2024 Mallee Horticulture Crop Report

mallee
catchment management authority

Publication details

Publication title: 2024 Mallee Horticulture Crop Report

Report Number: 42952

Project Number: 2136-2294

Contract Number: 100046

June 2025

Sponsor: Mallee Catchment Management Authority

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Acknowledgements

Sustainable Irrigation Program

Cover images

Grape Harvest, Cardross.

Version	Prepared	Author	Reviewed
Draft	5 May 2025	Sue Argus	Mallee CMA & DEECA
Final	12 June 2025	Sue Argus	Geoff Rix

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Acknowledgement of Country

Mallee Catchment Management Authority (CMA) acknowledges and respects Traditional Owners, Aboriginal communities and organisations. We recognise the diversity of their cultures and the deep connections they have with Victoria's lands and waters. We value partnerships with them for the health of people and country.
Mallee CMA Board, management and staff pay their respects to Elders past, present and emerging and recognise the primacy of Traditional Owners' obligations, rights and responsibilities to use and care for their traditional lands and waters.

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Executive summary

This report is the continuation of a series of triennial crop reports first produced in 1997 with the aim of accurately measuring irrigation status and development in the Mallee catchment.

The Mallee catchment has irrigated horticulture along the Murray River from Woorinen South to the South Australian border and in the Murrayville Groundwater Management Area (GMA), (**Map 1 page 19**).

The report presents maps and information on irrigated horticulture over the twenty-seven-year period from 1997 to 2024.

Key findings

The irrigated area across the Mallee catchment in 2024 was 185 hectares less than in 2021 (**Table 6, page 26**). This is the first of the triennial crop reports since 1997 that recorded a decrease in irrigated area since the previous report.

From 2021 to 2024 was also the first triennial period with a net decrease (-45 hectares) in almond plantings. There were few new almond plantings in this period and a small percentage of trees died in wet conditions associated with the 2022 Murray River flood event.

Crop types in 2024

Almonds were the dominant crop type in the Mallee catchment in 2024, and 99% of almond plantings were grown in the private diverter river reaches.

The top ten crop types in 2024 (Table 5, page 24) were:

1. almonds, 26,365 ha with 71% of plantings in the Boundary Bend and Wemen river reaches;
2. table grapes, 11,115 ha with 78% of plantings in the Mildura, Robinvale and Red Cliffs irrigation districts, and the Boundary Bend and Colignan river reaches;
3. wine grapes, 7,400 ha with 60% of plantings in the Colignan, Nyah and Lock 10 to South Australia river reaches;
4. citrus, 5,330 ha with 68% of plantings in the Colignan river reach;
5. winter field crops, 4,795 ha with 71% of crops in the Nyah and Boundary Bend river reaches;
6. olives, 3,755 ha with 74% of plantings in the Boundary Bend river reach;
7. potatoes, 2,730 ha with 100% of crops in the Boundary Bend river reach and the Murrayville GMA;
8. fruit trees other than olives, mainly stone fruit and avocados, 2,055 ha with 66% of plantings in the Nyah and Boundary Bend river reaches;
9. dried grapes, 1,965 ha with 82% of plantings in the Colignan river reach and the Mildura, Merbein and Red Cliffs irrigation districts; and
10. vegetables other than carrots and potatoes, 1,855 ha with 71% of crops in the Wemen and Colignan river reaches and the Red Cliffs irrigation district.

Crop type changes from 1997 to 2024

The dominant crop type across the Mallee catchment was wine grapes from 1997 to 2006, then almonds from 2009 to 2024 (**Figure 4, page 25**).

The main new plantings between 1997 and 2024 were almonds, table grapes and olives. Almond plantings increased by 24,620 hectares, from 1,745 hectares in 1997 to 26,365 hectares in 2024. Table grapes and olives increased by 6,965 hectares and 3,600 hectares respectively.

Key findings

The largest removal of plantings from 1997 to 2024 was dried grapes and wine grapes, with a net decrease of 4,365 hectares and 2,575 hectares respectively.

The dominant crop type changed between 1997 and 2024 in eight of the twelve study areas. In the Red Cliffs, Mildura and Merbein pumped irrigation districts, and the Mildura private diverters river reach, the dominant crop changed from wine or dried grapes to table grapes.

In the Nyah, Boundary Bend and Wemen river reaches the dominant crop changed from seasonal crops (vegetables or field crops) to almonds, and in the Colignan to Yatpool river reach the change was from wine grapes to citrus.

Rate of change from 1997 to 2024

On average, the irrigated area across the Mallee catchment increased by 1,151 hectares per year for the twenty-seven years from 1997 to 2024 (**Table 6, page 26**).

Permanent plantings increased by an average of 1,186 hectares per year, while seasonal cropping averaged a decrease of 35 hectares per year.

The only change period with a net decrease (-185 ha) in the irrigated area was from 2021 to 2024. This period was also the only change period with a net decrease (-45 ha) in almond plantings.

New permanent plantings (planted or top-worked in the previous three years)

In 2024, 10% (6,055 hectares) of permanent crops across the Mallee catchment had been planted or top-worked[1] in the previous three years (**Figure 5, page 27**). These 'new' plantings were mainly table grapes (2,225 hectares) and citrus (1,060 hectares).

The proportion of new permanent plantings across the Mallee catchment decreased from 17% of plantings in 2018 to 13% in 2021 to 10% in 2024. This trend was replicated in the private diverter river reaches (**Figure 55, page 108**). However, in the pumped irrigation districts the proportion of new permanent plantings increased from 16% in 2018 to 18% in 2021, then decreased to 13% in 2024 (**Figure 15, page 43**).

Areas for 'new' permanent plantings are conservative as top-worked plantings can be difficult to detect from triennial imagery, particularly with table grapes.

Planting trends - permanent plantings, seasonal crops and vacant areas

The area of permanent plantings irrigated in the Mallee catchment in 2024 was 32,010 hectares greater than in 1997; a 114% increase from 27,960 to 59,970 hectares (**Figure 6, page 28**).

The area of seasonal crops (field crops and vegetables) irrigated in 2024 was 945 hectares less than in 1997; an 8% decrease from 11,435 to 10,490 hectares.

Seasonal cropping areas, the area irrigated plus the area vacant, almost doubled from 12,545 hectares in 1997 to 22,285 hectares in 2024. However, the area irrigated in each of the seasons recorded remained relatively constant, within 15% of 12,000 hectares. The exception was 2009, when seasonal cropping was greatly reduced due to impacts of the Millennium drought.

[1] Top-worked plantings have been grafted to a new variety. It is a way of changing varieties without starting from scratch with a new plant. The process quickens the return to production as it is not a full re-planting.

Key findings

Across the pumped irrigation districts, the proportion of permanent plantings, seasonal cropping and vacant areas (**Figure 16, page 44**) changed from:

- 92% permanent, 6% seasonal and 2% vacant in 1997; to
- 68% permanent, 5% seasonal and 27% vacant in 2024.

In the private diverter river reaches, the proportion of permanent plantings, seasonal cropping and vacant areas (**Figure 56, page 109**) changed from:

- 53% permanent, 43% seasonal and 4% vacant in 1997; to
- 74% permanent, 12% seasonal and 14% vacant in 2024.

Table 1 shows the area in 2024 of permanent plantings, seasonal crops and vacant areas in the private diverter river reaches, the pumped irrigation districts and the Murrayville GMA. In 2024, 74% of the irrigable area was in the private diverter river reaches, 19% in the pumped irrigation districts and 7% in the Murrayville GMA.

Table 1: Permanent and seasonal cropping areas in the Mallee catchment in 2024

2024 (ha)	Private diverters	Pumped districts	Murrayville GMA	Mallee total
Permanent plantings	48,650	11,275	45	59,970
Seasonal crops	7,955	825	1,710	10,490
Total irrigated (ha)	56,605	12,100	1,755	70,460
Vacant P (was permanent)	3,305	3,345	0	6,650
Vacant S (was seasonal)	5,650	1,150	4,995	11,795
Total irrigable (ha)	65,560	16,595	6,750	88,905
% of 2024 irrigable area	74%	19%	7%	100%

Irrigation development - new development (expansion) and retired areas

From 1997 to 2024, there were 3,580 hectares retired from irrigation and 51,545 hectares of expansion. The net result was an increase in the irrigable area of 47,965 hectares, a 117% increase from 40,940 to 88,905 hectares (**Table 7, page 30**).

Expansion was predominantly in the private diverter river reaches where 44,935 hectares (87%) of expansion occurred, mainly in the in the Boundary Bend and Wemen river reaches.

Retired areas were 51% in the pumped irrigation districts, 46% in private diverter river reaches and 3% in the Murrayville GMA. Areas retired in the pumped districts were mainly for urban development while areas in the private diverter reaches were retired for farm infrastructure such as dams and sheds, for conservation or drainage purposes or returned to dryland cropping.

Potential future irrigation development

New irrigation development activity was mapped from observation of soil survey pits and on-ground works in recent aerial and satellite imagery. (**Figure 8, page 31.**)

There were 120 hectares mapped of new plantings between July 2024 and June 2025. These were mainly table grapes, potatoes, wine grapes and citrus in the private diverter reaches of Boundary Bend, Colignan to Yatpool, Mildura and Wemen.

Also mapped, were 13,500 hectares of land with soil survey pits visible in aerial or satellite imagery. These sites are mainly in the Boundary Bend, Colignan to Yatpool and Wemen river reaches. Note that these developments might not proceed and the soil survey area does not reflect the area that might be planted.

Key findings

Salinity impact zones (*does not apply to the Murrayville GMA*)

The dominant salinity impact zone, across irrigated and non-irrigated areas in the Mallee catchment, changed from the high impact zone (HIZ) in 1997 to the lowest impact zone (L1) from 2003 to 2024 (**Figure 9, page 32**).

In 2024, 88% of the irrigable area was in low salinity impact zones: L1, L2, L3 and L4, and 12% was in the HIZ.

From 1997 to 2024, areas irrigated in low impact zones increased by 34,285 hectares, a 124% increase from 27,685 to 61,970 hectares. Areas irrigated in the HIZ decreased by 4,100 hectares, a 38% decrease from 10,835 to 6,735 hectares.

Salinity impact zones – new and retired areas

Areas retired from irrigation between 1997 and 2024 were 55% (1,900 hectares) in the HIZ (**Table 8, page 33**).

Areas of expansion in this period were predominantly (73%) in the lowest salinity impact zone, L1, and 1% were in the HIZ. Expansion in the HIZ was development on existing irrigation properties.

Irrigation methods

The dominant irrigation method in the Mallee catchment changed from furrow in 1997 to overhead in 2003 then to drip irrigation from 2006 to 2024 (**Figure 11, page 34**).

Drip irrigation was the dominant method in each of the twelve study areas in 2024, except for the Robinvale irrigation district where low level sprinklers were dominant and the Murrayville GMA where centre pivots were dominant.

The use of pressurised systems (drip, low level and overhead irrigation) increased from 61% of the irrigated area in 1997 to 98% by 2024. Gravity systems (furrow and flood) decreased from 39% of the irrigated area in 1997 to 2% in 2024.

Irrigation properties

In 2024, there were approximately 1,695 irrigation properties in the Mallee catchment with an average property size (irrigable area) of 52 hectares (**Figure 12, page 35**). 15% of properties had an irrigable area over 40 hectares, and these properties farmed 85% of the irrigable area.

From 1997 to 2024, the number of properties decreased by 753 (31%), while average property size (irrigable area) increased from 17 to 52 hectares per property. Properties with an irrigable area of less than 40 hectares decreased by 847, while the number over 40 hectares increased by 94.

77% of properties were in the pumped irrigation districts, 22% were private diverters and 1% were in the Murrayville GMA (**Figure 13, page 36**).

Average property size (irrigable area) in the private diverter areas increased from 45 hectares in 1997 to 169 hectares in 2024. In the pumped irrigation districts, it increased from 9 hectares to 12 hectares, and in the Murrayville GMA, it is estimated to have increased from 121 hectares to 355 hectares.

Introduction

This report was commissioned by the Mallee Catchment Management Authority (Mallee CMA) to provide an accurate snapshot of irrigation status and change in the Mallee catchment over twenty-seven years, from 1997 to 2024. The study will enhance understanding of the dynamics of irrigation and its impact on salinity and water quality.

The study area is all irrigated horticulture in the Mallee catchment, along the Murray River from Woorinen South to the South Australian border and in the Murrayville Groundwater Management Area (GMA), (**Map 1, page 19**).

The project was identified as a key action (#1, #2 and #3) within the Victorian Mallee Irrigation Region Land and Water Management Plan 2020-29 with respect to planning and management of water availability issues.

Purpose of the report

The report will inform the Mallee CMA with respect to:

- Monitoring and evaluating implementation of the Mallee Land and Water Management Plan 2020-29;
- Planning for future irrigation and salinity management programs;
- Analysis and modelling of salinity impacts from irrigation developments;
- Mallee region reporting to State and Commonwealth Governments including review of regional items on the Basin Salinity Management 2030 Strategy registers;
- Achieving high-level, long-term goals of the Mallee Regional Catchment Strategy (2022-28); and
- Investment priorities of the Sustainable Irrigation Program and other State programs.

Outputs

Outputs from the 2024 Mallee Horticulture Crop Report and its associated spatial crop mapping include:

- A draft and final report;
- A fact sheet;
- A MS Excel file with data analysis summaries and charts; and
- Spatial mapping with meta data and a data licence agreement.

Method

SunRISE Mapping and Research (SunRISE) - crop mapping

SunRISE crop mapping is captured to the individual patch or variety level using a map base of high-resolution, scale accurate aerial imagery. Details for each crop patch such as type, variety, year planted, and irrigation method are collected from irrigators, field surveys and aerial imagery interpretation. Some details are discernible from the imagery while others such as variety are provided by property owners or managers.

Details are also collected in collaboration with local agencies and industry bodies to support specific programs, such as planting statistics for industry planning and management, and spatial information for infrastructure development, biosecurity, economic assessments and environmental monitoring.

SunRISE records crop and property details from irrigators on an on-going basis. This is generally a part of the process of providing maps and plans for property management and planning such as irrigation design, redevelopment, property sales, soil surveys, spray records, export registration, organic certification and environmental management. All data is securely stored by SunRISE and confidential details are only released to a third-party with permission from the owner.

Imagery sources

SunRISE crop mapping is primarily based on high-resolution aerial imagery that has been updated every three years since 1997 (**Figure 1)**. The 2024 aerial imagery was acquired through the Coordinated Imagery Program, Department of Transport and Planning, Victoria with a range of purchase partners.

SunRISE also uses online imagery sources such as Metromap, Google Earth, Sentinel Hub and Decipher Ag. These provide snap shots at different times of the year which helps to map winter crops and monitor land or plantings in transition.

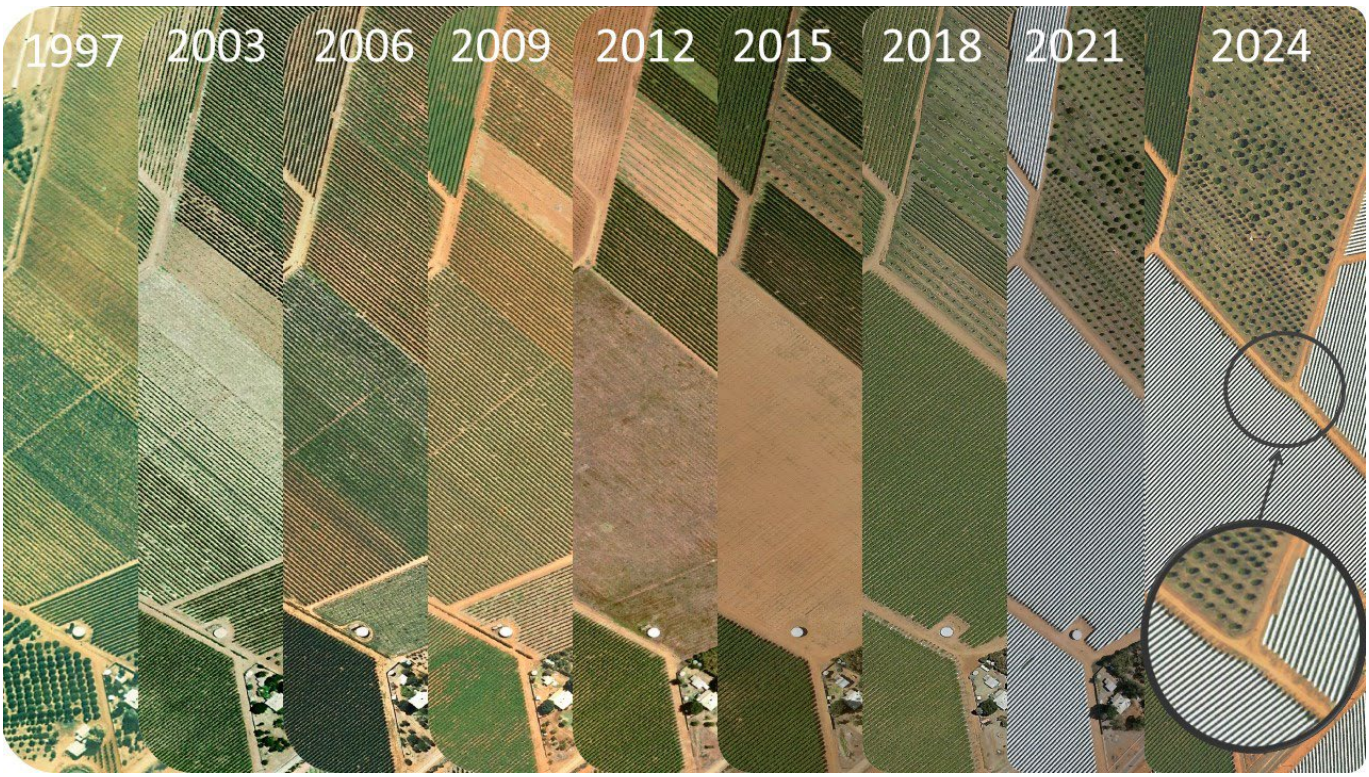


Figure 1: Three-yearly aerial imagery used by SunRISE to map irrigated horticulture

Method

Adjustments made since earlier reports

Information in this 2024 report may vary from earlier reports due to:

- SunRISE collates crop and property details on an on-going basis. As more details are collected, earlier databases are backfilled where relevant and continually improved.
- The boundary between the Nyah and Boundary Bend private diverter river reaches was adjusted in 2021 based on information on the extents of water use licences and diversion sites.
- In October 2020, the Mallee CMA employed staff[2] to conduct field surveys of crop types and irrigation methods visible from public roads. It was estimated that 45% of the irrigated area was observed, resulting in a correction to 3% of crop types and 5% of irrigation methods.
- Additional centre pivots were added to the Murrayville GMA. Earlier mapping only had active pivots which wasn't consistent with mapping of pivots in other districts. All pivot sites where the central pivot infrastructure is in place are mapped regardless of whether the site was active in the recorded year.
- Additional mapped areas were 'retired from irrigation'. The definition of areas 'retired' from irrigation was extended to include areas that no longer had irrigation infrastructure in place and had not been irrigated for over ten years. This scenario was applied to areas that were returned to dryland agriculture. The original definition for retired was a change in land use that precluded use for irrigation and dryland agriculture does not necessarily preclude future irrigation development.

All corrections/adjustments are backfilled to the earlier triennial databases where relevant.

Winter and summer field crops

Since 2021, mapping of field crops has included recording whether it is 'winter' irrigated (active July-October or April-June) or 'summer' irrigated (active from November to March)[3]. This detail is only presented in this report for 2024 field crops. Information on changes from 1997 to 2024 with respect to field crops does not include the summer/winter split.

Irrigation areas in the Mallee catchment

All irrigation areas within the Mallee catchment boundary have been mapped from a map base of high-resolution aerial imagery. The 2024 crop mapping was based on aerial imagery flown between the 21st of January 2024 and 28th of February 2024. The imagery was acquired through the Coordinated Imagery Program, Department of Transport and Planning, Victoria.

Irrigation seasons

Information presented in this report refers to the years: 1997, 2003, 2006, 2009, 2012, 2015, 2018, 2021 and 2024. The aerial imagery used for each of these years was captured at the start of the year, hence the information represents the 1996-97, 2002-03, 2005-06, 2008-09, 2011-12, 2014-15, 2017-18, 2020-21 and 2023-24 seasons respectively.

[2] Working for Victoria, Employment Program – Ground truthing crop data

[3] Note that some field crop areas are irrigated in winter and summer. These are recorded as 'summer' field crops.

Method

Positional and area accuracies

The aerial imagery is generally processed to sub-metre positional accuracy and the crop mapping has been captured at a scale of 1:2,000 or better from the imagery.

Hectare totals have been rounded to the nearest five hectares.

Limitations of mapping irrigated winter field crops

Hectares for winter seasonal crops, vegetables and field crops (e.g. irrigated cereal crops, pasture and fodder crops), are not as reliable as for permanent plantings. Seasonal crops can be rotated from site to site, and it is difficult to determine annual irrigation activity.

Also, the amount of irrigation water applied to broadacre field crops can vary depending on the season. A crop may grow purely on rainfall in a wet season, need only supplementary irrigation water or require irrigating throughout the growing season. There may be broadacre field crops in the mapping that have grown in any one of these three scenarios.

This is particularly the case for the Murrayville Groundwater Management Area (GMA) where 99% of irrigated crops in 2024 were seasonal. Information for the Murrayville GMA should be treated as estimates only. There was limited imagery available for each of the report years from 1997 to 2024 and there were difficulties in differentiating between vegetable/potato crops and field crops.

Limitations of retired and expansion areas

Expansion and retired areas are approximate only. Irrigation developments and retired areas often overlap with existing areas. Overlapping areas are not necessarily excised as it would result in very fragmented mapping. For example, when circular pivots are replaced by rectangular planting layouts for permanent plantings there are fragments of expansion areas, existing areas and retired areas. Not all expansion and retired fragments are recorded or retained in the mapping.

New permanent plantings (planted or top-worked in the previous three years)

The report includes information on ‘new’ permanent crops, planted or top-worked in the previous three-year period. The information provides an indication of development activity that is otherwise not reflected in information on changes in areas and crop types, i.e. the same area re-planted to the same crop type, but with a new variety.

This particularly applies in the pumped irrigation districts. Expansion of the irrigable area is limited, so it may appear that little development or change has occurred, however, redevelopment and top-working to different varieties can be significant.

The information on new permanent plantings is an indication only of development activity. Also, the figures are conservative as top-worked plantings can be difficult to detect from the three-yearly aerial imagery.

Definitions

The following definitions apply in this report.

Table 2 lists the 'crop types' used in this report and shows their relationship to 'irrigated', 'irrigable' and 'vacant' areas.

The **irrigable area** is the **irrigated area** (total area of permanent plantings and seasonal crops irrigated in the season recorded) plus the **vacant area** (areas capable of being irrigated that were not irrigated in the season recorded).

Table 2: Crop types and their relationship to the 'irrigated area', 'irrigable area' and 'retired area'

Crop types			
Grape - Dried	Permanent plantings	Irrigated area	Irrigable area
Grape - Table			
Grape - Wine			
Citrus			
Fruit tree - Olive			
Fruit tree - Other			
Nut - Almond			
Nut - Other			
Miscellaneous			
Field crop - Summer	Seasonal crops		
Field crop - Winter			
Vegetable			
Vacant P, not irrigated, previously an irrigated permanent planting	Vacant area	Vacant area	
Vacant S, not irrigated, previously an irrigated seasonal crop			
	Retired area: previously irrigated, can no longer be irrigated		

The crop types include **vacant areas**, 'Vacant P' and 'Vacant S'. Vacant areas were irrigated, but not in the season recorded. If the vacant area was previously a permanent planting, it is recorded as **Vacant P**, if it was previously a seasonal crop such as pasture or vegetables, it is recorded as **Vacant S**. Vacant areas are included as they are integral to monitoring change. They are areas that can be temporarily out of production while the land is in redevelopment, or are a part of rotational cropping systems. They can also be out of production for many years before being irrigated again.
An increase in irrigable area can arise from new 'greenfield' development (land that has never been irrigated) as well as new development or redevelopment on existing irrigation properties. Redevelopment often involves new, more efficient, planting layouts that increase the irrigable area. A decrease in irrigable area only occurs when areas are **retired** from irrigation.

Areas **retired** from irrigation have undergone a change in land use and can no longer be irrigated. SunRISE generally relies on updated aerial imagery, or digital cadastre, for evidence of land use change such as residential development, buildings, sheds and dams. Also **retired** from the crop mapping are areas that have been set aside for conservation purposes or areas that have not been irrigated for over ten years and the irrigation infrastructure has been removed. These latter areas are generally returned to dryland agriculture.

Areas retired are removed from the mapping and are no longer included in irrigable, irrigated or vacant areas.

Definitions

Property

One property is a holding with the one owner or corporate entity. A property generally comprises more than one 'farm', 'fruit block' or land parcel. Property numbers are determined from grower/owner input and are estimates only due to difficulties in maintaining change in ownership details.

Some property owners irrigate in more than one irrigation district or river reach. Hence, property numbers across the Mallee catchment are less than the sum of property numbers for each of the study areas.

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. Salinity impact zones in this report refer to 'Salinity Offset Charging Zones', comprising four low impact zones (L1, L2, L3 and L4) and one high impact zone (HIZ).

Charging zones are used to determine levy charges for new developments, and have been used in this study, for ease of presentation, rather than the twelve 'Salinity Accountability 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 salinity offset charging zones and salinity accountability zones is shown in **Table 3.**

Table 3: Salinity impact zones

	Salinity offset charging zones	Salinity accountability zones
Low salinity impact zones	L1	LIZ 1, LIZ 2
	L2	LIZ 3
	L3	LIZ 4, LIZ 5
	L4	LIZ 6, LIZ 7
High salinity impact zones	HIZ	HIZ 1, HIZ 2, HIZ 3, HIZ 4, HIZ 5

Irrigation type descriptions

Irrigation methods are grouped as drip, low level, overhead and furrow as described in **Table 4**. Many irrigators use dual systems, such as drip with overhead sprinklers or cooling sprays, however, only the main irrigation method is referred to in this report.

Table 4: Description of irrigation methods

Irrigation method	Description
Drip	Includes: subsurface-drip
Low level	Includes: micro jet, micro sprinkler, sprinkler
Overhead	Includes: centre pivot, travel (lateral move)
Furrow	Gravity systems including flood
Vacant	Vacant (not irrigated) areas that were previously irrigated and could still be irrigated

Study area

The report covers twelve study areas in the Mallee catchment: five pumped irrigation districts, six river reaches of private diverters and the Murrayville Groundwater Management Area (GMA) as shown in **Map 1**. References to the 'Mallee catchment' in this report refer to the twelve study areas.

Pumped irrigation districts

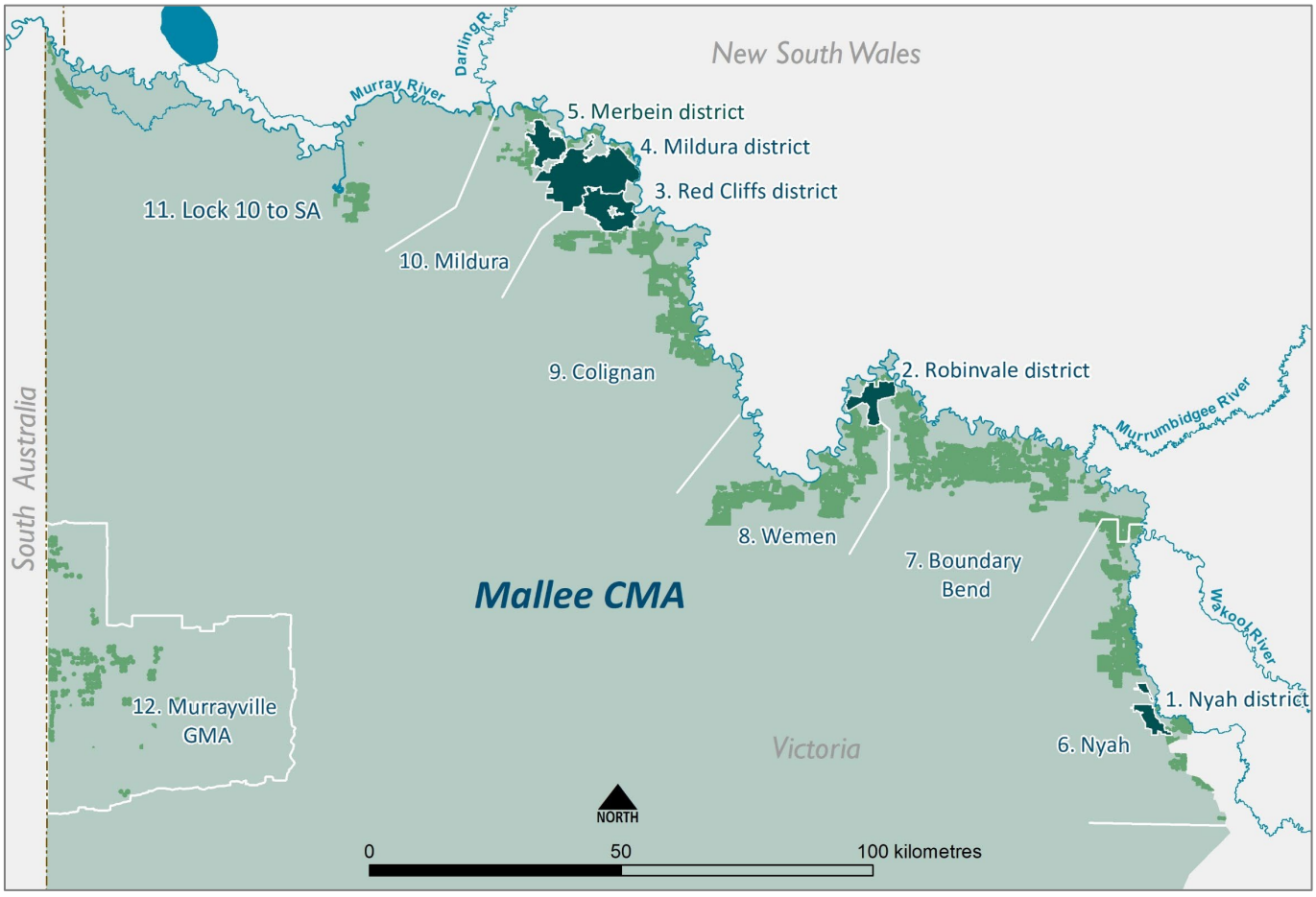
1. Nyah irrigation district
2. Robinvale irrigation district
3. Red Cliffs irrigation district
4. Mildura irrigation district
5. Merbein irrigation district

Murray River reaches (private diverters)

6. Nyah river reach - Woorinen South to the Wakool River junction
7. Boundary Bend river reach - Wakool River junction to the Euston weir
8. Wemen river reach - Euston weir to Liparoo
9. Colignan river reach - Colignan to Yatpool
10. Mildura river reach - Mildura to Lock 10
11. Lock 10 to SA river reach - Lock 10 to the South Australian border

Murrayville Groundwater Management Area (GMA)

12. Murrayville GMA



Map 1: **Map of the twelve study areas in the Mallee catchment**

1. Mallee catchment summary

In summary for irrigated horticulture in the Mallee catchment from 1997 to 2024

Crop types 2024

The top ten crop types in the Mallee catchment in 2024 (Table 5, page 24) were:

1. almonds, 26,365 ha (30% of the irrigable area);
2. table grapes, 11,115 ha (13% of the irrigable area);
3. wine grapes, 7,400 ha (8% of the irrigable area);
4. citrus, 5,330 ha (6% of the irrigable area);
5. winter field crops, 4,795 ha (5% of the irrigable area);
6. olives, 3,755 ha (4% of the irrigable area);
7. potatoes, 2,730 ha (3% of the irrigable area);
8. fruit trees other than olives (mainly avocados and stone fruit), 2,055 ha (2% of the irrigable area);
9. dried grapes, 1,965 ha (2% of the irrigable area); and
10. vegetables other than carrots and potatoes, 1,855 ha (2% of the irrigable area).

Crop type changes from 1997 to 2024

Wine grapes were the dominant crop from 1997 to 2006, then almonds from 2009 to 2024.

The main changes in crop types from 1997 to 2024 (Figure 4, page 25) were:

- almond trees increased by 24,620 ha, a 1,411% increase from 1,745 to 26,365 ha;
- table grape plantings increased by 6,965 ha, a 168% increase from 4,150 to 11,115 ha;
- dried grape plantings decreased by 4,365 ha, a 69% decrease from 6,330 to 1,965 ha;
- olive trees increased by 3,600 ha, a 2,323% increase from 155 to 3,755 ha; and
- wine grape plantings decreased by 2,575 ha, a 26% decrease from 9,975 to 7,400 ha.

Rate of change from 1997 to 2024

On average, the irrigated area across the Mallee catchment increased by 1,151 ha per year for the twenty-seven years from 1997 to 2024 (**Table 6, page 26**).

Permanent plantings increased by an average of 1,186 ha per year, while seasonal cropping averaged a decrease of 35 ha per year.

The only change period with a net decrease (-185 ha) in the irrigated area was from 2021 to 2024. This period was also the only change period with a net decrease (-45 ha) in almond plantings.

In summary for irrigated horticulture in the Mallee catchment

New permanent plantings (planted or top-worked in the previous three years)

In 2024, 6,055 ha (10%) of permanent crops in the Mallee catchment had been planted or top-worked within the previous three years (**Figure 5, page 27**). These new crops were mainly table grapes and citrus:

1. table grapes (2,240 ha);
2. citrus (1,060 ha);
3. pistachios and walnuts (a total of 690 ha);
4. almonds (610 ha);
5. dried grapes (395 ha);
6. fruit trees (365 ha, including avocados, stone fruit and mangos);
7. olives (335 ha);
8. wine grapes (310 ha); and
9. nurseries and tree plantations (a total of 50 ha).

The proportion of new permanent plantings across the Mallee catchment decreased from 17% of plantings in 2018 to 13% in 2021 to 10% in 2024. This trend was replicated in the private diverter river reaches (**Figure 55, page 108**). In the pumped irrigation districts, the proportion of new permanent plantings increased from 16% in 2018 to 18% in 2021, then decreased to 13% in 2024 (**Figure 15, page 43**).

Planting trends - permanent plantings, seasonal crops and vacant areas

The area irrigated across the Mallee catchment in 2024 was 31,065 ha (79%) greater than in 1997. This was the net result of an additional 32,010 ha of permanent plantings irrigated and a decrease of 945 ha in irrigated seasonal crops (**Figure 6, page 28**).

Seasonal cropping areas, the area irrigated plus the area vacant, almost doubled from 12,545 ha in 1997 to 22,285 ha in 2024. However, the area irrigated in each of the seasons recorded remained relatively constant, within 15% of 12,000 hectares. The exception was 2009, when seasonal cropping was greatly reduced due to impacts of the Millennium drought.

From 1997 to 2024:

- irrigated permanent crops increased by 32,010 ha, from 27,960 to 59,970 ha;
- irrigated seasonal crops decreased by 945 ha, from 11,435 to 10,490 ha;
- vacant areas, previously irrigated permanent plantings increased by 6,215 ha, from 435 to 6,650 ha; and
- vacant areas, previously irrigated seasonal crops increased by 10,685 ha, from 1,110 to 11,795 ha.

In 2024, 80% of the irrigated area was in the private diverter river reaches, 17% in the pumped irrigation districts and 3% in the Murrayville GMA (**Figure 7, page 29**).

Irrigation development - new development (expansion) and retired areas

From 1997 to 2024, there were 3,580 ha retired from irrigation and 51,545 ha of expansion (**Table 7, page 30**). The net result was an increase in the irrigable area of 47,965 ha, a 117% increase from 40,940 to 88,905 ha.

Expansion was predominantly in the private diverter river reaches where 44,935 ha (87%) of expansion occurred; 17,295 ha were in the Boundary Bend river reach and 12,020 ha were in the Wemen river reach.

Retired areas were 51% in the pumped irrigation districts, 46% in private diverter river reaches and 3% in the Murrayville GMA. Areas retired in the pumped districts were mainly for urban development while areas in the private diverter reaches were retired for farm infrastructure such as dams and sheds, for conservation purposes or returned to dryland cropping.

In summary for irrigated horticulture in the Mallee catchment

Potential irrigation development

Actual and potential new irrigation developments after June 2024 were mapped from observation of soil survey pits and on-ground works in recent aerial and satellite imagery (**Figure 8, page 31**).

Areas mapped were:

- 120 ha planted between July 2024 and June 2025. Plantings were mainly table grapes, potatoes, wine grapes and citrus in the private diverter reaches of Boundary Bend, Colignan to Yatpool, Mildura and Wemen; and
- 13,500 ha of land with soil survey pits that were visible in aerial or satellite imagery, or land cultivated on existing irrigation properties for potential expansion. These sites are mainly in the Boundary Bend, Colignan to Yatpool and Wemen river reaches. Note that potential developments might not proceed, and the soil survey areas do not reflect the area that might be planted.

Salinity impact zones (*does not apply to the Murrayville GMA*)

The dominant salinity impact zone, across irrigated and non-irrigated areas, changed from the high impact zone (HIZ) in 1997 to the lowest impact zone (L1) from 2003 to 2024 (**Figure 9, page 32**).

In 2024, 88% of the irrigable area was in low salinity impact zones: L1, L2, L3 and L4, and 12% was in the high impact zone, HIZ.

Figure 2 shows the change in salinity impact zones in irrigated areas. From 1997 to 2024, areas irrigated in low impact zones increased by 34,285 ha, a 124% increase from 27,685 to 61,970 ha. Areas irrigated in the HIZ decreased by 4,100 ha, a 38% decrease from 10,835 to 6,735 ha.

