Mallee Irrigated Horticulture

1997 - 2009

February 2010

mallee
catchment management authority

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Disclaimer

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Contents

Introduction

This report was commissioned by the Mallee Catchment Management Authority (Mallee CMA). Its primary objective is to inform monitoring, evaluation, reporting and improvement (MERI) of the Victorian Mallee Land and Water Management Plan and the Mallee CMA's Water Resources Program.

The report provides comprehensive information on irrigated horticulture along the Murray River, in Victoria, from Nyah to the South Australian Border for the twelve year period 1997 to 2009.

Analysis of SunRISE 21's crop mapping has been undertaken to present information with respect to the following parameters:

1. Crop type (grapevine, citrus, fruit tree, nut tree, other, field crop, vegetable, vacant);
2. Grape use (dried, table, wine, other);
3. Irrigation method (drip, low level, overhead, other pressurised, furrow/flood);
4. Irrigation development (new and retired areas);
5. Properties (numbers and average size) and;
6. Salinity impact zone.

SunRISE 21 crop mapping is captured to the individual patch or variety level using a map base of high resolution orthophoto imagery. This scale accurate imagery provides accurate areas (hectares), and was generated from 1997, 2003, 2006 and 2009 aerial photography flown late in the summer irrigation season.

1997 2003 2006 2009

Attribute details for each crop patch such as type, year planted and irrigation method are collected from irrigators, drive-by surveys or orthophoto imagery interpretation. Some details are discernable from the imagery whilst others, such as variety, are only obtained from irrigators.

SunRISE 21 records crop details from irrigators on an ongoing basis. This is generally in response to meeting their mapping and information needs for irrigation upgrades, winery contracts, quality assurance and, more recently, applications for critical water needs.

Details are also collected in collaboration with local agencies and industry bodies to support specific programs such as irrigation supply infrastructure upgrades, water use efficiency assessment, economic assessments, drought impacts, drainage assessment, water trade and salinity impacts and industry planting statistics. Citrus growers for instance are surveyed annually by the Murray Valley Citrus Board to provide up-to-date planting statistics for crop forecasting and industry planning. Privacy of individual property details is maintained and only aggregated information is published.

Method and Data

Information in this report has been compiled from analysis of SunRISE 21's crop mapping databases. A description of the databases is provided in Appendix 1, in ANZLIC[1] metadata format.

Orthophoto Imagery

SunRISE 21 maps irrigated horticulture from high resolution orthophoto imagery (i.e. scale accurate digital imagery processed from aerial photography). The 1997 crop mapping is based on a limited coverage of SunRISE 21 1996 and 1997 orthophoto imagery, as well as the Murray-Darling Basin Authority's 1996 infrared orthophoto series. The 2003 crop mapping is based on February 2003 orthophotos, the 2006 crop mapping from February 2006 imagery and the 2009 crop mapping from February 2009 imagery. The 1997 crop mapping represents crops irrigated in the 1996-97 irrigation season. Similarly, the 2003 mapping represents the 2002-03 irrigation season, 2006 mapping represents the 2005-06 irrigation season and 2009 mapping represents the 2008-09 season.

Positional and Area Accuracies

The orthophoto imagery was processed to a positional accuracy of one metre. Hence the crop mapping generally has a positional accuracy to one metre. The crop mapping has been captured at a scale of 1:5,000 or better from the imagery.

Hectares for seasonal plantings of vegetables and field crops (such as pasture) have a lesser reliability as the imagery provides only one snap-shot of the season, making it difficult to determine the extent of irrigation activity in that season. For instance, the image may show no activity at the time of the photography, but still have visible infrastructure such as channels and bays for flood irrigation or footprints of pivot irrigation. Seasonal crops may be irrigated intermittently depending on water supply or they may be rotational with the full extent of activity in a given season difficult to determine.

It is likely that a significant proportion of the areas mapped as vacant and previously a seasonal planting ('Vacant-SP'), are no longer irrigated with water transferred to permanent plantings. However, they are left in the crop mapping to register that it is 'irrigable' land. Areas are only 'retired' from the mapping when there is a change in land use that precludes the land from being irrigated, such as residential development or dam or building construction. Hence, irrigated areas may be over-stated for seasonal cropping from a water use perspective.

Hectare figures in this report have been rounded to the nearest five hectares.

Vacant and Retired Areas

The crop mapping includes a crop type of 'vacant'. In general, vacant areas were previously irrigated, but have been cleared and are in redevelopment. Where the vacant area was previously a permanent planting, it is referred to in this report as 'Vacant PP', or if it was previously a seasonal planting, such as pasture or vegetables, it is referred to as 'Vacant SP'.

In particular for vacant areas that were previously seasonal cropping, the area may actually be retired from irrigation; however, until SunRISE 21 has clear evidence that the area has undergone a change in land use that precludes it from being irrigated, it remains mapped as a vacant area. SunRISE 21 generally relies on updated orthophoto imagery, or digital cadastre, for evidence of land use change such as residential development, dam construction and industrial buildings.

[1] ANZLIC - The spatial information council of Australia and New Zealand

Crop Mapping Attributes

The main crop mapping attributes used to produce the information in this report (i.e. crop type, irrigation method, grape use and year planted) are captured from either interpretation of orthophoto imagery, drive-by surveys or irrigator surveys. It is estimated that the accuracy of these attributes is at least 90% for permanent plantings and 70% for seasonal plantings.

Property Definition

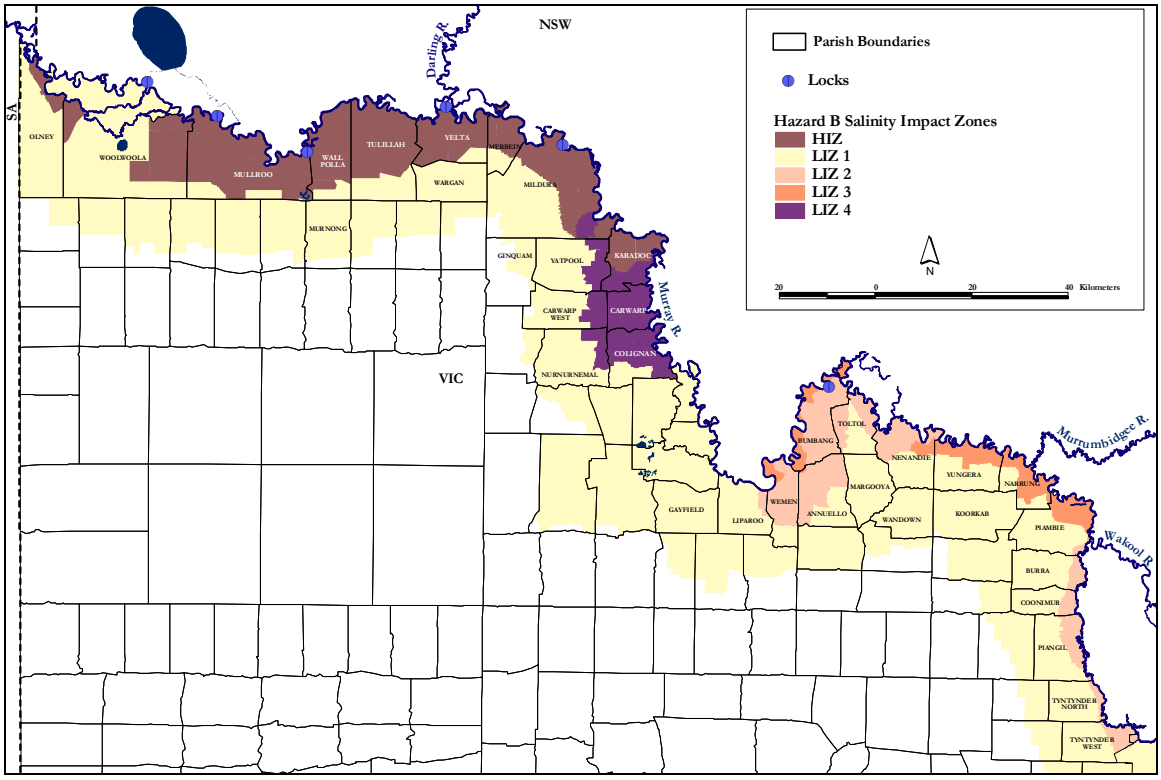
One property is a holding with the one owner or corporate entity. A property generally comprises more than one 'fruit block' or land parcel. Property numbers are estimates only, as no attempt has been made to resolve the intricacies of title ownership, property management and family and corporate partnerships. Properties irrigating less than one hectare are assumed to have house and garden supply and have been excluded from analysis on property numbers.

Salinity Impact Zones

Salinity impact zones are mapped zones in north-west Victoria that correlate to tonnes of salt displaced to the Murray River from new irrigation. The salinity impact zones in this report refer to 'Hazard B' zones (comprising four low impact zones (LIZ) and one high impact zone (HIZ)). These are used for levying new development and have been used in this study, purely for ease of presentation, rather than the 'Hazard A' zones (seven low impact zones and 5 high impact zones) which are used for reporting river salinity impacts to the Murray-Darling Basin Authority (salinity register). The relationship between Hazard A and Hazard B zones is as follows:

Hazard B Zones	Hazard A Zones
LIZ 1	LIZ 1, LIZ 2
LIZ 2	LIZ 3
LIZ 3	LIZ 4, LIZ 5
LIZ 4	LIZ 6, LIZ 7
HIZ	HIZ 1, HIZ 2, HIZ 3, HIZ 4, HIZ 5

Hazard B Salinity Impact Zones and Parishes



Crop Report Districts

Reporting is based on ten districts; four pumped irrigation districts (Robinvale, Red Cliffs, Mildura and Merbein) and six river reaches (Nyah (including the Nyah irrigation district), Boundary Bend, Wemen, Colignan, Mildura and Lock 10 to South Australia) as shown in the following map.

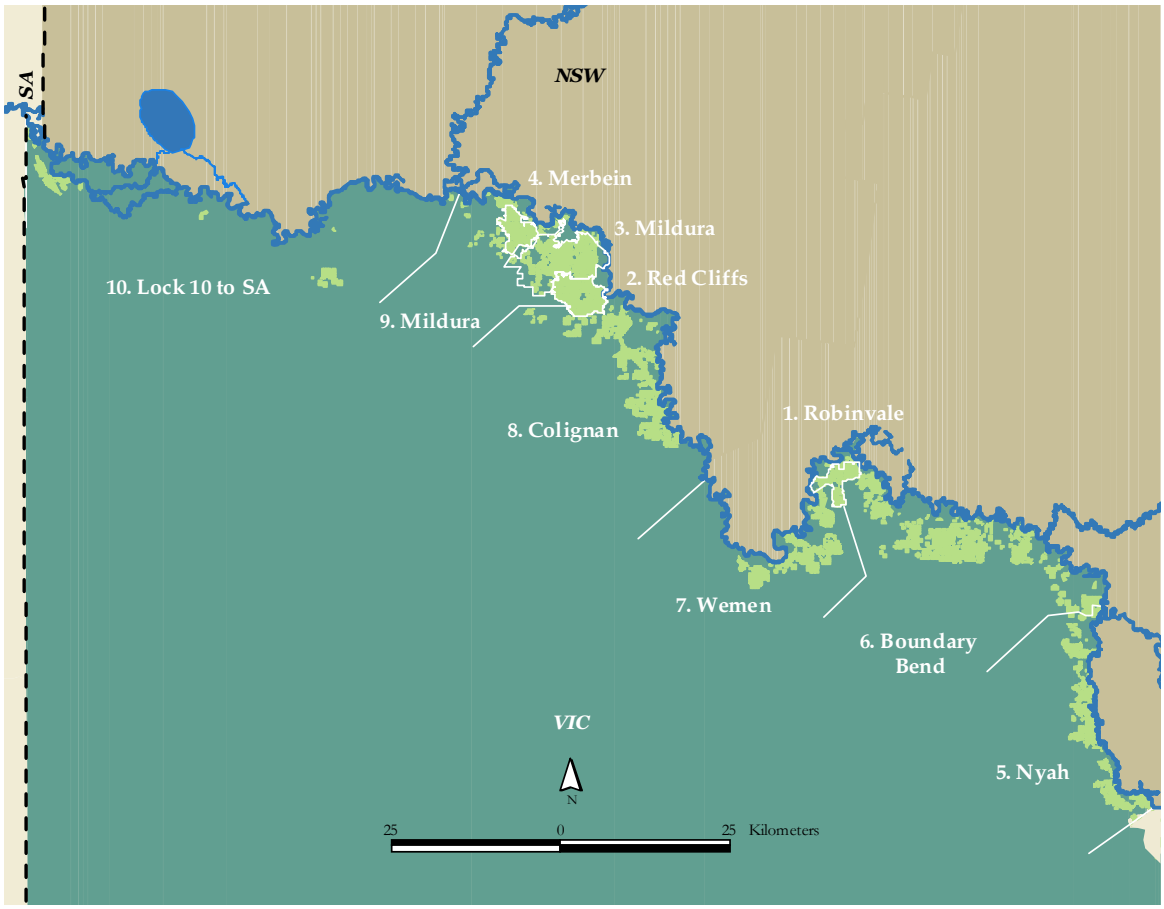
Pumped Irrigation Districts

1. Robinvale - Robinvale pumped irrigation district
2. Red Cliffs - Red Cliffs pumped irrigation district
3. Mildura - Mildura pumped irrigation district
4. Merbein - Merbein pumped irrigation district

River Reaches (Private Diverters)

5. Nyah - Nyah to the Wakool River junction including the Nyah pumped irrigation district
6. Boundary Bend - Wakool River junction to the Euston weir
7. Wemen - Euston weir to Liparoo
8. Colignan - Colignan to Yatpool
9. Mildura - Mildura to Lock 10
10. Lock 10 to SA - Lock 10 to the South Australian border

Map of the Crop Report Districts



1. Mallee Irrigation Summary

1.1 Victorian Mallee Summary

The following is information on irrigated horticulture along the Murray River from Nyah to the South Australian border for the period 1997 to 2009.

Irrigated Area

- The irrigated area increased by 30,130 hectares; a 75% increase from 40,185 hectares in 1997 to 70,315 hectares in 2009. This increase is due to a 30,400 hectare increase in the private diverter areas, and a 270 hectare decrease in the pumped irrigation districts.
- Across the four pumped districts 27% of the irrigated area was vacant (not irrigated) in the 2008-09 irrigation season. In the private diverter areas, 17% of the irrigated area was vacant in 2008-09, equating to a regional 'not irrigated' total of 20%. Of note is that the not irrigated areas in the pumped districts was predominantly permanent plantings (24% permanent, 3% seasonal), while in the private diverter areas it was mainly seasonal plantings (12% seasonal, 5% permanent) not being irrigated.

Crop Types and Wine, Dried and Table Grapes

- Grapevines remained the dominant crop type from 1997 to 2009, with wine grapes remaining the dominant produce. The 2009 area of grapevines (21,720 hectares) is closely followed by the area of almond trees (19,905 hectares).
- While the main development between 1997 and 2003 was wine grape plantings, the main growth spurt from 2003 to 2009 was the planting of almond trees. Other significant crop type changes are a 3,995 hectare increase in fruit trees and a 5,855 hectare decrease in the field crops. (See Appendix 2 for a listing of fruit trees and field crops.)
- A 43% increase in wine grape plantings occurred between 1997 and 2006, followed by a 15% decrease between 2006 and 2009. A 44% increase in table grape plantings occurred between 1997 and 2006, followed by a 6% decrease between 2006 and 2009. A 53% decline in dried grape plantings occurred from 1997 to 2009.

Irrigation Methods

- The dominant irrigation method changed from 'furrow/flood' in 1997 to 'drip' in 2009. This was driven by the predominance of new wine grape plantings and nut trees to be drip irrigated, the abandonment of flood irrigated field crops, and the conversion of furrow and overhead to drip for existing plantings, particularly in the 2006 to 2009 period.
- Only 3% of irrigated crops are flood or furrow irrigated (1% in private diverter areas and 7% in the pumped districts). Note that a significant proportion of the area not irrigated in 2008-09 (i.e. crop type = vacant) was furrow irrigated, and these areas may come back into production.

Salinity Impact Zones

- Irrigated crops were predominantly in the high salinity impact zone (HIZ) in 1997 and in the lowest salinity impact zone (LIZ 1) in 2009. This is largely due to new irrigation occurring in low salinity impact zones. There has also been a 33% decrease in irrigating of crops in the high salinity impact zone. Note that a significant proportion of the area not irrigated in 2008-09 (i.e. crop type = vacant) is in HIZ and may come back in production.

Property Numbers and Size

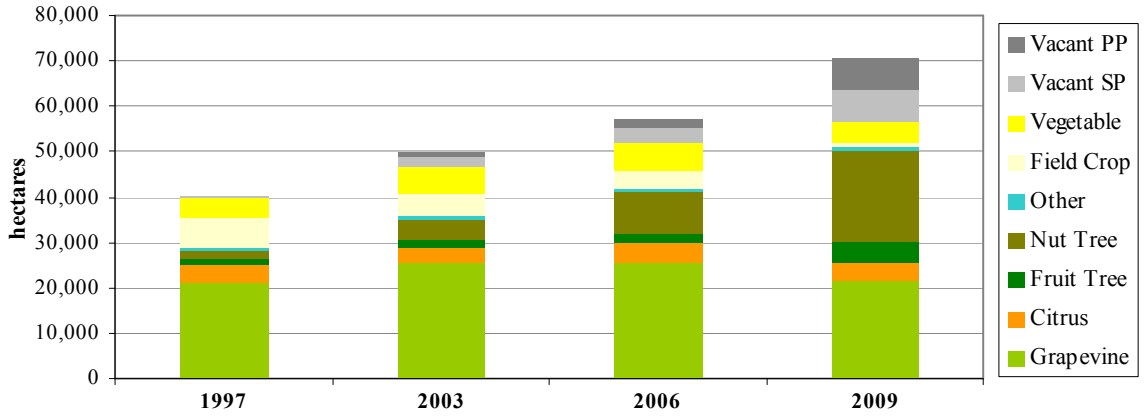
- There is estimated to be 2,275 irrigation properties in the Victorian Murray-Mallee region. Numbers declined by 182 properties (7%) between 1997 and 2009, with the average property size (irrigated area) increasing from 16.4 hectares to 30.9 hectares. The majority (70%) of properties are in the pumped districts with an average property size of 9.9 hectares.

Victorian Mallee Summary - Crop Types

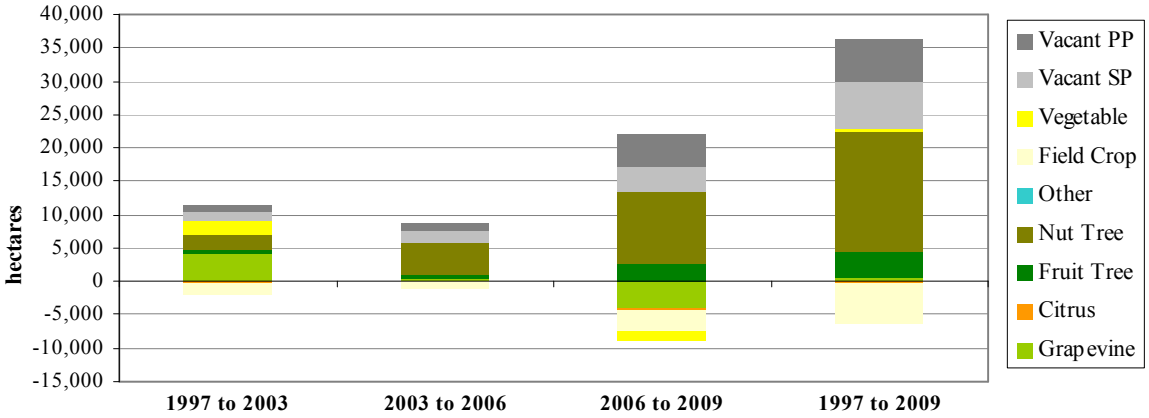
Crop Type		Area 1997	Area 2003	Area 2006	Area 2009	2009 Type 2009 Total		Change 1997 to 2009
Permanent plantings	Grapevine	21,210	25,325	25,690	21,720	31%		+510
	Citrus	3,970	3,825	3,945	3,655	5%		-315
	Fruit Tree	985	1,650	2,205	4,980	7%		+3,995
	Nut Tree	2,115	4,335	9,200	19,905	28%		+17,790
	Other	615	675	710	565	1%		-50
Seasonal crops	Field Crop	6,715	5,020	4,015	860	1%		-5,855
	Vegetable	4,080	6,080	6,050	4,755	7%		+675
Vacant	Vacant SP	360	1,855	3,505	7,195	20%	10%	+6,835
	Vacant PP	135	875	1,880	6,680		10%	+6,545
Total hectares		**40,185**	**49,640**	**57,200**	**70,315**	**100%**		**+30,130**

Vacant PP = previously a permanent planting Vacant SP = previously a seasonal planting.

Crop Type per Year



Crop Type Change

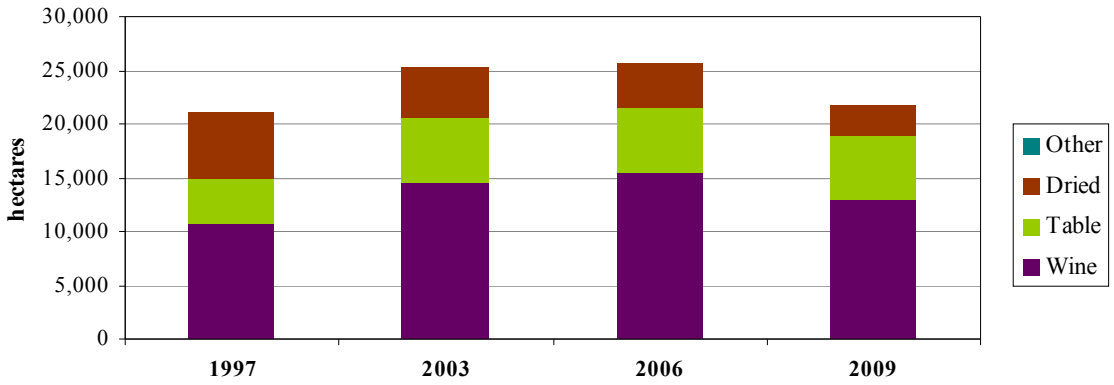


Victorian Mallee Summary - Grape Use

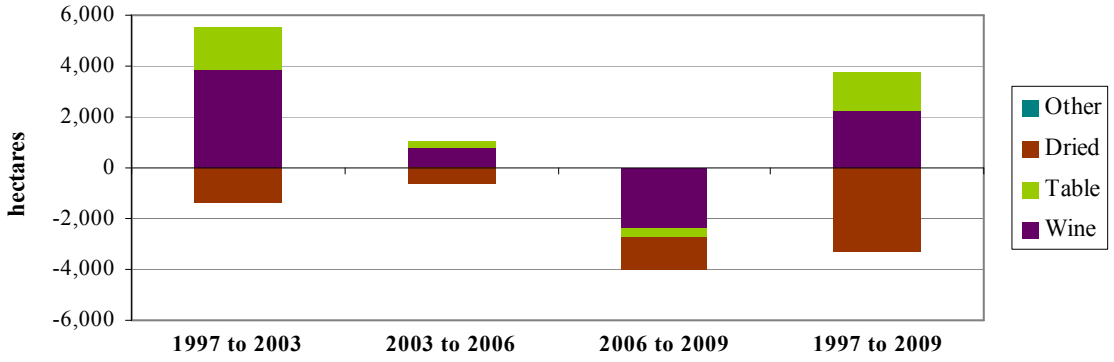
Grape Use	Area 1997	Area 2003	Area 2006	Area 2009	2009 Use 2009 Total %	Change 1997 to 2009
Wine	10,770	14,595	15,435	13,050	60%	+2,280
Table	4,225	5,900	6,075	5,730	26%	+1,505
Dried	6,145	4,790	4,140	2,905	13%	-3,240
Other	70	40	40	35	0%	-35
Total hectares	**21,210**	**25,325**	**25,690**	**21,720**	**100%**	**+510**

Other = juice, cannery or research

Grape Use per Year



Grape Use Change

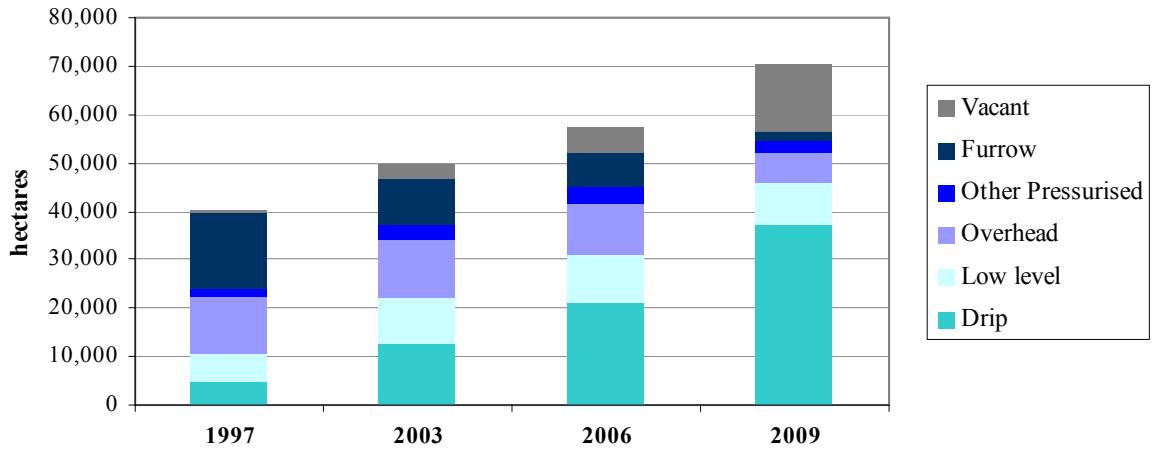


Victorian Mallee Summary - Irrigation Methods

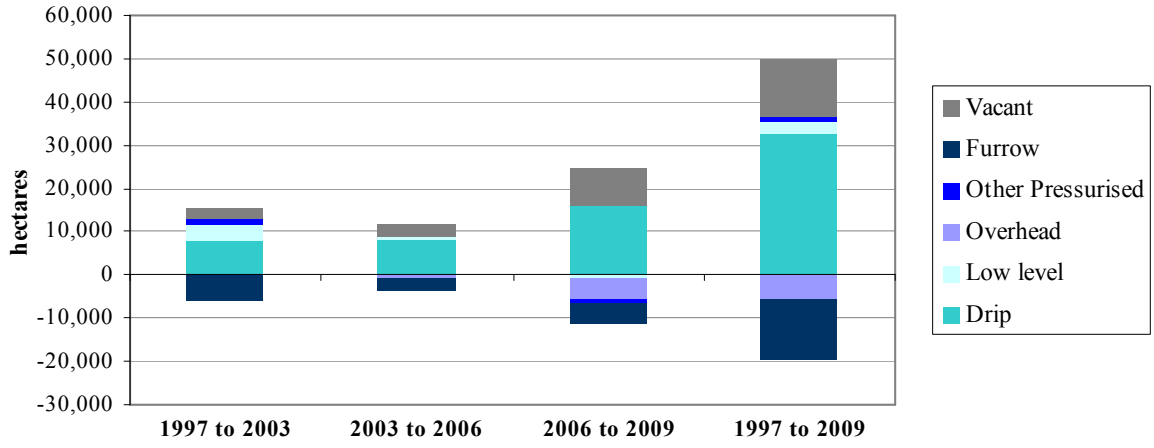
Irrigation Method	Area 1997	Area 2003	Area 2006	Area 2009	2009 Method 2009 Total %	Change 1997 to 2009
Drip	4,645	12,675	21,170	37,250	53%	+32,605
Low level	5,970	9,635	9,790	8,855	13%	+2,885
Overhead	11,665	11,640	10,605	5,845	8%	-5,820
Other Pressurised	1,700	3,270	3,380	2,565	4%	+865
Furrow	15,710	9,690	6,870	1,925	3%	-13,785
Vacant	495	2,730	5,385	13,875	20%	+13,380
Total hectares	**40,185**	**49,640**	**57,200**	**70,315**	**100%**	**+30,130**

Other pressurised includes centre pivot and miscellaneous sprinklers

Irrigation Method per Year



Irrigation Method Change

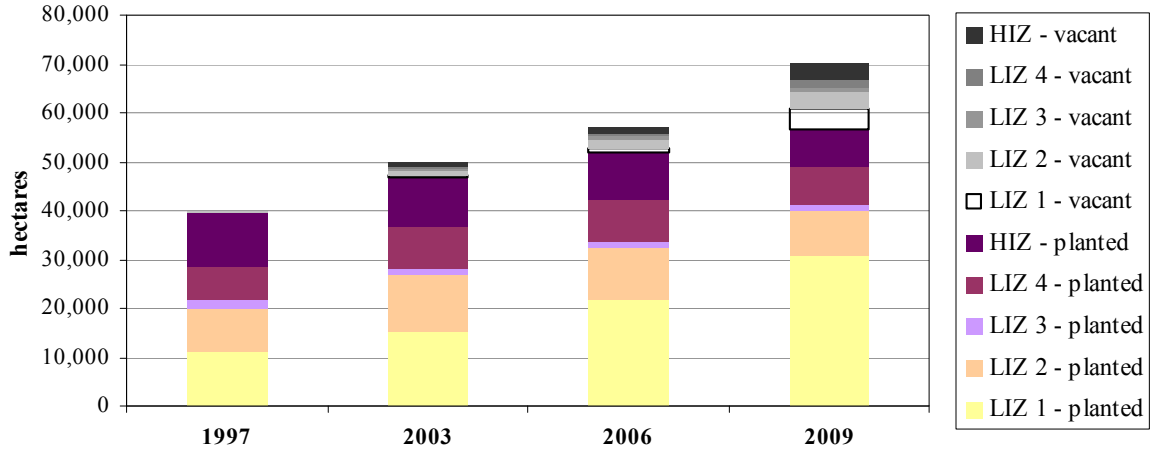


Victorian Mallee Summary - Salinity Impact Zones

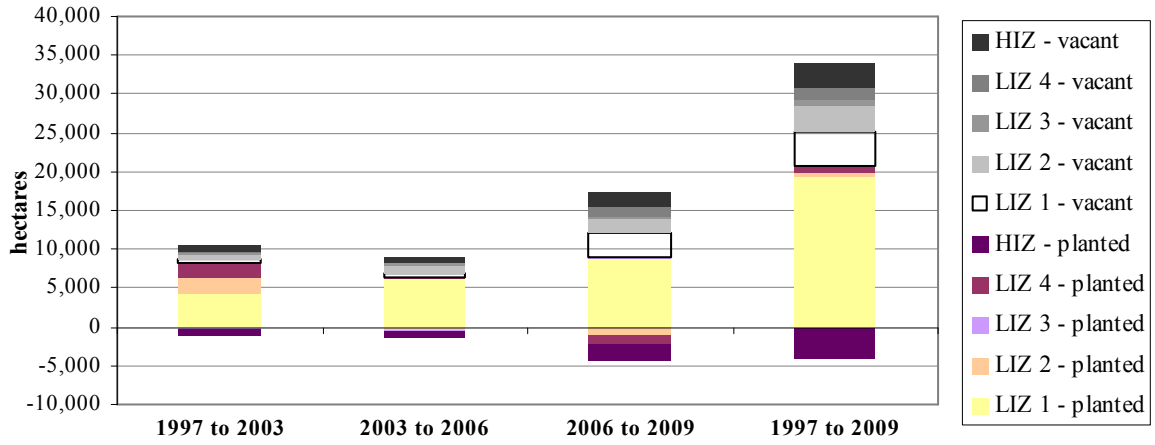
Salinity Impact Zone		Area 1997	Area 2003	Area 2006	Area 2009	2009 Zone 2009 Total %	Change 1997 to 2009
Planted	LIZ 1	11,190	15,495	21,690	30,520	43%	+19,330
	LIZ 2	8,965	11,165	10,705	9,465	13%	+500
	LIZ 3	1,670	1,375	1,335	1,465	2%	-205
	LIZ 4	6,650	8,390	8,505	7,505	11%	+855
	HIZ	11,215	10,485	9,580	7,485	11%	-3,730
Vacant	LIZ 1	65	515	1,160	4,410	6%	+4,345
	LIZ 2	135	740	1,675	3,550	5%	+3,415
	LIZ 3	35	385	635	895	1%	+860
	LIZ 4	95	330	490	1,620	2%	+1,525
	HIZ	165	760	1,425	3,400	5%	+3,235
Total hectares		**40,185**	**49,640**	**57,200**	**70,315**	**100%**	**+30,130**

LIZ = Low Impact Zone, HIZ = High Impact Zone. The impact zones are 'Hazard B' zones.

Salinity Impact Zone per Year



Salinity Impact Zone Change



Victorian Mallee Summary – Irrigation Development

Irrigation Development from 1997 to 2009

	Hectares			% of 1997
Irrigated crops in 1997 (1996-97 season)	**40,185**			
Retired between 1997 and 2009		**-1,425**		-4%
New areas between 1997 and 2009		**+31,555**		+79%
Irrigated crops in 2009 (2008-09 season)			**70,315**	

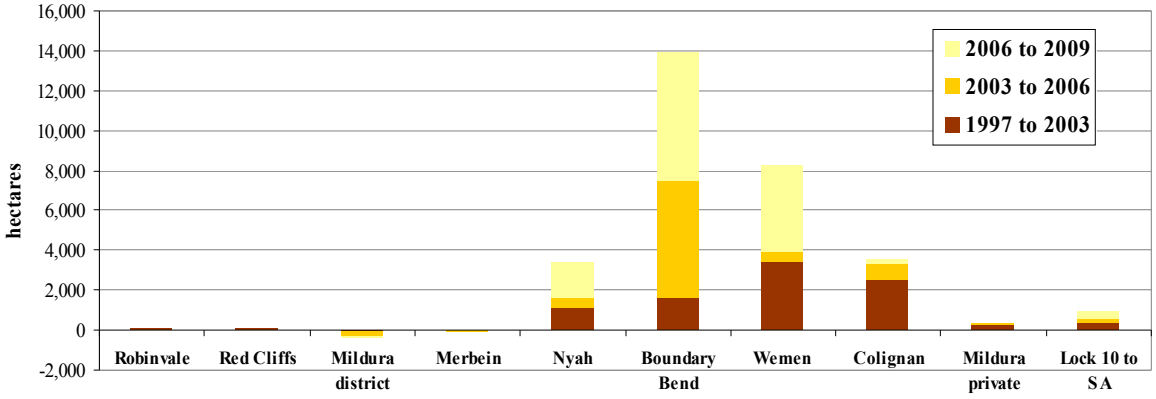
Retired = change in land use that precludes use for irrigation e.g. urban development, dam construction.

Irrigation Development per Report District

Report District		Crop Area (ha)			Change 1997 to 2009			
		1997	2009	2009% Vacant	Retired	New area	Total change	% change
Pumped Districts	Robinvale district	2,320	2,420	13%	-20	+120	+100	+4%
	Red Cliffs district	4,450	4,530	24%	-95	+175	+80	+2%
	Mildura district	6,480	6,080	30%	-610	+210	-400	-6%
	Merbein district	3,130	3,080	35%	-75	+25	-50	-2%
	total	**16,380**	**16,110**	**27%**	**-800**	**+530**	**-270**	**-2%**
Private Diverters	Nyah*	5,815	9,235	44%	-25	+3,445	+3,420	+59%
	Boundary Bend	5,380	19,275	10%	-140	+14,035	+13,895	+258%
	Wemen	2,285	10,540	7%	-210	+8,465	+8,255	+361%
	Colignan	7,105	10,660	16%	-50	+3,605	+3,555	+50%
	Mildura	1,415	1,730	33%	-50	+365	+315	+22%
	Lock 10 to SA	1,805	2,765	23%	-150	+1,110	+960	+53%
	total	**23,805**	**54,205**	**17%**	**-625**	**+31,025**	**+30,400**	**+128%**
Total		**40,185**	**70,315**	**20%**	**-1,425**	**+31,555**	**+30,130**	**+75%**

'Crop Area' includes irrigated and not irrigated (vacant) areas.
*Nyah river reach includes the Nyah pumped irrigation district.

Change in area per Report District



Victorian Mallee Summary - Property Change

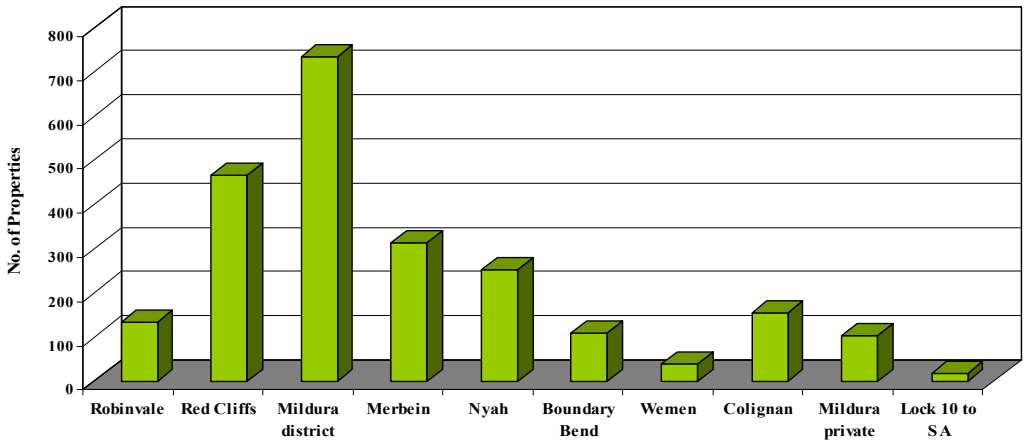
Property Size (cropped area)	Number of Properties				Change	
	1997	2003	2006	2009	1997 to 2009	2009%
1 to 5 ha	700	699	685	696	-4	31%
5 to 10 ha	836	751	740	688	-148	30%
10 to 20 ha	551	537	501	457	-94	20%
20 to 40 ha	215	209	206	223	+8	10%
> 40 ha	155	200	206	211	+56	9%
Total Properties	**2,457**	**2,396**	**2,338**	**2,275**	**-182**	**100%**
Average property size (ha)	**16.4**	**20.7**	**24.5**	**30.9**		

Properties irrigating less than one hectare have been excluded from the analysis.

Number of Properties per Report District

Report District		Number of properties estimate			Ave. 2009 property size (cropped area - ha)
		1997	2009	Change	
Pumped Districts	Robinvale district	169	133	-36	18.2
	Red Cliffs district	514	465	-49	9.7
	Mildura district	839	735	-104	8.3
	Merbein district	329	314	-15	9.8
	Pumped Districts total	**1,823**	**1,629**	**-194**	**9.9**
Private Diverters	Nyah river reach	249	252	+3	36.6
	Boundary Bend river reach	118	108	-10	178.5
	Wemen river reach	37	38	+1	277.4
	Colignan river reach	143	155	+12	68.8
	Mildura river reach	110	103	-7	16.8
	Lock 10 to SA river reach	17	18	+1	153.6
	Private Diverters total	**668**	**680**	**+12**	**79.7**
Total properties		**2,457**	**2,275**	**-182**	**30.9**

Totals are less than the sums per district as there are properties irrigating in more than one district.
Cropped area includes irrigated/not irrigated areas.



1.2 Pumped Irrigation Districts Summary

The following is information on irrigated horticulture across the four pumped irrigation districts, Robinvale, Red Cliffs, Mildura and Merbein, for the period 1997 to 2009.

Irrigated Area

- The irrigated area decreased by 270 hectares; a 2% decrease from 16,380 hectares in 1997 to 16,110 hectares in 2009. This decrease is due to areas (800 hectares) being retired for other land uses, predominantly urban or residential development. New areas (530 hectares) were planted due to more efficient planting layouts following the removal of drying racks and gravity fed irrigation as well as some previously not irrigated land parcels being developed.
- Across the four pumped districts 27% of the irrigated area was vacant (not irrigated) in the 2008-09 irrigation season. This comprised 3,845 hectares (24%) vacant that was previously permanent plantings and 450 hectares (3%) that was previously seasonal plantings.

Crop Types and Wine, Dried and Table Grapes

- Grapevines grown for wine production remained the dominant crop type from 1997 (5,925 hectares) to 2009 (4,850 hectares).
- There was a decline in the area of all crop types between 1997 and 2009 except for a 60 hectare increase in nut trees. The dominant change was a 27% decline in the area of grapevines that occurred mainly in the 2006 to 2009 period, along with low water allocations and low wine grape prices.
- While an 11% increase in wine grape plantings occurred between 1997 and 2003, it was followed by a 26% decline from 2003 to 2009. Table grape plantings increased by 33% between 1997 and 2003, followed by a 5% decline from 2003 to 2009. Dried grape plantings declined from 1997 to 2009 by 63%.

Irrigation Methods

- The dominant irrigation method changed from 'furrow' in 1997 to 'low level' in 2009.
- Significant conversion of furrow irrigation to drip and low level systems occurred in the 1997 to 2003 period in line with the increase in wine grape and table grape plantings. Further significant decline in furrow and overhead irrigation occurred from 2006 to 2009, due to crops not being irrigated and conversion to drip or low level sprinkler irrigation.
- Only 7% of irrigated crops were furrow irrigated in 2009. Note that a significant proportion of the area not irrigated in 2008-09 (i.e. crop type = vacant) was furrow irrigated, and these areas may come back into production.

Salinity Impact Zones

- Irrigated crops are predominantly in the high salinity impact zone (HIZ) however there was a 33% decline in irrigated crops in HIZ between 1997 and 2009. This decline occurred mainly in the 2006 to 2009 period in areas that could potentially come back into production.

Property Numbers and Size

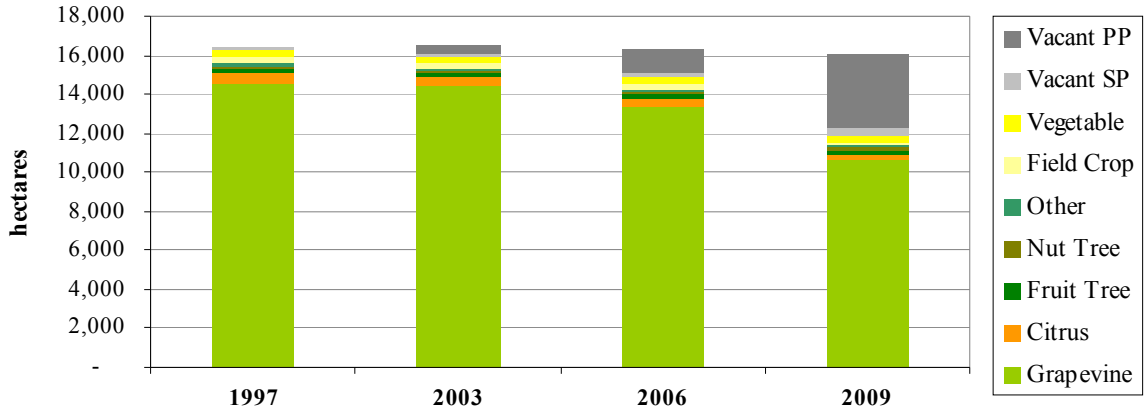
- The pumped districts have an estimated 1,629 properties, with an average property size (cropped area) of 9.9 hectares.
- Numbers declined by 194 properties between 1997 and 2009; with the average property size increasing from 9.0 hectares to 9.9 hectares.
- 45% of properties are in the Mildura pumped district with an average property size of 8.3 hectares.

