino is quite reasonable,'

'The shape of the Pendolino isn't brilliant, they tend to want to grow everywhere you don't want them to grow, but the fruit we will get off them this year will be excellent. They've set really well.'

Growers reported a variety of pruning strategies, from heavy early pruning to little or no pruning till trees were four or more years old. Harvesters have recommended that at least 1 meter of trunk is required to shake trees effectively, they state that they have found it advisable to tell growers to leave 1.2 meters to ensure the required one meter trunk. Both hand and machine pruning have been practised among growers. Recommendations with regard to pruning vary, some growers recommending that trees be opened up to let in the light, in particular to reduce disease problems, while others have suggested that the trees be allowed to develop dense canopies to protect fruit from sunburn and allow a longer maturation period in the bright Australian sun.

Frost

A-1.2 - frost			
n=35	planted	frost susceptible	frost tolerant
Barnea	16	3	
Coratina	10	1	
Corregiola	29	2	
Frantoio	29	3	1
Kalamata	16	2	
Leccino	15		2
Manzanillo	33	5	2
Nevadillo Blanco	17	1	
Paragon	16	1	
Picual	17	2	

Table A-1.2 showing varieties reported in terms of their frost susceptibility or tolerance

All regions except E7 and I3 report some frosts. Table A-1.2 shows Manzanillo, Barnea and Frantoio are more frequently noted as frost susceptible, while Corregiola, Picual, Nevadillo Blanco, Leccino, Coratina Kalamata and Paragon are also mentioned by growers as showing susceptibility to frosts. Several growers reported using sprinklers to mitigate the effects of frost: *'the frost mainly affects like this time now when they are starting to put out new shoots, the bud and the flowers and this is when we get our extreme frost here. The nights start becoming quite clear and it gets really cold. What we have done, we've got sprinklers, all our rows are done by sprinklers and we also pump our water from underground and that comes out about 18 degrees so we have put an alarm out there and when the alarm goes off at 1 degree or whatever we set the sprinklers going in a rotation around the grove. They get about a ten minute watering every hour.'*

There were some differences between the regions in reporting of tolerance to frost. Manzanillo were generally thought to be susceptible to frost, but one grower in E6 said *'I think [Manzanillo] are resistant to frost. But having said that I'd really have to go through and do a proper analysis to work that out'*. In E1 Leccino it seems *'just loves the frosts. If you are going to plant on the flat it would be good if you plant more Leccino in our region,'* on the other hand in E1 you should *'keep your Barnea off frosted areas'*, while Frantoio were *'fractionally susceptible but only around flowering.'* A grower in D5 region found for Frantoio *'the foliage gives it that little bit extra protection from the frost'*

Flowering & Pollination

A-2 - flowering all regions									
	Planted	flowers				pollinators			
		imperfections	early	mid	late	not needed	pollinate	problems	biannual
n=35									
Arbequina	7			1					
Azapa	7				1				2
Barnea	16		2			1	5	1	
Blanquette	1						1		
Bouquettier	1								1
Coratina	10			1					
Corregiola	29			3	1		6		1
Frantoio	29		1	4	2		9		1
Hardy's Mammoth	8		1		2		1	1	
Hojiblanca	2			1					
Kalamata	16			2	2		5	2	
Koroneiki	17			1			4		
Leccino	15				3		6		
Manzanillo	33		11	2	1	1	10	2	1
Mission	10				1		1		
Mission Californian	5		1						1
Mission WA	10						1		
Nevadillo Blanco	17	1	4	1			7	4	
Paragon	16			3	2		3		2
Pendolino	13		2				7		
Pendulina	7						2		
Picholine	2						2		
Picual	17			1	1	1	6	1	
Queen of Spain	2						1		
Sevillano	2								
UC13A6	11		2	1					1
Uncertain	21						3		
Verdale	3		1				1		
Verdale Wagga	2								1
Verdale SA	6		1			1	1		

Table A-2 shows flowering times, principal flowering problems by variety, varieties recognised by growers to act as pollinators for other varieties or self pollinate, and varieties that are biannual.

Table A-2 shows numbers of varieties planted, timing of flowering in terms of early, mid or late and information on pollination. Varieties that flower at the same times are seen as likely pollinators *'crossover in terms of flowering times between Manzanillo and Frantoio, they tend to flower at about the same time, and I tend to think that that is a reasonable indication that there is a cross pollination thing here. E3'*. However others' experiences have differed *'Manzanillo and Frantoio are flowering at quite different times. One's flowering is almost over before the other one starts.'* As the first quote comes from a grower in region E3 and

the second from E7, there seem to be regional differences in flowering times. These issues are explored further below in sections on regions.

Some varieties are thought to be self pollinating and so not need pollinators, these included Barnea, Manzanillo, Picual and Verdale SA. Wind was also held to influence pollination in some situations.

Some varieties are not producing at all: *‘Nevadillo is flowering first. So there obviously could be issues that there might not be other pollinators around when they are flowering. That could well be because they’re budding up but then we haven’t had the fruit from them.’* One grower also noted imperfections in the flowers of Nevadillo Blanco. Other varieties are showing some tendency to be biannual *‘Mission is a bit fussy, we have done very well with some of the oil qualities. It is a bit shy on the bearing and it is certainly biannual as well. Azapa is very biannual. One year we had no flowers after a big crop year. Wagga Verdale is also a bit biannual. They are all a bit biannual.’*

Asked: Have you got any feeling as to which variety might pollinate which? One grower responded: *‘No, wouldn’t have a clue’*. While another simply said: *‘No’*. Flowering times and pollinators are a vexed issue.

Moisture content and management

Water content and processing

A-2.3 - processing & moisture content			
N=35	Planted	Moisture content	Processing problems
Arbequina	7	1	
Barnea	16	4	3
Corregiola	29	2	
Frantoio	29	2	
Koroneiki	17	1	
Leccino	15	2	1
Manzanillo	33	6	8
Nevadillo Blanco	17	3	
Paragon	16	1	
Picual	17	3	3
UC13A6	11	1	1

Table A-2.3 shows the relationship between moisture content and problems reported with processing

Table A-2.3 shows varieties reported by growers as retaining moisture and varieties posing problems for processing. Twelve of the growers noted the importance of managing irrigation prior to harvest as for many varieties if the moisture content is too high the oil yield can be adversely effected.

‘The Barnea was pretty bad 14%. Big fleshy waterbogged fruit. Even though half of them are green, half of them were black they’re still a waterbogger like the UC13A6s.’ Manzanillo was noted y growers and processors for retained water lowering oil percent as were *‘Picual, as low as 10% [oil yield] by fresh weight. Some of the moisture content was up around 66%, certainly well over the high 50s threshold we don’t want to exceed. Leccino was disappointing because the again the actual moisture wasn’t so bad around 57%, between 55-57%, and we are getting 13-14% yield. Frantoio last year again it was picked later so the oil accumulation was better and we dried the fruit out a little bit more. Getting 24%. Barnea*

generally disappointing around 16-17% over the three years, but again I think a lot of that is management issues that I've got to work on.' Another grower also noted Picual would 'retain their moisture more and also being a later variety they are a little bit prone to rainfall.' The effect of 'rain can be quite dramatic, we began pressing Corregiola after rain this year and as they go on harvesting for say three weeks, the percentage of oil was going up sort of 2%.'

Moisture and irrigation management

While rainfall cannot be controlled irrigation clearly can and one solution adopted by many growers is not to irrigate before harvest: 'It would have been nearly six weeks I reckon. Probably I could say a good six weeks. ... The moisture by the end of the harvest period we got to around about 50% by stopping irrigation that long before.'

The advice one grower gave was to 'set parameters of moisture content for set varieties. Frantoio, Corregiola as far as I see it sit somewhere in 50-54%. Picual and Arbequina give you more latitude in that I don't mind doing Picual up to sort of 59% without any problems what so ever. You don't want any over 60%. Basically the lowest you can get it with Manzanillo.'

Harvesting, processing and moisture content

As well as reducing the oil content as a percentage of fresh weight high moisture content can make also harvesting more difficult: 'We made this mistake last year, we irrigated last year right up to the death knell and it made it difficult to shake and it made it difficult to extract oil'. Others also point out that processing 'is more difficult when you have more water in them, that is when he is finding it. He [processor] is saying that I don't think you will get as much oil today because these are very wet'. As a result: 'you really have got to reduce the pace the speed into your decanter by a quarter, sometimes a third, depending on what moisture it's sitting at as well.'

Harvest and harvest problems

A-2.4 - harvest experiences							
n=37	Planted	easy	harvest probs	fruit left	green	black	by hand
Arbequina	7	1					
Barnea	16	3					
Barouni	2	1					1
Coratina	10	1			1		
Corregiola	29	2	7	2		1	1
Frantoio	29	2	4	1			1
Kalamata	16						2
Koroneiki	17		3	1			
Leccino	15	1	2				
Manzanillo	33	7	2	1		1	3
Mission WA	4	1	1				
Nevadillo Blanco	17	2	1				
Paragon	16		1				
Pendolino	13	1					
Picual	17	3					
Verdale SA	6	1					

Table A-2.4 shows experience of growers and harvesters in harvesting olive varieties

Table A-2.4 shows the reported harvest experiences of growers and harvesters in all regions. There was little uniformity in their responses, however, seven of the thirty three Manzanillo growers have found that variety easy to harvest. Most problems were reported with Corregiola: *‘The fruit just doesn’t want to come off.’* More generally, growers recognise *‘harvesting is a big problem. As I said Koroneiki would be the hardest I’ve had to harvest probably followed by Corregiola, and then the others are all much of a muchness. Even Frantoio, Leccino, the Tuscan trees, their fruit is a bit smaller so it takes a bit more harvesting. The bigger the fruit the easier it is to harvest’.* Even with Manzanillo, generally recognised as *‘relatively easy but still fruit gets left behind.’*

Where the moisture content can be adequately managed, oil content can be satisfactory:

‘Nevadillo went up to between 23-25% they were excellent at about 51% moisture.’

‘If I can get Manzanos in the machine now under the 58% I can still get 18-19% out of it without talc or anything.’

‘Manzanillo is that if you take a dry Manzanillo to the mill and that’s not ripe you can 24-23% out of it very easily. If you take a waterbogged Manzanillo that’s ripe to the mill forget about getting any oil out of it. They are a very fibrous waterboggling small stoned fruit and when they are ripe the oil emulsifies to a point. Makes it extremely difficult and you have to slow the machine right down.’

Pickling & processing

A-2.5 - pickling and processing: all varieties, all regions					
n=35	planted	process well	process probs	pickling	pickling probs
177	1	1	.	.	.
Barnea	16	.	3	.	.
Coratina	10	1	.	.	.
Corregiola	29	2	.	.	.
Frantoio	29	5	.	1	.
FS17	3	1	.	.	.
Kalamata	16	1	.	1	.
Koroneiki	17	1	.	1	.
Leccino	15	1	1	.	.
Manzanillo	33	1	8	3	.
Mission	10	.	1	.	.
Paragon	16	2	.	.	1
Pendolino	13	1	1	.	.
Picual	17	.	3	.	.
UC13A6	11	.	1	.	.

Table A-2.5 shows growers’ and processors’ assessment of how varieties process

Table A-2.5 shows growers’ and processors’ assessments of varieties in terms of processing for oil and of pickling. *Manzanillo is noted as pickling well: ‘Best picklers Manzanillo, yes, for sheer precociousness and relative ease of management, and Joe’s nodding, for sell ability and pickling ability. They produce a beautiful black, large juicy plum looking fruit up here, with a good flesh to seed ratio and as long as they haven’t got too mature the texture is not too bad. If they get over mature they can be too soft.’* *On the other hand Manzanillo was noted for its oil processing problems: ‘Manzanillo is the only one from what I have been told by the processor that has caused problems with processing. The amount of rubbish that comes in different forms of harvesting can be a problem.’* The problem that it does not malax

well is shared by other varieties as can be seen from the table. The separate problem of moisture content, which also effects processing is discussed above.

Frantoio was the variety most often cited as processing well: ‘its called Frantoio because it is the millers olive its just fantastic, Wayne automatically starting saying, I can’t do a thing wrong with Frantoio as it is so easy to process.’ On the other hand according to another grower: ‘the Frantoio were quite easy to process but hard to pick.’

Oil types

A-5 types of oils identified as produced by various varieties on clay soils									
N=35	peppery	green	bitter	medium	mild oils	fruity oils	strong	pungent	sweet
Azapa	.	.	1	1	.	1	.	1	.
Barnea	.	.	.	.	2	.	.	.	1
Coratina	.	.	.	.	.	.	.	1	.
Corregiola	1	.	1	1	1	3	1	2	.
Frantoio	1	.	.	1	3	2	1	.	.
Koroneiki	1	.	.	.	.	.	.	.	.
Manzanillo	3	.	.	.	3	2	3	.	.
Mission	.	.	.	.	1	.	.	.	.
Mission WA	1	1	.	.	.	.	1	1	.
Nevadillo Blanco	1	.	.	.	.	1	1	.	.
Paragon	.	.	.	.	.	1	.	1	.
Picual	1	1	.	.	.	.	1	1	.

Table A-5 types of oils as described by growers produced by various varieties.

Table A-5 shows the descriptions of oil types produced by various varieties. While technical standards for accurate description of oil quality are emerging, growers for the most part used idiomatic descriptors for their oils. These descriptions of oil type, those used by the growers or that their customers have used colloquially to describe the oil, are used here. ‘*Frantoio is a peppery oil. It is on the boundary of being a robust oil but it is so that people like it very much and is very well accepted.*’ Frantoio growers described the oil produced predominately as mild or fruity, however it was also described as peppery, medium and strong. There was little consensus in the description of oil type. None the less, the type of oil ultimately produced was widely recognised as an important issue, if not the most important issue in the long term. Growers were asked which varieties they would plant again if they were starting again from scratch but this time with all the knowledge and experience they had gained, one grower said ‘*if I was going to put in some more I’d look at the end product, what we are going to taste and perhaps from the blending angle*’.

A number of growers talked about the value of various varieties for blending, ‘*Manzanillo, well I was extremely surprised, that nearly knocked your eyeballs out. It was that strong in flavour you couldn’t have sold it without blending it*’. However strong flavour is not the only criteria for blending: ‘*Barnea was a bit bland but nice. I think Barnea would be nice for blending with other oils.*’

More generally, what consumers like ‘*depends on the type of person. I find some people enjoy a greener more bitter type of olive. Melbourne people seem to like a darker type of olive.*’ Other growers noted that ethnic background could influence consumer preference, particularly among those who origins were in olive producing regions.

Growers cite a number of factors as influencing the type of oil produced. Differences were commonly put down to region ‘*Frantoio has got a little more life to it than Manzanillo. High*

palmitic levels, low oleic levels and that's common to all the oils in Queensland as far as I can see' or soil differences. In this study the differences in description of oil type did not follow either differences in description of soils, as is apparent from the tables below, nor from regional differences. Indeed the differences between varieties were not always clear 'Frantoio and maybe a little more citrusy than the Corregiola. The Corregiola may be more grassy, but only very slightly and I'm not totally convinced.' However differences in management seemed to be significant at least for some growers: 'We have definitely found that Manzanillo picked early makes very, very good oil, ... bit more pepper and pungency, much better aroma, polyphenols were around about 400-450. Picked late it is very bland. I definitely know that if we delay the harvest, we go down to about 250'.

Oils and soil types

A-5.5 - types of oils identified as produced by various varieties on clay soils						
n=13	pungent	peppery	green	mild oils	fruity oils	strong
Corregiola	1	1	.	.	2	.
Frantoio	.	.	.	1	1	.
Koroneiki	.	1	.	.	.	.
Manzanillo	.	.	.	1	1	.
Mission	.	.	.	1	.	.
Mission WA	1	1	1	.	.	1
Paragon	1	.	.	.	1	.
Pendolino	.	1	.	.	.	.
Picual	1	1	1	.	.	1

Table A-5.5 types of oils as described by growers produced by various varieties on clay soils

With the possible exception that 2 growers, from regions D5 and E3, found Corregiola produces a fruity oil, there is no consensus emerging on the oil type produced on clay soils.

A-5.6 - oil type by variety on sandy loam soils			
n=12	pungent	mild oils	fruity oils
Barnea	.	1	.
Corregiola	1	.	1
Manzanillo	.	.	1
Paragon	1	.	1

Table A-5.6 types of oils as described by growers produced by various varieties on sandy loam soils

There is no consensus evident from this table.

A-5.7 - oil types produced by varieties on sandy soils							
n=10	medium	strong	pungent	sweet	Peppery	mild oils	fruity oils
Barnea	.	.	.	1	.	1	.
Coratina	.	.	1	.	.	.	.
Corregiola	.	.	1	.	.	1	2
Frantoio	1	.	.	.	.	1	1
Manzanillo	.	1	.	.	1	1	1
Paragon	.	.	1	.	.	.	1

Table A-5.7 types of oils as described by growers produced by various varieties on sandy soils

There is little consensus here.

Soils

The soils on which olives were grown varied considerably both across and within regions; indeed the soils varied within properties in some instances: *'Our soil is a really heavy clay. It varies between a sandy clay loam and a heavy clay but the trees have responded well and have grown to very good height and size and producing regal sort of crops'*. Another larger growers also has a range of soils: *'the approx five thousand trees are all on different soils. heavy black basalt has proved okay for manzanilla. Corregiola, Leccino, Bouquettier are all good on the red clay on a hill with good drainage'*. Some groves are very fortunately situated, *'you can go down 5 or 6 foot in our soil and it's basically nearly like the top, so it's deep and very fertile.'* However, another grower with some good soil notes that *'the trees that have this massive growth spurt on the really good soil haven't really yielded.'* Olives have been grown on poorer soils, one grower said: *'I guess it's just another crop that suits some of our poorer soil, so using up a bit of land, so there's been a few reasons why it's good for us. I think it's a good area for growing them.'* What most growers would agree on is that whatever the soil characteristics, *'It just has to be managed according to the soil.'*

Preparation

Soil and general preparation of the grove is broadly agreed as important for the long term health and productivity of the trees, so even growers who do not regularly fertilise have some at least some soil preparation at the outset: *'The only fertiliser we've used we used originally. We put the crusher dust in when we deep ripped and then we've only used feedlot manure, rotted feedlot manure put on in the autumn.'* Use of crusher dust is common, however not all growers have found it useful: *'Basically we planted into crusher dust which was what was advocated at the time by the supplier, but I think that was a waste of money. From that we just did horticultural practice which is fertiliser which is basically potash and nitrogen.'* Others have used lime: *'When I first planted there was lime applied to the paddock. Ten ton of lime went onto about 7 acres so it would have been a ton an a bit per acre and five ton of super went on the same area and then it was deep ripped into the rows, but that's the only fertiliser the trees have had extra. They are doing quite well but I won't say they wouldn't do better with [follow up fertiliser] but these growers have added nothing since.'*

More commonly growers follow up the initial ground preparation with further addition of some form of fertiliser: *'We only put 30-40 grams NPK per tree. Before that when we planted the trees we put compost. We dug the hole and put a shovel or more of the compost and then we put the sand on top and then we planted the tree. That was the first initial plant. Then after 6 months we put 40-50 grams of NPK and twelve months later we went along again and with the same NPK we put 100grams or more, not a lot. A few people put an enormous quantity, we put a very limited amount. Apart from that we only put chicken manure and also with the compost which is made from sheep and some other manure'*.