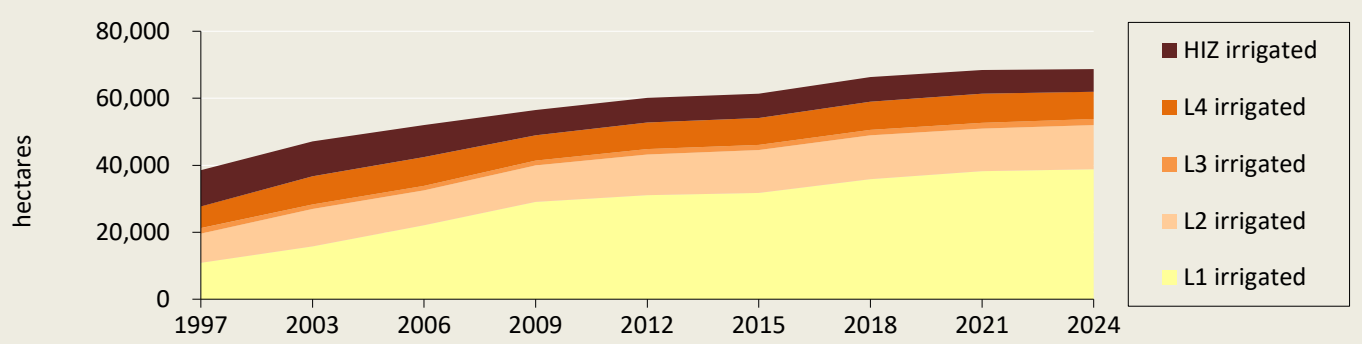


Figure 2: Change in salinity impact zones in irrigated areas from 1997 to 2024

Salinity impact zones – new and retired areas

From 1997 to 2024, 55% (1,900 ha) of areas retired from irrigation across the Mallee catchment were in the high salinity impact zone, HIZ (**Table 8, page 33**).

Irrigation expansion in this period was predominantly (73%) in the lowest salinity impact zone, L1. 26% of expansion was in zones L2 to L4 and 1% was in the high impact zone. (Expansion in the HIZ was development on existing irrigation properties.)

In summary for irrigated horticulture in the Mallee catchment

Irrigation methods

Figure 3 shows the change in irrigation methods across the Mallee catchment from 1997 to 2024. The dominant method changed from furrow in 1997 to overhead sprinklers in 2003, then to drip irrigation from 2006 to 2024

In 2024, the irrigable area of 88,905 ha comprised (Figure 11, page 34):

- 60% (53,455 ha) drip irrigation;
- 8% (7,405 ha) low level sprinklers;
- 9% (8,180 ha) overhead sprinklers including centre pivot and lateral move systems;
- 2% (1,420 ha) furrow or flood irrigation; and
- 21% (18,445 ha) vacant, not irrigated.

From 1997 to 2024:

- drip irrigation increased by 49,500 ha (1,252%);
- low level irrigation increased by 1,495 ha (25%);
- overhead irrigation decreased by 6,115 ha (43%); and
- furrow irrigation decreased by 13,815 ha (91%).

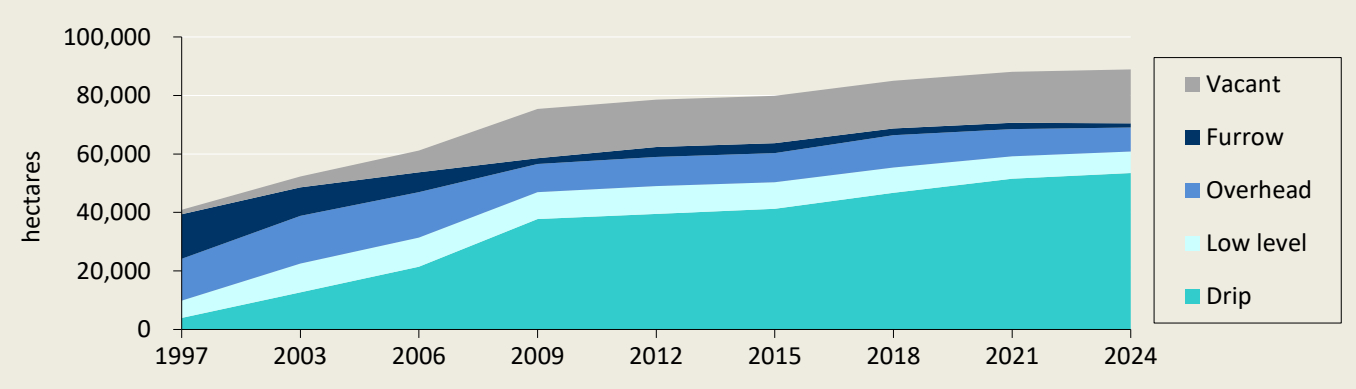


Figure 3: Change in irrigation methods from 1997 to 2024 across the Mallee catchment

Irrigation properties

In 2024, there were approximately 1,695 irrigation properties in the Mallee catchment with an average property size (irrigable area) of 52 ha (**Figure 12, page 35**). 15% of properties had an irrigable area over 40 ha, and these properties farmed 85% of the irrigable area.

From 1997 to 2024, the number of properties decreased by 753 (31%), while average property size (irrigable area) increased from 17 to 52 ha per property. Properties with an irrigable area of less than 40 ha decreased by 847, while the number over 40 ha increased by 94.

77% of properties were in the pumped irrigation districts, 22% were private diverters and 1% were in the Murrayville GMA (**Figure 13, page 36**).

1.1 Mallee catchment - crop types in 2024

Table 5 lists crop types in 2024 across the Mallee catchment (i.e. the pumped irrigation districts, private diverter river reaches and Murrayville GMA).

The top ten crop types that were irrigated in 2024 were:

1. almonds, 26,365 ha (30% of the irrigable area);
2. table grapes, 11,115 ha (13% of the irrigable area);
3. wine grapes, 7,400 ha (8% of the irrigable area);
4. citrus, 5,330 ha (6% of the irrigable area);
5. winter field crops, 4,795 ha (5% of the irrigable area);
6. olives, 3,755 ha (4% of the irrigable area);
7. potatoes, 2,730 ha (3% of the irrigable area);
8. fruit trees other than olives (mainly stone fruit and avocados), 2,055 ha (2% of the irrigable area);
9. dried grapes, 1,965 ha (2% of the irrigable area); and
10. vegetables other than carrots and potatoes, 1,855 ha (2% of the irrigable area).

Table 5: Mallee catchment - crop types in 2024

	Crop type		2024 (ha)	2024 %	Description
Permanent plantings	Grapevine	Dried	1,965	2%	Currant, sultana and raisin varieties
		Table	11,115	13%	Red, white and black varieties
		Wine	7,400	8%	Red & white varieties & a small proportion of juiced grapes
	Citrus		5,330	6%	Mainly navels and mandarins. Also: grapefruit, lemon, lime, blood orange, common orange, pummelo, tangelo, Valencia.
	Fruit tree	Olive	3,755	4%	
		Other	2,055	2%	Mainly avocados and stone fruit. Also: date palm, fig, jujube, loquat, mango, persimmon, pome fruit and pomegranate.
	Nut tree	Almond	26,365	30%	
		Other	1,505	2%	Mainly pistachio. Also, walnut and chestnut.
	Other	Miscellaneous	480	1%	Mainly nurseries and tree plantations. Also: aquaculture, berries, fresh flowers, native plants and passionfruit.
	Permanent crops (sub-total)		59,970	67%	
Seasonal crops	Field crop	Summer	460	1%	Field crops irrigated/active from November to March. Mainly pasture, lucerne, hemp, turf and maize.
		Winter	4,795	5%	Field crops irrigated/active July-October or April-June. Mainly cereal and fodder crops.
	Vegetable	Carrot	650	1%	Mainly salad greens and cucurbits (e.g. cucumber, melon, pumpkin, zucchini). Also: asparagus, beans, beetroot, broccoli, cabbage, capsicum, cauliflower, chilli, eggplant, garlic, herbs, onion, peas, corn, tomato and other vegetables.
		Potato	2,730	3%	
		Other	1,855	2%	
	Seasonal crops (sub-total)		10,490	12%	
Vac.	Vacant P		6,650	8%	Vacant (not irrigated), previously a permanent crop
	Vacant S		11,795	13%	Vacant (not irrigated), previously a seasonal crop
	Total irrigable area (ha)		88,905	100%	

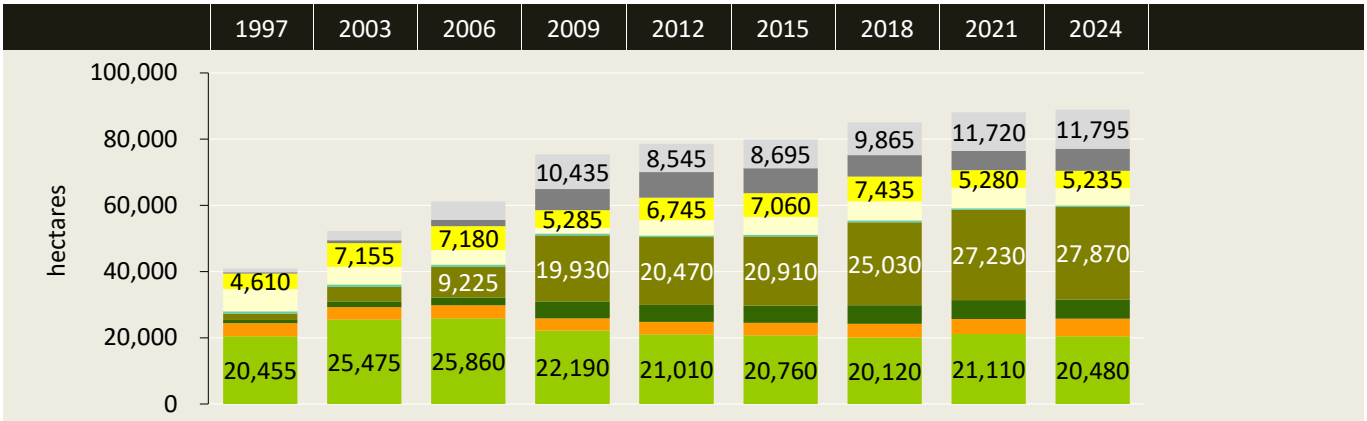
1.2 Mallee catchment - crop types from 1997 to 2024

Figure 4 summarises irrigated crop types across the Mallee catchment from 1997 to 2024.

The dominant crop type was wine grapes from 1997 to 2006, then almonds from 2009 to 2024.

The main changes in crop types from 1997 to 2024 were:

- almond plantings increased by 24,620 ha, a 1,411% increase from 1,745 to 26,365 ha;
- table grape plantings increased by 6,965 ha, a 168% increase from 4,150 to 11,115 ha;
- dried grape plantings decrease by 4,365 ha, a 69% decrease from 6,330 to 1,965 ha;
- olive trees increased by 3,600 ha, a 2,323% increase from 155 to 3,755 ha;
- wine grape plantings decreased by 2,575 ha, a 26% decrease from 9,975 to 7,400 ha;
- citrus plantings increased by 1,330 ha, a 33% increase from 4,000 to 5,330 ha; and
- nut trees other than almond (mainly pistachio) increased by 1,325 ha, a 736% increase from 180 to 1,505 ha.



Crop type		1997	2003	2006	2009	2012	2015	2018	2021	2024	% of 2024	Change 1997-2024
Permanent	Grape Dried	6,330	4,915	4,185	2,980	3,015	2,985	3,050	2,440	1,965	2%	-4,365
	Grape Table	4,150	5,800	5,810	5,645	6,425	7,275	8,965	10,495	11,115	13%	+6,965
	Grape Wine	9,975	14,760	15,865	13,565	11,570	10,500	8,105	8,175	7,400	8%	-2,575
	Citrus	4,000	3,830	4,005	3,720	3,830	3,760	4,115	4,600	5,330	6%	+1,330
	Fruit Olive	155	745	1,285	4,075	3,805	3,670	3,820	3,765	3,755	4%	+3,600
	Fruit Other	790	945	1,030	970	1,300	1,520	1,755	1,925	2,055	2%	+1,265
	Nut Almond	1,745	4,145	9,010	19,695	20,195	20,610	24,485	26,410	26,365	30%	+24,620
	Nut Other	180	205	215	235	275	300	545	820	1,505	2%	+1,325
	Other	635	735	755	575	495	510	590	545	480	1%	-155
Seasonal	Field Crop	6,825	5,345	4,405	1,795	4,690	5,440	5,805	6,190	5,255	6%	-1,570
	Veg. Carrot	1,575	2,600	2,540	2,490	2,420	2,570	1,500	680	650	1%	-925
	Veg. Potato	1,805	2,745	2,810	1,810	2,695	2,635	3,375	2,615	2,730	3%	+925
	Veg. Other	1,230	1,810	1,830	985	1,630	1,855	2,560	1,985	1,855	2%	+625
Vacant P		435	915	1,890	6,370	7,690	7,595	6,520	5,760	6,650	8%	+6,215
Vacant S		1,110	2,790	5,515	10,435	8,545	8,695	9,865	11,720	11,795	13%	+10,685
Total (ha)		40,940	52,285	61,150	75,345	78,580	79,920	85,055	88,125	88,905	100%	+47,965
Dominant		wine grape			almond							

Figure 4: Mallee catchment - crop types from 1997 to 2024

1.3 Mallee catchment - rate of change

Table 6 summarises the net change in planted area by crop type across the Mallee catchment. There are eight change periods from 1997 to 2024. Each change period spans three years except for the first period from 1997 to 2003, hence, an average change per year figure is provided so that figures can be compared across the change periods.

Cells shaded blue in the table below denote the permanent planting with the highest net **increase** within the specified change period and red shading denotes the permanent planting with the highest net **decrease**.

Figures highlight the growth periods for almond, olive, wine grape, table grape and citrus plantings, and periods of removal of wine and dried grape plantings. They also highlight fluctuations in seasonal cropping in response to water availability, particularly from 2003 to 2009 in the Millennium drought.

On average, the irrigated area across the Mallee catchment increased by 1,151 ha per year from 1997 to 2024. And the area of permanent plantings increased by an average of 1,186 ha per year in the twenty-seven-year period.

The highest growth period for permanent plantings was from 2006 to 2009 with an increase in plantings of 9,300 ha. The net increase was the result of a decrease in all plantings except for almonds, olives and other nuts (walnuts and pistachios). Almonds had a net increase in every change period until 2021 to 2024 when there was a net decrease of 45 ha. There were few new almond plantings in 2021 to 2024 and wet conditions during the 2022 Murray River flood event drowned trees in some low-lying areas.

The only change period with a net decrease in almonds or a net decrease in the irrigated area was 2021 to 2024.

Table 6: Mallee catchment - rate of change in crop types from 1997 to 2024

Crop type	Change period								Total 1997-24
	1997-03	2003-06	2006-09	2009-12	2012-15	2015-18	2018-21	2021-24	
Grape Dried	-1,415	-730	-1,205	+35	-30	+65	-610	-475	-4,365
Grape Table	+1,650	+10	-165	+780	+850	+1,690	+1,530	+620	+6,965
Grape Wine	+4,785	+1,105	-2,300	-1,995	-1,070	-2,395	+70	-775	-2,575
Citrus	-170	+175	-285	+110	-70	+355	+485	+730	+1,330
Fruit Olive	+590	+540	+2,790	-270	-135	+150	-55	-10	+3,600
Fruit Other	+155	+85	-60	+330	+220	+235	+170	+130	+1,265
Nut Almond	+2,400	+4,865	+10,685	+500	+415	+3,875	+1,925	-45	+24,620
Nut Other	+25	+10	+20	+40	+25	+245	+275	+685	+1,325
Miscellaneous	+100	+20	-180	-80	+15	+80	-45	-65	-155
Change: permanent crops	+8,120	+6,080	+9,300	-550	+220	+4,300	+3,745	+795	+32,010
Ave. change/year perm.	+1,353	+2,027	+3,100	-183	+73	+1,433	+1,248	+265	+1,186
Field Crop	-1,480	-940	-2,610	+2,895	+750	+365	+385	-935	-1,570
Vegetable	+2,545	+25	-1,895	+1,460	+315	+375	-2,155	-45	+625
Change: seasonal crops	+1,065	-915	-4,505	+4,355	+1,065	+740	-1,770	-980	-945
Ave. change/year seasonal	+178	-153	-751	+726	+178	+123	-295	-163	-35
Change: irrigated area (ha)	+9,185	+5,165	+4,795	+3,805	+1,285	+5,040	+1,975	-185	+31,065
Ave. change/year irrigated	+1,531	+1,722	+1,598	+1,268	+428	+1,680	+658	-62	+1,151
Vacant P	+480	+975	+4,480	+1,320	-95	-1,075	-760	+890	+6,215
Vacant S	+1,680	+2,725	+4,920	-1,890	+150	+1,170	+1,855	+75	+10,685
Change: irrigable area (ha)	+11,345	+8,865	+14,195	+3,235	+1,340	+5,135	+3,070	+780	+47,965
Ave. change/year irrigable	+1,891	+2,955	+4,732	+1,078	+447	+1,712	+1,023	+260	+1,776

1.4 Mallee catchment - new permanent plantings

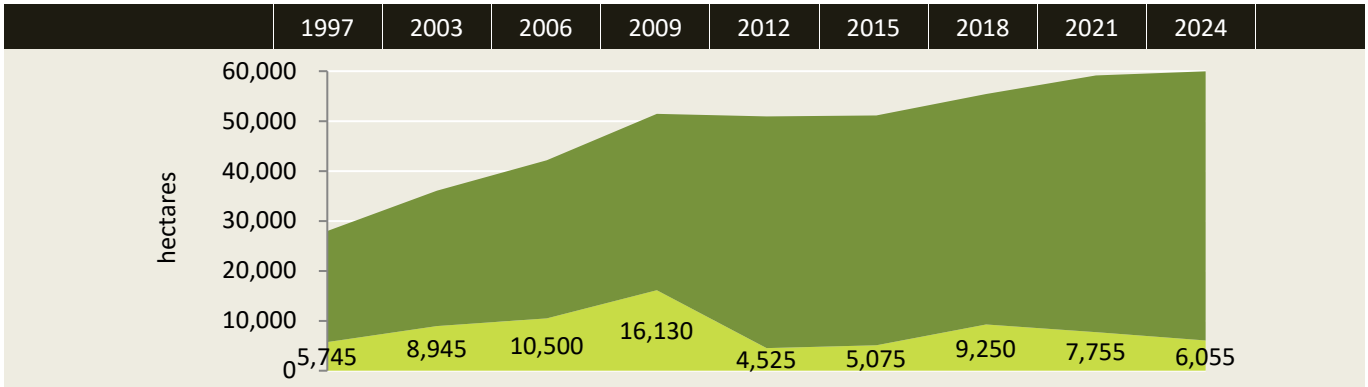
Figure 5 shows the proportion of permanent crops planted or top-worked within the previous three years across the Mallee catchment from 1997 to 2024. The information provides an indication of development activity that doesn't necessarily involve a change in area or crop type as it includes replanting or top working to different varieties. The figures are conservative, as top worked plantings can be difficult to interpret from the three-yearly aerial imagery, particularly for grapevines.

In 2024:

- 6,055 ha (10%) of permanent crops were planted or top-worked within the previous three years.
- These new plantings were:
    1. table grapes (2,240 ha);
    2. citrus (1,060 ha);
    3. pistachios and walnuts (a total of 690 ha);
    4. almonds (610 ha);
    5. dried grapes (395 ha);
    6. fruit trees other than olives (365 ha, includes avocados, stone fruit and mangos);
    7. olives (335 ha);
    8. wine grapes (310 ha); and
    9. nurseries and tree plantations (a total of 50 ha).
- New permanent plantings in the irrigation districts was: Mildura 525 ha, Red Cliffs 350 ha, Robinvale 295 ha, Merbein 270 ha and Nyah 45 ha.
- New permanent plantings in the private diverter river reaches was: Colignan 1,510 ha, Wemen 1,065 ha, Nyah 750 ha, Boundary Bend 600 ha, Mildura private diverters 340 ha and Lock 10 to SA 305 ha.

From 1997 to 2024:

- The proportion of new permanent plantings was at its lowest in 2012 with 9% planted in the previous three years and highest in 2009 with 31% planted in the previous three years.



Permanent plantings	1997	2003	2006	2009	2012	2015	2018	2021	2024	% of 2024
≤3yr old plantings	5,745	8,945	10,500	16,130	4,525	5,075	9,250	7,755	6,055	10%
>3yr old plantings	22,215	27,135	31,660	35,330	46,385	46,055	46,180	51,420	53,915	90%
Total (ha)	27,960	36,080	42,160	51,460	50,910	51,130	55,430	59,175	59,970	100%
% 3year development	21%	25%	25%	31%	9%	10%	17%	13%	10%	
Average 3-year dev.	18%									

Figure 5: Mallee catchment - three-year old permanent plantings from 1997 to 2024

1.5 Mallee catchment - planting trends

Figure 6 summarises planting trends with respect to permanent crops, seasonal crops and vacant areas across the Mallee catchment from 1997 to 2024.

The area irrigated in 2024 was 31,065 ha (79%) greater than in 1997. This was the net result of an additional 32,010 ha of permanent plantings irrigated and a decrease of 945 ha in irrigated seasonal crops.

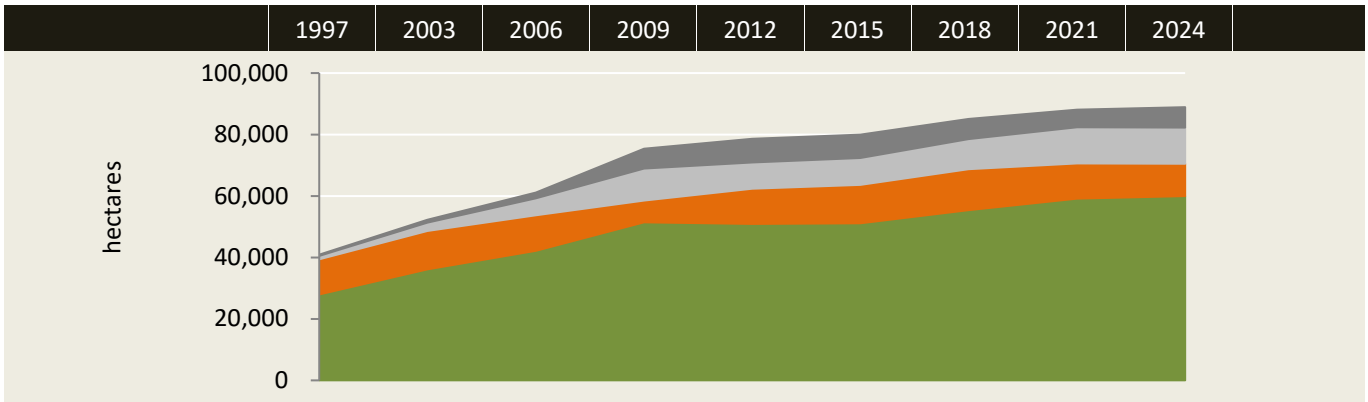
Seasonal cropping areas almost doubled from 1997 to 2024, but the area irrigated in the recorded years remained relatively constant, within 15% of 12,000 ha. The exception was 2009, when seasonal cropping was greatly reduced due to impacts of the Millennium drought.

In 2024, the irrigable area of 88,905 ha comprised:

- 67% (59,970 ha) irrigated permanent plantings;
- 12% (10,490 ha) irrigated seasonal crops;
- 8% (6,650 ha) vacant, previously an irrigated permanent planting; and
- 13% (11,795 ha) vacant, previously an irrigated seasonal crop.

From 1997 to 2024:

- irrigated permanent crops increased by 32,010 ha, from 27,960 to 59,970 ha;
- irrigated seasonal crops decreased by 945 ha, from 11,435 to 10,490 ha;
- vacant areas, previously irrigated permanent plantings increased by 6,215 ha, from 435 to 6,650 ha; and
- vacant areas, previously irrigated seasonal crops increased by 10,685 ha, from 1,110 to 11,795 ha.



	1997	2003	2006	2009	2012	2015	2018	2021	2024	Change 1997-2024
Permanent - irrigated	27,960	36,080	42,160	51,460	50,910	51,130	55,430	59,175	59,970	+32,010
Seasonal - irrigated	11,435	12,500	11,585	7,080	11,435	12,500	13,240	11,470	10,490	-945
Total irrigated (ha)	39,395	48,580	53,745	58,540	62,345	63,630	68,670	70,645	70,460	+31,065
Vacant - permanent	435	915	1,890	6,370	7,690	7,595	6,520	5,760	6,650	+6,215
Vacant - seasonal	1,110	2,790	5,515	10,435	8,545	8,695	9,865	11,720	11,795	+10,685
Total irrigable (ha)	40,940	52,285	61,150	75,345	78,580	79,920	85,055	88,125	88,905	+47,965
% Permanent	68%	69%	69%	68%	65%	64%	65%	67%	67%	
% Seasonal	28%	24%	19%	9%	15%	16%	16%	13%	12%	
% Vacant P	1%	2%	3%	8%	10%	10%	8%	7%	8%	
% Vacant S	3%	5%	9%	14%	11%	11%	12%	13%	13%	

Figure 6: Mallee catchment - planting trends from 1997 to 2024

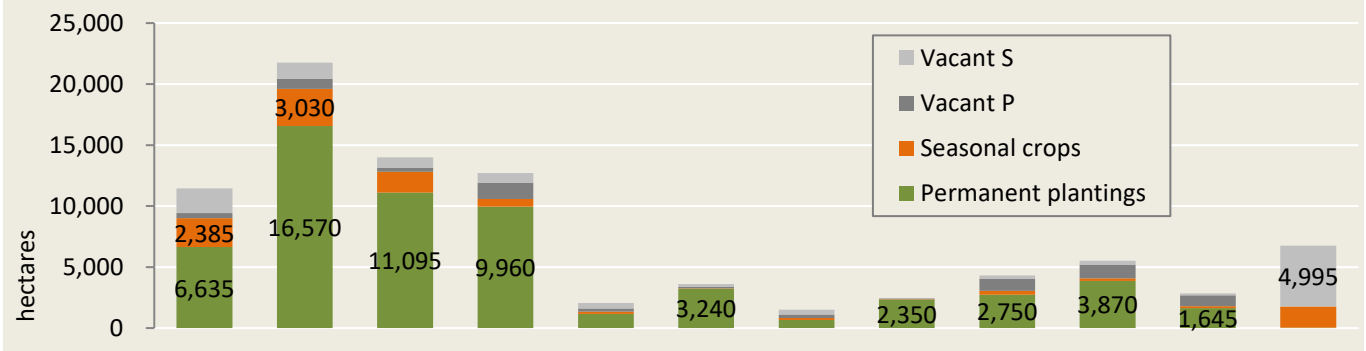
1.5.1 Mallee catchment - 2024 plantings in each study area

Figure 7 shows the area of permanent crops, seasonal crops and vacant areas in each of the study areas across the Mallee catchment in 2024.

In 2024:

- 74% of the irrigable area was in the private diverter river reaches (mainly the Boundary Bend and Wemen river reaches);
- 19% of the irrigable area was in the pumped irrigation districts (mainly the Mildura and Red Cliffs districts); and
- 7% of the irrigable area was in the Murrayville GMA.

- 81% of permanent plantings were irrigated in the private diverter river reaches, 19% in the pumped irrigation districts and less than 1% in the Murrayville GMA.
- 76% of seasonal crops were irrigated in the private diverter river reaches, 8% in the irrigation districts and 16% in the Murrayville GMA.
- 50% of vacant areas, previously irrigated permanent crops (Vacant P) were in the irrigation districts and 50% in the private diverter river reaches.
- 48% of vacant areas, previously irrigated seasonal crops (Vacant S) were in the private diverter reaches, 42% in the Murrayville GMA and 10% in the irrigation districts.



	Nyah	Boundary Bend	Wemen	Colignan	Mildura	Lock 10 to SA	Nyah	Robin-vale	Red Cliffs	Mildura	Merbein	Murray-ville
	Private diverters						Pumped irrigation districts					
Permanent	6,635	16,570	11,095	9,960	1,150	3,240	660	2,350	2,750	3,870	1,645	45
Seasonal	2,385	3,030	1,730	615	185	10	150	10	310	205	150	1,710
Vacant P	420	835	335	1,310	285	120	290	55	975	1,130	895	0
Vacant S	2,010	1,320	835	825	440	220	400	0	275	310	165	4,995
2024 total (ha)	11,450	21,755	13,995	12,710	2,060	3,590	1,500	2,415	4,310	5,515	2,855	6,750
	65,560						16,595					
Permanent	81%						19%					<1%
Seasonal	76%						8%					16%
Irrigated	80%						17%					3%
Vacant P	50%						50%					0%
Vacant S	48%						10%					42%
Irrigable	74%						19%					7%

Figure 7: Mallee catchment - permanent plantings, seasonal crops and vacant areas in 2024

1.6 Mallee catchment - irrigation development

Table 7 summarises irrigation development with respect to new development (expansion) and areas retired from irrigation across the Mallee catchment from 1997 to 2024.

From 1997 to 2024, the irrigable area in the Mallee catchment increased by 47,965 ha, a 117% increase from 40,940 to 88,905 ha. The net increase of 47,965 ha was the balance of 3,580 ha retired from irrigation and 51,545 ha of expansion.

Across the pumped districts the irrigable area decreased by 885 ha, a 5% decrease from 17,480 ha in 1997 to 16,595 ha in 2024. The net decrease was the balance of 1,840 ha retired from irrigation and 955 ha of expansion.

In the private diverter river reaches, the irrigable area increased by 43,305 ha, a 195% increase from 22,255 ha in 1997 to 65,560 ha in 2024. The net increase of 43,305 ha was the balance of 1,630 ha retired from irrigation and 44,935 ha of expansion.

In the Murrayville GMA, the irrigable area increased by 5,545 ha, a 460% increase from 1,205 ha in 1997 to 6,750 ha in 2024. The net increase of 5,545 ha was the balance of 110 ha retired from irrigation and 5,655 ha of expansion.

Table 7: Mallee catchment - summary of irrigation development from 1997 to 2024

	Study area	1997 irrigable area (ha)	1997 to 2024		2024 irrigable area (ha)	Net change 1997-2024	Growth % 1997-2024
			Retired[4]	New			
Pumped irrigation districts	Nyah[5]	1,120	-85	+465	1,500	+380	+34%
	Robinvale	2,320	-35	+130	2,415	+95	+4%
	Red Cliffs	4,450	-235	+95	4,310	-140	-3%
	Mildura	6,445	-1,185	+255	5,515	-930	-14%
	Merbein	3,145	-300	+10	2,855	-290	-9%
	Sub-total (ha)	17,480	-1,840	+955	16,595	-885	-5%
Private diverters	Nyah	4,970	-80	+6,560	11,450	+6,480	+130%
	Boundary Bend	5,125	-665	+17,295	21,755	+16,630	+324%
	Wemen	2,150	-175	+12,020	13,995	+11,845	+551%
	Colignan	6,925	-285	+6,070	12,710	+5,785	+84%
	Mildura	1,445	-125	+740	2,060	+615	+43%
	Lock10 to SA	1,640	-300	+2,250	3,590	+1,950	+119%
	Sub-total (ha)	22,255	-1,630	+44,935	65,560	+43,305	+195%
Murrayville GMA (ha)		1,205	-110	+5,655	6,750	+5,545	+460%
Mallee catchment total (ha)		40,940	-3,580	+51,545	88,905	+47,965	+117%

[4] Retired areas were previously irrigated but have undergone a change in land use and no longer have irrigation infrastructure e.g. urban development, sheds, dams, land set aside for conservation or returned to dryland agriculture.
[5] Hectares for the Nyah irrigation district include areas outside the district but supplied with water from the district, whereas figures for the other pumped districts only include areas inside the district boundary.

1.6.1 Mallee catchment - potential irrigation development

Figure 8 shows irrigation expansion from mid-2021 to mid-2024 along the Murray River in the Mallee catchment and potential future development sites. Areas do not include the Murrayville GMA.

From 2021 to 2024, the irrigable area increased by 815 ha, from 81,340 to 82,155 ha. The net increase of 815 ha was the balance of 980 ha retired from irrigation and 1,795 ha of expansion. Expansion areas are coloured bright green in **Figure 8**.

Potential future development areas are coloured orange in **Figure 8**. They represent actual and potential developments post June 2024. Areas include:

- 120 ha planted between July 2024 and June 2025. Plantings were mainly table grapes, potatoes, wine grapes and citrus in the private diverter reaches of Boundary Bend, Colignan to Yatpool, Mildura and Wemen; and
- 13,500 ha of land with soil survey pits that were visible in aerial or satellite imagery, or land cultivated on existing irrigation properties for potential expansion. These sites are mainly in the Boundary Bend, Colignan to Yatpool and Wemen river reaches. Note that potential developments might not proceed, and the soil survey areas do not reflect the area that might be planted.

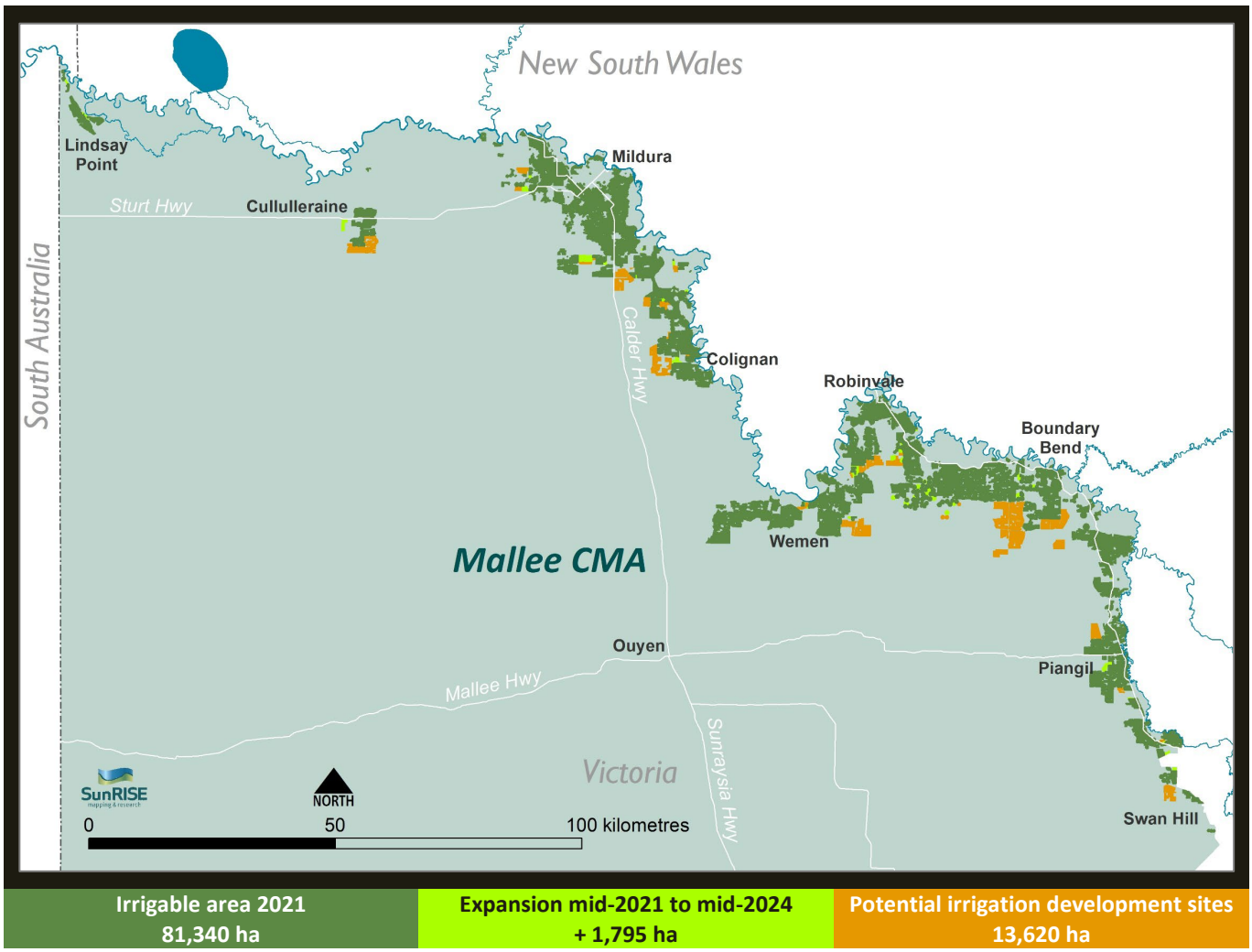


Figure 8: Mallee catchment - irrigation expansion and potential future development sites

1.7 Mallee catchment - salinity impact zones

Figure 9 summarises the irrigable area in each Murray River salinity impact zone in the Mallee catchment (excluding the Murrayville GMA[6]) from 1997 to 2024. The dominant salinity impact zone, across irrigated and non-irrigated areas, changed from the high impact zone (HIZ) in 1997 to the lowest impact zone (L1) by 2003.

In 2024, the irrigable area of 82,155 ha comprised:

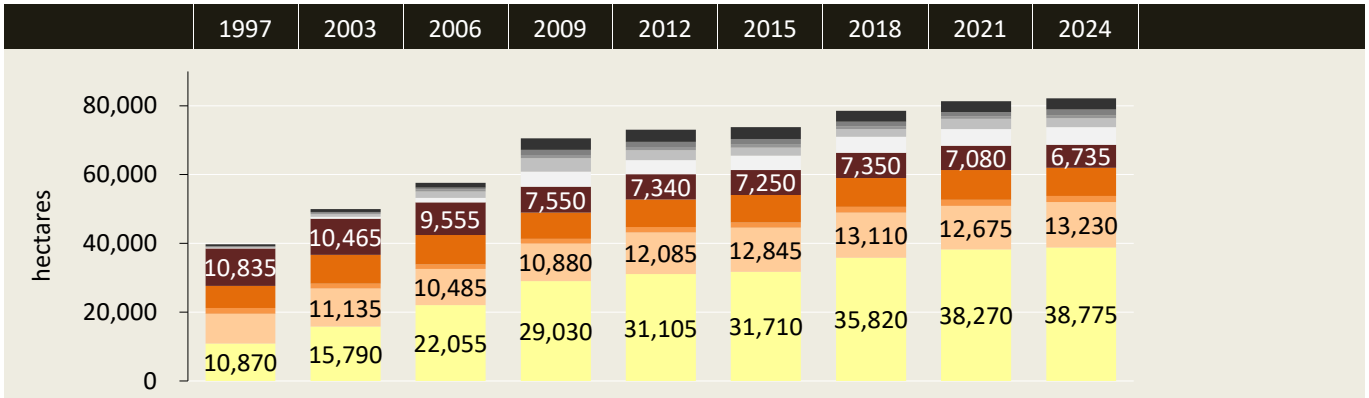
- 53% (43,830 ha) in the lowest impact zone, L1;
- 19% (15,900 ha) in L2;
- 3% (2,520 ha) in L3;
- 12% (9,950 ha) in L4; and
- 12% (9,955 ha) in the high impact zone, HIZ.

From 1997 to 2024, the area irrigated in:

- L1 to L4 increased by 34,285 ha, a 124% increase from 27,685 to 61,970 ha; and
- HIZ decreased by 4,100 ha, a 38% decrease from 10,835 to 6,735 ha.