Pumped Districts Summary - Crop Types

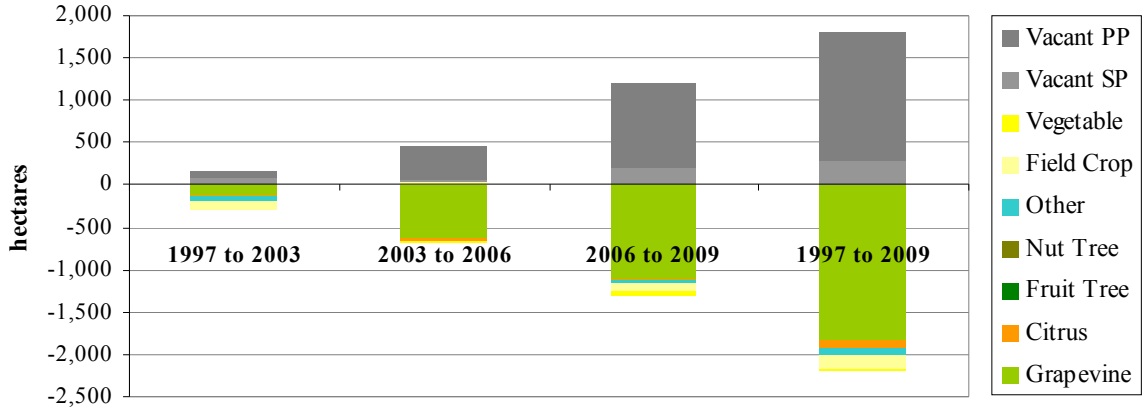
Crop Type		Area 1997	Area 2003	Area 2006	Area 2009	2009 Type 2009 Total		Change 1997 to 2009
Permanent plantings	Grapevine	14,550	14,440	13,415	10,645	66%		-3,905
	Citrus	535	395	350	265	2%		-270
	Fruit Tree	235	220	205	190	1%		-45
	Nut Tree	130	145	150	190	1%		+60
	Other	190	155	135	85	1%		-105
Seasonal crops	Field Crop	340	230	260	150	1%		-190
	Vegetable	300	320	345	290	2%		-10
Vacant	Vacant SP	50	140	185	450	27%	3%	+400
	Vacant PP	50	400	1,185	3,845		24%	+3,795
Total hectares		**16,380**	**16,445**	**16,230**	**16,110**		**100%**	**-270**

Vacant PP = previously a permanent planting Vacant SP = previously a seasonal planting.

Crop Type per Year



Crop Type Change

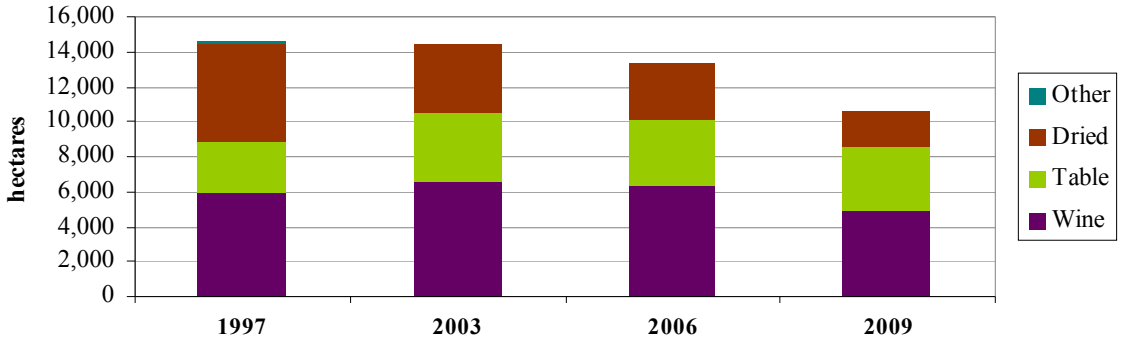


Pumped Districts Summary - Grape Use

Grape Use	Area 1997	Area 2003	Area 2006	Area 2009	2009 Use 2009 Total %	Change 1997 to 2009
Wine	5,925	6,565	6,345	4,850	46%	-1,075
Table	2,945	3,910	3,810	3,700	35%	+755
Dried	5,615	3,935	3,230	2,070	19%	-3,545
Other	65	30	30	25	0%	-40
Total hectares	**14,550**	**14,440**	**13,415**	**10,645**	**100%**	**-3,905**

Other = juice, cannery or research

Grape Use per Year



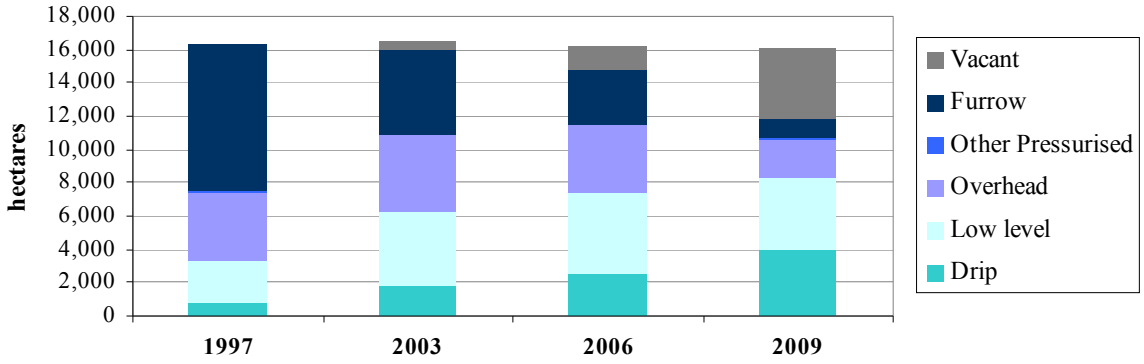
Grape Use Change

Pumped Districts Summary - Irrigation Methods

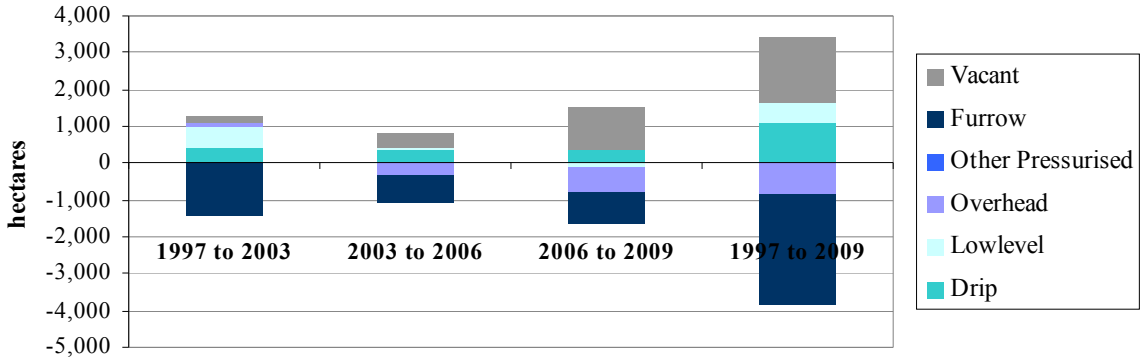
Irrigation Method	Area 1997	Area 2003	Area 2006	Area 2009	2009 Method 2009 Total %	Change 1997 to 2009
Drip	730	1,845	2,575	3,930	24%	+3,200
Low level	2,625	4,430	4,865	4,315	27%	+1,690
Overhead	4,100	4,525	4,070	2,400	15%	-1,700
Other Pressurised	65	30	30	15	0%	-50
Furrow	8,760	5,075	3,320	1,155	7%	-7,605
Vacant	100	540	1,370	4,295	27%	+4,195
Total hectares	**16,380**	**16,445**	**16,230**	**16,110**	**100%**	**-270**

Other pressurised includes centre pivot and miscellaneous sprinklers

Irrigation Method per Year



Irrigation Method Change

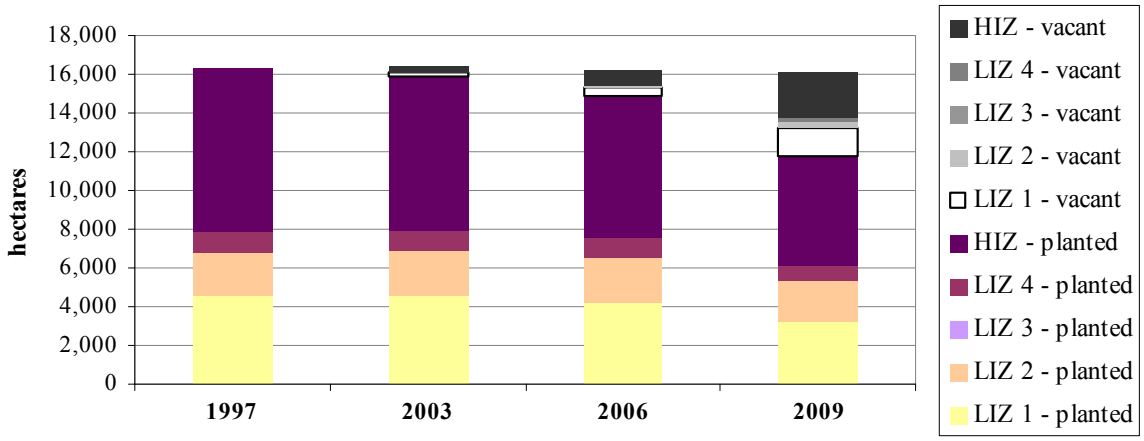


Pumped Districts Summary - Salinity Impact Zones

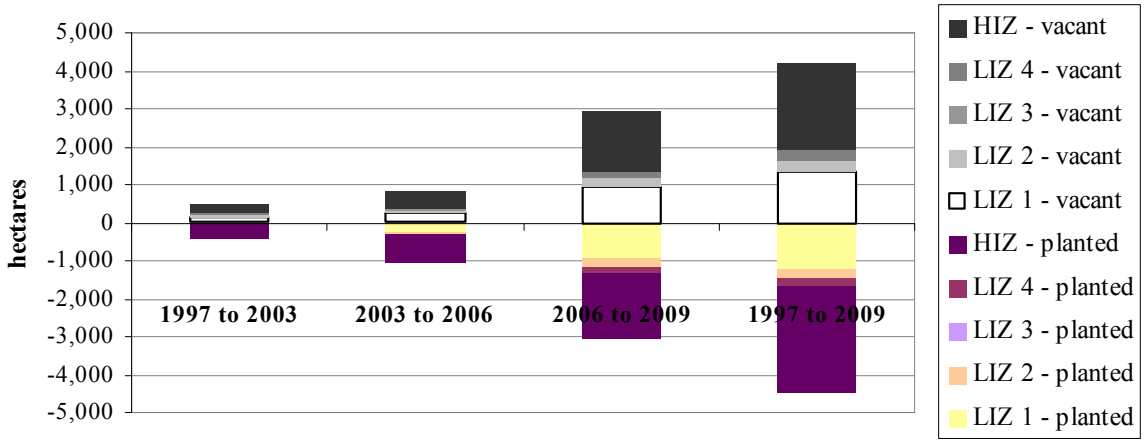
Salinity Impact Zone		Area 1997	Area 2003	Area 2006	Area 2009	2009 Zone 2009 Total %	Change 1997 to 2009
Planted	LIZ 1	4,515	4,505	4,245	3,275	20%	-1,240
	LIZ 2	2,295	2,340	2,285	2,095	13%	-200
	LIZ 3	20	20	20	15	0%	-5
	LIZ 4	1,015	1,005	980	780	5%	-235
	HIZ	8,435	8,035	7,330	5,650	35%	-2,785
Vacant	LIZ 1	50	170	435	1,390	9%	+1,340
	LIZ 2	5	35	110	305	2%	+300
	LIZ 3	0	0	5	5	0%	+5
	LIZ 4	10	50	75	275	2%	+265
	HIZ	35	285	745	2,320	14%	+2,285
Total hectares		**16,380**	**16,445**	**16,230**	**16,110**	**100%**	**-270**

LIZ = Low Impact Zone, HIZ = High Impact Zone. The impact zones are 'Hazard B' zones.

Salinity Impact Zone per Year



Salinity Impact Zone Change



Pumped Districts Summary – Irrigation Development

Irrigation Development from 1997 to 2009

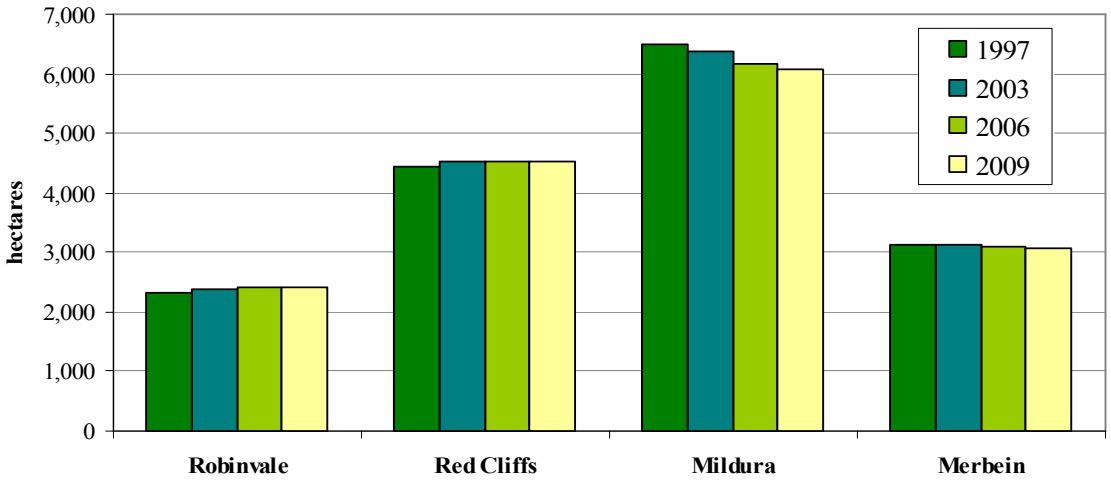
	Hectares			% of 1997
Irrigated crops in 1997 (1996-97 season)	**16,380**			
Retired between 1997 and 2009		**-800**		-5%
New areas between 1997 and 2009		**+530**		+3%
Irrigated crops in 2009 (2008-09 season)			**16,110**	

Retired = change in land use that precludes use for irrigation e.g. urban development, dam construction.

Irrigation Development per District

Pumped District	Crop Area (ha)					Change 1997 to 2009			
	1997	2003	2006	2009	2009% Vacant	Retired	New area	Total change	% change
Robinvale	2,320	2,395	2,420	2,420	13%	-20	+120	+100	+4%
Red Cliffs	4,450	4,540	4,540	4,530	24%	-95	+175	+80	+2%
Mildura	6,480	6,375	6,170	6,080	30%	-610	+210	-400	-6%
Merbein	3,130	3,135	3,100	3,080	35%	-75	+25	-50	-2%
Total	**16,380**	**16,445**	**16,230**	**16,110**	**27%**	**-800**	**+530**	**-270**	**-2%**

'Crop Area' includes irrigated and not irrigated (vacant) areas.



Pumped Districts Summary – Property Change

Change in Property Size

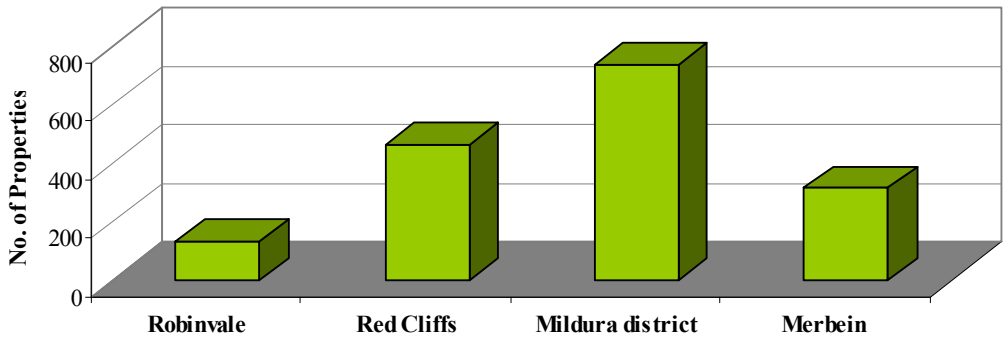
Property Size (cropped area)	Number of Properties				Change	
	1997	2003	2006	2009	1997 to 2009	2009%
1 to 5 ha	552	544	533	544	-8	33%
5 to 10 ha	711	641	633	579	-132	36%
10 to 20 ha	442	430	397	346	-96	21%
20 to 40 ha	102	105	104	124	+22	8%
> 40 ha	16	28	36	36	+20	2%
Total Properties	**1,823**	**1,748**	**1,703**	**1,629**	**-194**	**100%**
Average property size (ha)	**9.0**	**9.4**	**9.5**	**9.9**		

Properties irrigating less than one hectare are assumed to have house and garden supply and have been excluded from analysis on property numbers.

Number of Properties per Report District

District		Number of properties estimate			Ave. 2009 property size (cropped area - ha)
		1997	2009	Change	
Pumped Districts	Robinvale	169	133	-36	18.2
	Red Cliffs	514	465	-49	9.7
	Mildura	839	735	-104	8.3
	Merbein	329	314	-15	9.8
	Pumped Districts total	**1,823**	**1,629**	**-194**	**9.9**

Totals are less than the sums per district as there are properties irrigating in more than one district.
Cropped area includes irrigated/not irrigated areas.



1.3 Private Diverters Summary

The following is information on irrigated horticulture for private diverters, along the Murray River from Nyah to the South Australian border, for the period 1997 to 2009.

Irrigated Area

- The irrigated area increased by 30,400 hectares; a 128% increase from 23,805 hectares in 1997 to 54,205 hectares in 2009. This increase is mainly due to the planting of nut trees (17,730 hectares of almonds), grapevines (4,415 hectares) and fruit trees (4,040 hectares, predominantly olive trees). Irrigation development predominantly occurred in the Boundary Bend area (46% of the 30,400 hectare increase) and the Wemen area (27% of the 30,400 hectare increase).
- In the 2008-09 irrigation season, 17% of the irrigated area was vacant (not irrigated), with 12% of vacant areas previously being seasonal plantings and 5% previously being permanent plantings. The 'drying off' of seasonal plantings was predominantly with respect to surface irrigated field crops such as pasture.

Crop Types and Wine, Dried and Table Grapes

- Grapevines were the dominant crop type from 1997 to 2006, but were replaced by nut trees by 2009.
- An 88% increase in wine grape plantings occurred between 1997 and 2006, followed by a 10% decrease (890 hectares) between 2006 and 2009. Table grape plantings increased by 77% from 1997 to 2006, followed by a 10% decrease between 2006 and 2009. Dried grape plantings increased by 72% from 1997 to 2006, followed by an 8% decrease between 2006 and 2009.

Irrigation Methods

- The dominant irrigation method changed from 'furrow/flood' in 1997 to 'drip' in 2009. This was driven by the predominance of new wine grape plantings and nut trees to be drip irrigated, the abandonment of flood irrigated field crops, and the conversion of furrow and overhead to low level or drip for existing plantings, particularly in the 2006 to 2009 period.
- Only 1% of irrigated crops are flood or furrow irrigated. However, a significant proportion of the area not irrigated in 2008-09 (i.e. crop type = vacant) was furrow irrigated, and these areas may come back into production.

Salinity Impact Zones

- Irrigated crops remained predominantly in the lowest salinity impact zone (LIZ 1) from 1997 to 2009. Crops irrigated in the high salinity impact zone decreased by 945 hectares.

Property Numbers and Size

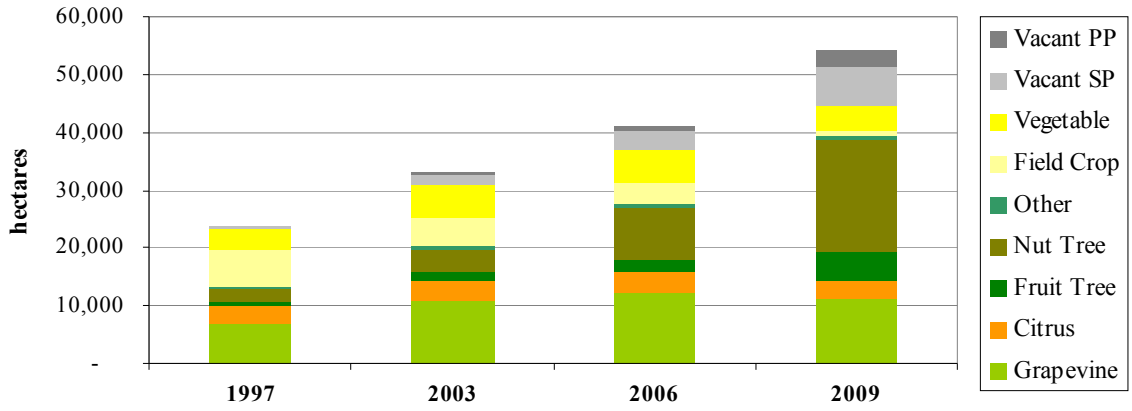
- There is estimated to be 680 private diversion properties in the Victorian Murray-Mallee region. Numbers declined by 12 properties between 1997 and 2009, with the average property size (irrigated area) increasing from 35.6 hectares to 79.7 hectares. The majority of properties are in the Nyah and Colignan areas.

Private Diverters Summary - Crop Types

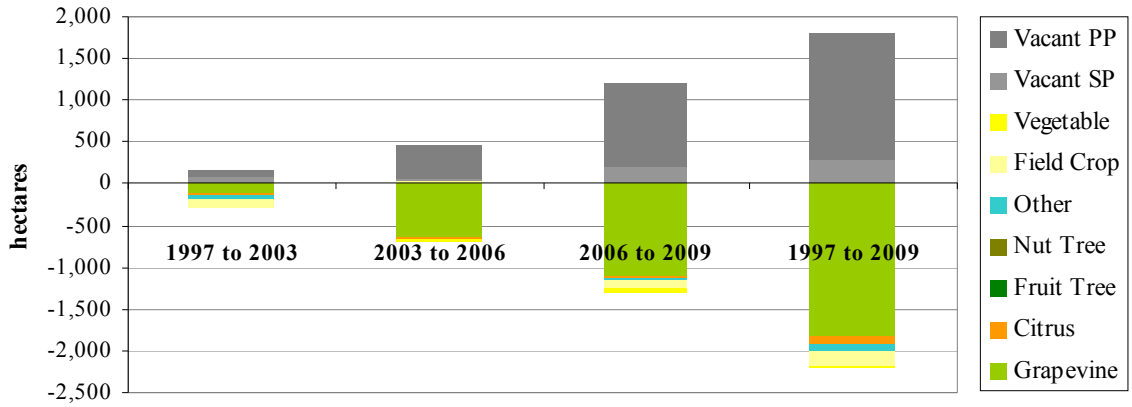
Crop Type		Area 1997	Area 2003	Area 2006	Area 2009	2009 Type 2009 Total		Change 1997 to 2009
Permanent plantings	Grapevine	6,660	10,885	12,275	11,075	20%		+4,415
	Citrus	3,435	3,430	3,595	3,390	6%		-45
	Fruit Tree	750	1,430	2,000	4,790	9%		+4,040
	Nut Tree	1,985	4,190	9,050	19,715	36%		+17,730
	Other	425	520	575	480	1%		+55
Seasonal crops	Field Crop	6,375	4,790	3,755	710	1%		-5,665
	Vegetable	3,780	5,760	5,705	4,465	8%		+685
Vacant	Vacant SP	310	1,715	3,320	6,745	17%	12%	+6,435
	Vacant PP	85	475	695	2,835		5%	+2,750
Total hectares		**23,805**	**33,195**	**40,970**	**54,205**	**100%**		**+30,400**

Vacant PP = previously a permanent planting Vacant SP = previously a seasonal planting.

Crop Type per Year



Crop Type Change

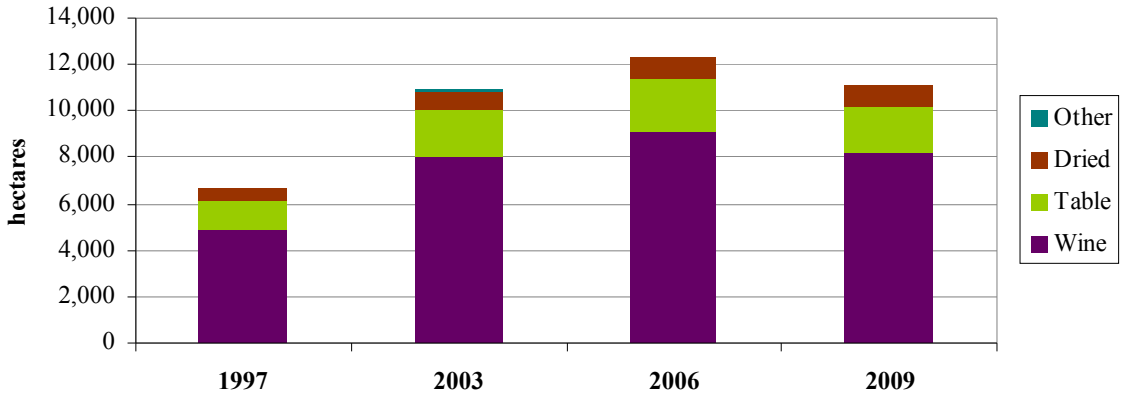


Private Diverters Summary - Grape Use

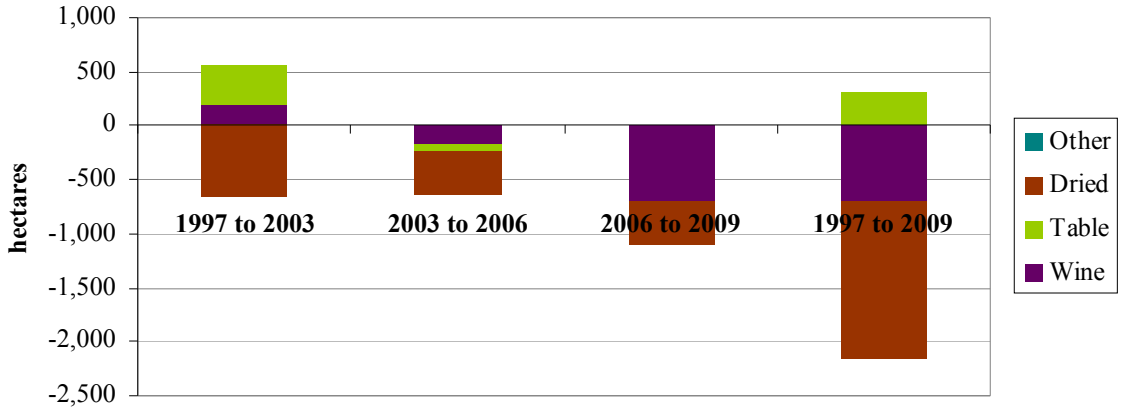
Grape Use	Area 1997	Area 2003	Area 2006	Area 2009	2009 Use 2009 Total %	Change 1997 to 2009
Wine	4,845	8,030	9,090	8,200	74%	+3,355
Table	1,280	1,990	2,265	2,030	18%	+750
Dried	530	855	910	835	8%	+305
Other	5	10	10	10	0%	+5
Total hectares	**6,660**	**10,885**	**12,275**	**11,075**	**100%**	**+4,415**

Other = juice, cannery or research

Grape Use per Year



Grape Use Change

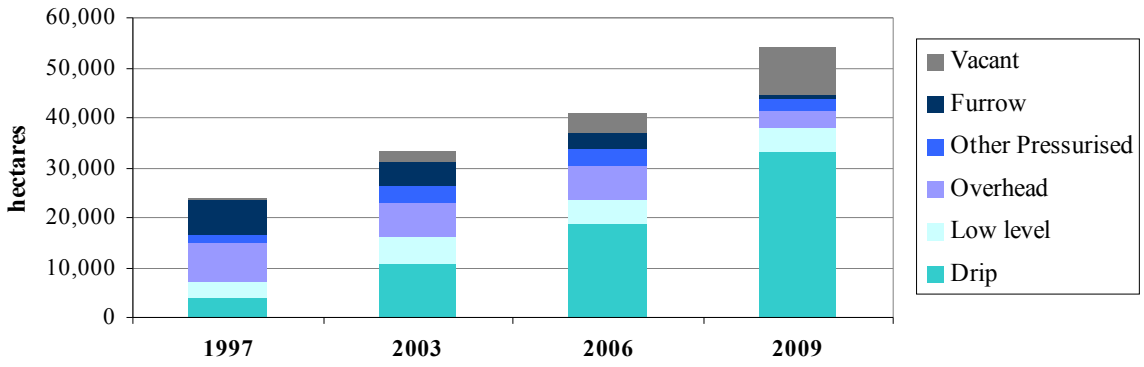


Private Diverters Summary - Irrigation Methods

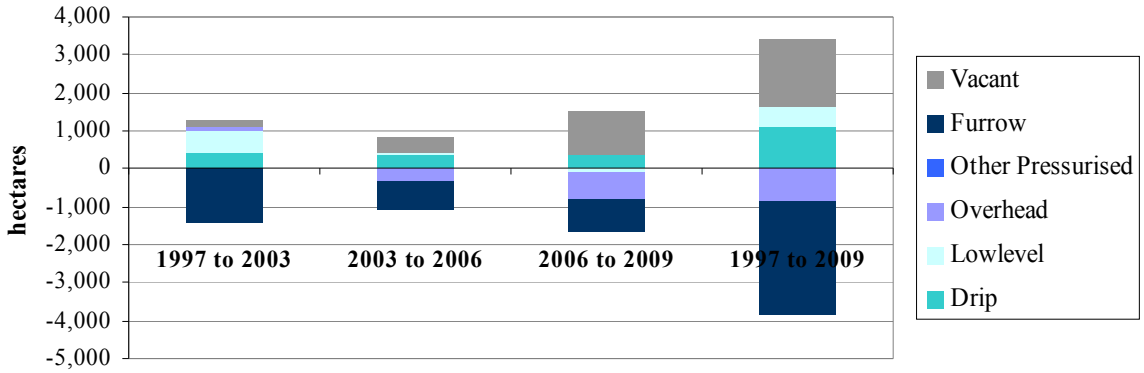
Irrigation Method	Area 1997	Area 2003	Area 2006	Area 2009	2009 Method 2009 Total %	Change 1997 to 2009
Drip	3,915	10,830	18,595	33,320	61%	+29,405
Low level	3,345	5,205	4,925	4,540	8%	+1,195
Overhead	7,565	7,115	6,535	3,445	6%	-4,120
Other Pressurised	1,635	3,240	3,350	2,550	5%	+915
Furrow	6,950	4,615	3,550	770	1%	-6,180
Vacant	395	2,190	4,015	9,580	18%	+9,185
Total hectares	**23,805**	**33,195**	**40,970**	**54,205**	**100%**	**+30,400**

Other pressurised includes centre pivot and miscellaneous sprinklers

Irrigation Method per Year



Irrigation Method Change

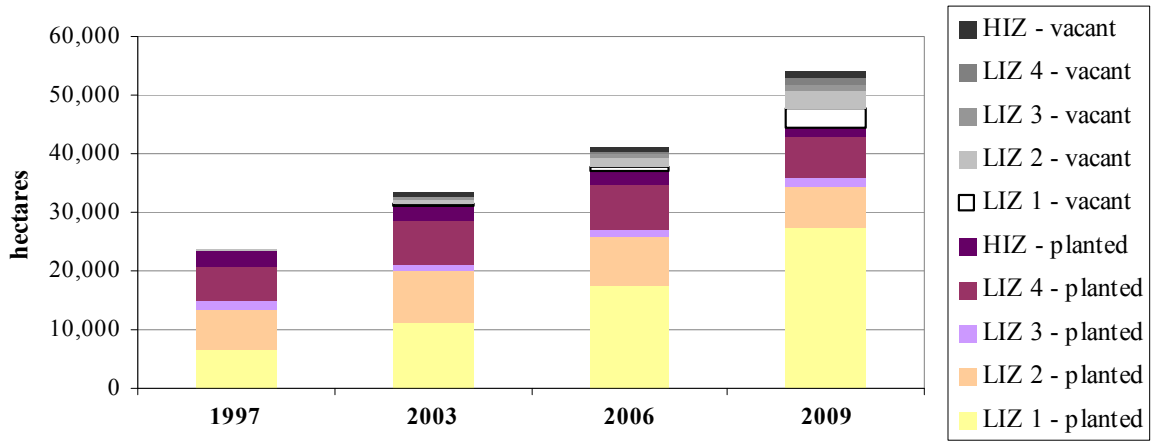


Private Diverters Summary - Salinity Impact Zones

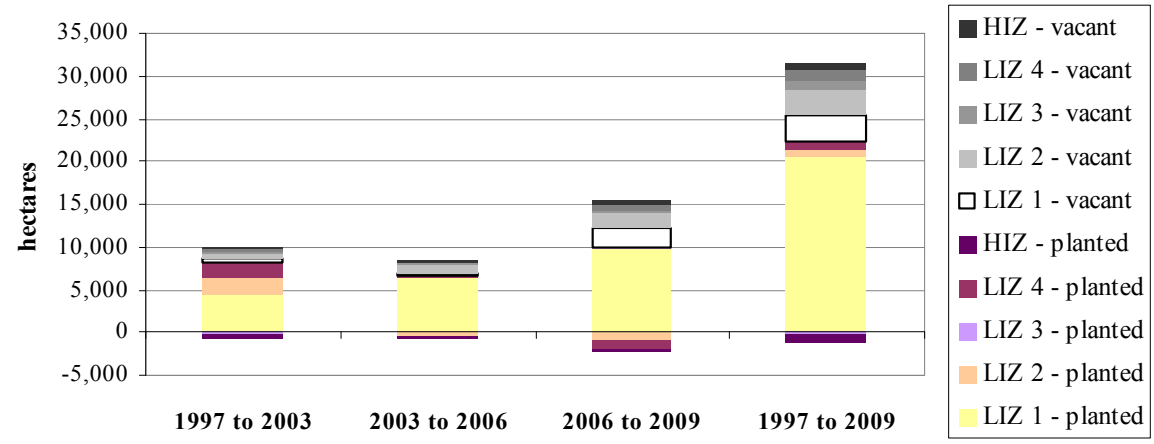
Salinity Impact Zone		Area 1997	Area 2003	Area 2006	Area 2009	2009 Zone 2009 Total %	Change 1997 to 2009
Planted	LIZ 1	6,675	10,990	17,445	27,245	50%	+20,570
	LIZ 2	6,670	8,825	8,420	7,370	14%	+700
	LIZ 3	1,650	1,355	1,315	1,450	3%	-200
	LIZ 4	5,635	7,385	7,525	6,725	12%	+1,090
	HIZ	2,780	2,450	2,250	1,835	3%	-945
Vacant	LIZ 1	15	345	725	3,020	6%	+3,005
	LIZ 2	130	705	1,565	3,245	6%	+3,115
	LIZ 3	35	385	630	890	2%	+855
	LIZ 4	85	280	415	1,345	2%	+1,260
	HIZ	130	475	680	1,080	2%	+950
Total hectares		**23,805**	**33,195**	**40,970**	**54,205**	**100%**	**+30,400**

LIZ = Low Impact Zone, HIZ = High Impact Zone. The impact zones are 'Hazard B' zones.

Salinity Impact Zone per Year



Salinity Impact Zone Change



Private Diverters Summary – Irrigation Development

Irrigation Development from 1997 to 2009

	Hectares			% of 1997
Irrigated crops in 1997 (1996-97 season)	**23,805**			
Retired between 1997 and 2009		**-625**		-3%
New areas between 1997 and 2009		**+31,025**		+130
Irrigated crops in 2009 (2008-09 season)			**54,205**	

Retired = change in land use that precludes use for irrigation e.g. urban development, dam construction.

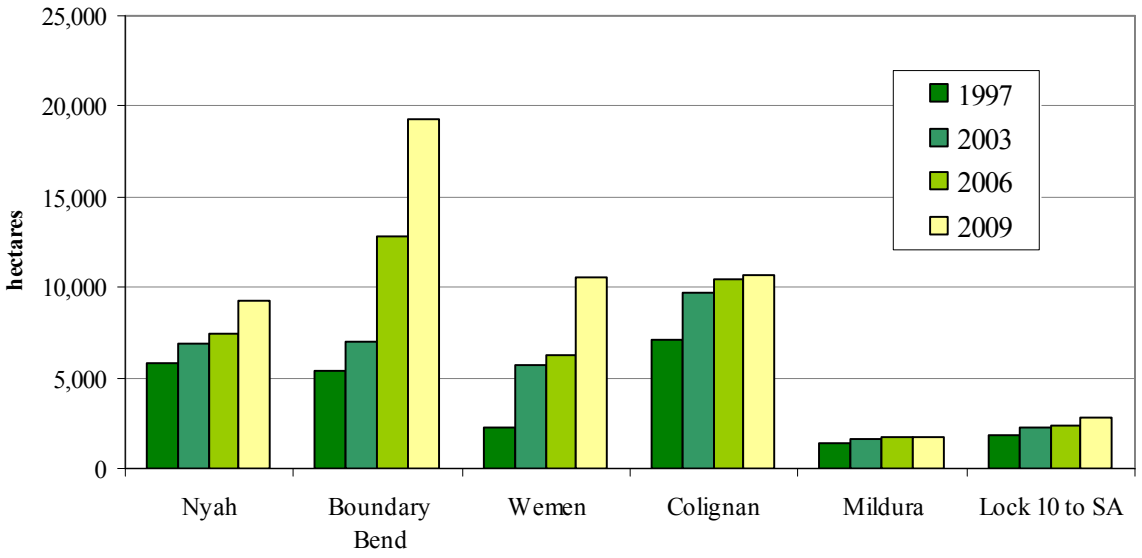
Irrigation Development per Report District

River Reach		Crop Area (ha)			Change 1997 to 2009			
		1997	2009	2009% vacant	Retired	New area	Total change	% change
Private Diverters	Nyah*	5,815	9,235	44%	-25	+3,445	+3,420	+59%
	Boundary Bend	5,380	19,275	10%	-140	+14,035	+13,895	+258%
	Wemen	2,285	10,540	7%	-210	+8,465	+8,255	+361%
	Colignan	7,105	10,660	16%	-50	+3,605	+3,555	+50%
	Mildura	1,415	1,730	33%	-50	+365	+315	+22%
	Lock 10 to SA	1,805	2,765	23%	-150	+1,110	+960	+53%
	Private Diverters total	**23,805**	**54,205**	**17%**	**-625**	**+31,025**	**+30,400**	**+128%**

'Crop Area' includes irrigated and not irrigated (vacant) areas.

*Nyah river reach includes the Nyah pumped irrigation district.

Change in area per River Reach



Private Diverters Summary - Property Change

Change in Property Size

Property Size (cropped area)	Number of Properties				Change	
	1997	2003	2006	2009	1997 to 2009	2009%
1 to 5 ha	155	161	156	155	0	23%
5 to 10 ha	137	120	117	120	-17	18%
10 to 20 ha	125	126	123	130	+5	19%
20 to 40 ha	118	114	107	104	-14	15%
> 40 ha	133	165	168	171	+38	25%
Total Properties	**668**	**686**	**671**	**680**	**+12**	**100%**
Average property size (ha)	**35.6**	**48.4**	**61.1**	**79.7**		

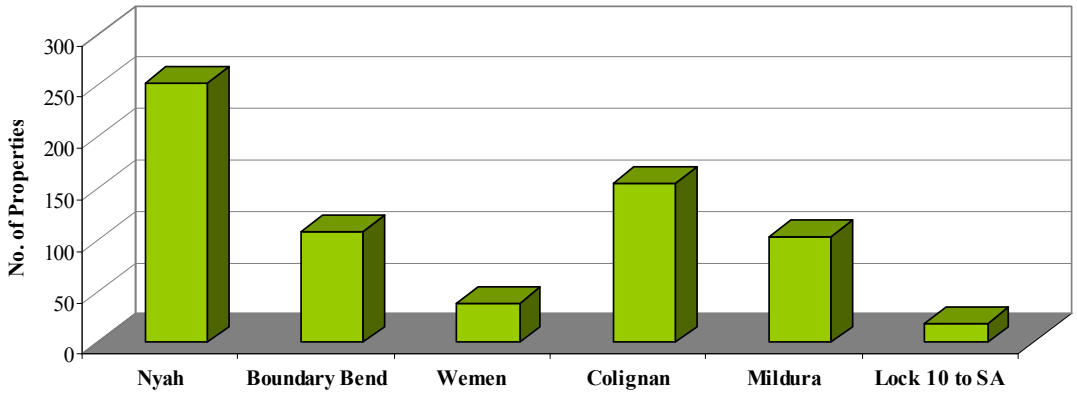
Properties irrigating less than one hectare are assumed to have house and garden supply and have been excluded from the property analysis.

Number of Properties per River Reach

Report District		Number of properties estimate			Ave. 2009 property size (cropped area - ha)
		1997	2009	Change	
Private Diverters	Nyah river reach*	249	252	+3	36.6
	Boundary Bend river reach	118	108	-10	178.5
	Wemen river reach	37	38	+1	277.4
	Colignan river reach	143	155	+12	68.8
	Mildura river reach	110	103	-7	16.8
	Lock 10 to SA river reach	17	18	+1	153.6
	Private Diverters total	**668**	**680**	**+12**	**79.7**

Totals are less than the sums per district as there are properties irrigating in more than one district.
Cropped area includes irrigated/not irrigated areas.

*Nyah river reach includes the Nyah pumped irrigation district.