Others when establishing their groves have taken the opportunity to install irrigation equipment which is also used to deliver fertiliser: *'We fertigate through the drip system, we have drip lines. We have buried them under the ground 20cm on each side of the tree and we have a soil moisture meter which tells us when we need to irrigate. We have from a consultant he made up an irrigation plan and also a fertigation plan and we follow this plan'*.

Nutrition

Because olives grow as feral plants in many part of Australia, there can be a tendency to believe that they can survive any kind of treatment, one grower notes: *'A lot of them are quite bullet proof in their handling. You can treat them many foolish ways and they will still be fine'*. Another suggests to get the best out of the crop, careful nutrition management is

called for: *'Some people just say ok its and olive and they just pickle it. I like my olive to be crisp, nice and firm. Some people describe as my still have bone in them, others are just mush. That is why I like the nutrition to be just right.'*

'The nutrition, that's a tricky one because all of the varieties differ' says one grower. Other growers have also found differences in the requirements of varieties: *'One variety in particular FS17 it can't tolerate a high nitrate. We lost crops for two years now because of that. Nevadillo is the same. While they are two different physical structures, one is a dwarf type of plant (FS17) and one is very robust, vigorous plant (Nevadillo), they both have a dislike to nitrogen at the cell softening stage. Lost crop from those two varieties only for that particular reason. All the others seem to be able to tolerate it.'* Another growers also found Nevadillo Blanco had special requirements *'we still have problems with carrying fruit but with a lesser degree than what they should. We don't know if it is cross flowering or a problem with the soil, some trace element like Boron for instance which we have given to the trees so we are in the period of trying to find out what we are really doing.'*

Several growers spoke of the timing of fertiliser application, as well as variation of requirements of different varieties as being important: *'We apply fertiliser every day through the growing season. The amount varies per variety and the timing of the nutrient and the amount of nutrient varies to the physiological development of the tree itself per variety.'* Another grower looks precisely at the plant requirements: *'The amount we put in reduces. Each time we fertigate we put a reasonable dose in because they're flowering ..., and by December January we are not giving them anything. After harvest we will put some phos acid out, maybe a bit of nitrogen depending how late it ismainly through that spring period. Our watering with neutron probes keeps track of what they need'.*

Leaf analysis in particular to identify status in terms of trace elements is quite common: *'I basically use complete mineral mix or something similar. I have also last year started foliar fertiliser about this time of year. That is one of the jobs I should be doing at the moment. I did that after we had some leaf analysis done. I give them extra boron after doing that as well as a couple trace elements'.*

Nutrition we have just finished quite a large fertiliser program. We've put out quite a bit of hydro complex 150 kilos per hectare and 250 kilos in our large trees as well as spraying them with a product from Solarcourt CAB calcium and boron and we found after leaf analysis our calcium levels were down a little so we are trying to remedy that. Over the past few years we have done very little. We've had soil and leaf analysis each year and our nutrient levels have been pretty good so we haven't had to apply any real major fertilisers. The ground we are growing them in has grown vegetables in the past and probably had a residual of nitrogen and other nutrients there.

'I am in the habit now of, I do a leaf analysis now every January and what is lacking, and mostly its calcium I am putting Ental through the dripper system. I did put other nutrients for fertiliser, I put about 2 tonne of Rapid Raiser every year. In ever alternate row, in the other row I put Gypsum and I am putting about 60 tonne per year on 3000 trees. I put a cover crop in about ever second row, and alternate every year. I leave one row empty so that I can put my pruning's into mulch. I put my cover crop in as soon as I can after harvest so I can get good growth while the ground is still warm. The cover crop I have been using is rye corn, but this year I have put oats.'

'we are going to do our own leaf analysis. We are putting on organic manures every year. Everything has had that every year that they have been planted and basically we treat them with a bit of nitrogen and a mixed fertiliser through the year. The ones that are now the oldest for the last two years have been getting fungicide every season post harvest, block of

copper. I guess we are basing the program similar to what we do on a citrus tree in some respects, just trying to modify it according to the growth cycle which is slightly earlier than citrus'.

Growers on all qualities of soil attend to the nutritional needs of their trees: 'We are on very good quality soil. Our inputs to date have been less than some of the other properties I am managing, put it that way. For our mature trees as in the five year old stuff we are looking at applying around 200 grams of nitrogen per season and generally between 60 and 80 grams of P&K as a general rule of thumb. That's applied via fertigation in spring weekly and from this time of the year I mostly taper that back to fortnightly and we finish end of December with nitrogen input and continue on with calcium and boron. They go on as a foliar spray early in spring pre bud burst and then a second boron application will go on in within the next fortnight. This year we will also be putting on a calcium foliar. Again the potassium and calcium play a pretty major role in the frost protection that we are trying to offer the trees due to increased cell wall thickness and elasticity is offers'.

On poorer soils the challenge is much greater, 'I haven't seen any major difference in water usage and even fertiliser. It may be because our ground is so lacking in all the nutrients that no matter what variety you've got you still need to put a lot of fertiliser on them'. After losing some trees on a poor quality soil one grower 'deep ripped again and replanted those trees. But no basically it's a good slope, it's a good orientation, poor quality soil but he has built that up with fertiliser'. However there is reason to think that growers on poorer soils rise and meet the challenges posed. One grower, on a sandy soils notes that in terms of nutrition, they must add all that is required '[we add] Everything. We grow in a medium that has nothing' they are doing annual leaf tissue analysis and are reporting good yields 'nutritionally I think some of the growers over here are a bit more switched on because of the poor soil conditions that we have, so the soils aren't forgiving. If we go two weeks without feeding the trees just all stop. No margin for error, so there is a constant supply of nutrients. Needless to say especially the better growing areas where the soils are nice and loamy and rich, full of nutrients that are fed twice a year, whereas over here you just can't do that. That is, poorer soils means stricter nutrition management means better production'. This grower had previous experience of growing vegetable crops, but was not basing his nutrition regimen on vegetables rather he says: 'this is like tree crops, I've done a fair bit of work on citrus so we've all got similar regimes over here'.

Organic

Several growers were growing organically, however issues of plant nutrition remain 'Well, yes we were hoping to stay organic and this is something now we are going to like put our faith or something like that and work around it. We are trying to get away from using chemicals. Our fertilisation program has all been organic and we find that rather successful'. Organic growers are using different sources of nutrient 'Nutrition is predominantly organic fertilisers and seaweed' but are still using considerable quantities 'Yes, last year I put on 24 tons of manure around 1200 trees. I haven't done it this year, but I expect to do it again next year. I am hoping to get a little clever. I may end up not putting straight urea on next year, I might try to get a mix of NPK but soil analysis does show that P&K is pretty good. It's N short and organic material that's short'. Another organic grower reported 'The soil issues are significant to ensure balance of nutrients and trees must be irrigated to grow quickly, reliable water supplies are critical to the economic potential. Organic growing requires greater investment in staff numbers.'

Yields and performance assessments

The following tables show the fruit yields and oil percentages achieved as reported by growers, these tables are followed by tables showing growers' overall assessments of the varieties in all regions and on all soils. The contents of these tables are explored in more detail in the following sections which consider each region separately looking at variety performance, then yields and assessment on different soils. The tables immediately below the A-3 tables provide an overview of the yields obtained in all regions, and overall assessment of the performance of varieties in the A-4 tables.

All yield tables (A3) show percentages of oil extracted from fruit ranging from below 10% by weight to above 20% and where growers report variation in the percentages extracted. The tables also show yield of fruit, low, high and variable fruit yields. Fruit yield information is given in qualitative terms rather than per tree or per hectare weights as growers sometimes reported weight per tree and sometimes per hectare or per acre and sometimes just as good or bad. Further the absolute weight could be misleading as yield per tree alters with age, growers evaluation of whether the yield was low or high were therefore used. The total numbers 'planted' are also included in the second column for comparison and to enable some notion of the relative weight of the numbers. The yield information presented on these tables is further analysed and presented by region.

A-3 - yields all regions									
n=35	planted	oil%	10-15%	15-19%	>20 %	%varies	yield		yield varies
		below 10%					low yield	high yield	
Arbequina	7							1	
Azapa	7		1					1	1
Barnea	16			3	2		4	2	
Californian Queen	1		1						
Coratina	10		1					1	1
Corregiola	29		3	4	6	2	3	3	4
Frantoio	29		1	3	9	2	6	6	5
FS17	3		1						
Hardy's Mammoth	16				1		5		
Kalamata	16			1	2		2		
Koroneiki	17				3			1	
Leccino	15	1	1	1	2		3	2	
Manzanillo	33	6	5	10	2	2	9	7	4
Mission	10				1		1		
Mission WA	4				2				
Nab Tamri	2								1
Nevadillo Blanco	17	1			4		5	2	
Paragon	16		1	4	3		2	3	1
Pendolino	13			1				1	
Picual	17		2	1	2		3	1	
UC13A6	11		2				2		
UCLA	1						1		
Verdale SA	6							1	
177	1				1				

Table A-3 shows oil percentage and fruit yields achieved for varieties on all soils reported by growers in all regions

Table A-3 shows that only two of thirty-three Manzanillo growers report oil percentages of 20% or above with nine growers reporting low fruit yields. Frantoio growers report with growers evenly split between high and low fruit yields while the bulk of those reporting oil % are getting 20% or above. Almost one third of Hardy's Mammoth growers report low fruit yields.

A-3.1 yields for varieties in all regions on good soils									
n=10	planted	oil %					yield		
		below 10%	10-15%	15-19%	>20%	% varies	high yield	low yield	yield varies
Azapa	6		1				1		1
Barnea	3			1			1	1	
Barouni	2						1		
Coratina	2		1				1		1
Corregiola	8		2		1	1	2	1	1
Frantoio	7				2	2	2	2	3
FS17	2		1						
Hardy's Mammoth	2							1	
Kalamata	4							2	
Leccino	3		1				1	1	
Manzanillo	8	3	1	3		1	2	4	2
Nab Tamri	1								1
Nevadillo Blanco	5	1					1	1	
Paragon	4		1	2				1	
Picual	3		1		1				
UC13A6	3							1	

Table A-3.1 shows oil percentage and fruit yields achieved for various selected varieties on good soils reported by growers in all regions.

Table A-3.1 shows numbers of growers describing their soil as 'good' with varieties planted, the oil percentages reported by growers and the fruit yield reported. Thus of eight growers of Manzanillo on self described 'good' soils, three reported oil percentages below 10%, comparison with table A-3 shows this is 3 of the total of 5 growers reporting oil percentages below 10%, three reported oil percentages between 15 and 19%, four growers reported low yield while two reported high fruit yields and two reported variable fruit yields. Comparison with table A-3 suggests that growers on good soil are over represented among those reporting low fruit yields. Half of those growers with Paragon planted reported oil percentages between 15 and 19% and while two of the seven Frantoio growers reported oil percentages above 20% there was no consensus on fruit yields for this variety. The information contained in this table is considered further, region by region, below.

A-3.2 yields for varieties in all regions on well drained soils									
n=10	planted	oil %					yield		
		below 10%	10-15%	15-19%	>20%	% varies	high yield	low yield	yield varies
Azapa	3		1				1		1
Barnea	4			2			1	2	
Coratina	2								1
Corregiola	7		2		1		1		
Frantoio	8			1	3		1	1	1
FS17	1		1						
Kalamata	5			1				1	
Koroneiki	6				1				
Leccino	4		1				1	1	
Manzanillo	9	3		5			3	2	1
Mission WA	1				1				
Nab Tamri	1								1
Nevadillo Blanco	4	1			1		1	2	
Paragon	5		1	3	1			1	
Picual	5		1		1			1	

Table A-3.2 shows oil percentage and fruit yields achieved for various selected varieties on well-drained soils reported by growers in all regions.

Table A-3.2 shows numbers of growers describing their soil as ‘well-drained’ with varieties planted, the oil percentages reported by growers and the fruit yield reported. Among Manzanillo growers, five of the nine reported oil yields of 15-19% with three of the nine reporting high fruit yields, two low yields and one reported variable yields for fruit. Three of the eight Frantoio growers reported oil percentages above 20%, while three of the five Paragon growers and half of the Barnea growers reported oil percentages of 15-19%. The information contained in this table is considered further, region by region, below.

A-3.3 - yields for varieties in all regions on poor soils									
n=6	planted	oil %					fruit yield		
		below 10%	10-15%	15-19%	>20 %	%varies	high yield	low yield	yield varies
Azapa	1	.	1	.	.	.	1	.	1
Corregiola	6	.	1	.	2	.	.	1	1
Frantoio	4	.	.	1	1	.	2	2	2
FS17	1	.	1	.	.	.	.	.	.
Hardy's Mammoth	3	.	.	.	.	.	.	2	.
Koroneiki	4	.	.	.	1	.	.	.	.
Leccino	2	1	.	.	.	.	.	.	.
Manzanillo	6	1	2	2	.	.	2	1	2
Mission	1	.	.	.	.	.	.	1	.
Nevadillo Blanco	6	.	.	.	1	.	.	1	.
Paragon	3	.	.	1	.	.	1	1	1
Picual	3	.	.	1	.	.	.	1	.
UC13A6	2	.	.	.	.	.	.	1	.
UCLA	1	.	.	.	.	.	.	1	.
Verdale SA	2	.	.	.	.	.	1	.	.

Table A-3.3 shows oil percentage and fruit yields achieved for various selected varieties on poor soils reported by growers in all regions.

Table A-3.3 shows numbers of growers describing their soil as 'poor' with varieties planted, the oil percentages reported by growers and the fruit yield reported. There is little consensus on oil percentages or fruit yield apparent from this table. The information contained in this table is considered further, region by region, below.

A-3.4 - yields for varieties in all regions on clay soils									
n=13	planted	Oil %					Yield		
		below 10%	10-15%	15-19%	>20%	oil %/varies	low yield	high yield	yield varies
Arbequina	3								
Azapa	1								
Barnea	6	.	.	2	1	.	1	1	.
Barouni	1	.	.	.	.	.	.	1	.
Blanquette	1								
Bouquettier	1								
Californian Queen	1	.	1	.	.	.	.	.	.
Katsouliera	1								
Coratina	3	.	.	.	.	.	.	.	1
Corregiola	13	.	2	3	4	1	2	3	3
Frantoio	9	.	1	2	5	1	4	2	3
Hardy's Mammoth	4	.	.	.	.	.	2	.	.
Jumbo Kalamata	1								
Kalamata	4	.	.	.	1	.	1	.	.
Koroneiki	6								
Leccino	5	.	1	.	.	.	2	1	.
Manzanillo	11	2	5	2	.	1	4	4	1
Mission	5	.	.	.	1	.	.	.	.
Mission calif	1								
Mission WA	1								
Nevadillo Blanco	4	1	.	.	1	.	3	.	.
Paragon	4	.	1	1	1	.	1	.	1
Pendulina	4								
Pendolino	5	.	.	1	.	.	.	.	.
Picholine	1								
Picual	6	.	1	.	2	.	1	.	.
Queen of Spain	1								
UC	1								
UC13A6	5	.	1	.	.	.	1	.	.
Verdale	1								
Verdale SA	2	.	.	.	.	.	.	1	.
Verdale Qld	1								
Verdale Wagga	1								

Table A-3.4 shows oil % achieved and fruit yields of various varieties on clay soils reported by growers in all regions

Table A-3.4 shows numbers of growers describing on clay soils with varieties planted, the oil percentages reported by growers and the fruit yield reported. The table shows over half those growing Manzanillo on clay soils are achieving oil percentages up to 15%, yields are split with four growers reporting low and four high yields. Six Coratina growers report high or

variable yields of fruit, while 7 of the fifteen are achieving oil percentages above 15%. More than half the Frantoio growers report oil percentages in excess of 20%, comparison with table A-3 shows this is also more than half of all Frantoio growers achieving this oil %, but almost half report low and a third variable fruit yields.

A-3.5 - yields for varieties on sandy loam soil									
n=12	planted	Oil %					yield		
		below 10%.	10-15%	15-19%	>20%	% varies	low yield	high yield	varies
Arbequina	3	.	.	.	.	.	.	1	.
Barnea	6	.	.	1	1	.	3	2	.
Coratina	4	.	.	.	.	.	.	.	1
Corregiola	8	.	.	1	2	1	.	.	2
Frantoio	8	.	.	.	2	1	2	2	2
Hardy's Mammoth	1	.	.	.	1	.	1	.	.
Kalamata	4	.	.	.	1	.	1	.	.
Koroneiki	3	.	.	.	1	.	.	1	.
Leccino	7	.	1	1	1	.	2	2	.
Manzanillo	9	.	1	3	1	.	4	4	1
Nevadillo Blanco	6	.	.	.	2	.	3	.	.
Paragon	5	.	.	.	2	.	.	2	.
Picual	6	.	2	.	1	.	1	1	.
UC13A6	3	.	1	.	.	.	1	.	.
Verdale SA	2	.	.	.	.	.	.	1	.

Table A-3.5 shows oil % achieved and fruit yields of various varieties on sandy loam soils reported by growers in all regions

Table A-3.5 shows numbers of growers describing on sandy loam soils with varieties planted, the oil percentages reported by growers and the fruit yield reported. Four of nine Manzanillo growers on sandy loam soils in all regions reported low fruit yields with three reporting oil yields of 15-19%. Two of each of eight growers with Corregiola or Frantoio report oil 20% or above, with fruit yields reported as variable, two of the five Paragon growers report similar oil percentages, but high fruit yields.

A-3.6 - yields on sandy soils									
n=10	planted	Oil %					Yield		
		below 10%.	10-15%	15-19%	>20%	%varies	low yield	high yield	yield varies
Barnea	6	.		.	.		1	.	.
Coratina	4	.	1	.	.		.	1	.
Corregiola	8	.	1	1	2		2	1	
Frantoio	9			1	3		3	2	1
Hardy's Mammoth	3	.		.	.		1	.	.
Kalamata	5	.		1	.		1	.	.
Koroneiki	4				1				
Leccino	6	1		1	.		1	.	
Manzanillo	10	3	1	5			3	2	1
Mission	4	.		.	.		1	.	
Nevadillo Blanco	7	1		.	3		3	.	
Paragon	5	.	1	3	1		1	1	.
Picual	6		1	1	1		1	1	
UCLA	1						1		

Table A-3.6 shows oil % achieved and fruit yields of various varieties on sandy soils reported by growers in all regions

Half of the ten Manzanillo growers in all regions report oil percentages between 15 and 19% while three report percentages below 10%. A range of fruit yields were reported with 3 reporting low yields, two high and one finding yields varied. One third of Frantoio growers reported oil percentages above 20%, and one third reported low fruit yields, similarly of Corregiola growers on sandy soils in all regions, one quarter report low fruit yields and one quarter report oil percentages above 20%. Three of seven Nevadillo Blanco growers on sandy soil report low fruit yields and the same number report oil percentages above 20% with one reporting oil percentages below 10%: *'The Nevadillo from 62 trees we picked 125 kilograms. And we got 7.5% oil'*, this grower was also one of those reporting oil percentages below 10% for Manzanillo.