From 1997 to 2024, the irrigable area in:

- L1 to L4 increased by 43,895 ha, a 155% increase from 28,305 to 72,200 ha; and
- HIZ decreased by 1,475 ha, a 13% decrease from 11,430 to 9,955 ha. The decrease was the balance of HIZ areas retired from irrigation and expansion in existing HIZ properties.



Salinity impact zone		1997	2003	2006	2009	2012	2015	2018	2021	2024	% in 2024	Change 1997-2024
Irrigated	L1	10,870	15,790	22,055	29,030	31,105	31,710	35,820	38,270	38,775	47%	+27,905
	L2	8,715	11,135	10,485	10,880	12,085	12,845	13,110	12,675	13,230	16%	+4,515
	L3	1,655	1,370	1,340	1,455	1,610	1,510	1,665	1,735	1,815	2%	+160
	L4	6,445	8,390	8,545	7,600	7,945	8,030	8,410	8,670	8,150	10%	+1,705
	HIZ	10,835	10,465	9,555	7,550	7,340	7,250	7,350	7,080	6,735	8%	-4,100
Not Irrigated	L1	150	555	1,215	4,315	4,160	4,175	4,645	4,775	5,055	6%	+4,905
	L2	245	755	1,895	3,915	2,865	2,345	2,280	2,990	2,670	3%	+2,425
	L3	55	390	640	920	920	970	815	780	705	1%	+650
	L4	170	330	465	1,525	1,495	1,485	1,315	1,190	1,800	2%	+1,630
	HIZ	595	830	1,420	3,375	3,510	3,475	3,145	3,175	3,220	4%	+2,625
Total (ha)		39,735	50,010	57,615	70,565	73,035	73,795	78,555	81,340	82,155	100%	+42,420
Dominant zone		HIZ	L1									

Figure 9: Mallee catchment - irrigable area in each salinity impact zone from 1997 to 2024

[6] Salinity impact zones do not apply in the Murrayville GMA.

Salinity zones of retired and expansion areas

Table 8 shows the salinity impact zones of areas retired from irrigation and expansion areas from 1997 to 2024.

From 1997 to 2024 (excluding the Murrayville GMA):

- 55% (1,900 ha) of areas retired from irrigation were in the high impact zone (HIZ); and
- 73% of expansion areas were in the lowest salinity impact zone (L1), 26% were in zones L2 to L4 and 1% were in the high impact zone, HIZ. (Expansion in the HIZ was development on existing irrigation properties.)

Table 8: Mallee catchment - salinity impact zones of retired and expansion areas

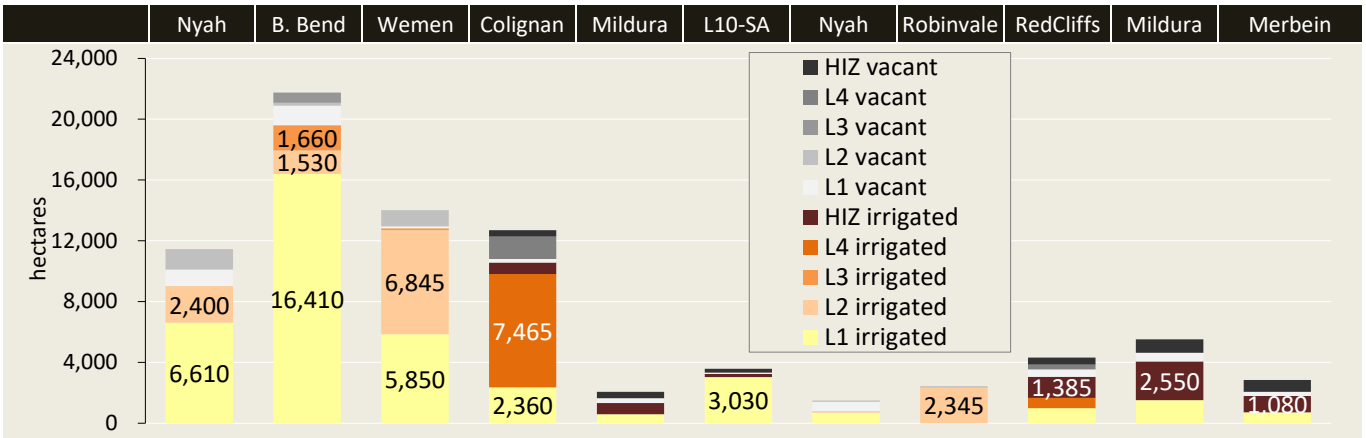
Salinity Impact Zone	1997	Retired		Expansion		2024	Change 1997-2024	% Change
	irrigable ha	ha	%	ha	%	irrigable ha		
L1	11,020	-825	24%	+33,635	73%	43,830	+32,810	+298%
L2	8,960	-425	12%	+7,365	16%	15,900	+6,940	+77%
L3	1,710	-190	5%	+1,000	2%	2,520	+810	+47%
L4	6,615	-130	4%	+3,465	8%	9,950	+3,335	+50%
HIZ	11,430	-1,900	55%	+425	1%	9,955	-1,475	-13%
Total	39,735	-3,470	100%	+45,890	100%	82,155	+42,420	+107%

Salinity zones in each study area in 2024

Figure 10 shows salinity impact zones in each private diverter river reach and irrigation district in 2024. In 2024, the total irrigable area in the high salinity impact zone was 9,955 ha:

- 28% (2,830 ha) of HIZ areas were in the private diverter river reaches of Colignan to Yatpool, Mildura and Lock 10 to SA; and
- 72% (7,125 ha) of HIZ areas were in the irrigation districts of Red Cliffs, Mildura and Merbein.

The Mildura irrigation district had the highest proportion of HIZ areas, 34% (3,430 ha) in 2024.



Total 2024 ha	Nyah	B. Bend	Wemen	Colignan	Mildura	L10-SA	Nyah	Robinvale	RedCliffs	Mildura	Merbein
	11,450	21,755	13,995	12,710	2,060	3,590	1,500	2,415	4,310	5,515	2,855
HIZ ha	-	-	-	1,175	1,170	485	-	-	1,835	3,430	1,860
% of HIZ total	-	-	-	12%	12%	5%	-	-	18%	34%	19%
	Private diverters 28% of the HIZ area						Irrigation districts 72% of the HIZ area				
Dominant zone	L1	L1	L2	L4	HIZ	L1	L1	L2	HIZ	HIZ	HIZ
	L1						HIZ				

Figure 10: Mallee catchment - salinity impact zones in each study area in 2024

1.8 Mallee catchment - irrigation methods

Figure 11 summarises irrigation methods across the Mallee catchment from 1997 to 2024.

The dominant irrigation method changed from furrow in 1997 to overhead in 2003, then drip irrigation from 2006 to 2024.

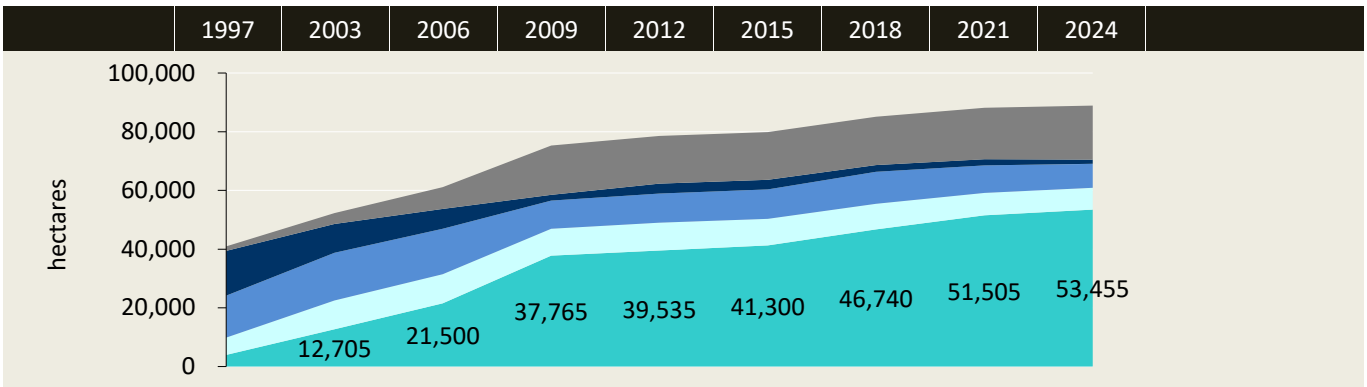
Drip irrigation was the dominant method in each of the study areas in 2024, except for the Robinvale district where low level sprinklers were dominant and the Murrayville GMA where centre pivots were dominant.

In 2024, the irrigable area of 88,905 ha comprised:

- 60% (53,455 ha) drip irrigation;
- 8% (7,405 ha) low level irrigation;
- 9% (8,180 ha) overhead sprinklers and pivots;
- 2% (1,420 ha) furrow irrigation; and
- 21% (18,445 ha) vacant, not irrigated.

From 1997 to 2024:

- drip irrigation increased by 49,500 ha, a 1,252% increase from 3,955 to 53,455 ha;
- low level irrigation increased by 1,495 ha, a 25% increase from 5,910 to 7,405 ha;
- overhead irrigation decreased by 6,115 ha, a 43% decrease from 14,295 to 8,180 ha; and
- furrow irrigation decreased by 13,815 ha, a 91% decrease from 15,235 to 1,420 ha.



Irrigation method[7]	1997	2003	2006	2009	2012	2015	2018	2021	2024	% in 2024	Change 1997-2024
Drip	3,955	12,705	21,500	37,765	39,535	41,300	46,740	51,505	53,455	60%	+49,500
Low level	5,910	9,835	9,915	9,145	9,465	9,035	8,660	7,665	7,405	8%	+1,495
Overhead	14,295	16,260	15,520	9,680	9,935	10,000	10,985	9,360	8,180	9%	-6,115
Furrow	15,235	9,780	6,810	1,950	3,410	3,295	2,285	2,115	1,420	2%	-13,815
Vacant	1,545	3,705	7,405	16,805	16,235	16,290	16,385	17,480	18,445	21%	+16,900
Total (ha)	40,940	52,285	61,150	75,345	78,580	79,920	85,055	88,125	88,905	100%	+47,965
Dominant	furrow	o'head	drip								

Figure 11: Mallee catchment - irrigation methods from 1997 to 2024

[7] Overhead irrigation includes pivots and lateral move systems. Furrow includes flood irrigation. (Refer to Table 4.)

1.9 Mallee catchment - property change

Figure 12 provides estimates of property numbers and average property size (irrigable area) in the Mallee catchment from 1997 to 2024.

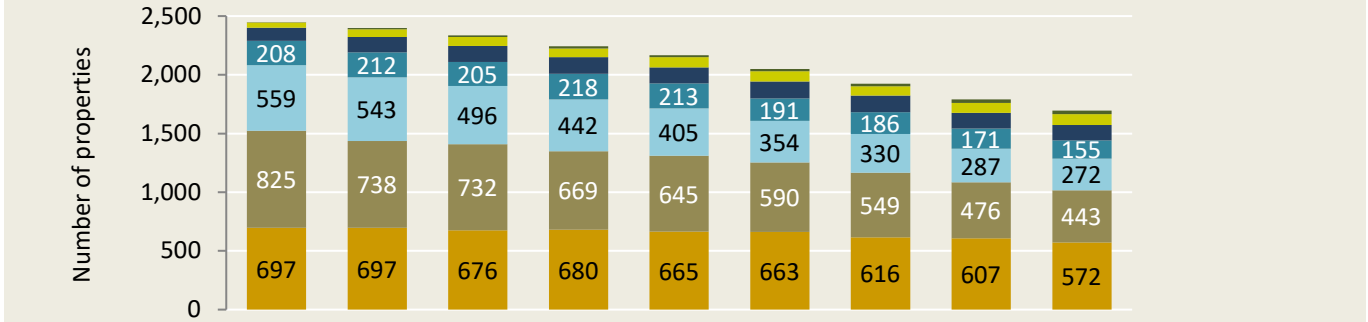
In 2024:

- there were approximately 1,695 irrigation properties; and
- 15% of properties had an irrigable area over 40 ha, and these properties farmed 85% of the irrigable area.

From 1997 to 2024:

- the number of properties decreased by 753, a 31% decrease from 2,448 to 1,695 properties;
- properties with an irrigable area less than 40 ha decreased by 847, while the number over 40 ha increased by 94; and
- average property size (irrigable area) increased from 17 to 52 ha per property.

Note: Total property numbers across the Mallee catchment are less than the sum of property numbers in each of the twelve study areas as some properties irrigate in more than one study area.



Property size (irrigable area)	1997	2003	2006	2009	2012	2015	2018	2021	2024	% in 2024	Change 1997-2024
1 to 5 ha	697	697	676	680	665	663	616	607	572	34%	-125
5 to 10 ha	825	738	732	669	645	590	549	476	443	26%	-382
10 to 20 ha	559	543	496	442	405	354	330	287	272	16%	-287
20 to 40 ha	208	212	205	218	213	191	186	171	155	9%	-53
40 to 100 ha	113	131	137	141	135	146	142	134	131	8%	+18
100 to 500 ha	42	66	75	73	86	87	78	86	93	5%	+51
> 500 ha	4	11	15	19	17	19	24	29	29	2%	+25
Total properties	2,448	2,398	2,336	2,242	2,166	2,050	1,925	1,790	1,695	100%	-753
Average size (ha)	17	22	26	34	36	39	44	49	52		

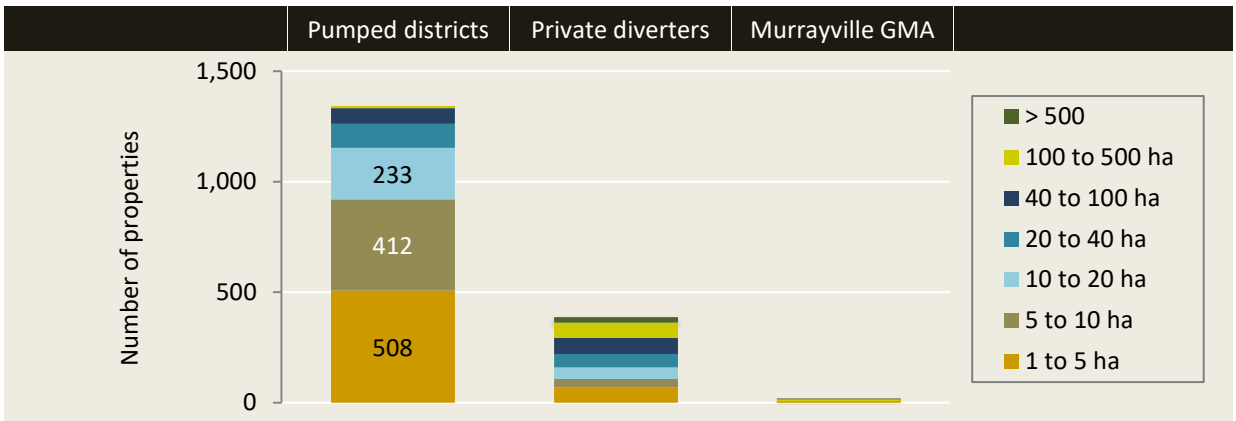
Figure 12: Mallee catchment - property numbers and sizes from 1997 to 2024

1.9.1 Mallee catchment - private diverter and district properties

Figure 13 shows estimates of property numbers and average property size (irrigable area) in the pumped irrigation districts, the private diverter river reaches and the Murrayville GMA in 2024.

In 2024:

- 77% of properties were in the pumped irrigation districts with an average property size of 12 ha (**Figure 22, page 50)**;
- 22% of properties were private diverters with an average property size of 169 ha (**Figure 62, page 115)**; and
- 1% of properties were Murrayville GMA irrigators. Average property size was 355 ha (**Figure 103, page 182**).



Property size (irrigable area)	Pumped districts	Private diverters	Murrayville GMA	Total
1 to 5 ha	508	68	4	580
5 to 10 ha	412	40	0	452
10 to 20 ha	233	52	0	285
20 to 40 ha	109	60	1	170
40 to 100 ha	71	73	2	146
100 to 500 ha	10	70	8	88
> 500 ha	0	24	4	28
Total properties	1,343	387	19	1,749[8]
% in 2024	77%	22%	1%	
Average size (ha)	12	169	355	

Figure 13: Mallee catchment - pumped district and private diverter property numbers in 2024

[8] The total number of properties in Figure 13 (1,749 properties) is greater than the total number of properties across the Mallee catchment (1,695 properties, Figure 12) as some properties irrigate in more than one study area/river reach.

2. Pumped irrigation districts

2.1 Pumped irrigation districts summary

In summary for the pumped irrigation districts: Nyah, Robinvale, Red Cliffs, Mildura and Merbein

Crop types in 2024

The main plantings in the pumped irrigation districts in 2024 (Table 9, page 40) were:

1. table grapes, 6,465 ha (39% of the irrigable area);
2. wine grapes, 2,365 ha (14% of the irrigable area);
3. dried grapes, 1,095 ha (7% of the irrigable area);
4. citrus, 435 ha (3% of the irrigable area);
5. vegetables (mainly cucurbits), 420 ha (3% of the irrigable area);
6. field crops, summer and winter, 405 ha (2% of the irrigable area); and
7. fruit trees other than olives (mainly avocados), 305 ha (2% of the irrigable area).

Crop type changes from 1997 to 2024

The dominant crop changed from dried grape plantings in 1997 to wine grapes from 2003 to 2009, then table grapes from 2012 to 2024 (**Figure 14, page 41**).

The main crop type changes from 1997 to 2024 were:

- dried grapes decreased by 4,865 ha, an 82% decrease from 5,960 to 1,095 ha;
- wine grapes decreased by 3,520 ha, a 60% decrease from 5,885 to 2,365 ha; and
- table grapes increased by 3,425 ha, a 113% increase from 3,040 to 6,465 ha.

Rate of change from 1997 to 2024

On average, the irrigated area across the pumped irrigation districts has decreased by 187 ha per year for the twenty-seven years from 1997 to 2024 (**Table 10, page 42**).

Permanent plantings decreased by an average of 176 ha per year, while seasonal cropping averaged a decrease of 10 ha per year.

Permanent planting areas that had been dried-off through the Millennium drought started to come back into production after 2012, and vacant areas (i.e. 'Vacant P') continued to decrease through to 2021. However, from 2021 to 2024, this trend reversed and vacant areas in the pumped districts increased by 130 ha.

In summary for the pumped irrigation districts: Nyah, Robinvale, Red Cliffs, Mildura and Merbein

New permanent plantings (planted or top-worked in the previous three years)

In 2024, 1,485 ha (13%) of permanent crops in the irrigation districts were planted or top-worked within the previous three years (**Figure 15, page 43**).

The proportion of these new plantings in each irrigation district was: 35% in Mildura, 24% in Red Cliffs, 20% in Robinvale, 18% in Merbein and 3% in the Nyah irrigation district.

The new plantings were:

1. table grapes (1,065 ha);
2. dried grapes (125 ha);
3. wine grapes (105 ha);
4. citrus (80 ha);
5. avocado and other fruit trees (a total of 55 ha);
6. nurseries (30 ha); and
7. almonds, pistachios and walnuts (a total of 25 ha).

From 1997 to 2024, the proportion of new permanent plantings was at its lowest in 2009 with 9% planted in the previous three years and highest in 1997 and 2021 with 18% planted in the previous three years.

Planting trends - permanent plantings, seasonal crops and vacant areas

In 2024, the irrigable area in the pumped irrigation districts was 16,595 ha (**Figure 16, page 44**) comprising:

- 68% (11,275 ha) permanent plantings;
- 5% (825 ha) seasonal crops;
- 20% (3,345 ha) vacant, previously an irrigated permanent planting; and
- 7% (1,150 ha) vacant, previously an irrigated seasonal crop.

The proportion of permanent plantings, seasonal cropping and vacant areas changed from:

- 92% permanent, 6% seasonal and 2% vacant in 1997; to
- 68% permanent, 5% seasonal and 27% vacant in 2024.

Irrigation development - new development (expansion) and retired areas

From 1997 to 2024, the irrigable area in the pumped districts decreased by 885 ha, a 5% decrease from 17,480 ha to 16,595 ha (**Figure 17, page 45**).

The net decrease of 885 ha was the balance of 1,840 ha retired from irrigation and 955 ha of expansion. Areas were mainly retired in the Mildura irrigation district for urban development.

In summary for the pumped irrigation districts: Nyah, Robinvale, Red Cliffs, Mildura and Merbein

Salinity impact zones

The dominant salinity impact zone across the irrigable area in the pumped irrigation districts was the high impact zone, HIZ (**Figure 18, page 46**).

In 2024, the irrigable area of 16,595 ha comprised:

- 35% (5,840 ha) in the lowest salinity impact zone, L1;
- 16% (2,590 ha) in L2;
- < 1% (25 ha) in L3;
- 6% (1,015 ha) in L4; and
- 43% (7,125 ha) in HIZ.

From 1997 to 2024, the irrigable area in:

- L1 to L4 increased by 485 ha, a 5% increase from 8,985 to 9,470 ha; and
- HIZ decreased by 1,370 ha, a 16% decrease from 8,495 to 7,125 ha.

Salinity impact zones of retired and expansion areas (Table 11, page 47) were:

- 79% (1,450 ha) of areas retired from irrigation were in the HIZ; and
- 74% of expansion areas were in L1 and 8% were in HIZ. (Expansion in the HIZ was development on existing irrigation properties.)

Irrigation methods

The dominant irrigation method across the pumped irrigation districts was furrow irrigation from 1997 to 2003. Low level irrigation replaced furrows as the dominant method from 2006 to 2009, then drip irrigation from 2012 to 2024 (**Figure 20, page 48**). In 2024, the irrigable area of 16,595 ha comprised:

- 46% (7,585 ha) drip irrigation;
- 21% (3,560 ha) low level irrigation;
- 4% (735 ha) overhead sprinklers;
- 1% (220 ha) furrow irrigation; and
- 27% (4,495 ha) vacant, not irrigated.

From 1997 to 2024:

- drip irrigation increased by 6,820 ha, an 892% increase from 765 to 7,585 ha;
- low level irrigation increased by 865 ha, a 32% increase from 2,695 to 3,560 ha;
- overhead irrigation decreased by 3,595 ha, an 83% decrease from 4,330 to 735 ha; and
- furrow irrigation decreased by 9,130 ha, a 98% decrease from 9,350 to 220 ha.

Irrigation properties

In 2024, there were approximately 1,343 irrigation properties in the irrigation districts with an average property size (irrigable area) of 12 ha (**Figure 22, page 50**). From 1997 to 2024:

- the number of properties decreased by 644, a 32% decrease from 1,987 to 1,343 properties;
- properties with an irrigable area less than 20 ha decreased by 709, while the number over 20 ha increased by 65; and
- average property size (irrigable area) increased from 9 to 12 ha per property.

2.1.1 Pumped districts summary - crop types in 2024

Table 9 lists crop types across the five pumped irrigation districts in 2024.

The main irrigated crops in 2024 were:

1. table grapes, 6,465 ha (39% of the irrigable area);
2. wine grapes, 2,365 ha (14% of the irrigable area);
3. dried grapes, 1,095 ha (7% of the irrigable area);
4. citrus, 435 ha (3% of the irrigable area);
5. vegetables (mainly cucurbits), 420 ha (3% of the irrigable area);
6. field crops, summer and winter, 405 ha (2% of the irrigable area); and
7. fruit trees other than olives (mainly avocados), 305 ha (2% of the irrigable area).

Table 9: Pumped irrigation districts - crop types in 2024

	Crop type		2024 (ha)	2024 %	Description
Permanent plantings	Grapevine	Dried	1,095	7%	Currant, sultana and raisin varieties
		Table	6,465	39%	Red, white and black varieties
		Wine	2,365	14%	Includes a very small proportion of juiced grapes
	Citrus		435	3%	Mainly navels and mandarins. Also: grapefruit, lemon, lime, blood orange, common orange, tangelo and Valencia.
	Fruit tree	Olive	75	<1%	
		Other	305	2%	Mainly avocados. Also: date palm, fig, jujube, loquat, mango, persimmon, pomegranate and stone fruit.
	Nut tree	Almond	165	1%	
		Other	200	1%	Mainly pistachio. Also: walnut and chestnut.
	Other	Miscellaneous	170	1%	Mainly nurseries. Also: aquaculture, fresh flowers, native plants, passionfruit and tree plantation.
	Permanent crops (sub-total)		11,275	68%	
Seasonal crops	Field crop	Summer	215	1%	Field crops irrigated/active November-March. Mainly pasture, lucerne and turf.
		Winter	190	1%	Field crops irrigated/active July-October or April-June. Mainly fodder and cereal crops.
	Vegetable	Carrot	-	-	
		Potato	-	-	
		Other	420	3%	Mainly cucurbits (e.g. cucumber, melon, pumpkin, zucchini). Also: asparagus, bean, capsicum, chilli, eggplant, garlic, onion, pea, salad greens, sweet corn, tomato and other vegetables.
	Seasonal crops (sub-total)		825	5%	
Vac.	Vacant P		3,345	20%	Vacant (not irrigated), previously a permanent crop
	Vacant S		1,150	7%	Vacant (not irrigated), previously a seasonal crop
	Total irrigable area (ha)		16,595	100%	

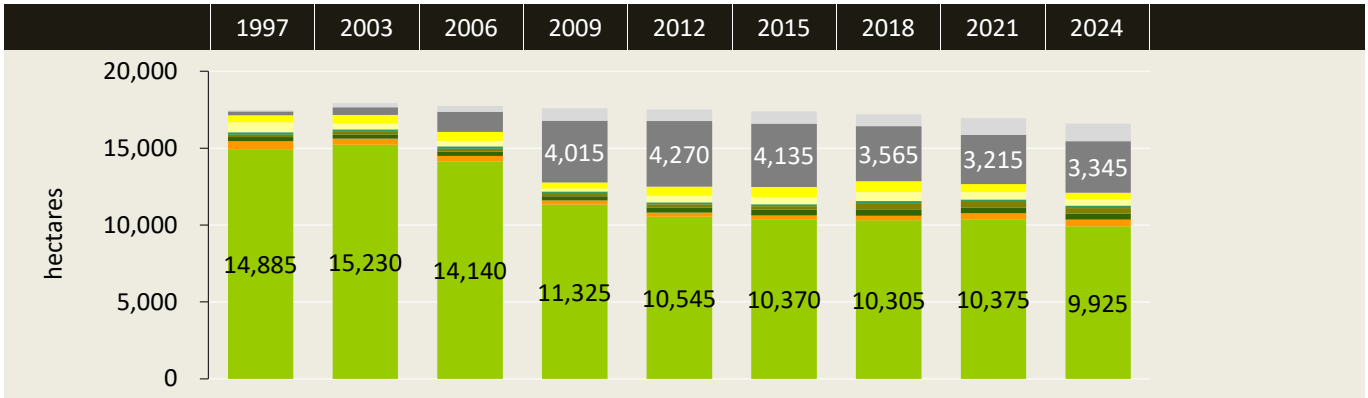
2.1.2 Pumped districts summary - crop types from 1997 to 2024

Figure 14 summarises irrigated crop types across the five pumped irrigation districts from 1997 to 2024.

The dominant crop changed from dried grapes in 1997 to wine grapes from 2003 to 2009, then table grapes from 2012 to 2024.

From 1997 to 2024, the main planting changes were:

- dried grapes decreased by 4,865 ha, an 82% decrease from 5,960 to 1,095 ha;
- wine grapes decreased by 3,520 ha, a 60% decrease from 5,885 to 2,365 ha;
- table grapes increased by 3,425 ha, a 113% increase from 3,040 to 6,465 ha;
- field crops decreased by 230 ha, a 36% decrease from 635 to 405 ha;
- other nuts (pistachios and walnuts) increased by 165 ha, a 471% increase from 35 to 200 ha; and
- citrus decreased by 130 ha, a 23% decrease from 565 to 435 ha.



Crop type		1997	2003	2006	2009	2012	2015	2018	2021	2024	% of 2024	Change 1997-2024
Permanent	Grape Dried	5,960	4,125	3,365	2,245	2,175	2,035	1,780	1,250	1,095	7%	-4,865
	Grape Table	3,040	3,970	3,895	3,850	4,260	4,720	5,580	6,395	6,465	39%	+3,425
	Grape Wine	5,885	7,135	6,880	5,230	4,110	3,615	2,945	2,730	2,365	14%	-3,520
	Citrus	565	395	360	275	270	245	300	405	435	3%	-130
	Fruit Olive	60	85	80	95	120	115	105	80	75	<1%	+15
	Fruit Other	215	185	190	170	215	275	320	285	305	2%	+90
	Nut Almond	115	130	140	175	145	155	185	170	165	1%	+50
	Nut Other	35	40	50	45	55	60	160	185	200	1%	+165
	Other	165	160	150	105	135	140	185	170	170	1%	+5
Seasonal	Field Crop	635	395	370	185	425	475	575	470	405	2%	-230
	Veg. Carrot	10	20	30	30	50	50	60	10	0	0%	-10
	Veg. Potato	-	-	-	-	-	-	-	-	-	-	-
	Veg. Other	455	525	535	355	535	585	665	510	420	3%	-35
Vacant P		250	495	1,325	4,015	4,270	4,135	3,565	3,215	3,345	20%	+3,095
Vacant S		90	265	365	830	755	775	780	1,080	1,150	7%	+1,060
Total (ha)		17,480	17,925	17,735	17,605	17,520	17,380	17,205	16,955	16,595	100%	-885
Dominant		dried g.	wine grape			table grape						

Figure 14: Pumped irrigation districts - crop types from 1997 to 2024

2.1.3 Pumped districts summary - rate of change

Table 10 summarises the net change in planted area by crop type across the pumped irrigation districts in the Mallee catchment. There are eight change periods from 1997 to 2024. Each change period spans three years except for the first period from 1997 to 2003, hence, an average change per year figure is provided so that figures can be compared across the change periods.

Cells shaded blue in the table below denote the permanent planting with the highest net **increase** within the specified change period and red shading denotes the permanent planting with the highest net **decrease**.

Figures highlight the growth periods for wine and table grape plantings and periods of removal of wine and dried grape plantings. They also highlight fluctuations in seasonal cropping in response to water availability, particularly from 2003 to 2012 in the Millennium drought.

On average, the irrigated area across the pumped districts decreased by 187 ha per year from 1997 to 2024. The decrease comprised an average of 176 ha per year of permanent plantings and 10 ha per year of seasonal crops, mainly field crops.

The highest growth period for permanent plantings was from 2015 to 2018 with an increase in plantings of 200 ha over the three years. The net increase was driven by table grapes and pistachios.

Permanent planting areas that had been dried-off through the Millennium drought started to come back into production after 2012, and vacant areas (i.e. 'Vacant P') continued to decrease through to 2021. This trend reversed in the 2021 to 2024 change period with vacant areas increasing by 130 ha.

Table 10: Pumped irrigation districts - rate of change in crop types from 1997 to 2024

Crop type	Change period								Total 1997-24
	1997-03	2003-06	2006-09	2009-12	2012-15	2015-18	2018-21	2021-24	
Grape Dried	-1,835	-760	-1,120	-70	-140	-255	-530	-155	-4,865
Grape Table	+930	-75	-45	+410	+460	+860	+815	+70	+3,425
Grape Wine	+1,250	-255	-1,650	-1,120	-495	-670	-215	-365	-3,520
Citrus	-170	-35	-85	-5	-25	+55	+105	+30	-130
Fruit Olive	+25	-5	+15	+25	-5	-10	-25	-5	+15
Fruit Other	-30	+5	-20	+45	+60	+45	-35	+20	+90
Nut Almond	+15	+10	+35	-30	+10	+30	-15	-5	+50
Nut Other	+5	+10	-5	+10	+5	+100	+25	+15	+165
Miscellaneous	-5	-10	-45	+30	+5	+45	-15	0	+5
Change: permanent crops	+185	-1,115	-2,920	-705	-125	+200	+110	-395	-4,765
Ave. change/year perm.	+31	-372	-973	-235	-42	+67	+37	-132	-176
Field Crop	-240	-25	-185	+240	+50	+100	-105	-65	-230
Vegetable	+80	+20	-180	+200	+50	+90	-205	-100	-45
Change: seasonal crops	-160	-5	-365	+440	+100	+190	-310	-165	-275
Ave. change/year seas.	-27	-1	-61	+73	+17	+32	-52	-28	-10
Change: irrigated area (ha)	+25	-1,120	-3,285	-265	-25	+390	-200	-560	-5,040
Ave. change/year irrigated	+4	-373	-1,095	-88	-8	+130	-67	-187	-187
Vacant P	+245	+830	+2,690	+255	-135	-570	-350	+130	+3,095
Vacant S	+175	+100	+465	-75	+20	+5	+300	+70	+1,060
Change: irrigable area (ha)	+445	-190	-130	-85	-140	-175	-250	-360	-885
Ave. change/year irrigable	+74	-63	-43	-28	-47	-58	-83	-120	-33

2.1.4 Pumped districts summary - new permanent plantings

Figure 15 shows the proportion of permanent crops planted or top-worked in the previous three years across the pumped irrigation districts from 1997 to 2024.

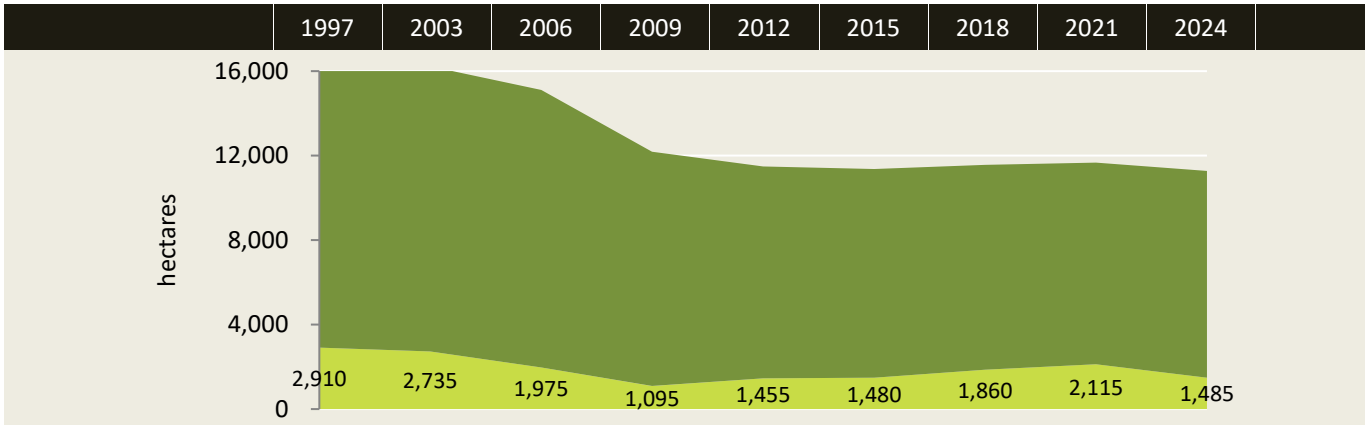
The information provides an indication of development activity that doesn't necessarily involve a change in area or crop type as it includes replanting or top working to different varieties. The figures are conservative, as top worked plantings can be difficult to interpret from the three-yearly aerial imagery, particularly for grapevines.

In 2024:

- 1,485 ha (13%) of permanent crops were planted or top-worked within the previous three years.
- These new plantings were:
    1. table grapes (1,065 ha);
    2. dried grapes (125 ha);
    3. wine grapes (105 ha);
    4. citrus (80 ha);
    5. avocado and other fruit trees (a total of 55 ha);
    6. nurseries (30 ha); and
    7. almonds, pistachios and walnuts (a total of 25 ha).
- The area of new permanent plantings by irrigation district was: Mildura 525 ha, Red Cliffs 350 ha, Robinvale 295 ha, Merbein 270 ha and Nyah 45 ha.

From 1997 to 2024:

- The proportion of new permanent plantings was at its lowest in 2009 with 9% planted in the previous three years and highest in 1997 and 2021 with 18% planted in the previous three years.



Permanent plantings	1997	2003	2006	2009	2012	2015	2018	2021	2024	% of 2024
≤3yr old plantings	2,910	2,735	1,975	1,095	1,455	1,480	1,860	2,115	1,485	13%
>3yr old plantings	13,130	13,490	13,135	11,095	10,030	9,880	9,700	9,555	9,790	87%
Total (ha)	16,040	16,225	15,110	12,190	11,485	11,360	11,560	11,670	11,275	100%
% 3year development	18%	17%	13%	9%	13%	13%	16%	18%	13%	
Average 3-year dev.	14%									

Figure 15: Pumped irrigation districts - three-year old permanent plantings from 1997 to 2024

2.1.5 Pumped districts summary - planting trends

Figure 16 summarises planting trends with respect to permanent crops, seasonal crops and vacant areas in the pumped irrigation districts from 1997 to 2024.

The proportion of permanent plantings, seasonal cropping and vacant areas changed from:

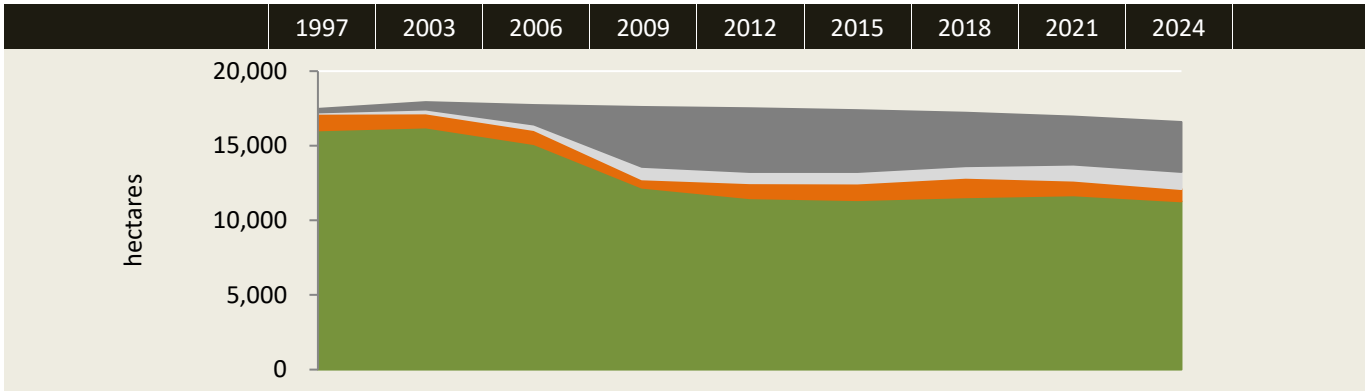
- 92% permanent, 6% seasonal and 2% vacant in 1997; to
- 68% permanent, 5% seasonal and 27% vacant in 2024.