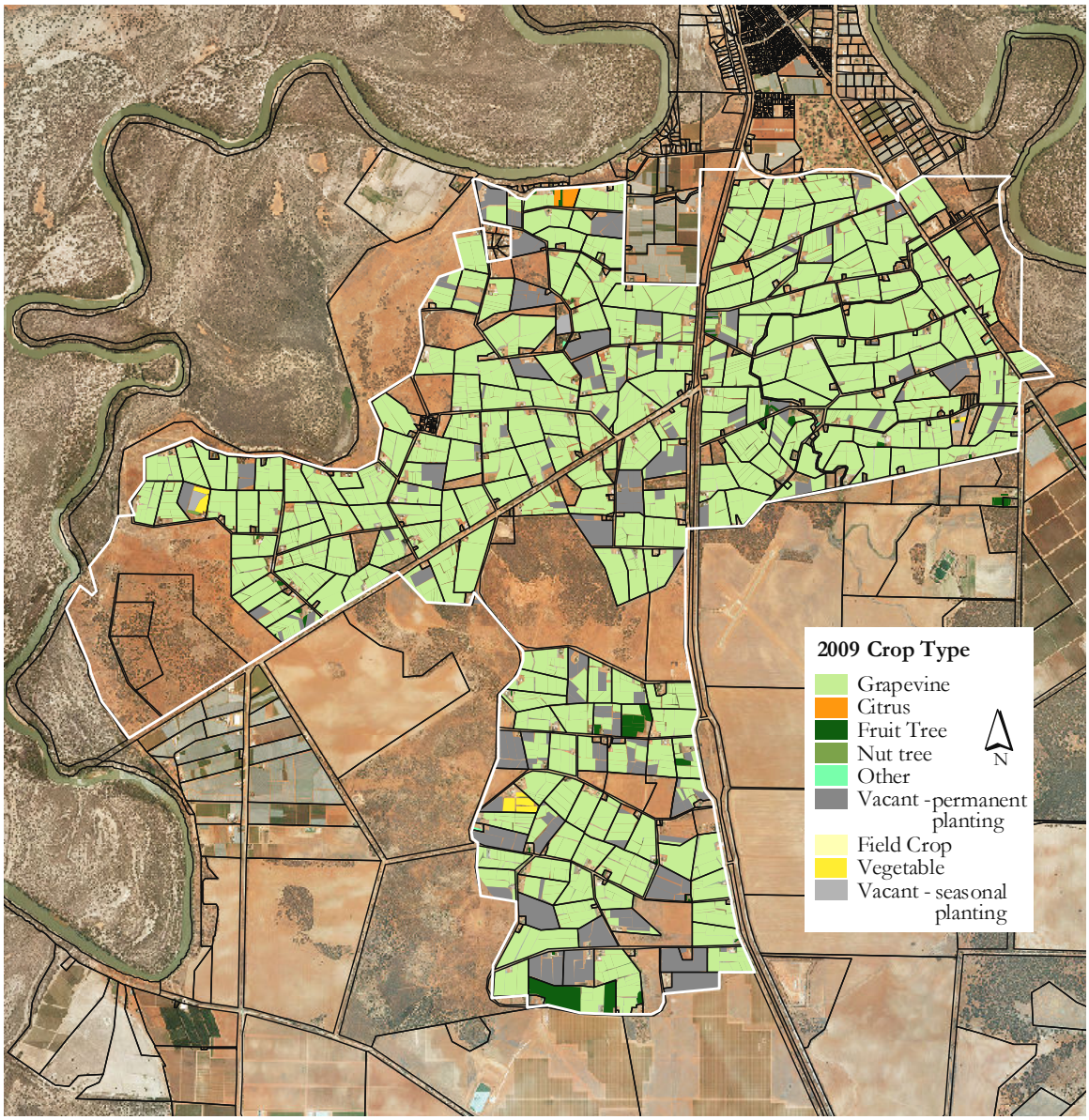
2. Pumped Irrigation Districts

2.1 Robinvale Pumped Irrigation District

The following presents information on irrigated crops in the Robinvale district from 1997 to 2009. In summary:

- The irrigated area increased by 100 hectares (a 4% increase) from 2,320 hectares in 1997 to 2,420 hectares in 2009.
- 13% of the irrigated area was vacant in the 2008-09 irrigation season; comprising 13% previously permanent plantings and 0% previously seasonal plantings.
- Grapevines grown for table grape production remained the dominant crop type from 1997 to 2009.
- The dominant irrigation method changed from 'furrow' in 1997 to 'low level' by 2003.
- Crops are predominantly in the low salinity impact zone, LIZ 2.
- The Robinvale district has approximately 133 properties, with an average property size (cropped area) of 18.2 hectares.

Map of the Robinvale district showing 2009 crop types

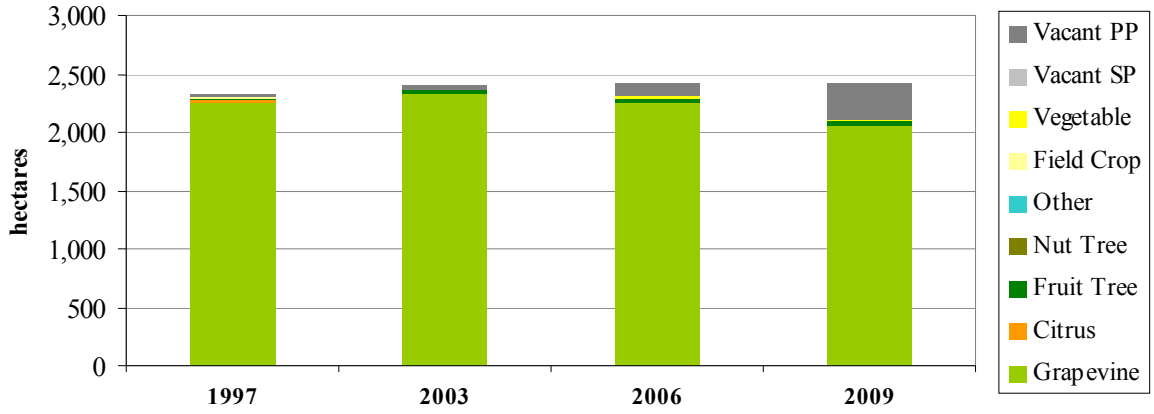


Robinvale – Crop Types

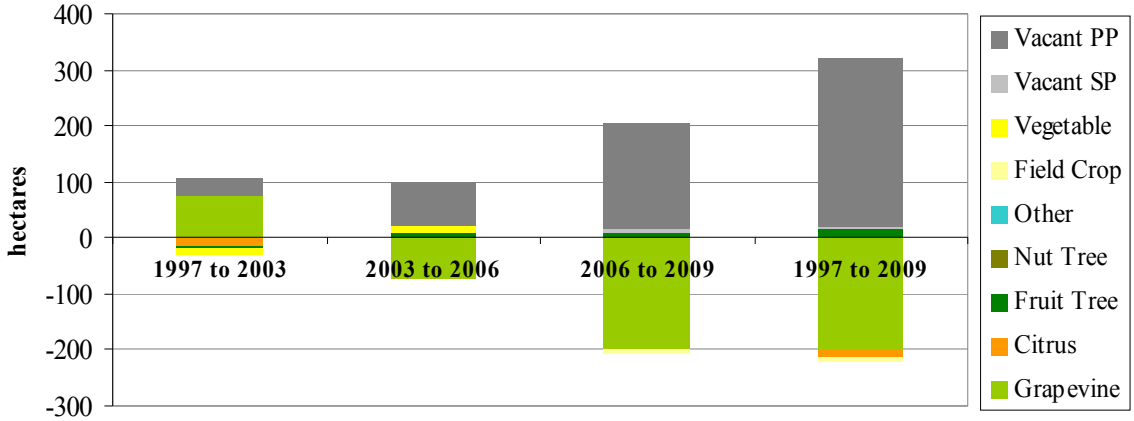
Crop Type		Area 1997	Area 2003	Area 2006	Area 2009	2009 Type 2009 Total		Change 1997 to 2009
Permanent plantings	Grapevine	2,255	2,330	2,255	2,055	85%		-200
	Citrus	20	5	5	5	0%		-15
	Fruit Tree	25	20	30	40	2%		+15
	Nut Tree	0	0	0	0	0%		0
	Other	0	0	0	0	0%		0
Seasonal crops	Field Crop	5	5	5	0	0%		-5
	Vegetable	10	0	10	10	0%		0
Vacant	Vacant SP	0	0	0	5	13%	0%	+5
	Vacant PP	5	35	115	305		13%	+300
Total hectares		**2,320**	**2,395**	**2,420**	**2,420**	**100%**		**+100**

Vacant PP = previously a permanent planting Vacant SP = previously a seasonal planting.

Crop Type per Year



Crop Type Change

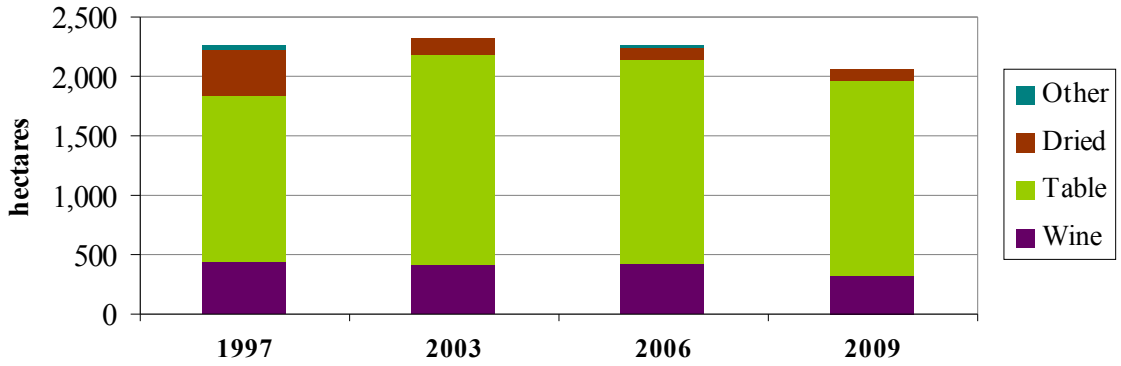


Robinvale – Grape Use

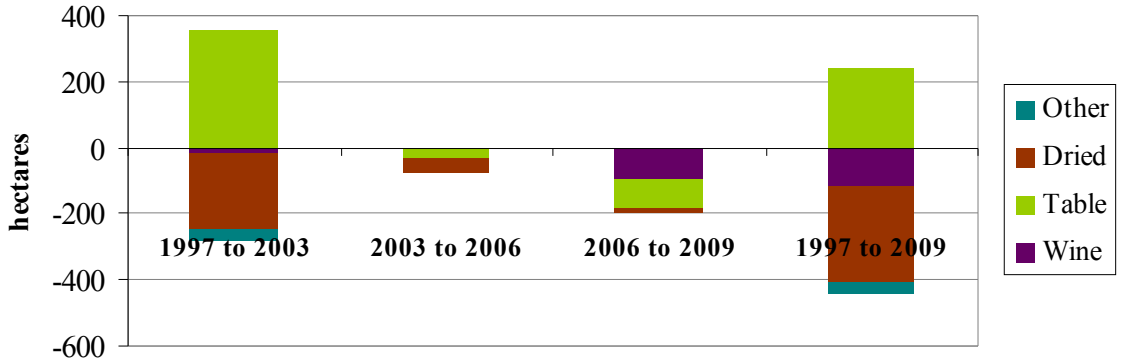
Grape Use	Area 1997	Area 2003	Area 2006	Area 2009	2009 Use 2009 Total %	Change 1997 to 2009
Wine	450	430	425	330	16%	-120
Table	1,400	1,755	1,725	1,640	80%	+240
Dried	370	140	100	85	4%	-285
Other	35	5	5	0	0%	-35
Total hectares	**2,255**	**2,330**	**2,255**	**2,055**	**100%**	**-200**

Other = juice, cannery or research

Grape Use per Year



Grape Use Change

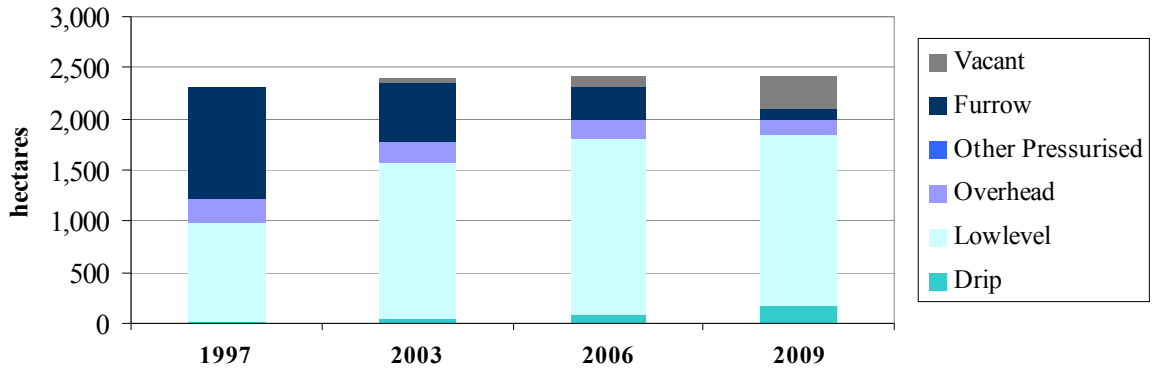


Robinvale – Irrigation Methods

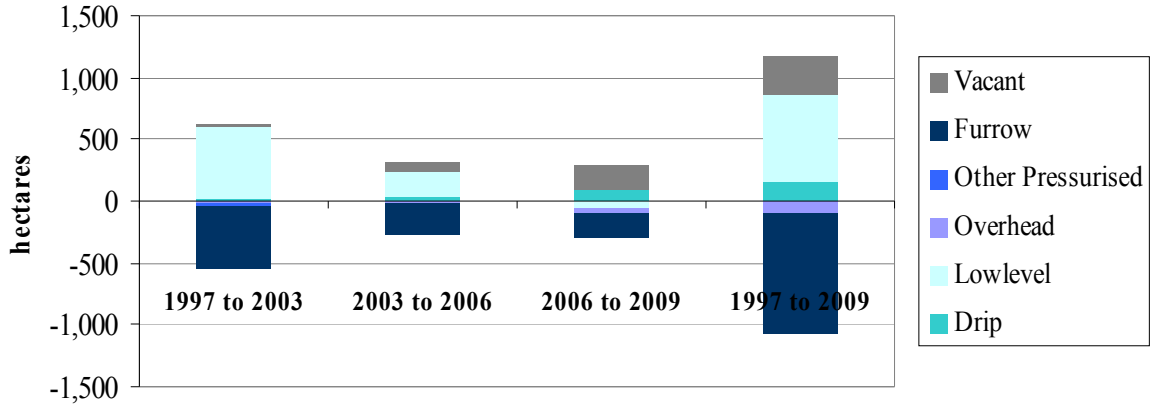
Irrigation Method	Area 1997	Area 2003	Area 2006	Area 2009	2009 Method 2009 Total %	Change 1997 to 2009
Drip	30	50	85	180	7%	+150
Low level	950	1,525	1,715	1,665	69%	+715
Overhead	235	210	190	145	6%	-90
Other pressurised	10	0	0	0	0%	-10
Furrow	1,090	575	315	120	5%	-970
Vacant	5	35	115	310	13%	+305
Total hectares	**2,320**	**2,395**	**2,420**	**2,420**	**100%**	**+100**

Other pressurised includes centre pivot and miscellaneous sprinklers

Irrigation Method per Year



Irrigation Method Change

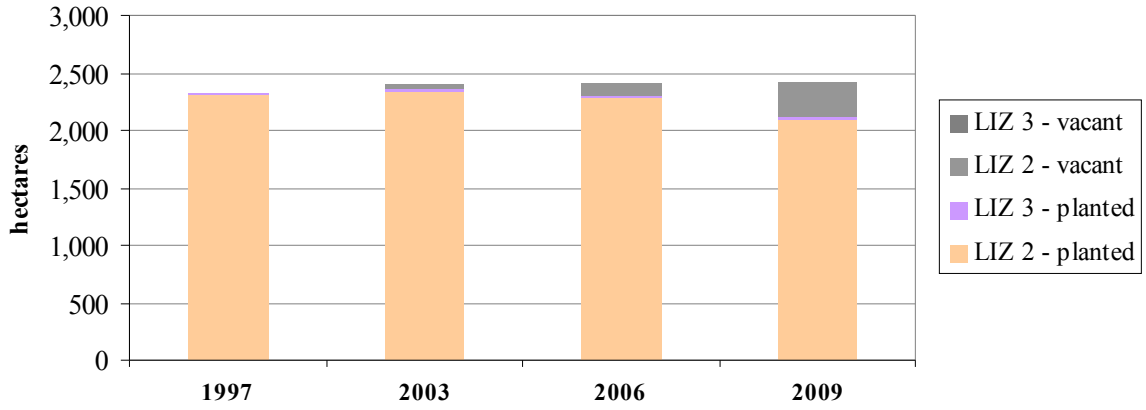


Robinvale – Salinity Impact Zones

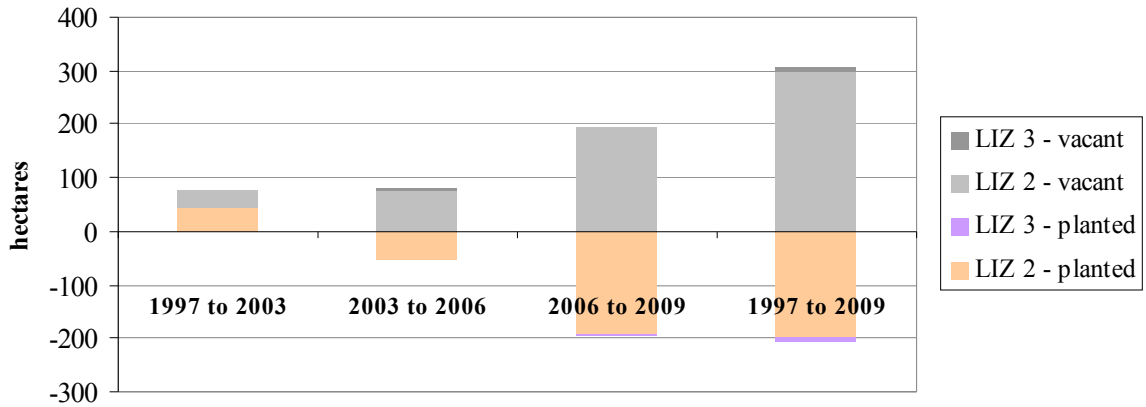
Salinity Impact Zone		Area 1997	Area 2003	Area 2006	Area 2009	2009 Zone 2009 Total %	Change 1997 to 2009
Planted	LIZ 1						
	LIZ 2	2,295	2,340	2,285	2,095	87%	-200
	LIZ 3	20	20	20	15	1%	-5
	LIZ 4						
	HIZ						
Vacant	LIZ 1						
	LIZ 2	5	35	110	305	13%	+300
	LIZ 3	0	0	5	5	0%	+5
	LIZ 4						
	HIZ						
Total hectares		**2,320**	**2,395**	**2,420**	**2,420**	**100%**	**+100**

LIZ = Low Impact Zone, HIZ = High Impact Zone. The impact zones are 'Hazard B' zones.

Salinity Impact Zone per Year



Salinity Impact Zone Change

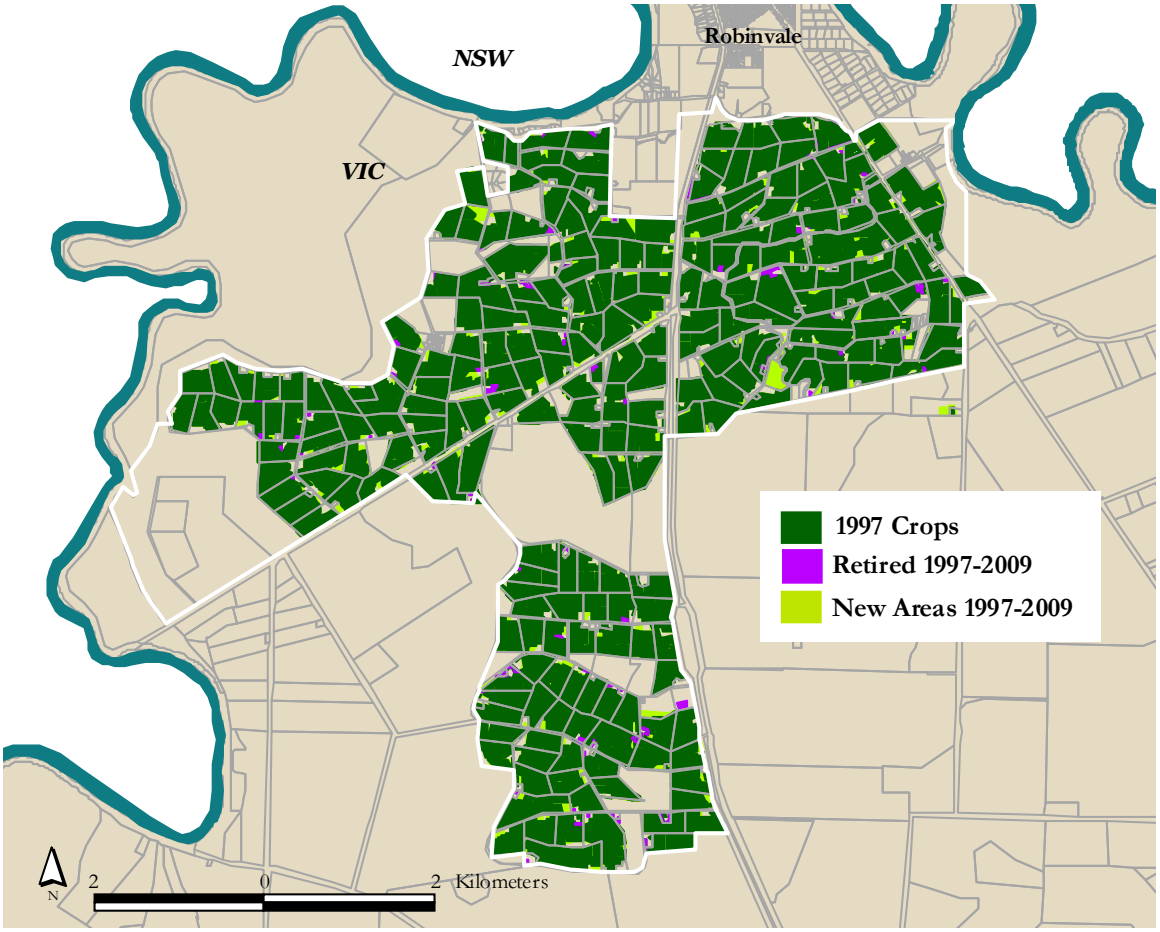


Robinvale – Irrigation Development and Property Change

Irrigation Development from 1997 to 2009

	Hectares			% of 1997
Irrigated crops in 1997 (1996-97 season)	**2,320**			
Retired between 1997 and 2009		**-20**		-1%
New areas between 1997 and 2009		**+120**		+5%
Irrigated crops in 2009 (2008-09 season)			**2,420**	

Retired = change in land use that precludes use for irrigation e.g. urban development, dam construction.



Property Change

Property Size (cropped area)	Number of Properties				Change 1997 to 2009	2009%
	1997	2003	2006	2009		
< 5 ha	4	3	4	6	+2	5%
5 to 10 ha	88	70	58	54	-34	41%
10 to 20 ha	52	55	48	40	-12	30%
20 to 40 ha	20	21	21	22	+2	17%
> 40 ha	5	8	11	11	+6	8%
Total Properties	**169**	**157**	**142**	**133**	**-36**	**100%**
Average property size (ha)	**13.7**	**15.3**	**17.0**	**18.2**		

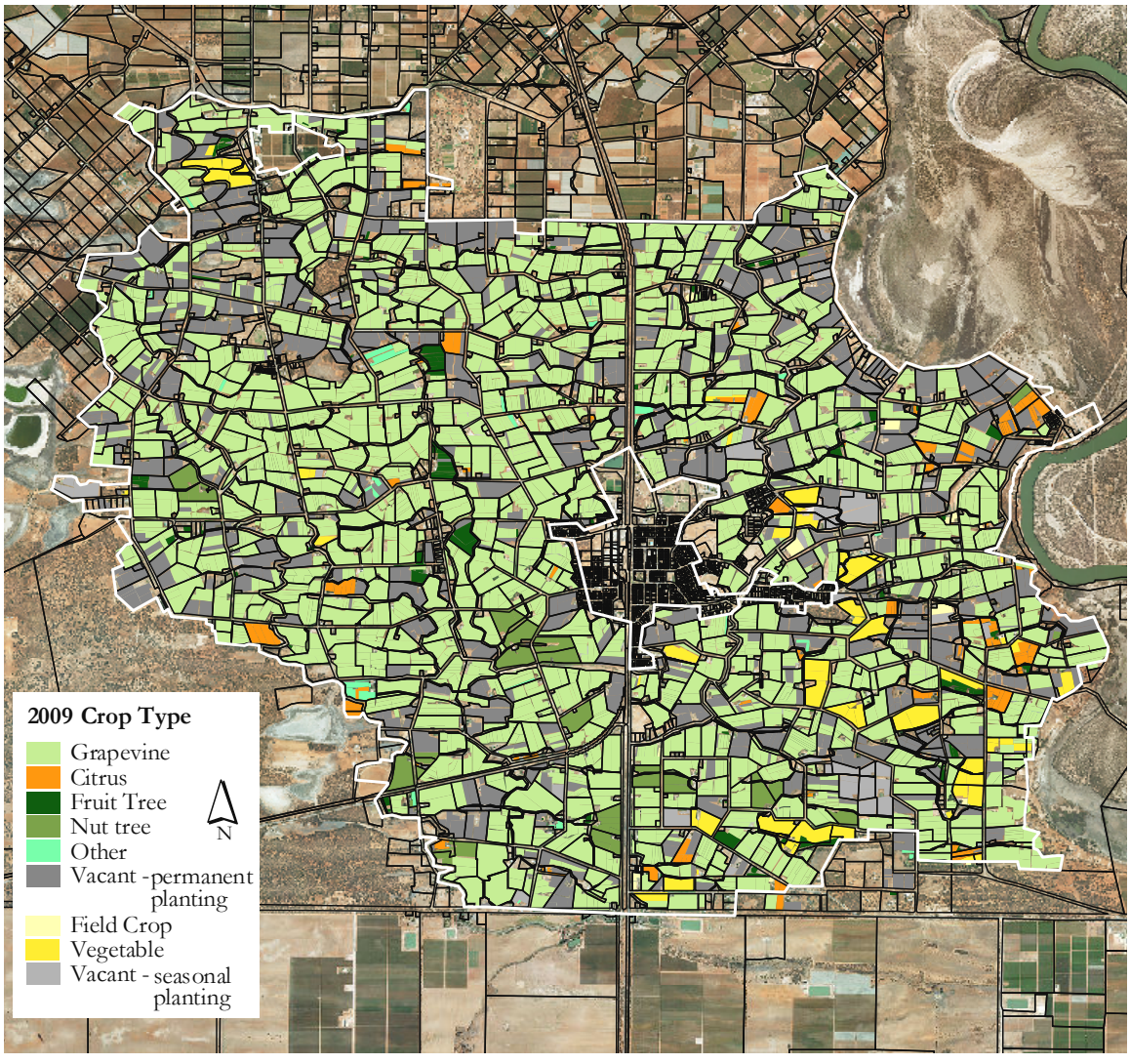
Properties irrigating less than one hectare have been excluded from the property analysis.

2.2 Red Cliffs Pumped Irrigation District

The following presents information with respect to irrigated crops for the Red Cliffs pumped irrigation district from 1997 to 2009. In summary:

- The irrigated area increased by 80 hectares, a 2% increase from 4,450 hectares in 1997 to 4,530 hectares in 2009.
- 24% of the irrigated area was vacant in the 2008-09 irrigation season; comprising 22% previously permanent plantings and 2% previously seasonal plantings.
- Grapevines grown for wine production remained the dominant crop type from 1997 to 2009.
- The dominant irrigation method changed from 'furrow' in 1997 to 'overhead' in 2003 then to 'drip' by 2009.
- The Red Cliffs district has approximately 465 properties, with an average property size (cropped area) of 9.7 hectares.
- Crops are predominantly in the high salinity impact zone, HIZ.

Map of the Red Cliffs district showing 2009 crop types

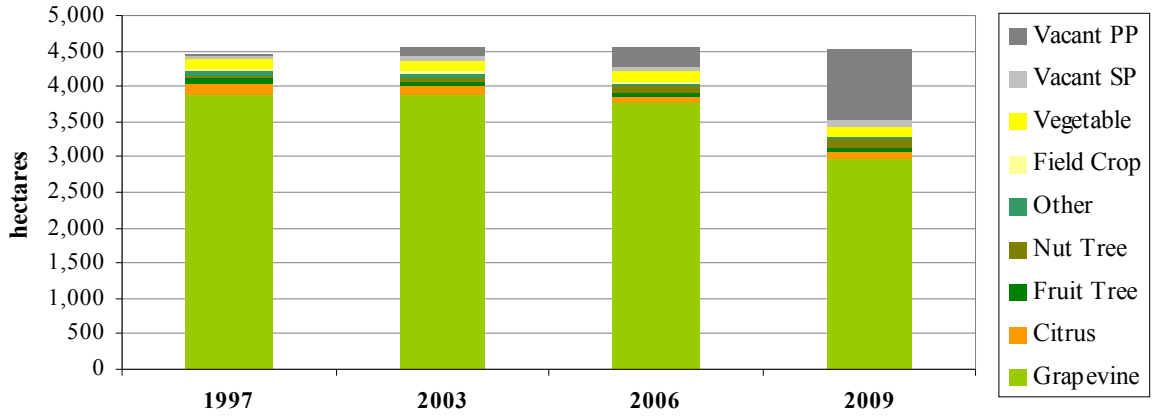


Red Cliffs District – Crop Types

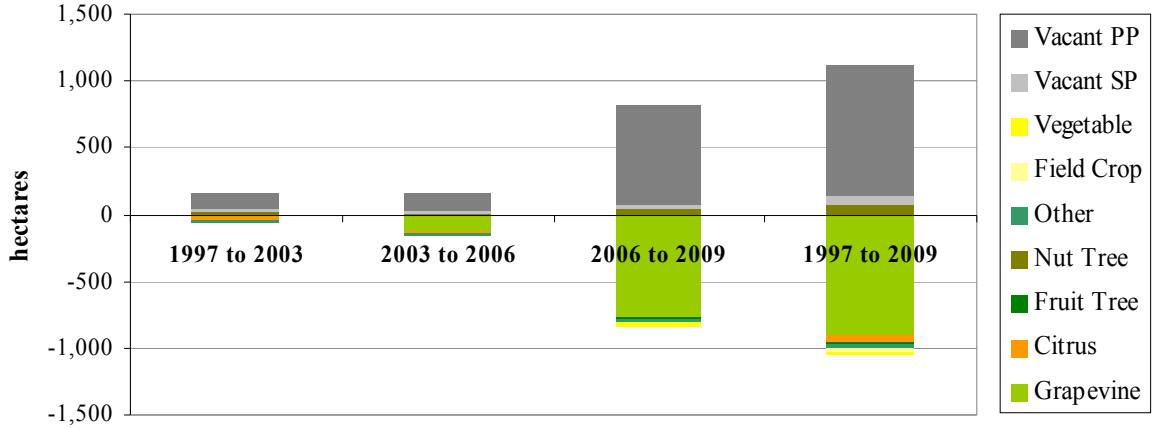
Crop Type		Area 1997	Area 2003	Area 2006	Area 2009	2009 Type 2009 Total		Change 1997 to 2009
Permanent plantings	Grapevine	3,895	3,885	3,760	2,995	66%		-900
	Citrus	140	110	100	90	2%		-50
	Fruit Tree	80	75	65	55	1%		-25
	Nut Tree	45	70	75	115	3%		+70
	Other	50	45	40	20	0%		-30
Seasonal crops	Field Crop	40	25	15	15	0%		-25
	Vegetable	160	165	170	145	3%		-15
Vacant	Vacant SP	25	40	55	95	24%	2%	+70
	Vacant PP	15	125	260	1,000		22%	+985
Total hectares		**4,450**	**4,540**	**4,540**	**4,530**	**100%**		**+80**

Vacant PP = previously a permanent planting Vacant SP = previously a seasonal planting.

Crop Type per Year



Crop Type Change

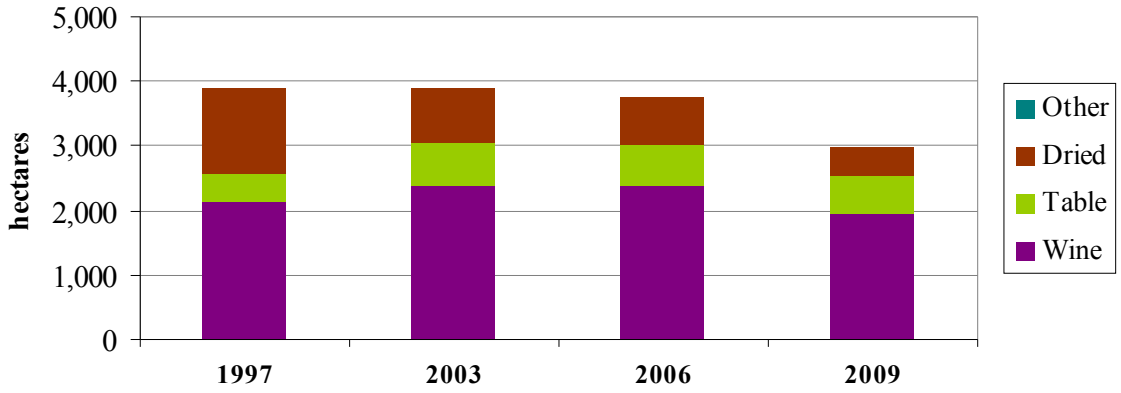


Red Cliffs District – Grape Use

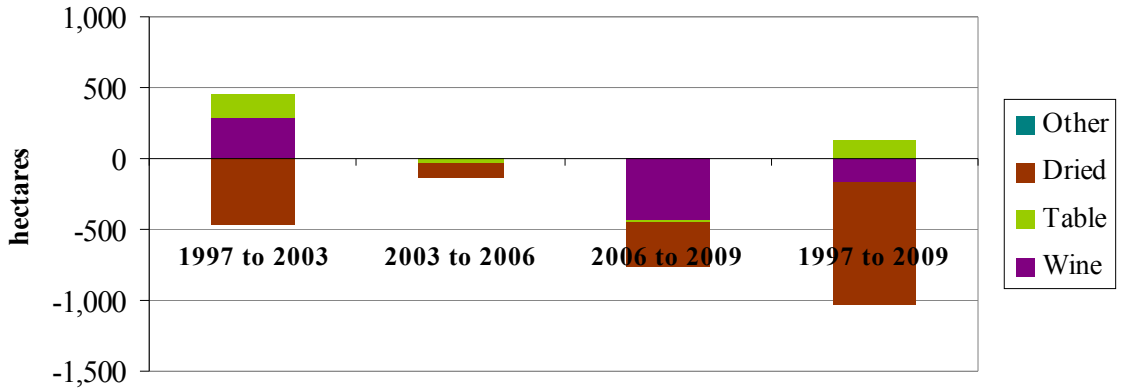
Grape Use	Area 1997	Area 2003	Area 2006	Area 2009	2009 Use 2009 Total %	Change 1997 to 2009
Wine	2,115	2,395	2,390	1,955	65%	-160
Table	470	645	610	600	20%	+130
Dried	1,310	845	760	440	15%	-870
Other						
Total hectares	**3,895**	**3,885**	**3,760**	**2,995**	**100%**	**-900**

Other = juice, cannery or research

Grape Use per Year



Grape Use Change

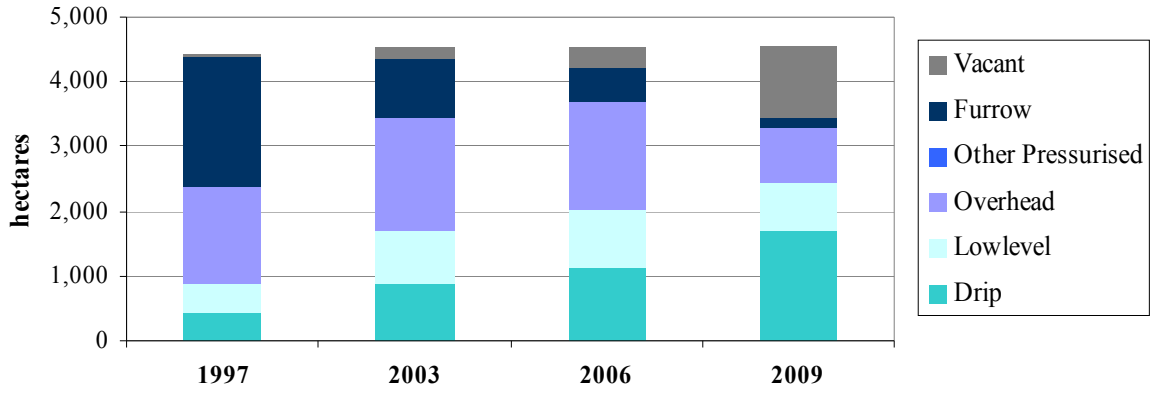


Red Cliffs District – Irrigation Methods

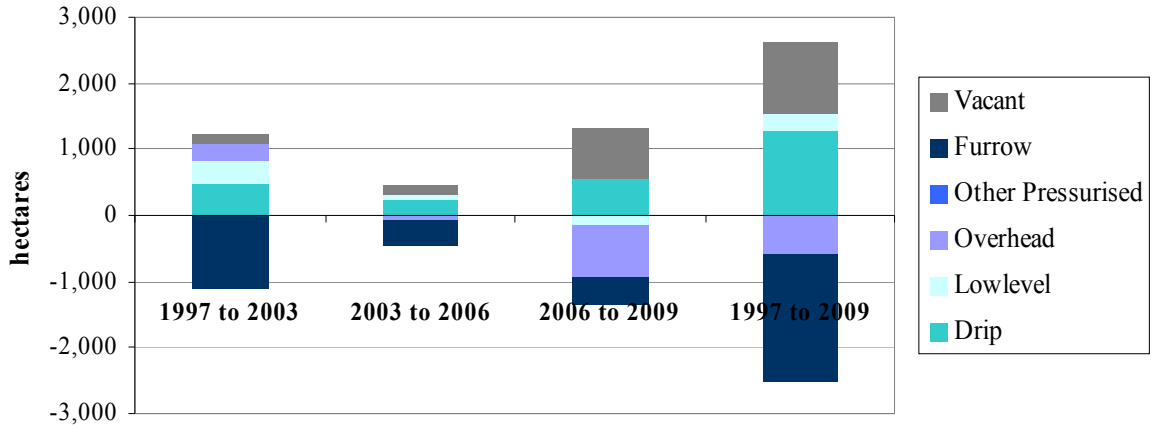
Irrigation Method	Area 1997	Area 2003	Area 2006	Area 2009	2009 Method 2009 Total %	Change 1997 to 2009
Drip	415	890	1,135	1,695	37%	+1,280
Low level	480	825	895	745	16%	+265
Overhead	1,470	1,735	1,650	875	19%	-595
Other Pressurised	15	0	0	0	0%	-15
Furrow	2,030	925	545	120	3%	-1,910
Vacant	40	165	315	1,095	24%	+1,055
Total hectares	**4,450**	**4,540**	**4,540**	**4,530**	**100%**	**+80**

Other pressurised includes centre pivot and miscellaneous sprinklers

Irrigation Method per Year



Irrigation Method Change

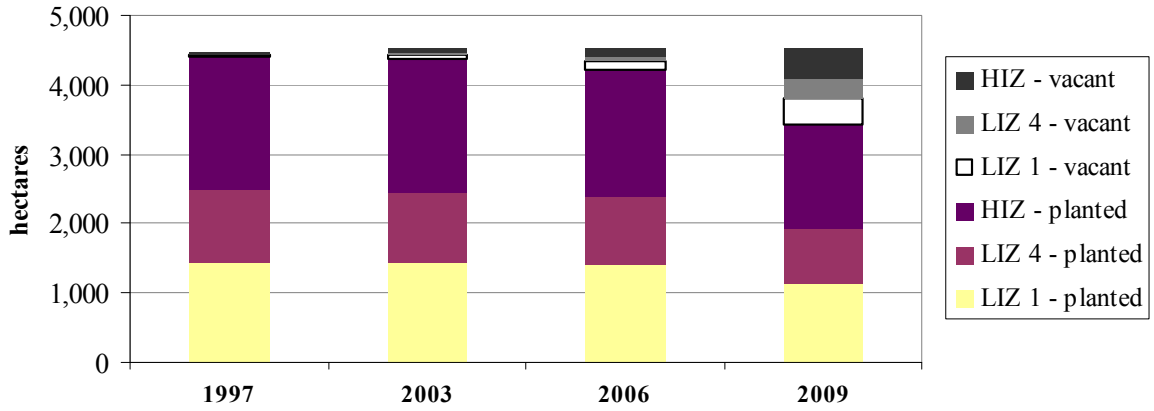


Red Cliffs District – Salinity Impact Zones

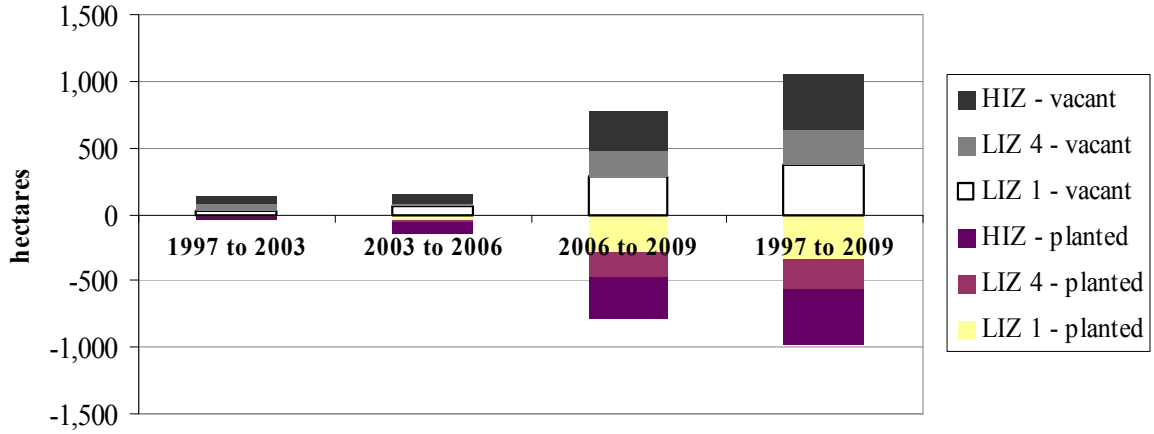
Salinity Impact Zone		Area 1997	Area 2003	Area 2006	Area 2009	2009 Zone 2009 Total %	Change 1997 to 2009
Planted	LIZ 1	1,455	1,445	1,410	1,125	25%	-330
	LIZ 2						
	LIZ 3						
	LIZ 4	1,015	1,005	980	780	17%	-235
	HIZ	1,940	1,925	1,835	1,530	34%	-410
Vacant	LIZ 1	15	45	100	385	8%	+370
	LIZ 2						
	LIZ 3						
	LIZ 4	10	50	75	275	6%	+265
	HIZ	15	70	140	435	10%	+420
Total hectares		**4,450**	**4,540**	**4,540**	**4,530**	**100%**	**+80**

LIZ = low impact zone, HIZ = high impact zone

Salinity Impact Zone per Year



Salinity Impact Zone Change

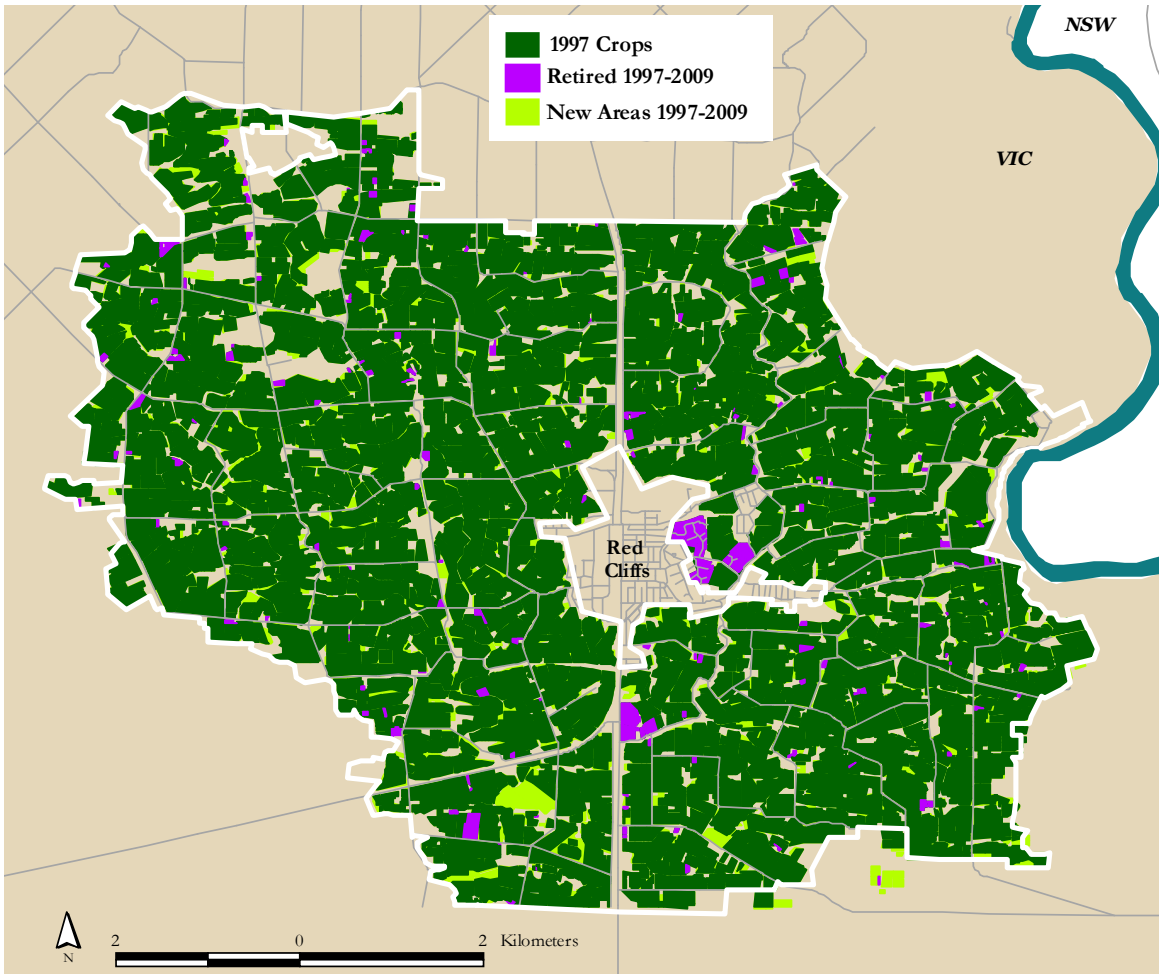


Red Cliffs District – Irrigation Development and Property Change

Irrigation Development from 1997 to 2009

	Hectares			% of 1997
Irrigated crops in 1997 (1996-97 season)	**4,450**			
Retired between 1997 and 2009		**-95**		-2%
New areas between 1997 and 2009		**+175**		+4%
Irrigated crops in 2009 (2008-09 season)			**4,530**	

Retired = change in land use that precludes use for irrigation e.g. urban development, dam construction.