Assessments

The tables headed 'assessment' look at growers' overall evaluation of varieties. Growers were asked in the course of the interview which of the varieties they thought 'best' and 'worst' and which they would 'plant again' if they were starting again but with the knowledge and experience they had accumulated of olive growing. Though some growers voluntarily nominated varieties they would 'not plant again', many growers were reluctant to nominate a 'worst' variety or varieties, *'it might be unfair to the trees'* one said. Less than one third of the growers actually identified a 'worst' variety. Growers, though they were more generous in their praise, were also cautious in naming a 'best' variety, with only just over half doing so. In consequence many varieties are described as 'doing well', as fruiting well or producing 'good fruit' or 'good oil'. The assessment information is further analysed in terms of region and soil types and presented below.

A-4 - assessments of varieties in all regions on all soils										
n=35	planted	best	2nd	do well	plant again	good oil	good fruit	worst	don't do well	not plant again
Arbequina	7			1	3			1		
Azapa	7	1		1	3	2				
Barnea	16	2		9	6	2				2
Barouni	2	1			1		1			
Bouquettier	1			1		1				
Californian Queen	1	1			1					
Coratina	10	1		3	5	2				
Corregiola	29	5	3	6	7	7		1	3	1
Frantoio	29	6	3	6	13	9		1	1	1
FS17	3									1
Hardy's Mammoth	8					1		4	1	1
Jumbo Kalamata	3	1	1					1		
Kalamata	16	2	1	5	8	1				
Koroneiki	17			2	4	2			1	2
Leccino	15			3	5	2		2	2	1
Manzanillo	33	8	3	6	6	7	1	3	4	5
Mission	10	1	1	2	2	2		1		
Mission Californian	5					2				
Mission WA	4				1	1				
Nab Tamri	2				1					
Nevadillo Blanco	17	1	1	2	3	3		2	3	3
Paragon	16	2	1	1	4	4				
Pendolino	13			2	5	1				2
Pendulina	7							1		
Picholine	2				1					
Picual	17	2		7	7	4			2	1
Sevillano	2	1			1					
UC13A6	11	3	1	1	2	1	1	2	1	1
UCLA	1								1	
Verdale SA	6			1						
177	1			1						

Table A-4. shows growers' assessment of varieties in all region on all soils

Table A-4 shows the assessment of growers on all soil types in all regions surveyed. Of sixteen Kalamata and ten Coratina growers, eight and five respectively have said they would plant these varieties again if they were starting their groves again from scratch; no growers of these varieties have made negative comments about these varieties. Similarly thirteen of twenty nine Frantoio growers and seven of seventeen Picual growers, have said they would plant these varieties again, with one grower each of these varieties saying they would not plant them again. It is also worth noting that though there were only seven growers for each of the varieties Arbequina and Azapa, three of each of these growers have included these varieties among those they would plant again. By contrast, only six of the thirty-three

Manzanillo growers would plant the variety again , with almost as many saying they would not, and three identifying this variety as among the worst. Four of eight Hardy’s Mammoth growers put this among the worst varieties. The information in this table is further analysed in terms of soils and region below.

A-4.1 assessment of varieties in all regions on good soils										
n=10	planted	best	2nd	do well	plant again	good oil	good fruit	worst	don't do well	not plant again
Azapa	6	1	.	1	3	2	.	.	.	.
Barnea	3	.	.	2	1	.	.	.	.	.
Barouni	2	1	.	.	1	.	1	.	.	.
Coratina	2	1	.	2	1	1	.	.	.	.
Corregiola	8	1	.	1	4	4	.	.	2	.
Frantoio	7	2	.	.	4	2	.	.	.	1
Jumbo Kalamata	1	.	.	.	.	.	.	1	.	.
Kalamata	4	1	.	1	2	.	.	.	.	.
Leccino	3	.	.	.	2	.	.	.	.	.
Manzanillo	8	2	1	2	3	3	1	.	2	.
Mission calif	1	.	.	.	.	1	.	.	.	.
Mission WA	2	.	.	.	1	.	.	.	.	.
Nab Tamri	1	.	.	.	1	.	.	.	.	.
Nevadillo Blanco	5	.	.	.	1	1	.	1	1	2
Paragon	4	1	.	.	1	2	.	.	.	.
Pendolino	1	.	.	.	1	.	.	.	.	.
Picholine	1	.	.	.	1	.	.	.	.	.
Picual	3	.	.	2	1	1	.	.	1	.
Sevillano	1	1	.	.	1	.	.	.	.	.
UC13A6	3	.	1	.	1	.	.	1	.	.

Table A-4.1 shows growers’ assessment of varieties in all regions on good soils

Table A4.1 shows the comments of growers on soils described as ‘good’ on the overall performance of varieties. Half or more of the growers of Frantoio, Corregiola and Azapa would plant these varieties again, though one Frantoio grower would not plant the variety again ‘*I don’t think I would bother with Frantoio ... For this area [E4] it’s not giving definitive enough oil*’ consideration of table A-4 shows this is the only grower in the survey who said they would not plant Frantoio again. Half the Azapa and half the Corregiola growers also reported getting good oil from these varieties. Three of the eight Manzanillo growers also would plant again and reported good oil from Manzanillo. Two of five Nevadillo Blanco growers would not plant Nevadillo Blanco again ‘*the worst performing ones are the Nevadillo Blanco ... they are nine years old and I don’t think we’ve picked a single fruit*’.

A-4.2 assessment of varieties in all regions on well drained soils										
n=10	planted	best	2nd	do well	plant again	good oil	good fruit	worst	don't do well	not plant again
Arbequina	2							1		
Azapa	3			1	1	1				
Barnea	4			3	1	1				1
Bouquettier	1			1		1				
Coratina	2	1		1						
Corregiola	7			2	2	2			2	
Frantoio	8			2	5	2			1	
Kalamata	5			1						
Koroneiki	6				1	1				1
Leccino	4			2	2	1		1		
Manzanillo	9	1		2	3	3			2	3
Mission WA	1					1				
Nab Tamri	1				1					
Nevadillo Blanco	4			1	2	2			1	1
Paragon	5	1			2	3				
Pendolino	2			1	1	1				1
Picual	5			3	3	1				1

Table A-4.2 shows growers' assessment of varieties in all regions on well-drained soils

Table A4.2 shows the comments of growers on soils described as 'well-drained' on the overall performance of varieties. Five of eight Frantoio growers would plant the variety again while one notes the variety does not do well as they found the variety only '*spasmodically set fruit*'. The same grower also found '*Corregiola are really spasmodic. there'll be one prolific tree then the next. Three will have no fruit. I simply don't get it.*' and would not plant that variety again either, comparison with table A-4 shows this is the only grower who said they would not plant this variety again. Three of the eight Manzanillo growers would plant that variety again if they were starting their grove again from scratch, three also reported good oil, two reported the variety 'do well' only one identified Manzanillo as the 'best' variety, however two growers found the variety did not do well and three would not plant the variety again.

A-4.3 assessment of varieties on poor soils										
n=6	planted	best	2nd	do well	plant again	good oil	good fruity	worst	don't do well	not plant again
Arbequina	3	.	.	1	2	.		.	.	
Azapa	1	.	.	1	1	1		.	.	
Barnea	2	1	.	2	1	.		.	.	
Coratina	2	.	.	1	1	.		.	.	
Corregiola	6	.	1	3	1	1		.	1	
Frantoio	4	1	2	1	1	1		.	.	
Hardy's Mammoth	3	.	.	.	.	.		1	1	1
Kalamata	2	.	.	1	1	.		.	.	
Koroneiki	4	.	.	1	1	.		.	.	
Manzanillo	6	1	1	1	1	1		1	1	
Mission	1	.	.	.	.	.		1	.	
Nevadillo Blanco	6	.	.	.	.	.		.	1	
Picual	3	1	.	2	1	.		.	.	
UC13A6	2	.	.	.	.	.		1	.	1
UCLA	1	.	.	.	.	.		.	1	
Verdale SA	2	.	.	1	.	.		.	.
Verdale Wagga	1	.	.	1	.	.		.	.

Table A-4.3 shows growers' assessment of varieties in all regions on poor soils

Table A4.3 shows the comments of growers on soils described as 'poor' on the overall performance of varieties. Three of the six Corregiola growers reported the variety 'do well' one would plant Corregiola again and one noted the variety did not do well. Two of the three Arbequina growers would plant the variety again and one reported they 'do well'. Picual was also noted to do well by two of the three growers, with one who would plant the variety again. Frantoio was held to be second best or best by three of its four growers.

A-4.4 - assessment of varieties on clay soil										
n=13	planted	best	2nd	do well	plant again	good oil	good fruit	don't do well	worst	not plant again
Arbequina	3	.	.	.	1	.	.	.	1	.
Azapa	1									
Barnea	6	.	.	3	1	.	.	.	.	.
Barouni	1	1	.	.	1	.	1	.	.	.
Blanquette	1									
Bouquettier	1	.	.	1	.	1	.	.	.	.
Californian Queen	1	1	.	.	1	.	.	.	.	.
Katsouliera	1									
Coratina	3	1	.	1	.	.	.	.	.	.
Corregiola	13	2	1	3	4	4	.	2	1	.
Frantoio	9	3	1	1	4	2	.	1	.	.
Hardy's Mammoth	4	.	.	.	.	.	.	.	2	.
Jumbo Kalamata	1	1	1	.	.	.	.	.	.	.
Kalamata	4	1	1	.	1	.	.	.	.	.
Koroneiki	6	.	.	1	1	.	.	1	.	1
Leccino	5	.	.	1	1	.	.	1	2	.
Manzanillo	11	3	1	2	1	3	.	2	1	.
Mission	5	1	1	1	2	2	.	.	.	.
Mission calif	1	.	.	.	.	1	.	.	.	.
Mission WA	1	.	.	.	1	.	.	.	.	.
Nevadillo Blanco	4	.	.	.	.	.	.	1	1	1
Paragon	4	1	1	.	2	1	.	.	.	.
Pendulina	4									
Pendolino	5	.	.	1	2	.	.	.	.	.
Picholine	1									
Picual	6	.	.	3	1	1	.	1	.	.
queen Spain	1									
UC	1									
UC13A6	5	1	.	.	1	.	1	1	1	.
Verdale	1									
Verdale SA	2	.	.	1	.	.	.	.	.	.
Verdale Qld	1									
Verdale Wagga	1	.	.	1	.	.	.	.	.	.

Table A-4.4 shows growers' assessment of varieties in all regions on clay soils

Table A4.4 shows the comments of growers on clay soils on the overall performance of varieties. The table shows all growers on clay soil in the study grew Corregiola. Four of the thirteen say they would again plant Corregiola if they were starting again in the region, three have identified Corregiola as best or second best and three have said the variety does well, four note that good oil is produced from the variety. One grower notes Corregiola as their worst variety and two say it does not do well rather, according to one: *'Corregiola are really spasmodic. There'll be one prolific tree then the next, I simply don't get it. They also need to*

be pruned the most'. The next most widely grown variety on clay soils in the study was Manzanillo, with 11 growers. Comparison with table A-4 shows that one third of Manzanillo growers in the study were growing on clay soils, only one of these has said they would plant Manzanillo again compared to six in the whole study, though four Manzanillo growers on clay soils have identified it as their best or second best variety. One third of the Frantoio growers on clay soils in the study have identified this variety as 'best' and four of the nine would plant Frantoio again. Of the six growers on clay soils each with Barnea and Picual half have said these varieties 'do well' and one grower each would plant again.

A-4.5 - assessments of varieties on sandy loam soils										
n=12	Planted	best	2nd	do well	plant again	good oil	good fruit	worst	don't do well	not plant again
Arbequina	3	.	.	.	1	.	.	1	.	.
Azapa	2	1	.	.	2	.	.	.	.	.
Barnea	6	.	.	1	1	1	.	.	.	1
Coratina	4	1	.	1	2	.	.	.	.	.
Corregiola	8	1	.	1	1	1	.	.	.	.
Frantoio	8	1	.	1	4	1	.	1	.	.
Hardy's Mammoth	1	.	.	.	.	1	.	1	.	.
Jumbo Kalamata	1	.	.	.	.	.	.	1	.	.
Kalamata	4	1	.	1	3	1	.	.	.	.
Koroneiki	3	.	.	1	1	1	.	.	.	.
Leccino	7	.	.	1	3	1	.	1	1	1
Manzanillo	9	3	.	2	.	.	1	1	.	.
Nevadillo Blanco	6	.	.	1	.	.	.	1	1	.
Paragon	5	2	.	.	2	1	.	.	.	.
Pendolino	6	.	.	.	2	.	.	.	.	.
Pendulina	2	.	.	.	.	.	.	1	.	.
Picholine	2	.	.	.	1	.	.	.	.	.
Picual	6	1	.	2	2	1	.	.	1	.
Sevillano	1	1	.	.	1	.	.	.	.	.
UC13A6	3	1	1	.	1	1	.	1	1	.
Verdale Wagga	1	.	.	1	.	.	.	.	.	.

Table A-4.5 shows growers' assessment of varieties in all regions on sandy loam soils

Table A4.3 shows the comments of growers on sandy loam soils on the overall performance of varieties. It shows both of those growing Azapa, three of four of those growing Kalamata and half those growing Frantoio or Coratina would plant these varieties again. One third of Manzanillo growers identified the variety as their best and two of the nine noted they 'do well'.

A-4.6 - assessments of varieties on sandy soils									
n=10	planted	best	2nd	do well	plant again	good oil	don't do well	worst	not plant again
Arbequina	4	.	.	1	2	.	.	1	.
Azapa	2	.	.	.	.	1	.	.	.
Barnea	6	1	.	4	2	.	.	.	.
Coratina	4	.	.	2	3	1	.	.	.
Corregiola	8	.	1	1	1	1	.	1	.
Frantoio	9	2	1	1	3	3	.	1	1
FS17	2	.	.	.	.	.	.	.	1
Hardy's Mammoth	3	.	.	.	.	.	1	.	1
Kalamata	5	.	.	3	2	.	.	.	.
Leccino	6	.	.	.	.	.	.	1	.
Manzanillo	10	2	1	2	3	3	.	1	1
Mission	4	1	.	.	.	.	.	1	.
Nevadillo Blanco	7	.	.	.	.	.	2	1	2
Paragon	5	1	.	.	2	2	.	.	.
Picual	6	2	.	3	5	.	.	.	.
UC13A6	3	.	.	.	.	.	1	.	1
UCLA	1	.	.	.	.	.	1	.	.

Table A-4.6 shows growers' assessment of varieties in all regions on sandy soils

Table A4.3 shows the comments of growers on sandy soils on the overall performance of varieties. Of ten growers initially planting Manzanillo, only three would plant the variety if they were starting again. By contrast, five of the six Picual growers on sandy soils would plant that variety again, and comparison with table A-4 five of a total of seven growers who would plant Picual again are on sandy soils. Other varieties noted to 'do well' or that would be planted again by more than half of those growing the variety included Barnea, Coratina and Kalamata.

Regional variation

D5

As noted above, zone D5 has as a cool wet climate and extends over mid-latitude locations, Australia and other parts of the world. Though moisture regime is considered non-limiting in winter and only moderately limiting in summer, irrigation may still be required for critical growth stages in the olive. Four growers were interviewed in region D5 from Yarrowonga, Swansea, Wagga and New Norfolk, three having prior experience in horticulture, the other in viticulture.

D5-1 - Varieties Planted					
n=4	planted	don't bear	removed	grasshoppers	thrip
Arbequina	2				
Barnea	2				
Mission Californian	1				
Corregiola	4				
Frantoio	4				
Hardy's Mammoth	3	1			1
Hojiblanca	1				
Kalamata	2				1
Koroneiki	1				
Leccino	2				
Manzanillo	4		1		
Mission	2		1		
Nevadillo Blanco	3			1	
Paragon	4			1	
Picual	2				
UC13A6	3				
uncertain	1				
Verdale	2				

Table D5-1 shows principal varieties planted by growers in D5 region, together with problems experienced.

Column one of table D5-1 lists the varieties grown and column two shows the number of growers growing each variety. Between them the growers surveyed in this region grow a range of seventeen olive varieties, with all growing Corregiola, Frantoio, Manzanillo and Paragon, and three quarters growing Hardy's Mammoth, Nevadillo Blanco and UC13A6. Few problems were reported.

D5 Flowering and pollination

D5-2 - flowering & pollination									
N=4	planted	imperfections	self pollinate	flowering/earlier	Flowering/mid	flowering/later	pollinators	pollinators/problems	biannual
Arbequina	2				1				
Mission Californian	1			1					
Corregiola	4				1		1		
Frantoio	4				1		1		
Hardy's Mammoth	3					1	1	1	
Hojiblanca	1				1				
Kalamata	2				1	1	1	1	
Koroneiki	1				1		1		
Manzanillo	4			1	1	1	2		
Mission	2					1			
Nevadillo Blanco	3						2		
Paragon	4				1		1		
Pendolino	1						1		
Picual	1				1				
UC13A6	3			1	1				
uncertain	1						1		
Verdale	2			1			1		

Table D5-2 shows flowering times, principal flowering problems by variety, varieties recognised by growers to act as pollinators for other varieties or self pollinate, and varieties that are biannual.

Table D5-2 shows that flowering times of varieties are spread around a mid period of flowering from late October to December, but by the '*end you can get the residual few things flowering Kalamata and Hardy's Mammoth and that may even account for some of the lower yields because there may not be much pollen around*'. There were no reports of imperfections in the flowers, self pollination or biannual varieties.

D5 Yield

D5-3 – Yields on all soils									
n=4	planted	oil %					Yield		
		below 10%	10-15%	15-19%	>20%	%/varies	low yield	high yield	yield varies
Arbequina	2	.	.	.	.	.	.	1	.
Barnea	2	.	.	.	1	.	.	.	.
Corregiola	4	.	1	.	2	.1	.	1	.
Frantoio	4	.	1	.	2	.	.	2	1
Hardy's Mammoth	3	.	.	.	1	.	1	.	.
Kalamata	2	.	.	.	1	.	.	.	.
Koroneiki	1	.	.	.	1	.	.	1	.
Manzanillo	4	.	1	1	.	.	.	2	.
Mission	2	.	.	.	.	.	1	.	.
Nevadillo Blanco	3	.	.	.	1	.	2	.	.
Paragon	4	.	.	.	1	.	.	1	.
Picual	2	.	.	.	1	.	.	.	.
UC13A6	3	.	2	.	.	.	.	.	.