In 2024, the irrigable area of 16,595 ha comprised:

- 68% (11,275 ha) irrigated permanent plantings;
- 5% (825 ha) irrigated seasonal crops;
- 20% (3,345 ha) vacant, previously an irrigated permanent planting; and
- 7% (1,150 ha) vacant, previously an irrigated seasonal crop.

From 1997 to 2024:

- irrigated permanent crops decreased by 4,765 ha, from 16,040 to 11,275 ha;
- irrigated seasonal crops decreased by 275 ha, from 1,100 to 825 ha;
- vacant areas, previously irrigated permanent plantings increased by 3,095 ha, from 250 to 3,345 ha; and
- vacant areas, previously irrigated seasonal crops increased by 1,060 ha, from 90 to 1,150 ha.



	1997	2003	2006	2009	2012	2015	2018	2021	2024	Change 1997-2024
Permanent - irrigated	16,040	16,225	15,110	12,190	11,485	11,360	11,560	11,670	11,275	-4,765
Seasonal - irrigated	1,100	940	935	570	1,010	1,110	1,300	990	825	-275
Total irrigated (ha)	17,140	17,165	16,045	12,760	12,495	12,470	12,860	12,660	12,100	-5,040
Vacant - permanent	250	495	1,325	4,015	4,270	4,135	3,565	3,215	3,345	+3,095
Vacant - seasonal	90	265	365	830	755	775	780	1,080	1,150	+1,060
Total irrigable (ha)	17,480	17,925	17,735	17,605	17,520	17,380	17,205	16,955	16,595	-885
% Permanent	92%	91%	85%	69%	66%	66%	67%	69%	68%	
% Seasonal	6%	5%	5%	3%	6%	6%	8%	6%	5%	
% Vacant P	1%	3%	8%	23%	24%	24%	21%	19%	20%	
% Vacant S	1%	1%	2%	5%	4%	4%	4%	6%	7%	

Figure 16: Pumped irrigation districts - planting trends from 1997 to 2024

2.1.6 Pumped districts summary - irrigation development

Figure 17 summarises irrigation development with respect to new development (expansion) and areas retired[9] from irrigation in the pumped irrigation districts from 1997 to 2024.

- The irrigable area decreased by 885 ha, a 5% decrease from 17,480 ha in 1997 to 16,595 ha in 2024. The net decrease of 885 ha was the balance of 1,840 ha retired from irrigation and 955 ha of expansion.
- The irrigable area in the Nyah and Robinvale districts increased by 34% (380 ha) and 4% (95 ha) respectively.
- The irrigable area in the Mildura, Red Cliffs and Merbein districts decreased by 14% (930 ha), 3% (140 ha) and 9% (290 ha) respectively.

District	1997 irrigable area (ha)	1997 to 2024		2024 irrigable area (ha)	Net change 1997-2024	Growth 1997-2024
		Retired	New			
Nyah[10]	1,120	-85	+465	1,500	+380	+34%
Robinvale	2,320	-35	+130	2,415	+95	+4%
Red Cliffs	4,450	-235	+95	4,310	-140	-3%
Mildura	6,445	-1,185	+255	5,515	-930	-14%
Merbein	3,145	-300	+10	2,855	-290	-9%
Total	17,480	-1,840	+955	16,595	-885	-5%

Figure 17: Pumped irrigation districts - irrigation development from 1997 to 2024

[9] Retired areas were previously irrigated but have undergone a change in land use and no longer have irrigation infrastructure e.g. urban development, sheds, dams, land set aside for conservation or returned to dryland agriculture.
[10] Hectares for the Nyah irrigation district include areas outside the district but supplied with water from the district, whereas figures for the other districts only include areas inside the district boundary.

2.1.7 Pumped districts summary - salinity impact zones

Figure 18 summarises river salinity impact zones of irrigated areas in the five pumped irrigation districts from 1997 to 2024. The high impact zone was the dominant zone across the irrigable area from 1997 to 2024.

In 2024, the irrigable area of 16,595 ha comprised:

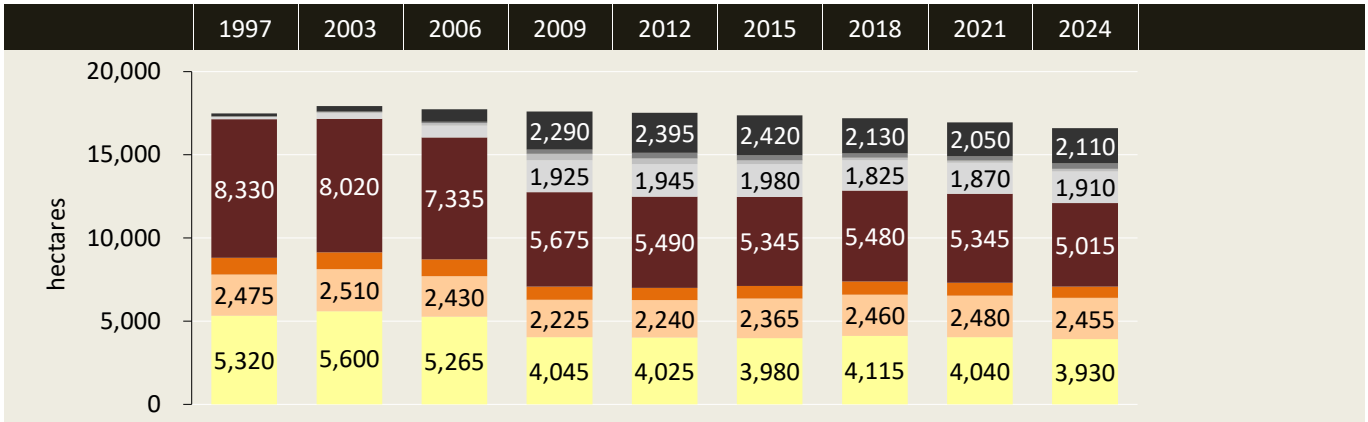
- 35% (5,840 ha) in the lowest salinity impact zone, L1;
- 16% (2,590 ha) in L2;
- < 1% (25 ha) in L3;
- 6% (1,015 ha) in L4; and
- 43% (7,125 ha) in HIZ.

From 1997 to 2024, the area irrigated in:

- L1 to L4 decreased by 1,725 ha, a 20% decrease from 8,810 to 7,085 ha; and
- HIZ decreased by 3,315 ha, a 40% decrease from 8,330 to 5,015 ha. The area irrigated in HIZ decreased by 2,985 ha from 1997 to 2015, increased by 135 ha between 2015 and 2018 then decreased by 465 between 2018 and 2024. The increase between 2015 and 2018 was largely due to vacant areas in HIZ being brought back into production after the Millennium drought and the decreases were mainly areas retired from irrigation for urban development.

From 1997 to 2024, the irrigable area in:

- L1 to L4 increased by 485 ha, a 5% increase from 8,985 to 9,470 ha; and
- HIZ decreased by 1,370 ha, a 16% decrease from 8,495 to 7,125 ha.



Salinity impact zone		1997	2003	2006	2009	2012	2015	2018	2021	2024	% in 2024	Change 1997-2024
Irrigated	L1	5,320	5,600	5,265	4,045	4,025	3,980	4,115	4,040	3,930	24%	-1,390
	L2	2,475	2,510	2,430	2,225	2,240	2,365	2,460	2,480	2,455	15%	-20
	L3	20	20	20	20	15	15	15	15	15	<1%	-5
	L4	995	1,015	995	795	725	765	790	780	685	4%	-310
	HIZ	8,330	8,020	7,335	5,675	5,490	5,345	5,480	5,345	5,015	30%	-3,315
Not Irrigated	L1	130	335	705	1,925	1,945	1,980	1,825	1,870	1,910	11%	+1,780
	L2	20	65	160	365	350	220	130	115	135	1%	+115
	L3	0	0	5	5	10	10	10	10	10	<1%	+10
	L4	25	45	65	260	325	280	250	250	330	2%	+305
	HIZ	165	315	755	2,290	2,395	2,420	2,130	2,050	2,110	13%	+1,945
Total (ha)		17,480	17,925	17,735	17,605	17,520	17,380	17,205	16,955	16,595	100%	-885
Dominant zone		HIZ										

Figure 18: Pumped irrigation districts - irrigable area in each salinity impact zone from 1997 to 2024

Salinity zones of retired and expansion areas

Table 11 shows the salinity impact zones of areas retired from irrigation and expansion areas from 1997 to 2024.

From 1997 to 2024 in the pumped irrigation districts:

- 79% (1,450 ha) of areas retired from irrigation were in the high impact zone (HIZ); and
- 74% of expansion areas were in the lowest salinity impact zone (L1), 18% were in zones L2 to L4 and 8% were in the high impact zone, HIZ. (Expansion in the HIZ was development on existing irrigation properties.)

Table 11: Pumped irrigation districts - salinity impact zones of retired and expansion areas

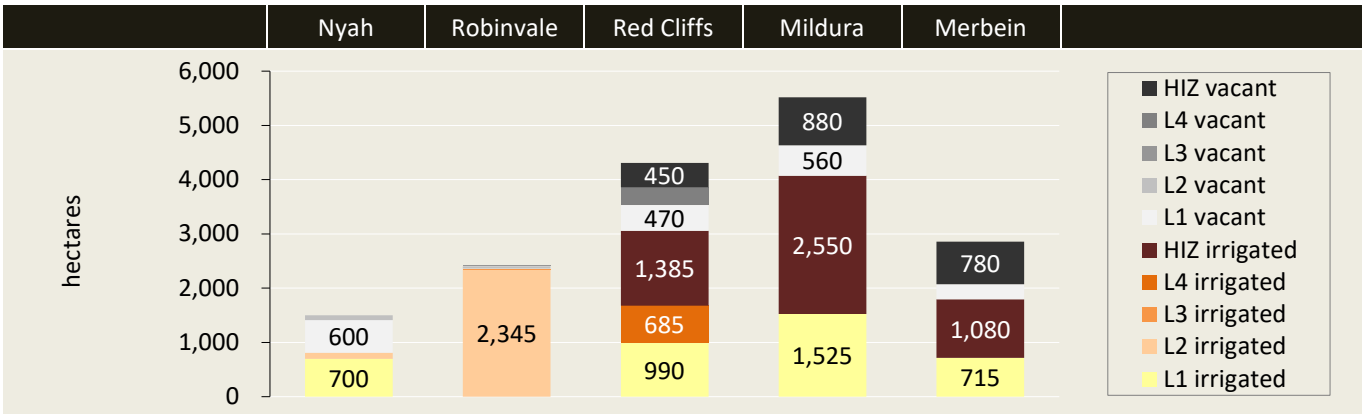
Salinity Impact Zone	1997	Retired		Expansion		2024	Change 1997-2024	% Change
	irrigable ha	ha	%	ha	%	irrigable ha		
L1	5,450	-320	17%	+710	74%	5,840	+390	+7%
L2	2,495	-45	2%	+140	15%	2,590	+95	+4%
L3	20	0	0%	+5	1%	25	+5	+25%
L4	1,020	-25	1%	+20	2%	1,015	-5	- <1%
HIZ	8,495	-1,450	79%	+80	8%	7,125	-1,370	-16%
Total	17,480	-1,840	100%	+955	100%	16,595	-885	-5%

Salinity impact zones in each pumped irrigation district

Figure 19 compares salinity impact zones in each of the pumped irrigation districts in 2024.

In 2024:

- the high salinity impact zone, HIZ, was the dominant zone in the Red Cliffs, Mildura and Merbein irrigation districts;
- the lowest salinity impact zone, L1, was the dominant zone in the Nyah irrigation district; and
- L2 was the dominant zone in the Robinvale irrigation district.



Irrigation district	Nyah	Robinvale	Red Cliffs	Mildura	Merbein	2024 total
HIZ hectares	-	-	1,835	3,430	1,860	7,125
% of HIZ total	-	-	26%	48%	26%	100%
Dominant zone	L1	L2	HIZ	HIZ	HIZ	HIZ

Figure 19: Pumped irrigation districts - salinity impact zones in each district in 2024

2.1.8 Pumped districts summary - irrigation methods

Figure 20 summarises irrigation methods in the pumped irrigation districts from 1997 to 2024.

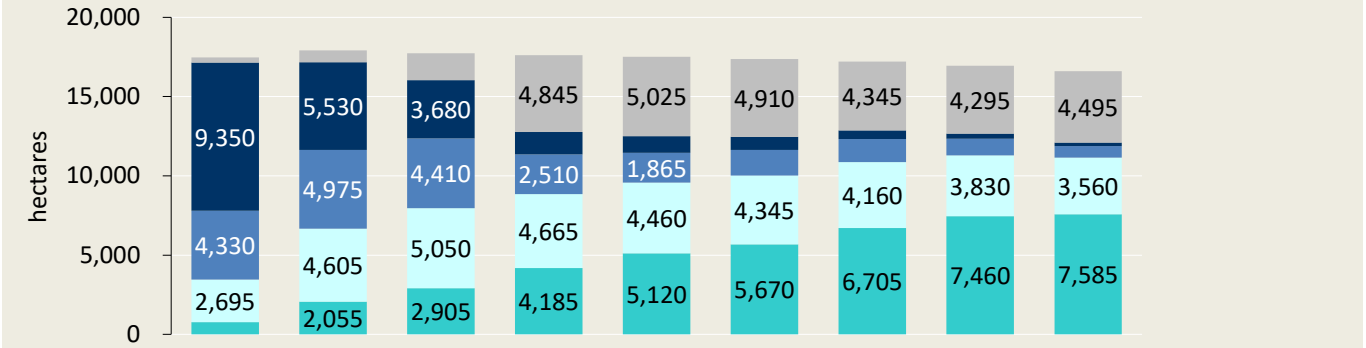
The dominant irrigation method in the pumped irrigation districts was furrow from 1997 to 2003, low level irrigation from 2006 to 2009, then drip irrigation from 2012 to 2024.

In 2024, the irrigable area of 16,595 ha comprised:

- 46% (7,585 ha) drip irrigation;
- 21% (3,560 ha) low level irrigation;
- 4% (735 ha) overhead sprinklers;
- 1% (220 ha) furrow irrigation; and
- 27% (4,495 ha) vacant, not irrigated.

From 1997 to 2024:

- drip irrigation increased by 6,820 ha, an 892% increase from 765 to 7,585 ha;
- low level irrigation increased by 865 ha, a 32% increase from 2,695 to 3,560 ha;
- overhead irrigation decreased by 3,595 ha, an 83% decrease from 4,330 to 735 ha; and
- furrow irrigation decreased by 9,130 ha, a 98% decrease from 9,350 to 220 ha.



Irrigation method[11]	1997	2003	2006	2009	2012	2015	2018	2021	2024	% in 2024	Change 1997-2024
Drip	765	2,055	2,905	4,185	5,120	5,670	6,705	7,460	7,585	46%	+6,820
Low level	2,695	4,605	5,050	4,665	4,460	4,345	4,160	3,830	3,560	21%	+865
Overhead	4,330	4,975	4,410	2,510	1,865	1,610	1,455	1,060	735	4%	-3,595
Furrow	9,350	5,530	3,680	1,400	1,050	845	540	310	220	1%	-9,130
Vacant	340	760	1,690	4,845	5,025	4,910	4,345	4,295	4,495	27%	+4,155
Total (ha)	17,480	17,925	17,735	17,605	17,520	17,380	17,205	16,955	16,595	100%	-885
Dominant	furrow		low level		drip						

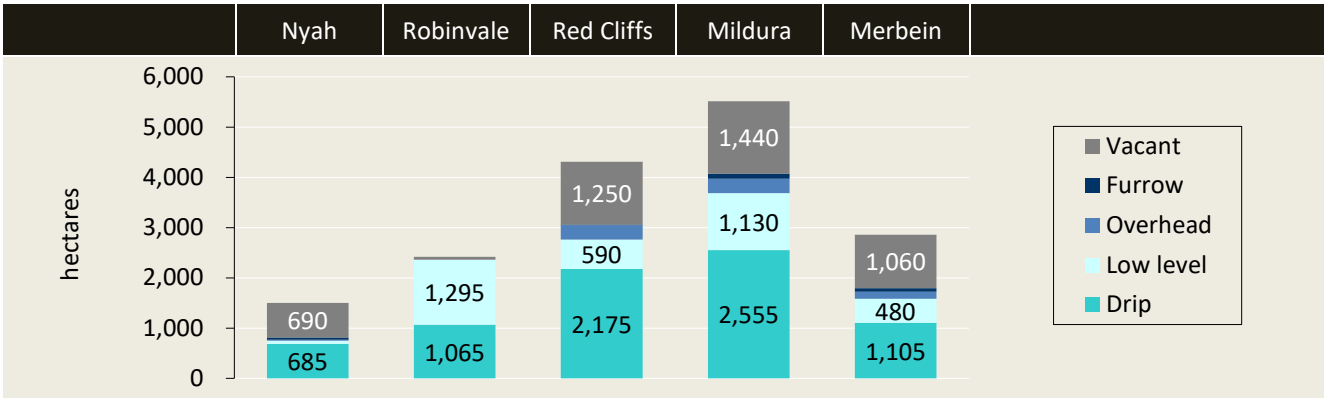
Figure 20: Pumped irrigation districts - irrigation methods from 1997 to 2024

[11] Overhead irrigation includes pivots and lateral move systems. Furrow includes flood irrigation. (Refer to Table 4.)

Irrigation methods in each pumped irrigation district in 2024

Figure 21 shows irrigation methods in each of the pumped irrigation districts in 2024.

Drip irrigation was the dominant method in each district, except for Robinvale where low level sprinklers were dominant.



	Nyah	Robinvale	Red Cliffs	Mildura	Merbein	2024 total
Hectares in 2024	1,500	2,415	4,310	5,515	2,855	16,595
% of 2024 total	9%	15%	26%	33%	17%	100%
Dominant	drip	low level	drip	drip	drip	drip

Figure 21: Pumped irrigation districts - irrigation methods in each district in 2024

2.1.9 Pumped districts summary - property change

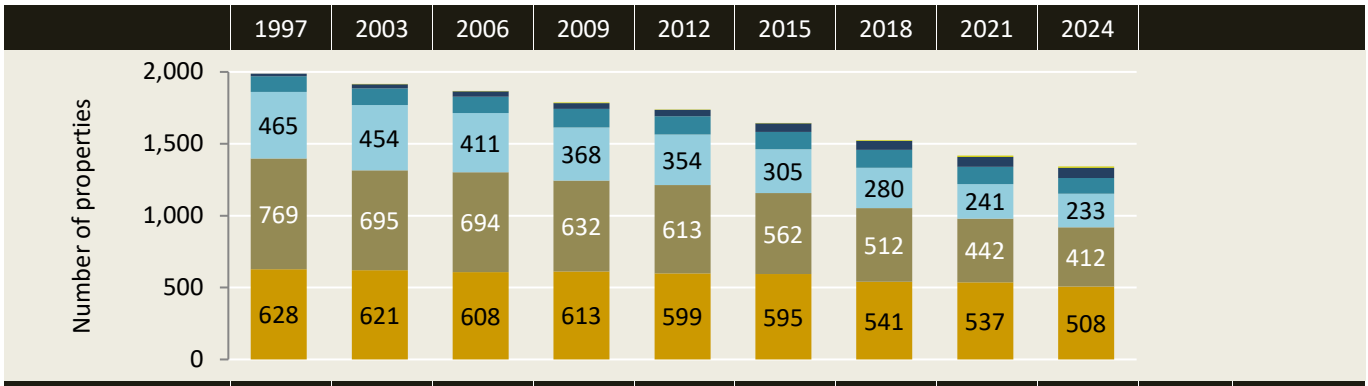
Figure 22 provides an estimate of property numbers and average property size (irrigable area) across the five pumped irrigation districts from 1997 to 2024.

In 2024:

- there were approximately 1,343 irrigation properties; and
- most properties (86%) had an irrigable area less than 20 ha.

From 1997 to 2024:

- the number of properties decreased by 644, a 32% decrease from 1,987 to 1,343 properties;
- properties with an irrigable area less than 20 ha decreased by 709, while the number over 20 ha increased by 65; and
- average property size (irrigable area) increased from 9 to 12 ha per property.



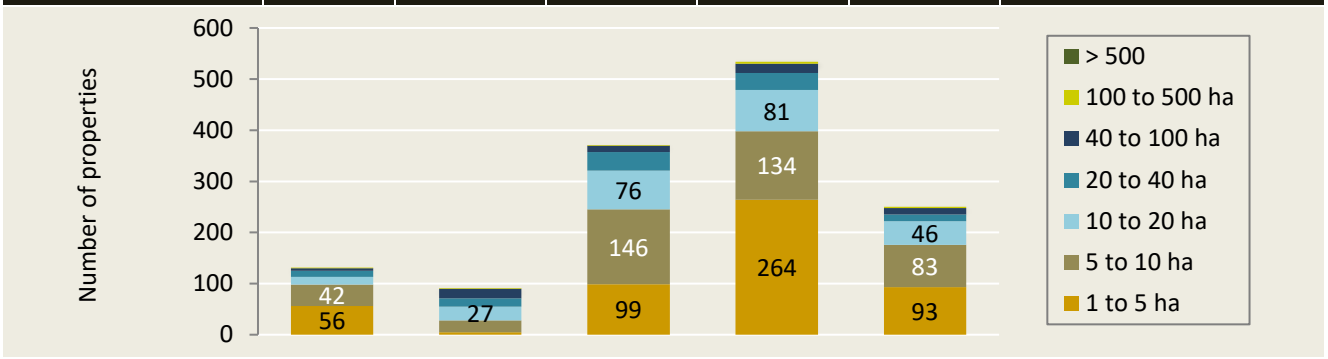
Property size (irrigable area)	1997	2003	2006	2009	2012	2015	2018	2021	2024	% in 2024	Change 1997-2024
1 to 5 ha	628	621	608	613	599	595	541	537	508	38%	-120
5 to 10 ha	769	695	694	632	613	562	512	442	412	31%	-357
10 to 20 ha	465	454	411	368	354	305	280	241	233	17%	-232
20 to 40 ha	108	116	115	131	125	121	124	119	109	8%	+1
40 to 100 ha	17	29	37	40	45	59	63	70	71	5%	+54
100 to 500 ha	0	1	2	3	3	4	5	8	10	1%	+10
> 500 ha	-	-	-	-	-	-	-	-	-	-	-
Total properties	1,987	1,916	1,867	1,787	1,739	1,646	1,525	1,417	1,343	100%	-644
Average size (ha)	9	9	9	10	10	11	11	12	12		

Figure 22: Pumped irrigation districts - property numbers and sizes from 1997 to 2024

Irrigation properties in each pumped irrigation district in 2024

Figure 23 provides an estimate of property numbers and average property size (irrigable area) in each of the five pumped irrigation districts in 2024.

- 66% of irrigation properties were in the Mildura and Red Cliffs irrigation districts in 2024.
- Properties in the irrigation districts had an average irrigable area of 10 to 12 ha, except for the Robinvale district where the average irrigable area was 27 ha.



	Nyah	Robinvale	Red Cliffs	Mildura	Merbein	2024 total
Total properties	131	91	371	534	250	1,377[12]
% of 2024 total	10%	7%	27%	39%	18%	100%
Ave. property size irrigable area (ha)	11	27	12	10	11	

Figure 23: Pumped irrigation districts - property numbers and average size in each district in 2024

[12] The total number of properties from each irrigation district (1,377 properties, Figure 23) is greater than the total number of properties across the irrigation districts (1,343 properties, Figure 22) as some properties irrigate in more than one district.

2.2 Nyah irrigation district

In summary for the Nyah irrigation district

Crop types in 2024

The main plantings in the Nyah irrigation district in 2024 were:

1. wine grapes, 530 ha (35% of the irrigable area);
2. vegetables other than carrots or potatoes, 85 ha (6% of the irrigable area); and
3. winter field crops, 45 ha (3% of the irrigable area).

Crop type changes from 1997 to 2024

Wine grapes were the dominant crop from 1997 to 2024.

The main crop type changes from 1997 to 2024 were:

- wine grapes increased by 210 ha, a 66% increase from 320 to 530 ha;
- field crops decreased by 205 ha, a 76% decrease from 270 to 65 ha; and
- dried grapes decreased by 190 ha, an 83% decrease from 230 to 40 ha.

New permanent plantings (planted or top-worked in the previous three years)

In 2024, 45 ha (7%) of permanent crops were planted or top-worked in the previous three years. This was the second highest area of new plantings since 2009, down from 65 ha in 2021.

The new permanent plantings in 2024 were:

1. wine grapes (25 ha);
2. dried grapes (10 ha); and
3. pistachios (10 ha).

Planting trends - permanent plantings, seasonal crops and vacant areas

In 2024, the irrigable area of 1,500 ha comprised:

- 44% (660 ha) was irrigated permanent plantings;
- 10% (150 ha) was irrigated seasonal crops;
- 19% (290 ha) vacant, previously an irrigated permanent planting; and
- 27% (400 ha) vacant, previously an irrigated seasonal crop.

The proportion of permanent plantings, seasonal cropping and vacant areas changed from:

- 60% permanent, 38% seasonal and 2% vacant in 1997; to
- 44% permanent, 10% seasonal and 46% vacant in 2024.

In summary for the Nyah irrigation district

Irrigation development - new development (expansion) and retired areas

In the Nyah irrigation district the irrigable area increased by 380 ha, a 34% increase from 1,120 ha in 1997 to 1,500 ha in 2024. The increase was mainly due to expansion of the district to include adjacent areas irrigated with water from the district.

The net increase of 380 ha was the balance of 85 ha retired from irrigation and 465 ha of expansion.

Salinity impact zones

The Nyah irrigation district is in low salinity impact zones L1 and L2.

In 2024, the irrigable area of 1,500 ha comprised:

- 87% (1,300 ha) in the lowest salinity zone L1; and
- 13% (200 ha) in L2.

From 1997 to 2024 the irrigable area in:

- L1 increased by 375 ha, a 41% increase from 925 to 1,300 ha; and
- L2 increased by 5 ha, a 3% increase from 195 to 200 ha.

Irrigation methods

The dominant irrigation method in the Nyah irrigation district was furrow irrigation from 1997 to 2003, then drip irrigation from 2006 to 2024.

In 2024, the irrigable area of 1,500 ha comprised:

- 46% (685 ha) drip irrigation;
- 4% (65 ha) low level irrigation;
- 1% (20 ha) overhead sprinklers;
- 3% (40 ha) furrow irrigation; and
- 46% (690 ha) vacant, not irrigated.

Irrigation properties

In 2024, there were approximately 131 irrigation properties with an average property size (irrigable area) of 11 ha.

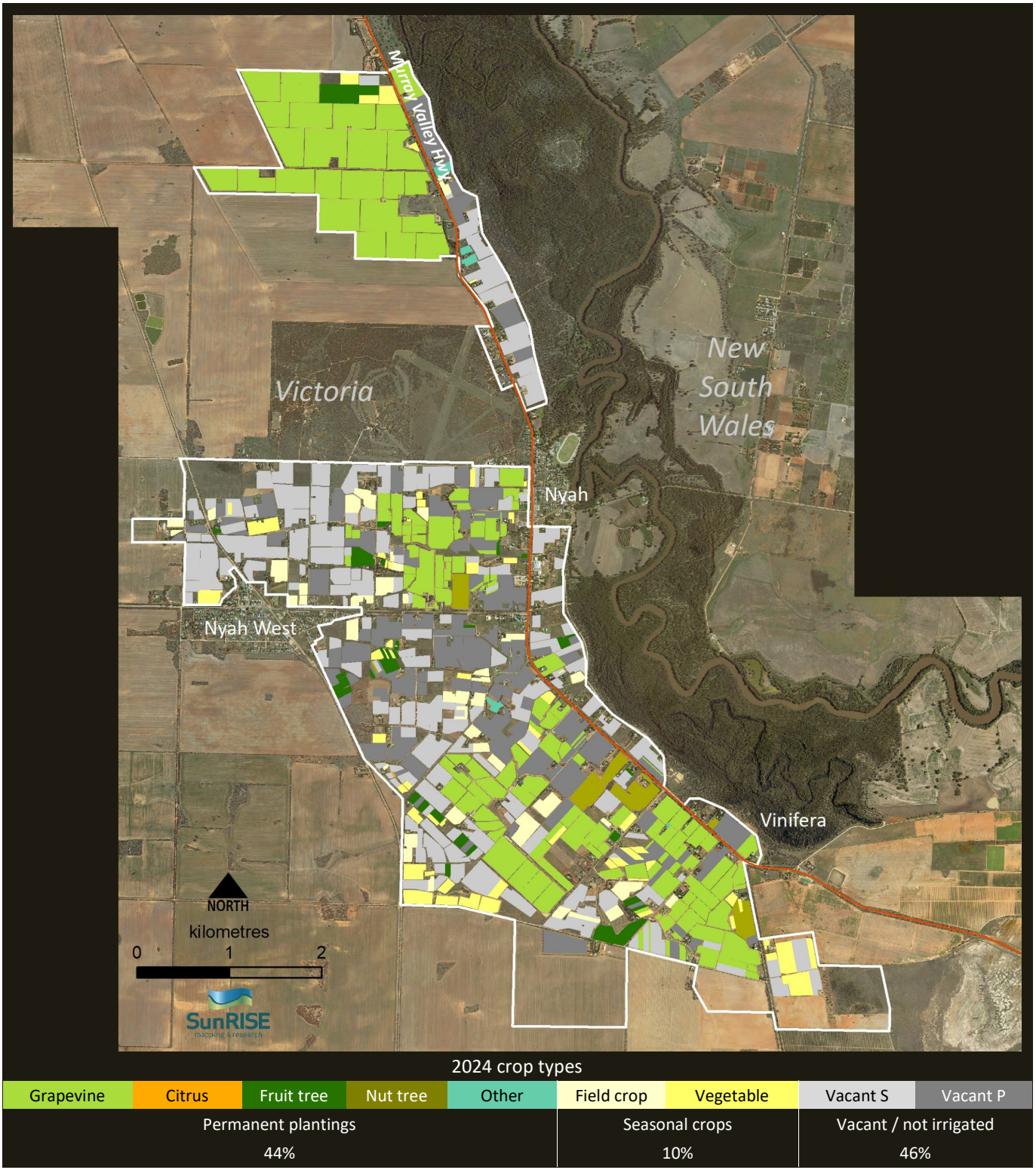
From 1997 to 2024:

- the number of properties decreased by 26, a 17% decrease from 157 to 131 properties;
- properties with an irrigable area less than 20 ha decreased by 36, while the number over 20 ha increased by 10; and
- average property size (irrigable area) increased from 7 to 11 ha per property.

2.2.1 Nyah irrigation district - crop types in 2024

Map 2 shows the Nyah irrigation district with crop types in 2024. The district shown in the map is the gazetted district plus adjacent areas irrigated with water from the district.

The aerial photography was flown in January 2024 (*source: Coordinated Imagery Program, DTP Victoria*).



Map 2: Nyah irrigation district showing crop types in 2024

2.2.2 Nyah irrigation district - crop types from 1997 to 2024

Figure 24 summarises crop types in the Nyah irrigation district from 1997 to 2024.

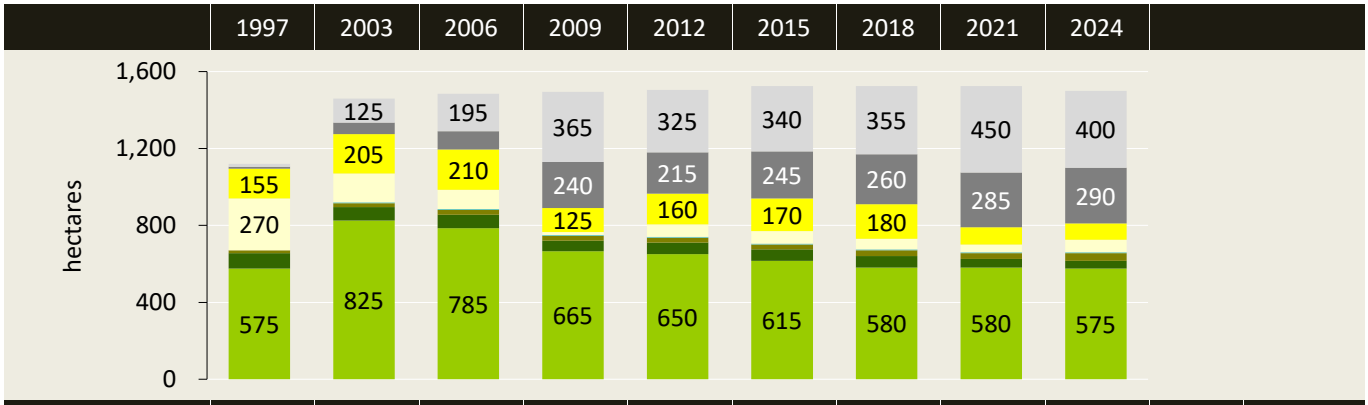
The dominant crop type was wine grapes from 1997 to 2024.

In 2024, the main plantings were:

1. wine grapes, 530 ha (35% of the irrigable area);
2. vegetables other than carrots and potatoes, 85 ha (6% of the irrigable area); and
3. field crops, 65 ha (4% of the irrigable area).

From 1997 to 2024, the main planting changes were:

- wine grapes increased by 210 ha, a 66% increase from 320 to 530 ha;
- field crops decreased by 205 ha, a 76% decrease from 270 to 65 ha; and
- dried grapes decreased by 190 ha, an 83% decrease from 230 to 40 ha.



Crop type		1997	2003	2006	2009	2012	2015	2018	2021	2024	% of 2024	Change 1997-2024
Permanent	Grape Dried	230	155	135	120	115	100	85	40	40	3%	-190
	Grape Table	25	25	20	15	15	15	10	15	5	<1%	-20
	Grape Wine	320	645	630	530	520	500	485	525	530	35%	+210
	Citrus	-	-	-	-	-	-	-	-	-	-	-
	Fruit Olive	10	10	10	10	10	10	10	10	10	1%	0
	Fruit Other	70	60	60	45	50	50	50	35	30	2%	-40
	Nut Almond	5	5	5	5	5	5	5	0	0	0%	-5
	Nut Other	10	15	20	20	20	20	25	30	40	3%	+30
	Other	0	5	5	5	5	5	5	5	5	<1%	+5
Seasonal	Field Crop	270	150	100	15	65	65	55	40	65	4%	-205
	Veg. Carrot	10	20	30	30	50	50	60	10	0	0%	-10
	Veg. Potato	-	-	-	-	-	-	-	-	-	-	-
	Veg. Other	145	185	180	95	110	120	120	80	85	6%	-60
Vacant P		10	60	95	240	215	245	260	285	290	19%	+280
Vacant S		15	125	195	365	325	340	355	450	400	27%	+385
Total (ha)		1,120	1,460	1,485	1,495	1,505	1,525	1,525	1,525	1,500	100%	+380
Dominant		wine grape										

Figure 24: Nyah irrigation district - crop types from 1997 to 2024

2.2.3 Nyah irrigation district - new permanent plantings

Figure 25 shows the proportion of permanent crops planted or top-worked within the previous three years in the Nyah irrigation district from 1997 to 2024.

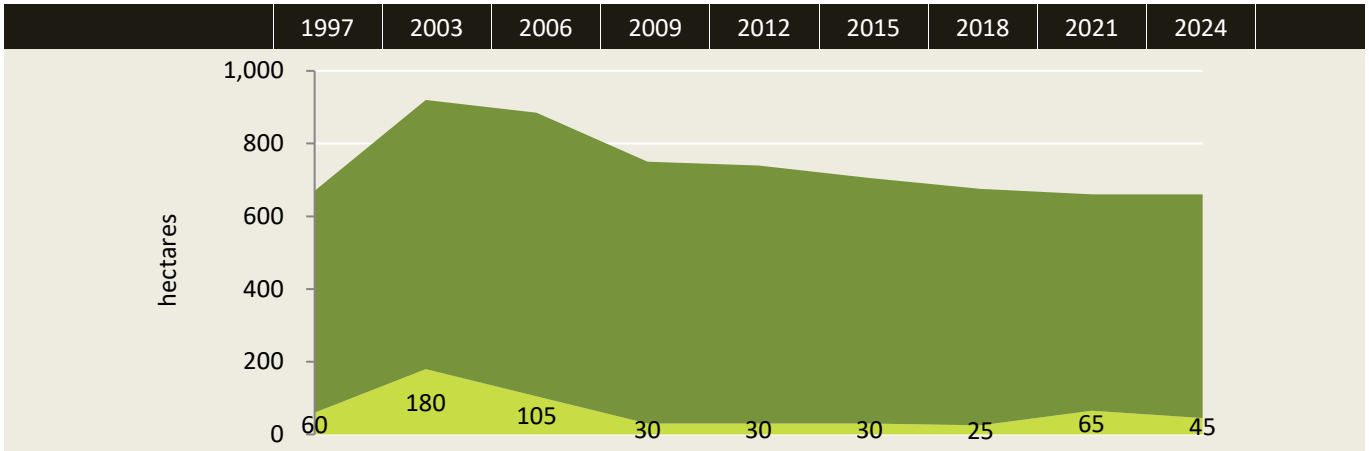
The information provides an indication of development activity that doesn't necessarily involve a change in area or crop type as it includes replanting or top working to different varieties. The figures are conservative, as top worked plantings can be difficult to interpret from the three-yearly aerial imagery, particularly for grapevines.

In 2024:

- 45 ha (7%) of permanent crops were planted or top-worked within the previous three years. This was the second highest area of new plantings since 2009, down from 65 ha in 2021.
- The new plantings were:
    1. wine grapes (25 ha);
    2. dried grapes (10 ha); and
    3. pistachios (10 ha).

From 1997 to 2024:

- The proportion of new permanent plantings was at its lowest from 2009 to 2018 with 4% planted in the previous three years and highest in 2003 with 20% (180 ha) planted in the previous three years.



Permanent plantings	1997	2003	2006	2009	2012	2015	2018	2021	2024	% of 2024
≤3yr old plantings	60	180	105	30	30	30	25	65	45	7%
>3yr old plantings	610	740	780	720	710	675	650	595	615	93%
Total (ha)	670	920	885	750	740	705	675	660	660	100%
% 3year development	9%	20%	12%	4%	4%	4%	4%	10%	7%	
Average 3-year dev.	8%									

Figure 25: Nyah irrigation district - three-year old permanent plantings from 1997 to 2024

2.2.4 Nyah irrigation district - planting trends

Figure 26 summarises planting trends with respect to permanent crops, seasonal crops and vacant areas in the Nyah irrigation district from 1997 to 2024.

The proportion of permanent plantings, seasonal cropping and vacant areas changed from:

- 60% permanent, 38% seasonal and 2% vacant in 1997; to
- 44% permanent, 10% seasonal and 46% vacant in 2024.