Property Change

Property size (cropped area)	Number of properties				Change 1997 to 2009	2009%
	1997	2003	2006	2009		
1 to 5 ha	95	97	99	105	+10	23%
5 to 10 ha	271	250	257	220	-51	47%
10 to 20 ha	128	128	109	95	-33	20%
20 to 40 ha	17	19	23	37	+20	8%
> 40 ha	3	6	9	8	+5	2%
Total properties	**514**	**500**	**497**	**465**	**-49**	**100%**
Average property size (ha)	**8.7**	**9.1**	**9.1**	**9.7**		

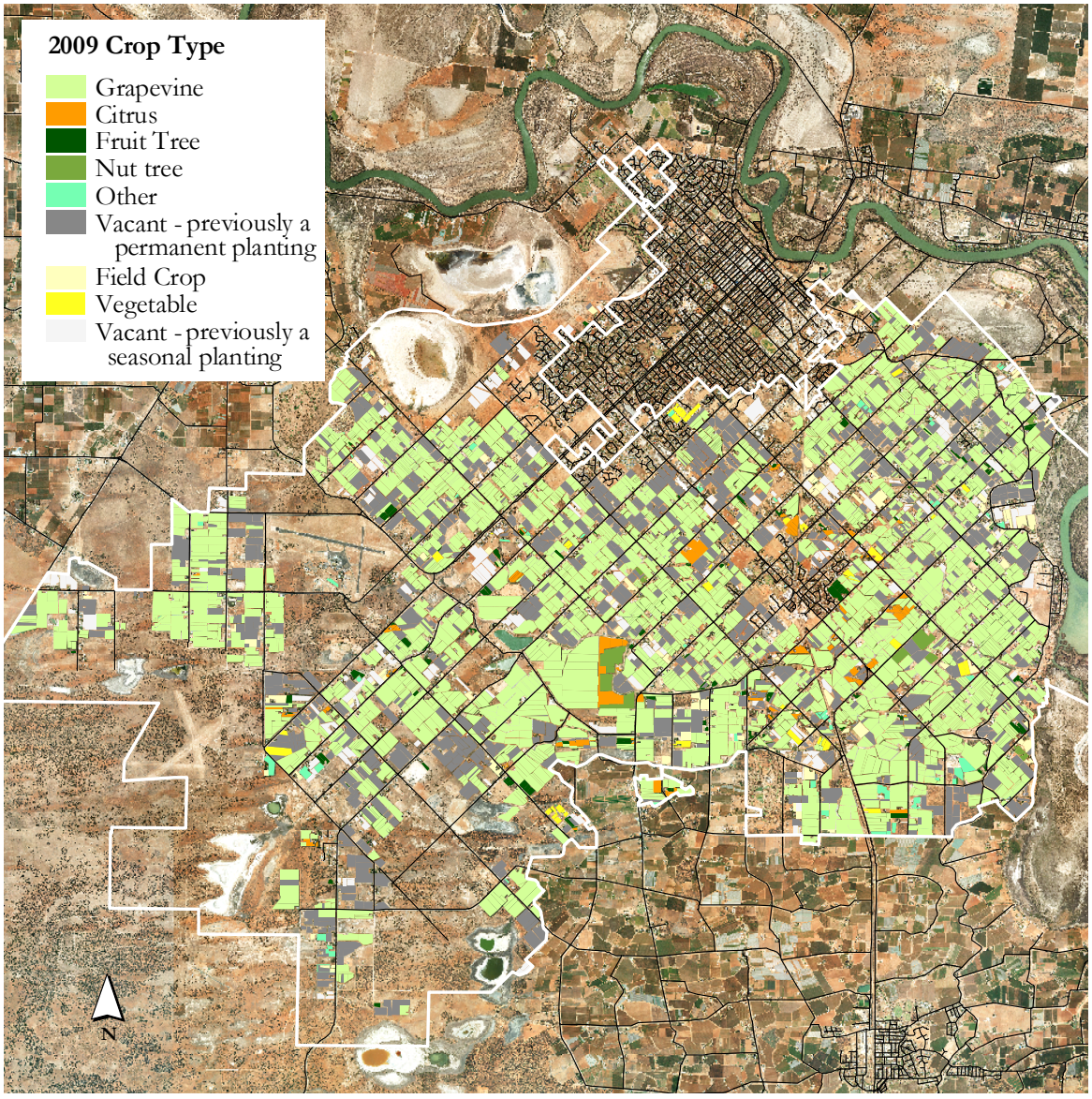
Properties irrigating less than one hectare have been excluded from the property analysis.

2.3 Mildura Pumped Irrigation District

The following presents information with respect to irrigated crops for the Mildura district from 1997 to 2009. In summary:

- The irrigated area decreased by 400 hectares (a 6% decrease) from 6,480 hectares in 1997 to 6,080 hectares in 2009.
- 30% of the irrigated area was vacant in the 2008-09 irrigation season; comprising 25% previously permanent plantings and 5% previously seasonal plantings.
- Grapevines grown for wine production remained the dominant crop type from 1997 to 2009.
- The dominant irrigation method changed from 'furrow' in 1997, to 'overhead' by 2003 and then to 'drip' by 2009.
- The Mildura district has approximately 735 properties, with an average property size (cropped area) of 8.3 hectares.
- Crops are predominantly in the high salinity impact zone, HIZ.

Map of the Mildura irrigation district showing 2009 crop types

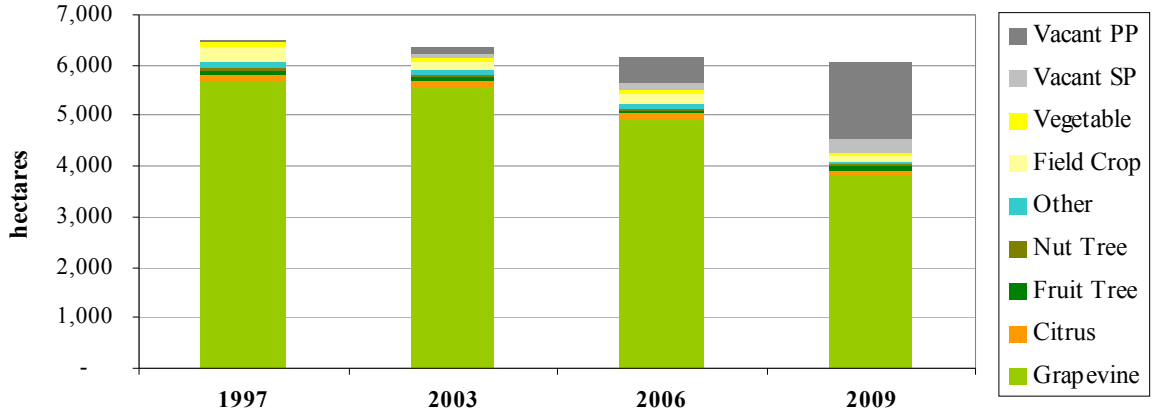


Mildura Irrigation District – Crop Types

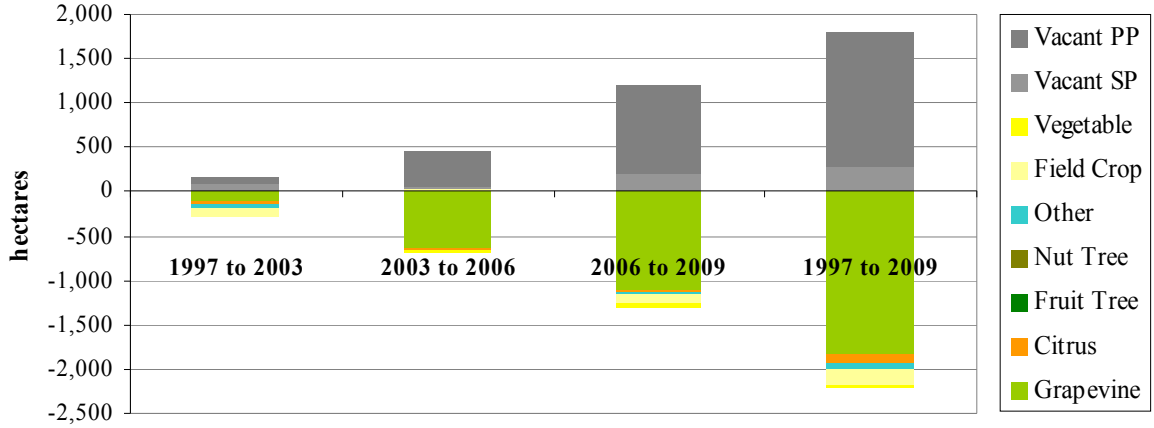
Crop Type		Area 1997	Area 2003	Area 2006	Area 2009	2009 Type 2009 Total		Change 1997 to 2009
Permanent plantings	Grapevine	5,675	5,565	4,935	3,835	63%		-1,840
	Citrus	165	135	115	85	1%		-80
	Fruit Tree	75	70	65	70	1%		-5
	Nut Tree	35	30	35	50	1%		+15
	Other	130	100	85	50	1%		-80
Seasonal crops	Field Crop	275	180	210	110	2%		-165
	Vegetable	85	90	85	55	1%		-30
Vacant	Vacant SP	20	90	110	290	30%	5%	+270
	Vacant PP	20	115	530	1,535		25%	+1,515
Total hectares		**6,480**	**6,375**	**6,170**	**6,080**	**100%**		**-400**

Vacant PP = previously a permanent planting Vacant SP = previously a seasonal planting.

Crop Type per Year



Crop Type Change

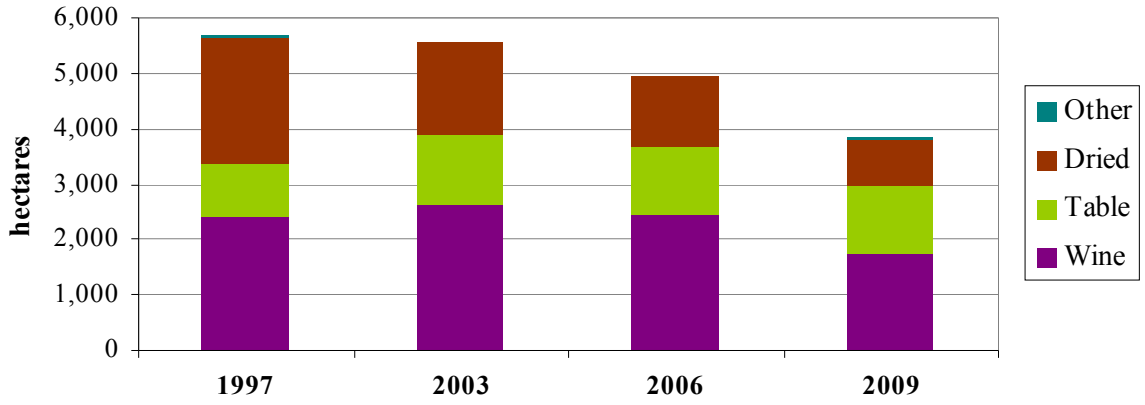


Mildura Irrigation District – Grape Use

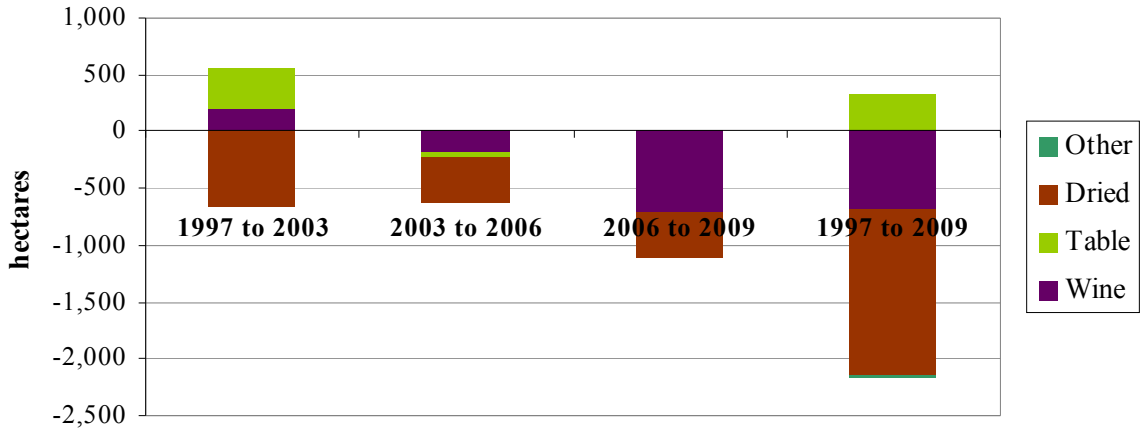
Grape Use	Area 1997	Area 2003	Area 2006	Area 2009	2009 Use 2009 Total %	Change 1997 to 2009
Wine	2,430	2,620	2,440	1,740	45%	-690
Table	925	1,290	1,245	1,240	33%	+315
Dried	2,310	1,650	1,245	850	22%	-1,460
Other	10	5	5	5	0%	-5
Total hectares	**5,675**	**5,565**	**4,935**	**3,835**	**100%**	**-1,840**

Other = juice, cannery or research

Grape Use per Year



Change in Grape Use

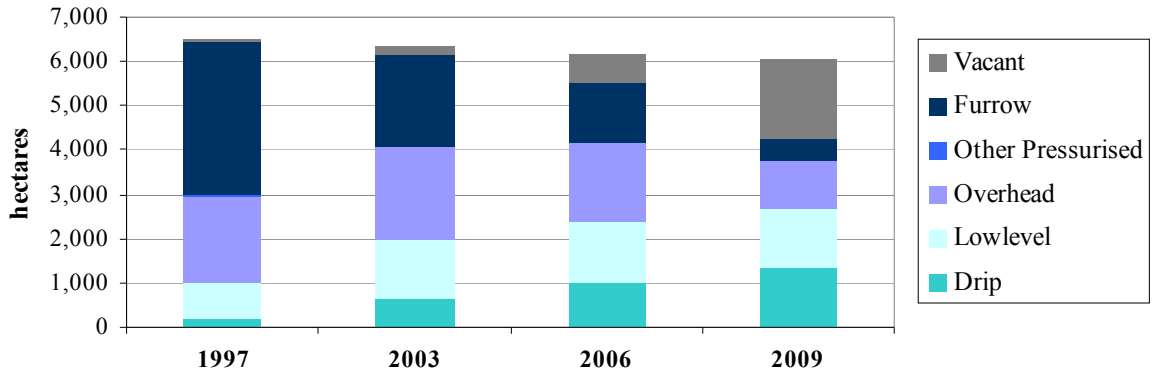


Mildura Irrigation District – Irrigation Methods

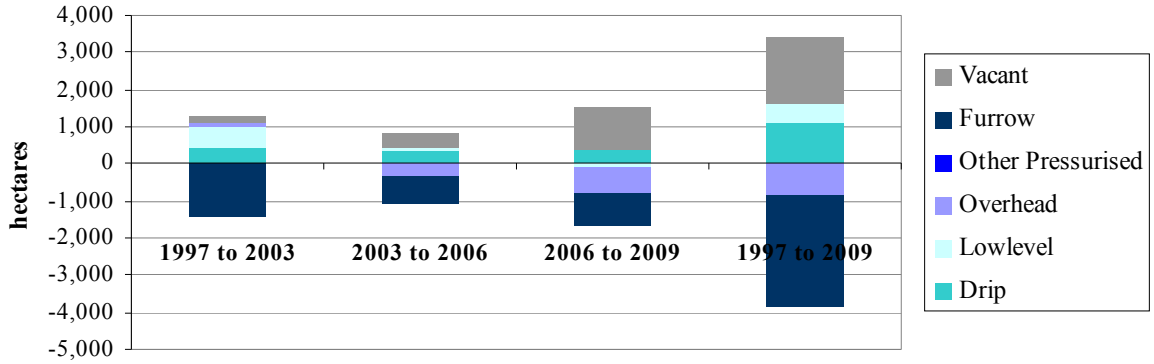
Irrigation Method	Area 1997	Area 2003	Area 2006	Area 2009	2009 Method 2009 Total	Change 1997 to 2009
Drip	215	640	980	1,335	22%	+1,120
Low level	790	1,350	1,425	1,325	22%	+535
Overhead	1,930	2,080	1,765	1,105	18%	-825
Other Pressurised	25	20	15	15	0%	-10
Furrow	3,480	2,080	1,345	475	8%	-3,005
Vacant	40	205	640	1,825	30%	+1,785
Total hectares	**6,480**	**6,375**	**6,170**	**6,080**	**100%**	**-400**

Other pressurised includes centre pivot and miscellaneous sprinklers

Irrigation Method per Year



Change in Irrigation Methods

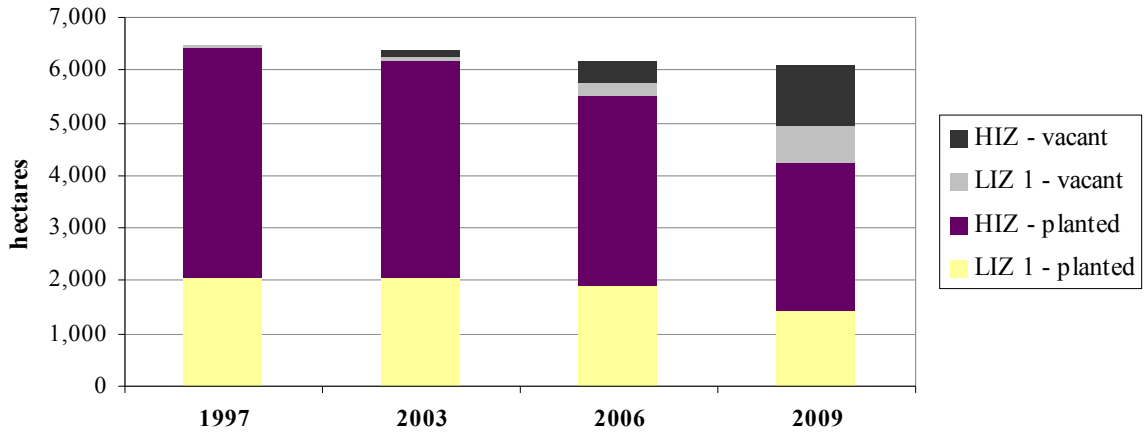


Mildura District – Salinity Impact Zones

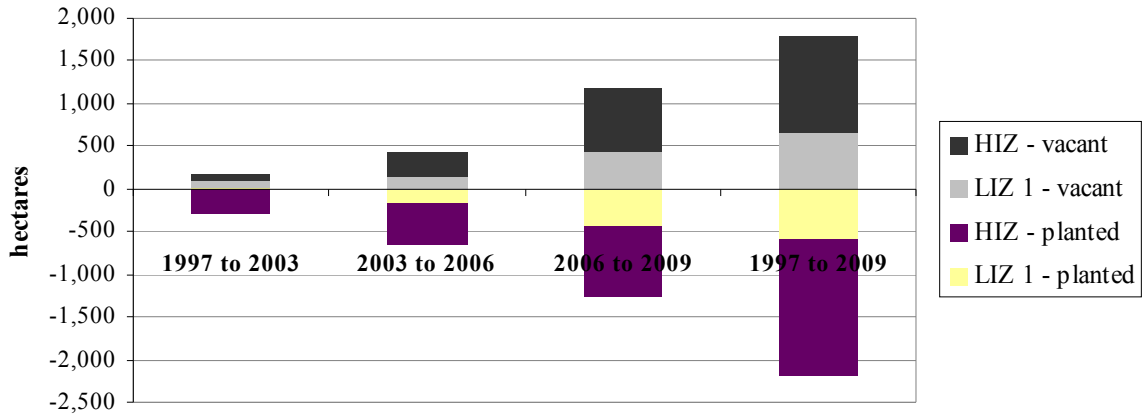
Salinity Impact Zone		Area 1997	Area 2003	Area 2006	Area 2009	2009 Zone 2009 Total	Change 1997 to 2009
Planted	LIZ 1	2,040	2,060	1,895	1,450	24%	-590
	LIZ 2						
	LIZ 3						
	LIZ 4						
	HIZ	4,400	4,110	3,635	2,805	46%	-1,595
Vacant	LIZ 1	25	90	250	680	11%	+655
	LIZ 2						
	LIZ 3						
	LIZ 4						
	HIZ	15	115	390	1,145	19%	+1,130
Total hectares		**6,480**	**6,375**	**6,170**	**6,080**	**100%**	**-400**

LIZ = low impact zone, HIZ = high impact zone.

Salinity Impact Zone per Year



Salinity Impact Zone Change

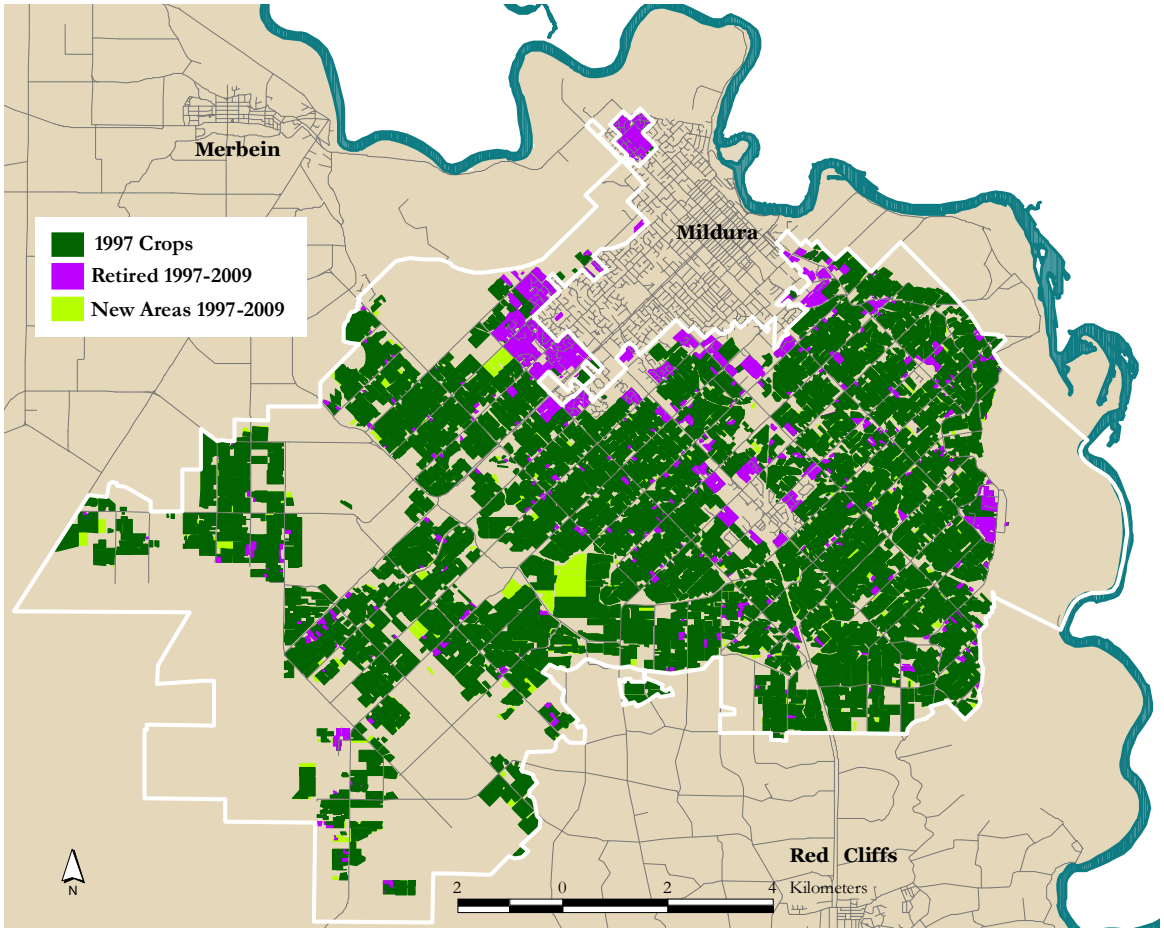


Mildura – Irrigation Development and Property Change

Irrigation Development from 1997 to 2009

	Hectares			% of 1997
Irrigated crops in 1997 (1996-97 season)	**6,480**			
Retired between 1997 and 2009		**-610**		**-9%**
New areas between 1997 and 2009		**+210**		**+3%**
Irrigated crops in 2009 (2008-09 season)			**6,080**	

Retired = change in land use that precludes use for irrigation e.g. urban development, dam construction.



Property Change

Property Size (cropped area)	Number of Properties				2009 %	Change 1997 to 2009
	1997	2003	2006	2009		
1 to 5 ha	385	370	358	359	49%	-26
5 to 10 ha	238	226	219	192	26%	-46
10 to 20 ha	166	146	143	128	17%	-38
20 to 40 ha	45	45	39	42	6%	-3
> 40 ha	5	11	12	14	2%	+9
Total Properties	**839**	**798**	**771**	**735**	**100%**	**-104**
Average property size (ha)	**7.7**	**8.0**	**8.0**	**8.3**		

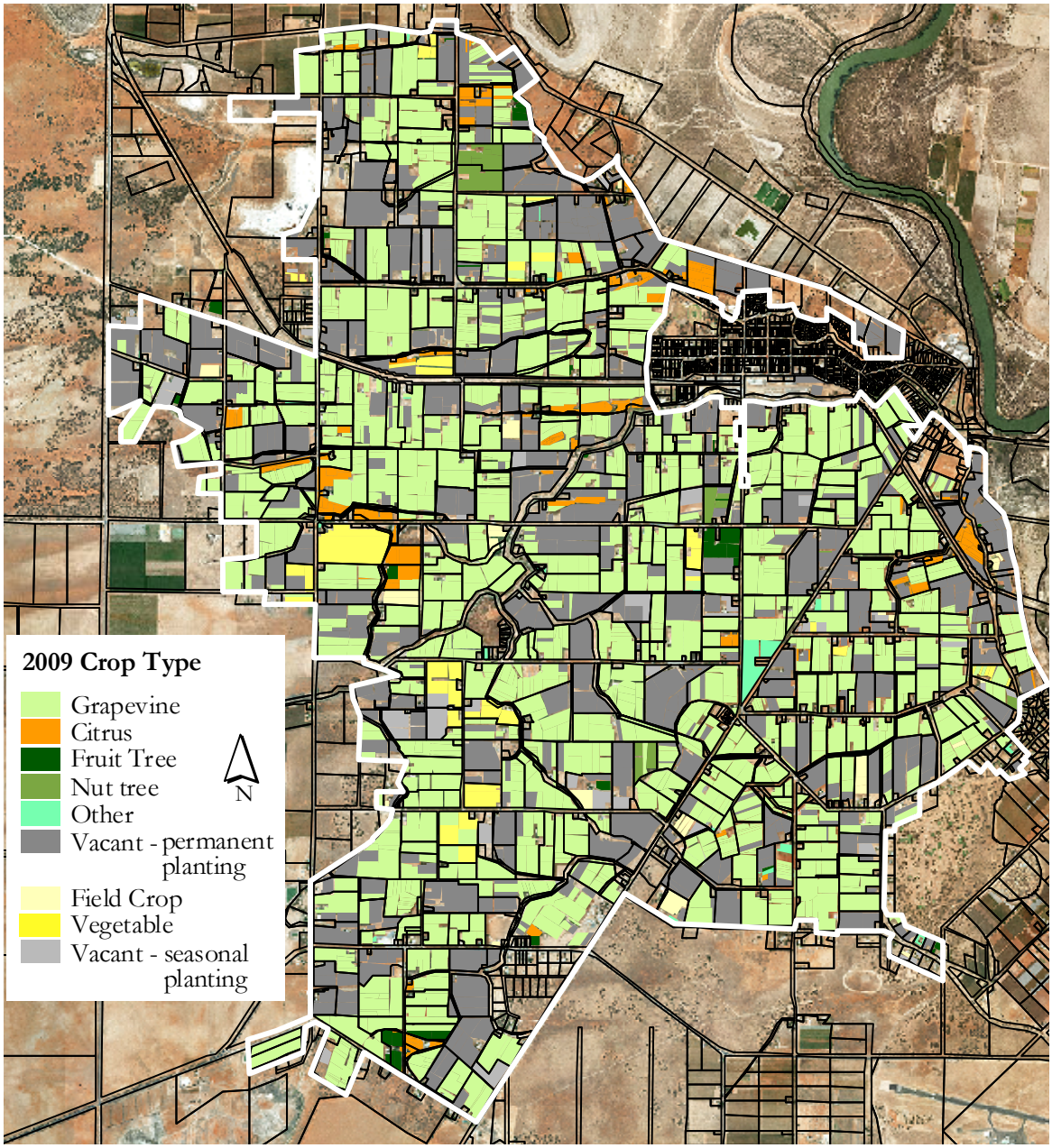
Properties irrigating less than one hectare have been excluded from the property analysis.

2.4 Merbein Pumped Irrigation District

The following presents information with respect to irrigated crops for the Merbein pumped irrigation district from 1997 to 2009. In summary:

- The irrigated area decreased by 50 hectares, a 2% decrease from 3,130 hectares in 1997 to 3,080 hectares in 2009.
- 35% of the irrigated area was vacant in the 2008-09 irrigation season; comprising 33% previously permanent plantings and 2% previously seasonal plantings.
- Grapevines remained the dominant crop type from 1997 to 2009. These were predominantly for dried grape production until 2006, and then for wine grape production in 2009.
- The dominant irrigation method was 'furrow' until 2006, then 'drip' in 2009.
- Merbein has approximately 314 properties, with an average size (crop area) of 9.8 ha.
- Crops are predominantly grown in the high salinity impact zone, HIZ.

Map of the Merbein district showing 2009 crop types

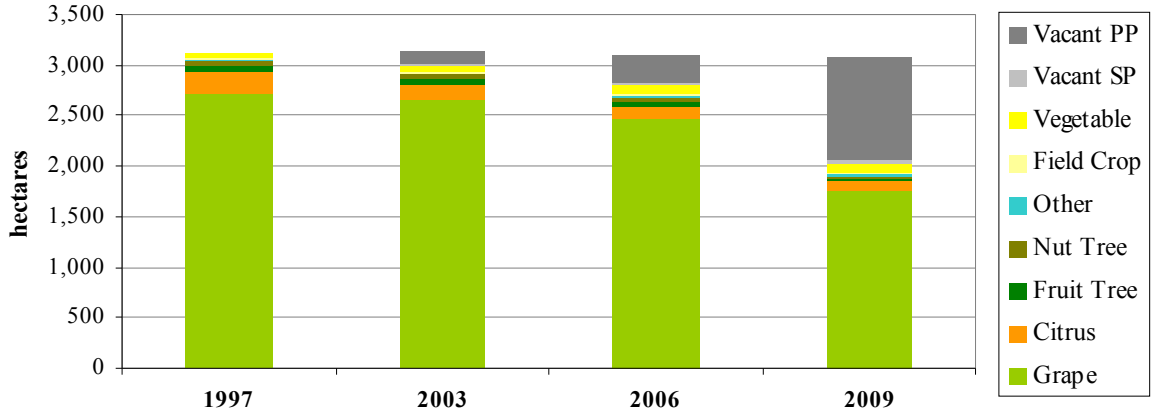


Merbein Irrigation District – Crop Types

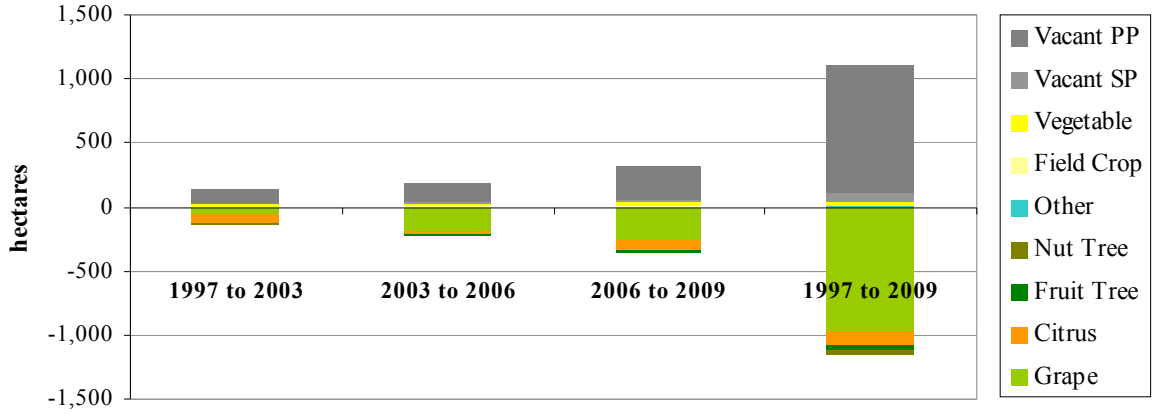
Crop Type		Area 1997	Area 2003	Area 2006	Area 2009	2009 Type 2009 Total		Change 1997 to 2009
Permanent plantings	Grapevine	2,725	2,660	2,465	1,760	57%		-965
	Citrus	210	145	130	85	3%		-125
	Fruit Tree	55	55	45	25	1%		-30
	Nut Tree	50	45	40	25	1%		-25
	Other	10	10	10	15	0%		+5
Seasonal crops	Field Crop	20	20	30	25	1%		+5
	Vegetable	45	65	80	80	3%		+35
Vacant	Vacant SP	5	10	20	60	35%	2%	+55
	Vacant PP	10	125	280	1,005		33%	+995
Total hectares		**3,130**	**3,135**	**3,100**	**3,080**	**100%**		**-50**

Vacant PP = previously a permanent planting Vacant SP = previously a seasonal planting.