Table D5-3 shows oil percentage and fruit yields achieved for various selected varieties on all soils reported by growers in region D5

Table D5-3 shows half of all growers with Frantoio in zone D5 report high fruit yields and oil percentages at or above 20%. Growers reports of oil percentage vary for Corregiola. For Manzanillo growers report that while producing high fruit yields it has lower oil percentages. Growers with Nevadillo Blanco report low yields, but high oil percentages

D5 Soils and yield

There were no growers reporting yields on good soils, therefore there is no table D5-3.1.

D5-3.2 - Yield on well drained soil									
n=1	planted	Oil %					Yield		
		below 10%	10-15%	15-19%	>20%	% varies	low yield	high yield	yield varies
Corregiola					1				
Frantoio					1			1	1
Manzanillo				1				1	
Mission							1		
Nevadillo Blanco					1		1		
Paragon					1				
Picual					1				

Table D5-3.2 shows oil percentage and fruit yields achieved for various selected varieties on well-drained soils reported by growers in region D5

Numbers are too small in table D5-3.2 and D5-3.3 to draw any strong inferences from the data on well-drained and poor soils, tables D5-3.2 and D5-3.3 respectively. However it is noteworthy that on both qualities of soil Frantoio achieved high or variable yields.

D5-3.3 - Yield on poor soil									
n=1	planted	Oil %					Yield		
		below 10%	10-15%	15-19%	>20%	% varies	low yield	high yield	yield varies
Frantoio	1	.	.	.	.	.	.	1	1
Mission	1	.	.	.	.	.	1	.	.

Table D5-3.3 shows oil percentage and fruit yields achieved for various selected varieties on poor soils reported by growers in region D5

D5-3.5 - Yields in clay soil									
n=2	planted	Oil %					Yield		
		below 10%	10-15%	15-19%	>20%	% varies	low yield	high yield	yield varies
Barnea	2	.	.	.	1	.	.	.	.
Corregiola	2	.	1	.	2	.	.	1	.
Frantoio	2	.	1	.	2	.	.	.	.
Kalamata	1	.	.	.	.	.	.	.	.
Manzanillo	2	.	1	1	.	.	.	1	.
Nevadillo Blanco	1	.	.	.	1	.	1	.	.
Paragon	2	.	.	.	1	.	.	.	.
Picual	1	.	.	.	1	.	.	.	.
UC13A6	2	.	1	.	.	.	.	.	.

Table D5-3.5 shows oil % achieved and fruit yields of various varieties on clay soils reported by growers in region D5

Table D5-3.4 shows growers in climatic region D5 growing Corregiola and Frantoio on clay soils reported oil percentages of 20% or more and one Corregiola grower reported a high fruit yield.

D5-3.5 - yields for varieties on sandy loam soil									
n=2	planted	Oil %					Yield		
		below 10%	10-15%	15-19%	>20%	% varies	low yield	high yield	yield varies
Arbequina	2							1	
Corregiola	2				1			1	
Frantoio	2	.	.	.	1	.	.	1	.
Hardy's Mammoth	1				1		1		
Kalamata	2	.	.		1	.	.		.
Koroneiki	1				1			1	
Manzanillo	2	.	.	1	.	.	.	2	.
Nevadillo Blanco	2	.	.		1	.	2		.
Paragon	2	.	.		1	.	.		.
Picual	2	.	.	.	1	.	.	.	.

Table D5-3.5 shows oil % achieved and fruit yields of various varieties on sandy loam soils reported by growers in region D5

Though numbers are small, table D5-3.5 shows high oil percentages were reported on all varieties but Arbequina and Manzanillo by half the growers on sandy loam soils in this region, the only Koroneiki grower reported both high fruit yields and high oil percentages

‘Koroneiki is always quite a good yielder and excellent oil’. Both Nevadillo Blanco growers reported low fruit yields while both Manzanillo growers reported high fruit yields.

D5-3.6 - yields on sandy soils									
n=2	planted	oil %					Yield		
		below 10%	10-15%	15-19%	>20%	%/varies	low yield	high yield	yield varies
Corregiola	2				1				
Frantoio	2				1			1	1
Manzanillo	2			1					
Mission	2						1		
Nevadillo Blanco	2				1		1		
Paragon	2				1				
Picual	1				1			1	

Table D5-3.6 oil % achieved and fruit yields of various varieties on sandy soils reported by growers in region D5

The number is small in table D5-3.6 and there is no consensus as to yield or oil percentages from any variety on sandy soils, however it is noteworthy that on sandy soil in this region several varieties are reported by growers as producing oil percentages of 20% or above.

D5 Assessment

D5 - assessments of varieties in all soils										
n=4	planted	best	2nd	do well	plant again	good oil	good fruit	worst	don't do well	not plant again
Arbequina	2	.	.	.	.	.	.	1		.
Barnea	2	.	.	1	1	.	.	.		.
Corregiola	4	1	.	.	1	.	.	.		.
Frantoio	4	1	.	1	1	.	.	.		.
Hardy's Mammoth	3	.	.	.	.	1	.	2		.
Kalamata	2	.	.	1	1	1	.	.		.
Koroneiki	1	.	.	1	1	1	.	.		.
Leccino	2	.	.	1	1	.	.	1		.
Manzanillo	4		.	1	.	.	.	3		.
Mission	2	.	.	.	.	.	.	1		.
Nevadillo Blanco	3	.	.	1	.	.	.	.		.
Paragon	4	1	1	.	1	1	.	.		.
Pendolino	2	.	.	.	1	.	.	.		.
Pendulina	2	.	.	.	.	.	.	1		.
Picual	2	.	.	1	1	.	.	.		.
UC13A6	3	1	.	.	.	1	1	.	1	.

Table D5-4. shows growers' assessment of varieties in region D5 on all soils

Table D5-4 shows that with the exception of Frantoio and Paragon there is little consensus emerging on the better varieties in this region, so as one grower says: ‘we’d say that Frantoio is probably a good variety to have’. Other varieties that do well and would be replanted include Barnea Kalamata, Koroneiki and Picual. Growers were divided in their

assessment of Leccino. Despite Manzanillo's good fruit yields, together with Hardy's Mammoth, it is identified by half or more of the growers as 'worst', comparison with table A-4 shows all growers who rated Manzanillo 'worst' were from region D5. The one grower who thought well of Manzanillo none the less had only faint praise saying: '*I mean Manzanillo is useful for what it's supposed to be used for, it does quite well*'.

D5 Soils and assessment

There were no growers' assessments of varieties on good soils, therefore there is no table D5-4.1.

D5-4.2 – assessment of varieties on well drained soil										
n=1	planted	best	2nd	do well	plant again	good oil	good fruit	don't do well	worst	not plant again
Arbequina	1	.	.	.	.	.	.	.	1	
Leccino	1	.	.	.	.	.	.	.	1	
Manzanillo	1	.	.	.	.	.	.	.	1	
Paragon	1	1	.	.	1	.	.	.	.
Picual	1	.	.	1	1	.	.	.	.
UC13A6	1	.	.	.	.	.	.	1	.	

Table D5-4.2 shows growers' assessment of varieties in region D5 on well-drained soils

Numbers are too small and the varieties too diverse to draw any inferences on the influence of soils on variety performance from tables D5-4.2 and D5-4.3, however it is noteworthy that the poor assessment of Manzanillo in this region is across soil types.

D5-4.3 – assessment of varieties in poor soil										
n=1	planted	best	2nd	do well	plant again	good oil	good fruit	don't do well	worst	not plant again
Frantoio	1	1	.	.			.	.	.	.
Manzanillo	1	.	.	.			.	.	1	.
Mission	1	.	.	.			.	.	1	.

Table D5-4.3 shows growers' assessment of varieties in region D5 on poor soils

D5-4.4 - Varieties on Clay Soil										
n=2		best	2nd	do well	plant again	good oil	good fruit	don't do well	worst	not plant again
Arbequina	1	.	.	.	.		.	.	1	
Barnea	2	.	.	1	1		.	.	.	
Corregiola	2	1	.	.	1		.	.	.	
Hardy's Mammoth	1	.	.	.	.		.	.	1	
Leccino	1	.	.	.	.		.	.	1	
Manzanillo	2	1	.	.	.		.	.	1	
Paragon	2	1	1	.	1		.	.	.	
Picual	1	.	.	1	1		.	.	.	
UC13A6	1	.	.	.	.		1	1	.	

Table D5-4.4 shows growers' assessment of varieties in region D5 on clay soils

Tables, D5-4.4, D5-4.5 and D5-4.6 indicate no consensus on varieties on different soil types in region D5.

D5-4.5 - assessments of varieties on sandy loam soils										
n=2		best	2nd	do well	plant again	good oil	good fruit	don't do well	worst	not plant again
Arbequina	2	.	.	.	.	.	.	.	1	.
Leccino	2	.	.	.	.	.	.	.	1	.
Manzanillo	2	1	.	.	.	.	.	.	.	.
Paragon	2	1	.	.	1	.	.	.	.	.
Picual	2	.	.	1	1	.	.	.	.	.
UC13A6	1	.	.	.	.	.	.	1	.	.

Table D5-4.5 shows growers' assessment of varieties in region D5 on sandy loam soils

D5-4.6 – assessment of varieties on sandy soil										
n=2	planted	best	2nd	do well	plant again	good oil	good fruit	don't do well	worst	not plant again
Frantoio	2	1								
Leccino	2								1	
Manzanillo	2	1							1	
Mission	2								1	
Paragon	2	1			1					
Picual	1			1	1					
UC13A6	1							1		

Table D5-4.6 shows growers' assessment of varieties in region D5 on sandy soils

E1

Zones E1 is the classical Mediterranean type climate, characterized by having cool wet winters and a significant dry season which requires irrigation for olive production. Five growers were interviewed in region E1 near towns such as Keith, Guilderton and Gingin. Three growers have prior experience in horticulture, another in general farming and for one it was a first experience of tree crops.

E1-1 - varieties planted						
n=5	planted	don't bear	removed	black scale	soft nose	anthracnose
Arbequina	2	.	.			.
Barnea	4	.	.			1
Coratina	3	.	.			.
Corregiola	3	.	.			.
Frantoio	5	.	.	1		.
FS17	1	.	.			.
Hardy's Mammoth	1	.	.			.
Kalamata	3	.	.			.
Koroneiki	3	.	.			.
Leccino	4	.	.			.
Manzanillo	5	.	.	1		.
Minerva	1	.	.			.
Mission WA	1	.	.			.
Nevadillo Blanco	4	.	.	2	1	1
Paragon	1	.	.			.
Pendolino	4	.	.			.
Picual	4	.	.	1		.
Queen of Spain	1	.	.			.
Sevillano	1	.	.			.
UC13A6	1	.	1			1
Verdale SA	1	.	.			.
177						

Table E1-1 shows principal varieties planted by growers in E1 region, together with problems experienced.

As table E1-1 shows between them growers in region E1 grow a range of olive varieties, with all growing Manzanillo and Frantoio, four of the five growing Barnea, Leccino, Nevadillo Blanco, Pendolino, and Picual more than half growing Coratina, Corregiola, Kalamata and Koroneiki. Two of the four Nevadillo Blanco growers in this region reported the variety had suffered from black scale, comparison with table A-1 shows this is half the total report of black scale on Nevadillo Blanco.

E1 flowering and pollination

E1-2 - flowering									
n=5	planted	imperfections	pollinators/not needed	flowering/earlier	flowering/later	flowering/mid	pollinators	pollinators/problems	biannual
Barnea	4						1		
Corregiola	3						1		
Frantoio	5						3		
Hardy's Mammoth	1				1				
Leccino	4				1		2		
Manzanillo	5			2			1		
Nevadillo Blanco	4	1		1				1	
Pendolino	4			1			1		
Picual	4						1		

Table E1-2 shows flowering times, principal flowering problems by variety, varieties recognised by growers to act as pollinators for other varieties or self pollinate, and varieties that are biannual.

Table E1-2 shows growers have reported early and late flowering, *'the Pendolino, Manzanillo are probably the earliest couple and the Hardy's Mammoth and the Leccino are probably the two latest ones we have got and everything else is in between. Flowering was starting late September for our earliest varieties'*, and ending in early November. Comparison with table A-2 above shows that one third of those mentioning Frantoio or Leccino as a pollinator were in this region.

Problems were reported with Nevadillo Blanco flowers and consequently with pollination: *'We do have those problems. There are a lot of imperfect flowers on Nevadillo. We have that problem here. I have noticed this year we've got a reasonably good set and I think there's probably been more pollen around to set what actually is an imperfect flower.'*

E1 Yield

E1-3 - Yields on all soils									
n=5	planted	Oil %					Yield		
		below 10%	10-15%	15-19%	>20%	%varies	low yield	high yield	varies
177	1	.	.	.	1	.	.	.	.
Barnea	4	.	.	1	.	.	.	.	.
Coratina	3	.	.	.	.	.	.	.	.
Corregiola	3	.	.	.	2	.	1	.	.
Frantoio	5	.	.	.	3	.	2	1	.
FS17	1	.	.	.	.	.	.	.	.
Hardy's Mammoth	1	.	.	.	.	.	1	.	.
Kalamata	3	.	.	.	.	.	.	.	.
Koroneiki	3	.	.	.	1	.	.	.	.
Leccino	4	1	.	1	1	.	1	.	.
Manzanillo	5	.	.	4	1	1	.	.	.
Mission WA	1	.	.	.	1	.	.	.	.
Nevadillo Blanco	4	.	.	.	3	.	1	1	.
Paragon	1	.	.	.	1	.	.	.	.
Picual	4	.	1	1	.	.	.	1	.
UC13A6	1	.	.	.	.	.	.	.	.

Table E1-3 shows oil percentage and fruit yields achieved for various selected varieties on all soils reported by growers in region E1

Table E1-3 shows growers reported that Manzanillo achieved good if sometimes variable oil percentages, but there were no reports on fruit yield for this variety. Frantoio and Nevadillo Blanco achieved 20% or above oil yield with low fruit yields. The low fruit yield reported on Nevadillo Blanco may be explained by the flower imperfection noted above.

E1 Soil and yield

There were no growers reporting yields on good soils, therefore there is no table E1-3.1.

Low numbers make drawing inferences as to the influence of soil in this region difficult.

E1-3.2 - Yield on well-drained soil									
n=1	planted	Oil %					Yield		
		below 10%	10-15%	15-19%	>20%	%varies	low yield	high yield	yield varies
Barnea	1			1					
Manzanillo	1			1					

Table E1-3.2 shows oil percentage and fruit yields achieved for various selected varieties on well-drained soils reported by growers in region E1

E1-3.3 - Yields on poor soil									
n=1	planted	Oil %					Yield		
		below 10%	10-15%	15-19%	>20%	%varies	low yield	high yield	yield varies
Corregiola	1				1		1		1
Frantoio	1				1		1		
Koroneiki	1				1				
Leccino	1	1							
Manzanillo	1		1	1				1	
Nevadillo Blanco	1				1				
Pical	1			1					
Verdale SA	1							1	

Table E1-3.3 shows oil percentage and fruit yields achieved for various selected varieties on poor soils reported by growers in region E1

No growers on clay soils were surveyed in region E1 and so no table E1-3.5.

E1-3.5 - yields for varieties on sandy loam soil									
n=1	planted	Oil %					Yield		
		below 10%	10-15%	15-19%	>20%	%varies	low yield	high yield	yield varies
Corregiola	1				1				1
Manzanillo	1		1					1	
Verdale SA	1								1

Table E1-3.5 shows oil % achieved and fruit yields of various varieties on sandy loam soils reported by growers in region E1

The numbers are too small to draw any inferences.

E1-3.6 - yields in sandy soil									
n=1	planted	Oil %					Yield		
		below 10%	10-15%	15-19%	>20%	%varies	low yield	high yield	varies
Corregiola	1				1		1		
Frantoio	1				1		1		
Koroneiki	1				1				
Manzanillo	1			1					
Nevadillo Blanco	1				1				
Pical	1			1					

Table E1-3.6. shows oil % achieved and fruit yields of various varieties on sandy soils reported by grower in region E1

The number is too small to draw any inferences.

E1 Assessment

E1-4 – assessment of varieties on all soils										
n=5	Planted	best	2nd	do well	plant again	good oil	good fruit	not so well	worst	not plant again
177	1	.	.	1	.	.	.	.	.	.
Arbequina	2	.	.	2	2	.	.	.	.	.
Barnea	4	2	.	3	3	1	.	.	.	1
Coratina	3	.	.	2	3	.	.	.	.	.
Corregiola	3	1	2	3	1	.	.	.	.	.
Frantoio	5	.	2	2	2	3	.	.	1	.
Hardy's Mammoth	1	.	.	.	.	.	.	.	1	.
Kalamata	3	.	.	1	1	.	.	.	.	.
Leccino	4	.	.	1	2	1	.	.	.	.
Manzanillo	5	1	.	1	1	2	.	1	.	2
Nevadillo Blanco	4	.	.	.	1	1	.	2	.	1
Paragon	1	.	.	.	1	.	.	.	.	.
Pendolino	4	.	.	1	1	1	.	.	.	1
Picual	4	2	.	3	3	1	.	.	.	1
UC13A6	1	1	.	1	.	.	.	.	.	.

Table E1-4. shows growers' assessment of varieties in region E1 on all soils

Table E1-4 shows all Coratina and Arbequina growers in this region would plant these varieties again if they were planning groves from 'scratch'. Three of four Barnea and Picual growers in this region would plant these varieties again. Only two of four Leccino and two of five Frantoio growers would replant, and only one Manzanillo grower would replant Manzanillo, while two say they would not plant Manzanillo again, comparison with table A-4 shows these are two of a total seven Manzanillo growers surveyed who would not plant Manzanillo again.

Soil and assessment

The numbers are too small to draw strong inferences on the assessment of the varieties on these qualities of soils, however, the tables for well drained and poor soils, E1-4.2 and E1-4.3 are very similar in some respects, thus the growers of Arbequina, Coratina, Corregiola and Frantoio who thought these varieties 'do well' were growing the varieties on different qualities of soil

E1-4.2 - Varieties on well drained soil										
n=1	Planted	best	2nd	do well	plant again	good oil	good fruit	not so well	worst	not plant again
Arbequina	1	.	.	1	1	.	.	.	.	.
Barnea	1	1	.	1	1	.	.	.	.	.
Coratina	1	.	.	1	1	.	.	.	.	.
Corregiola	1	.	1	1	.	.	.	.	.	.
Frantoio	1	.	1	1	.	1	.	.	.	.
Manzanillo	1	.	.	.	.	1	.	.	.	.
Nevadillo	1	.	.	.	.	.	.	1	.	.

Blanco										
Picual	1	1	.	1	1	.	.	.	.	.

Table E1-4.2 shows growers' assessment of varieties in region E1 on poor soils

Numbers are too small in table E1-4.2 to draw any inferences.

There was no data for table E1-4.1 assessment of varieties on good soil.