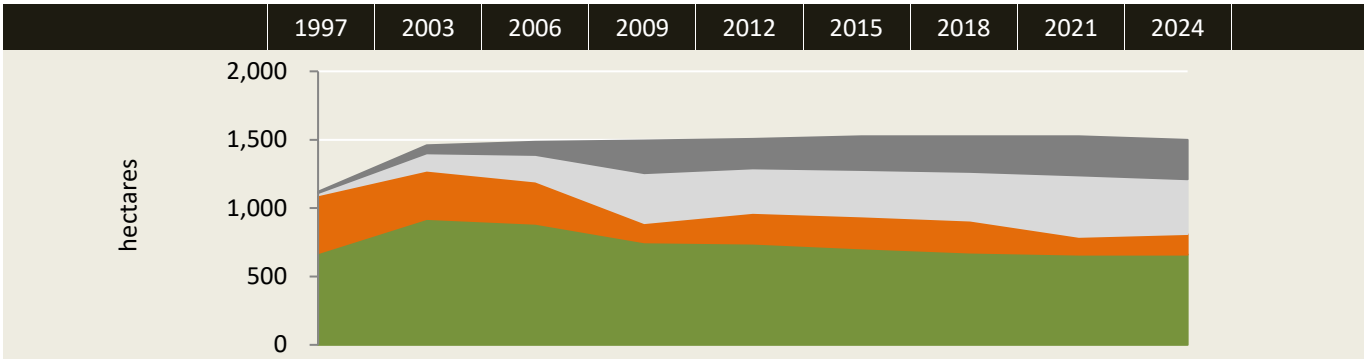
The area vacant was at its highest in 2021 with 48% of the irrigable area not irrigated.

In 2024, the irrigable area of 1,500 ha comprised:

- 44% (660 ha) irrigated permanent plantings;
- 10% (150 ha) irrigated seasonal crops;
- 19% (290 ha) vacant, previously an irrigated permanent planting; and
- 27% (400 ha) vacant, previously an irrigated seasonal crop.

From 1997 to 2024:

- irrigated permanent crops decreased by 10 ha, from 670 to 660 ha;
- irrigated seasonal crops decreased by 275 ha, 425 to 150 ha;
- vacant areas, previously irrigated permanent plantings increased by 280 ha, from 10 to 290 ha; and
- vacant areas, previously irrigated seasonal crops increased by 385 ha, from 15 to 400 ha.



	1997	2003	2006	2009	2012	2015	2018	2021	2024	Change 1997-2024
Permanent - irrigated	670	920	885	750	740	705	675	660	660	-10
Seasonal - irrigated	425	355	310	140	225	235	235	130	150	-275
Total irrigated (ha)	1,095	1,275	1,195	890	965	940	910	790	810	-285
Vacant - permanent	10	60	95	240	215	245	260	285	290	+280
Vacant - seasonal	15	125	195	365	325	340	355	450	400	+385
Total irrigable (ha)	1,120	1,460	1,485	1,495	1,505	1,525	1,525	1,525	1,500	+380
% Permanent	60%	63%	60%	50%	49%	46%	44%	43%	44%	
% Seasonal	38%	24%	21%	9%	15%	15%	15%	9%	10%	
% Vacant P	1%	4%	6%	16%	14%	16%	17%	19%	19%	
% Vacant S	1%	9%	13%	24%	22%	22%	23%	29%	27%	

Figure 26: Nyah irrigation district - planting trends from 1997 to 2024

2.2.5 Nyah irrigation district - irrigation development

Map 3 shows irrigation development from 1997 to 2024 in the Nyah irrigation district with respect to new development (expansion) and areas retired from irrigation.

- The irrigable area increased by 380 ha, a 34% increase from 1,120 ha in 1997 to 1,500 ha in 2024.
- The net increase of 380 ha was the balance of 85 ha retired from irrigation and 465 ha of expansion.

		Hectares			% change since 1997
Irrigable area in 1997 (1996-97 season)		1,120			
Retired between 1997 and 2024			-85		-8%
Expansion between 1997 and 2024			+465		+42%
Net change from 1997 to 2024				+380	+34%
Irrigable area in 2024 (2023-24 season)				1,500	

Map 3: Nyah irrigation district - irrigation development from 1997 to 2024

2.2.6 Nyah irrigation district - salinity impact zones

Figure 27 summarises river salinity impact zones of irrigated areas in the Nyah irrigation district from 1997 to 2024. The Nyah district is in low salinity impact zones L1 and L2. No irrigable areas are in the high impact zone.

In 2024, the irrigable area of 1,500 ha comprised:

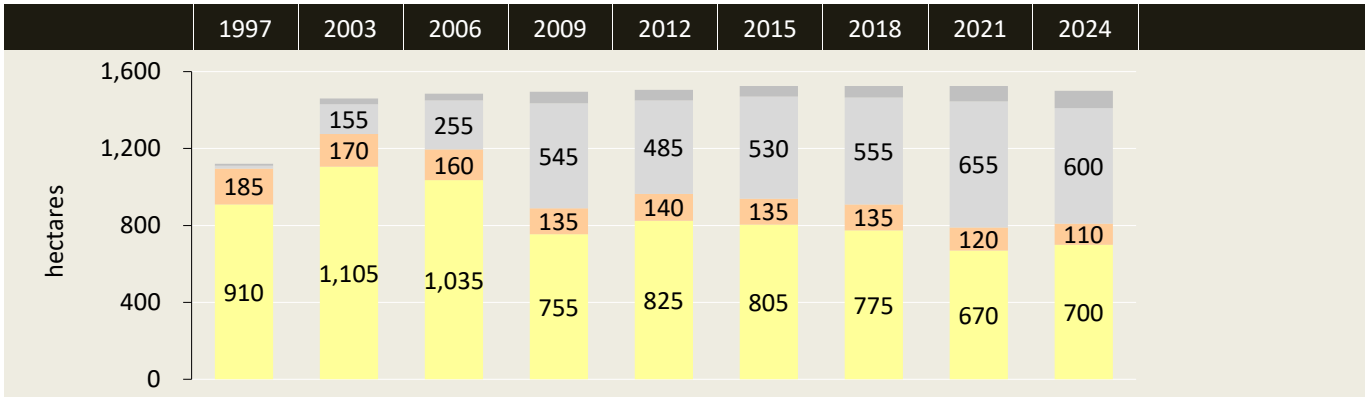
- 87% (1,300 ha) in the lowest salinity impact zone, L1; and
- 13% (200 ha) in L2.

From 1997 to 2024, the area irrigated in:

- L1 decreased by 210 ha, a 23% decrease from 910 to 700 ha; and
- L2 decreased by 75 ha, a 41% decrease from 185 to 110 ha.

From 1997 to 2024, the irrigable area in:

- L1 increased by 375 ha, a 41% increase from 925 to 1,300 ha; and
- L2 increased by 5 ha, a 3% increase from 195 to 200 ha.



Salinity impact zone		1997	2003	2006	2009	2012	2015	2018	2021	2024	% in 2024	Change 1997-2024
Irrigated	L1	910	1,105	1,035	755	825	805	775	670	700	47%	-210
	L2	185	170	160	135	140	135	135	120	110	7%	-75
	L3	-	-	-	-	-	-	-	-	-	-	-
	L4	-	-	-	-	-	-	-	-	-	-	-
	HIZ	-	-	-	-	-	-	-	-	-	-	-
Not Irrigated	L1	15	155	255	545	485	530	555	655	600	40%	+585
	L2	10	30	35	60	55	55	60	80	90	6%	+80
	L3	-	-	-	-	-	-	-	-	-	-	-
	L4	-	-	-	-	-	-	-	-	-	-	-
	HIZ	-	-	-	-	-	-	-	-	-	-	-
Total (ha)		1,120	1,460	1,485	1,495	1,505	1,525	1,525	1,525	1,500	100%	+380
Dominant zone		L1										

Figure 27: Nyah irrigation district - irrigable area in each salinity impact zone from 1997 to 2024

2.2.7 Nyah irrigation district - irrigation methods

Figure 28 summarises irrigation methods in the Nyah irrigation district from 1997 to 2024.

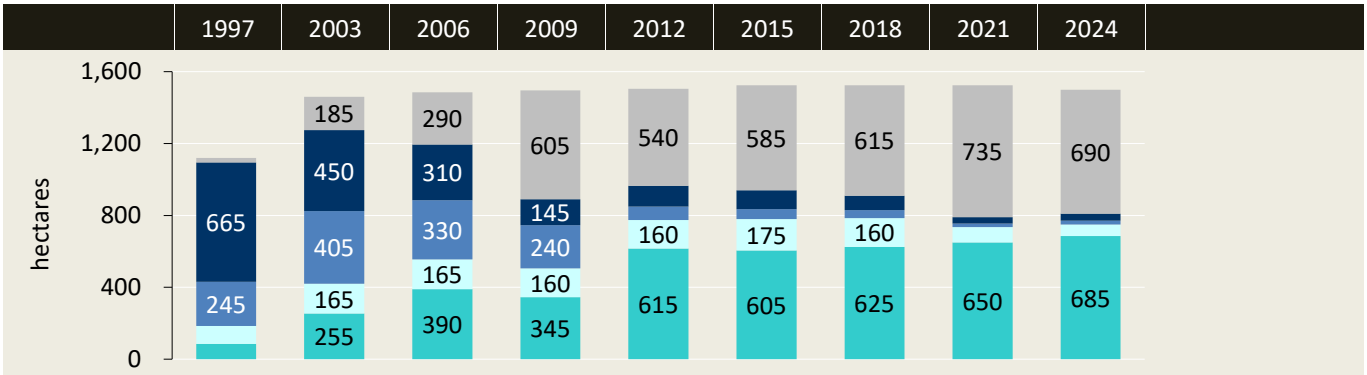
The dominant irrigation method in the Nyah irrigation district was furrow irrigation from 1997 to 2003, then drip irrigation from 2006 to 2024.

In 2024, the irrigable area of 1,500 ha comprised:

- 46% (685 ha) drip irrigation;
- 4% (65 ha) low level irrigation;
- 1% (20 ha) overhead sprinklers;
- 3% (40 ha) furrow irrigation; and
- 46% (690 ha) vacant, not irrigated.

From 1997 to 2024:

- drip irrigation increased by 600 ha, a 706% increase from 85 to 685 ha;
- low level irrigation decreased by 35 ha, a 35% decrease from 100 to 65 ha;
- overhead irrigation decreased by 225 ha, a 92% decrease from 245 to 20 ha; and
- furrow irrigation decreased by 625 ha, a 94% decrease from 665 to 40 ha.



Irrigation method[13]	1997	2003	2006	2009	2012	2015	2018	2021	2024	% in 2024	Change 1997-2024
Drip	85	255	390	345	615	605	625	650	685	46%	+600
Low level	100	165	165	160	160	175	160	85	65	4%	-35
Overhead	245	405	330	240	75	55	45	20	20	1%	-225
Furrow	665	450	310	145	115	105	80	35	40	3%	-625
Vacant	25	185	290	605	540	585	615	735	690	46%	+665
Total (ha)	1,120	1,460	1,485	1,495	1,505	1,525	1,525	1,525	1,500	100%	+380
Dominant	furrow		drip								

Figure 28: Nyah irrigation district - irrigation methods from 1997 to 2024

[13] Overhead irrigation includes pivots and lateral move systems. Furrow includes flood irrigation. (Refer to Table 4.)

2.2.8 Nyah irrigation district - property change

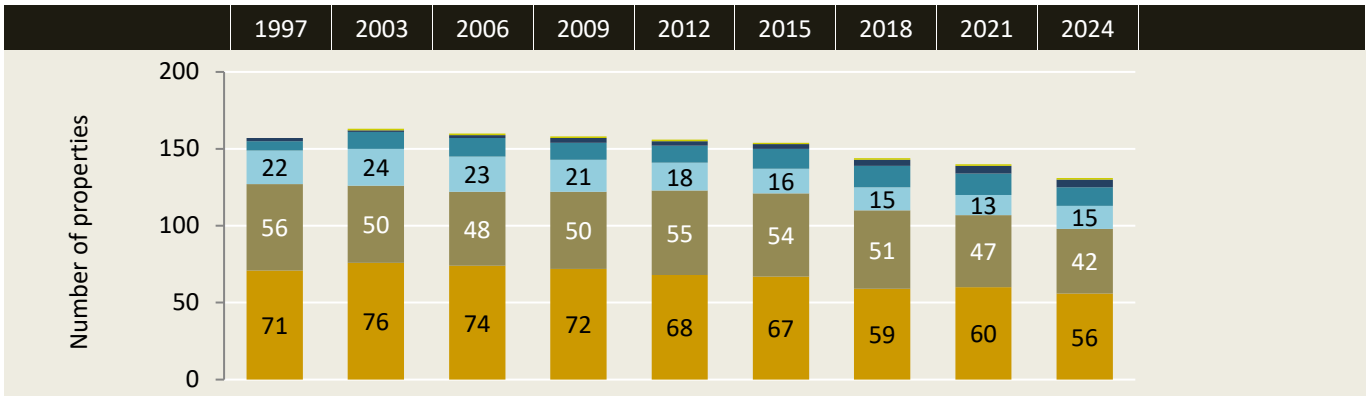
Figure 29 provides estimates of property numbers and average property size (irrigable area) in the Nyah irrigation district from 1997 to 2024.

In 2024:

- there were approximately 131 irrigation properties; and
- most properties (86%) had an irrigable area less than 20 ha.

From 1997 to 2024:

- the number of properties decreased by 26, a 17% decrease from 157 to 131 properties;
- properties with an irrigable area less than 20 ha decreased by 36, while the number over 20 ha increased by 10; and
- average property size (irrigable area) increased from 7 to 11 ha per property.



Property size (irrigable area)	1997	2003	2006	2009	2012	2015	2018	2021	2024	% in 2024	Change 1997-2024
1 to 5 ha	71	76	74	72	68	67	59	60	56	43%	-15
5 to 10 ha	56	50	48	50	55	54	51	47	42	32%	-14
10 to 20 ha	22	24	23	21	18	16	15	13	15	11%	-7
20 to 40 ha	6	11	12	11	11	13	14	14	12	9%	+6
40 to 100 ha	2	1	2	3	3	3	4	5	5	4%	+3
100 to 500 ha	0	1	1	1	1	1	1	1	1	1%	+1
> 500 ha	-	-	-	-	-	-	-	-	-	-	-
Total properties	157	163	160	158	156	154	144	140	131	100%	-26
Average size (ha)	7	9	9	9	10	10	11	11	11		

Figure 29: Nyah irrigation district - number of properties and average size from 1997 to 2024

2.3 Robinvale irrigation district

In summary for the Robinvale irrigation district

Crop types in 2024

The main plantings in the Robinvale irrigation district in 2024 were:

1. table grapes, 2,130 ha (88% of the irrigable area);
2. fruit trees, predominantly avocado, 130 ha (5% of the irrigable area); and
3. wine grapes, 65 ha (3% of the irrigable area).

Crop type changes from 1997 to 2024

Table grapes were the dominant crop from 1997 to 2024. The main crop type changes from 1997 to 2024 were:

- table grape plantings increased by 725 ha, a 52% increase from 1,405 to 2,130 ha;
- wine grape plantings decreased by 395 ha, an 86% decrease from 460 to 65 ha;
- dried grape plantings decreased by 380 ha, a 99% decrease from 385 to 5 ha; and
- fruit trees, mainly avocados, increased by 115 ha, a 767% increase from 15 to 130 ha.

New permanent plantings (planted or top-worked in the previous three years)

In 2024, 295 ha (13%) of permanent crops were planted or top-worked in the previous three years. These new plantings were:

1. table grapes (270 ha); and
2. avocados and wine grapes (a total of 25 ha).

From 1997 to 2024, the area of new permanent plantings was at its lowest in 2009 with 240 ha (11%) planted in the previous three years and highest in 2006 with 490 ha (21%) planted in the previous three years.

Planting trends - permanent plantings, seasonal crops and vacant areas

The irrigable area in 2024 was 2,415 ha of which:

- 97% (2,350 ha) was irrigated permanent plantings;
- <1% (10 ha) was irrigated seasonal crops; and
- 2% (55 ha) was vacant, not irrigated.

The proportion of permanent plantings, seasonal cropping and vacant areas changed from:

- 99% permanent, 1% seasonal and less than 1% vacant in 1997; to
- 97% permanent, less than 1% seasonal and 2% vacant in 2024.

In summary for the Robinvale irrigation district

Irrigation development - new development (expansion) and retired areas

In the Robinvale irrigation district the irrigable area increased by 95 ha, a 4% increase from 2,320 ha in 1997 to 2,415 ha in 2024.

The net increase of 95 ha was the balance of 35 ha retired from irrigation and 130 ha of expansion.

Salinity impact zones

The Robinvale irrigation district is in low salinity impact zones L2 and L3.

In 2024, the irrigable area of 2,415 ha comprised:

- 99% (2,390 ha) in the second lowest salinity impact zone, L2; and
- 1% (25 ha) in L3.

From 1997 to 2024 the irrigable area in:

- L2 increased by 90 ha, a 4% increase from 2,300 ha to 2,390 ha; and
- L3 increased by 5 ha, a 25% increase from 20 ha to 25 ha.

Irrigation methods

The dominant irrigation method in the Robinvale irrigation district changed from furrow irrigation in 1997 to low level sprinklers from 2003 to 2024.

In 2024, the irrigable area of 2,415 ha comprised:

- 44% (1,065 ha) drip irrigation;
- 54% (1,295 ha) low level irrigation;
- 0% (0 ha) overhead sprinklers;
- 0% (0 ha) furrow irrigation; and
- 2% (55 ha) vacant, not irrigated.

Irrigation properties

In 2024, there were approximately 91 irrigation properties with an average property size (irrigable area) of 27 ha.

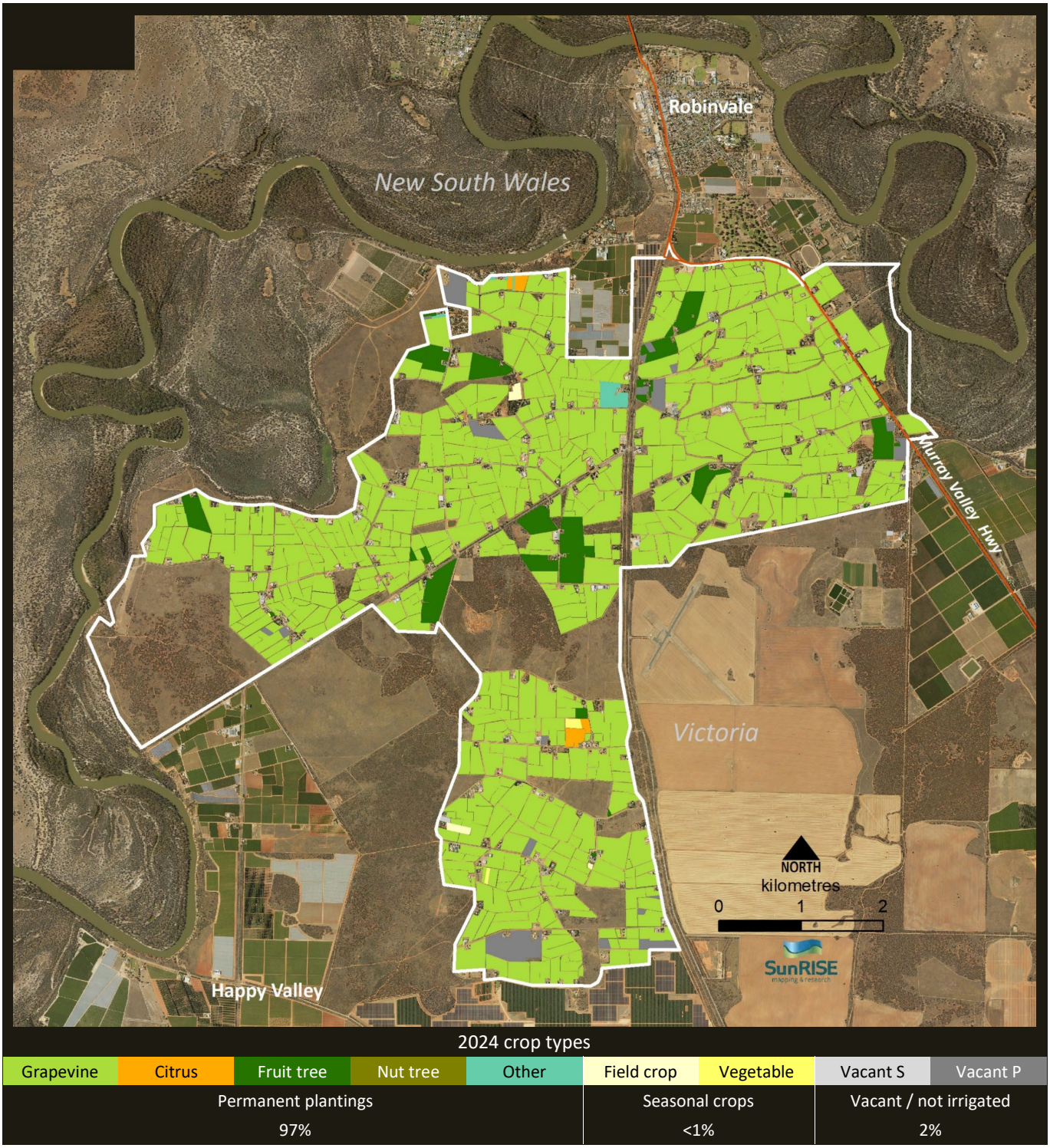
From 1997 to 2024:

- the number of properties decreased by 78, a 46% decrease from 169 to 91 properties;
- properties with an irrigable area less than 40 ha decreased by 93, while the number over 40 ha increased by 15; and
- average property size (irrigable area) increased from 14 ha to 27 ha per property.

2.3.1 Robinvale irrigation district - crop types in 2024

Map 4 shows the Robinvale irrigation district with crop types in 2024.

The aerial photography was flown in December 2023 (*source: Coordinated Imagery Program, DTP Victoria*).



Map 4: Robinvale irrigation district showing crop types in 2024

2.3.2 Robinvale irrigation district - crop types from 1997 to 2024

Figure 30 summarises crop types in the Robinvale irrigation district from 1997 to 2024.

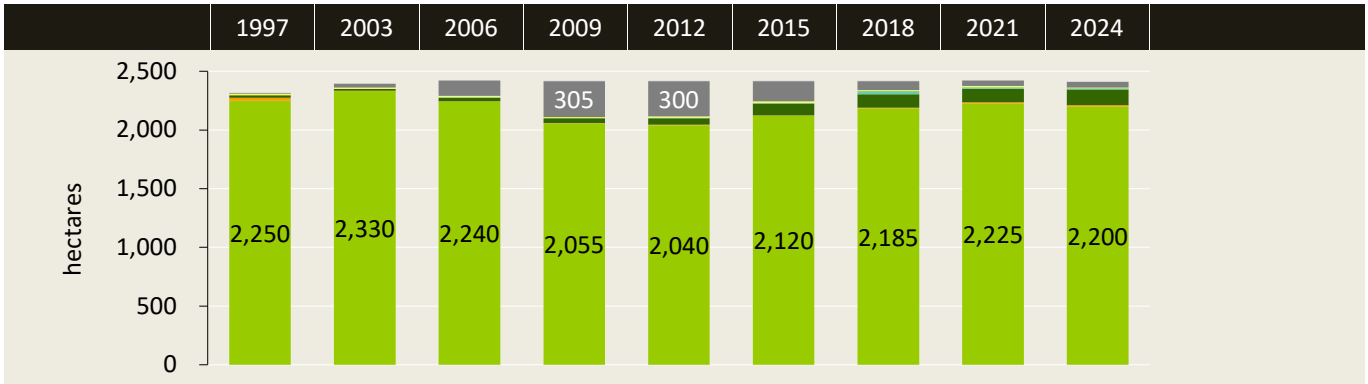
The dominant crop type was table grapes from 1997 to 2024.

In 2024 the main plantings were:

1. table grapes, 2,130 ha (88% of the irrigable area);
2. fruit trees, mainly avocados, 130 ha (5% of the irrigable area); and
3. wine grapes, 65 ha (3% of the irrigable area).

From 1997 to 2024, the main planting changes were:

- table grapes increased by 725 ha, a 52% increase from 1,405 to 2,130 ha;
- wine grapes decreased by 395 ha, an 86% decrease from 460 to 65 ha;
- dried grapes decreased by 380 ha, a 99% decrease from 385 to 5 ha; and
- fruit trees, mainly avocados, increased by 115 ha, a 767% increase from 15 to 130 ha.



Crop type		1997	2003	2006	2009	2012	2015	2018	2021	2024	% of 2024	Change 1997-2024
Permanent	Grape Dried	385	155	125	90	85	75	30	5	5	<1%	-380
	Grape Table	1,405	1,730	1,680	1,650	1,765	1,915	2,085	2,155	2,130	88%	+725
	Grape Wine	460	445	435	315	190	130	70	65	65	3%	-395
	Citrus	25	5	5	5	5	5	5	10	10	<1%	-15
	Fruit Olive	5	0	0	0	0	0	0	0	0	0%	-5
	Fruit Other	15	15	30	40	55	100	115	115	130	5%	+115
	Nut Almond	-	-	-	-	-	-	-	-	-	-	-
	Nut Other	-	-	-	-	-	-	-	-	-	-	-
	Other	0	0	5	5	5	5	25	15	10	<1%	+10
Seasonal	Field Crop	5	5	5	0	5	5	5	5	5	<1%	0
	Veg. Carrot	-	-	-	-	-	-	-	-	-	-	-
	Veg. Potato	-	-	-	-	-	-	-	-	-	-	-
	Veg. Other	10	5	5	5	5	10	5	5	5	<1%	-5
Vacant P		5	35	130	305	300	170	75	45	55	2%	+50
Vacant S		5	0	0	5	5	5	5	0	0	0%	-5
Total (ha)		2,320	2,395	2,420	2,420	2,420	2,420	2,420	2,420	2,415	100%	+95
Dominant		table grape										

Figure 30: Robinvale irrigation district - crop types from 1997 to 2024

2.3.3 Robinvale irrigation district - new permanent plantings

Figure 31 shows the proportion of permanent crops planted or top-worked within the previous three years in the Robinvale irrigation district from 1997 to 2024.

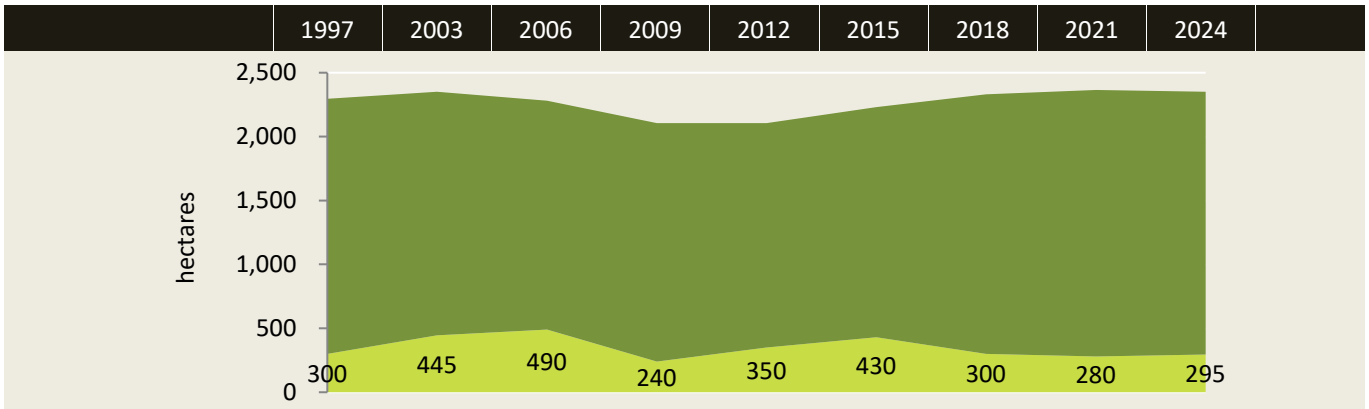
The information provides an indication of development activity that doesn't necessarily involve a change in area or crop type as it includes replanting or top working to different varieties. The figures are conservative, as top worked plantings can be difficult to interpret from the three-yearly aerial imagery, particularly for grapevines.

In 2024:

- 295 ha (13%) of permanent crops were planted or top-worked within the previous three years.
- These new plantings were:
    1. table grapes (270 ha);
    2. avocados (20 ha); and
    3. wine grapes (5 ha).

From 1997 to 2024:

- The proportion of new permanent plantings was at its lowest in 2009 with 11% (240 ha) planted in the previous three years and highest in 2006 with 21% (490 ha) planted in the previous three years.



Permanent plantings	1997	2003	2006	2009	2012	2015	2018	2021	2024	% of 2024
≤3yr old plantings	300	445	490	240	350	430	300	280	295	13%
>3yr old plantings	1,995	1,905	1,790	1,865	1,755	1,800	2,030	2,085	2,055	87%
Total (ha)	2,295	2,350	2,280	2,105	2,105	2,230	2,330	2,365	2,350	100%
% 3year development	13%	19%	21%	11%	17%	19%	13%	12%	13%	
Average 3-year dev.	15%									

Figure 31: Robinvale irrigation district - three-year old permanent plantings from 1997 to 2024

2.3.4 Robinvale irrigation district - planting trends

Figure 32 summarises planting trends with respect to permanent crops, seasonal crops and vacant areas in the Robinvale irrigation district from 1997 to 2024.

The proportion of permanent plantings, seasonal cropping and vacant areas changed from:

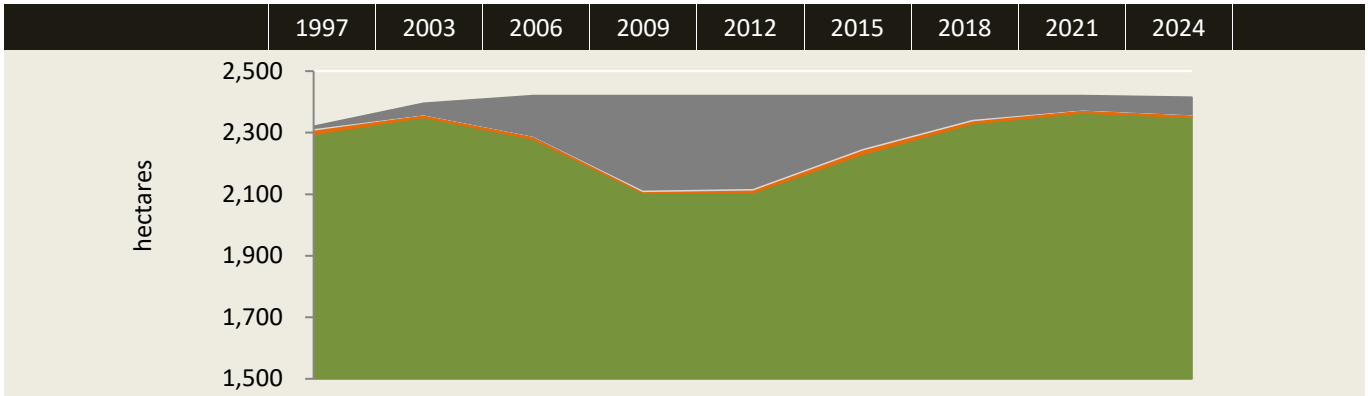
- 99% permanent, 1% seasonal and less than 1% vacant in 1997; to
- 97% permanent, less than 1% seasonal and 2% vacant in 2024.

In 2024, the irrigable area of 2,415 ha comprised:

- 97% (2,350 ha) irrigated permanent plantings;
- <1% (10 ha) irrigated seasonal crops;
- 2% (55 ha) vacant, previously an irrigated permanent planting; and
- 0% (0 ha) vacant, previously an irrigated seasonal crop.

From 1997 to 2024:

- irrigated permanent crops increased by 55 ha, from 2,295 to 2,350 ha;
- irrigated seasonal crops decreased by 5 ha, from 15 to 10 ha;
- vacant areas, previously irrigated permanent plantings increased by 50 ha, from 5 to 55 ha; and
- vacant areas, previously irrigated seasonal crops decreased by 5 ha, from 5 to 0 ha.



	1997	2003	2006	2009	2012	2015	2018	2021	2024	Change 1997-2024
Permanent - irrigated	2,295	2,350	2,280	2,105	2,105	2,230	2,330	2,365	2,350	+55
Seasonal - irrigated	15	10	10	5	10	15	10	10	10	-5
Total irrigated (ha)	2,310	2,360	2,290	2,110	2,115	2,245	2,340	2,375	2,360	+50
Vacant - permanent	5	35	130	305	300	170	75	45	55	+50
Vacant - seasonal	5	0	0	5	5	5	5	0	0	-5
Total irrigable (ha)	2,320	2,395	2,420	2,420	2,420	2,420	2,420	2,420	2,415	+95
% Permanent	99%	98%	94%	87%	87%	92%	96%	98%	97%	
% Seasonal	1%	<1%	<1%	<1%	<1%	1%	<1%	<1%	<1%	
% Vacant P	<1%	1%	5%	13%	12%	7%	3%	2%	2%	
% Vacant S	<1%	0%	0%	<1%	<1%	<1%	<1%	0%	0%	

Figure 32: Robinvale irrigation district - planting trends from 1997 to 2024

2.3.5 Robinvale irrigation district - irrigation development

Map 5 shows irrigation development from 1997 to 2024 in the Robinvale irrigation district with respect to new development (expansion) and areas retired from irrigation.

- The irrigable area increased by 95 ha, a 4% increase from 2,320 ha in 1997 to 2,415 ha in 2024.
- The net increase of 95 ha was the balance of 35 ha retired from irrigation and 130 ha of expansion.

		Hectares			% change since 1997
Irrigable area in 1997 (1996-97 season)		2,320			
Retired between 1997 and 2024			-35		-2%
Expansion between 1997 and 2024			+130		+6%
Net change from 1997 to 2024				+95	+4%
Irrigable area in 2024 (2023-24 season)				2,415	

Map 5: Robinvale irrigation district - irrigation development from 1997 to 2024

2.3.6 Robinvale irrigation district - salinity impact zones

Figure 33 summarises river salinity impact zones of irrigated areas in the Robinvale irrigation district from 1997 to 2024. The Robinvale district is in low salinity impact zones L2 and L3. No irrigable areas are in the high salinity impact zone.

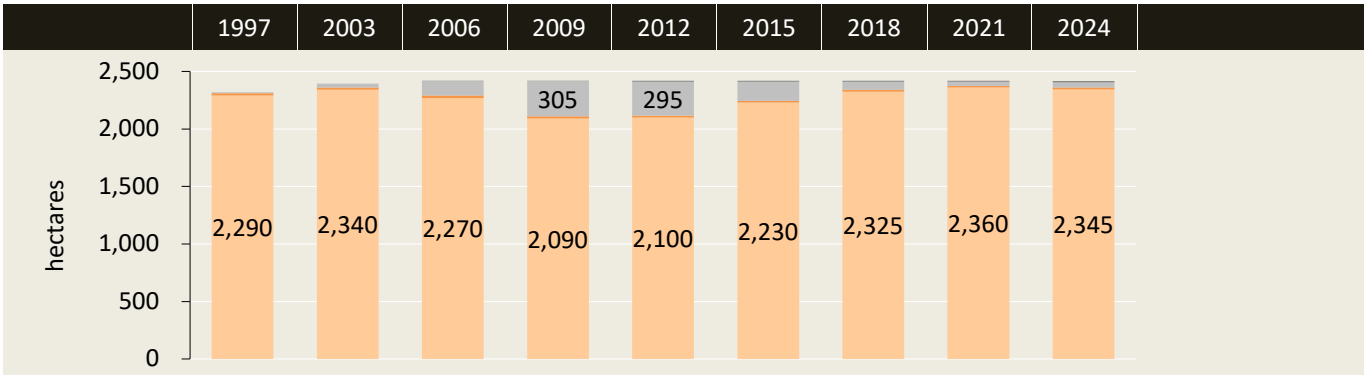
In 2024, irrigable areas were 99% in the second lowest salinity impact zone L2, and 1% in L3.

From 1997 to 2024, the area irrigated in:

- L2 increased by 55 ha, a 2% increase from 2,290 to 2,345 ha; and
- L3 decreased by 5 ha, a 25% decrease from 20 to 15 ha.

From 1997 to 2024, the irrigable area in:

- L2 increased by 90 ha, a 4% increase from 2,300 to 2,390 ha; and
- L3 increased by 5 ha, a 25% increase from 20 to 25 ha.



Salinity impact zone		1997	2003	2006	2009	2012	2015	2018	2021	2024	% in 2024	Change 1997-2024
Irrigated	L1	-	-	-	-	-	-	-	-	-	-	-
	L2	2,290	2,340	2,270	2,090	2,100	2,230	2,325	2,360	2,345	97%	+55
	L3	20	20	20	20	15	15	15	15	15	1%	-5
	L4	-	-	-	-	-	-	-	-	-	-	-
	HIZ	-	-	-	-	-	-	-	-	-	-	-
Not Irrigated	L1	-	-	-	-	-	-	-	-	-	-	-
	L2	10	35	125	305	295	165	70	35	45	2%	+35
	L3	0	0	5	5	10	10	10	10	10	<1%	+10
	L4	-	-	-	-	-	-	-	-	-	-	-
	HIZ	-	-	-	-	-	-	-	-	-	-	-
Total (ha)		2,320	2,395	2,420	2,420	2,420	2,420	2,420	2,420	2,415	100%	+95
Dominant zone		L2										

Figure 33: Robinvale irrigation district - irrigable area in each salinity impact zone from 1997 to 2024

2.3.7 Robinvale irrigation district - irrigation methods

Figure 34 summarises irrigation methods in the Robinvale irrigation district from 1997 to 2024.