Crop Type per Year



Crop Type Change

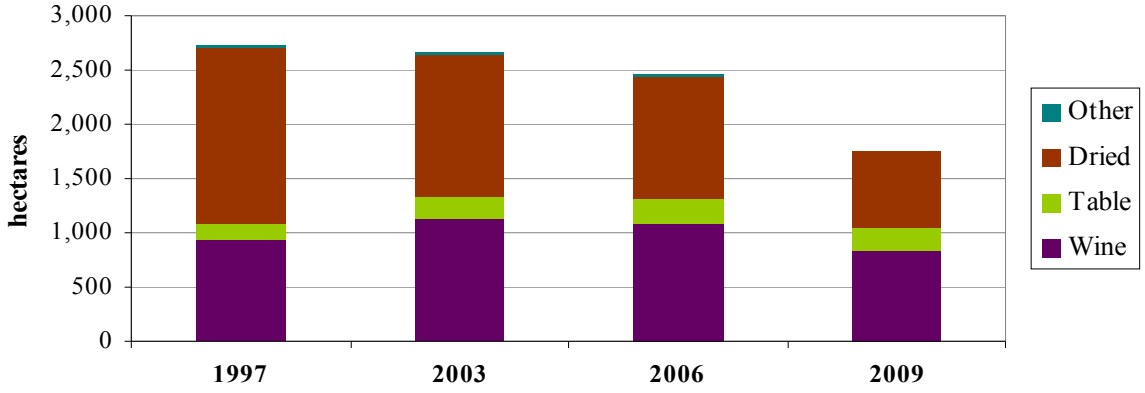


Merbein District – Grape Use

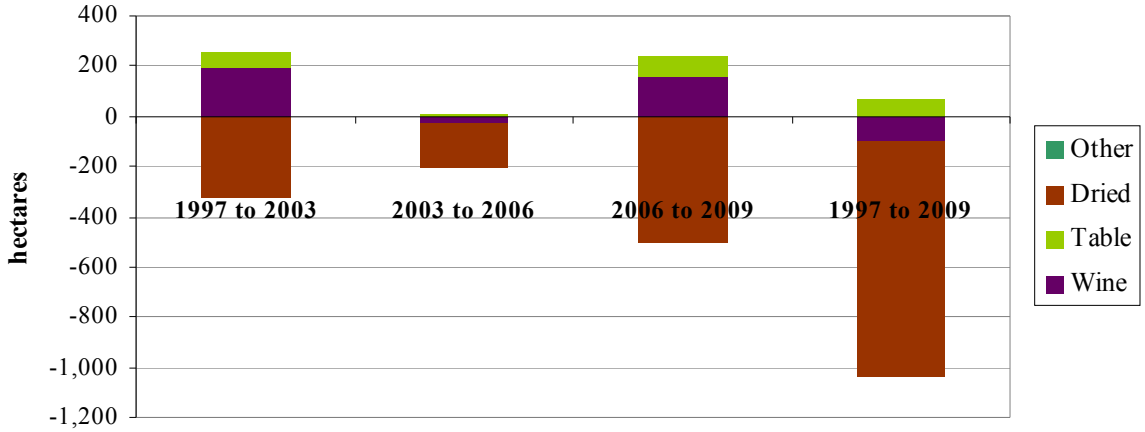
Grape Use	Area 1997	Area 2003	Area 2006	Area 2009	2009 Use 2009 Total %	Change 1997 to 2009
Wine	930	1,120	1,090	825	47%	-105
Table	150	220	230	220	13%	+70
Dried	1,625	1,300	1,125	695	39%	-930
Other	20	20	20	20	1%	0
Total hectares	**2,725**	**2,660**	**2,465**	**1,760**	**100%**	**-965**

Other = juice, cannery or research

Grape Use per Year



Grape Use Change

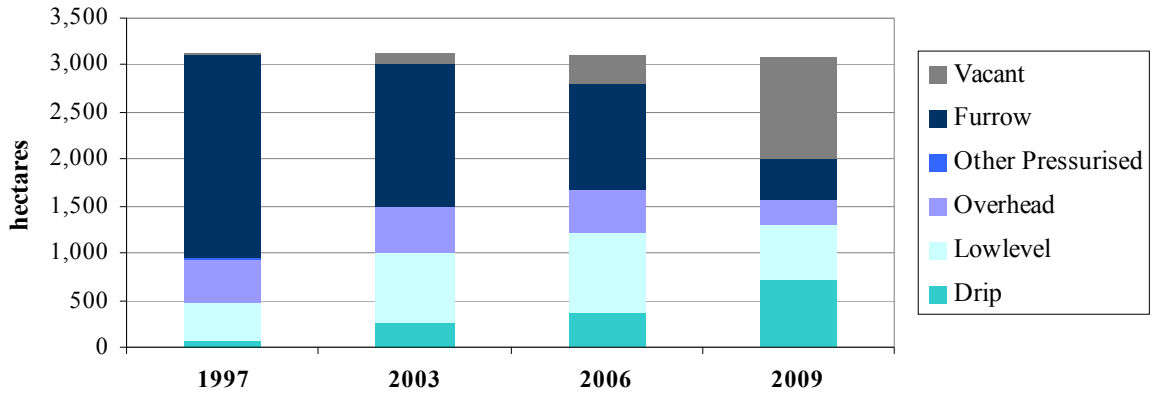


Merbein – Irrigation Methods

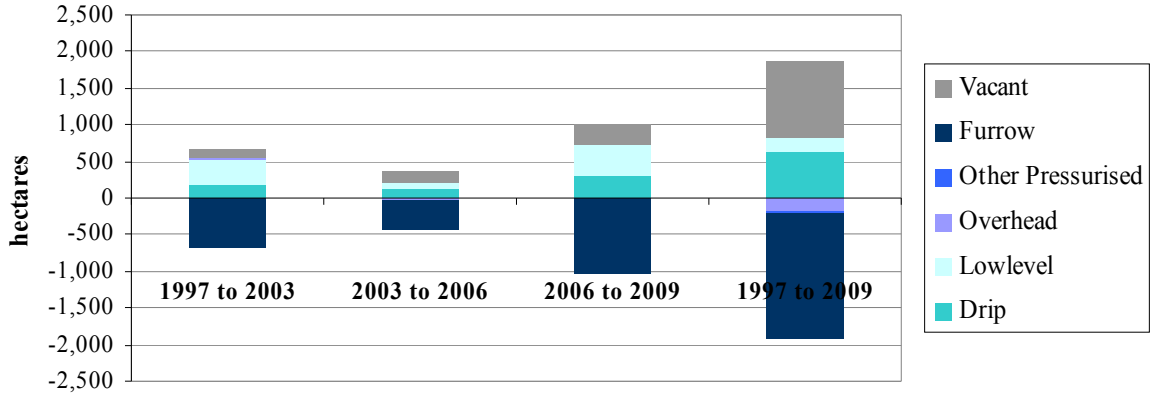
Irrigation Method	Area 1997	Area 2003	Area 2006	Area 2009	2009 Method 2009 Total	Change 1997 to 2009
Drip	70	265	375	720	23%	+650
Low level	405	730	830	580	19%	+175
Overhead	465	500	465	275	9%	-190
Other Pressurised	15	10	15	0	0%	-15
Furrow	2,160	1,495	1,115	440	14%	-1,720
Vacant	15	135	300	1,065	35%	+1,050
Total hectares	**3,130**	**3,135**	**3,100**	**3,080**	**100%**	**-50**

Other pressurised includes centre pivot and miscellaneous sprinklers

Irrigation Method per Year



Irrigation Method Change

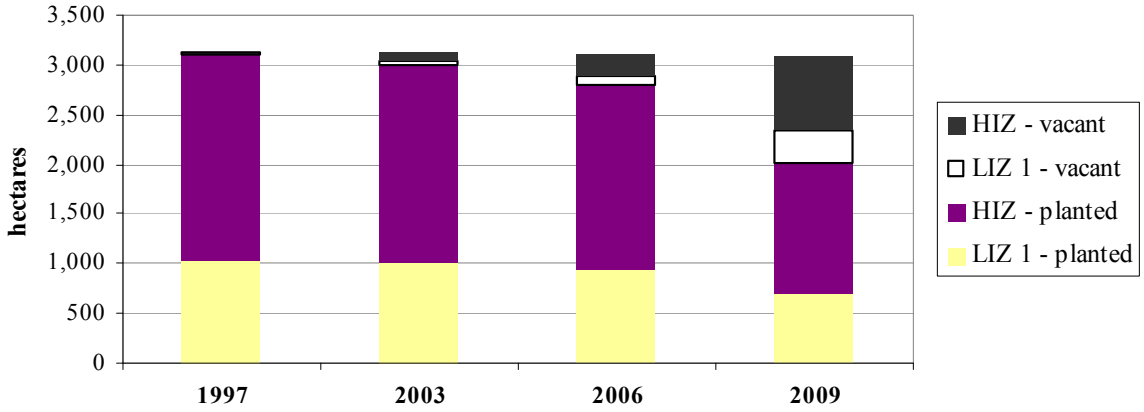


Merbein – Salinity Impact Zones

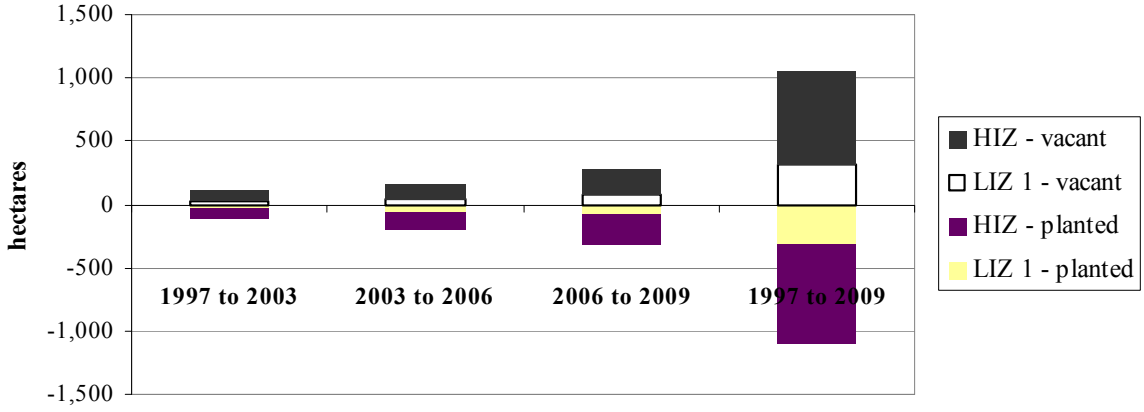
Salinity Impact Zone		Area 1997	Area 2003	Area 2006	Area 2009	2009 Zone 2009 Total %	Change 1997 to 2009
Planted	LIZ 1	1,020	1,000	940	700	23%	-320
	LIZ 2						
	LIZ 3						
	LIZ 4						
	HIZ	2,095	2,000	1,860	1,315	43%	-780
Vacant	LIZ 1	10	35	85	325	11%	+315
	LIZ 2						
	LIZ 3						
	LIZ 4						
	HIZ	5	100	215	740	24%	+735
Total hectares		**3,130**	**3,135**	**3,100**	**3,080**	**100%**	**-50**

LIZ = low impact zone, HIZ = high impact zone

Salinity Impact Zone per Year



Salinity Impact Zone Change

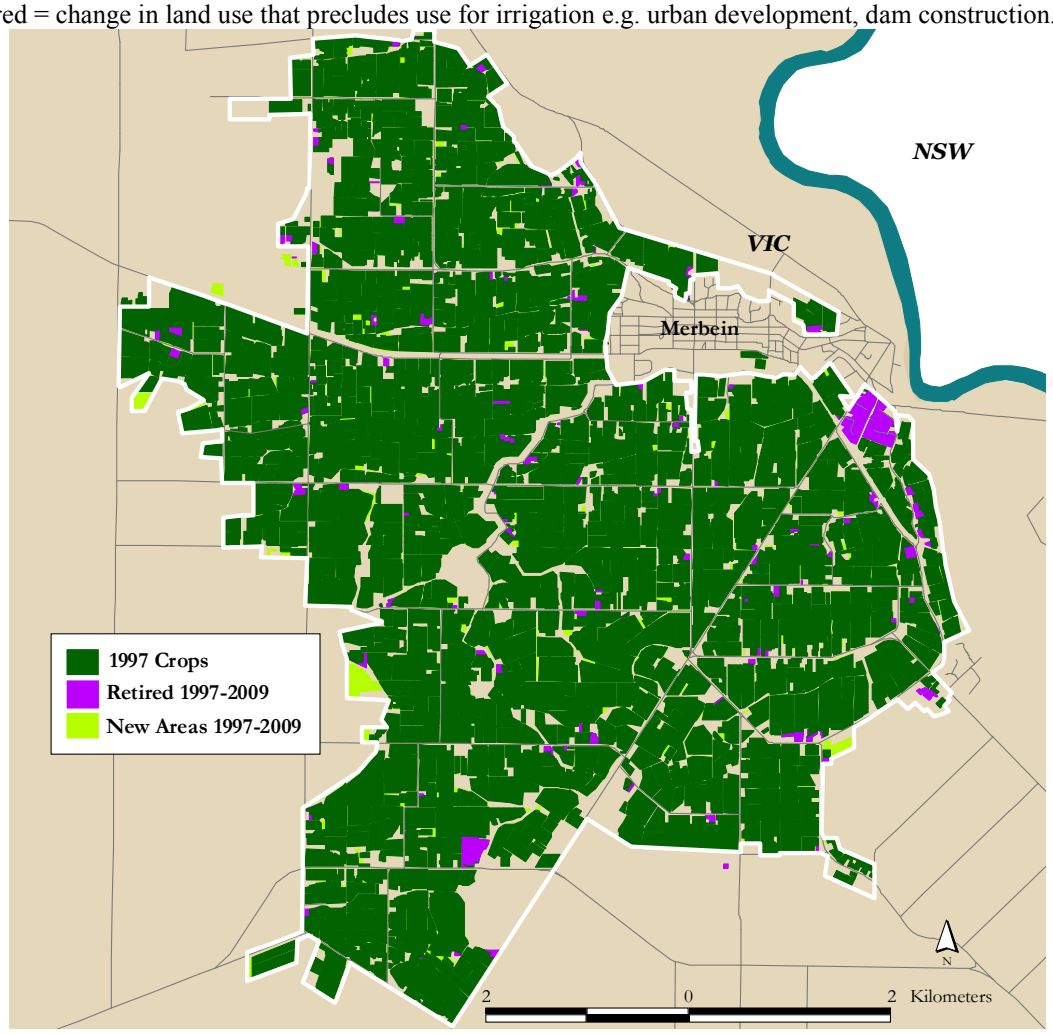


Merbein – Irrigation Development and Property Change

Irrigation Development from 1997 to 2009

	Hectares			% of 1997
Irrigated crops in 1997 (1996-97 season)	**3,130**			
Retired between 1997 and 2009		**-75**		-2%
New areas between 1997 and 2009		**+25**		+1%
Irrigated crops in 2009 (2008-09 season)			**3,080**	

Retired = change in land use that precludes use for irrigation e.g. urban development, dam construction.



Property Change

Property size (cropped area)	Number of properties				Change 1997 to 2009	2009%
	1997	2003	2006	2009		
< 5 ha	77	84	83	80	+3	25%
5 to 10 ha	139	119	122	126	-13	40%
10 to 20 ha	94	99	92	84	-10	27%
20 to 40 ha	17	16	19	20	+3	6%
> 40 ha	2	3	3	4	+2	1%
Total properties	**329**	**321**	**319**	**314**	**-15**	**100%**
Average property size (ha)	**9.5**	**9.8**	**9.7**	**9.8**		

Properties irrigating less than one hectare have been excluded from analysis on property numbers.

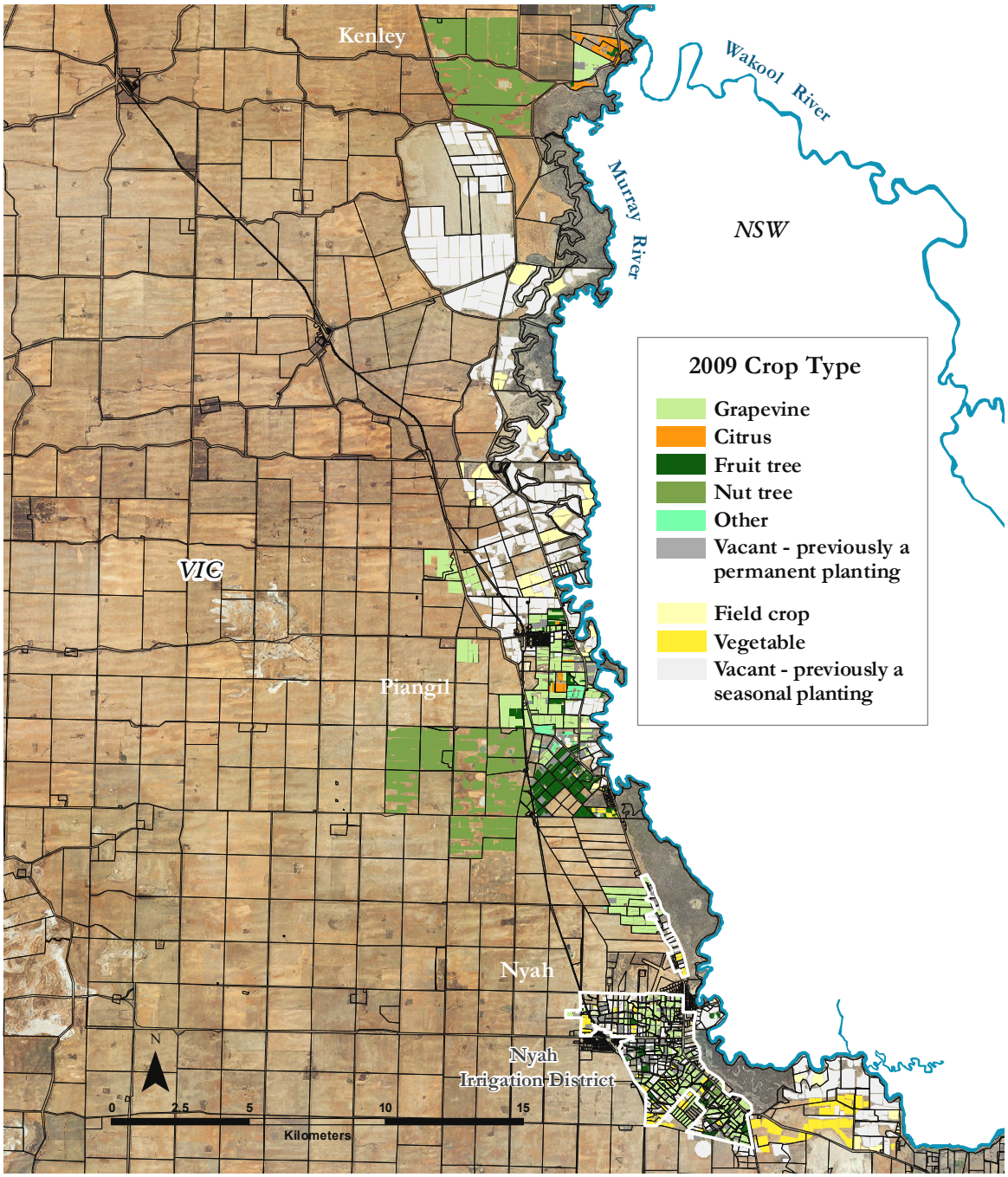
3. Private Diverters

3.1 Nyah River Reach (Nyah to the Wakool junction)

The following is information with respect to irrigation along the Nyah river reach, including the Nyah Irrigation District, from 1997 to 2009. In summary:

- The irrigated area increased by 3,420 hectares, a 59% increase from 5,815 hectares in 1997 to 9,235 hectares in 2009.
- 44% of the irrigated area was vacant in the 2008-09 irrigation season; comprising 4% previously permanent plantings and 40% previously seasonal plantings.
- The dominant crop type changed from field crops to almonds between 2006 and 2009.
- The dominant irrigation method changed from 'furrow' to 'drip' between 2006 and 2009.
- Nyah has approximately 252 irrigation properties, averaging 36.6 ha (crop area) per property.
- Crops were predominantly grown in LIZ 2 in 1997, however this changed to LIZ 1 by 2006.

Map of the Nyah river reach showing 2009 crop types

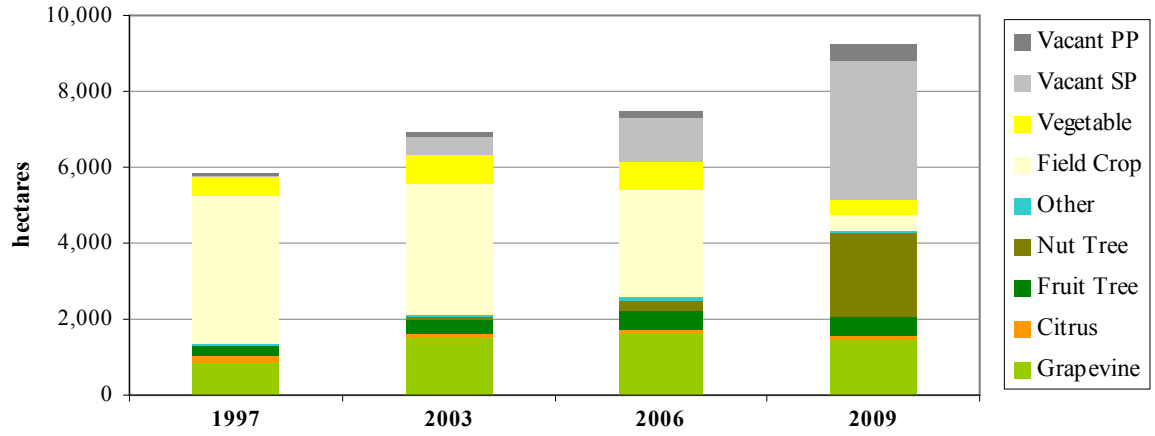


Nyah River Reach and Irrigation District – Crop Types

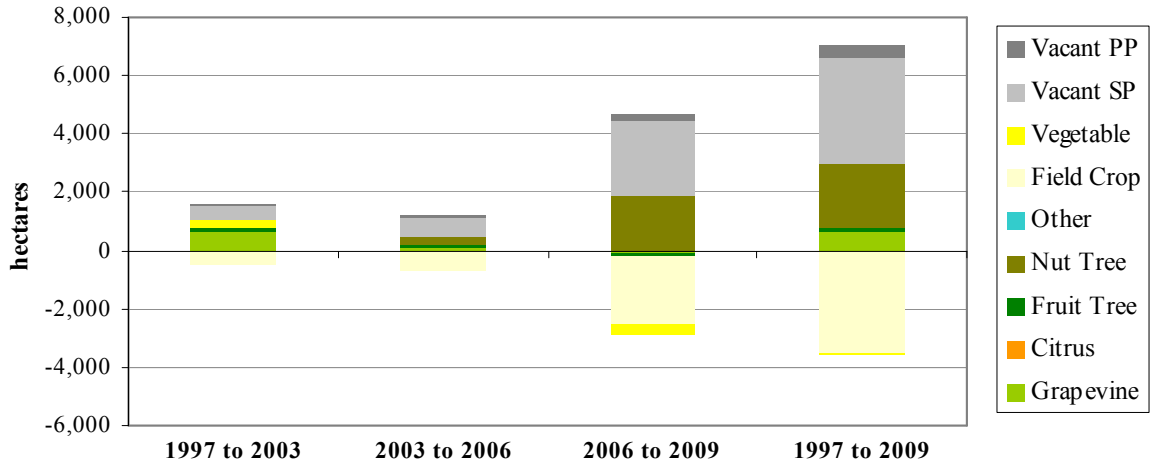
Crop Type		Area 1997	Area 2003	Area 2006	Area 2009	2009 Type 2009 Total		Change 1997 to 2009
Permanent plantings	Grapevine	885	1,490	1,605	1,485	16%		+600
	Citrus	140	115	105	105	1%		-35
	Fruit Tree	250	420	485	440	5%		+190
	Nut Tree	5	5	305	2,225	24%		+2,220
	Other	55	75	80	60	1%		+5
Seasonal crops	Field Crop	3,925	3,470	2,805	445	5%		-3,480
	Vegetable	465	765	760	385	4%		-80
Vacant	Vacant SP	75	480	1,165	3,680	44%	40%	+3,605
	Vacant PP	15	90	125	410		4%	+395
Total hectares		**5,815**	**6,910**	**7,435**	**9,235**	**100%**		**+3,420**

Vacant PP = previously a permanent planting Vacant SP = previously a seasonal planting.

Crop Type per Year



Crop Type Change

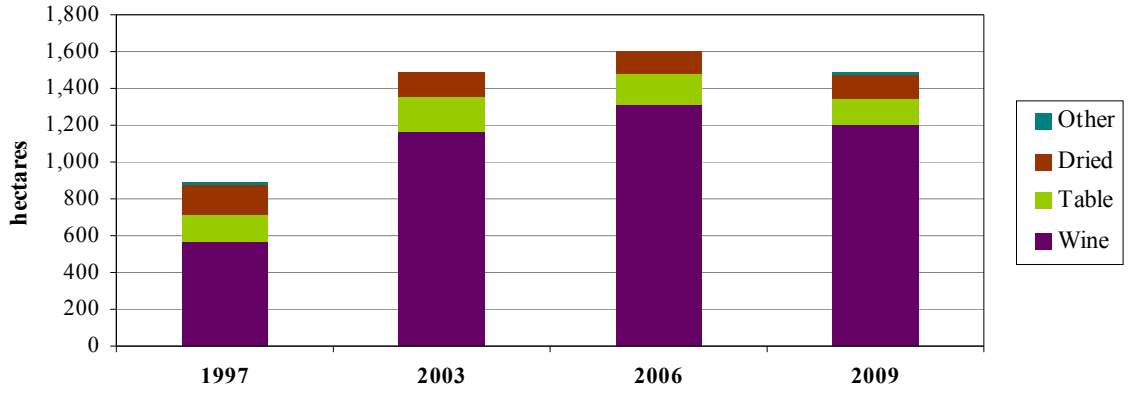


Nyah River Reach and Irrigation District – Grape Use

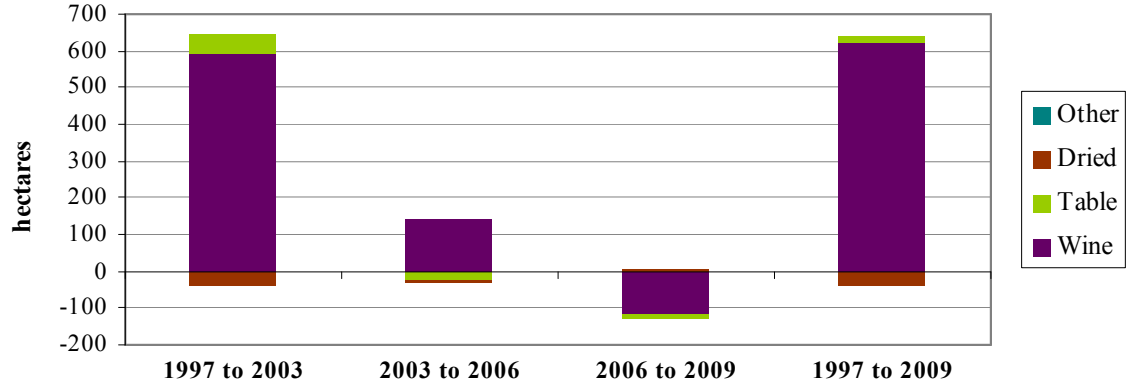
Grape Use	Area 1997	Area 2003	Area 2006	Area 2009	2009 Use 2009 Total %	Change 1997 to 2009
Wine	570	1,165	1,310	1,195	80%	+625
Table	140	190	165	155	10%	+15
Dried	170	130	125	130	9%	-40
Other	5	5	5	5	0%	0
Total hectares	**885**	**1,490**	**1,605**	**1,485**	**100%**	**+600**

Other = juice, cannery or research

Grape Use per Year



Grape Use Change

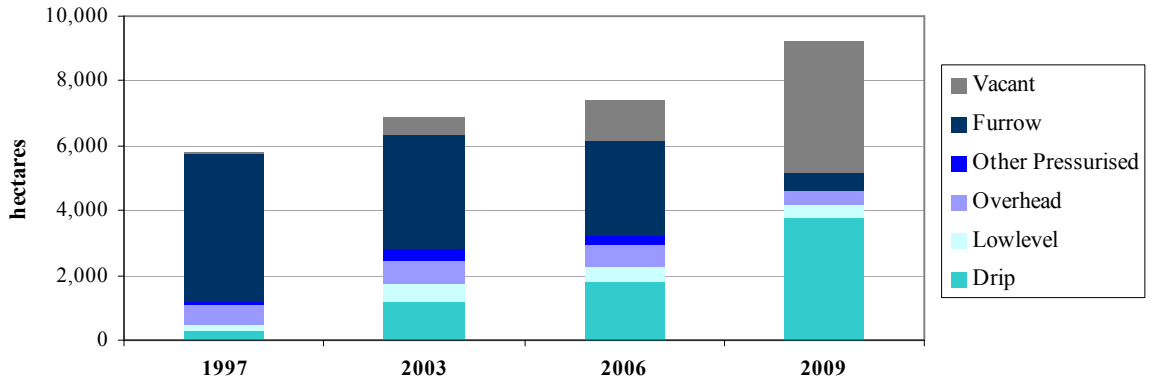


Nyah River Reach and Irrigation District – Irrigation Methods

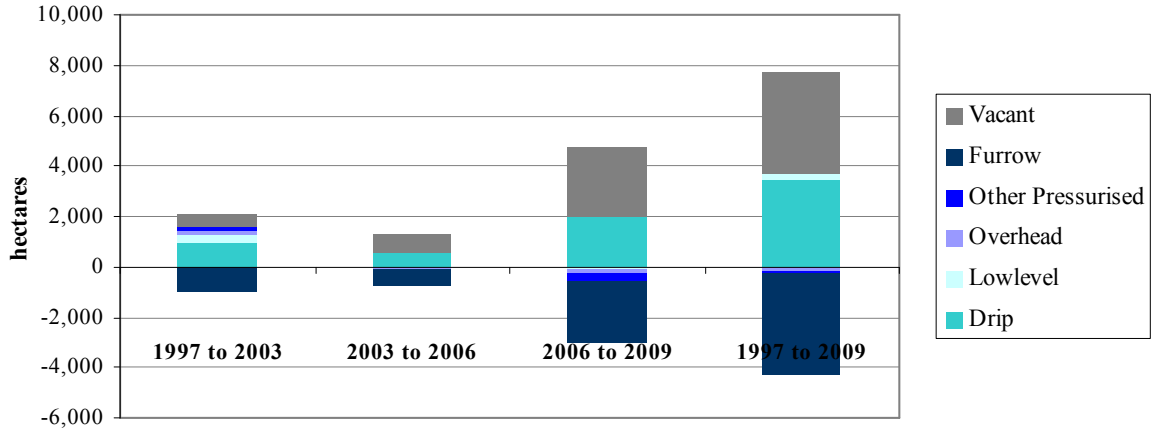
Irrigation Method	Area 1997	Area 2003	Area 2006	Area 2009	2009 Method 2009 Total	Change 1997 to 2009
Drip	285	1,210	1,775	3,750	41%	+3,465
Low level	185	545	500	435	5%	+250
Overhead	595	720	655	440	5%	-155
Other Pressurised	120	310	290	10	0%	-110
Furrow	4,540	3,555	2,925	510	6%	-4,030
Vacant	90	570	1,290	4,090	44%	+4,000
Total hectares	**5,815**	**6,910**	**7,435**	**9,235**	**100%**	**+3,420**

Other pressurised includes centre pivot and miscellaneous sprinklers

Irrigation Method per Year



Irrigation Method Change

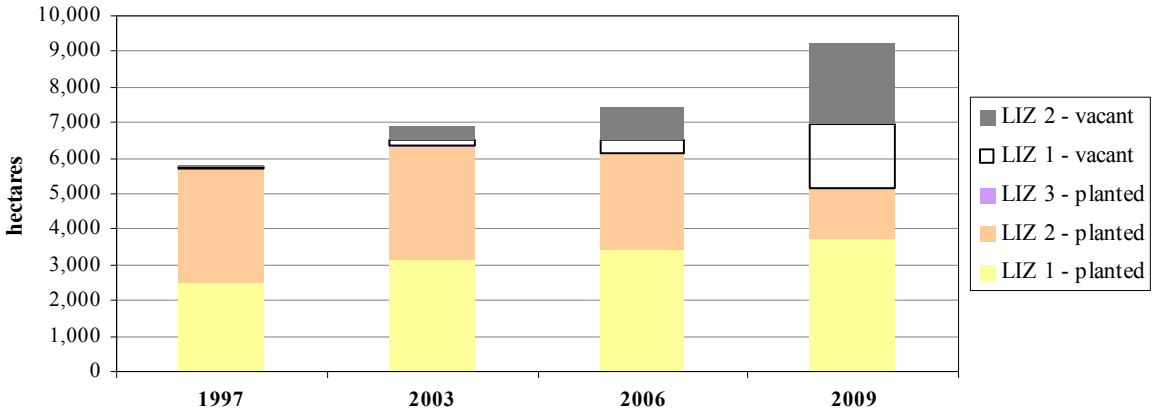


Nyah River Reach and Irrigation District – Salinity Impact Zones

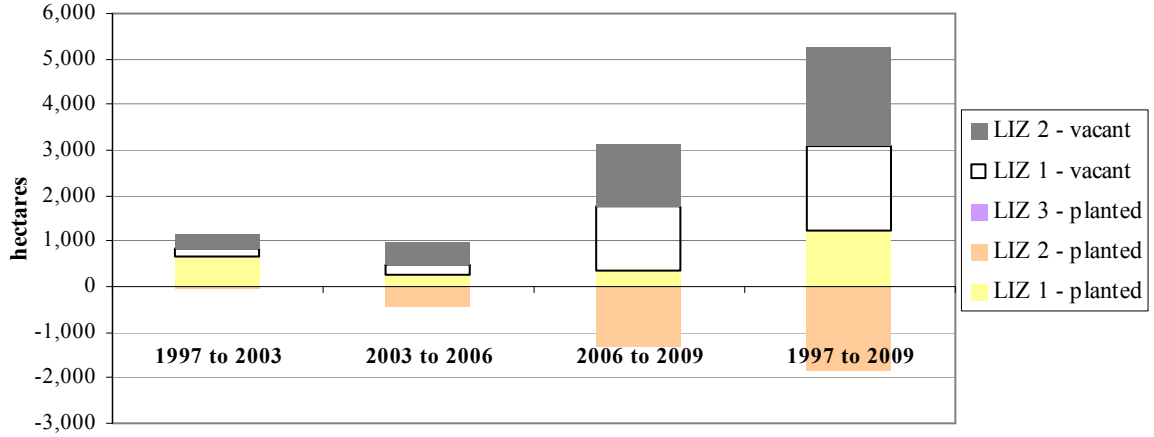
Salinity Impact Zone		Area 1997	Area 2003	Area 2006	Area 2009	2009 Zone 2009 Total %	Change 1997 to 2009
Planted	LIZ 1	2,485	3,150	3,400	3,740	40%	+1,255
	LIZ 2	3,230	3,180	2,735	1,395	15%	-1,835
	LIZ 3	10	10	10	10	0%	0
	LIZ 4						
	HIZ						
Vacant	LIZ 1	10	170	395	1,830	20%	+1,820
	LIZ 2	80	400	895	2,260	24%	+2,180
	LIZ 3	0	0	0	0	0%	0
	LIZ 4						
	HIZ						
Total hectares		**5,815**	**6,910**	**7,435**	**9,235**	**100%**	**+3,420**

LIZ = low impact zone, HIZ = high impact zone

Salinity Impact Zone per Year



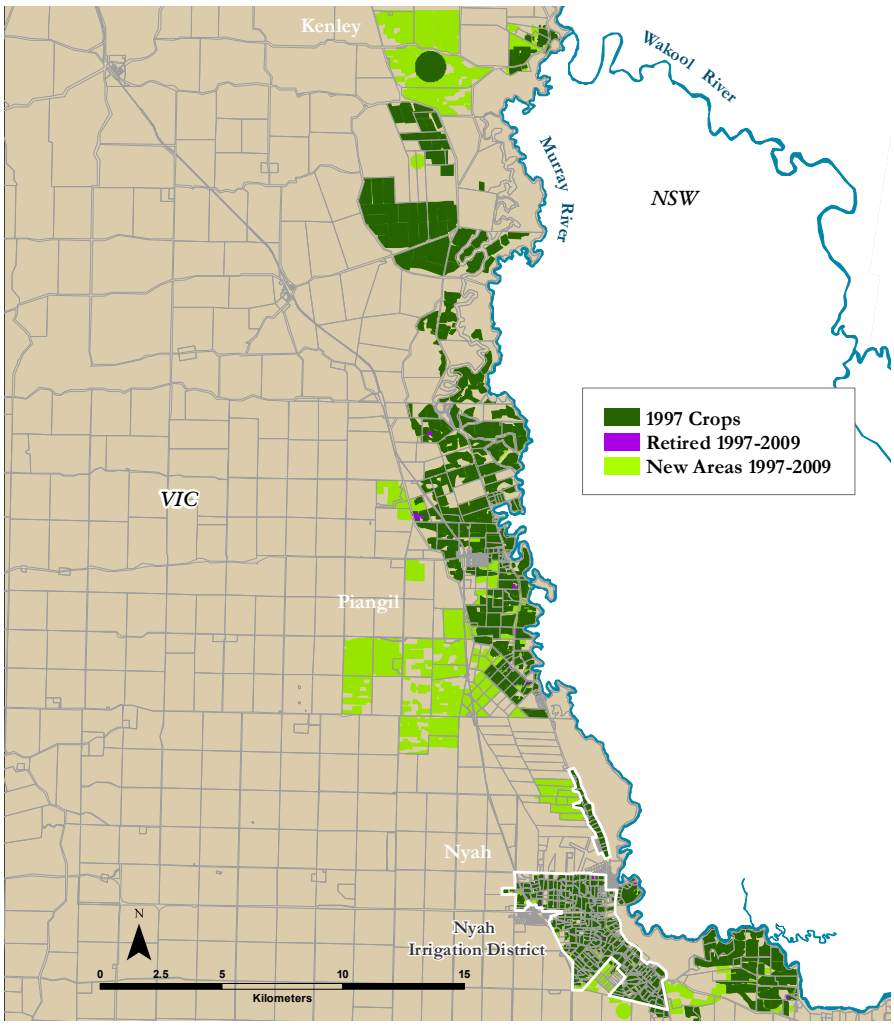
Salinity Impact Zone Change



Nyah Reach and Irrigation District – Development & Property Change

Irrigation Development from 1997 to 2009	Hectares			% of 1997
Irrigated crops in 1997 (1996-97 season)	**5,815**			
Retired between 1997 and 2009		**-25**		0%
New areas between 1997 and 2009		**+3,445**		+59%
Irrigated crops in 2009 (2008-09 season)			**9,235**	

Retired = change in land use that precludes use for irrigation e.g. urban development, dam construction.



Property Change

Property size (cropped area)	Number of properties				Change 1997 to 2009	2009%
	1997	2003	2006	2009		
< 5 ha	75	80	77	79	+4	31%
5 to 10 ha	77	69	68	65	-12	26%
10 to 20 ha	34	39	38	41	+7	16%
20 to 40 ha	26	28	25	21	-5	8%
> 40 ha	37	43	45	46	+9	18%
Total properties	**249**	**259**	**253**	**252**	**+3**	**100%**
Average property size (ha)	**23.4**	**26.7**	**29.4**	**36.6**		

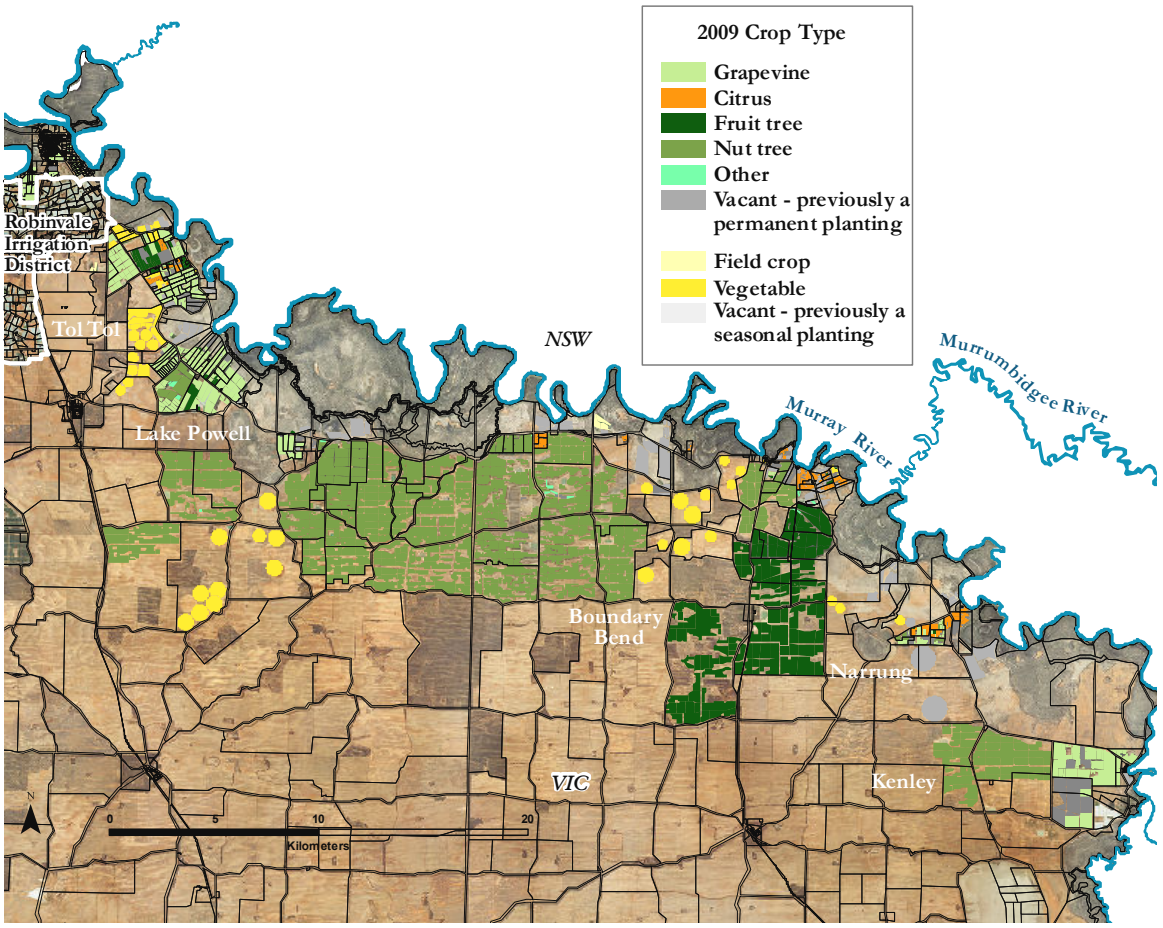
Properties irrigating less than one hectare have been excluded from analysis on property numbers.

3.2 Boundary Bend River Reach (Wakool junction to Euston weir)

The following presents information with respect to irrigation along the Boundary Bend river reach from 1997 to 2009. In summary:

- The irrigated area increased by 13,895 hectares, a 258% increase from 5,380 hectares in 1997 to 19,275 hectares in 2009.
- 10% of the irrigated area was vacant in the 2008-09 irrigation season; comprising 4% previously permanent plantings and 6% previously seasonal plantings.
- The dominant crop type changed from vegetables in 1997 and 2003 to almonds in 2006 and 2009.
- The dominant irrigation method changed from 'overhead' in 1997 to 'drip' by 2003.
- Boundary Bend has approximately 108 irrigation properties, averaging 178.5 ha (cropped area) per property.
- Crops have remained predominantly in the lowest salinity impact zone (LIZ 1) from 1997 to 2009.

Map of the Boundary Bend river reach showing 2009 crop types

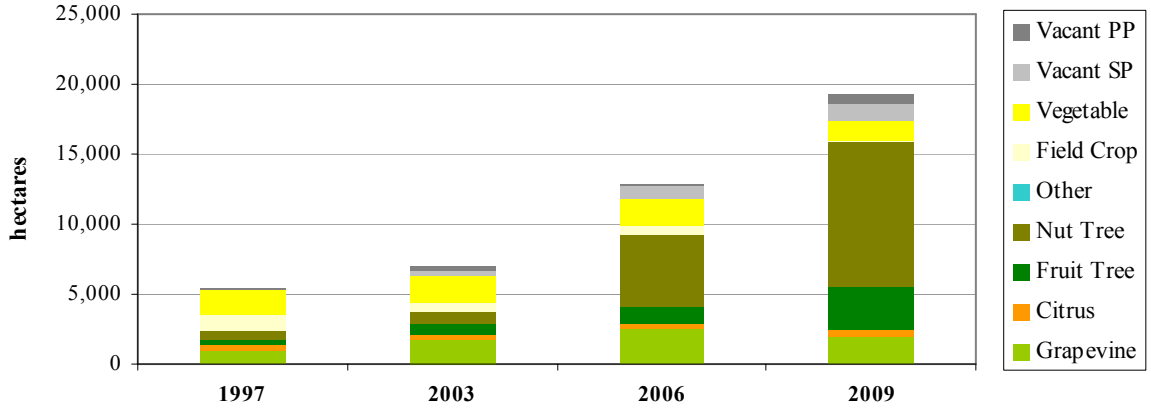


Boundary Bend River Reach – Crop Types

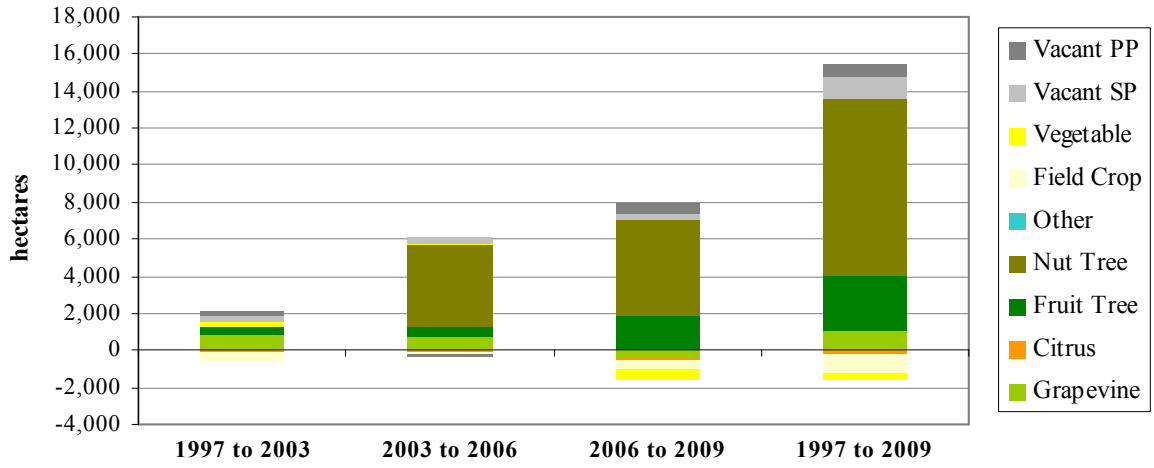
Crop Type		Area 1997	Area 2003	Area 2006	Area 2009	2009 Type 2009 Total		Change 1997 to 2009
Permanent plantings	Grapevine	1,000	1,785	2,520	2,070	11%		+1,070
	Citrus	465	410	370	300	2%		-165
	Fruit Tree	190	715	1,240	3,165	16%		+2,975
	Nut Tree	755	760	5,180	10,335	54%		+9,580
	Other	30	25	45	50	0%		+20
Seasonal crops	Field Crop	1,165	730	540	45	0%		-1,120
	Vegetable	1,705	1,915	1,960	1,435	7%		-270
Vacant	Vacant SP	25	415	825	1,180	10%	6%	+1,155
	Vacant PP	45	235	165	695		4%	+650
Total hectares		**5,380**	**6,990**	**12,845**	**19,275**	**100%**		**+13,895**

Vacant PP = previously a permanent planting Vacant SP = previously a seasonal planting.