E1-4.3 - Varieties on poor soils										
n=1	Planted	best	2nd	do well	plant again	good oil	good fruit	not so well	worst	not plant again
Arbequina	1	.	.	1	1	.	.	.	.	.
Barnea	1	1	.	1	1	.	.	.	.	.
Coratina	1	.	.	1	1	.	.	.	.	.
Corregiola	1	.	1	1	.	.	.	.	.	.
Frantoio	1	.	1	1	.	1	.	.	.	.
Manzanillo	1	.	.	.	.	1	.	.	.	.
Nevadillo										
Blanco	1	.	.	.	.	.	.	1	.	.
Picual	1	1	.	1	1	.	.	.	.	.
Verdale SA	1	.	.	1	.	.	.	.	.	.

Table E1-4.3 shows growers' assessment of varieties in region E1 on poor soils

Numbers are too small in table E1-4.3 to draw any inferences

There were no growers on clay soils surveyed in region E1 so no table E1-4.4

E1-4.5 - assessments of varieties on sandy loam soils										
n=1	planted	best	2nd	do well	plant again	good oil	good fruit	don't do well	worst	not plant again
Corregiola	1	.	.	1	.	.	.	.	.	.
Verdale SA	1	.	.	1	.	.	.	.	.	.
Verdale Wagga	1	.	.	1	.	.	.	.	.	.

Table E1-4.5 Shows grower's assessment of varieties in region E1 on sandy loam soils

The number is too small to draw any inferences.

E1-4.6 – assessment of varieties on sandy soil										
n=1		best	2nd	do well	plant again	good oil	good fruit	don't do well	worst	not plant again
Arbequina	1	.	.	1	1	.	.	.	.
Barnea	1	1	.	1	1	.	.	.	.
Coratina	1	.	.	1	1	.	.	.	.
Corregiola	1	.	1	1	.	.	.	.	.
Frantoio	1	.	1	1	.	1	.	.	.	
Manzanillo	1	.	1	.	.	1	.	.	.	
Nevadillo										
Blanco	1	.	.	.	.	.	.	1	.	
Picual	1	1	.	1	1	.	.	.	.

Table E1-4.6 shows grower's assessment of varieties in region E1 on sandy soils

The number is too small to draw any inferences.

E2

Zones E2 is also the classical Mediterranean type climate with cool wet winters and a significant dry season requiring irrigation for maximum olive production. Zone E2 has drier, cooler winters than E1 and the olives will require more water than those in E1. Four growers were interviewed in region E2 near towns such as Mypolonga, Gumeracha and Darling Point. Three growers have prior experience in horticulture, and for three it was also their first experience of tree crops.

E2-1 - Varieties Planted						
n=4	planted	don't bear	pythium rot	black scale	unstable	removed
Barnea	2					
Californian Queen	1					
Coratina	2					
Corregiola	4			1		
Frantoio	3		1			
Jumbo Kalamata	1					
Kalamata	2					
Koroneiki	2					
Leccino	2				1	
Manzanillo	4			2		
Mission	3					
Mission WA	1					
Nevadillo Blanco	1					
Paragon	2					
Pendolino	3					
Pendulina	2					
Picual	1					
UC13A6	1					

Table E2-1 shows principal varieties planted by growers in E2 region, together with problems experienced.

As table E2-1 shows between them growers in region E2 grow a range of olive varieties, with all growing Corregiola and Manzanillo and three quarters growing Frantoio, Mission and Pendolino. Half of those growing Manzanillo reported black scale.

E2 flowering and pollination

E2-2 - flowering									
n=4	planted	imperfections	pollinators/not needed	flowering/earlier	flowering/later	flowering/mid	pollinators	pollinators/problems	biannual
Leccino	2						1		
Pendolino	2						1		
Pendulina	3						2		

Table E2-2. shows flowering times, principal flowering problems by variety, varieties recognised by growers to act as pollinators for other varieties or self pollinate, and varieties that are biannual.

Growers in this region provided information only on varieties thought to be pollinators.

E2 Yield

E2 .3- Yields all soils									
n=4	Planted	Oil %					Yield		
		below10 %	10-15%	15-19%	>20%	%varies	low yield	high yield	varies
Barnea	2	.	.	1	.	.	.	.	.
Californian Queen	1	.	1	.	.	.	.	.	.
Corregiola	4	.	.	2	.	1	.	.	2
Kalamata	2	.	.	.	1	.	.	.	.
Koroneiki	2	.	.	.	1	.	.	.	.
Leccino	2	.	.	.	.	.	1	1	.
Manzanillo	4	1	.	2	1	.	1	.	1
Mission	3	.	.	.	1	.	.	.	.
Mission WA	1	.	.	.	1	.	.	.	.
Nevadillo Blanco	2	.	.	.	2	.	1	.	.
Paragon	2	.	.	1	.	.	.	.	.

Table E2-3 shows oil percentage and fruit yields achieved for various selected varieties on all soils reported by growers in region E2

Table E2-3 shows 2 of a possible 4 growers reported a variable fruit yield and an oil percentage for Corregiola between 15 and 19%, comparison with table A-3 shows this is half of all growers reporting this oil % for this variety. Nevadillo Blanco growers report oil percentage of 20% or above, this is half of all growers reporting this oil % for this variety comparison with table E2-3.6 shows both these growers were on sandy soils.

E2 Soil and yield

E2-3.2 - Yields in well drained soil									
n=1	Planted	Oil %					Yield		
		below 10%	10-15%	15-19%	>20%	% varies	low yield	high yield	yield varies
Frantoio	1	.	.	1	.	.	.	.	.
Koroneiki	1	.	.	.	1	.	.	.	.
Manzanillo	1	1	.	.	.	.	.	.	.
Mission WA	1	.	.	.	1	.	.	.	.
Paragon	1	.	.	1	.	.	.	.	.

Table E2-3.2 shows oil percentage and fruit yields achieved for various selected varieties on all soils reported by growers in region E2

Numbers are too low in table E2-3.2 to draw any inferences.

Yields on good or poor soils were not reported, thus tables E2-3.1 and E2-3.3 do not exist.

E2-3.5 - Yields in clay soil									
n=2		Oil %					Yield		
		below 10%	10-15%	15-19%	>20 %	% varies	low yield	high yield	yield varies
Corregiola	2	.	.	.	.	.	.	.	1
Leccino	1	.	.	.	.	.	1	.	.

Table E2-3.5 shows oil % achieved and fruit yields of various varieties on clay soils reported by growers in region e2

The numbers are too small to draw any inferences.

E2-3.5 - yields for varieties on sandy loam soil									
n=1		Oil %					Yield		
		below 10%	10-15%	15-19%	>20%	% varies	low yield	high yield	yield varies
Frantoio	1	.	.	.	.	.	1	.	.
Leccino	1	.	.	1	.	.	1	.	.
Manzanillo	1	.	.	1	.	.	.	.	.
Nevadillo Blanco	1	.	.	.	1	.	1	.	.
Picual	1	.	1	.	.	.	.	1	.

Table E2-3.5 shows oil % achieved and fruit yields of various varieties on sandy loam soils reported by growers in region E2

Numbers are too small to draw any inferences

E2-3.6 - yields in sandy soil									
n=2		Oil %					Yield		
		below 10%	10-15%	15-19%	>20 %	% varies	low yield	high yield	yield varies
Corregiola	2	.	.	.	1	.	1	.	.
Frantoio	2	.	.	.	1	.	2	.	.
Koroneiki	1	.	.	.	1	.	.	.	.
Leccino	2	1	.	1	.	.	1	.	.
Manzanillo	2	.	.	2	.	.	.	.	.
Nevadillo Blanco	2	.	.	.	2	.	1	.	.
Picual	2	.	1	1	.	.	.	1	.

Table E2-3.6 shows oil % achieved and fruit yields of various varieties on sandy soils reported by growers in region E2

Both Manzanillo growers on sandy soil in region E2 report oil percentages between 15-19% and both Nevadillo Blanco growers report oil percentages of 20% or above while both Frantoio growers report low fruit yields.

E2 Assessment

E2-4 – assessment of varieties all soils										
n=4	Planted	best	2nd	do well	plant again	good oil	good fruit	not so well	worst	not plant again
Californian Queen	1	1	.	.	1	.	.			
Coratina	2			1	2					
Corregiola	4	.	1	2	1	1	.	.	.	.
Frantoio	3	1	.	1	2	1	.	.	.	.
Jumbo Kalamata	1	1	1	.	.	.	.	.	.	.
Kalamata	2	1	1	.	2	.	.	.	.	.
Koroneiki	2	.	.	.	1	1	.	1	.	1
Leccino	2	.	.	.	.	.	.	1	1	1
Manzanillo	4	.	.	.	1	2	.	.	.	1
Mission	3	.	1	1	2	2	.	.	.	.
Mission WA	1	.	.	.	.	1	.	.	.	.
Nevadillo Blanco	1	.	.	1	1	1	.	.	.	.
Paragon	2	.	.	.	.	1	.	.	.	.
Pendolino	3			1						2
UC13A6	1	1								1

Table E2-4. shows growers' assessment of varieties in region E2 on all soils

Table E2-4 shows both Kalamata growers and both Coratina growers would plant these varieties again if planning a new grove while two of the three Frantoio growers and two of three Mission growers would plant those varieties again. In contrast two of three Pendolino growers would not plant the variety again. There was only one grower with California queen in this survey and that grower would plant the variety again, saying '*I would keep the main ones of have. I would keep my California Queen, ... I would keep them definitely*'.

E2 Soil and assessment

Growers made no assessments of varieties on poor or good soil thus there are no tables E2-4.1 and E2-4.3.

E2-4.2 – assessment of varieties in well drained soil										
n=1	Planted	best	2nd	do well	plant again	good oil	good fruit	not so well	worst	not plant again
Corregiola	1	.	.	1	.	.		.	.	.
Frantoio	1	.	.	1	1	1	.	.	.	.
Koroneiki	1	.	.	.	1	1	.	.	.	.
Manzanillo	1	.	.	.	1	1	.	.	.	1
Mission WA	1	.	.	.	.	1	.	.	.	.
Nevadillo Blanco	1	.	.	1	1	1	.	.	.	.
Paragon	1	.	.	.	.	1	.	.	.	.

Table E2-4.2 shows growers' assessment of varieties in region E2 on all soils

Numbers are too small in table E2-4.2 to draw any inferences

E2-4.4 - Varieties in clay soil										
n=1		best	2nd	do well	plant again	good oil	good fruit	don't do well	worst	not plant again
Corregiola	1	.	.	1	.		.	.	.	.
Frantoio	1	1	.	.	1	.	.	.	.	.
Leccino	1	.	.	.	.	.	.	1	1	.
Manzanillo	1	.	.	.	.	1	.	.	.	.
Mission	1	.	.	1	1	1	.	.	.	.
Pendolino	1	.	.	1	1	.	.	.	.	.
uncertain	1	.	.	.	.	1	.	.	.	.

Table E2-4.4 shows grower's assessment of varieties in region E2 on clay soils

Number of growers on clay soils in region E2 is too small to derive any inferences.

E2-4.5 - assessments of varieties on sandy loam soils										
n=1	planted	best	2nd	do well	plant again	good oil	good fruit	don't do well	worst	not plant again
Arbequina	1				1					
Coratina	1				1				.	.
Frantoio	1	1	.	.	1	.		.		
Pical	1	1			1					

Table E2-4.5 shows grower's assessment of varieties in region E2 on sandy loam soils

The number is too small to draw any inferences.

E2-4.6 - assessment of varieties on sandy soil										
n=2	planted	best	2nd	do well	plant again	good oil	good fruit	don't do well	worst	not plant again
Arbequina	2	.	.	1	2	.	.	.	.	.
Barnea	2	1		1	1					
Coratina	2	.	.	1	2	.	.	.	.	.
Corregiola	2	.	1	1	.	.	.	.	.	.
Frantoio	2	.	1	1	.	1	.	.	1	.
Kalamata	1	.	.	.	1	.	.	.	.	.
Leccino	2	.	.	.	.	.	.	.	.	1
Manzanillo	2	.	1	.	.	1	.	.	.	.
Nevadillo Blanco	2	.	.	.	.	.	.	1	.	.
Pical	2	2		1	1					

Table E2-4.6 shows grower's assessment of varieties in region E2 on sandy soils

Both Arbequina and both Coratina growers in region E2 would plant the variety again if they were starting again. For the other varieties, the numbers are small and there is no consensus evident.

E3

Zone E3 has hot, moisture limiting summers and mild winters with moisture limiting growth in winter as well. The zone requires irrigation throughout most of the year for optimal olive production. Nine growers were interviewed in region E3 near towns such as Tamworth, Denman, Inverell and Trangie. Growers had prior experience in horticulture, viticulture or general farming, for four it was however their first experience of tree crops.

E3-1 - Varieties planted														
n=9	planted	no pests and diseases	fail to fruit	black scale	soft nose	tolerance	fungal	thrip	verticillium	fruit fly	unstable	lace bug	don't bear	removed
Azapa	2	.	.	.	.	1	.	.	.	1	.	1	.	.
Barnea	4												.	.
Barouni	1													
Bouquettier	1													
Coratina	3													
Corregiola	9	.	.	.	.	1	.	.	.	.	.	1	.	1
Frantoio	8	1	.	1	.	.	.	1	.	.	.	.	.	1
FS 17	1													
Hardy's Mammoth	3												.	.
Kalamata	4	.	.	2	.	.	.	1	.	.	.	.	.	.
Koroneiki	6	.	.	.	.	.	.	.	.	.	.	1	.	.
Leccino	3	1	.	.	.	.	.	.	.	.	.	.	.	.
Manzanillo	8	.	1	2	1	1	.	2	.	.	.	1	.	2
Mission	2												.	.
Nevadillo Blanco	1												.	1
Paragon	5												.	1
Pendulina	1													
Picual	4	.	.	1	.	.	1	.	1	.	.	.	.	.
Queen of Spain	1													
UC	1	.	.	.	.	.	.	.	.	1	1	.	.	.
UC13A6	2	.	.	.	.	.	.	.	.	1	.	.	.	.
UCLA	1	.	.	.	.	.	.	.	.	1	.	.	.	.
uncertain	3	.	1	.	.	.	.	.	.	1	.	.	.	.
Verdale	1													
Verdale Qld	1												.	.
Verdale SA	1												.	.

Table E3-1 shows principal varieties planted by growers in E3 region, together with problems experienced.

As table E3-1 shows growers in region E3 between them they grow a range of olive varieties, with all growing Corregiola, eight of the nine growing Frantoio and Manzanillo, two thirds growing Koroneiki and more than half growing Paragon. Two growers report removal of

Manzanillo, one because they had intended to plant Frantoio and the supplier replaced them. For the other, *‘the Manzanillo did not survive, the Nevadillos and the Paragons a few more survived in that most of the Manzanillos just disappeared. Also the Corregiola as well’*. The grower had planted in autumn and the trees did not survive the frost.

E3 flowering and pollination

E3-2 - flowering									
	planted	imperfections	pollinators/not needed	flowering/earlier	flowering/later	flowering/mid	pollinators	pollinators/problems	biannual
n=9									
Azapa	2				1				1
Barnea	4						1		
Bouquettier	1								1
Corregiola	9					2	1		
Frantoio	8			1	1	1	2		
Hardy's Mammoth	3			1					
Kalamata	4					1	2		
Koroneiki	6						2		
Leccino	3						1		
Manzanillo	8			3			3		
Nevadillo Blanco	1					1	1		
Paragon	5				1		1		
Pendulina	1						1		
Picual	4						1		
Queen of Spain	1						1		
uncertain	3						1		

Table E3-2 shows flowering times, principal flowering problems by variety, varieties recognised by growers to act as pollinators for other varieties or self pollinate, and varieties that are biannual.

Table E3.2 shows different growers report Frantoio as flowering across all flowering periods. *‘Manzanillo, Corregiola and Azapa in that order and you get the others floating in around.’* Flowering begins early in October, and according to one grower *‘they will all pretty well overlap within a 21 day window.’*

E3 Yield

E3-3 - yields on all soils									
n=9	Planted	Oil %					Yield		
		below 10%	10-15%	15-19%	>20%	% varies	low yield	high yield	yield varies
Azapa	2	.	1	.	.	.	.	1	1
Barnea	4	.	.	1	.	.	1	1	.
Barouni	1	.	.	.	.	.	.	1	.
Coratina	3	.	.	.	.	.	.	.	1
Corregiola	9	.	2	1	1	1	1	2	1
Frantoio	8	.	.	.	3	1	2	3	2
FS17	1	.	1	.	.	.	.	.	.
Hardy's Mammoth	3	.	.	.	.	.	2	.	.
Kalamata	4	.	.	.	.	.	1	.	.
Leccino	3	.	1	.	.	.	1	1	.
Manzanillo	8	5	1	3	.	1	3	1	3
Nevadillo Blanco	1	1	.	.	.	.	1	.	.
Paragon	5	.	1	3	.	.	1	1	.
Picual	4	.	1	.	.	.	.	.	.
UCLA	1	.	.	.	.	.	1	.	.

Table E3-3 shows oil percentage and fruit yields achieved for various selected varieties on all soils reported by growers in region E3

Table E3-3 shows oil percentages and fruit yields reported by growers. Three of five Paragon growers reported oil percentages between 15-19% while three of 8 Frantoio growers reported percentages above 20% and high yields, others however report low or variable fruit yields. Comparison with table A-3 shows 5 of the survey total of 6 Manzanillo growers reporting oil percentages at or below 10% are in region E3, while six Manzanillo growers in this region reported fruit yield as low or variable and only one with high fruit yield. Two of the nine growers with Corregiola report oil percentages between 10-15%.

E3 Soil and yield

E3-3.1 - Yields in good soil									
n=5	Planted	Oil %					Yield		
		below 10%	10-15%	15-19%	>20%	% varies	low yield	high yield	yield varies
Azapa	2	.	1	.	.	.	.	1	1
Barnea	4	.	.	1	.	.	1	1	.
Barouni	1	.	.	.	.	.	.	1	.
Coratina	3	.	.	.	.	.	.	.	1
Corregiola	9	.	2	.	1	1	1	2	1
Frantoio	8	.	.	.	2	1	2	2	2
FS17	1	.	1	.	.	.	.	.	.
Hardy's Mammoth	3	.	.	.	.	.	1	.	.
Kalamata	4	.	.	.	.	.	1	.	.
Leccino	3	.	1	.	.	.	1	1	.
Manzanillo	8	3	1	3	.	1	3	1	2
Nevadillo Blanco	1	1	.	.	.	.	1	.	.
Paragon	5	.	1	2	.	.	1	.	.
Picual	4	.	1	.	.	.	.	.	.

Table E3-3.1 shows oil percentage and fruit yields achieved for various selected varieties on good soils reported by growers in region E3

From table E3-3.1 showing yields and oil percentages on soils described as good by growers there is no consensus apparent on either fruit yields or oil percentages achieved on good soils. There is some indication that the low yields reported by growers were achieved on good, well-drained soils (there may be some overlap in here as some growers have described their soil as both good and well drained). By contrast for Frantoio two of the three growers reporting oil yields above 20% and two of the three with high fruit yields are growing on good soil. The lower end oil yields reported for Corregiola were on good, well drained soil.