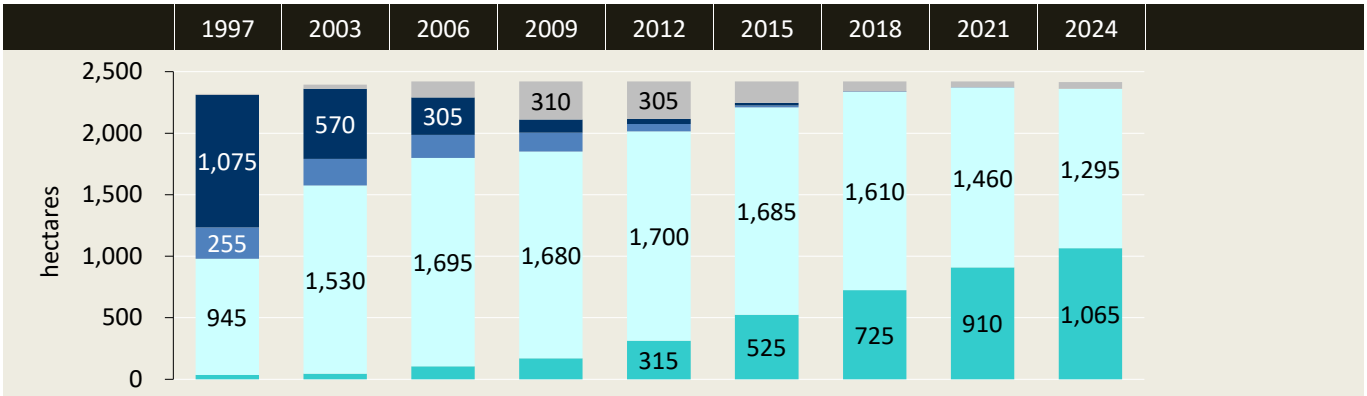
The dominant irrigation method in the Robinvale irrigation district changed from furrow irrigation in 1997 to low level sprinklers from 2003 to 2024.

In 2024, the irrigable area of 2,415 ha comprised:

- 44% (1,065 ha) drip irrigation;
- 54% (1,295 ha) low level irrigation;
- 0% (0 ha) overhead sprinklers;
- 0% (0 ha) furrow irrigation; and
- 2% (55 ha) vacant, not irrigated.

From 1997 to 2024:

- drip irrigation increased by 1,030 ha, a 2,943% increase from 35 to 1,065 ha;
- low level irrigation increased by 350 ha, a 37% increase from 945 to 1,295 ha;
- overhead irrigation decreased by 255 ha, a 100% decrease from 255 to 0 ha; and
- furrow irrigation decreased by 1,075 ha, a 100% decrease from 1,075 to 0 ha.



Irrigation method[14]	1997	2003	2006	2009	2012	2015	2018	2021	2024	% in 2024	Change 1997-2024
Drip	35	45	105	170	315	525	725	910	1,065	44%	+1,030
Low level	945	1,530	1,695	1,680	1,700	1,685	1,610	1,460	1,295	54%	+350
Overhead	255	215	185	155	60	15	5	5	0	0%	-255
Furrow	1,075	570	305	105	40	20	0	0	0	0%	-1,075
Vacant	10	35	130	310	305	175	80	45	55	2%	+45
Total (ha)	2,320	2,395	2,420	2,420	2,420	2,420	2,420	2,420	2,415	100%	+95
Dominant	furrow	low level									

Figure 34: Robinvale irrigation district - irrigation methods from 1997 to 2024

[14] Overhead irrigation includes pivots and lateral move systems. Furrow includes flood irrigation. (Refer to Table 4.)

2.3.8 Robinvale irrigation district - property change

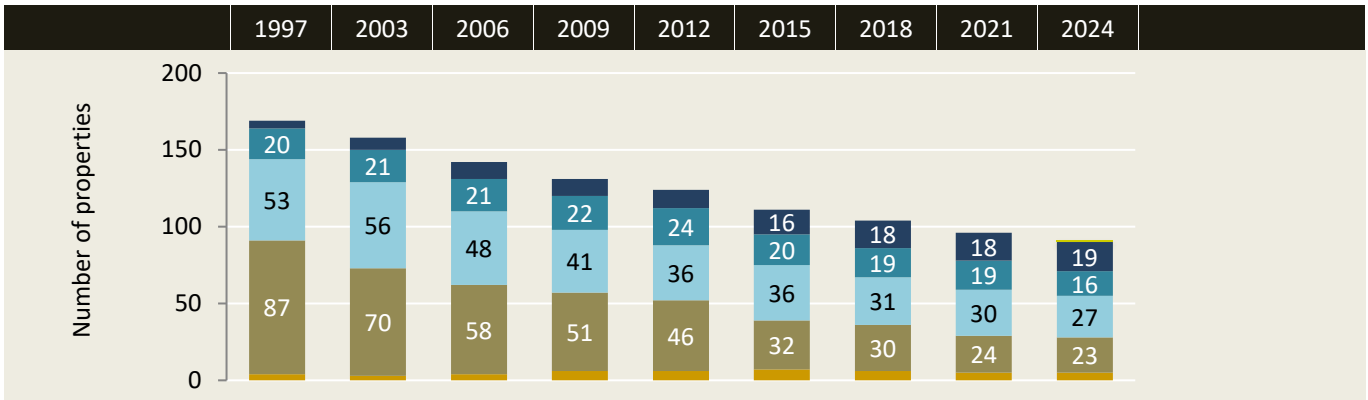
Figure 35 provides estimates of property numbers and average property size (irrigable area) in the Robinvale irrigation district from 1997 to 2024.

In 2024:

- there were approximately 91 irrigation properties; and
- most properties (78%) had an irrigable area less than 40 ha.

From 1997 to 2024:

- the number of properties decreased by 78, a 46% decrease from 169 to 91 properties;
- properties with an irrigable area less than 40 ha decreased by 93, while the number over 40 ha increased by 15; and
- average property size (irrigable area) increased from 14 to 27 ha per property.



Property size (irrigable area)	1997	2003	2006	2009	2012	2015	2018	2021	2024	% in 2024	Change 1997-2024
1 to 5 ha	4	3	4	6	6	7	6	5	5	5%	+1
5 to 10 ha	87	70	58	51	46	32	30	24	23	25%	-64
10 to 20 ha	53	56	48	41	36	36	31	30	27	30%	-26
20 to 40 ha	20	21	21	22	24	20	19	19	16	18%	-4
40 to 100 ha	5	8	11	11	12	16	18	18	19	21%	+14
100 to 500 ha	0	0	0	0	0	0	0	0	1	1%	+1
> 500 ha	-	-	-	-	-	-	-	-	-	-	-
Total properties	169	158	142	131	124	111	104	96	91	100%	-78
Average size (ha)	14	15	17	18	20	22	23	25	27		

Figure 35: Robinvale irrigation district - property numbers and sizes from 1997 to 2024

2.4 Red Cliffs irrigation district

In summary for the Red Cliffs irrigation district

Crop types in 2024

The main plantings in the Red Cliffs irrigation district in 2024 were:

1. table grapes, 1,185 ha (27% of the irrigable area);
2. wine grapes, 830 ha (19% of the irrigable area);
3. dried grapes, 265 ha (6% of the irrigable area); and
4. vegetables other than carrots and potatoes, 205 ha (5% of the irrigable area).

Crop type changes from 1997 to 2024

The main crop type changes from 1997 to 2024 were:

- wine grape plantings decreased by 1,120 ha, a 57% decrease from 1,950 ha to 830 ha;
- dried grape plantings decreased by 1,110 ha, an 81% decrease from 1,375 ha to 265 ha; and
- table grape plantings increased by 710 ha, a 149% increase from 475 ha to 1,185 ha.

New permanent plantings (planted or top-worked in the previous three years)

In 2024, 350 ha (13%) of permanent crops were planted or top-worked in the previous three years. The new plantings were:

1. table grapes (225 ha);
2. dried grapes (40 ha);
3. citrus (30 ha);
4. wine grapes (25 ha);
5. fruit trees including avocados (20 ha); and
6. nurseries (10 ha).

From 1997 to 2024, the area of new permanent plantings was at its lowest in 2015 with 305 ha (11%) planted in the previous three years and highest in 1997 with 1,080 ha (26%) planted in the previous three years.

Planting trends - permanent plantings, seasonal crops and vacant areas

In 2024, the irrigable area of 4,310 ha comprised:

- 64% (2,750 ha) irrigated permanent plantings;
- 7% (310 ha) irrigated seasonal crops;
- 23% (975 ha) vacant, previously an irrigated permanent planting; and
- 6% (275 ha) vacant, previously an irrigated seasonal crop.

The proportion of permanent plantings, seasonal cropping and vacant areas changed from:

- 92% permanent, 5% seasonal and 3% vacant in 1997; to
- 64% permanent, 7% seasonal and 29% vacant in 2024.

In summary for the Red Cliffs irrigation district

Irrigation development - new development (expansion) and retired areas

In the Red Cliffs irrigation district, the irrigable area decreased by 140 ha, a 3% decrease from 4,450 ha in 1997 to 4,310 ha in 2024.

The net decrease of 140 ha was the balance of 235 ha retired from irrigation and 95 ha of expansion.

Salinity impact zones

The Red Cliffs irrigation district is in salinity zones L1, L4 and HIZ.

In 2024, the irrigable area of 4,310 ha comprised:

- 34% (1,460 ha) in the lowest salinity impact zone, L1;
- 24% (1,015 ha) in L4; and
- 43% (1,835 ha) in HIZ.

From 1997 to 2024 the irrigable area in:

- L1 decreased by 15 ha, a <1% decrease from 1,475 to 1,460 ha;
- L4 decreased by 5 ha, a <1% decrease from 1,020 to 1,015 ha; and
- HIZ decreased by 120 ha, a 6% decrease from 1,955 to 1,835 ha in 2024. The net decrease in the HIZ was mainly areas retired from irrigation for housing developments.

Irrigation methods

The dominant irrigation method in the Red Cliffs irrigation district changed from furrow in 1997 to overhead from 2003 to 2006, then drip irrigation from 2009 to 2024.

In 2024, the irrigable area of 4,310 ha comprised:

- 50% (2,175 ha) drip irrigation;
- 14% (590 ha) low level irrigation;
- 7% (285 ha) overhead sprinklers;
- <1% (10 ha) furrow irrigation; and
- 29% (1,250 ha) vacant, not irrigated.

Irrigation properties

In 2024, there were approximately 371 irrigation properties with an average property size (irrigable area) of 12 ha.

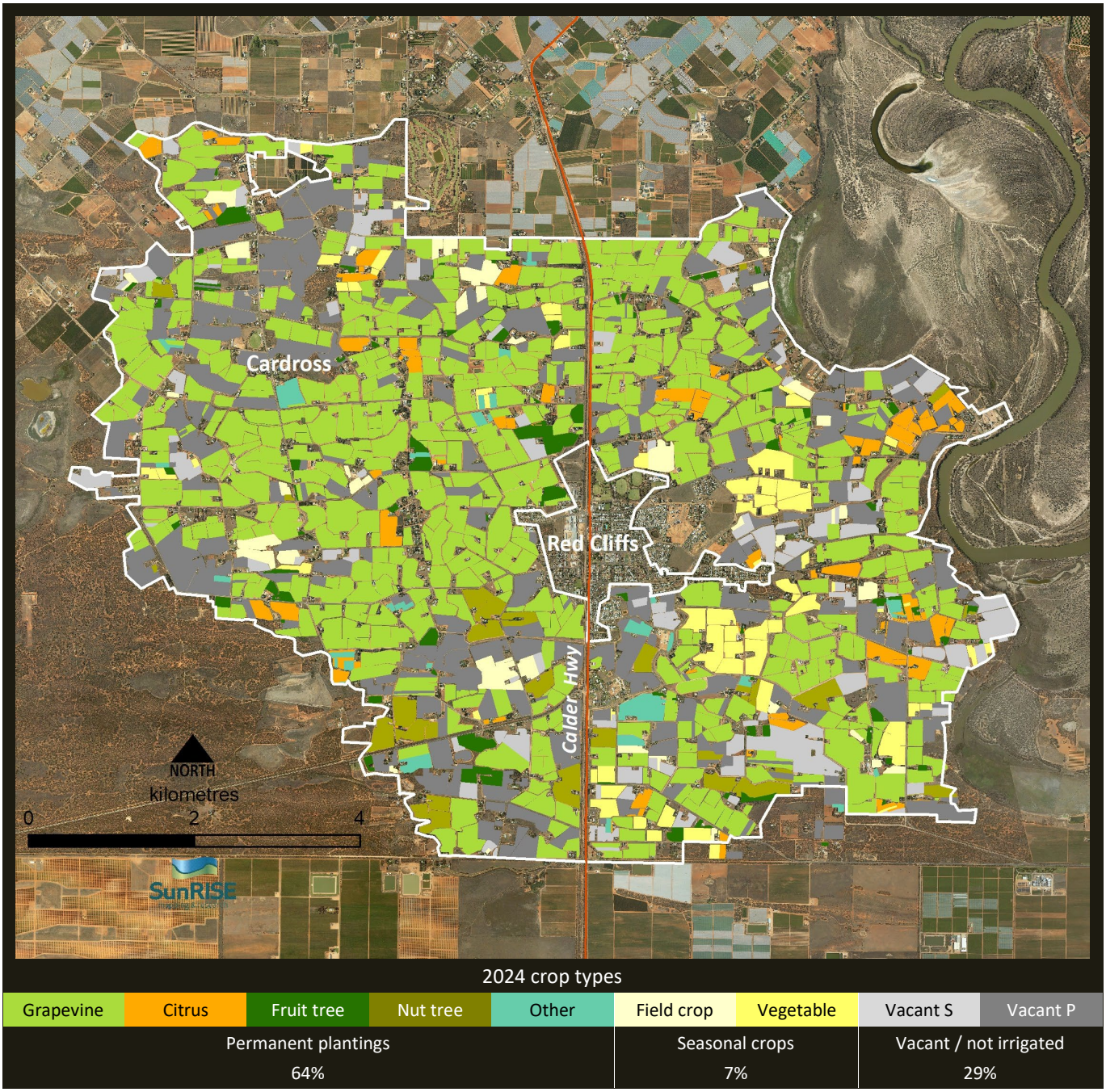
From 1997 to 2024:

- the number of properties decreased by 142, a 28% decrease from 513 to 371 properties;
- properties with an irrigable area less than 20 ha decreased by 172, while the number over 20 ha increased by 30; and
- average property size (irrigable area) increased from 9 to 12 ha per property.

2.4.1 Red Cliffs irrigation district - crop types in 2024

Map 6 shows the Red Cliffs irrigation district with crop types in 2024.

The aerial photography was flown in January 2024 (*source: Coordinated Imagery Program, DTP Victoria*).



Map 6: Red Cliffs irrigation district showing crop types in 2024

2.4.2 Red Cliffs irrigation district - crop types from 1997 to 2024

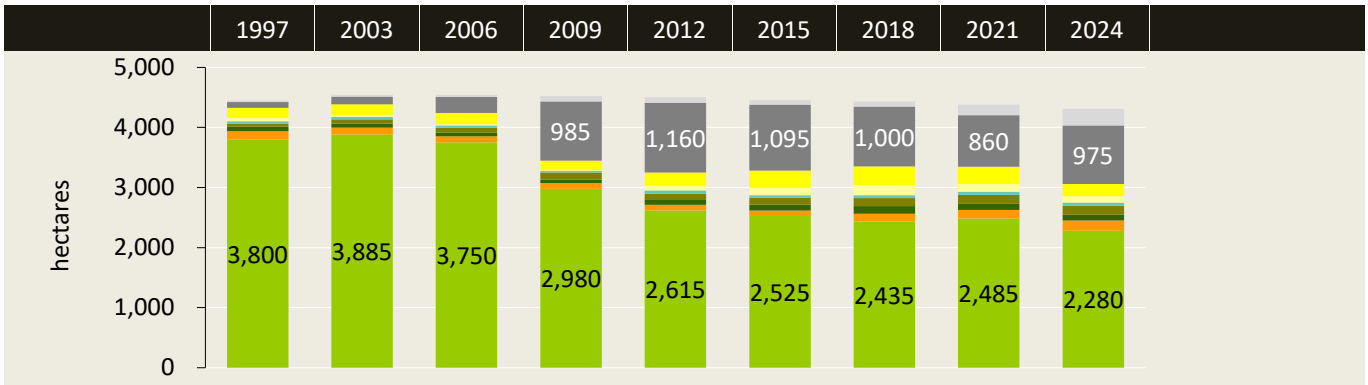
Figure 36 summarises crop types in the Red Cliffs irrigation district from 1997 to 2024. The dominant crop type was wine grapes from 1997 to 2018, then table grapes were dominant from 2021 to 2024.

The main plantings in 2024 were:

1. table grapes, 1,185 ha (27% of the irrigable area);
2. wine grapes, 830 ha (19% of the irrigable area);
3. dried grapes, 265 ha (6% of the irrigable area); and
4. vegetables other than carrots and potatoes, 205 ha (5% of the irrigable area).

From 1997 to 2024, the main planting changes were:

- wine grapes decreased by 1,120 ha, a 57% decrease from 1,950 to 830 ha;
- dried grapes decreased by 1,110 ha, an 81% decrease from 1,375 to 265 ha; and
- table grapes increased by 710 ha, a 149% increase from 475 to 1,185 ha.



Crop type		1997	2003	2006	2009	2012	2015	2018	2021	2024	% of 2024	Change 1997-2024
Permanent	Grape Dried	1,375	830	680	435	395	385	335	280	265	6%	-1,110
	Grape Table	475	665	645	660	740	815	985	1,180	1,185	27%	+710
	Grape Wine	1,950	2,390	2,425	1,885	1,480	1,325	1,115	1,025	830	19%	-1,120
	Citrus	140	110	105	95	100	90	130	145	170	4%	+30
	Fruit Olive	20	30	25	35	50	50	40	30	25	1%	+5
	Fruit Other	55	40	35	25	30	55	85	70	70	2%	+15
	Nut Almond	40	65	75	110	95	95	115	120	120	3%	+80
	Nut Other	5	5	5	5	10	15	20	30	30	1%	+25
	Other	45	45	40	30	50	45	50	50	55	1%	+10
Seasonal	Field Crop	50	25	20	10	80	120	170	130	105	2%	+55
	Veg. Carrot	-	-	-	-	-	-	-	-	-	-	-
	Veg. Potato	-	-	-	-	-	-	-	-	-	-	-
	Veg. Other	175	180	185	160	220	290	305	285	205	5%	+30
Vacant P		95	130	270	985	1,160	1,095	1,000	860	975	23%	+880
Vacant S		25	30	35	90	95	75	85	175	275	6%	+250
Total (ha)		4,450	4,545	4,545	4,525	4,505	4,455	4,435	4,380	4,310	100%	-140
Dominant		wine grape							table grape			

Figure 36: Red Cliffs irrigation district - crop types from 1997 to 2024

2.4.3 Red Cliffs irrigation district - new permanent plantings

Figure 37 shows the proportion of permanent crops planted or top-worked within the previous three years in the Red Cliffs irrigation district from 1997 to 2024.

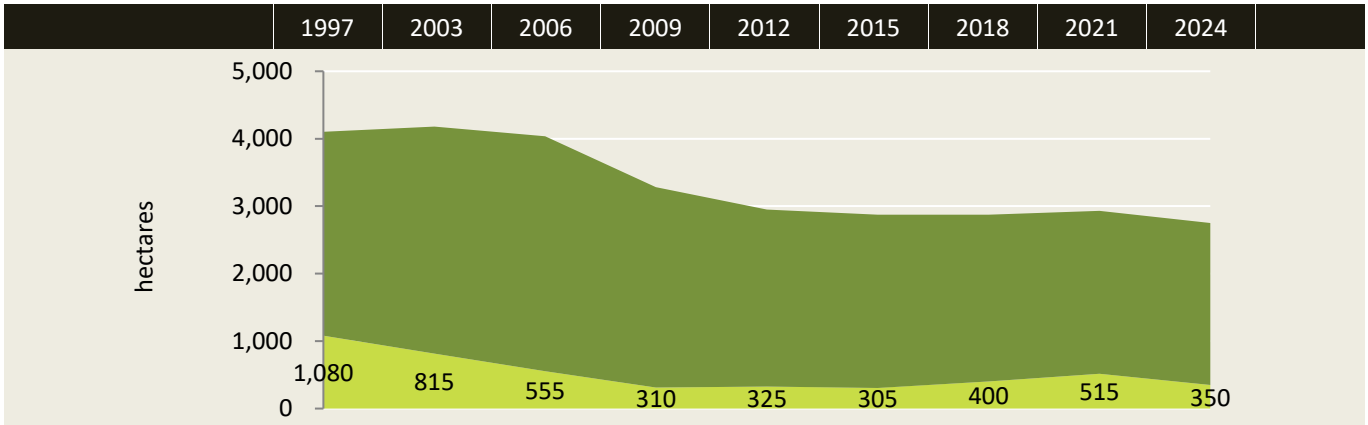
The information provides an indication of development activity that doesn't necessarily involve a change in area or crop type as it includes replanting or top working to different varieties. The figures are conservative, as top worked plantings can be difficult to interpret from the three-yearly aerial imagery, particularly for grapevines.

In 2024:

- 350 ha (13%) of permanent crops were planted or top-worked within the previous three years.
- These new plantings were:
    1. table grapes (225 ha);
    2. dried grapes (40 ha);
    3. citrus (30 ha);
    4. wine grapes (25 ha);
    5. fruit trees including avocados (20 ha); and
    6. nurseries (10 ha).

From 1997 to 2024:

- The proportion of new permanent plantings was at its lowest in 2009 with 9% (310 ha) planted in the previous three years and highest in 1997 with 26% (1,080 ha) planted in the previous three years.



Permanent plantings	1997	2003	2006	2009	2012	2015	2018	2021	2024	% of 2024
≤3yr old plantings	1,080	815	555	310	325	305	400	515	350	13%
>3yr old plantings	3,025	3,365	3,480	2,970	2,625	2,570	2,475	2,415	2,400	87%
Total (ha)	4,105	4,180	4,035	3,280	2,950	2,875	2,875	2,930	2,750	100%
% 3year development	26%	19%	14%	9%	11%	11%	14%	18%	13%	
Average 3-year dev.	15%									

Figure 37: Red Cliffs irrigation district - three-year old permanent plantings from 1997 to 2024

2.4.4 Red Cliffs irrigation district - planting trends

Figure 38 summarises planting trends with respect to permanent crops, seasonal crops and vacant areas in the Red Cliffs irrigation district from 1997 to 2024.

The proportion of permanent plantings, seasonal cropping and vacant areas changed from:

- 92% permanent, 5% seasonal and 3% vacant in 1997; to
- 64% permanent, 7% seasonal and 29% vacant in 2024.

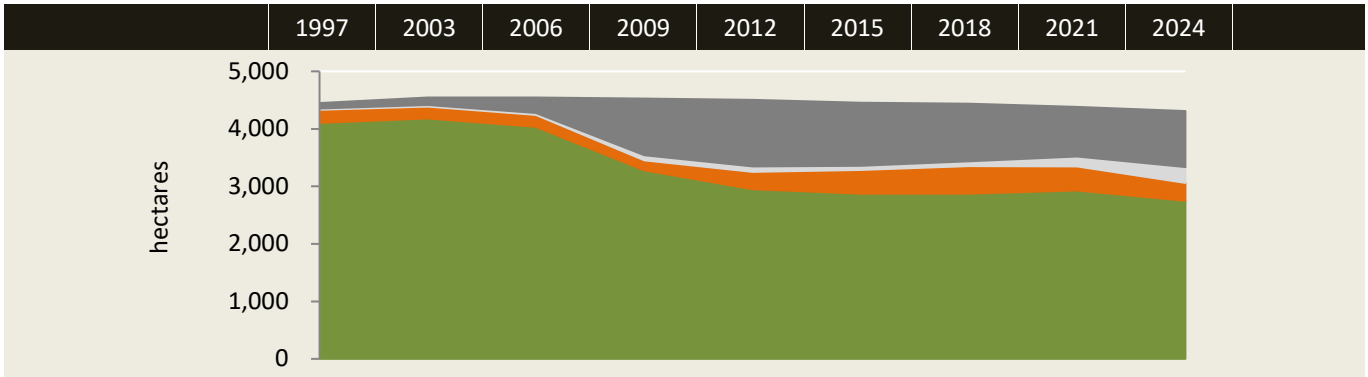
The proportion of vacant areas was at its highest in 2024 with 29% of the irrigable area not irrigated.

In 2024, the irrigable area of 4,310 ha comprised:

- 64% (2,750 ha) irrigated permanent plantings;
- 7% (310 ha) irrigated seasonal crops;
- 23% (975 ha) vacant, previously an irrigated permanent planting; and
- 6% (275 ha) vacant, previously an irrigated seasonal crop.

From 1997 to 2024:

- irrigated permanent crops decreased by 1,355 ha, from 4,105 to 2,750 ha;
- irrigated seasonal crops increased by 85 ha, from 225 to 310 ha;
- vacant areas, previously irrigated permanent plantings increased by 880 ha, from 95 to 975 ha; and
- vacant areas, previously irrigated seasonal crops increased by 250 ha, from 25 to 275 ha.



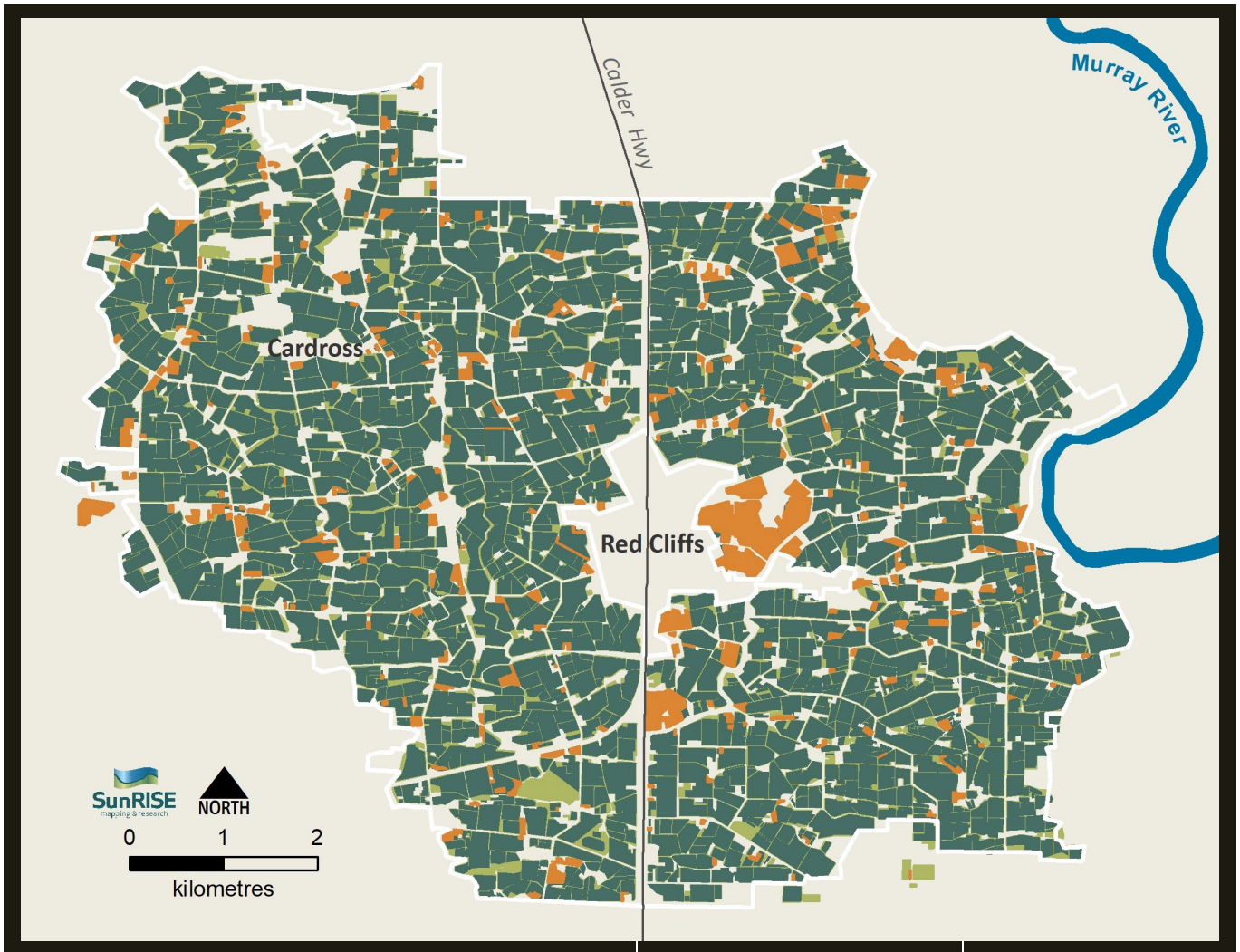
	1997	2003	2006	2009	2012	2015	2018	2021	2024	Change 1997-2024
Permanent - irrigated	4,105	4,180	4,035	3,280	2,950	2,875	2,875	2,930	2,750	-1,355
Seasonal - irrigated	225	205	205	170	300	410	475	415	310	+85
Total irrigated (ha)	4,330	4,385	4,240	3,450	3,250	3,285	3,350	3,345	3,060	-1,270
Vacant - permanent	95	130	270	985	1,160	1,095	1,000	860	975	+880
Vacant - seasonal	25	30	35	90	95	75	85	175	275	+250
Total irrigable (ha)	4,450	4,545	4,545	4,525	4,505	4,455	4,435	4,380	4,310	-140
% Permanent	92%	92%	89%	72%	65%	65%	65%	67%	64%	
% Seasonal	5%	5%	5%	4%	7%	9%	11%	9%	7%	
% Vacant P	2%	3%	6%	22%	26%	25%	23%	20%	23%	
% Vacant S	1%	1%	1%	2%	2%	2%	2%	4%	6%	

Figure 38: Red Cliffs irrigation district - planting trends from 1997 to 2024

2.4.5 Red Cliffs irrigation district - irrigation development

Map 7 shows irrigation development from 1997 to 2024 in the Red Cliffs irrigation district with respect to new development (expansion) and areas retired from irrigation.

- The irrigable area decreased by 140 ha, a 3% decrease from 4,450 ha in 1997 to 4,310 ha in 2024.
- The net decrease of 140 ha was the balance of 235 ha retired from irrigation and 95 ha of expansion.



		Hectares			% change since 1997
Irrigable area in 1997 (1996-97 season)		4,450			
Retired between 1997 and 2024			-235		-5%
Expansion between 1997 and 2024			+95		+2%
Net change from 1997 to 2024				-140	-3%
Irrigable area in 2024 (2023-24 season)				4,310	

Map 7: Red Cliffs irrigation district - irrigation development from 1997 to 2024

2.4.6 Red Cliffs irrigation district - salinity impact zones

Figure 39 summarises river salinity impact zones of irrigated areas in the Red Cliffs irrigation district from 1997 to 2024. The Red Cliffs district is in low salinity impact zones L1 and L4, and the high salinity impact zone, HIZ.

In 2024, the irrigable area of 4,310 ha comprised:

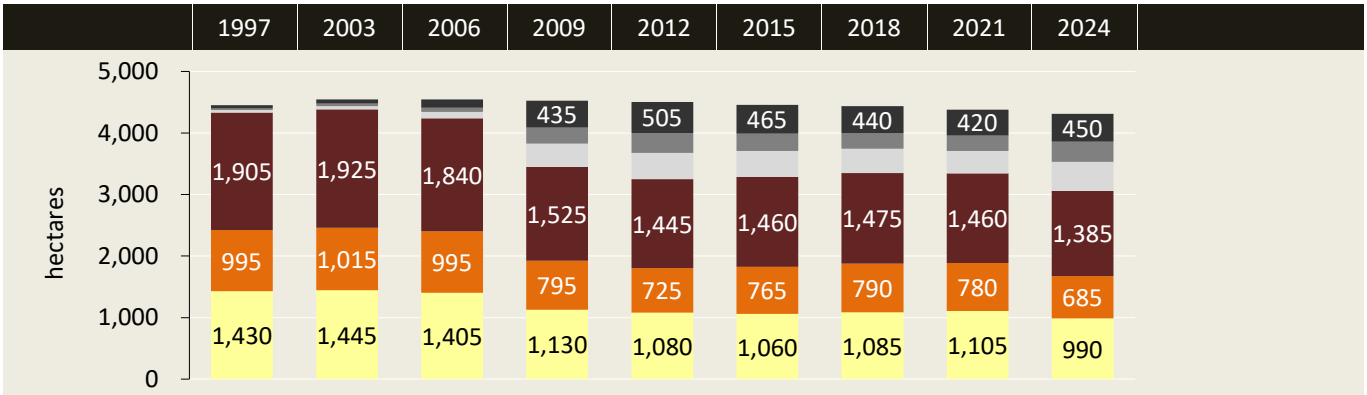
- 34% (1,460 ha) in the lowest salinity impact zone, L1;
- 24% (1,015 ha) in L4; and
- 43% (1,835 ha) in HIZ.

From 1997 to 2024, the area irrigated in:

- L1 decreased by 440 ha, a 31% decrease from 1,430 to 990 ha;
- L4 decreased by 310 ha, a 31% decrease from 995 to 685 ha; and
- HIZ decreased by 520 ha, a 27% decrease from 1,905 to 1,385 ha.

From 1997 to 2024, the irrigable area in:

- L1 decreased by 15 ha, a 1% decrease from 1,475 to 1,460 ha;
- L4 decreased by 5 ha, a <1% decrease from 1,020 to 1,015 ha; and
- HIZ decreased by 120 ha, a 6% decrease from 1,955 to 1,835 ha. The net decrease in the HIZ was mainly areas retired from irrigation for housing developments.



Salinity impact zone		1997	2003	2006	2009	2012	2015	2018	2021	2024	% in 2024	Change 1997-2024
Irrigated	L1	1,430	1,445	1,405	1,130	1,080	1,060	1,085	1,105	990	23%	-440
	L2	-	-	-	-	-	-	-	-	-	-	-
	L3	-	-	-	-	-	-	-	-	-	-	-
	L4	995	1,015	995	795	725	765	790	780	685	16%	-310
	HIZ	1,905	1,925	1,840	1,525	1,445	1,460	1,475	1,460	1,385	32%	-520
Not Irrigated	L1	45	50	105	380	425	425	395	365	470	11%	+425
	L2	-	-	-	-	-	-	-	-	-	-	-
	L3	-	-	-	-	-	-	-	-	-	-	-
	L4	25	45	65	260	325	280	250	250	330	8%	+305
	HIZ	50	65	135	435	505	465	440	420	450	10%	+400
Total (ha)		4,450	4,545	4,545	4,525	4,505	4,455	4,435	4,380	4,310	100%	-140
Dominant zone		HIZ										

Figure 39: Red Cliffs irrigation district - irrigable area in each salinity impact zone from 1997 to 2024

2.4.7 Red Cliffs irrigation district - irrigation methods

Figure 40 summarises irrigation methods in the Red Cliffs irrigation district from 1997 to 2024.

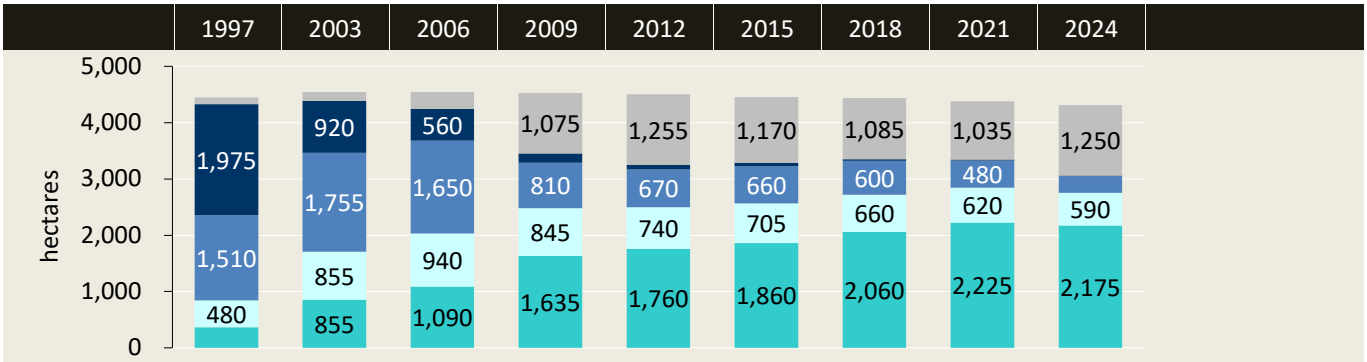
The dominant irrigation method changed from furrow in 1997 to overhead from 2003 to 2006, then drip irrigation from 2009 to 2024.

In 2024, the irrigable area of 4,310 ha comprised:

- 50% (2,175 ha) drip irrigation;
- 14% (590 ha) low level irrigation;
- 7% (285 ha) overhead sprinklers;
- <1% (10 ha) furrow irrigation; and
- 29% (1,250 ha) vacant, not irrigated.

From 1997 to 2024:

- drip irrigation increased by 1,810 ha, a 496% increase from 365 to 2,175 ha;
- low level irrigation increased by 110 ha, a 23% increase from 480 to 590 ha;
- overhead irrigation decreased by 1,225 ha, an 81% decrease from 1,510 to 285 ha; and
- furrow irrigation decreased by 1,965 ha, a 99% decrease from 1,975 to 10 ha.



Irrigation method[15]	1997	2003	2006	2009	2012	2015	2018	2021	2024	% in 2024	Change 1997-2024
Drip	365	855	1,090	1,635	1,760	1,860	2,060	2,225	2,175	50%	+1,810
Low level	480	855	940	845	740	705	660	620	590	14%	+110
Overhead	1,510	1,755	1,650	810	670	660	600	480	285	7%	-1,225
Furrow	1,975	920	560	160	80	60	30	20	10	<1%	-1,965
Vacant	120	160	305	1,075	1,255	1,170	1,085	1,035	1,250	29%	+1,130
Total (ha)	4,450	4,545	4,545	4,525	4,505	4,455	4,435	4,380	4,310	100%	-140
Dominant	furrow	overhead		drip							

Figure 40: Red Cliffs irrigation district - irrigation methods from 1997 to 2024

[15] Overhead irrigation includes pivots and lateral move systems. Furrow includes flood irrigation. (Refer to Table 4.)

2.4.8 Red Cliffs irrigation district - property change

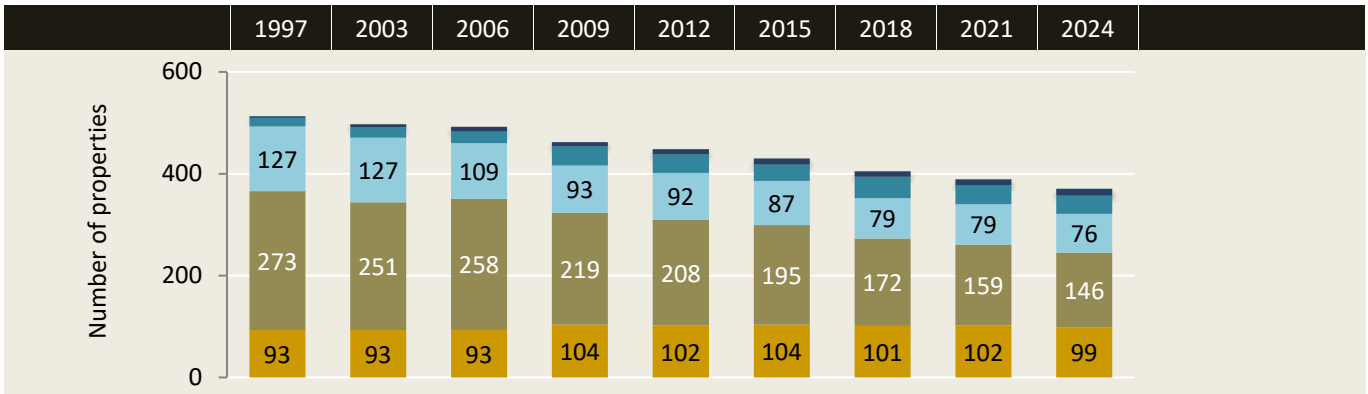
Figure 41 provides estimates of property numbers and average property size (irrigable area) in the Red Cliffs irrigation district from 1997 to 2024.