Crop Type per Year



Crop Type Change

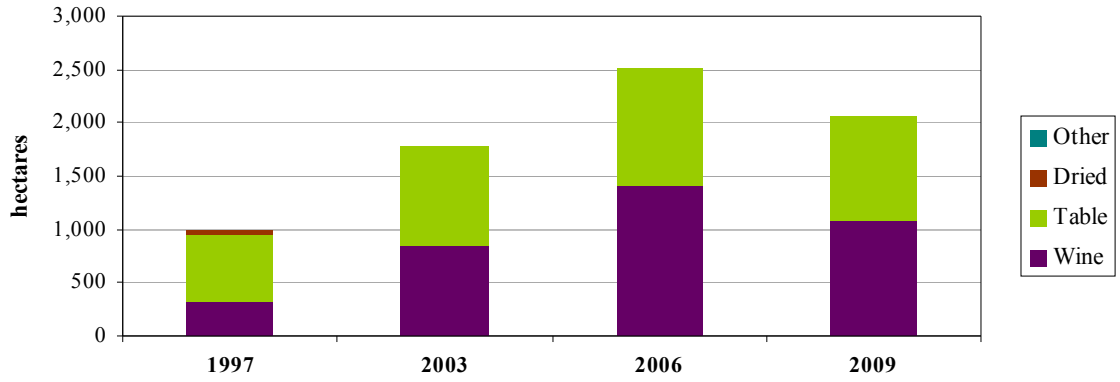


Boundary Bend River Reach – Grape Use

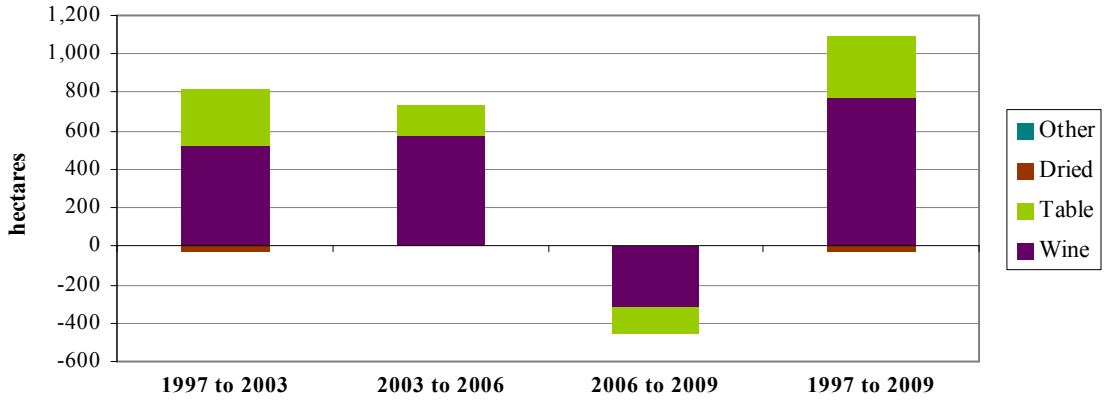
Grape Use	Area 1997	Area 2003	Area 2006	Area 2009	2009 Use 2009 Total %	Change 1997 to 2009
Wine	315	835	1,410	1,090	53%	+775
Table	650	945	1,105	975	47%	+325
Dried	35	5	5	5	0%	-30
Other						
Total hectares	**1,000**	**1,785**	**2,520**	**2,070**	**100%**	**+1,070**

Other = juice, cannery or research

Grape Use per Year



Grape Use Change

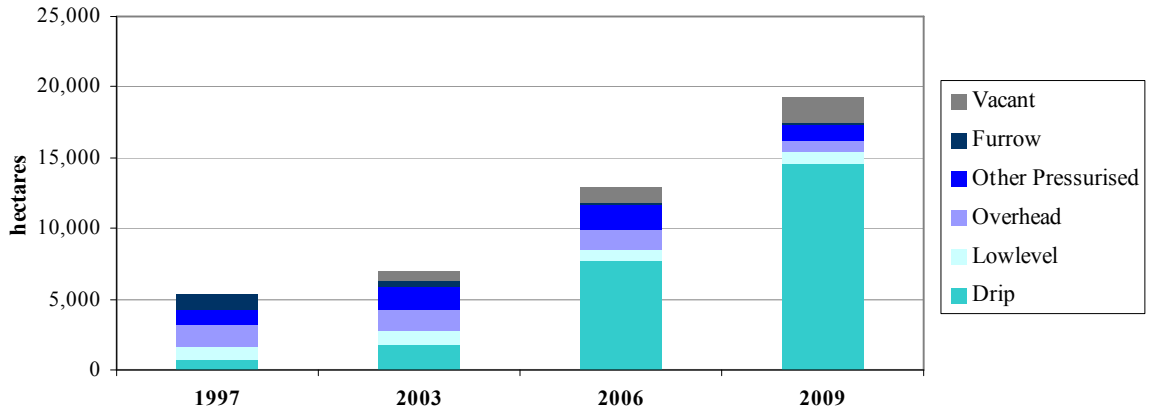


Boundary Bend River Reach – Irrigation Methods

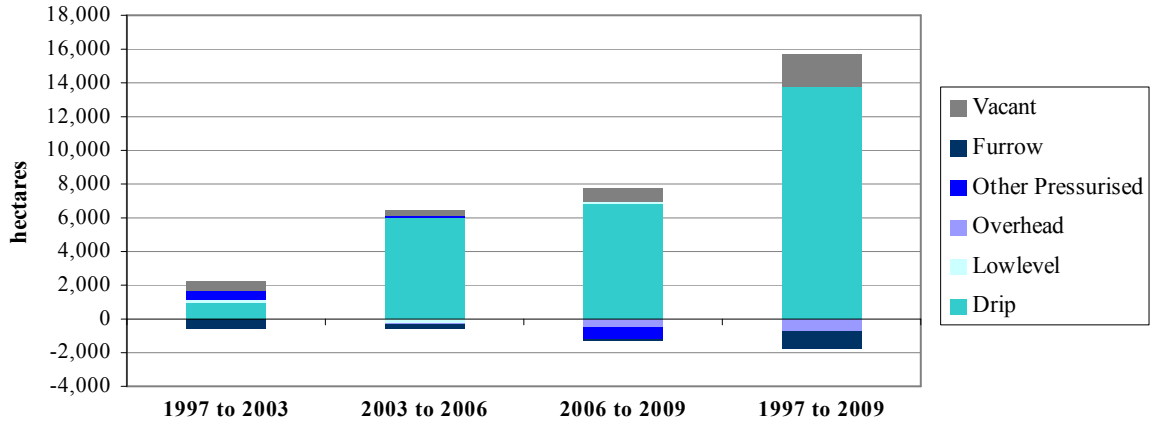
Irrigation Method	Area 1997	Area 2003	Area 2006	Area 2009	2009 Method 2009 Total	Change 1997 to 2009
Drip	750	1,735	7,695	14,565	76%	+13,815
Low level	890	1,050	825	850	4%	-40
Overhead	1,465	1,435	1,340	850	4%	-615
Other Pressurised	1,205	1,660	1,795	1,100	6%	-105
Furrow	1,000	460	200	35	0%	-965
Vacant	70	650	990	1,875	10%	+1,805
Total hectares	**5,380**	**6,990**	**12,845**	**19,275**	**100%**	**+13,895**

Other pressurised includes centre pivot and miscellaneous sprinklers

Irrigation Method per Year



Irrigation Method Change

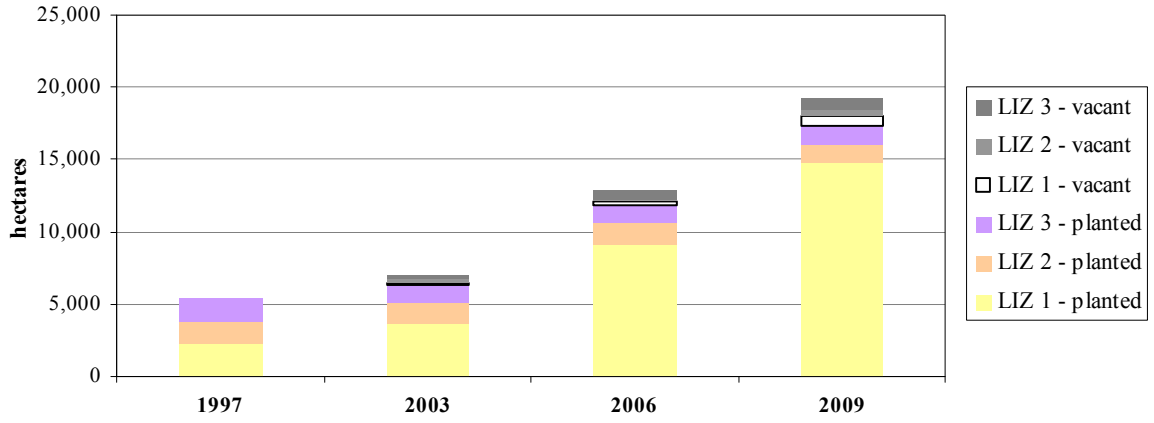


Boundary Bend River Reach – Salinity Impact Zones

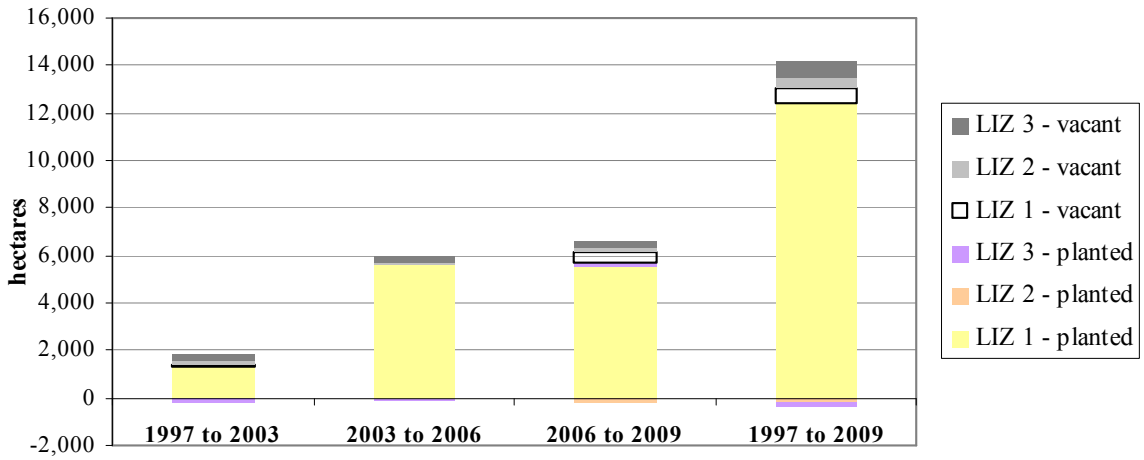
Salinity Impact Zone		Area 1997	Area 2003	Area 2006	Area 2009	2009 Zone 2009 Total %	Change 1997 to 2009
Planted	LIZ 1	2,310	3,590	9,185	14,745	76%	+12,435
	LIZ 2	1,470	1,455	1,425	1,255	7%	-215
	LIZ 3	1,530	1,295	1,245	1,400	7%	-130
	LIZ 4						
	HIZ						
Vacant	LIZ 1	0	120	175	630	3%	+630
	LIZ 2	50	220	245	440	2%	+390
	LIZ 3	20	310	570	805	4%	+785
	LIZ 4						
	HIZ						
Total hectares		**5,380**	**6,990**	**12,845**	**19,275**	**100%**	**+13,895**

LIZ = low impact zone, HIZ = high impact zone

Salinity Impact Zone per Year



Salinity Impact Zone Change

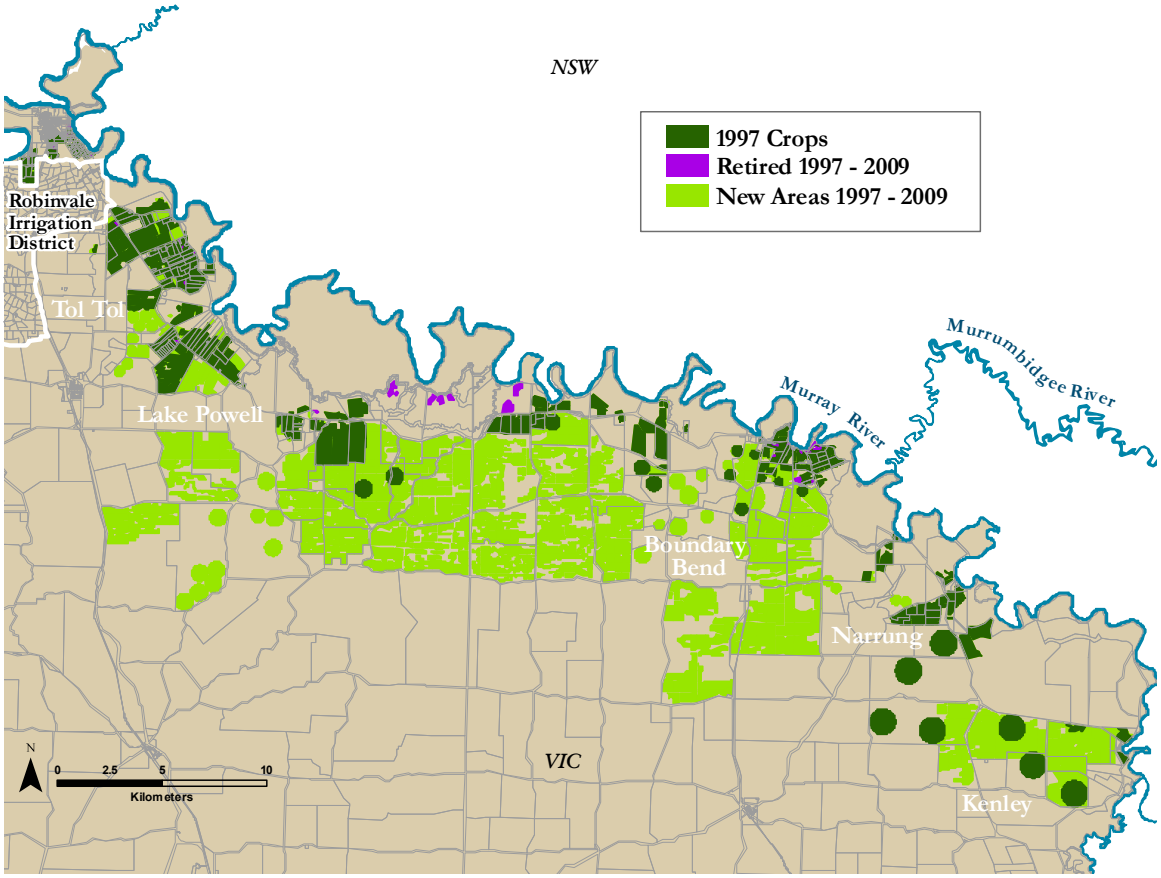


Boundary Bend - Irrigation Development and Property Change

Irrigation Development from 1997 to 2009

	Hectares			% of 1997
Irrigated crops in 1997 (1996-97 season)	**5,380**			
Retired between 1997 and 2009		**-140**		-3%
New areas between 1997 and 2009		**+14,035**		+261%
Irrigated crops in 2009 (2008-09 season)			**19,275**	

Retired = change in land use that precludes use for irrigation e.g. urban development, dam construction.



Property Change

Property size (cropped area)	Number of properties				Change 1997 to 2009	2009%
	1997	2003	2006	2009		
< 5 ha	19	19	18	17	-2	16%
5 to 10 ha	14	10	10	11	-3	10%
10 to 20 ha	32	32	29	28	-4	26%
20 to 40 ha	33	26	23	24	-9	22%
> 40 ha	20	27	27	28	+8	26%
Total properties	**118**	**114**	**107**	**108**	**-10**	**100%**
Average property size (ha)	**45.6**	**61.3**	**120.0**	**178.5**		

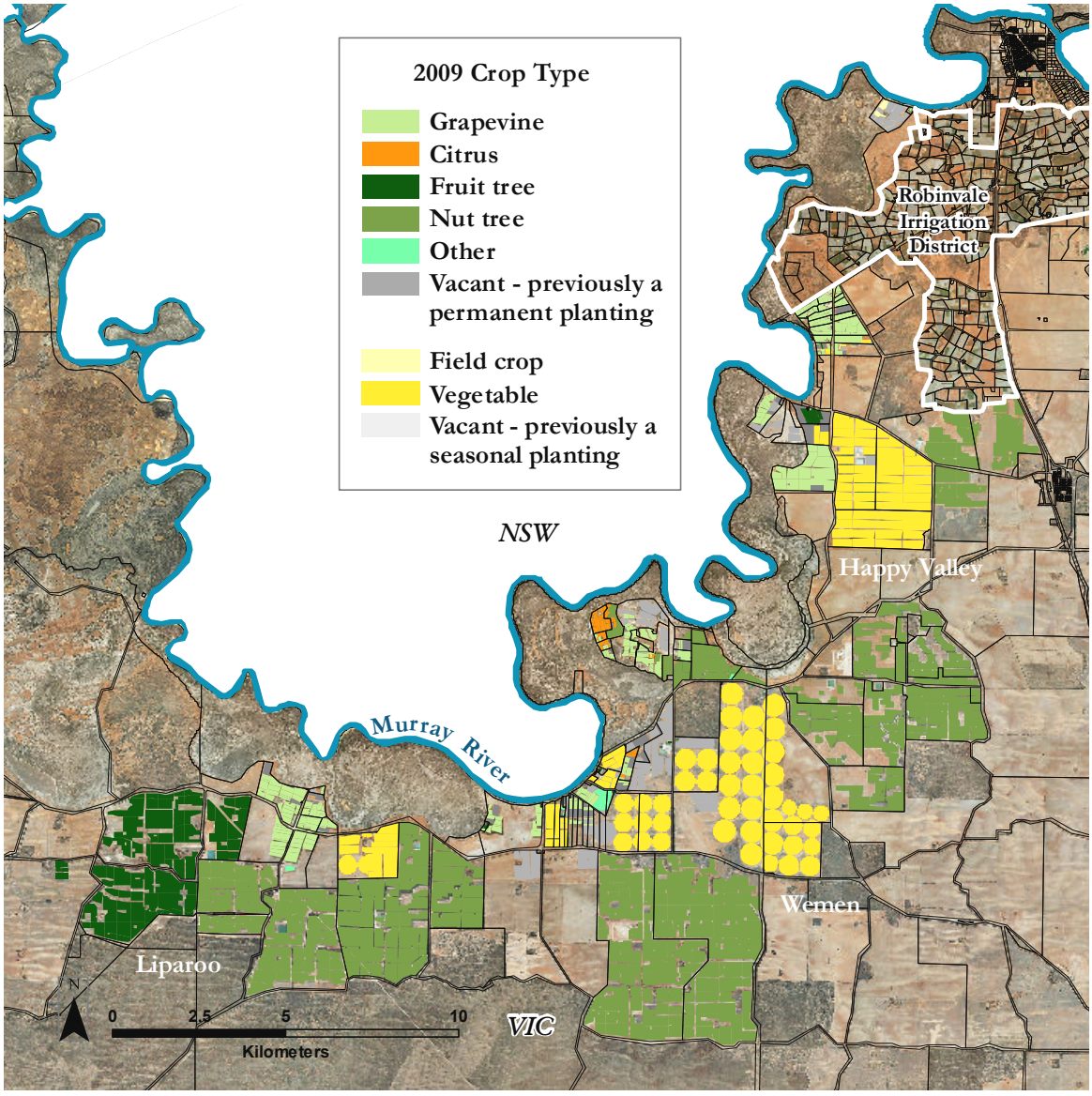
Properties irrigating less than one hectare are assumed to have house and garden supply and have been excluded from analysis on property numbers.

3.3 Wemen River Reach (Euston weir to Liparoo)

The following presents information with respect to irrigation along the Wemen river reach from 1997 to 2009. In summary:

- The irrigated area increased by 8,255 hectares, a 361% increase from 2,285 hectares in 1997 to 10,540 hectares in 2009.
- 7% of the irrigated area was vacant in the 2008-09 irrigation season; comprising 5% previously permanent plantings and 2% previously seasonal plantings.
- The dominant crop type changed from vegetables in 1997 and 2003 to almonds by 2006.
- The dominant irrigation method changed from 'low level' in 1997 to 'drip' by 2003.
- Wemen has approximately 38 irrigation properties, averaging 277.4 ha (cropped area) per property.
- Crops were predominantly grown in LIZ 2 from 1997 to 2006, however this changed to LIZ 1 by 2009.

Map of the Wemen river reach showing 2009 crop types

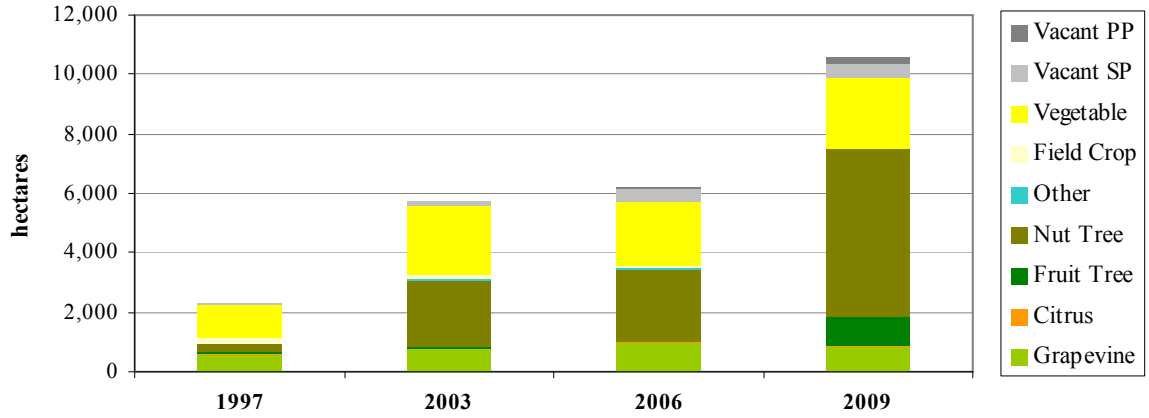


Wemen River Reach – Crop Types

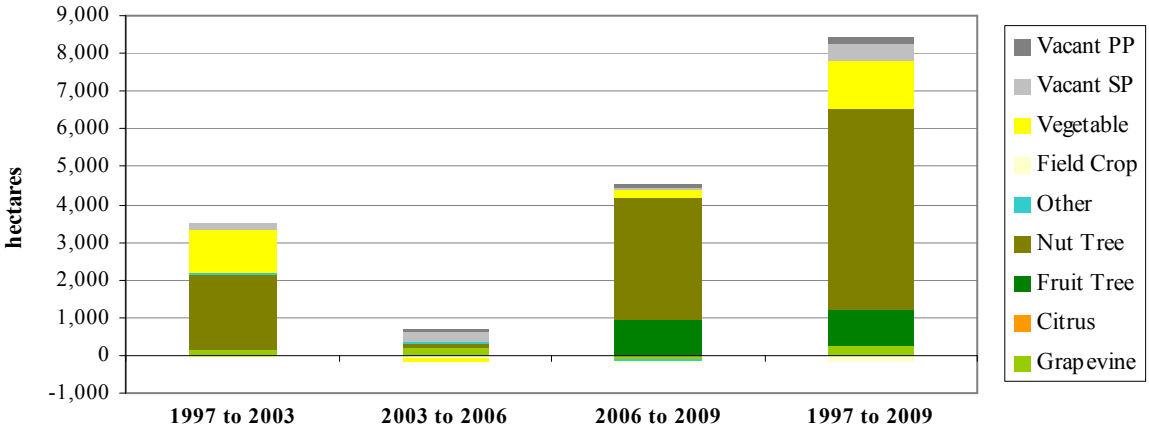
Crop Type		Area 1997	Area 2003	Area 2006	Area 2009	2009 Type 2009 Total		Change 1997 to 2009
Permanent plantings	Grapevine	560	720	950	815	8%		+255
	Citrus	60	55	55	55	1%		-5
	Fruit Tree	30	25	25	965	9%		+935
	Nut Tree	285	2,280	2,380	5,635	53%		+5,350
	Other	10	35	45	30	0%		+20
Seasonal crops	Field Crop	185	125	75	10	0%		-175
	Vegetable	1,140	2,330	2,200	2,375	23%		+1,235
Vacant	Vacant SP	15	140	435	490	7%	5%	+475
	Vacant PP	0	20	50	165		2%	+165
Total hectares		**2,285**	**5,730**	**6,215**	**10,540**	**100%**		**+8,255**

Vacant PP = previously a permanent planting Vacant SP = previously a seasonal planting.

Crop Type per Year



Crop Type Change

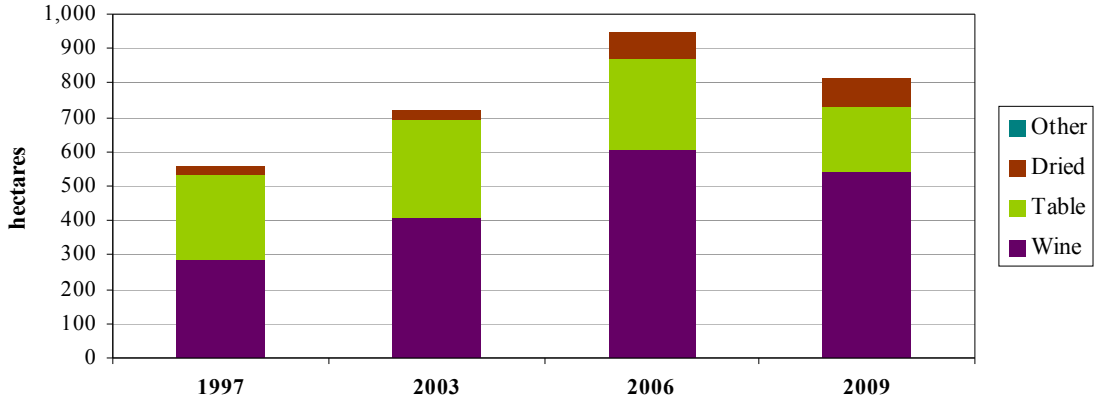


Wemen River Reach – Grape Use

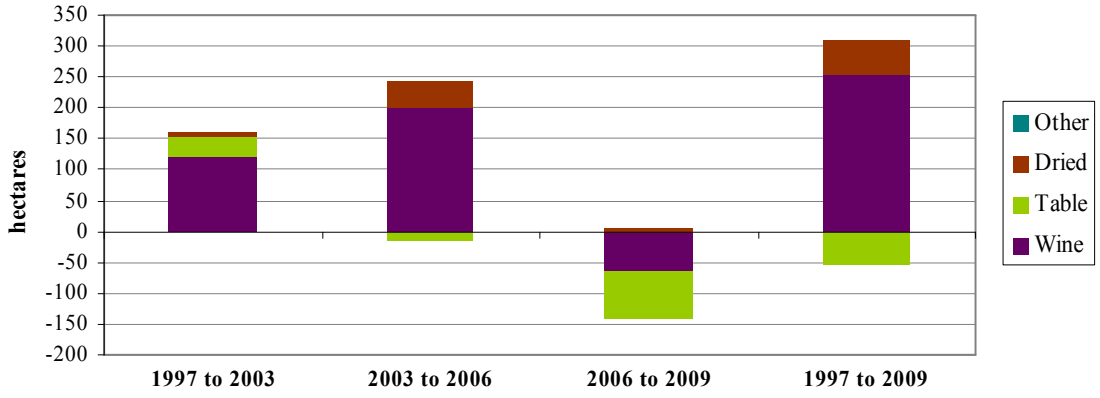
Grape Use	Area 1997	Area 2003	Area 2006	Area 2009	2009 Use 2009 Total %	Change 1997 to 2009
Wine	285	405	605	540	66%	+255
Table	250	285	270	195	24%	-55
Dried	25	30	75	80	10%	+55
Other						
Total hectares	**560**	**720**	**950**	**815**	**100%**	**+255**

Other = juice, cannery or research

Grape Use per Year



Grape Use Change

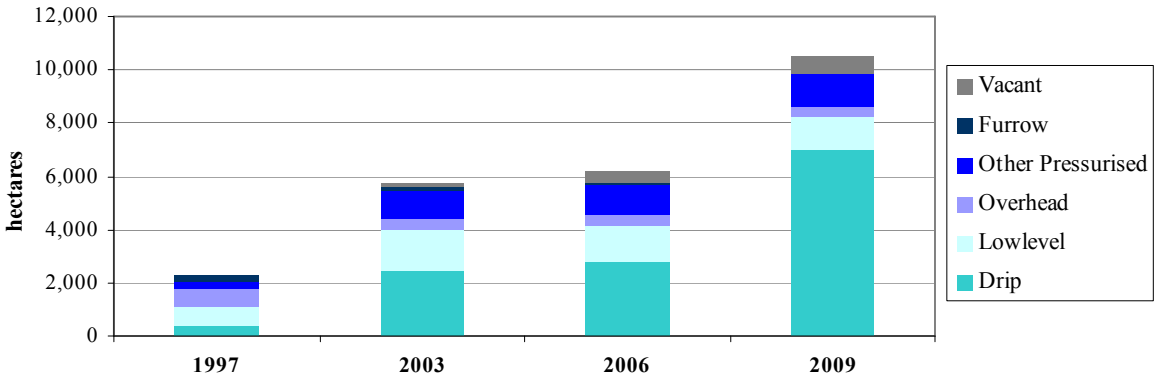


Wemen River Reach – Irrigation Methods

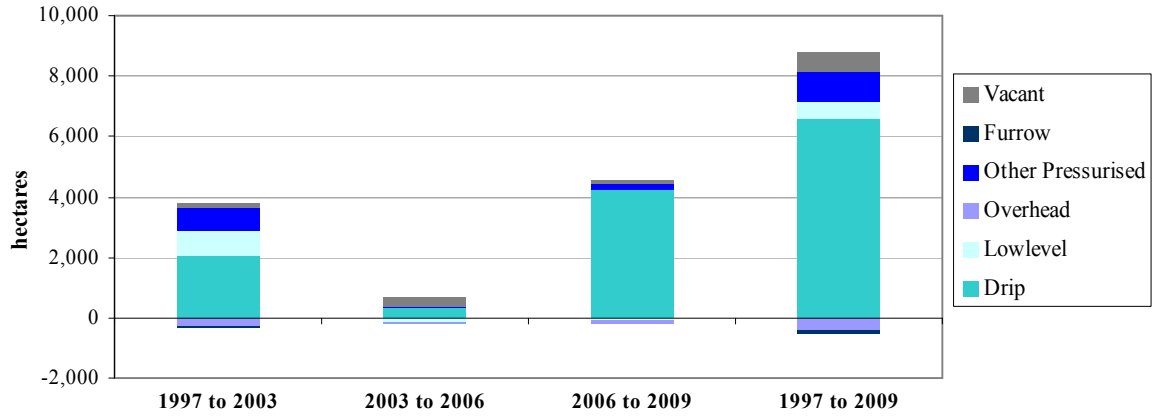
Irrigation Method	Area 1997	Area 2003	Area 2006	Area 2009	2009 Method 2009 Total	Change 1997 to 2009
Drip	395	2,465	2,795	7,010	67%	+6,615
Low level	720	1,515	1,345	1,270	12%	+550
Overhead	675	425	420	305	3%	-370
Other Pressurised	300	1,055	1,115	1,290	12%	+990
Furrow	180	110	55	10	0%	-170
Vacant	15	160	485	655	6%	+640
Total hectares	**2,285**	**5,730**	**6,215**	**10,540**	**100%**	**+8,255**

Other pressurised includes centre pivot and miscellaneous sprinklers

Irrigation Method per Year



Irrigation Method Change

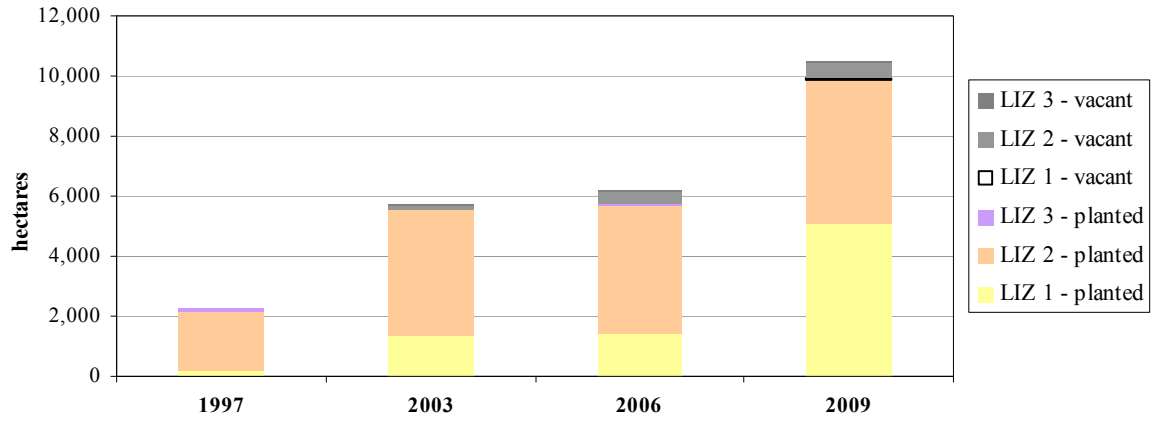


Wemen River Reach – Salinity Impact Zones

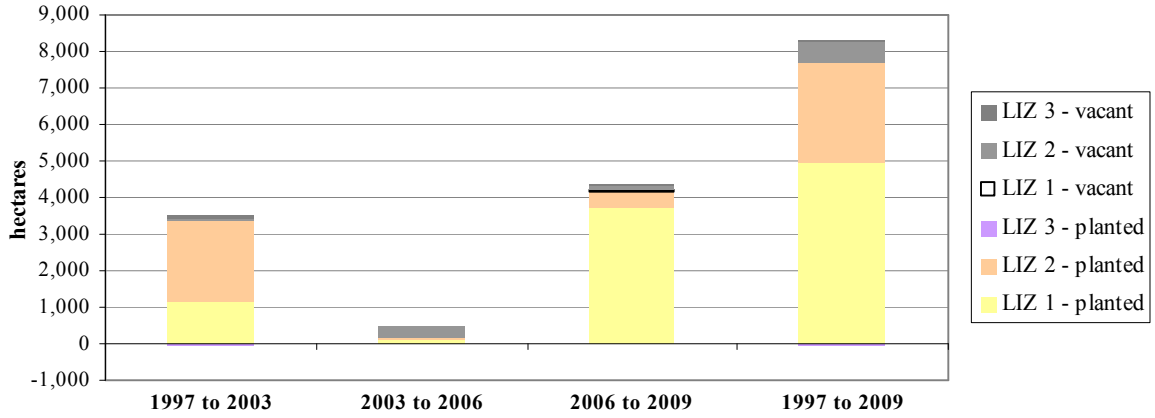
Salinity Impact Zone		Area 1997	Area 2003	Area 2006	Area 2009	2009 Zone 2009 Total %	Change 1997 to 2009
Planted	LIZ 1	190	1,330	1,410	5,125	49%	+4,935
	LIZ 2	1,970	4,190	4,260	4,720	45%	+2,750
	LIZ 3	110	50	60	40	0%	-70
	LIZ 4						
	HIZ						
Vacant	LIZ 1	0	0	0	25	0%	+25
	LIZ 2	0	85	425	545	5%	+545
	LIZ 3	15	75	60	85	1%	+70
	LIZ 4						
	HIZ						
Total hectares		**2,285**	**5,730**	**6,215**	**10,540**	**100%**	**+8,255**

LIZ = low impact zone, HIZ = high impact zone

Salinity Impact Zone per Year



Salinity Impact Zone Change

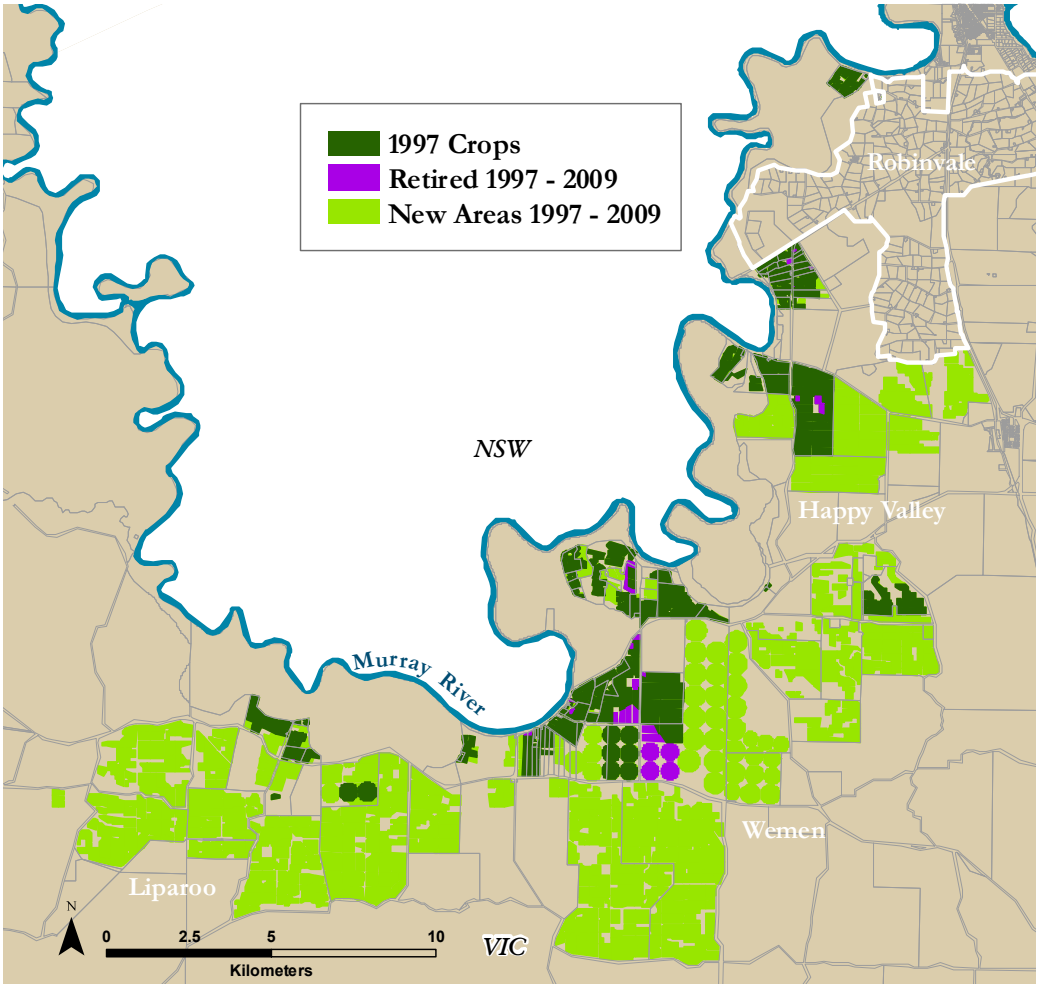


Wemen River Reach – Irrigation Development and Property Change

Irrigation Development from 1997 to 2009

	Hectares			% of 1997
Irrigated crops in 1997 (1996-97 season)	**2,285**			
Retired between 1997 and 2009		**-210**		-9%
New areas between 1997 and 2009		**+8,465**		+370%
Irrigated crops in 2009 (2008-09 season)			**10,540**	

Retired = change in land use that precludes use for irrigation e.g. urban development, dam construction.



Property Change

Property size (cropped area)	Number of properties				Change 1997 to 2009	2009%
	1997	2003	2006	2009		
< 5 ha	6	5	5	5	-1	13%
5 to 10 ha	2	3	3	3	+1	8%
10 to 20 ha	7	5	4	4	-3	11%
20 to 40 ha	9	9	10	10	+1	26%
> 40 ha	13	15	15	16	+3	42%
Total properties	**37**	**37**	**37**	**38**	**+1**	**100%**
Average property size (ha)	**61.8**	**154.9**	**168.0**	**277.4**		

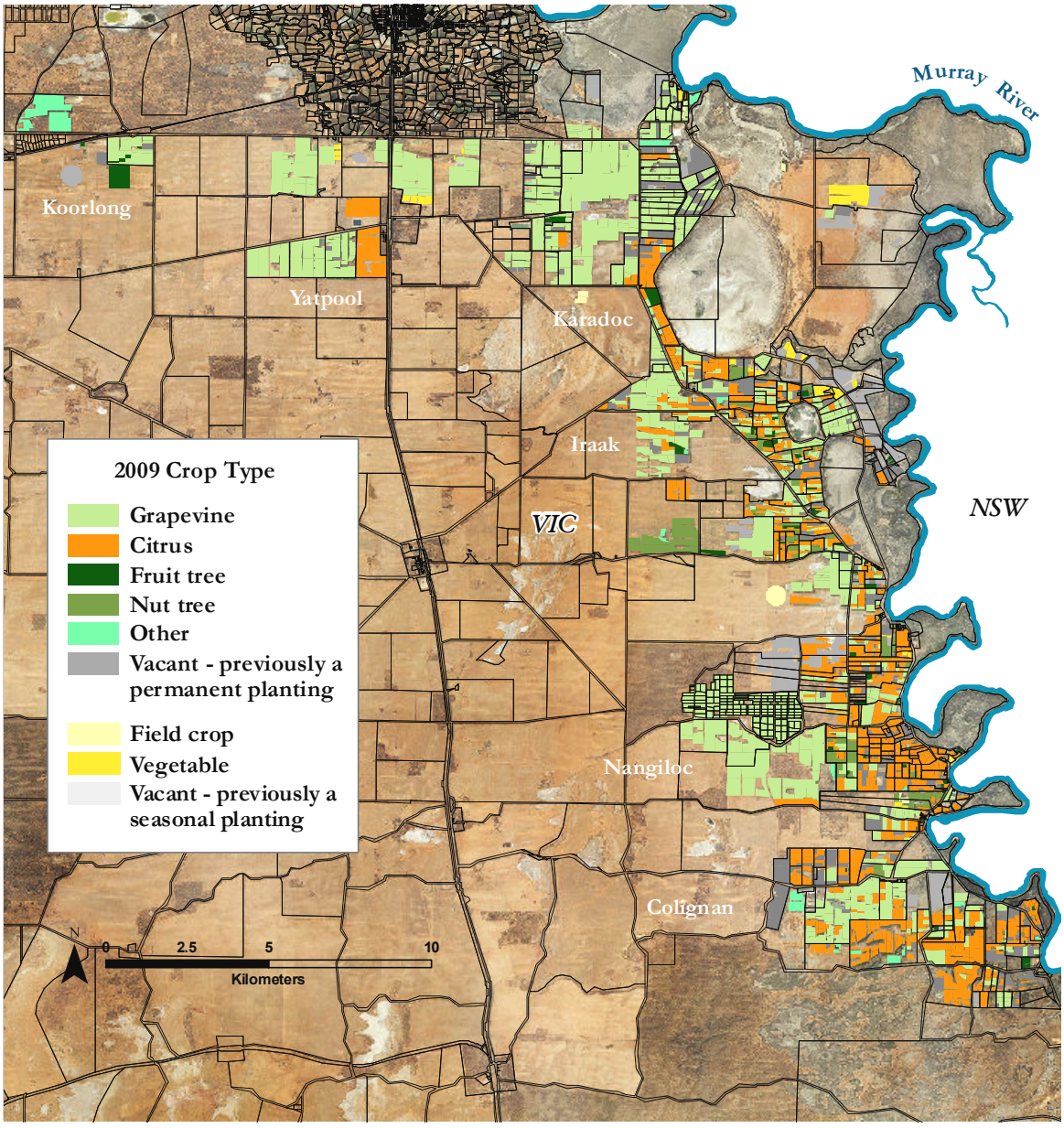
Properties irrigating less than one hectare have been excluded from the analysis on property numbers.