E3-3.2 - Yields on well drained soils									
n=5	Planted	Oil %					Yield		
		below 10%	10-15%	15-19%	>20%	% varies	low yield	high yield	yield varies
Azapa	2	.	1	.	.	.	.	1	1
Barnea	4	.	.	1	.	.	1	1	.
Coratina	3	.	.	.	.	.	.	.	1
Corregiola	9	.	2	.	.	.	.	1	.
Frantoio	8	.	.	.	1	.	1	1	1
FS17	1	.	1	.	.	.	.	.	.
Kalamata	4	.	.	.	.	.	1	.	.
Leccino	3	.	1	.	.	.	1	1	.
Manzanillo	8	2	.	2	.	.	2	1	1
Nevadillo Blanco	1	1	.	.	.	.	1	.	.
Paragon	5	.	1	2	.	.	1	.	.
Picual	4	.	1	.	.	.	.	.	.

Table E3-3.2 shows oil percentage and fruit yields achieved for various selected varieties on well-drained soils reported by growers in region E3

From table E3-3.2 there is again no clear consensus emerging on yields and oil percentages on well-drained soils. Two of eight Manzanillo growers have had oil percentages below 10% from Manzanillo while two have achieved 15-19%, two have also had low yields. Two of the three Paragon growers who achieved 15-19% oil yield have done so on well drained soil.

E3-3.3 - Yields in poor soil									
n=2	Planted	Oil %					Yield		
		below 10%	10-15%	15-19%	>20%	% varies	low yield	high yield	yield varies
Azapa	2		1					1	1
Corregiola	9		1						
Frantoio	8							1	
FS17	1		1						
Hardy's Mammoth	3						1		
Manzanillo	8	1		1					2
Paragon	5			1				1	
UCLA	1						1		

Table E3-3.3 shows oil percentage and fruit yields achieved for various selected varieties on poor soils reported by growers in region E3

As with well drained soils, table E3-3.3 shows no consensus emerging for poor soils. One quarter of growers though differing on the oil percentage of Manzanillo agree that the fruit yield varied.

E3 Assessment

E3-4 – assessment of varieties on all soils										
n=9	Planted	best	2nd	do well	plant again	good oil	good fruit	not so well	worst	not plant again
Azapa	2	.	.	1	1	1	.	.	.	.
Barnea	4	.	.	3	.	.	.	.	.	.
Barouni	1	1	.	.	1	.	1	.	.	.
Bouquettier	1	.	.	1	.	1	.	.	.	.
Coratina	3	1	.	1	.	1	.	.	.	.
Corregiola	9	1	.	2	3	4	.	2	.	.
Frantoio	8	1	.	1	3	2	.	1	.	.
Hardy's Mammoth	3	.	.	.	.	.	.	1	.	1
Kalamata	4	.	.	1	1	.	.	.	.	.
Leccino	3	.	.	1	1	.	.	.	.	.
Manzanillo	8	.	1	2	2	3	.	3	.	.
Nevadillo Blanco	1	.	.	.	.	.	.	1	.	1
Paragon	5	.	.	.	1	2	.	.	.	.
Picual	4	.	.	2	.	1	.	.	.	.
UC13A6	2	.	.	.	.	.	.	.	.	1
UCLA	1	.	.	.	.	.	.	1	.	.

Table E3-4. shows growers' assessment of varieties in region E3 on all soils

Table E3-4 shows growers assessments of varieties on all soil types in region E3. Three of the four Barnea growers would plant Barnea again. Corregiola growers are evenly divided on

whether the variety does well, but one third would plant the variety again. Verdicts on Manzanillo are also divided with two of the eight growers saying they would plant the variety again, and three saying it does not do well.

E3-3.5 - Yields in clay soil									
n=5	planted	Oil %					Yield		
		below 10%	10-15%	15-19%	>20%	% varies	low yield	high yield	yield varies
Azapa	1	.	1	.	.	.	.	1	1
Corregiola	5	.	1	.	2	.	1	.	1
Frantoio	4	.	.	1	1	.	2	2	2
Hardy's Mammoth	2	.	.	.	.	.	2	.	.
Koroneiki	4	.	.	.	1	.	.	.	.
Leccino	2	1	.	.	.	.	.	.	.
Manzanillo	4	1	2	1	.	.	1	1	2
Mission	1	.	.	.	.	.	1	.	.
Nevadillo Blanco	1	.	.	.	1	.	1	.	.
Paragon	1	.	.	1	.	.	1	1	1
Picual	2	.	.	1	.	.	1	.	.
Verdale SA	1	.	.	.	.	.	.	1	.
UC13A6	1	.	.	.	.	.	1	.	.

Table E3-3.5 shows oil % achieved and fruit yields of various varieties on clay soils reported by growers in region E3

Oil percentages reported by Manzanillo growers are distributed from below 10% to 15-20%, most being in the range 10-15%, and there is no unanimity on the fruit yields. The two Corregiola growers reporting oil percentage achieved 20% or more.

E3-3.5 - yields for varieties on sandy loam soil									
n=1		Oil %					Yield		
		below 10%	10-15%	15-19%	>20%	% varies	low yield	high yield	yield varies
Barnea	1	.	.	1	.	.	1	1	.
Coratina	1	.	.	.	.	.	.	.	1
Frantoio	1	.	.	.	1	.	1	1	1
Leccino	1	.	1	.	.	.	1	1	.
Picual	1	.	1	.	.	.	.	.	.

Table E3-3.5. shows oil % achieved and fruit yields of various varieties on sandy loam soils reported by growers in region E3

Numbers are too small to draw any inferences.

E3-3.6 - yields in sandy soil									
n=5	planted	Oil %					Yields		
		below 10%	10-15%	15-19%	>20%	% varies	low yield	high yield	yield varies
Corregiola	4		1		1			1	
Frantoio	4				1		1	1	
Hardy's Mammoth	2						1		
Kalamata	3						1		
Leccino	3			1			1		
Manzanillo	5	2	.	3	.	.	2	2	1
Nevadillo Blanco	3	1			2		3		
Paragon	4	.	1	3	.	.1	1	.	.
Picual	3		1		1			1	
UCLA	1						1		

Table E3-3.6 shows oil % achieved and fruit yields of various varieties on sandy soils reported by growers in region E3.

Nevadillo Blanco growers on sandy soils in region E3 all report low yields, with two of the three achieving oil percentages of 20% or above. Three each of Manzanillo and Paragon growers report oil percentages of between 15-19%. Two of the five Manzanillo growers report low and two high fruit yield, with one reporting variable yields.

E3 Soil and assessment

E3-4.1 – assessment of varieties in good soil										
n=5	planted	best	2nd	do well	plant again	good oil	good fruit	not so well	worst	not plant again
Barnea	1	.	.	1	.	.	.	.	.	.
Barouni	1	1	.	.	1	.	1	.	.	.
Coratina	1	1	.	1	.	.	.	.	.	.
Corregiola	4	.	.	1	3	3	.	1	.	.
Frantoio	3	1	.	.	2	1	.	.	.	.
Leccino	1	.	.	.	1	.	.	.	.	.
Manzanillo	4	.	1	2	1	3	.	2	.	.
Nevadillo Blanco	1	.	.	.	.	.	.	1	.	1
Paragon	2	.	.	.	1	2	.	.	.	.
Picual	1	.	.	1	.	.	.	.	.	.

Table E3-4.1 shows growers' assessment of varieties in region E3 on good soils

Table E3-4.1 shows assessments of varieties by growers who describe their soil as good in region E3. Three of the three who would plant Corregiola again are growing on good soil, comparison with table A-4.1 shows this is three of the total four in the survey on good soil who would plant this variety again; two also describe their soil as well-drained (see below). Growers are equally divided on how well Manzanillo do on good soils, and the three growers who were getting 'good oil' from Manzanillo are growing on good soil.

E3-4.2 – assessment of varieties in well drained soil										
n=5	Planted	best	2nd	do well	plant again	good oil	good fruit	not so well	worst	not plant again
Azapa	2	.	.	1	1	1	.	.	.	.
Barnea	4	.	.	1	.	.	.	.	.	.
Bouquettier	1	.	.	1	.	1	.	.	.	.
Coratina	3	1	.	1	.	.	.	.	.	.
Corregiola	9	.	.	1	2	2	.	2	.	.
Frantoio	8	.	.	.	1	.	.	1	.	.
Leccino	3	.	.	1	1	.	.	.	.	.
Manzanillo	8	.	.	2	1	2	.	2	.	.
Nevadillo Blanco	1	.	.	.	.	.	.	1	.	1
Paragon	5	.	.	.	1	2	.	.	.	.
Picual	4	.	.	1	.	.	.	.	.	.

Table E3-4.2 shows growers' assessment of varieties in region E3 on well-drained soils

No consensus is evident from table E3-4.2, showing assessment of varieties by growers describing their soil as well drained, on the performance of varieties. Two of those who would plant Corregiola again are growing on well-drained (and good) soils as are two who reported the variety did not do well.

E3-4.3 – assessment of varieties in poor soil										
n=2	Planted	best	2nd	do well	plant again	good oil	good fruit	not so well	worst	not plant again
Barnea	4	.	.	1	.			.	.	.
Frantoio	8	.	.	.	1			.	.	.
Hardy's Mammoth	3	.	.	.	.			1	.	1
Kalamata	4	.	.	1	1			.	.	.
Manzanillo	8	.	.	.	1			.	.	.
Picual	4	.	.	1	.			.	.	.
UC13A6	2	.	.	.	.			.	.	1
UCLA	1	.	.	.	.			1	.	.

Table E3-4.3 shows growers' assessment of varieties in region E3 on poor soils

Numbers are small and there is clearly no consensus on varieties emerging from table E3-4.3.

E3-4.4 – assessment of varieties in clay soil										
n=5	planted	best	2nd	do well	plant again	good oil	good fruit	don't do well	worst	not plant again
Arbequina	1	.	.	1	1	.	.	.	.	.
Azapa	1	.	.	1	1	1	.	.	.	.
Barnea	2	1	.	2	1	.	.	.	.	.
Coratina	2	.	.	1	1	.	.	.	.	.
Corregiola	5	.	1	3	1	1	.	1	.	.
Frantoio	4	1	2	1	1	1	.	.	.	.
Hardy's Mammoth	2	.	.	.	.	.	.	1	1	1
Kalamata	2	.	.	1	1	.	.	.	.	.
Koroneiki	4	.	.	1	1	.	.	.	.	.
Manzanillo	4	1	1	1	1	1	.	1	1	.
Mission	1	.	.	.	.	.	.	.	1	.
Nevadillo Blanco	1	.	.	.	.	.	.	1	.	.
Picual	2	1	.	2	1	.	.	.	.	.
UC13A6	1	.	.	.	.	.	.	.	1	1
UCLA	1	.	.	.	.	.	.	1	.	.
Verdale SA	1	.	.	1	.	.	.	.	.	.
Verdale wagga	1	.	.	1	.	.	.	.	.	.

Table E3-4.4 shows growers' assessment of varieties in region E3 on clay soils

It is apparent in table E3-4.4 that growers with Barnea or Picual on clay soil in region E3 unanimously note the varieties do well compared with three of the five growers with Corregiola. Three of the four with Frantoio rate it as best or second best. There is no clear consensus on what growers would plant again.

E3-4.5 - assessments of varieties on sandy loam soils										
n=1	planted	best	2nd	do well	plant again	good oil	good fruit	don't do well	worst	not plant again
Barnea	1	.	.	1	.	.	.	.	.	.
Coratina	1	1	.	1	.	.	.	.	.	.
Frantoio	1	.	.	.	1	.	.	.	.	.
Leccino	1	.	.	.	1	.	.	.	.	.
Picual	1	.	.	1	.	.	.	.	.	.

Table E3-4.5 shows grower's assessment of varieties in region E3 on sandy loam soils

The number is too small to draw any inferences.

E3-4.6 – assessment of varieties on sandy soil										
n=5	planted	best	2nd	do well	plant again	good oil	good fruit	don't do well	worst	not plant again
Arbequina	3				1				1	
Barnea	3			1						
Coratina	2									1
Frantoio	4				1				1	
Hardy's Mammoth	2							1		1
Kalamata	3			1	1					
Leccino	3								1	
Manzanillo	5	1		2	2	2				
Paragon	4	1			2	2				
Pical	3	1		2	2					
UC13A6	3							1		1
UCLA	1							1		

Table E3-4.6 shows grower's assessment of varieties in region E3 on sandy soils

Two of the three Pical growers on sandy soil in region E3 would plant Pical if they were planning their olive grove from 'scratch', two note the variety 'does well'. Manzanillo would be planted again by only two of the five growers of that variety. One of the two Hardy's Mammoth growers would not plant it again, and one of the three UC13A6 growers would not plant the variety again.

E6

Zone E6 has hot, moisture limiting summers and mild winters in which moisture limits growth also. The groves require irrigation most of the year for optimal olive production. Five growers were interviewed in region E6 near towns such as Mildura, Quorn and Waikerie. Three growers have prior experience in horticulture or viticulture, and for two it was also their first experience of tree crops.

E6-1 - Varieties planted					
n=5	planted	tolerance	no pest and diseases	don't bear	removed
Azapa	1				
Barnea	2			.	.
Corregiola	4		1	.	.
Frantoio	3	1		.	.
Kalamata	1			.	.
Manzanillo	4	1		.	.
Mission Californian	1				
Mission WA	1		1	.	.
Nab Tamri	1				
Nevadillo Blanco	1				
Pendulina	2			.	.
Picual	3			.	.
UC23A9	1				
Verdale SA	2			.	.
Verdale wagga	2			.	.

Table E6-1. shows principal varieties planted by growers in e6 region, together with problems experienced.

As table E6-1 shows growers in region E6 they grow a range of olive varieties between them, four of the five grow Corregiola and Manzanillo with three growing Frantoio, and Picual. There appear to be few pests or diseases or problems in this region.

E6 flowering and pollination

E6-2 - flowering									
n=5	planted	imperfections	pollinators/not needed	flowering/earlier	flowering/later	flowering/mid	pollinators	pollinators/problems	biannual
Azapa	1								1
Barnea	2		1	1			2		
Corregiola	4						1		1
Frantoio	3					1			
Kalamata	1				1		1		
Manzanillo	4			2		1			
Mission Californian	1								1
Mission WA	1						1		
Paragon									1
Picual	3						3		
UC13A6	1								1
Verdale Wagga	2								1

Table E6-2 shows flowering times, principal flowering problems by variety, varieties recognised by growers to act as pollinators for other varieties or self pollinate, and varieties that are biannual.

Table E6-2 shows flowering times for varieties reported by growers in region E6. Half the Manzanillo growers reported the variety as an flowering early. Both Barnea and Picual growers report planting the varieties as pollinators. *'The first year we were really disappointed that we didn't have any fruit at all, so we thought we'd better plant some pollinators. ... We have planted Picual and Barnea in there as a pollinator just to be on the safe side.'*

E6 Yield

E6-3 - Yields on all soils									
n=5	Oil %						Yield		
	planted	below 10%	10-15%	15-19%	>20%	% varies	low yield	high yield	yield varies
Barnea	2	.	.	.	.	.	2	1	.
Corregiola	4	.	.	.	1	.	.	.	1
Frantoio	3	.	.	.	1	.	.	.	.
Kalamata	1	.	.	1	.	.	.	.	.
Manzanillo	4	.	1	1	.	.	1	3	.
Nab Tamri	1	.	.	.	.	.	.	.	1
Nevadillo Blanco	1	.	.	.	.	.	.	1	.
Picual	3	.	.	.	1	.	2	.	.
Verdale SA	2	.	.	.	.	.	.	1	.

Table E6-3. shows oil % achieved and fruit yields of various varieties on all soils reported by growers in region E6

Table E6-3 shows fruit yield and oil percentages of varieties grown on all soils reported in region E6. Three of the four Manzanillo growers report high yields, and two of the three Picual growers report low yields as do both Barnea growers. This may be expected as both varieties are planted as pollinators

E6-3.1 - Yields on good soil									
n=2	planted	Oil %					Yield		
		below 10%	10-15%	15-19%	>20%	% varies	low yield	high yield	yield varies
Manzanillo	1	.	.	.	.	.	.	1	.
Nab Tamri	1	.	.	.	.	.	.	.	1
Nevadillo Blanco	1	.	.	.	.	.	.	1	.
Picual	1	.	.	.	1	.	.	.	.
UC23A9	1	.	.	.	.	.	.	1	.

Table E6-3.1 shows oil % achieved and fruit yields of various varieties on good soils reported by growers in region E6

The numbers are low and there is no consensus on fruit yields or oil percentages emerging in tables E6-3.1, E6-3.2, E6-3.3 and E6-3.4 for good, well-drained poor and clay soils.

E6-3.2 - Yields on well drained soils									
n=2	planted	Oil %					Yield		
		below 10%	10-15%	15-19%	>20%	% varies	low yield	high yield	yield varies
Barnea	1	.	.	.	.	.	1	.	.
Frantoio	2	.	.	.	1	.	.	.	.
Kalamata	1	.	.	1	.	.	.	.	.
Manzanillo	2	.	.	1	.	.	.	1	.
Nab Tamri	1	.	.	.	.	.	.	.	1
Nevadillo Blanco	1	.	.	.	.	.	.	1	.
Picual	1	.	.	.	.	.	1	.	.

Table E6-3.2 shows oil % achieved and fruit yields of various varieties on well drained soils reported by growers in region E6

E6-3.3. - Yields on poor soils									
n=1	planted	Oil %					Yield		
		below 10%	10-15%	15-19%	>20%	% varies	low yield	high yield	yield varies
Corregiola	1	.	.	.	1	.	.	.	1
Manzanillo	1	.	1	.	.	.	.	1	.
Verdale SA	1	.	.	.	.	.	.	1	.

Table E6-3.3 shows oil % achieved and fruit yields of various varieties on poor soils reported by growers in region E6

E6-3.5 - Yields on clay soils									
n=2	planted	Oil %					Yield		
		below 10%	10-15%	15-19%	>20%	% varies	low yield	high yield	yield varies
Corregiola	2	.	.	.	1	.	.	.	1
Manzanillo	1	.	1	.	.	.	.	1	.
Picual	1	.	.	.	1	.	.	.	.
Verdale SA	1	.	.	.	.	.	.	1	.

Table E6-3.5 shows oil % achieved and fruit yields of various varieties on clay soils reported by growers in region E6

E6-3.5 - yields for varieties on sandy loam soil									
n=2		Oil %					Yield		
		below 10%	10-15%	15-19%	>20%	% varies	low yield	high yield	yield varies
Corregiola	2	.	.	.	1	.	.	.	1
Manzanillo	2	.	1	.	.	.	.	2	.
Nab Tamri	1	.	.	.	.	.	.	.	1
Nevadillo Blanco	1	.	.	.	.	.	.	1	.
Verdale SA	1	.	.	.	.	.	.	1	.