In 2024:

- there were approximately 371 irrigation properties; and
- most properties (87%) had an irrigable area less than 20 ha.

From 1997 to 2024:

- the number of properties decreased by 142, a 28% decrease from 513 to 371;
- properties with an irrigable area less than 20 ha decreased by 172, while the number over 20 ha increased by 30; and
- average property size (irrigable area) increased from 9 to 12 ha per property.



Property size (irrigable area)	1997	2003	2006	2009	2012	2015	2018	2021	2024	% in 2024	Change 1997-2024
1 to 5 ha	93	93	93	104	102	104	101	102	99	27%	+6
5 to 10 ha	273	251	258	219	208	195	172	159	146	39%	-127
10 to 20 ha	127	127	109	93	92	87	79	79	76	21%	-51
20 to 40 ha	17	20	23	38	36	32	42	37	36	10%	+19
40 to 100 ha	3	6	9	8	10	12	11	12	13	3%	+10
100 to 500 ha	0	0	0	0	0	0	0	1	1	<1%	+1
> 500 ha	-	-	-	-	-	-	-	-	-	-	-
Total properties	513	497	492	462	448	430	405	390	371	100%	-142
Average size (ha)	9	9	9	10	10	10	11	11	12		

Figure 41: Red Cliffs irrigation district - property numbers and sizes from 1997 to 2024

2.5 Mildura irrigation district

In summary for the Mildura irrigation district

Crop types in 2024

The main plantings in the Mildura irrigation district in 2024 were:

1. table grapes, 2,310 ha (42% of the irrigable area);
2. wine grapes, 780 ha (14% of the irrigable area); and
3. dried grapes, 435 ha (8% of the irrigable area).

Crop type changes from 1997 to 2024

The dominant crop type changed from dried grapes in 1997 to wine grapes from 2003 to 2009, then table grapes from 2012 to 2024.

The main crop type changes from 1997 to 2024 were:

- dried grape plantings decreased by 1,895 ha, an 81% decrease from 2,330 to 435 ha;
- wine grape plantings decreased by 1,460 ha, a 65% decrease from 2,240 to 780 ha; and
- table grape plantings increased by 1,325 ha, a 135% increase from 985 to 2,310 ha.

New permanent plantings (planted or top-worked in the previous three years)

In 2024, 525 ha (14%) of permanent crops were planted or top-worked in the previous three years.

The new plantings were:

1. table grapes (435 ha);
2. wine grapes (30 ha);
3. dried grapes (25 ha);
4. citrus (15 ha);
5. almonds, fruit trees and nurseries (a total of 20 ha).

Planting trends - permanent plantings, seasonal crops and vacant areas

In 2024, the irrigable area of 5,515 ha comprised:

- 70% (3,870 ha) irrigated permanent plantings;
- 4% (205 ha) irrigated seasonal crops;
- 20% (1,130 ha) vacant, previously an irrigated permanent planting; and
- 6% (310 ha) vacant, previously an irrigated seasonal crop.

The proportion of permanent plantings, seasonal cropping and vacant areas changed from:

- 92% permanent, 6% seasonal and 2% vacant in 1997; to
- 70% permanent, 4% seasonal and 26% vacant in 2024.

In summary for the Mildura irrigation district

Irrigation development - new development (expansion) and retired areas

In the Mildura irrigation district, the irrigable area decreased by 930 ha, a 14% decrease from 6,445 ha in 1997 to 5,515 ha in 2024.

The net decrease of 930 ha was the balance of 1,185 ha retired from irrigation and 255 ha of expansion.

Salinity impact zones

The Mildura irrigation district is in the lowest salinity impact zone, L1 and in the high impact zone, HIZ.

In 2024, the irrigable area of 5,515 ha comprised:

- 38% (2,085 ha) in L1; and
- 62% (3,430 ha) in the HIZ.

From 1997 to 2024 the irrigable area in:

- L1 increased by 65 ha, a 3% increase from 2,020 to 2,085 ha; and
- HIZ decreased by 995 ha, a 22% decrease from 4,425 to 3,430 ha. The decrease was predominantly areas retired from irrigation for urban development.

The area irrigated in HIZ continued to decrease from 1997 to 2015, then increased by 105 ha between 2015 and 2018. The increase was largely due to vacant areas in HIZ being brought back into production after the Millennium drought.

Irrigation methods

The dominant irrigation method in the Mildura irrigation district changed from furrow in 1997, to overhead by 2006, then low level in 2009 and drip from 2012 to 2024.

In 2024, the irrigable area of 5,515 ha comprised:

- 46% (2,555 ha) drip irrigation;
- 20% (1,130 ha) low level irrigation;
- 5% (290 ha) overhead sprinklers;
- 2% (100 ha) furrow irrigation; and
- 26% (1,440 ha) vacant, not irrigated.

Irrigation properties

In 2024, there were approximately 534 irrigation properties with an average property size (irrigable area) of 10 ha.

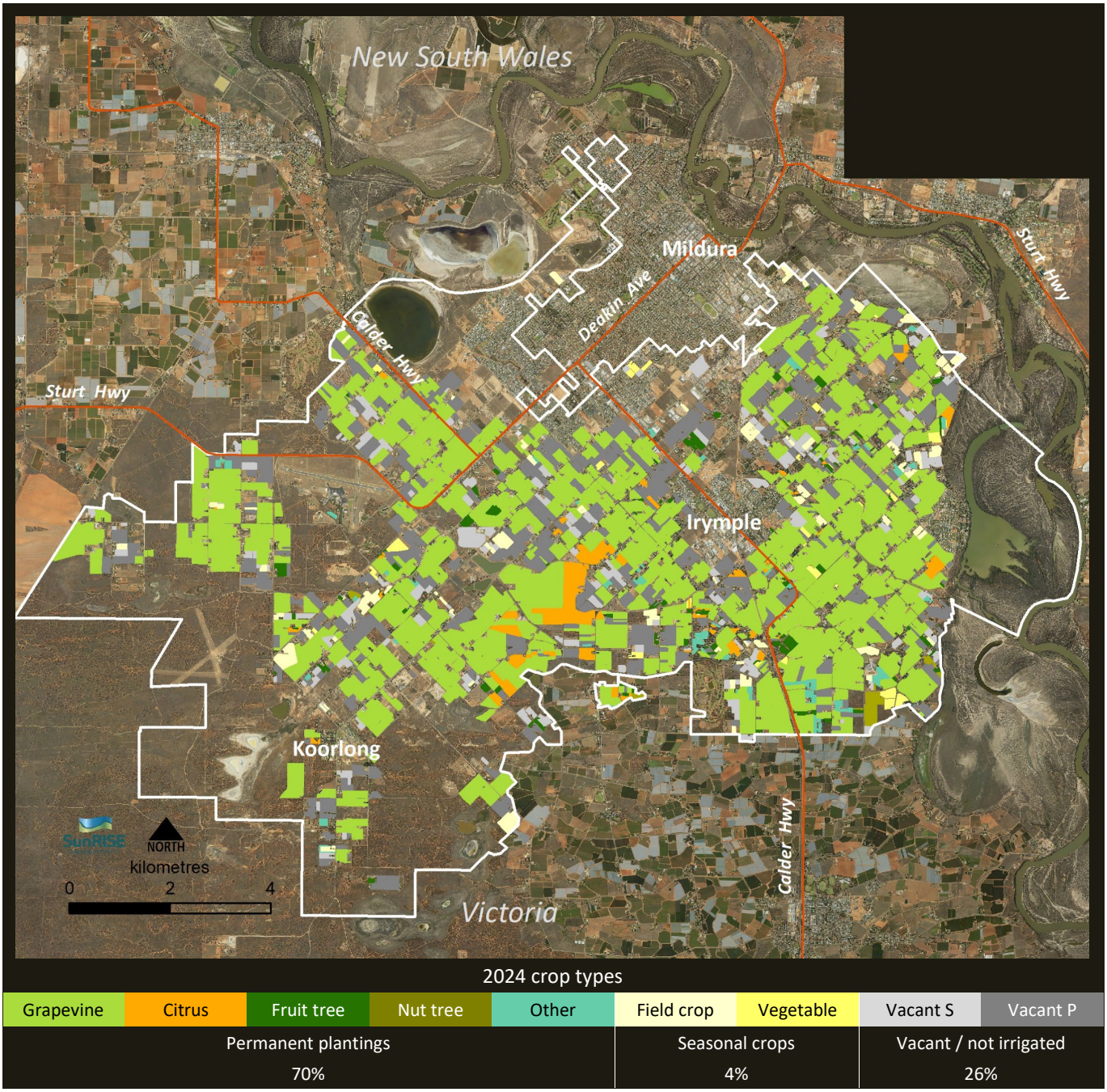
From 1997 to 2024:

- the number of properties decreased by 301, a 36% decrease from 835 to 534 properties;
- properties with an irrigable area less than 40 ha decreased by 319, while the number over 40 ha increased by 18; and
- average property size (irrigable area) increased from 8 to 10 ha per property.

2.5.1 Mildura irrigation district - crop types in 2024

Map 8 shows the Mildura irrigation district with crop types in 2024.

The aerial photography was flown in January 2024 (*source: Coordinated Imagery Program, DTP Victoria*).



Map 8: **Mildura irrigation district showing crop types in 2024**

2.5.2 Mildura irrigation district - crop types from 1997 to 2024

Figure 42 summarises crop types in the Mildura irrigation district from 1997 to 2024.

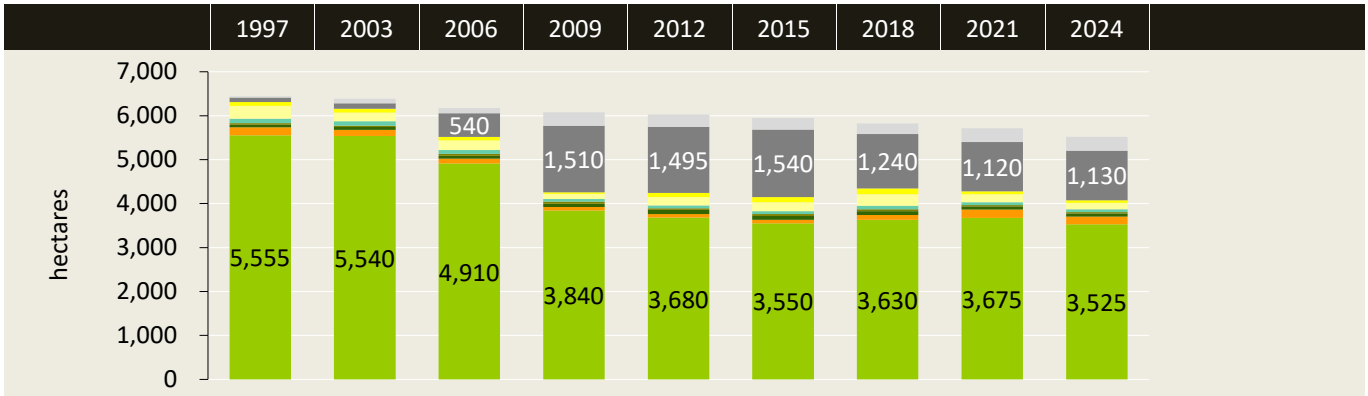
The dominant crop type changed from dried grapes in 1997 to wine grapes from 2003 to 2009, then table grapes from 2012 to 2024.

In 2024, the main plantings were:

1. table grapes, 2,310 ha (42% of the irrigable area);
2. wine grapes, 780 ha (14% of the irrigable area); and
3. dried grapes, 435 ha (8% of the irrigable area).

From 1997 to 2024, the main planting changes were:

- dried grapes decreased by 1,895 ha, an 81% decrease from 2,330 to 435 ha;
- wine grapes decreased by 1,460 ha, a 65% decrease from 2,240 to 780 ha; and
- table grapes increased by 1,325 ha, a 135% increase from 985 to 2,310 ha.



Crop type		1997	2003	2006	2009	2012	2015	2018	2021	2024	% of 2024	Change 1997-2024
Permanent	Grape Dried	2,330	1,690	1,310	875	870	780	710	540	435	8%	-1,895
	Grape Table	985	1,310	1,275	1,255	1,430	1,585	1,950	2,270	2,310	42%	+1,325
	Grape Wine	2,240	2,540	2,325	1,710	1,380	1,185	970	865	780	14%	-1,460
	Citrus	180	135	115	85	85	85	110	190	175	3%	-5
	Fruit Olive	20	35	35	40	45	40	40	30	30	1%	+10
	Fruit Other	40	35	30	30	45	45	45	40	50	1%	+10
	Nut Almond	30	25	30	45	30	35	40	25	20	<1%	-10
	Nut Other	5	5	10	10	10	5	10	5	5	<1%	0
	Other	105	100	90	55	65	70	80	70	65	1%	-40
Seasonal	Field Crop	290	195	215	115	185	205	260	180	145	3%	-145
	Veg. Carrot	-	-	-	-	-	-	-	-	-	-	-
	Veg. Potato	-	-	-	-	-	-	-	-	-	-	-
	Veg. Other	85	85	85	40	100	110	130	65	60	1%	-25
Vacant P		100	130	540	1,510	1,495	1,540	1,240	1,120	1,130	20%	+1,030
Vacant S		35	100	115	310	285	260	240	315	310	6%	+275
Total (ha)		6,445	6,385	6,175	6,080	6,025	5,945	5,825	5,715	5,515	100%	-930
Dominant		dried	wine			table						

Figure 42: Mildura irrigation district - crop types from 1997 to 2024

2.5.3 Mildura irrigation district - new permanent plantings

Figure 43 shows the proportion of permanent crops planted or top-worked in the previous three years in the Mildura irrigation district from 1997 to 2024.

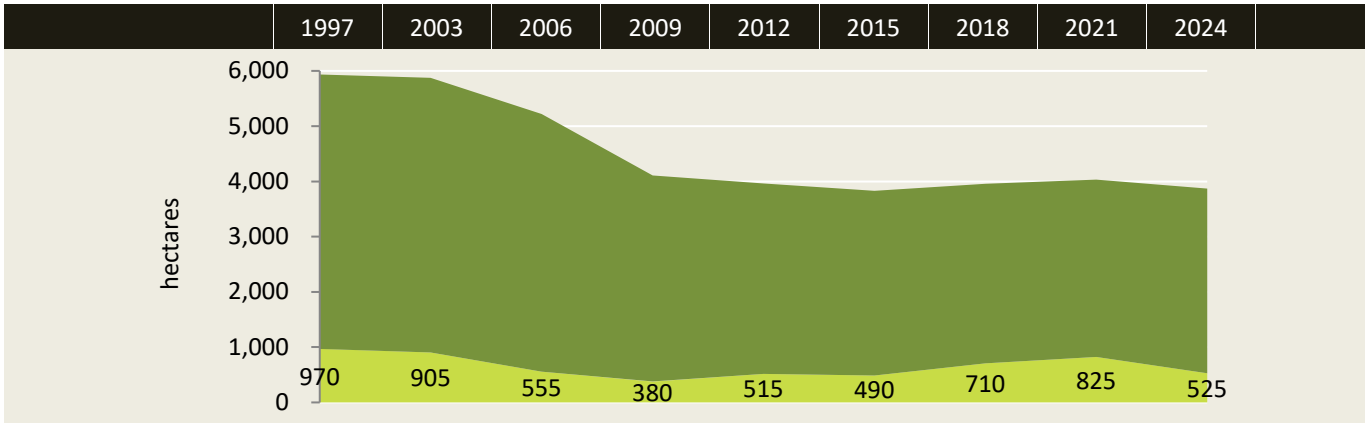
The information provides an indication of development activity that doesn't necessarily involve a change in area or crop type as it includes replanting or top working to different varieties. The figures are conservative, as top worked plantings can be difficult to interpret from the three-yearly aerial imagery, particularly for grapevines.

In 2024:

- 525 ha (14%) of permanent crops were planted or top-worked within the previous three years.
- These new plantings were:
    1. table grapes (435 ha);
    2. wine grapes (30 ha);
    3. dried grapes (25 ha);
    4. citrus (15 ha); and
    5. almonds, fruit trees and nurseries (a total of 20 ha).

From 1997 to 2024:

- The proportion of new permanent plantings was at its lowest in 2009 with 9% (380 ha) planted in the previous three years and highest in 2021 with 20% (825 ha) planted in the previous three years.



Permanent plantings	1997	2003	2006	2009	2012	2015	2018	2021	2024	% of 2024
≤3yr old plantings	970	905	555	380	515	490	710	825	525	14%
>3yr old plantings	4,965	4,970	4,665	3,725	3,445	3,340	3,245	3,210	3,345	86%
Total (ha)	5,935	5,875	5,220	4,105	3,960	3,830	3,955	4,035	3,870	100%
% 3year development	16%	15%	11%	9%	13%	13%	18%	20%	14%	
Average 3-year dev.	14%									

Figure 43: Mildura irrigation district - development of permanent plantings from 1997 to 2024

2.5.4 Mildura irrigation district - planting trends

Figure 44 summarises planting trends with respect to permanent crops, seasonal crops and vacant areas in the Mildura irrigation district from 1997 to 2024.

The proportion of permanent plantings, seasonal cropping and vacant areas changed from:

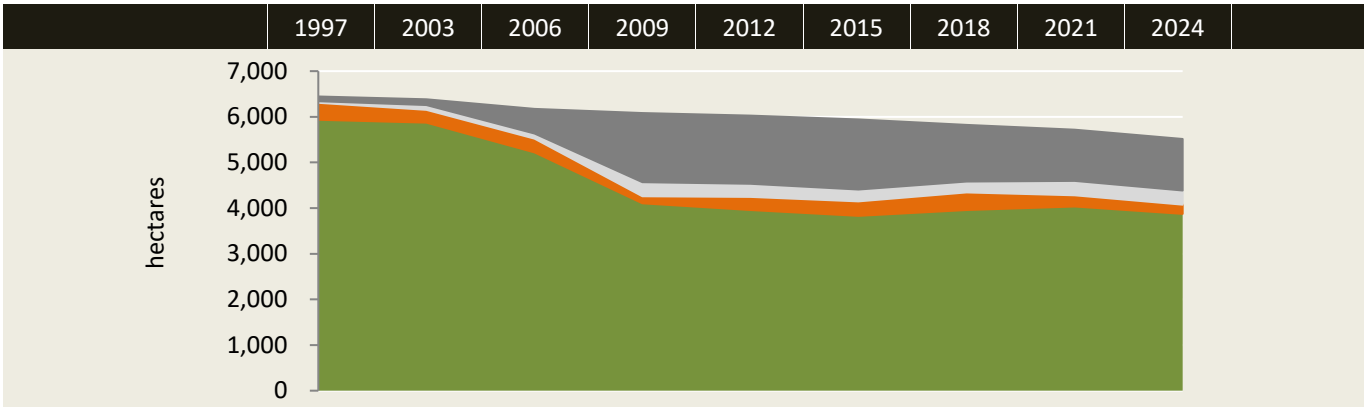
- 92% permanent, 6% seasonal and 2% vacant in 1997; to
- 70% permanent, 4% seasonal and 26% vacant in 2024.

In 2024, the irrigable area of 5,515 ha comprised:

- 70% (3,870 ha) irrigated permanent plantings;
- 4% (205 ha) irrigated seasonal crops;
- 20% (1,130 ha) vacant, previously an irrigated permanent planting; and
- 6% (310 ha) vacant, previously an irrigated seasonal crop.

From 1997 to 2024:

- irrigated permanent crops decreased by 2,065 ha, from 5,935 to 3,870 ha;
- irrigated seasonal crops decreased by 170 ha, from 375 to 205 ha;
- vacant areas, previously irrigated permanent plantings increased by 1,030 ha, from 100 to 1,130 ha; and
- vacant areas, previously irrigated seasonal crops increased by 275 ha, from 35 to 310 ha.



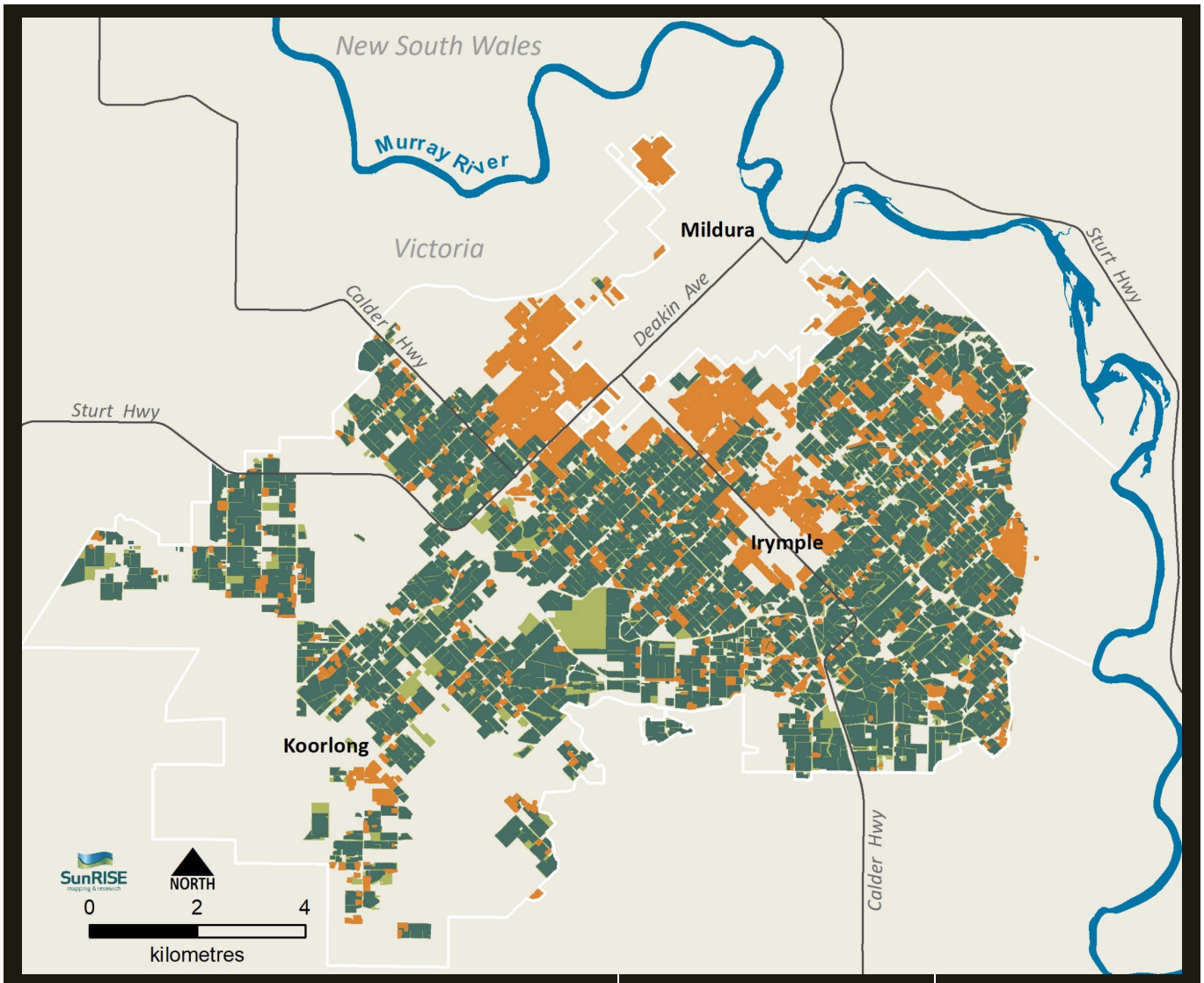
	1997	2003	2006	2009	2012	2015	2018	2021	2024	Change 1997-2024
Permanent - irrigated	5,935	5,875	5,220	4,105	3,960	3,830	3,955	4,035	3,870	-2,065
Seasonal - irrigated	375	280	300	155	285	315	390	245	205	-170
Total irrigated (ha)	6,310	6,155	5,520	4,260	4,245	4,145	4,345	4,280	4,075	-2,235
Vacant - permanent	100	130	540	1,510	1,495	1,540	1,240	1,120	1,130	+1,030
Vacant - seasonal	35	100	115	310	285	260	240	315	310	+275
Total irrigable (ha)	6,445	6,385	6,175	6,080	6,025	5,945	5,825	5,715	5,515	-930
% Permanent	92%	92%	85%	68%	66%	64%	68%	71%	70%	
% Seasonal	6%	4%	5%	3%	5%	5%	7%	4%	4%	
% Vacant P	2%	2%	9%	25%	25%	26%	21%	20%	20%	
% Vacant S	<1%	2%	2%	5%	5%	4%	4%	5%	6%	

Figure 44: Mildura irrigation district - planting trends from 1997 to 2024

2.5.5 Mildura irrigation district - irrigation development

Map 9 shows irrigation development from 1997 to 2024 in the Mildura irrigation district with respect to new development (expansion) and areas retired from irrigation.

- The irrigable area decreased by 930 ha, a 14% decrease from 6,445 ha in 1997 to 5,515 ha in 2024.
- The net decrease of 930 ha was the balance of 1,185 ha retired from irrigation and 255 ha of expansion. Retired areas were mainly for urban development.



		Hectares			% change since 1997
Irrigable area in 1997 (1996-97 season)		6,445			
Retired between 1997 and 2024			-1,185		-18%
Expansion between 1997 and 2024			+255		+4%
Net change from 1997 to 2024				-930	-14%
Irrigable area in 2024 (2023-24 season)				5,515	

Map 9: Mildura irrigation district - irrigation development from 1997 to 2024

2.5.6 Mildura irrigation district - salinity impact zones

Figure 45 summarises river salinity impact zones of irrigated areas in the Mildura irrigation district from 1997 to 2024. The Mildura district is in the lowest salinity impact zone, L1 and in the high salinity impact zone, HIZ.

In 2024, the irrigable area of 5,515 ha comprised:

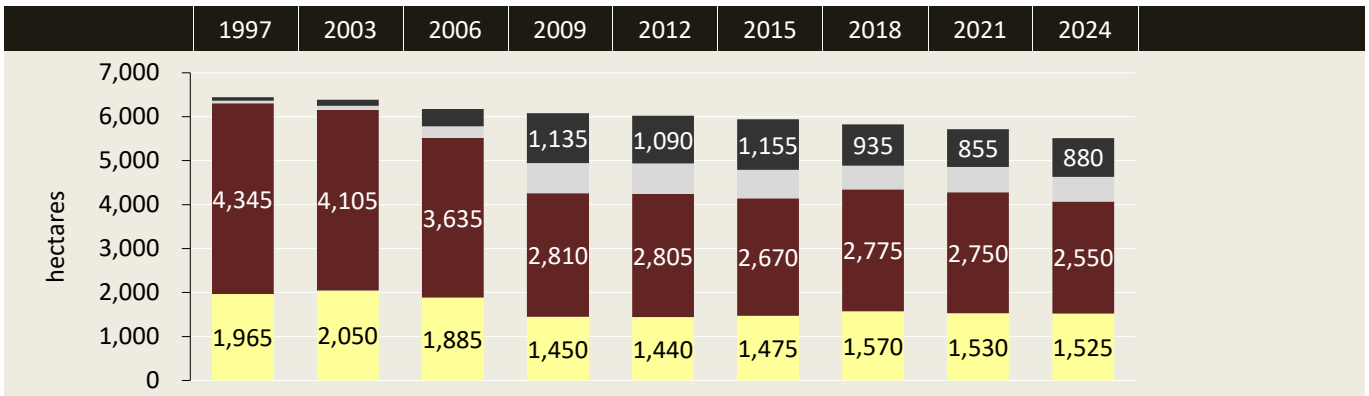
- 38% (2,085 ha) in L1; and
- 62% (3,430 ha) in the HIZ.

From 1997 to 2024, the area irrigated in:

- L1 decreased by 440 ha, a 22% decrease from 1,965 to 1,525 ha; and
- HIZ decreased by 1,795 ha, a 41% decrease from 4,345 to 2,550 ha.

From 1997 to 2024, the irrigable area in:

- L1 increased by 65 ha, a 3% increase from 2,020 to 2,085 ha; and
- HIZ decreased by 995 ha, a 22% decrease from 4,425 to 3,430 ha. The net decrease in the HIZ was mainly areas retired from irrigation for urban development.



Salinity impact zone		1997	2003	2006	2009	2012	2015	2018	2021	2024	% in 2024	Change 1997-2024
Irrigated	L1	1,965	2,050	1,885	1,450	1,440	1,475	1,570	1,530	1,525	28%	-440
	L2	-	-	-	-	-	-	-	-	-	-	-
	L3	-	-	-	-	-	-	-	-	-	-	-
	L4	-	-	-	-	-	-	-	-	-	-	-
	HIZ	4,345	4,105	3,635	2,810	2,805	2,670	2,775	2,750	2,550	46%	-1,795
Not Irrigated	L1	55	95	260	685	690	645	545	580	560	10%	+505
	L2	-	-	-	-	-	-	-	-	-	-	-
	L3	-	-	-	-	-	-	-	-	-	-	-
	L4	-	-	-	-	-	-	-	-	-	-	-
	HIZ	80	135	395	1,135	1,090	1,155	935	855	880	16%	+800
Total (ha)		6,445	6,385	6,175	6,080	6,025	5,945	5,825	5,715	5,515	100%	-930
Dominant zone		HIZ										

Figure 45: Mildura irrigation district - irrigable area in each salinity impact zone from 1997 to 2024

2.5.7 Mildura irrigation district - irrigation methods

Figure 46 summarises irrigation methods in the Mildura irrigation district from 1997 to 2024.

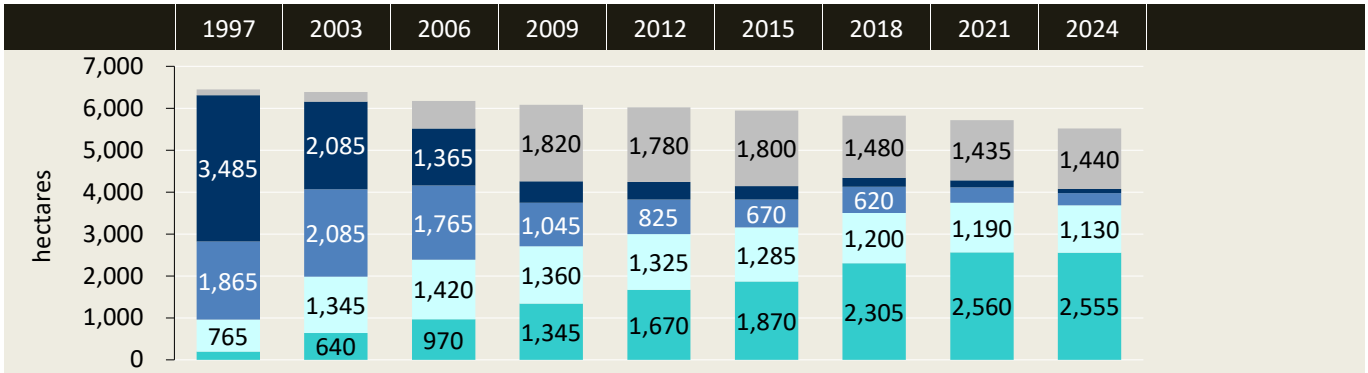
The dominant irrigation method in the Mildura irrigation district changed from furrow in 1997, to overhead by 2006, low level in 2009, then drip from 2012 to 2024.

In 2024, the irrigable area of 5,515 ha comprised:

- 46% (2,555 ha) drip irrigation;
- 20% (1,130 ha) low level irrigation;
- 5% (290 ha) overhead sprinklers;
- 2% (100 ha) furrow irrigation; and
- 26% (1,440 ha) vacant, not irrigated.

From 1997 to 2024:

- drip irrigation increased by 2,360 ha, a 1,210% increase from 195 to 2,555 ha;
- low level irrigation increased by 365 ha, a 48% increase from 765 to 1,130 ha;
- overhead irrigation decreased by 1,575 ha, an 84% decrease from 1,865 to 290 ha; and
- furrow irrigation decreased by 3,385 ha, a 97% decrease from 3,485 to 100 ha.



Irrigation method[16]	1997	2003	2006	2009	2012	2015	2018	2021	2024	% in 2024	Change 1997-2024
Drip	195	640	970	1,345	1,670	1,870	2,305	2,560	2,555	46%	+2,360
Low level	765	1,345	1,420	1,360	1,325	1,285	1,200	1,190	1,130	20%	+365
Overhead	1,865	2,085	1,765	1,045	825	670	620	365	290	5%	-1,575
Furrow	3,485	2,085	1,365	510	425	320	220	165	100	2%	-3,385
Vacant	135	230	655	1,820	1,780	1,800	1,480	1,435	1,440	26%	+1,305
Total (ha)	6,445	6,385	6,175	6,080	6,025	5,945	5,825	5,715	5,515	100%	-930
Dominant	furrow	furrow/ o'head	o'head	lowlevel	drip						

Figure 46: Mildura irrigation district - irrigation methods from 1997 to 2024

[16] Overhead irrigation includes pivots and lateral move systems. Furrow includes flood irrigation. (Refer to Table 4.)

2.5.8 Mildura irrigation district - property change

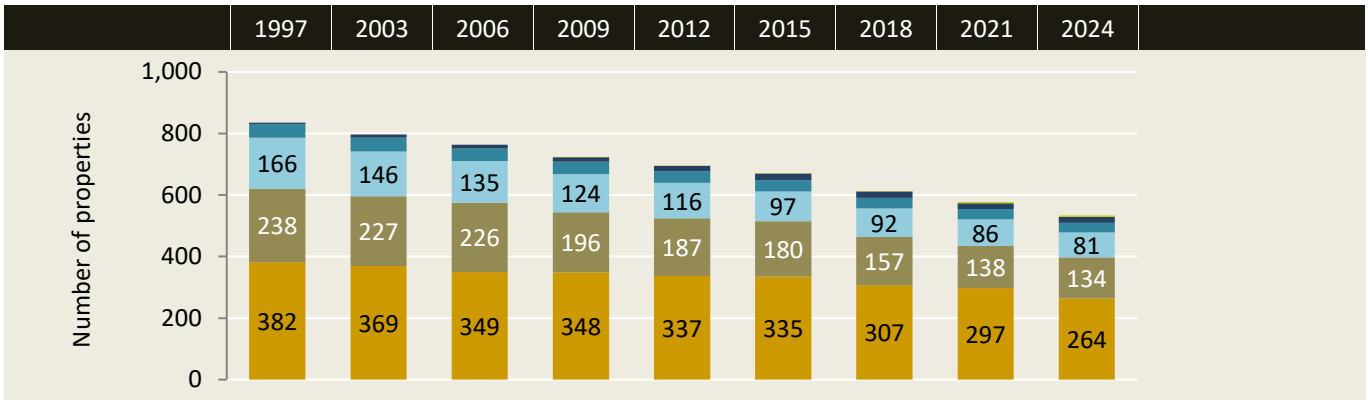
Figure 47 provides estimates of property numbers and average property size (irrigable area) in the Mildura irrigation district from 1997 to 2024.

In 2024:

- there were approximately 534 irrigation properties; and
- most properties (90%) had an irrigable area less than 20 ha.

From 1997 to 2024:

- the number of properties decreased by 301, a 36% decrease from 835 to 534 properties;
- properties with an irrigable area less than 40 ha decreased by 319, while the number over 40 ha increased by 18; and
- average property size (irrigable area) increased from 8 to 10 ha per property.



Property size (irrigable area)	1997	2003	2006	2009	2012	2015	2018	2021	2024	% in 2024	Change 1997-2024
1 to 5 ha	382	369	349	348	337	335	307	297	264	50%	-118
5 to 10 ha	238	227	226	196	187	180	157	138	134	25%	-104
10 to 20 ha	166	146	135	124	116	97	92	86	81	15%	-85
20 to 40 ha	45	44	41	40	37	36	35	33	33	6%	-12
40 to 100 ha	4	11	12	15	18	22	20	19	18	3%	+14
100 to 500 ha	0	0	0	1	1	1	2	4	4	1%	+4
> 500 ha	-	-	-	-	-	-	-	-	-	-	-
Total properties	835	797	763	724	696	671	613	577	534	100%	-301
Average size (ha)	8	8	8	8	9	9	10	10	10		

Figure 47: Mildura irrigation district - property numbers and sizes from 1997 to 2024

2.6 Merbein irrigation district

In summary for the Merbein irrigation district

Crop types in 2024

The main plantings in the Merbein irrigation district in 2024 were:

1. table grapes, 835 ha (29% of the irrigable area);
2. dried grapes, 350 ha (12% of the irrigable area); and
3. wine grapes, 160 ha (6% of the irrigable area).

Crop type changes from 1997 to 2024

Table grape plantings were the dominant crop from 2021 to 2024. Dried grapes were dominant from 1997 to 2018, except in 2009 when wine grapes were temporarily dominant. The main crop type changes from 1997 to 2024 were:

- dried grape plantings decreased by 1,290 ha, a 79% decrease from 1,640 to 350 ha;
- wine grape plantings decreased by 755 ha, an 83% decrease from 915 to 160 ha; and
- table grape plantings increased by 685 ha, a 457% increase from 150 to 835 ha.

New permanent plantings (planted or top-worked in the previous three years)

In 2024, 270 ha (16%) of permanent crops were planted or top-worked in the previous three years.

The new plantings were:

1. table grapes (135 ha);
2. dried grapes (50 ha);
3. citrus (35 ha);
4. wine grapes (20 ha);
5. nurseries (15 ha);
6. nut trees (10 ha); and
7. fruit trees (5 ha).

Planting trends - permanent plantings, seasonal crops and vacant areas

In 2024, the irrigable area of 2,855 ha comprised:

- 58% (1,645 ha) irrigated permanent plantings;
- 5% (150 ha) irrigated seasonal crops;
- 31% (895 ha) vacant, previously an irrigated permanent planting; and
- 6% (165 ha) vacant, previously an irrigated seasonal crop.