3.4 Colignan River Reach (Colignan to Yatpool)

The following presents information with respect to irrigation along the Colignan river reach from 1997 to 2009. In summary:

- The irrigated area increased by 3,555 hectares, a 50% increase from 7,105 hectares in 1997 to 10,660 hectares in 2009.
- 16% of the irrigated area was vacant in the 2008-09 irrigation season; comprising 10% previously permanent plantings and 6% previously seasonal plantings.
- Grapevines remained the dominant crop type from 1997 to 2009.
- The dominant irrigation method changed from 'overhead' in 1997 to 'drip' by 2003.
- Colignan has approximately 155 irrigation properties, averaging 68.8 ha (cropped area) per property.
- Crops remained predominantly in LIZ 4 from 1997 to 2009.

Map of the Colignan river reach showing 2009 crop types

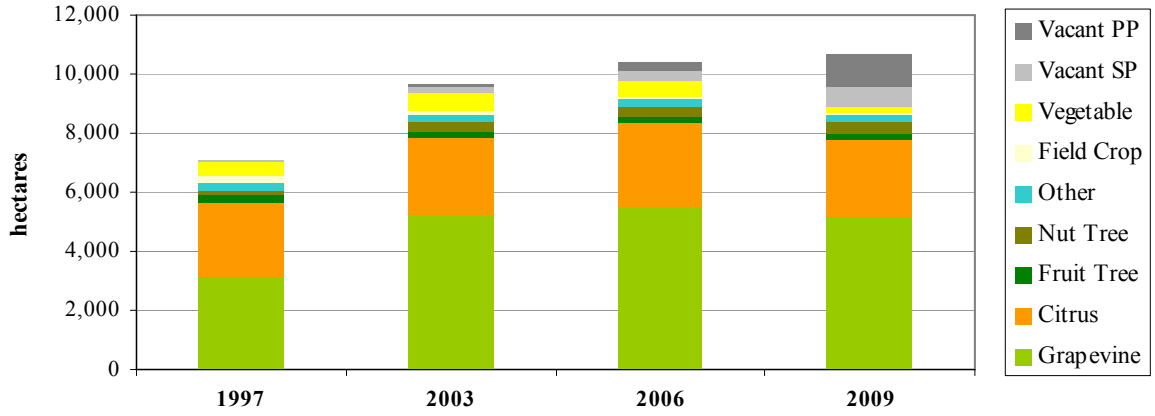


Colignan River Reach – Crop Types

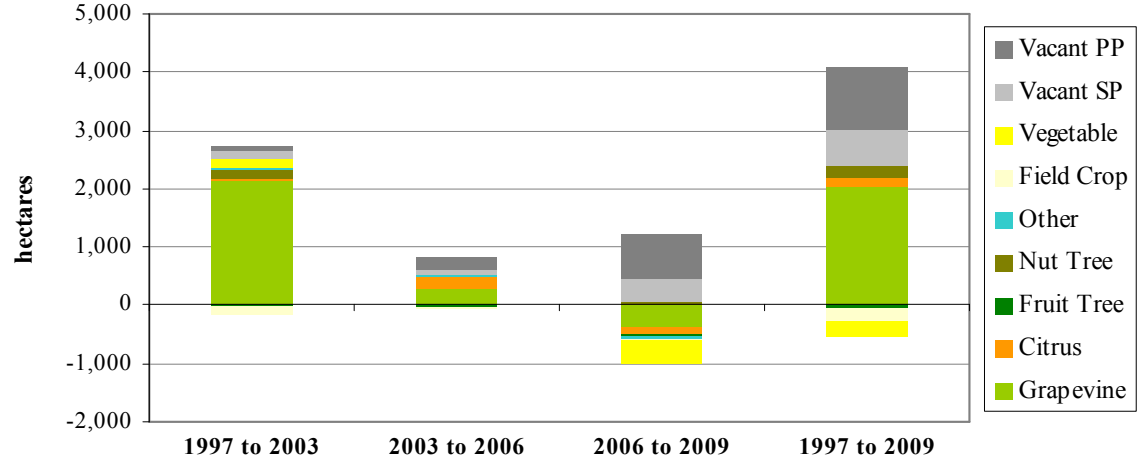
Crop Type		Area 1997	Area 2003	Area 2006	Area 2009	2009 Type 2009 Total		Change 1997 to 2009
Permanent plantings	Grapevine	3,095	5,245	5,530	5,140	48%		+2,045
	Citrus	2,545	2,585	2,795	2,685	25%		+140
	Fruit Tree	260	240	220	195	2%		-65
	Nut Tree	195	330	325	390	4%		+195
	Other	220	255	275	220	2%		0
Seasonal crops	Field Crop	255	115	85	60	1%		-195
	Vegetable	450	595	580	185	2%		-265
Vacant	Vacant SP	65	205	310	690	16%	6%	+625
	Vacant PP	20	115	310	1,095		10%	+1,075
Total hectares		**7,105**	**9,685**	**10,430**	**10,660**	**100%**		**+3,555**

Vacant PP = previously a permanent planting Vacant SP = previously a seasonal planting.

Crop Type per Year



Crop Type Change

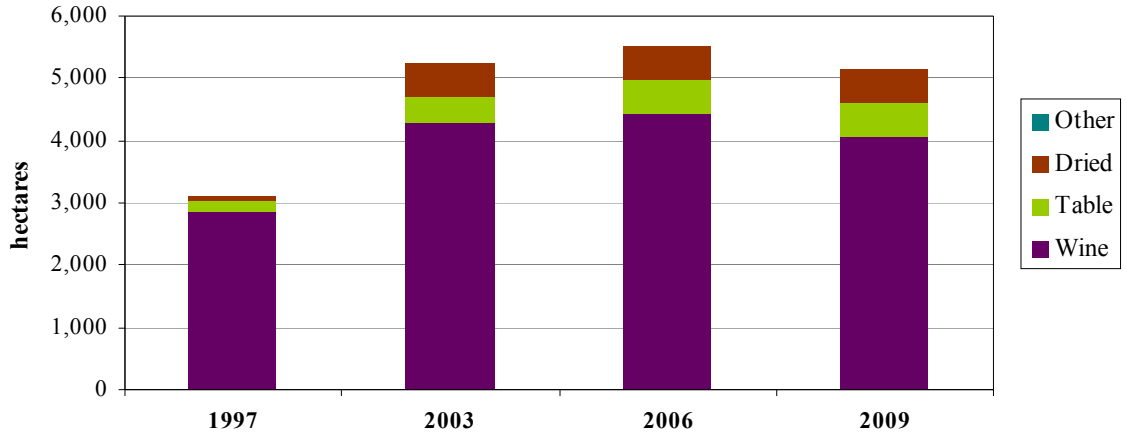


Colignan River Reach – Grape Use

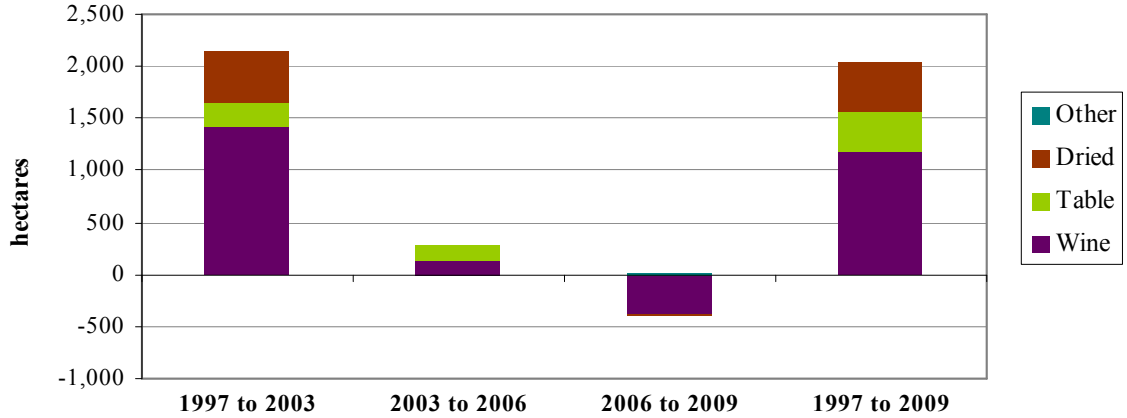
Grape Use	Area 1997	Area 2003	Area 2006	Area 2009	2009 Use 2009 Total %	Change 1997 to 2009
Wine	2,870	4,285	4,415	4,045	79%	+1,175
Table	175	420	565	560	11%	+385
Dried	50	540	550	530	10%	+480
Other	0	0	0	5	0%	+5
Total hectares	**3,095**	**5,245**	**5,530**	**5,140**	**100%**	**+2,045**

Other = juice, cannery or research

Grape Use per Year



Grape Use Change

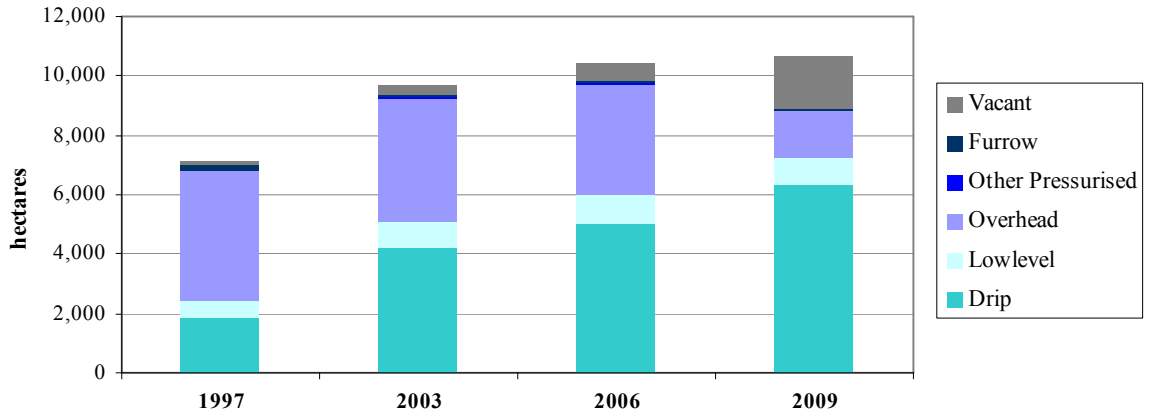


Colignan River Reach – Irrigation Methods

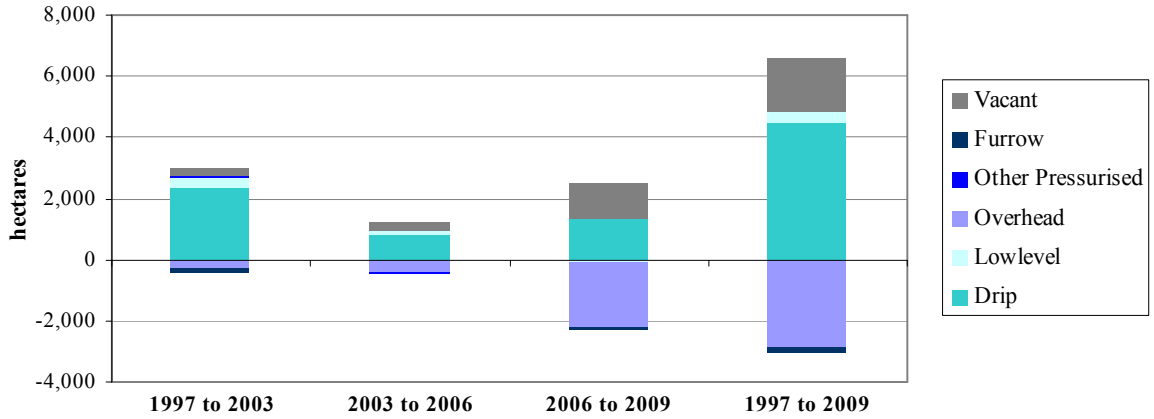
Irrigation Method	Area 1997	Area 2003	Area 2006	Area 2009	2009 Method 2009 Total	Change 1997 to 2009
Drip	1,875	4,245	5,030	6,355	60%	+4,480
Low level	535	860	1,000	905	8%	+370
Overhead	4,385	4,105	3,685	1,560	15%	-2,825
Other Pressurised	10	70	30	30	0%	+20
Furrow	215	85	65	25	0%	-190
Vacant	85	320	620	1,785	17%	+1,700
Total hectares	**7,105**	**9,685**	**10,430**	**10,660**	**100%**	**+3,555**

Other pressurised includes centre pivot and miscellaneous sprinklers

Irrigation Method per Year



Irrigation Method Change

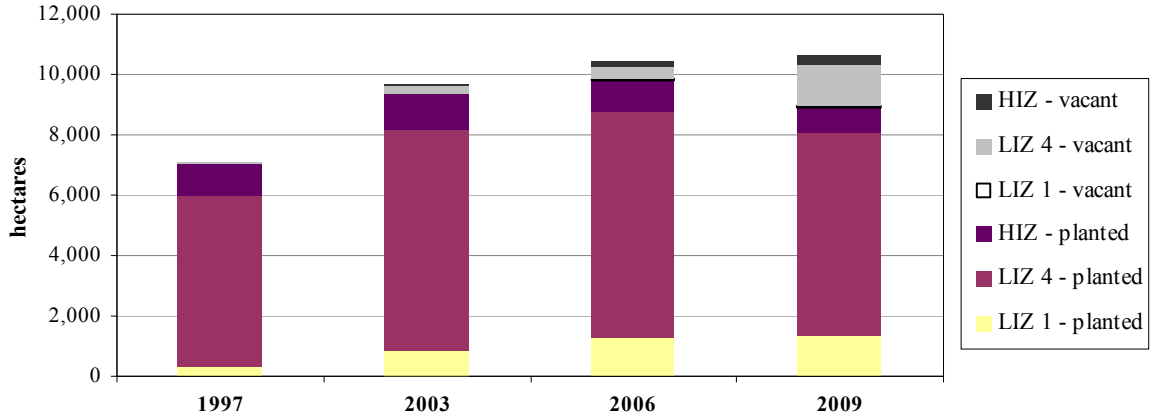


Colignan River Reach – Salinity Impact Zones

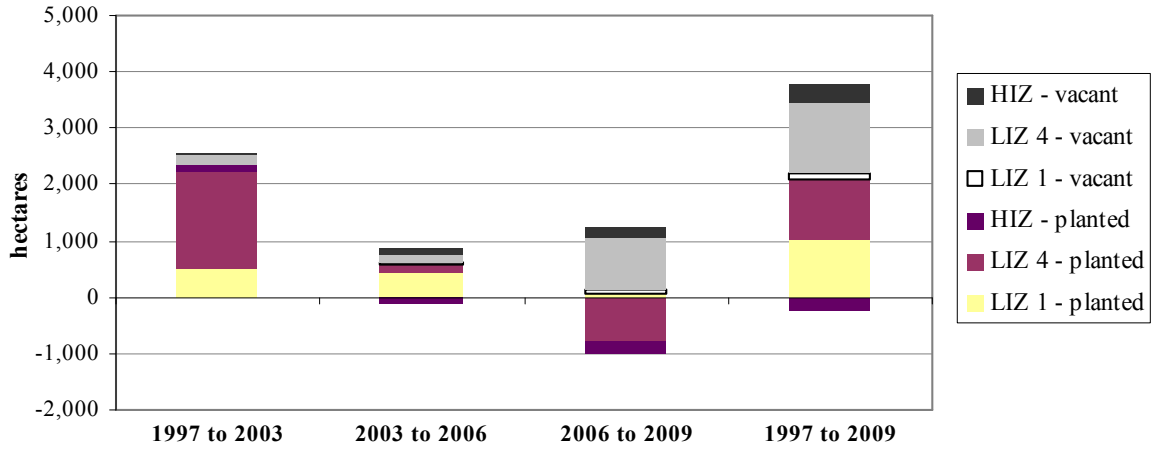
Salinity Impact Zone		Area 1997	Area 2003	Area 2006	Area 2009	2009 Zone 2009 Total %	Change 1997 to 2009
Planted	LIZ 1	345	835	1,280	1,360	13%	+1,015
	LIZ 2						
	LIZ 3						
	LIZ 4	5,635	7,380	7,525	6,725	63%	+1,090
	HIZ	1,040	1,140	1,005	795	7%	-245
Vacant	LIZ 1	0	10	45	85	1%	+85
	LIZ 2						
	LIZ 3						
	LIZ 4	85	280	415	1,340	13%	+1,255
	HIZ	5	30	160	355	3%	+350
Total hectares		**7,110**	**2,565**	**10,430**	**10,660**	**100%**	**+3,550**

LIZ = low impact zone, HIZ = high impact zone

Salinity Impact Zone per Year



Salinity Impact Zone Change

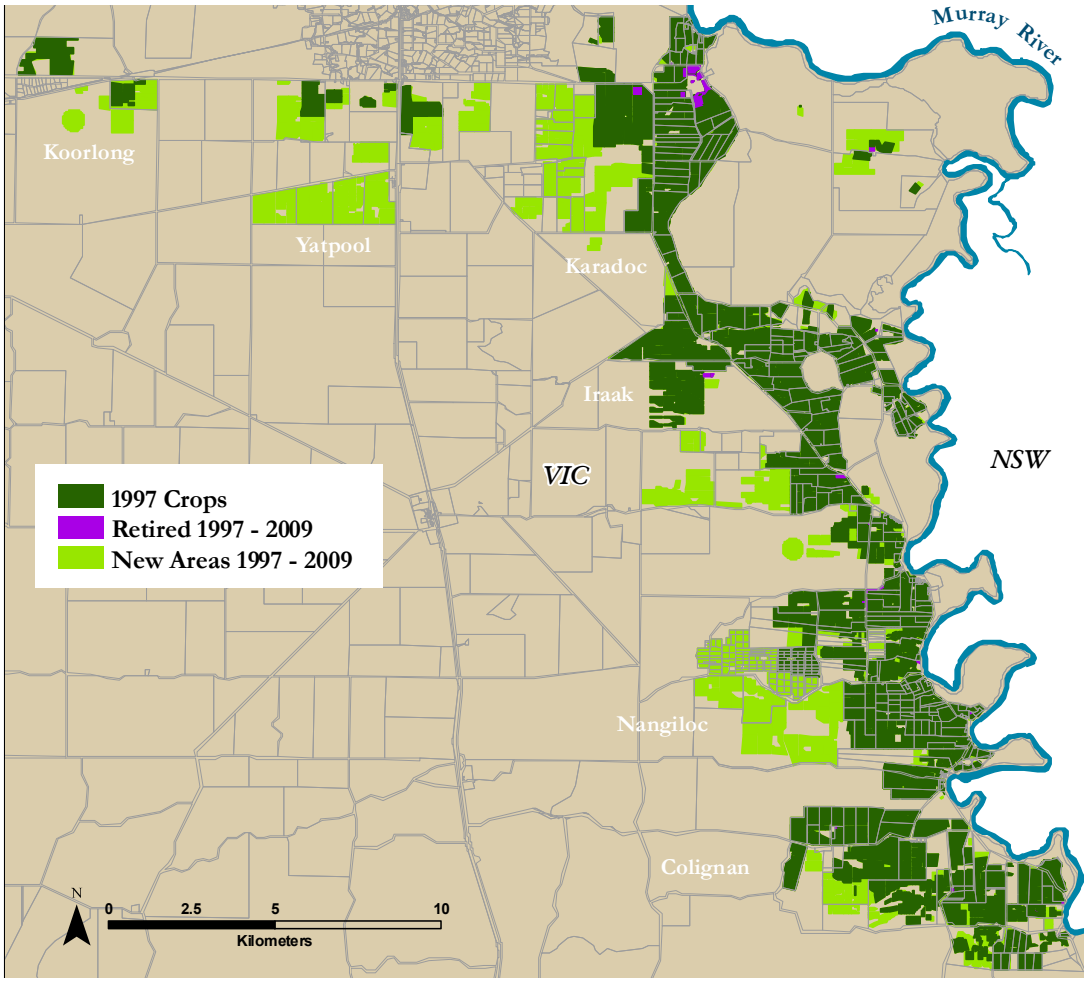


Colignan River Reach – Irrigation Development and Property Change

Irrigation Development from 1997 to 2009

	Hectares			% of 1997
Irrigated crops in 1997 (1996-97 season)	**7,105**			
Retired between 1997 and 2009		**-50**		-1%
New areas between 1997 and 2009		**+3,605**		+51%
Irrigated crops in 2009 (2008-09 season)			**10,660**	

Retired = change in land use that precludes use for irrigation e.g. urban development, dam construction.



Property Change

Property size (cropped area)	Number of properties				Change 1997 to 2009	2009%
	1997	2003	2006	2009		
< 5 ha	15	19	17	15	0	10%
5 to 10 ha	13	11	12	15	+2	10%
10 to 20 ha	33	29	30	30	-3	19%
20 to 40 ha	34	32	33	33	-1	21%
> 40 ha	48	60	62	62	+14	40%
Total properties	**143**	**151**	**154**	**155**	**+12**	**100%**
Average property size (ha)	**49.7**	**64.1**	**67.7**	**68.8**		

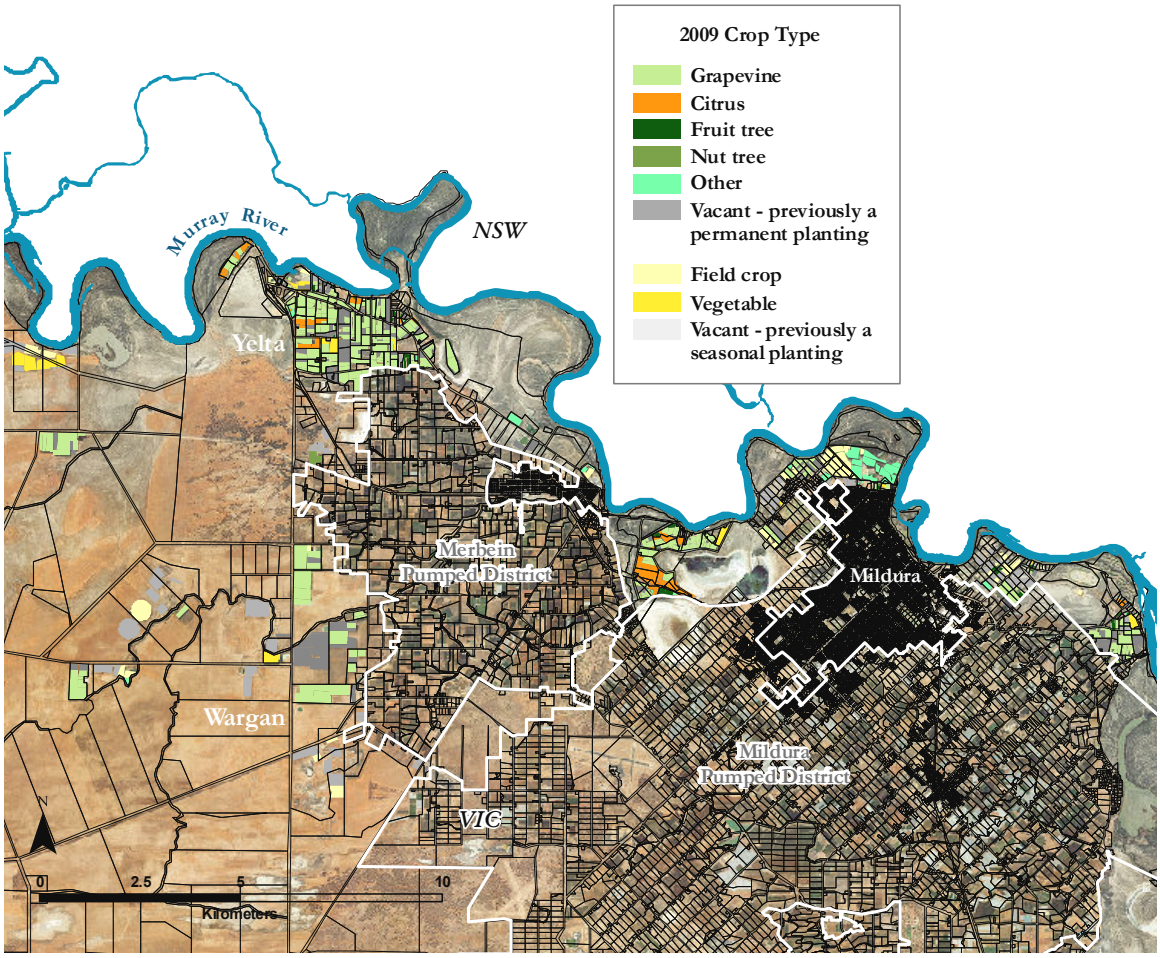
Properties irrigating less than one hectare have been excluded from the property analysis.

3.5 Mildura River Reach (Mildura to Lock 10)

The following presents information with respect to irrigation along the Mildura river reach from 1997 to 2009. In summary:

- The irrigated area increased by 315 hectares, a 22% increase from 1,415 hectares in 1997 to 1,730 hectares in 2009.
- 33% of the irrigated area was vacant in the 2008-09 irrigation season; comprising 17% previously permanent plantings and 16% previously seasonal plantings.
- Grapevines remained the dominant crop type from 1997 to 2009.
- Furrow irrigation was dominant in 1997, overhead sprinklers dominant in 2003 and then drip irrigation has been the dominant irrigation method since 2006.
- There are 103 Mildura private diverters, averaging 16.8 ha (cropped area) per property.
- Crops are grown predominantly in the high salinity impact zone.

Map of the Mildura river reach showing 2009 crop types

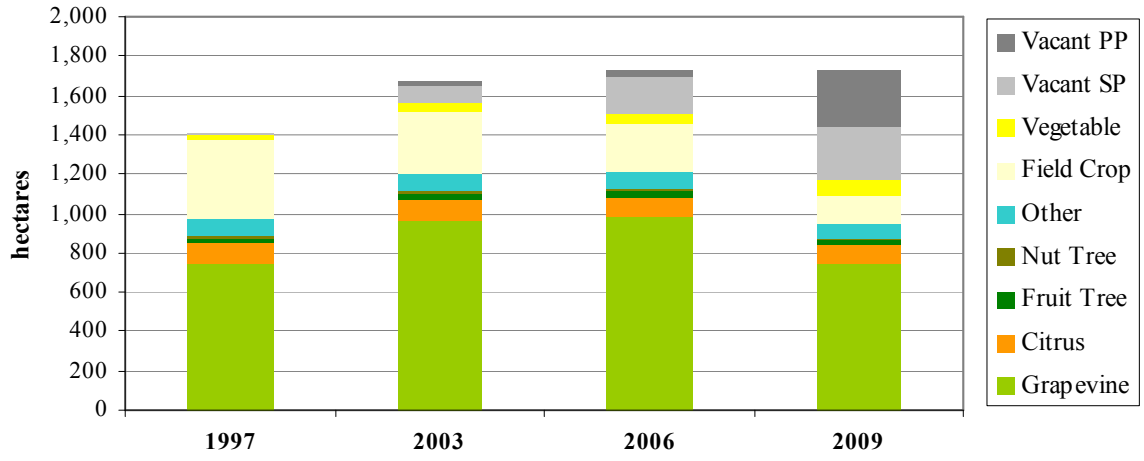


Mildura River Reach – Crop Types

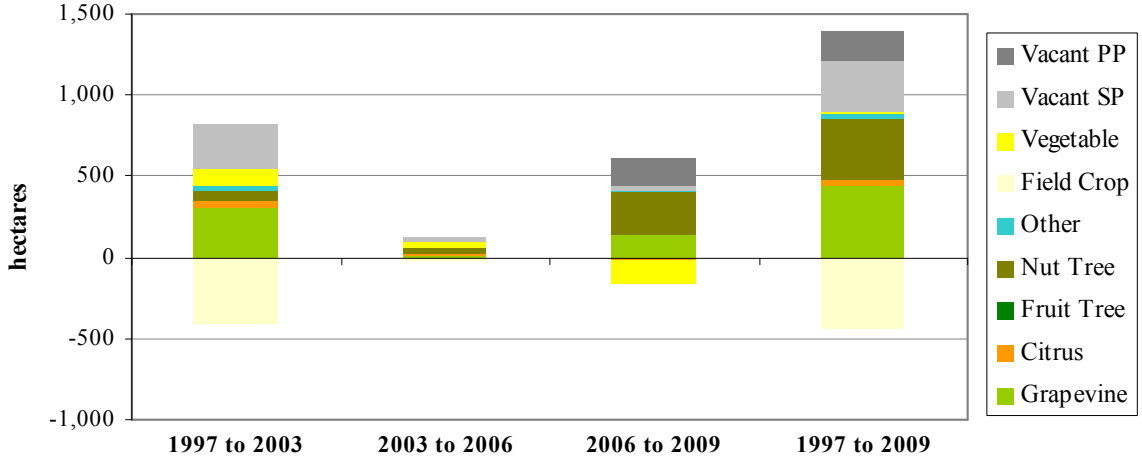
Crop Type		Area 1997	Area 2003	Area 2006	Area 2009	2009 Type 2009 Total		Change 1997 to 2009
Permanent plantings	Grapevine	745	965	985	745	43%		0
	Citrus	105	105	100	95	5%		-10
	Fruit Tree	20	30	30	25	1%		+5
	Nut Tree	10	10	10	10	1%		0
	Other	95	90	90	75	4%		-20
Seasonal crops	Field Crop	400	320	240	140	8%		-260
	Vegetable	20	45	55	80	5%		+60
Vacant	Vacant SP	15	90	180	270	33%	16%	+255
	Vacant PP	5	15	35	290		17%	+285
Total hectares		**1,415**	**1,670**	**1,725**	**1,730**	**100%**		**+315**

Vacant PP = previously a permanent planting Vacant SP = previously a seasonal planting.

Crop Type per Year



Crop Type Change

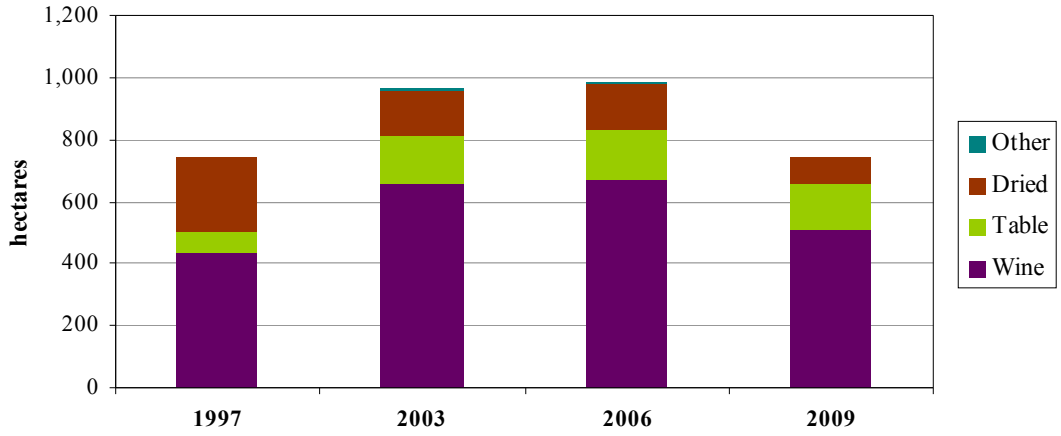


Mildura River Reach – Grape Use

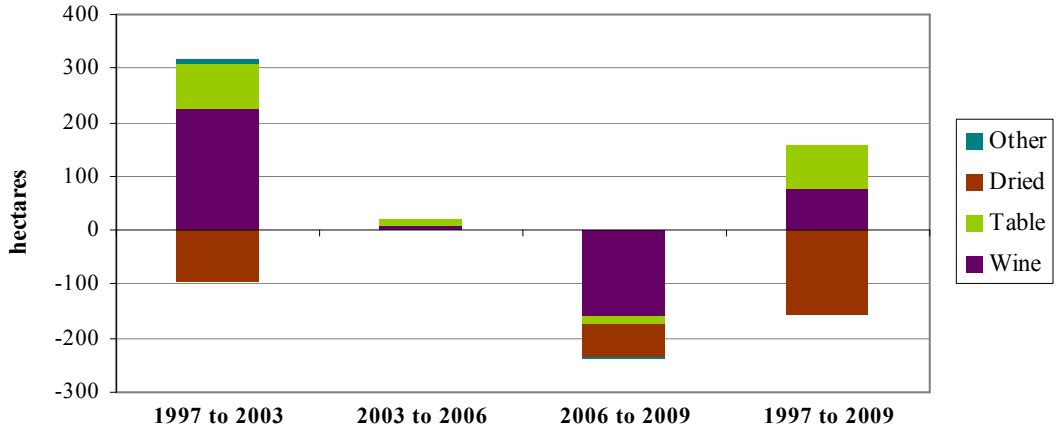
Grape Use	Area 1997	Area 2003	Area 2006	Area 2009	2009 Use 2009 Total %	Change 1997 to 2009
Wine	435	660	670	510	68%	+75
Table	65	150	160	145	19%	+80
Dried	245	150	150	90	12%	-155
Other	0	5	5	0	0%	0
Total hectares	**745**	**965**	**985**	**745**	**100%**	**0**

Other = juice, cannery or research

Grape Use per Year



Grape Use Change

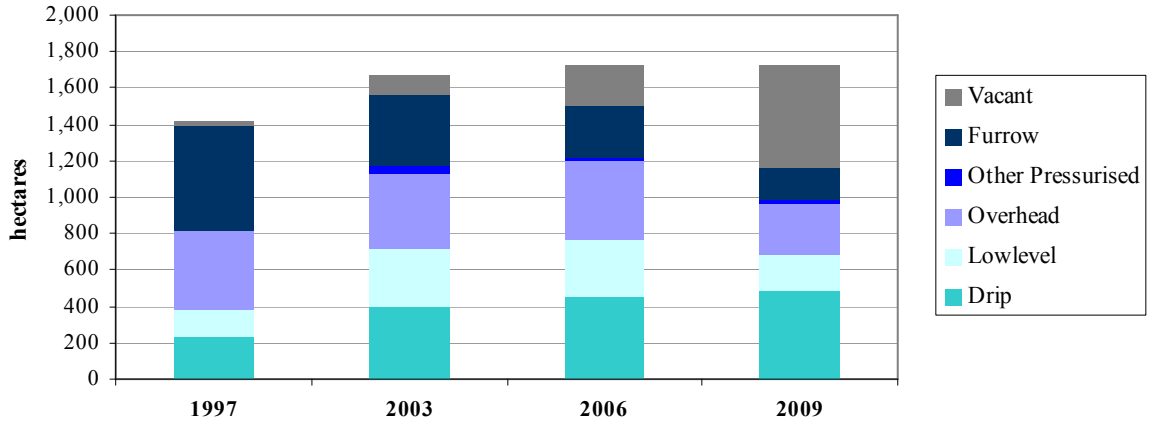


Mildura River Reach – Irrigation Methods

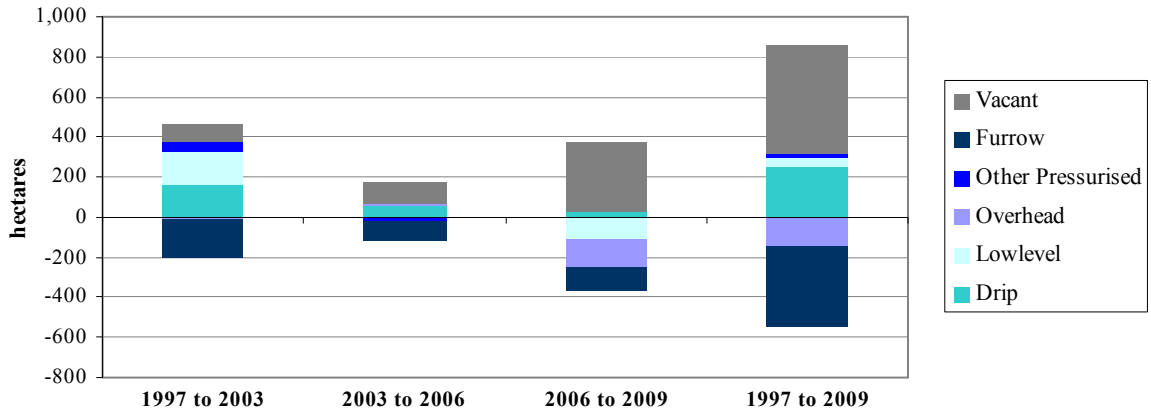
Irrigation Method	Area 1997	Area 2003	Area 2006	Area 2009	2009 Method 2009 Total	Change 1997 to 2009
Drip	235	400	455	480	28%	+245
Low level	145	310	310	200	12%	+55
Overhead	435	420	430	290	17%	-145
Other Pressurised	0	45	20	20	1%	+20
Furrow	580	390	295	180	10%	-400
Vacant	20	105	215	560	32%	+540
Total hectares	**1,415**	**1,670**	**1,725**	**1,730**	**100%**	**+315**

Other pressurised includes centre pivot and miscellaneous sprinklers

Irrigation Method per Year



Irrigation Method Change

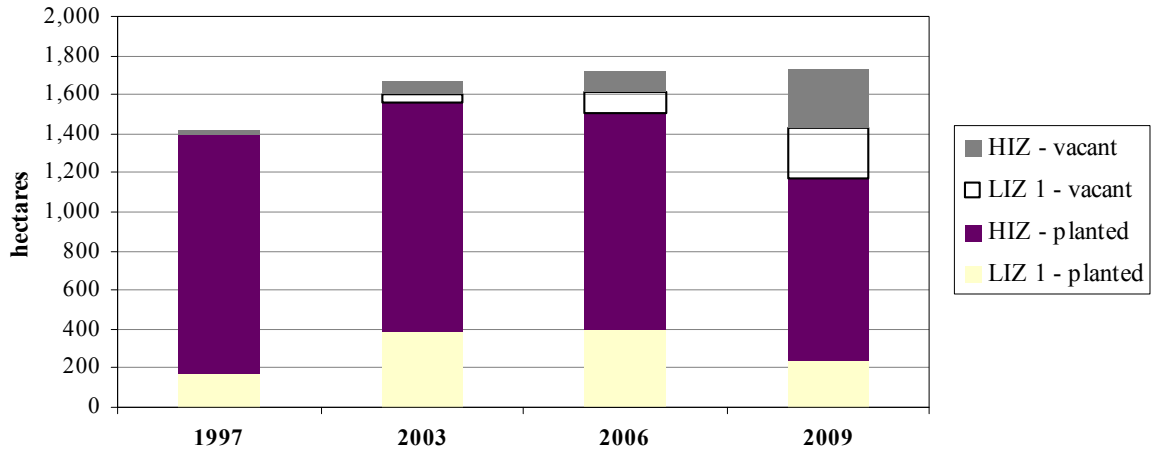


Mildura River Reach – Salinity Impact Zones

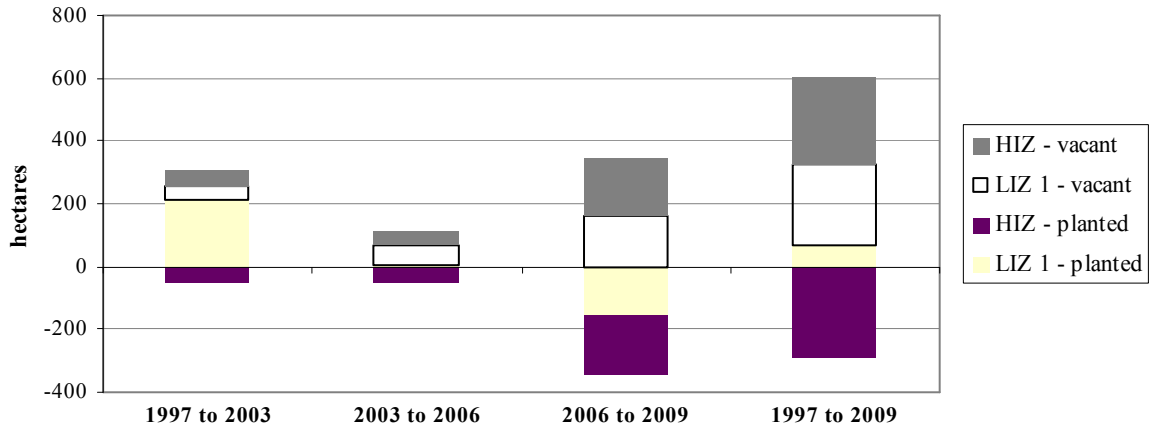
Salinity Impact Zone		Area 1997	Area 2003	Area 2006	Area 2009	2009 Zone 2009 Total %	Change 1997 to 2009
Planted	LIZ 1	175	390	395	240	14%	+65
	LIZ 2						
	LIZ 3						
	LIZ 4						
	HIZ	1,220	1,170	1,115	930	54%	-290
Vacant	LIZ 1	5	45	105	265	15%	+260
	LIZ 2						
	LIZ 3						
	LIZ 4						
	HIZ	15	65	110	295	17%	+280
Total hectares		**1,415**	**1,670**	**1,725**	**1,730**	**100%**	**+315**

LIZ = low impact zone, HIZ = high impact zone

Salinity Impact Zone per Year



Salinity Impact Zone Change

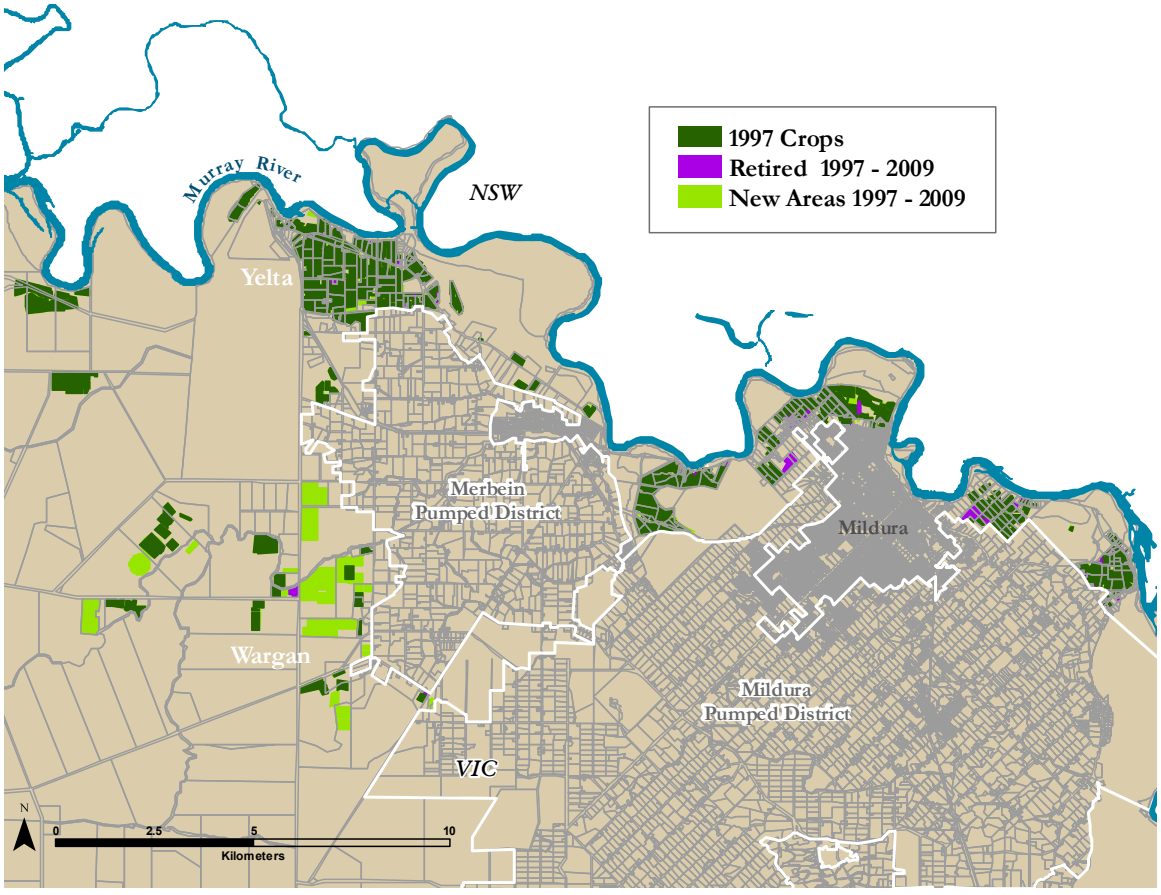


Mildura River Reach – Irrigation Development and Property Change

Irrigation Development from 1997 to 2009

	Hectares			% of 1997
Irrigated crops in 1997 (1996-97 season)	**1,415**			
Retired between 1997 and 2009		**-50**		-4%
New areas between 1997 and 2009		**+365**		+26%
Irrigated crops in 2009 (2008-09 season)			**1,730**	

Retired = change in land use that precludes use for irrigation e.g. urban development, dam construction.