Table E6-3.5. shows oil % achieved and fruit yields of various varieties on sandy loam soils reported by growers in region E6

Both Manzanillo growers report high fruit yields, otherwise there is no consensus despite the small number of growers.

E6-3.6 - yields on sandy soil									
n=1	planted	Oil %					Yield		
		below 10%	10-15%	15-19%	>20%	% varies	low yield	high yield	yield varies
Barnea	1	.	.	.	.	.	1	.	.
Frantoio	1	.	.	.	1	.	.	.	.
Kalamata	1	.	.	1	.	.	.	.	.
Manzanillo	1	.	.	1	.	.	.	.	.
Picual	1	.	.	.	.	.	1	.	.

Table E6-3.6 shows oil % achieved and fruit yields of various varieties on sandy soils reported by growers in region E6.

The number is too small to draw any inferences.

E6 Assessment

E6-4 - Varieties on all soils										
n=5	planted	best	2nd	do well	not so well	worst	plant again	not plant again	good oil	good fruit
Barnea	2	.	.	1	.	.	1	.	1	.
Corregiola	4	.	.	1	1	.	.	.	2	.
Frantoio	3	.	.	.	.	.	3	.	1	.
Kalamata	1	.	.	1	.	.	.	.	.	.
Manzanillo	4	.	.	1	.	.	1	1	.	.
Mission Californian	1	.	.	.	.	.	.	.	1	.
Mission WA	1	.	.	.	.	.	1	.	.	.
Nab Tamri	1	.	.	.	.	.	1	.	.	.
Nevadillo Blanco	1	.	.	.	.	.	1	.	1	.
Picual	3	.	.	1	2	.	1	.	2	.
Verdale SA	2	.	.	1	.	.	.	.	.	.
Verdale Wagga	2	.	.	1	.	.	.	.	.	.

Table E6-4. shows growers' assessment of varieties in region E6 on all soils

Table E6-4 shows all of the Frantoio growers would plant the variety again, by comparison, table A-4 shows a little under half of all Frantoio growers in the survey would plant the variety again. Two of the three Picual growers are not satisfied with the variety's performance despite two also reporting the variety produces good oil.

E6-4.1 – assessment of varieties on good soil										
n=2	planted	best	2nd	do well	plant again	good oil	good fruit	not so well	worst	not plant again
Mission Californian	1	.	.	.	.	1	.	.	.	.
Corregiola	2	.	.	.	.	1	.	1	.	.
Frantoio	1	.	.	.	1	.	.	.	.	.
Manzanillo	1	.	.	.	1	.	.	.	.	.
Mission WA	1	.	.	.	1	.	.	.	.	.
Nab Tamri	1	.	.	.	1	.	.	.	.	.
Nevadillo Blanco	1	.	.	.	1	1	.	.	.	.
Picual	1	.	.	1	.	1	.	1	.	.

Table E6-4.1. shows growers' assessment of varieties in region E6 on good soils

Table E6-4.1 shows there is no consensus emerging in the evaluation of varieties on good soil in region E6.

E6-4.2 - assessment of varieties on well drained soil										
n=2	planted	best	2nd	do well	plant again	good oil	good fruit	not so well	worst	not plant again
Barnea	1	.	.	1	.	.	.			.
Frantoio	2	.	.	.	2	.	.			.
Kalamata	1	.	.	1	.	.	.			.
Manzanillo	2	.	.	.	1	.	.			1
Mission Californian	1	.	.	.	.	1	.			
Nab Tamri	1	.	.	.	1	.	.			
Nevadillo Blanco	1	.	.	.	1	1	.			
Picual	1	.	.	.	1	.	.			

Table E6-4.2. shows growers' assessment of varieties in region E6 on well drained soils

Table E6-4.2 shows that two of the two possible Frantoio growers have indicated they would plant Frantoio again on well drained soil in region E6.

E6-4.3 - assessment of varieties on poor soils										
n=1	planted	best	2nd	do well	plant again	good oil	good fruit	not so well	worst	not plant again
Corregiola	1	.	.	1	.	.	.	.	.	.
Verdale SA	1	.	.	1	.	.	.	.	.	.
Verdale Wagga	1	.	.	1	.	.	.	.	.	.

Table E6-4.3. shows growers' assessment of varieties in region E6 on poor soils

The number is too small to draw any inference from table E6-4.3

E6-4.4 – assessment of varieties on clay soil										
n=2	planted	best	2nd	do well	plant again	good oil	good fruit	don't do well	worst	not plant again
Corregiola	2	.	.	1	.	1	.	1	.	
Mission WA	1	.	.	.	1	.	.	.	.
Picual	1	.	.	1	.	1	.	1	.	
Verdale SA	1	.	.	1	.	.	.	.	.
Verdale Wagga	1	.	.	1	.	.	.	.	.

Table E6-4.4 shows growers' assessment of varieties in region E6 on clay soils

Table E6-4.4 shows there is no consensus emerging from growers on clay soils in region E6

E6-4.5 - assessments of varieties on sandy loam soils										
n=2	planted	best	2nd	do well	plant again	good oil	good fruit	don't do well	worst	not plant again
Corregiola	2	.	.	1	.	.	.	.
Frantoio	1	.	.	.	1	.	.	.		
Manzanillo	2	.	.	.	1	.	.	.		
Mission Californian	1	.	.	.	.	1	.	.		
Nevadillo Blanco	1	.	.	.	1	1	.	.		
Verdale SA	1	.	.	1	.	.	.	.
Verdale Wagga	1	.	.	1	.	.	.	.

Table E6-4.5 shows grower's assessment of varieties in region E6 on sandy loam soils

The numbers are small and there is no emergent consensus apparent in table E6-4.5.

E6-4.6 – assessments of varieties on sandy soil										
n=1	planted	best	2nd	do well	plant again	good oil	good fruit	don't do well	worst	not plant again
Barnea	1	.	.	1	.	.	.	.	.	.
Frantoio	1	.	.	.	1	.	.	.	.	.
Kalamata	1	.	.	1	.	.	.	.	.	.
Manzanillo	1	.	.	.	.	.	.	.	.	1
Picual	1	.	.	.	1	.	.	.	.	.

Table E6-4.6 shows grower's assessment of varieties in region E6 on sandy soils

The number is too small to draw any inferences from table E6-4.6.

Smaller olive growing regions

E4

Zone E4 has hot, moisture limiting summers and mild winters with moisture limiting growth in winter. The zone requires irrigation for most of the year for optimal olive production. Two growers were interviewed in region E4. For both growers it was their first experience of tree crops.

E4 Planted

E4-1 - Varieties planted						
n=2	planted	black scale	verticillium	unstable	removed	don't bear
Azapa	1					
Barnea	2			1	.	.
Buchine	1				.	.
Coratina	2		1	1	.	.
Corregiola	1	1			.	.
Frantoio	1		1		.	.
FS17	1				.	.
Kalamata	1					
Leccino	2	1			.	.
Manzanillo	2					
Mission WA	1				.	.
Nevadillo Blanco	2				.	.
Paragon	1	1			.	.
Pical	2				.	.
uncertain	1				.	.

Table E4-1 shows principal varieties planted by growers in e4 region, together with problems experienced.

As table E4-1 shows between them they grow a range of olive varieties, both growing Barnea, Coratina, Leccino Manzanillo, Nevadillo Blanco and Pical.

E4 flowering and pollination

E4-2 - flowering									
n=2	planted	imperfections	pollinators/not needed	flowering/earlier	flowering/later	flowering/mid	pollinators	pollinators/problems	biannual
Barnea	2			1			1	1	
Kalamata	1							1	
Leccino	2				1				
Manzanillo	2							2	1
Nevadillo Blanco	2			1			1	2	
Paragon	1					1			
Pical	2						1	1	

Table E4-2 shows flowering times, principal flowering problems by variety, varieties recognised by growers to act as pollinators for other varieties or self pollinate, and varieties that are biannual.

Table E4-2 shows both Manzanillo and Nevadillo Blanco growers report pollination problems with these varieties. One reports that on the advice of a consultant ‘we replaced the Nevadillo with Picual’ as a pollinator for Barnea. The other notes ‘We also have a huge Manzanillo tree next to a Nevadillo and it didn’t do anything’. Comparison with table A-2 shows that the two growers reporting pollination problems with Manzanillo were from region E4, while half of those reporting such problems with Nevadillo Blanco were from this region.

E4 Yield

E4-3 - Yields on all soils									
n=2	Planted	Oil %					Yield		
		below 10%	10-15%	15-19%	>20%	% varies	low yield	high yield	yield varies
Barnea	2	.	.	.	1	.	1	.	.
Coratina	2	.	1	.	.	.	.	1	.
Leccino	2	.	.	.	1	.	.	.	.
Manzanillo	2	.	.	.	.	.	1	.	.
Paragon	1	.	.	.	1	.	.	1	.

Table E4-3. shows oil % achieved and fruit yields of various varieties on all soils reported by growers in region E4

Table E4-3 indicates there is no consensus in terms of yield.

E4-3.1 - Yields in good soil									
n=1	Planted	Oil %					Yield		
		below 10%	10-15%	15-19%	>20%	% varies	low yield	high yield	yield varies
Coratina	2	.	1	.	.	.	.	1	.

Table E4-3.1 shows oil percentage and fruit yields achieved for various selected varieties on good soils reported by growers in region E4

The number is too small to draw any inferences from table E4-3.1

No yield data were reported for well-drained or poor soils so there are no tables E4-3.2 or E4-3.3.

E4-3.5 - yields for varieties on sandy loam soil									
n=1		Oil %					Yield		
		below 10%	10-15%	15-19%	>20%	% varies	low yield	high yield	yield varies
Barnea	1	.	.	.	1	.	1	.	.
Leccino	1	.	.	.	1	.	.	.	.
Manzanillo	1	.	.	.	.	.	1	.	.
Paragon	1	.	.	.	1	.	.	1	.

Table E4-3.5. shows oil % achieved and fruit yields of various varieties on sandy loam soils reported by growers in region E4

Numbers are too small on both sandy loam and sandy soils to draw any inferences

E4-3.6 - yields in sandy soil									
n=1		Oil %					Yield		
		below 10%	10-15%	15-19%	>20%	% varies	low yield	high yield	yield varies
Coratina	1	.	1	.	.	.	.	1	.

Table E4-3.6 shows oil % achieved and fruit yields of various varieties on sandy soils reported by growers in region E4

E4 Assessment

E4-4 – assessment of varieties on all soils										
n=2	Planted	best	2nd	do well	plant again	good oil	good fruit	not so well	worst	not plant again
Azapa	1	.	.	.	.	1	.	.	.	.
Barnea	2	.	.	1	1	.	.	.	.	1
Coratina	2	.	.	1	2	1	.	.	.	.
Frantoio	1	.	.	.	.	1	.	.	.	1
FS17	1	.	.	.	.	.	.	.	.	1
Kalamata	1	.	.	1	1	.	.	.	.	.
Leccino	2	.	.	.	.	1	.	1	.	.
Manzanillo	2	.	.	.	1	.	.	.	.	.
Nevadillo Blanco	2	.	.	.	.	.	.	1	.	1
Paragon	1	.	.	.	1	.	.	.	.	.
Pical	2	.	.	.	1	.	.	.	.	.

Table E4-4. shows growers' assessment of varieties in region E4 on all soils

Table E4-4 shows that both Coratina growers would plant Coratina again, this represents two of the five shown in table A-4 who indicate that they would include this variety were they starting their grove with the knowledge obtained. There is no other variety upon which there was any consensus in this region

E4-4.1 – assessment of varieties in good soil										
n=1	Planted	best	2nd	do well	plant again	good oil	good fruit	not so well	worst	not plant again
Azapa	1	.	.	.	.	1	.	.	.	.
Barnea	1	.	.	1	1	.	.	.	.	.
Coratina	1	.	.	1	1	1	.	.	.	.
Frantoio	1	.	.	.	.	1	.	.	.	1
FS17	1	.	.	.	.	.	.	.	.	1
Kalamata	1	.	.	1	1	.	.	.	.	.
Manzanillo	1	.	.	.	1	.	.	.	.	.
Nevadillo Blanco	1	.	.	.	.	.	.	.	.	1
Pical	1	.	.	.	1	.	.	.	.	.

Table E4-4.1 shows growers' assessment of varieties in region E4 on all soils

The number of growers is too small to draw any inferences from table E4-4.1.

No E4-4.4 clay assessment

E4-4.5 - assessments of varieties on sandy loam soils										
n=1	planted	best	2nd	do well	plant again	good oil	good fruit	don't do well	worst	not plant again
Barnea	1	.	.	.	.	.	.	.	.	1
Coratina	1	.	.	.	1	.	.	.	.	.
Leccino	1	.	.	.	.	1	.	1	.	.
Nevadillo Blanco	1	.	.	.	.	.	.	1	.	.
Paragon	1	.	.	.	1	.	.	.	.	.

Table E4-4.5 shows grower's assessment of varieties in region E4 on sandy loam soils

The number is too small to draw any inferences from either table E4-4.5 or table E4-4.6, one grower, who found Leccino did not do well on sandy loam soil suggested that the soil may be an issue *'I don't know if it's the soil because I've seen Leccino in Moree where it's growing profoundly and we have further down the slope the soil gets a bit heavier and the trees grow much better so I would assume that Leccino doesn't like the sandy loam.'*

E4-4.6 – assessment of varieties on sandy soil										
n=1	planted	best	2nd	do well	plant again	good oil	good fruit	don't do well	worst	not plant again
Azapa	1	.	.	.	.	1	.	.	.	.
Barnea	1	.	.	1	1	.	.	.	.	.
Coratina	1	.	.	1	1	1	.	.	.	.
Frantoio	1	.	.	.	.	1	.	.	.	1
FS17	1	.	.	.	.	.	.	.	.	1
Kalamata	1	.	.	1	1	.	.	.	.	.
Manzanillo	1	.	.	.	1	.	.	.	.	.
Nevadillo Blanco	1	.	.	.	.	.	.	.	.	1
Picual	1	.	.	.	1	.	.	.	.	.

Table E4-4.6 shows grower's assessment of varieties in region E4 on sandy soils

E7

Zone E7 is the wettest of the warm seasonally wet/dry climates. Two growers were interviewed in region E7.

E7 Planted

E7-1 - Varieties planted				
n=2	planted	anthracnose	don't bear	removed
Arbequina	1			
Azapa	1			
Corregiola	1		.	.
Frantoio	2			
Hardy's Mammoth	1		.	.
Koroneiki	1		.	.
Manzanillo	2	1	.	.
Nevadillo Blanco	2		.	.
Paragon	1		.	.
Picual	1			
UC13A6	1		.	.

Table E7-1 shows principal varieties planted by growers in e7 region, together with problems experienced.

As table E7-1 shows between them the two growers surveyed in this region grow a range of olive varieties, both growing Frantoio, Manzanillo and Nevadillo Blanco.

E7 flowering and pollination

E7-2 - flowering										
n=2	planted	imperfections	pollinators/not needed	flowering/earlier	flowering/late	flowering/mid	pollinators	pollinators/problems	biannual	
Manzanillo	2		1	1			1			
Paragon	1				1		1			

Table E7-2 shows flowering times, principal flowering problems by variety, varieties recognised by growers to act as pollinators for other varieties or self pollinate, and varieties that are biannual.

The numbers are small, and there is no consensus evident from table E7-2.

E7 Yield

E7-3 - yields on all soils									
n=2	planted	Oil%					yield		
		below 10%	10-15%	15-19%	>20%	% varies	low yield	high yield	yield varies
Frantoio	2	.	.	1	.	.	1	.	1
Hardy's Mammoth	1	.	.	.	.	.	1	.	.
Manzanillo	2	.	1	.	.	.	1	1	.
Nevadillo Blanco	2	.	.	.	.	.	1	.	.
Paragon	2	.	.	.	.	.	1	.	1
Picual	1	.	.	.	.	.	1	.	.
UC13A6	1	.	.	.	.	.	1	.	.

Table E7-3. shows oil % achieved and fruit yields of various varieties on all soils reported by growers in region E7

Table E7-3 shows oil percentage yields are low for all varieties on which growers reported.

No yields on good or well drained soil were reported, there are no tables E7-3.1 or E7-3.2

E7-3.3 - Yields on poor soils									
n=1	planted	Oil %					Yield		
		below 10%	10-15%	15-19%	>20%	% varies	low yield	high yield	yield varies
Frantoio	1	.	.	1	.	.	1	.	1
Hardy's Mammoth	1	.	.	.	.	.	1	.	.
Manzanillo	1	.	1	.	.	.	1	1	.
Nevadillo Blanco	1	.	.	.	.	.	1	.	.
Paragon	1	.	.	.	.	.	1	.	1
Picual	1	.	.	.	.	.	1	.	.
UC13A6	1	.	.	.	.	.	1	.	.
uncertain	1	.	.	.	.	.	1	.	.

Table E7-3.3 shows oil % achieved and fruit yields of various varieties on poor soils reported by growers in region E7

It is clear from table E7-3.3 that the low yields reported on table E7-3 are all reported by the grower on poor soil.

E7-3.5 Yields on clay soils									
n=1	planted	Oil %					Yield		
		below 10%	10-15%	15-19%	>20%	% varies	low yield	high yield	yield varies
Frantoio	1	.	.	1	.	.	1	.	1
Hardy's Mammoth	1	.	.	.	.	.	1	.	.
Manzanillo	1	.	1	.	.	.	1	1	.
Nevadillo Blanco	1	.	.	.	.	.	1	.	.
Paragon	1	.	.	.	.	.	1	.	1
Picual	1	.	.	.	.	.	1	.	.
UC13A6	1	.	.	.	.	.	1	.	.

Table E7-3.5 shows oil % achieved and fruit yields of various varieties on clay soils reported by growers in region E7

Numbers reporting are too small to draw any inferences.

E7 Assessment

E7-4 – assessment of varieties on all soils										
n=2	planted	best	2nd	do well	plant again	good oil	good fruit	not so well	worst	not plant again
Arbequina	1	.	.	.	1	.	.	.	.
Azapa	1	.	.	.	1	.	.	.	.
Frantoio	2	.	1	.	.	.	.	.	.
Hardy's Mammoth	1	.	.	.	.	.	.	.	1	
Koroneiki	1	.	.	1	1	.	.	.	.
Manzanillo	2	2	.	1	.	.	1	.	.	
UC13A6	1	.	.	.	.	.	.	.	1	

Table E7-4. shows growers' assessment of varieties in region E7 on all soils

Table E7-4 shows both Manzanillo growers identified Manzanillo as the best variety, that is a quarter of all growers so identifying (see table A-4).

E7-4.1 – assessment of varieties on good soils										
n=1	planted	best	2nd	do well	plant again	good oil	good fruit	not so well	worst	not plant again
Azapa	1				1					
Manzanillo	1	1					1			

Table E7-4.1 shows growers' assessment of varieties in region E7 on all soils

The number is too small to draw any inference from table E7-4.1.

There were no data on assessment of varieties from growers, on well drained soils and so no table E7-4.2.

E7-4.3 – assessment of varieties on poor soil										
n=1	Planted	best	2nd	do well	plant again	good oil	good fruit	not so well	worst	not plant again
Arbequina	1	.	.	.	1			.	.	.
Frantoio	1	.	1	.	.			.	.	.
Hardy's Mammoth	1	.	.	.	.			.	1	.
Koroneiki	1	.	.	1	1			.	.	.
Manzanillo	1	1	.	1	.			.	.	.
UC13A6	1	.	.	.	.			.	1	.

Table E7-4.3 shows growers' assessment of varieties in region E7 on all soils

The number is too small to draw any inference from the table E7-4.3.

E7-4.4 – assessment of varieties on clay soil										
n=1		best	2nd	do well	plant again	good oil	good fruit	don't do well	worst	not plant again
Arbequina	1	.	.	.	1	.	.	.	.	.
Frantoio	1	.	1	.	.	.	.	.	.	.
Hardy's Mammoth	1	.	.	.	.	.	.	.	1	.
Koroneiki	1	.	.	1	1	.	.	.	.	.
Manzanillo	1	1	.	1	.	.	.	.	.	.
UC13A6	1	.	.	.	.	.	.	.	1	.

Table E7-4.4 shows growers' assessment of varieties in region E7 on clay soils

The number of growers is too small to draw any inferences

E7-4.5 - assessments of varieties on sandy loam soils										
n=1	planted	best	2nd	do well	plant again	good oil	good fruit	don't do well	worst	not plant again
Azapa	1				1					
Manzanillo	1	1					1			

Table E7-4.5 shows grower's assessment of varieties in region E7 on sandy loam soils

The numbers are too small to draw any inferences

F3

F3 Planted

Zone F3: F comes under warm wet climates and F3 has a cooler, drier summer than F1 and F2 which are not represented in this survey. Three growers were interviewed in region F3. For at least one it was their first experience of tree crops.

F3-1 - Varieties planted						
n=3	planted	black scale	no pest and diseases	anthracnose	don't bear	removed
Azapa	1					
Barnea	1				.	.
Corregiola	3	1	1		.	.
Frantoio	3	1	1		.	.
Jumbo						
Kalamata	2				.	.
Kalamata	2				.	.
Koroneiki	2	1			.	.
Leccino	2	1			.	.
Manzanillo	3	2	1		.	.
Mission	2	1	1		.	.
Nevadillo						
Blanco	3	2		2	.	.
Paragon	1				.	.
Pendolino	3	1			.	.
Picholine	1				.	.
Picual	1				.	.
Sevillano	1				.	.
Signore	1				.	.
UC13A6	1	1			.	.
uncertain	1				.	.

Table F3-1 shows principal varieties planted by growers in f3 region, together with problems experienced.

As table F3-1 shows between them the three growers in region F3 grow a range of olive varieties, with all growing Corregiola, Frantoio, Manzanillo, Nevadillo Blanco and Pendolino.

F3 flowering and pollination

F3-2 - flowering										
n=3	planted	imperf ctions	self pollinat e	flowerin g/earlier	flowerin g/later	flowerin g/mid	pollinat or	pollinat or	problem s	biannua l
Manzanillo	3		1	1						
Paragon	1				1					

Table F3-2 shows flowering times, principal flowering problems by variety, varieties recognised by growers to act as pollinators for other varieties or self pollinate, and varieties that are biannual.

There is no consensus on flowering times evident in table F3-2.

F3 Yield

F3-3 – Yields on all soils									
n=3	Planted	below 10%	10-15%	15-19%	>20%	% varies	low yield	high yield	yield varies
Corregiola	3	.	.	1	.	.	1	.	.
Frantoio	3	.	.	1	.	1	1	.	1
Kalamata	2	.	.	.	.	.	1	.	.
Manzanillo	3	.	1	.	.	.	2	.	.
UC13A6	1	.	.	.	.	.	1	.	.

Table F3-3. shows oil % achieved and fruit yields of various varieties on all soils reported by growers in region F3

Table F3-3 shows two of three Manzanillo growers report low yields on that variety.

F3-3.1 - Yields on good soils									
n=1	planted	below 10%	10-15%	15-19%	>20%	% varies	low yield	high yield	yield varies
Frantoio	1	.	.	.	.	1	.	.	1
Kalamata	1	.	.	.	.	.	1	.	.
Manzanillo	1	.	.	.	.	.	1	.	.
UC13A6	1	.	.	.	.	.	1	.	.

Table F3-3.1 shows oil % achieved and fruit yields of various varieties on sandy loam soils reported by growers in region F3

Table F3-3.1 show that least one of the Manzanillo growers reporting low yields in table F3-3 is growing on good soil.

Yields for well drained and poor soils were not reported and there are no tables F3-3.1 and F3-3.2.

F3-3.5 yields for varieties on sandy loam soil									
n=1		below 10%	10-15%	15-19%	>20%	% varies	low yield	high yield	yield varies
Frantoio	1	.	.	.	.	1	.	.	1
Kalamata	1	.	.	.	.	.	1	.	.
Manzanillo	1	.	.	.	.	.	1	.	.
UC13A6	1	.	.	.	.	.	1	.	.
	1								

Table F3-3.5 shows oil % achieved and fruit yields of various varieties on sandy loam soils reported by growers in region F3

The numbers were too small to draw any inference.

F3-3.6 - yields on sandy soils									
n=1	planted	below 10%	10-15%	15-19%	>20%	% varies	low yield	high yield	yield varies
Corregiola	1			1			1		
Frantoio	1			1			1		
Manzanillo	1		1				1		

Table F3-3.6 shows oil % achieved and fruit yields of various varieties on sandy soils reported by growers in region F3.

The number is too small to draw any inferences.

F3 Assessment

F3-4 – assessment of varieties on all soils										
n=3	Planted	best	2nd	do well	plant again	good oil	good fruit	not so well	worst	not plant again
Azapa	1	1	.	.	1	.	.	.	.	.
Corregiola	3	2	1	.	1	.	.	.	1	1
Frantoio	3	3	1	.	2	1	.	.	.	.
Jumbo Kalamata	2	.	.	.	.	.	.	.	1	.
Kalamata	2	1	.	.	2	.	.	.	.	.
Koroneiki	2	.	.	.	1	.	.	.	.	.
Leccino	2	.	.	.	1	.	.	.	.	.
Manzanillo	3	3	1	.	.	.	.	.	.	1
Mission	2	1	.	.	.	.	.	.	.	.
Nevadillo Blanco	3	1	1	.	.	.	.	.	2	.
Paragon	1	1	.	.	.	.	.	.	.	.
Pendolino	3	.	.	.	1	.	.	.	.	.
Picholine	1	.	.	.	1	.	.	.	.	.
Picual	1	.	.	.	1	.	.	.	.	.
Sevillano	1	1	.	.	1	.	.	.	.	.
UC13A6	1	.	1	.	1	.	.	.	1	.

Table F3-4. shows growers' assessment of varieties in region F3 on all soils

Table F3-4 shows all growers in region F3 thought Manzanillo and Frantoio among their best varieties, however, one of these would not plant Manzanillo again, noting 'We would have elected not to plant Corregiola and replaced it with Koroneiki and Picual for extra flavours such as bitterness/pungency. We would also have planted Kalamata rather than Manzanillo.' Two would plant Frantoio again. Two of the possible two Kalamata growers would plant Kalamata again. Two of the three Nevadillo Blanco growers thought this their worst variety.

F3-4.1 – assessments of varieties on good soil										
n=1	Planted	best	2nd	do well	plant again	good oil	good fruit	not so well	worst	not plant again
Azapa	1	1			1					
Frantoio	1	1			1					
Jumbo Kalamata	1								1	
Kalamata	1	1			1					
Leccino	1				1					
Manzanillo	1	1								
Nevadillo Blanco	1								1	
Corregiola	1	1			1					
Paragon	1	1								
Pendolino	1				1					
Picholine	1				1					
Sevillano	1	1			1					
UC13A6	1		1		1					

Table F3-4.1 shows growers' assessment of varieties in region F3 on all soils

The number is too small to draw any inferences from table F3-4.1.

Assessments for varieties on well drained and poor soils were not reported and there are no tables F3-4.1 and F3-4.2.

F3-4.5 - assessments of varieties on sandy loam soils										
n=1	planted	best	2nd	do well	plant again	good oil	good fruit	don't do well	worst	not plant again
Azapa	1	1			1					
Frantoio	1	1			1					
Jumbo Kalamata	1								1	
Kalamata	1	1			1					
Leccino	1				1					
Manzanillo	1	1								
Nevadillo Blanco	1								1	
Corregiola	1	1			1					
Paragon	1	1								
Pendolino	1				1					
Picholine	1				1					
Sevillano	1	1			1					
UC13A6	1		1		1					

Table F3-4.5 shows growers' assessment of varieties in region F3 on all soils

The number is too small to draw any inferences.

F3-4.6 – assessments of varieties on sandy soil										
n=1	planted	best	2nd	do well	plant again	good oil	good fruit	don't do well	worst	not plant again
Corregiola	1	.	.	.	.	.	.	.	1	
Frantoio	1	1	.	.	1	1	.	.	.	
Manzanillo	1	1	.	.	.	.	.	.	.
Mission	1	1	.	.	.	.	.	.	.
Nevadillo Blanco	1	.	.	.	.	.	.	.	1	

Table F3-4.6 shows grower's assessment of varieties in region F3 on sandy soils

The number is too small to draw any inferences.

I3

I3 Planted

Zone I3: I comes under hot, seasonally wet/dry climates and I3 is cooler and wetter than I1 and I2. Only one grower was interviewed in region I3, thus olives can be grown there, however one grower is insufficient to draw any further inferences as to performance.

I3-1 - Varieties planted				
n=1	planted	fruit fly	don't bear	removed
Azapa	1		.	.
Corregiola	1		.	.
Helena	1		.	.
Kalamata	1		.	.
Manzanillo	1	1	.	.
Mission	1		.	.
Mission Californian	1		.	.
Nab Tamri	1		.	.
Paragon	1		.	.
Frantoio	1		.	.
UC13A6	1		.	.
UC23A9	1		.	.
UC6A7	1		.	.
Verdale SA	1		.	.

Table I3-1 shows principal varieties planted by the grower interviewed from the I3 region, together with problems experienced.

I3 Flowering and pollination

I3-2 - flowering									
n=1	planted	imperfec tions	No poll'tors	Flower earlier	flowering /later	flowering /mid	pollinator s	pollinator s/prob	Bi- annual
Frantoio	1								1
Paragon	1								1

Table I3-2. shows flowering times, principal flowering problems by variety, varieties recognised by growers to act as pollinators for other varieties or self pollinate, and varieties that are biannual.

I3 Assessment

Variety assessment I3										
n=1	Planted	best	2nd	do well	plant again	good oil	good fruit	not so well	worst	not plant again
Frantoio	1	.	.	1			.	.	.	.
Manzanillo	1	1	.	.			.	.	.	.
Mission	1	.	.	1			.	.	.	.
Paragon	1	.	.	1			.	.	.	.

Table I3-4. shows grower's assessment of varieties in region I3 on all soils

I3-4.4 - assessment of varieties on clay soils										
n=1		best	2nd	do well	plant again	good oil	good fruit	don't do well	worst	not plant again
Frantoio	1	.	.	1			.	.	.	.
Manzanillo	1	1	.	.			.	.	.	.
Mission	1	.	.	1			.	.	.	.
Paragon	1	.	.	1			.	.	.	.

Table I3-4.4 shows grower's assessment of varieties in region I3 on clay soils

Conclusion

Though the numbers of growers interviewed was relatively small in this survey, all together, growers had planted or had experience, direct or indirect, with and commented on forty-eight varieties of olive. Some varieties have been recommended by growers across Australia. Among varieties grown by large numbers of growers, Frantoio is well supported, and would be planted again by 13 of 29 growers, 4 of 7 of these growers growing on good soils and 5 of 8 on well drained soils. Manzanillo though grown by the greatest number of growers is recommended by less than 20% of those growing the variety and then mainly by those growing it for table fruit, not for oil. Half of all those growing Coratina and Kalamata would plant those varieties again, while Hardy's Mammoth and Manzanillo would not be planted again or are considered among the worst varieties by growers.

Olives are a resilient crop, with few reporting pest or disease problems. Fewer than one quarter of growers of any olive variety reported pest or diseases for that variety and no pests or diseases were reported for the majority of varieties, thus few pest or diseases are experienced in olive groves.

Trees were reported to be three to four years at the time of their first harvest, though this could range from 2 to 10 years. In one case it Hardy's Mammoth trees had been in ten years, the grower was no-longer expecting a harvest from these trees. The first harvests yielded small quantities of fruit, commercial harvests were reported from trees of most varieties of around five to six year old.

Varieties have differing habit and differing pruning requirements. Harvesters recommended early training to establish tree shape that suited harvest machinery, Barnea and Frantoio were tall trees requiring pruning to keep the fruit within reach of harvest techniques. There was some diversity in grower approaches to pruning and training of trees reported.

Frost was an issue in all regions except E7 and I3, Manzanillo was particularly noted as susceptible to frost damage; Barnea and Frantoio were also noted as frost susceptible. Leccino was reported to be frost tolerant. Frost at flowering was noted as a particular problem where flowers were damaged by frost. However, flowering time seems to vary from one variety to another and from one region to another. Issues of pollination are further complicated by uncertainty regarding varieties.

The moisture content of the fruit was agreed to require careful management to ensure that fruit was suitable for processing and that good oil yields were achieved. Varieties noted as particularly affected by excess moisture included Manzanillo, Barnea Nevadillo Blanco and Picual. Oil yields by weight were also affected in Leccino. Moisture content was also noted to render harvesting more difficult. Processing problems as a result of moisture content were reported by Manzanillo, Barnea and Picual growers as well as processors. Irrigation management prior to harvest was the strategy most frequently recommended to prevent high levels of moisture in the fruit becoming a problem.

Manzanillo, and other large fruited varieties were reported to be easy to harvest while most harvest problems were reported with Corregiola, Koroneiki and Frantoio. Fruit left after harvest was commonly reported, at times estimated as high as 10% of fruit being left were reported.

Frantoio was most frequently cited as processing well, Corregiola and Paragon were also noted as processing well. Manzanillo, and to a lesser extent Picual, were noted for problems with processing, while Manzanillo was said to pickle well.

Frantoio growers reported oil percentages at or above 20% reporting of fruit yields for Frantoio were evenly spread. Of other varieties, reports on oil percentages for Corregiola were spread from 10 to above 20% and fruit yields were also reported spread. Manzanillo growers reported oil percentages predominately in the lower ranges and fruit yields as spread. Manzanillo growers on better soils were slightly more frequently reporting low yields, while none on clay soils reported oil percentages at or above 20%, half all Manzanillo growers reporting oil% between 15 and 19 % were growing on sandy soils, there were only two reports of higher oil percentages for Manzanillo, 20% or above one of which was on sandy loam soil. Frantoio growers on clay soils were slightly over represented in their reporting of oil percentage of 20% or above.

Kalamata, Coratina and Frantoio are varieties that growers have said they would plant again if they were starting their groves from scratch. Those saying they would plant Frantoio again were slightly more likely to be growing on soil they described as good or well drained, than on soil described as poor. No Coratina grower on clay soil was included among those who said they would plant the variety again. Nearly as many Manzanillo growers said they would not plant Manzanillo again as said they would and half of all Hardy's Mammoth growers ranked the variety as among the worst. Of the seven growers who would plant Picual again, five were on sandy soil.

The regions

Growers in region D5 reported growing seventeen varieties of olives between them. High fruit yields were reported for Manzanillo, but low oil percentage yields. Half of those growing Frantoio reported oil percentages of 20% or above, on all soil types. Despite these good results only one of the four Frantoio growers in this region said they would plant this variety again. Manzanillo and Hardy's Mammoth were held to be among the worst varieties by growers in this region.

Growers in region E1 reported growing twenty-two varieties of olives between them. Two of the four Nevadillo Blanco growers reported the variety suffered with black scale. Some pollination problems were also reported for this variety in this region. However growers reported oil yields of 20% and above for Nevadillo Blanco and Frantoio together some high fruit yields. All Coratina and Arbequina growers in this region report they would plant these varieties again, though only two of the five Frantoio growers would plant again.

Growers in region E2 reported growing eighteen varieties of olives between them. Manzanillo were noted by two of the four growers to be effected by black scale. Oil percentages of 20% or above were reported by Nevadillo Blanco growers on sandy soil in this region. Both Kalamata and Coratina growers in this region would plant these varieties again, as would the only California queen grower in the survey.

Growers in region E3 reported growing twenty-six varieties of olives between them. Black scale and thrip were noted to effect Frantoio, Kalamata and Manzanillo. Very low oil percentages for Manzanillo were reported by five of eight growers in the region across all soil types. In contrast, three of eight Frantoio growers reported 20% or above oil percent also across all soils. Three of eight and three of nine Corregiola and Frantoio growers respectively in this region would plant these varieties again. The Corregiola growers were on clay soils, while the Frantoio growers were across all soils. Two of eight Manzanillo growers, both on sandy soil would plant Manzanillo again. The only Nevadillo Blanco grower would not plant this variety again.

Growers in region E6 reported growing fifteen varieties of olives between them with no reports of pests or disease. Manzanillo growers have reported high fruit yields but low to mid oil percentage yields. All Frantoio growers in this region would plant the variety again.

Growers in region E4, a smaller olive growing region, reported growing fourteen varieties of olives between them with only sporadic reports of pests or diseases. Both Coratina growers in this region would plant the variety again, however the only grower with Frantoio would not plant the variety again.

Growers in region E7, a smaller olive growing region, reported growing eleven varieties of olives between them with one Manzanillo grower reporting anthracnose. The Arbequina and Azapa growers in this region would plant these varieties again.

Growers in region F3, a smaller olive growing region, reported growing eighteen varieties of olive between them with two Nevadillo Blanco growers reporting black scale and anthracnose as problems, two Manzanillo growers also reported black scale as a problem. Two of the three Manzanillo growers reported low fruit yields. Two of three Frantoio growers and both Kalamata growers would plant these varieties again.

Only one grower was interviewed in I3 region, indicating that it is possible to grow olives there.

The interviews have indicated that differences in soil type may be interacting with regional differences in explaining differences in performance of olive varieties across Australian olive growing regions, however small numbers meant that meaningful comparisons were not always possible with this data. It would be interesting to look at both regional variation correlated with soil differences. Other issues which have emerged include the importance of preparation and nutrition management for establishing a successful olive enterprise. To some extent it appears likely that soil management by experienced growers may tend to mask the influence of soils on olive performance. Small numbers interviewed in some regions, E4, E7, F3 and I3 have meant that no more than an indication of performance of varieties was possible.

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