Property Change

Property size (cropped area)	Number of properties				Change 1997-2009	2009%
	1997	2003	2006	2009		
< 5 ha	38	36	37	36	-2	35%
5 to 10 ha	31	27	24	23	-8	22%
10 to 20 ha	21	21	22	18	-3	17%
20 to 40 ha	12	17	16	13	+1	13%
> 40 ha	8	10	11	13	+5	13%
Total properties	**110**	**111**	**110**	**103**	**-7**	**100%**
Average property size (ha)	**12.9**	**15.0**	**15.7**	**16.8**		

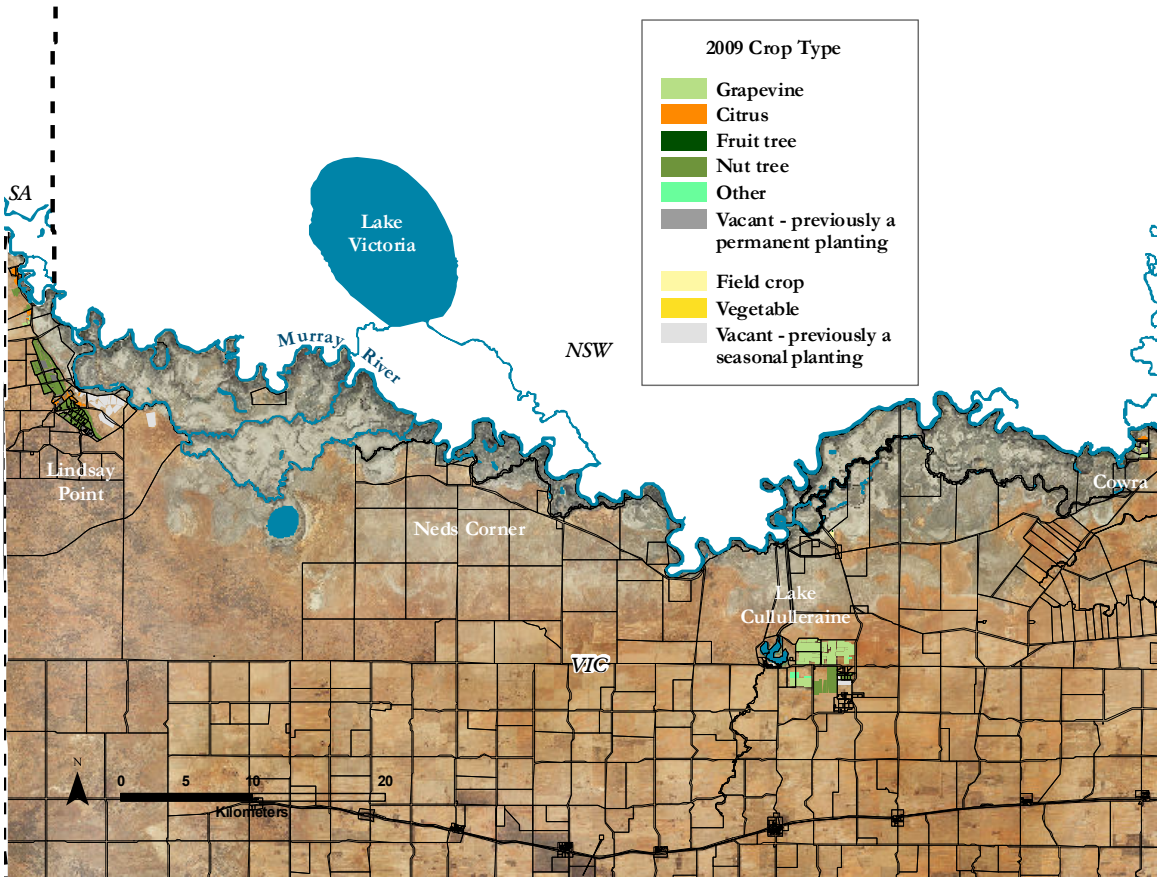
Properties irrigating less than one hectare are assumed to have house and garden supply and have been excluded from analysis on property numbers.

3.6 Lock 10 to the South Australian Border

The following presents information with respect to irrigation along the Lock 10 to SA river reach from 1997 to 2009. In summary:

- The irrigated area increased by 960 hectares, a 53% increase from 1,805 hectares in 1997 to 2,765 hectares in 2009.
- 23% of the irrigated area was vacant in the 2008-09 irrigation season; comprising 7% previously permanent plantings and 16% previously seasonal plantings.
- Nut trees (almonds) remained the dominant crop type from 1997 to 2009.
- The dominant irrigation method was low level sprinklers from 1997 to 2006, changing to 'drip' by 2009.
- The Lock 10 to SA river reach has 18 irrigation properties, averaging 153.6 ha (cropped area) per property.
- Crops are predominantly grown in the lowest salinity impact zone, LIZ 1.

Map of Lock 10 to the South Australia Border showing 2009 crop types

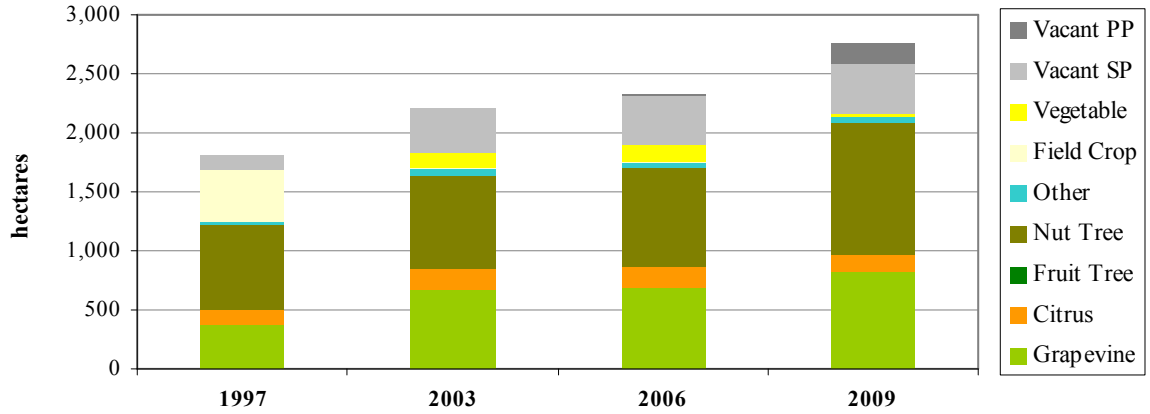


Lock 10 to South Australia – Crop Types

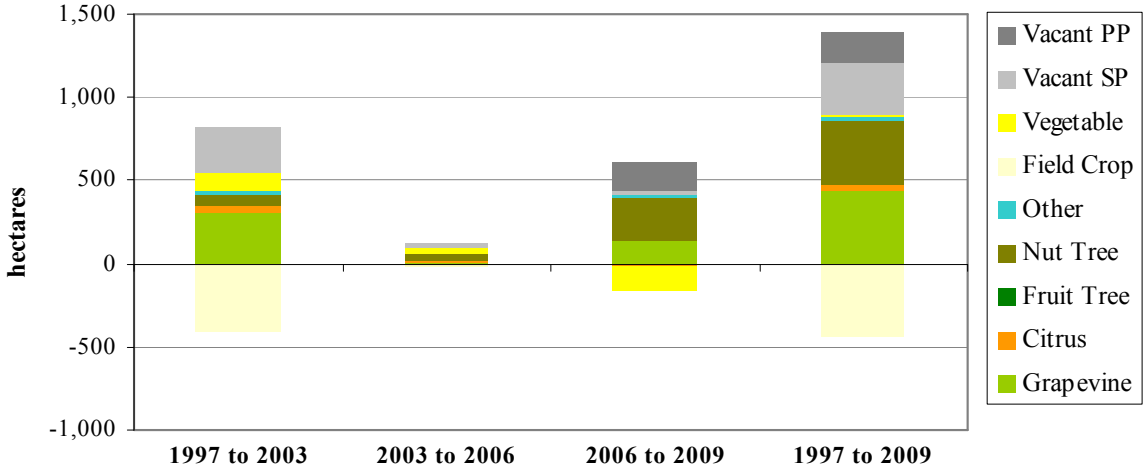
Crop Type		Area 1997	Area 2003	Area 2006	Area 2009	2009 Type 2009 Total		Change 1997 to 2009
Permanent plantings	Grapevine	375	680	685	820	30%		+445
	Citrus	120	160	170	150	5%		+30
	Fruit Tree	0	0	0	0	0%		0
	Nut Tree	735	805	850	1,120	41%		+385
	Other	15	40	40	45	2%		+30
Seasonal crops	Field Crop	445	30	10	10	0%		-435
	Vegetable	0	110	150	5	0%		+5
Vacant	Vacant SP	115	385	405	435	23%	16%	+320
	Vacant PP	0	0	10	180		7%	+180
Total hectares		**1,805**	**2,210**	**2,320**	**2,765**	**100%**		**+960**

Vacant PP = previously a permanent planting Vacant SP = previously a seasonal planting.

Crop Type per Year



Crop Type Change

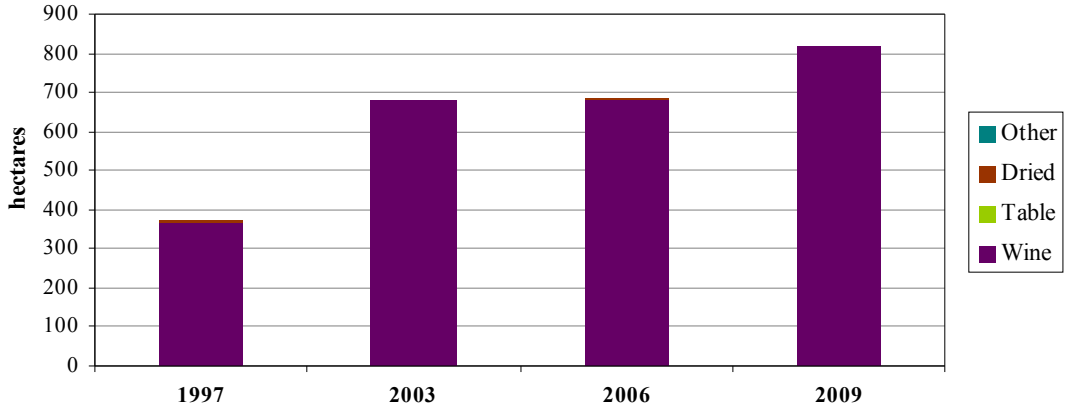


Lock 10 to South Australia – Grape Use

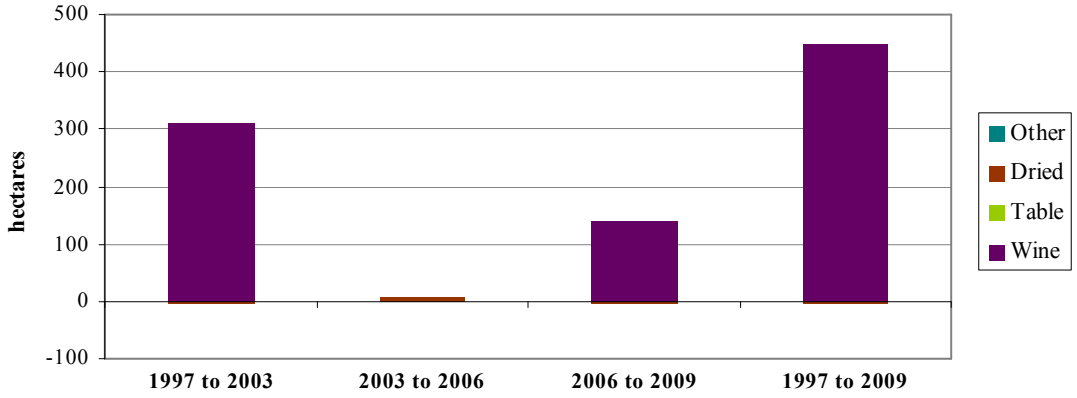
Grape Use	Area 1997	Area 2003	Area 2006	Area 2009	2009 Use 2009 Total %	Change 1997 to 2009
Wine	370	680	680	820	100%	+450
Table						
Dried	5	0	5	0	0%	-5
Other						
Total hectares	**375**	**680**	**685**	**820**	**100%**	**+445**

Other = juice, cannery or research

Grape Use per Year



Grape Use Change

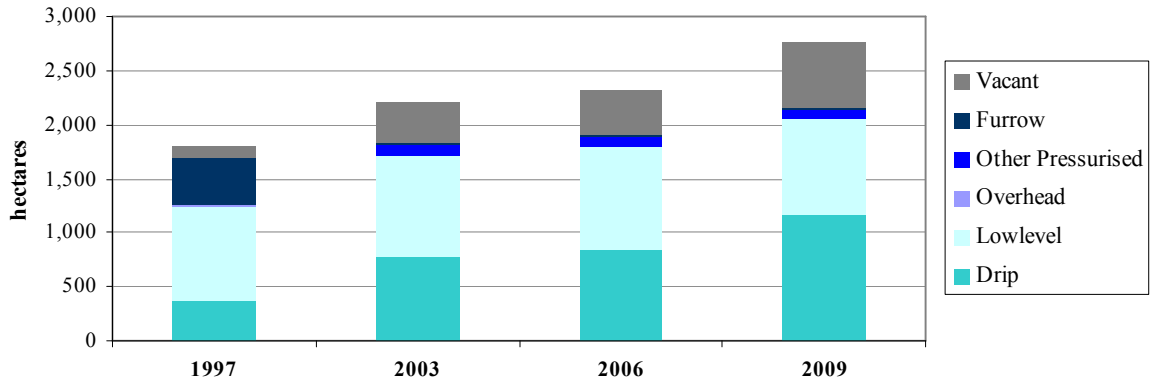


Lock 10 to South Australia – Irrigation Methods

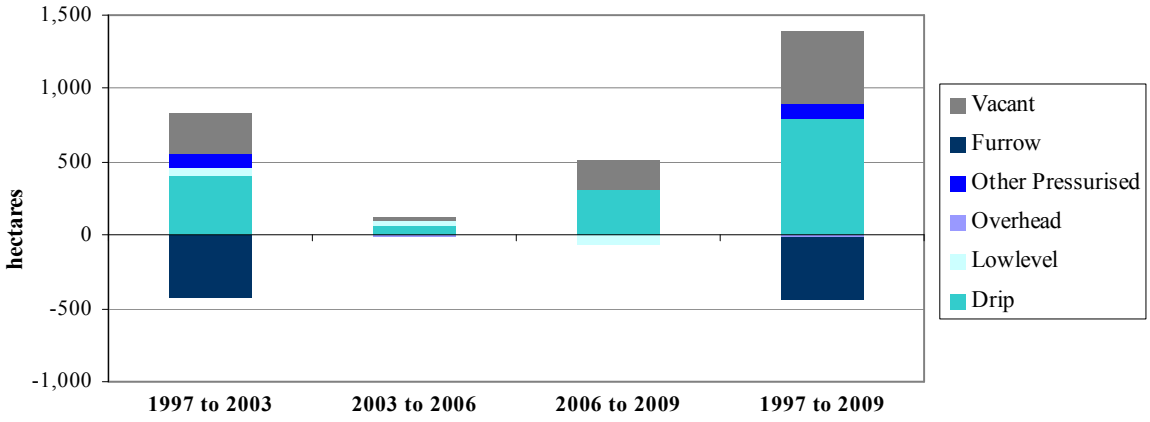
Irrigation Method	Area 1997	Area 2003	Area 2006	Area 2009	2009 Method 2009 Total	Change 1997 to 2009
Drip	375	775	845	1,160	42%	+785
Low level	870	925	945	880	32%	+10
Overhead	10	10	5	0	0%	-10
Other Pressurised	0	100	100	100	4%	+100
Furrow	435	15	10	10	0%	-425
Vacant	115	385	415	615	22%	+500
Total hectares	**1,805**	**2,210**	**2,320**	**2,765**	**100%**	**+960**

Other pressurised includes centre pivot and miscellaneous sprinklers

Irrigation Method per Year



Irrigation Method Change

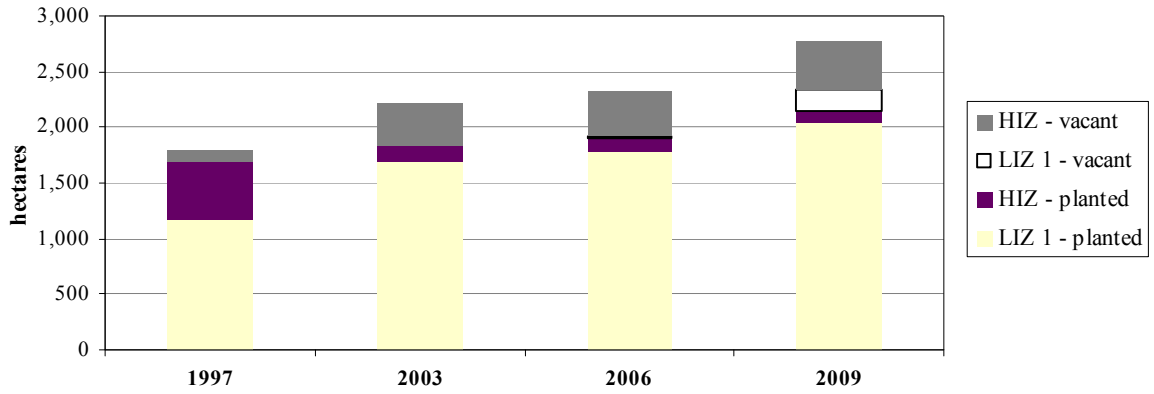


Lock 10 to South Australia – Salinity Impact Zones

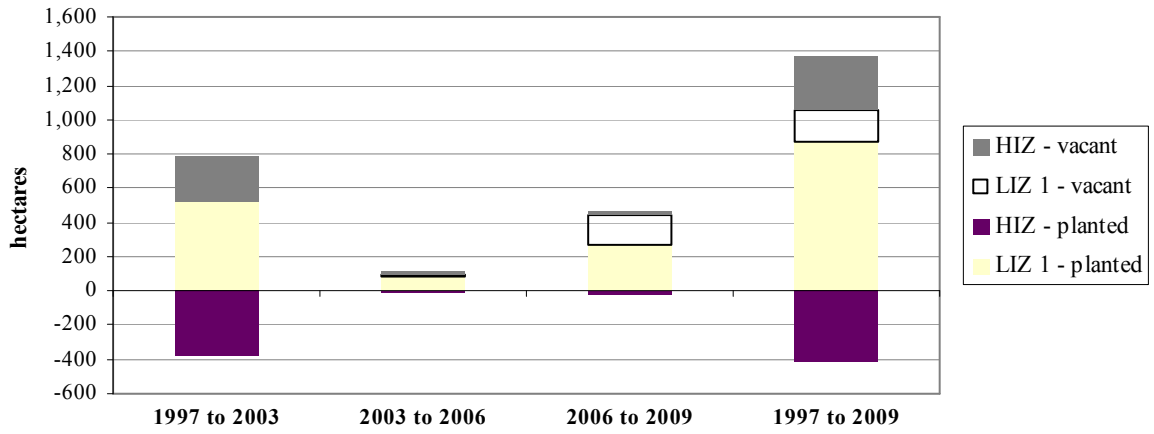
Salinity Impact Zone		Area 1997	Area 2003	Area 2006	Area 2009	2009 Zone 2009 Total %	Change 1997 to 2009
Planted	LIZ 1	1,170	1,690	1,775	2,040	74%	+870
	LIZ 2						
	LIZ 3						
	LIZ 4						
	HIZ	520	135	130	110	4%	-410
Vacant	LIZ 1	0	0	5	185	7%	+185
	LIZ 2						
	LIZ 3						
	LIZ 4						
	HIZ	115	385	410	430	16%	+315
Total hectares		**1,805**	**2,210**	**2,320**	**2,765**	**100%**	**+960**

LIZ = low impact zone, HIZ = high impact zone

Salinity Impact Zone per Year



Salinity Impact Zone Change

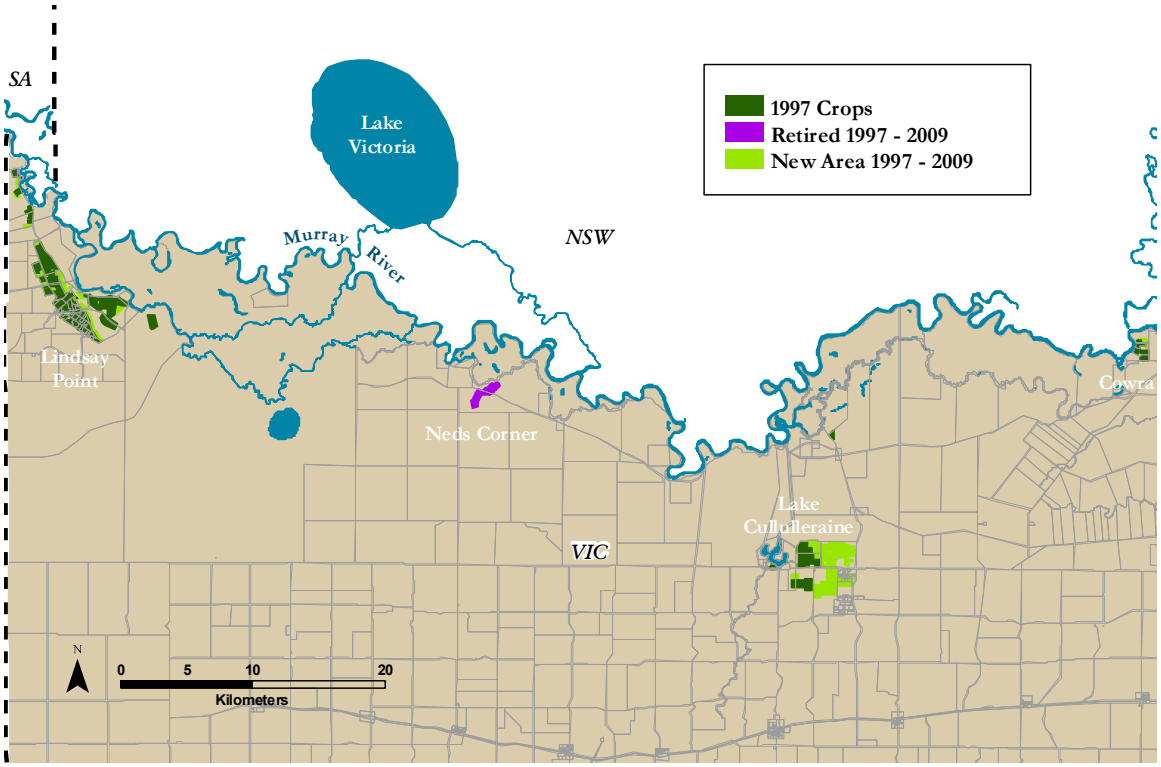


Lock 10 to SA – Irrigation Development and Property Change

Irrigation Development from 1997 to 2009

	Hectares			% of 1997
Irrigated crops in 1997 (1996-97 season)	**1,805**			
Retired between 1997 and 2009		**-150**		-8%
New areas between 1997 and 2009		**+1,110**		+61%
Irrigated crops in 2009 (2008-09 season)			**2,765**	

Retired = change in land use that precludes use for irrigation e.g. urban development, dam construction.



Property Change

Property size (cropped area)	Number of properties				Change 1997 to 2009	2009%
	1997	2003	2006	2009		
< 5 ha	2	2	2	2	0	11%
5 to 10 ha	1	0	0	0	-1	0%
10 to 20 ha	3	3	3	2	-1	11%
20 to 40 ha	2	2	2	2	0	11%
> 40 ha	9	12	11	12	+3	67%
Total properties	**17**	**19**	**18**	**18**	**+1**	**100%**
Average property size (ha)	**106.2**	**116.3**	**128.9**	**153.6**		

Properties irrigating less than one hectare are assumed to have house and garden supply and have been excluded from analysis on property numbers.

Appendix 1 SunRISE 21 Crop Mapping Metadata

Metadata Element	Definition and allowable values
Dataset	
ANZLIC Identifier	*Unique identifier*
Title	Irrigated horticulture of the Lower Murray-Darling
Custodian	
Custodian	SunRISE 21 Inc.
Jurisdiction	Victoria and New South Wales
Description	
Abstract	The mapping of irrigated horticulture of the Lower Murray-Darling (Victoria and New South Wales) commenced in 1996 in order to better understand and monitor changes in the region's irrigation industry; including its environmental, social and economic impacts. Components of the datasets are used by irrigators, industry groups, research agencies and government agencies across a range of programs. The dataset is maintained on an ongoing basis by SunRISE 21 incorporated (a community based, not-for-profit organisation). Complete datasets have been compiled every three years with the exception of the year 2000 (i.e. 1997, 2003, 2006 and 2009). The 1997, 2003, 2006 and 2009 datasets are, in general, mapped from 1997, 2003, 2006 and 2009 orthophoto imagery flown in February of that year and hence represent the 1996-97, 2002-03, 2005-06 and 2008-09 irrigation seasons respectively. The datasets comprise individual polygons to the on-farm crop patch level where a patch represents a particular variety of crop, planted in a particular year and having a particular irrigation method. **Projection:** The data is stored on datum GDA94, projection MGA54.
Search Word	AGRICULTURE Crops AGRICULTURE Irrigation AGRICULTURE Horticulture LAND Use
Geographic Extent Name (GEN)	GEN_CATAGORY: 1:250 000 map series GEN_CUSTODIAL_JURISTDICTION: Australia GEN_NAME: Menindee 5403, Ana Branch 5407, Pooncarie 5408 Mildura 5411, Balranald 5412, Swan Hill 5416
Geographic Bounding Box	North Bounding Latitude: -32.235581 South Bounding Latitude: -35.20984 East Bounding Longitude: 143.472575 West Bounding Longitude: 140.95869
Description	
Beginning Date	1996-07-01 (01 July 1996)
Ending Date	Current
Dataset Status	
Progress	On going
Maintenance and update frequency	On going
Access	
Stored data format	DIGITAL ArcView shapefile, vector polygon coverages, GDA94 Zone54. Data is stored in separate files for each irrigation season; 1996-97, 2002-03, 2005-06 and 2008-09 irrigation seasons. Next planned season is 2011-2012.
Available data format	DIGITAL – ArcView shapefile or dbf database, with confidential fields and/or records removed.
Access constraint	Restricted access subject to written application, licensing conditions and fee. Access is only provided to non-confidential attributes and for the term of and purpose of a designated project. SunRISE 21 is responsible for maintaining the security and confidentiality of the data. Some details are only collected through grower surveys and these are only released with authorisation of the grower.
Data Quality	
Lineage	Crop patches are mapped from high resolution orthophoto imagery (generally 0.3 – 0.35 metre pixel resolution) using ArcView or ArcGIS software. Crop details (attributes) are captured from a combination of imagery interpretation, drive-by surveys and irrigator surveys.
Positional Accuracy	The orthophoto map base has positional accuracy of < 2 metres. Some of the more remote irrigated crops are mapped from digital aerial photography referenced from airborne GPS with an estimated positional accuracy of < 10 metres. Crop polygons are mapped from the orthophoto or aerial photo image base at a scale of 1:5,000 or better.
Attribute Accuracy	Accuracy of attributes varies considerably throughout the dataset. For instance, some

	details are readily discernable from the orthophoto imagery; e.g. grapevines are easily distinguished from other crop types, white plastic sheeting over grapevines is interpreted as 'table' grapes, a 20 metre circular pattern is interpreted as 'overhead' irrigation, redevelopment of crops is generally discernable from updated orthophoto imagery (updated every three years) and therefore the year of planting can be deduced. Other details such as crop varieties and rootstocks are only collected through grower surveys. 70% of growers have been surveyed, accounting for 60% of the irrigated area. Surveyed growers are predominantly those with permanent plantings. Attribute accuracy is dependent on grower surveys and those features readily discernable from the imagery. It is higher; estimated to be 90%, for permanent crops (grapevines, citrus, fruit trees, nut trees, other miscellaneous crops and vacant (permanent planting area in redevelopment)). And lower; estimated to be 70%, for seasonal crops (vegetables, field crops such as pasture and vacant (seasonal planting area in redevelopment)); as seasonal cropping can be rotational and whilst visible as a footprint in the orthophoto imagery; it is not necessarily irrigated in any one season. Also, there has been little emphasis on collecting specific details such as varieties for seasonal cropping.
Logical consistency	Not relevant
Completeness	**Spatial completeness**: all areas visible as an irrigation footprint from digital aerial photography or orthophoto imagery are mapped. The mapping is considered to be a complete coverage of irrigated horticulture in the Lower Murray-Darling of VIC and NSW. **Attribute completeness:** at least 90% for all significant attribute fields except for crop variety where 70% of variety data has been collected for permanent plantings. Grapevines, citrus and nut trees are the dominant permanent crops in the region hence attribute completeness is more of a focus for these crop types.
Contact Information	
Contact Organisation	SunRISE 21 Inc.
Contact Person	Executive Officer
Mail Address	PO Box 997, Mildura VIC, 3502
Telephone	(03) 5023 7355
Facsimile	(03) 5021 1457
Electronic Address	mapping@sunrise21.org.au
Metadata date	
Metadata date	2008-03-26
Additional metadata	
Additional metadata	**Associated Reports*:*** *Irrigated Horticulture of the Lower Murray – Darling 1997 to 2003*, SunRISE 21, June 2004. *Mallee Zone Salinity and Irrigation Information Base*, MDBC, draft final report November 2006. *Irrigation Water Use Efficiency Benchmarking*, DPI, DSE, SunRISE 21, June 2006. *Economic Sustainability Study of Mildura Horticultural Region*, RMCG, March 2006. *Irrigation Change in the Pumped Irrigation Districts 2006 - 2007*, Lower Murray Water, April 2007. *Mallee Water Trade and Irrigation Development 1975 to 2006*, Mallee CMA, May 2007. *Trade Out of the Salinity High Impact Zone - Defining the Headroom*, Mallee CMA and DSE, December 2007. *Victorian Mallee 2006 Crop Report*, Mallee Catchment Management Authority, January 2008. *Irrigation Best Management Practice Survey*, LMD CMA, February 2008. *2007 – 2008 Drought Impact: Crops 'Not Irrigated' in the Pumped Irrigation Districts of North Western Victoria*, Mallee Catchment Management Authority, February 2008. *National Citrus Plantings Database, 2003 Citrus Report,* Horticulture Australia, Australian Citrus Growers, July 2006. *National Citrus Plantings Database, 2008 Citrus Report,* Horticulture Australia, Citrus Australia, November 2008.

Crop Data Dictionary

Field Name	Field Type	Definition and Allowable Values
Ortho	string	Year of the orthophoto that the mapping is based on. E.g. status in 2006 crop mapping = '2006' after it is checked/mapped against 2006 orthophoto imagery.
Source	string	Agency or program for collection of the data e.g. grower survey conducted through an industry QA program, winery or WUE project.
Survey	string	Year that the grower was last surveyed. NS = grower Not Surveyed.
Location	string	Property location or irrigation district.
Block_id	string	Unique Block reference allocated by SR21. First 4 letters of 'Location'+3 numbers e.g. REDC365. Allotments or grower recognised block numbers may be used.
Property	string	Property owner or enterprise name. Surname first then space then initials e.g. SMITH B&J. One 'property' may own multiple 'blocks'.
Patch	string	Patch ID – A to Z &/or letter-number combinations such as A1, A2, A3 (unless otherwise specified by grower)
Area_ha	numeric 2 dec.	Area of crop patch in hectares
Row_m	numeric 2 dec.	Row and plant spacing in metres (may be collected in feet and converted to metres). Only collected for permanent plantings.
Plant_m		
Trees	numeric 0 dec.	Collected from growers for citrus plantings. Else calculated from [Area_ha]*10,000/[Row_m]/[Plant_m].
Type	string	Type = Citrus, Field Crop, Fruit Tree, Grapevine, Nut Tree, Other, Vacant-P (previously a permanent planting), Vacant-S (previously a seasonal planting), Vegetable.
Category	string	Crop category e.g. Navel-Late. Citrus categories assigned as per National varieties master list.
Variety	string	Crop variety name. NS = Not Surveyed. Variety may equal Type &/or Category except for citrus and grapevines.
Rootstock	string	Crop rootstock name or 'Own Roots'. NS = Not Surveyed. May be blank except for citrus & grapevines.
Year	numeric	Year of planting (of rootstock) e.g. 1978 1900 = year planted unknown, but planted before 1996.
Rework	numeric	Year reworked or top-worked e.g. 2000
Use	string	Crop use for grapes (e.g. wine, dried, table, juice, cannery, research)
Int_trees	numeric	Number of interplant trees
Int_type	string	Inter-planted crop type
Int_catego	string	Inter-planted crop category
Inter_var	string	Inter-planted crop variety
Inter_root	string	Inter-planted crop rootstock
Inter_yr	numeric	Year of inter-planting
Trellis	string	Grapevine trellis type
Irrigation	string	Irrigation method e.g. Flood, furrow, (non-pressurised) low level, drip, overhead, pivot, sprinklers (pressurised).
Installed	string	Year pressurised system installed
Outlet	string	Irrigation supply meter outlet number
MVWG_id	numeric	Wine grape grower ID
Citrus_id	string	Grower's citrus registration number
State	string	VIC, NSW, QLD, NT, WA, or SA
District	string	Crop Report district
Hazard a	string	Hazard A salinity impact zone (VIC only)
Hazard b	string	Hazard B salinity impact zone (VIC only)
Change	string	Land use change since 1997 = 'new area' or 'retired' e.g. 'new area' = new irrigated crop in an area not irrigated prior to 1997. 'Retired' = an area retired after 1997 where the change in land use precludes use for irrigated horticulture such as residential development.

Many data entries are confidential or sensitive and these are not released without appropriate permission.

Appendix 2 2009 Crop Varieties List

CITRUS

Category	Variety
Grapefruit	Grapefruit
Grapefruit	Marsh
Grapefruit	Oroblanco
Grapefruit-Red	Ruby
Grapefruit-Red	RubyBlush
Grapefruit-Red	RubyPink
Grapefruit-Red	StarRuby
Grapefruit-White	Thompson
Lemon	Eureka
Lemon	Lemon
Lemon	Lisbon
Lemon	Meyer
Lime	Lime
Lime	Tahitian
Mandarin	Afourer
Mandarin	AvanaTardivo
Mandarin	Mandarin
Mandarin-Early	Amigo
Mandarin-Early	Clementine
Mandarin-Early	Fallglo
Mandarin-Early	Fewtrell
Mandarin-Early	Imperial
Mandarin-Early	OkitsuWase
Mandarin-Late	Carra
Mandarin-Late	Emperor
Mandarin-Late	Kara
Mandarin-Late	Murcott
Mandarin-Late	Ortanique
Mandarin-Mid	Daisy
Mandarin-Mid	Ellendale
Mandarin-Mid	Hickson
Navel	Navel
Navel	RedFlesh
Navel	Rogue
Navel	Salisbury
Navel-Early	CaraCara
Navel-Early	Fisher
Navel-Early	Fukumoto
Navel-Early	Hammet
Navel-Early	ItalianNavelina
Navel-Early	Leng
Navel-Early	LloydLeng
Navel-Early	Navelina
Navel-Early	Newhall
Navel-Early	NucellarLeng
Navel-Early	Pasin
Navel-Early	Ryan
Navel-Early	Thomson
Navel-Early	Whitely
Navel-Late	AutumnGold
Navel-Late	Barnfield
Navel-Late	Chislett
Navel-Late	Christensen
Navel-Late	Edwards
Navel-Late	LateLane
Navel-Late	Pollock
Navel-Late	Powell
Navel-Late	Rohde
Navel-Late	Scopelliti
Navel-Late	SummerGold
Navel-Late	SummerNavel
Navel-Late	Taylor
Navel-Late	Toc
Navel-Late	Toomey
Navel-Late	Wiffen
Navel-Mid	Atwood
Navel-Mid	Palmer
Navel-Mid	Washington
Orange	CommonOrange
Orange	Hamlin
Orange	ParsonBrown
Orange	Salustiana
Orange	Seville
Orange	SmoothSeville
Orange-Blood	ArnoldBlood
Orange-Blood	BloodOrange
Orange-Blood	Maltese
Pummelo	Pummelo
Tangelo	Minneola
Tangelo	Seminole
Tangelo	Tangelo
Valencia	Appleby
Valencia	Berri
Valencia	Casey
Valencia	Newton
Valencia	Smith
Valencia	Valencia
Valencia-Seedless	Delta
Valencia-Seedless	McMahon
Valencia-Seedless	Valencia-Seedless

FIELD CROPS

Category	Variety
Cereal	Cereal
FieldCrop	FieldCrop
Maize	Maize
Oats	Oats
Pasture	Pasture
Turf	Turf

2009 Crop Varieties List

FRUIT TREES

Category	Variety
Apricot	Apricot
Apricot	Hunter
Apricot	Storey
Avocado	Avocado
Avocado	Bacon
Avocado	Fuerte
Avocado	Gwen
Avocado	Hass
Avocado	Lamb
Avocado	Reed
Avocado	Wurtz
DatePalm	DatePalm
Fig	Fig
FruitTree	FruitTree
FruitTree	Jujubes
FruitTree	TropicalFruit
Mango	HoneyGold
Mango	KensingtonPride
Mango	Mango
Nectarine	Nectarine
Olive	JumboKalamatos
Olive	Kalamata
Olive	Manzanillo
Olive	Olive
Olive	OliveAU13A6
Olive	SpanishQueen
Olive	Verdale
Persimmon	Fuyu
Persimmon	Persimmon
Plum	BlackAmber
Plum	Plum
Plum	QueenRosa
Pomegranate	Pomegranate
Pomegranate	Wonderful
Stonefruit	Peach
Stonefruit	Stonefruit

NUT TREES

Category	Variety
Almond	Almond
Almond	Carmel
Almond	Nonpariel/Carmel
Pecan	Pecan
Pistachio	Pistachio
Pistachio	Siora
Walnut	Walnut

OTHER

Category	Variety
Arboretum	Arboretum
Flower	Discolour/JubileeCrown/Salignu
Flower	FreshFlower
Flower	PinkIce
Flower	Proteacea
Flower	Rose
Flower	SafariSunset
Flower	SilvanRed/Salignum
Garden	Garden-trees
NativeShrub	NativeShrub
NativeTree	Banksia
Nursery	Nursery
Woodlot	BlueGum
Woodlot	Eucalyptus
Woodlot	Native Vegetation
Woodlot	RedGum
Woodlot	Willow
Woodlot	Woodlot

VEGETABLES

Category	Variety
Asparagus	Asparagus
Asparagus	Idalea
Asparagus	Uc157
Asparagus	Uc157/F1
Beetroot	Beetroot
Broccoli	Broccoli
Carrot	Carrot
Melon	Melon
Potato	Potato
Rockmelon	Rockmelon
Vegetable	Corn
Vegetable	Vegetable-Mix
Zucchini	Zucchini

2009 Crop Varieties List

GRAPEVINES

Category	Variety
Grape	Apple
Grape	AutumGiant
Grape	AutumnRoyal
Grape	Barbera
Grape	BlackAmerica
Grape	BlackMuscat
Grape	BrownMuscat
Grape	BrucesSport
Grape	CabernetFranc
Grape	CabernetSauvignon
Grape	Calmeria
Grape	CanadaMuscat
Grape	Cardinal
Grape	Carina
Grape	Centennial
Grape	Chambourcin
Grape	Chardonnay
Grape	CheninBlanc
Grape	Colombard
Grape	CrimsonSeedless
Grape	Crouchen
Grape	Currant
Grape	DawnSeedless
Grape	DiamondMuscat
Grape	Dolcetto
Grape	Doradillo
Grape	Durif
Grape	EarlyMuscat
Grape	FantasySeedless
Grape	FlameSeedless
Grape	Frontignac
Grape	Gamay
Grape	Globe
Grape	Gold
Grape	GoldenGlobe
Grape	Gordo
Grape	Grenache
Grape	HamburgMuscat
Grape	Italia
Grape	JadeSeedless
Grape	Kismiski
Grape	Kyoho
Grape	Legrein
Grape	Malbec
Grape	Malvasia
Grape	MarooSeedless
Grape	Mataro
Grape	MenindeeSeedless
Grape	MerbeinSeedless

Category	Variety
Grape	Merlot
Grape	MidnightBeauty
Grape	MossSultana
Grape	Muscat
Grape	MuscatGordoBlanco
Grape	Nebbiolo
Grape	NS
Grape	Nyora
Grape	Ohanez
Grape	OrangeMuscat
Grape	Perlette
Grape	PetitVerdot
Grape	PinotGrigio
Grape	PinotGris
Grape	PinotNoir
Grape	PremiumWhite
Grape	PurpleCornichon
Grape	Queen
Grape	RalliSeedless
Grape	RedEmperor
Grape	RedGlobe
Grape	RhineRiesling
Grape	Ribier
Grape	Riesling
Grape	RubyCabernet
Grape	RubyRed
Grape	RubySeedless
Grape	Sangiovese
Grape	SauvignonBlanc
Grape	Semillon
Grape	Sharana
Grape	Shirana
Grape	Shiraz
Grape	SmallBeriSultana
Grape	Sugarone
Grape	Sultana
Grape	Sunmuscat
Grape	Tarango
Grape	Tempranillo
Grape	ThompsonSeedless
Grape	TokayFriulilo
Grape	Touriga
Grape	Traminer
Grape	Verdelho
Grape	Viognier
Grape	Waltham
Grape	WalthamCross
Grape	Zante
Grape	Zinfandal

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