The proportion of permanent plantings, seasonal cropping and vacant areas changed from:

- 97% permanent, 2% seasonal and 1% vacant in 1997; to
- 58% permanent, 5% seasonal and 37% vacant in 2024.

In summary for the Merbein irrigation district

Irrigation development - new development (expansion) and retired areas

In the Merbein irrigation district, the irrigable area decreased by 290 ha, a 9% decrease from 3,145 ha in 1997 to 2,855 ha in 2024.

The net decrease of 290 ha was the balance of 300 ha retired from irrigation and 10 ha of expansion. Areas retired were mainly for urban development.

Salinity impact zones

The Merbein district is in the lowest salinity impact zone, L1 and in the high salinity impact zone, HIZ.

In 2024, the irrigable area of 2,855 ha was:

- 35% (995 ha) in L1; and
- 65% (1,860 ha) in HIZ.

From 1997 to 2024 the irrigable area in:

- L1 decreased by 35 ha, a 3% decrease from 1,030 to 995 ha; and
- HIZ decreased by 255 ha, a 12% decrease from 2,115 to 1,860 ha, predominantly areas retired from irrigation for urban development.

Irrigation methods

The dominant irrigation method in the Merbein district was furrow irrigation from 1997 to 2006, then drip irrigation from 2009 to 2024.

In 2024, the irrigable area of 2,855 ha comprised:

- 39% (1,105 ha) drip irrigation;
- 17% (480 ha) low level irrigation;
- 5% (140 ha) overhead sprinklers;
- 2% (70 ha) furrow irrigation; and
- 37% (1,060 ha) vacant, not irrigated.

Irrigation properties

In 2024, there were approximately 250 irrigation properties with an average property size (irrigable area) of 11 ha.

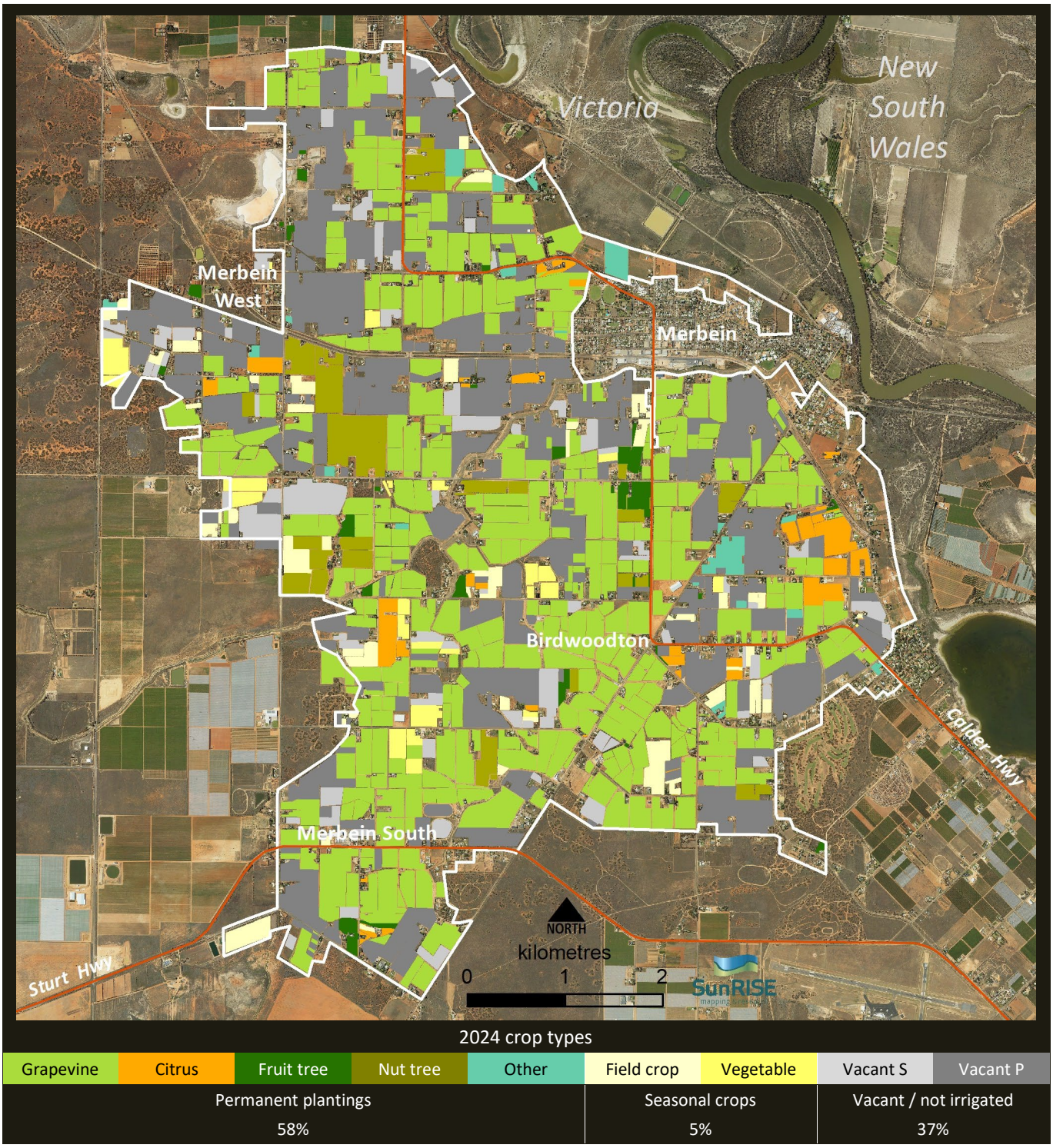
From 1997 to 2024:

- the number of properties decreased by 80, a 24% decrease from 330 to 250 properties;
- properties with an irrigable area less than 40 ha decreased by 93, while the number over 40 ha increased by 13; and
- average property size (irrigable area) increased from 10 to 11 ha per property.

2.6.1 Merbein irrigation district - crop types in 2024

Map 10 shows the Merbein irrigation district with crop types in 2024.

The aerial photography was flown in January 2024 (*source: Coordinated Imagery Program, DTP Victoria*).



Map 10: Merbein irrigation district showing crop types in 2024

2.6.2 Merbein irrigation district - crop types from 1997 to 2024

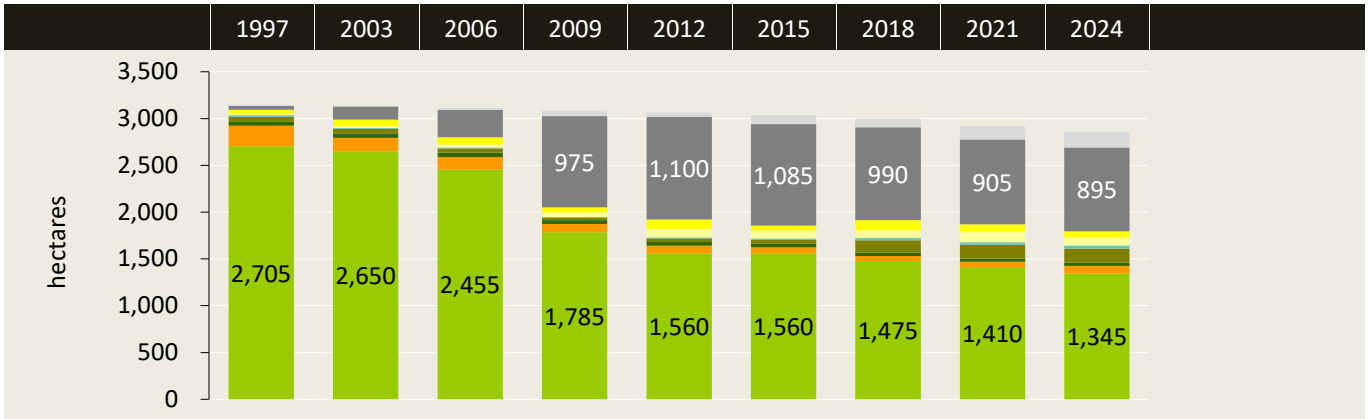
Figure 48 summarises crop types in the Merbein irrigation district from 1997 to 2024. The dominant crop type was dried grapes from 1997 to 2018, except in 2009 when wine grapes were temporarily dominant. Table grapes were the dominant crop from 2021 to 2024.

In 2024, the main plantings were:

1. table grapes, 835 ha (29% of the irrigable area);
2. dried grapes, 350 ha (12% of the irrigable area); and
3. wine grapes, 160 ha (6% of the irrigable area).

From 1997 to 2024, the main planting changes were:

- dried grapes decreased by 1,290 ha, a 79% decrease from 1,640 to 350 ha;
- wine grapes decreased by 755 ha, an 83% decrease from 915 to 160 ha; and
- table grapes increased by 685 ha, a 457% increase from 150 to 835 ha.



Crop type		1997	2003	2006	2009	2012	2015	2018	2021	2024	% of 2024	Change 1997-2024
Permanent	Grape Dried	1,640	1,295	1,115	725	710	695	620	385	350	12%	-1,290
	Grape Table	150	240	275	270	310	390	550	775	835	29%	+685
	Grape Wine	915	1,115	1,065	790	540	475	305	250	160	6%	-755
	Citrus	220	145	135	90	80	65	55	60	80	3%	-140
	Fruit Olive	5	10	10	10	15	15	15	10	10	<1%	+5
	Fruit Other	35	35	35	30	35	25	25	25	25	1%	-10
	Nut Almond	40	35	30	15	15	20	25	25	25	1%	-15
	Nut Other	15	15	15	10	15	20	105	120	125	4%	+110
	Other	15	10	10	10	10	15	25	30	35	1%	+20
Seasonal	Field Crop	20	20	30	45	90	80	85	115	85	3%	+65
	Veg. Carrot	-	-	-	-	-	-	-	-	-	-	-
	Veg. Potato	-	-	-	-	-	-	-	-	-	-	-
	Veg. Other	40	70	80	55	100	55	105	75	65	2%	+25
Vacant P		40	140	290	975	1,100	1,085	990	905	895	31%	+855
Vacant S		10	10	20	60	45	95	95	140	165	6%	+155
Total (ha)		3,145	3,140	3,110	3,085	3,065	3,035	3,000	2,915	2,855	100%	-290
Dominant		dried			wine	dried			table			

Figure 48: Merbein irrigation district - crop types from 1997 to 2024

2.6.3 Merbein irrigation district - new permanent plantings

Figure 49 shows the proportion of permanent crops planted or top-worked in the previous three years in the Merbein irrigation district from 1997 to 2024.

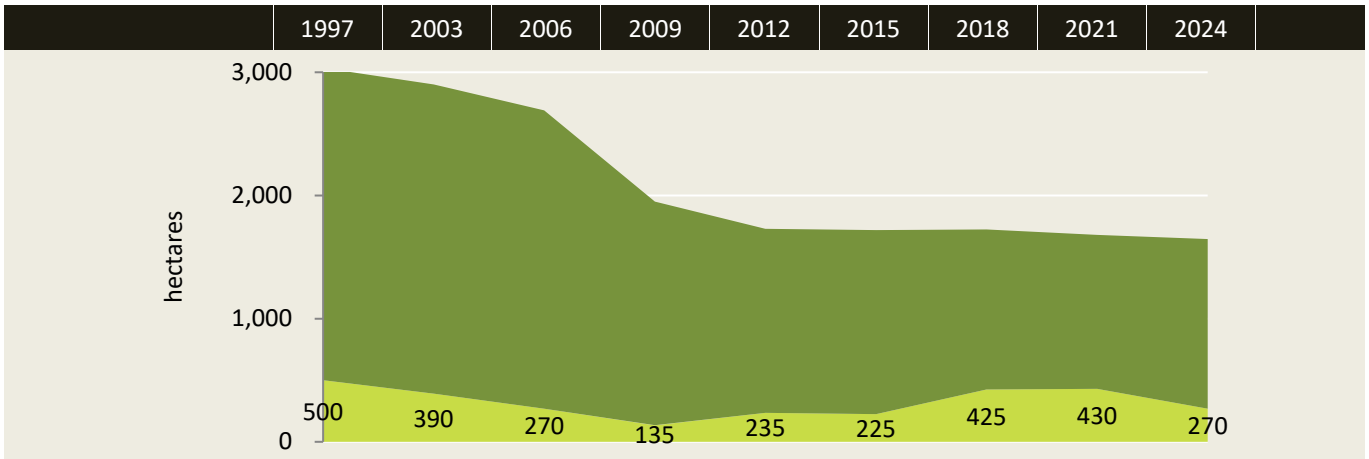
The information provides an indication of development activity that doesn't necessarily involve a change in area or crop type as it includes replanting or top working to different varieties. The figures are conservative, as top worked plantings can be difficult to interpret from the three-yearly aerial imagery, particularly for grapevines.

In 2024:

- 270 ha (16%) of permanent crops were planted or top-worked within the previous three years.
- These new plantings were:
    1. table grapes (135 ha);
    2. dried grapes (50 ha);
    3. citrus (35 ha);
    4. wine grapes (20 ha);
    5. nurseries (15 ha);
    6. nut trees (10 ha); and
    7. fruit trees (5 ha).

From 1997 to 2024:

- The proportion of new permanent plantings was at its lowest in 2009 with 7% (135 ha) planted in the previous three years and highest in 2021 with 26% (430 ha) planted in the previous three years.



Permanent plantings	1997	2003	2006	2009	2012	2015	2018	2021	2024	% of 2024
≤3yr old plantings	500	390	270	135	235	225	425	430	270	16%
>3yr old plantings	2,535	2,510	2,420	1,815	1,495	1,495	1,300	1,250	1,375	84%
Total (ha)	3,035	2,900	2,690	1,950	1,730	1,720	1,725	1,680	1,645	100%
% 3year development	16%	13%	10%	7%	14%	13%	25%	26%	16%	
Average 3-year dev.	16%									

Figure 49: Merbein irrigation district - three-year old permanent plantings from 1997 to 2024

2.6.4 Merbein irrigation district - planting trends

Figure 50 summarises planting trends with respect to permanent crops, seasonal crops and vacant areas in the Merbein irrigation district from 1997 to 2024.

The proportion of permanent plantings, seasonal cropping and vacant areas changed from:

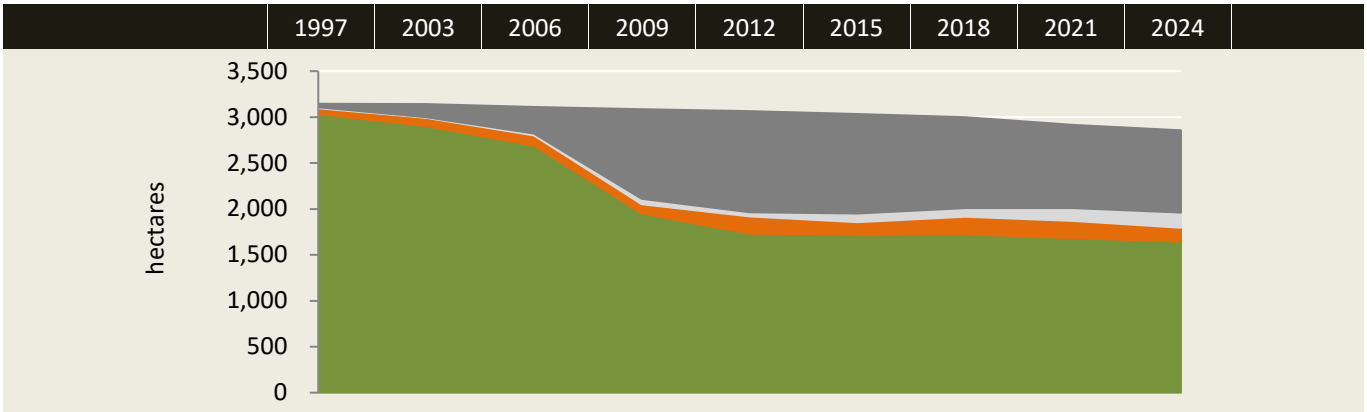
- 97% permanent, 2% seasonal and 1% vacant in 1997; to
- 58% permanent, 5% seasonal and 37% vacant in 2024.

In 2024, the irrigable area of 2,855 ha comprised:

- 58% (1,645 ha) irrigated permanent plantings;
- 5% (150 ha) irrigated seasonal crops;
- 31% (895 ha) vacant, previously an irrigated permanent planting; and
- 6% (165 ha) vacant, previously an irrigated seasonal crop.

From 1997 to 2024:

- irrigated permanent crops decreased by 1,390 ha, from 3,035 to 1,645 ha;
- irrigated seasonal crops increased by 90 ha, from 60 to 150 ha;
- vacant areas, previously irrigated permanent plantings increased by 855 ha, from 40 to 895 ha; and
- vacant areas, previously irrigated seasonal crops increased by 155 ha, from 10 to 165 ha.



	1997	2003	2006	2009	2012	2015	2018	2021	2024	Change 1997-2024
Permanent - irrigated	3,035	2,900	2,690	1,950	1,730	1,720	1,725	1,680	1,645	-1,390
Seasonal - irrigated	60	90	110	100	190	135	190	190	150	+90
Total irrigated (ha)	3,095	2,990	2,800	2,050	1,920	1,855	1,915	1,870	1,795	-1,300
Vacant - permanent	40	140	290	975	1,100	1,085	990	905	895	+855
Vacant - seasonal	10	10	20	60	45	95	95	140	165	+155
Total irrigable (ha)	3,145	3,140	3,110	3,085	3,065	3,035	3,000	2,915	2,855	-290
% Permanent	97%	92%	86%	63%	56%	57%	58%	58%	58%	
% Seasonal	2%	3%	4%	3%	6%	4%	6%	6%	5%	
% Vacant P	1%	4%	9%	32%	36%	36%	33%	31%	31%	
% Vacant S	<1%	<1%	1%	2%	1%	3%	3%	5%	6%	

Figure 50: Merbein irrigation district - planting trends from 1997 to 2024

2.6.5 Merbein irrigation district - irrigation development

Map 11 shows irrigation development from 1997 to 2024 in the Merbein irrigation district with respect to new development (expansion) and areas retired from irrigation.

- The irrigable area decreased by 290 ha, a 9% decrease from 3,145 ha in 1997 to 2,855 ha in 2024.
- The net decrease of 290 ha was the balance of 300 ha retired from irrigation and 10 ha of expansion.

		Hectares			% change since 1997
Irrigable area in 1997 (1996-97 season)		3,145			
Retired between 1997 and 2024			-300		-10%
Expansion between 1997 and 2024			+10		+<1%
Net change from 1997 to 2024				-290	-9%
Irrigable area in 2024 (2023-24 season)				2,855	

Map 11: Merbein irrigation district - irrigation development from 1997 to 2024

2.6.6 Merbein irrigation district - salinity impact zones

Figure 51 summarises river salinity impact zones of irrigated areas in the Merbein irrigation district from 1997 to 2024. The Merbein district is in the lowest salinity impact zone, L1 and the high salinity impact zone, HIZ.

In 2024, the irrigable area of 2,855 ha comprised:

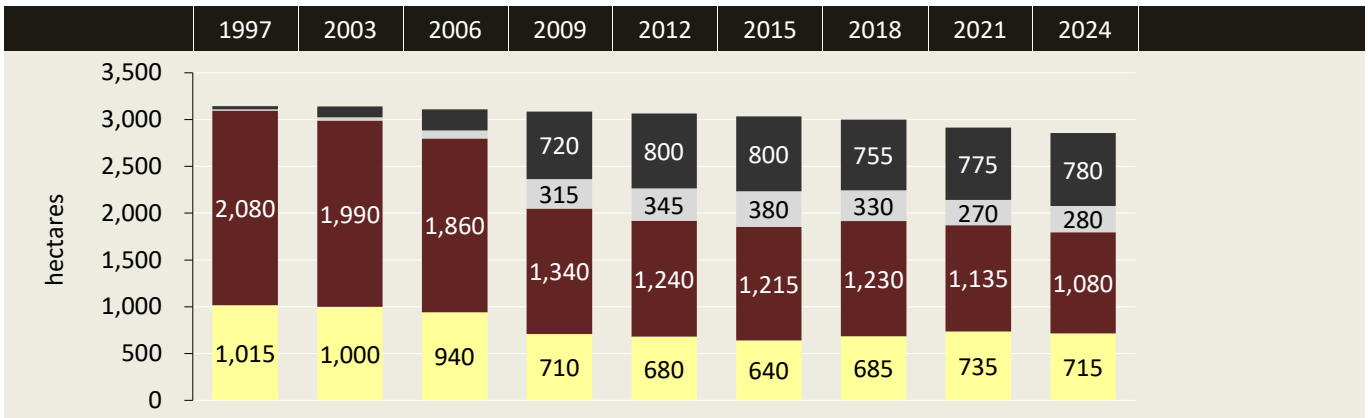
- 35% (995 ha) in L1; and
- 65% (1,860 ha) in the HIZ.

From 1997 to 2024, the area irrigated in:

- L1 decreased by 300 ha, a 30% decrease from 1,015 to 715 ha; and
- HIZ decreased by 1,000 ha, a 48% decrease from 2,080 to 1,080 ha.

From 1997 to 2024, the irrigable area in:

- L1 decreased by 35 ha, a 3% decrease from 1,030 to 995 ha; and
- HIZ decreased by 255 ha, a 12% decrease from 2,115 to 1,860 ha. The net decrease in the HIZ was mainly areas retired from irrigation for housing developments.



Salinity impact zone		1997	2003	2006	2009	2012	2015	2018	2021	2024	% in 2024	Change 1997-2024
Irrigated	L1	1,015	1,000	940	710	680	640	685	735	715	25%	-300
	L2	-	-	-	-	-	-	-	-	-	-	-
	L3	-	-	-	-	-	-	-	-	-	-	-
	L4	-	-	-	-	-	-	-	-	-	-	-
	HIZ	2,080	1,990	1,860	1,340	1,240	1,215	1,230	1,135	1,080	38%	-1,000
Not Irrigated	L1	15	35	85	315	345	380	330	270	280	10%	+265
	L2	-	-	-	-	-	-	-	-	-	-	-
	L3	-	-	-	-	-	-	-	-	-	-	-
	L4	-	-	-	-	-	-	-	-	-	-	-
	HIZ	35	115	225	720	800	800	755	775	780	27%	+745
Total (ha)		3,145	3,140	3,110	3,085	3,065	3,035	3,000	2,915	2,855	100%	-290
Dominant zone		HIZ										

Figure 51: Merbein irrigation district - irrigable area in each salinity impact zone from 1997 to 2024

2.6.7 Merbein irrigation district - irrigation methods

Figure 52 summarises irrigation methods in the Merbein irrigation district from 1997 to 2024.

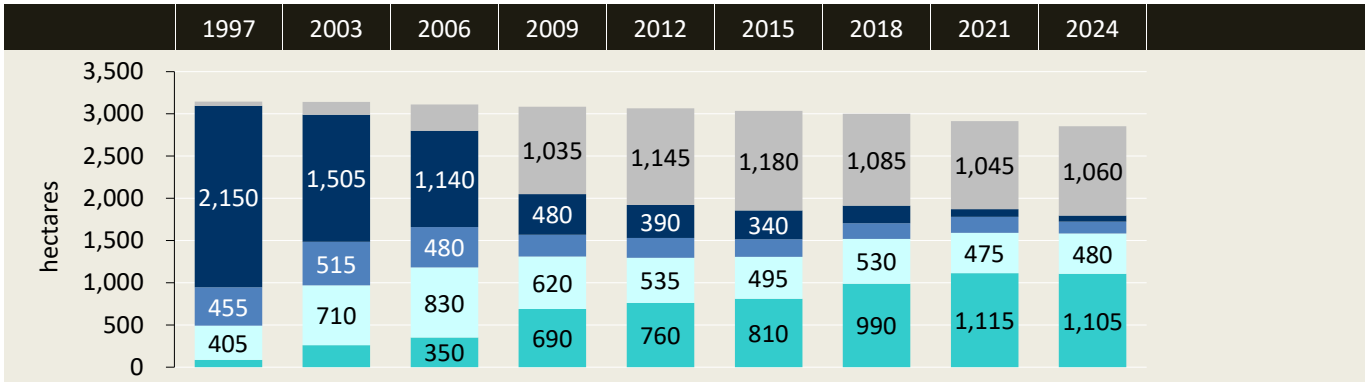
The dominant irrigation method in the Merbein district was furrow irrigation from 1997 to 2006, then drip irrigation from 2009 to 2024.

In 2024, the irrigable area of 2,855 ha comprised:

- 39% (1,105 ha) drip irrigation;
- 17% (480 ha) low level irrigation;
- 5% (140 ha) overhead sprinklers;
- 2% (70 ha) furrow irrigation; and
- 37% (1,060 ha) vacant, not irrigated.

From 1997 to 2024:

- drip irrigation increased by 1,020 ha, a 1,200% increase from 85 to 1,105 ha;
- low level irrigation increased by 75 ha, a 19% increase from 405 to 480 ha;
- overhead irrigation decreased by 315 ha, a 69% decrease from 455 to 140 ha; and
- furrow irrigation decreased by 2,080 ha, a 97% decrease from 2,150 to 70 ha.



Irrigation method[17]	1997	2003	2006	2009	2012	2015	2018	2021	2024	% in 2024	Change 1997-2024
Drip	85	260	350	690	760	810	990	1,115	1,105	39%	+1,020
Low level	405	710	830	620	535	495	530	475	480	17%	+75
Overhead	455	515	480	260	235	210	185	190	140	5%	-315
Furrow	2,150	1,505	1,140	480	390	340	210	90	70	2%	-2,080
Vacant	50	150	310	1,035	1,145	1,180	1,085	1,045	1,060	37%	+1,010
Total (ha)	3,145	3,140	3,110	3,085	3,065	3,035	3,000	2,915	2,855	100%	-290
Dominant	furrow			drip							

Figure 52: Merbein irrigation district - irrigation methods from 1997 to 2024

[17] Overhead irrigation includes pivots and lateral move systems. Furrow includes flood irrigation. (Refer to Table 4.)

2.6.8 Merbein irrigation district - property change

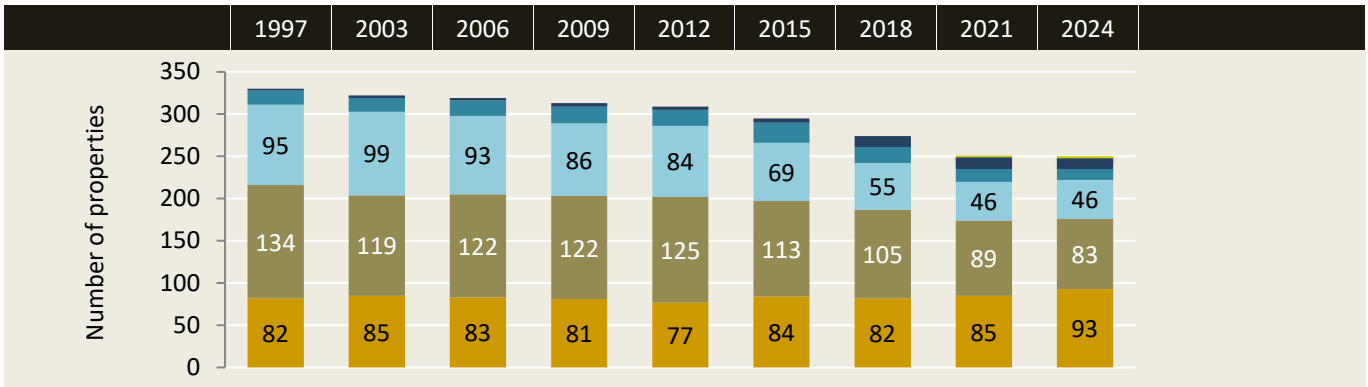
Figure 53 provides estimates of property numbers and average property size (irrigable area) in the Merbein irrigation district from 1997 to 2024.

In 2024:

- there were approximately 250 irrigation properties; and
- most properties (89%) had an irrigable area less than 20 ha.

From 1997 to 2024:

- the number of properties decreased by 80, a 24% decrease from 330 to 250 properties;
- properties with an irrigable area less than 40 ha decreased by 93, while the number over 40 ha increased by 13; and
- average property size (irrigable area) increased from 10 to 11 ha per property.



Property size (irrigable area)	1997	2003	2006	2009	2012	2015	2018	2021	2024	% in 2024	Change 1997-2024
1 to 5 ha	82	85	83	81	77	84	82	85	93	37%	+11
5 to 10 ha	134	119	122	122	125	113	105	89	83	33%	-51
10 to 20 ha	95	99	93	86	84	69	55	46	46	19%	-49
20 to 40 ha	17	16	18	20	19	24	19	15	13	5%	-4
40 to 100 ha	2	3	3	4	4	5	13	14	13	5%	+11
100 to 500 ha	0	0	0	0	0	0	0	2	2	1%	+2
> 500 ha	-	-	-	-	-	-	-	-	-	-	-
Total properties	330	322	319	313	309	295	274	251	250	100%	-80
Average size (ha)	10	10	10	10	10	10	11	12	11		

Figure 53: Merbein irrigation district - property numbers and sizes from 1997 to 2024

3. Private diverters

3.1 Private diverters summary

In summary for private diverter river reaches: Nyah, Boundary Bend, Wemen, Colignan to Yatpool, Mildura, and Lock 10 to South Australia

Crop types in 2024

The main plantings in the private diverter river reaches in 2024 (Table 12, page 105) were:

1. almonds, 26,200 ha (40% of the irrigable area);
2. wine grapes, 5,035 ha (8% of the irrigable area);
3. citrus, 4,895 ha (7% of the irrigable area);
4. table grapes, 4,650 ha (7% of the irrigable area);
5. field crops, 4,325 ha (7% of the irrigable area); and
6. olives, 3,635 ha (6% of the irrigable area).

Crop type changes from 1997 to 2024

The dominant crop type changed from field crops in 1997 to wine grapes from 2003 to 2006 then almonds from 2009 to 2024 (**Figure 54, page 106**).

The main crop type changes from 1997 to 2024 were:

- almonds increased by 24,570 ha, a 1,507% increase from 1,630 to 26,200 ha;
- olives increased by 3,570 ha, a 5,492% increase from 65 to 3,635 ha;
- table grape plantings increased by 3,540 ha, a 319% increase from 1,110 to 4,650 ha;
- field crops decreased by 1,640 ha, a 27% decrease from 5,965 to 4,325 ha;
- citrus increased by 1,460 ha, a 43% increase from 3,435 to 4,895 ha; and
- fruit trees other than olives (mainly stone fruit and avocados), increased by 1,175 ha, a 204% increase from 575 to 1,750 ha.

Rate of change from 1997 to 2024

On average, the irrigated area across private diverter river reaches increased by 1,305 ha per year for twenty-seven years from 1997 to 2024 (**Table 13, page 107**).

Permanent plantings increased by an average of 1,361 ha per year, while seasonal cropping averaged a decrease of 57 ha per year.

Permanent planting areas that had been dried-off through the Millennium drought started to come back into production after 2015. Hence, vacant areas (i.e. 'Vacant P') started to decrease after 2015. This trend continued until the period from 2021 to 2024 when there was a net increase in vacant areas of 760 ha across the private diverter reaches.

In summary for private diverter river reaches: Nyah, Boundary Bend, Wemen, Colignan to Yatpool, Mildura, and Lock 10 to South Australia

New permanent plantings (planted or top-worked in the previous three years)

In 2024, 4,570 ha (9%) of permanent crops in the private diverter river reaches were planted or top-worked within the previous three years (**Figure 55, page 108**). These new plantings were mainly table grapes and citrus:

1. table grapes (1,175 ha);
2. citrus (980 ha);
3. pistachios (675 ha);
4. almonds (600 ha);
5. olives (335 ha);
6. fruit trees other than olives (310 ha, mainly stone fruit and avocados);
7. dried grapes (270 ha);
8. wine grapes (205 ha); and
9. miscellaneous (20 ha).

The proportion of new plantings in each river reach was: 33% in Colignan, 23% Wemen, 16% Nyah, 13% Boundary Bend, 7% Lock 10 to SA and 7% Mildura private diverters.

Planting trends - permanent plantings, seasonal crops and vacant areas

The proportion of permanent plantings, seasonal cropping and vacant areas in the private diverter river reaches (**Figure 56, page 109**) changed from:

- 53% permanent, 43% seasonal and 4% vacant in 1997; to
- 74% permanent, 12% seasonal and 14% vacant in 2024.

In 2024, the irrigable area of 65,560 ha comprised:

- 74% (48,650 ha) irrigated permanent plantings;
- 12% (7,955 ha) irrigated seasonal crops;
- 5% (3,305 ha) vacant, previously an irrigated permanent planting; and
- 9% (5,650 ha) vacant, previously an irrigated seasonal crop.

Irrigation development - expansion and retired areas

Across the private diverter river reaches, the irrigable area increased by 43,305 ha, a 195% increase from 22,255 ha in 1997 to 65,560 ha in 2024 (**Figure 57, page 110**).

The net increase of 43,305 ha was the balance of 1,630 ha retired from irrigation and 44,935 ha of expansion.

Expansion occurred in each of the six river reaches between 1997 and 2024. The largest growth areas were:

- the Boundary Bend river reach with a net increase in irrigable area of 16,630 ha (+324%); and
- the Wemen river reach with a net increase in irrigable area of 11,845 ha (+551%).

In summary for private diverter river reaches: Nyah, Boundary Bend, Wemen, Colignan to Yatpool, Mildura, and Lock 10 to South Australia

Salinity impact zones

The dominant salinity impact zone across irrigable areas in the private diverter river reaches changed from L2 in 1997 to L1 from 2003 to 2024 (**Figure 58, page 111**).

In 2024, the irrigable area of 65,560 ha comprised:

- 58% (37,990 ha) in the lowest salinity impact zone, L1;
- 20% (13,310 ha) in L2;
- 4% (2,495 ha) in L3;
- 14% (8,935 ha) in L4; and
- 4% (2,830 ha) in the high salinity impact zone, HIZ.

From 1997 to 2024 the irrigable area in:

- L1 to L4 increased by 43,410 ha, a 225% increase from 19,320 ha to 62,730 ha;
- HIZ decreased by 105 ha, a 4% decrease from 2,935 ha to 2,830 ha.

Salinity impact zones of retired and expansion areas (Table 14, page 112) were:

- 28% (450 ha) of areas retired from irrigation were in the high impact zone (HIZ); and
- 73% of expansion areas were in the lowest salinity impact zone (L1), 26% were in zones L2 to L4 and 1% were in the high impact zone, HIZ. (Expansion in the HIZ was development on existing irrigation properties.)

Irrigation methods

The dominant irrigation method in the private diverter river reaches changed from overhead sprinklers in 1997 to drip irrigation from 2003 to 2024 (**Figure 60, page 113**). In 2024, the irrigable area of 65,560 ha comprised:

- 70% (45,825 ha) drip irrigation;
- 6% (3,845 ha) low level irrigation;
- 9% (5,735 ha) overhead sprinklers, including centre pivot and lateral move systems;
- 2% (1,200 ha) furrow and flood irrigation; and
- 14% (8,955 ha) vacant, not irrigated.

From 1997 to 2024:

- drip irrigation increased by 42,665 ha, a 1,350% increase from 3,160 to 45,825 ha;
- low level irrigation increased by 630 ha, a 20% increase from 3,215 to 3,845 ha;
- overhead irrigation decreased by 3,420 ha, a 37% decrease from 9,155 to 5,735 ha; and
- furrow irrigation decreased by 4,650 ha, a 79% decrease from 5,850 to 1,200 ha.

Irrigation properties

In 2024, there were approximately 387 irrigation properties with an average property size (irrigable area) of 169 ha (**Figure 62, page 115**). From 1997 to 2024:

- the number of properties decreased by 113, a 23% decrease from 500 to 387 properties;
- properties with an irrigable area less than 100 ha decreased by 164, while the number over 100 ha increased by 51; and
- average property size (irrigable area) increased from 45 to 169 ha per property.

3.1.1 Private diverters summary - crop types in 2024

Table 12 lists crop types across the private diverter river reaches in 2024.

The main irrigated crops were:

1. almonds, 26,200 ha (40% of the irrigable area);
2. wine grapes, 5,035 ha (8% of the irrigable area);
3. citrus, 4,895 ha (7% of the irrigable area);
4. table grapes, 4,650 ha (7% of the irrigable area);
5. field crops (winter and summer), 4,325 ha (7% of the irrigable area);
6. olives, 3,635 ha (6% of the irrigable area);
7. fruit trees other than olives, 1,750 ha (3% of the irrigable area);
8. potatoes, 1,570 ha (2% of the irrigable area);
9. vegetables other than carrots and potatoes, 1,410 ha (2% of the irrigable area); and
10. nut trees other than almonds, 1,305 ha (2% of the irrigable area).

Table 12: Private diverters - crop types in 2024

	Crop type		2024 (ha)	2024 %	Description
Permanent plantings	Grapevine	Dried	870	1%	Currant, sultana and raisin varieties
		Table	4,650	7%	Red, white and black varieties
		Wine	5,035	8%	Red & white varieties & a small proportion of juiced grapes
	Citrus		4,895	7%	Mainly navels and mandarins. Also: grapefruit, lemon, lime, blood orange, common orange, pummelo, tangelo & Valencia.
	Fruit tree	Olive	3,635	6%	
		Other	1,750	3%	Mainly stone fruit and avocados. Also: date palm, fig, jujube, mango, persimmon, pome fruit and pomegranate.
	Nut tree	Almond	26,200	40%	
		Other	1,305	2%	Mainly pistachio.
	Other	Miscellaneous	310	<1%	Mainly tree plantations and nurseries. Also: aquaculture, berries, fresh flowers and native plants.
	Permanent crops (sub-total)		48,650	74%	
Seasonal crops	Field crop	Summer	210	<1%	Field crops irrigated/active from November to March. Mainly pasture, lucerne, hemp and maize.
		Winter	4,115	6%	Field crops irrigated/active July-October or April-June. Mainly cereal and fodder crops.
	Vegetable	Carrot	650	1%	
		Potato	1,570	2%	
		Other	1,410	2%	Mainly salad greens and cucurbits (e.g. cucumber, melons, pumpkin, zucchini). Also: asparagus, bean, beetroot, broccoli, capsicum, cauliflower, chilli, eggplant, garlic, herbs, onion, sweet corn, tomato and other vegetables.
	Seasonal crops (sub-total)		7,955	12%	
Vac.	Vacant P		3,305	5%	Vacant (not irrigated), previously a permanent crop
	Vacant S		5,650	9%	Vacant (not irrigated), previously a seasonal crop
	Total irrigable area (ha)		65,560	100%	

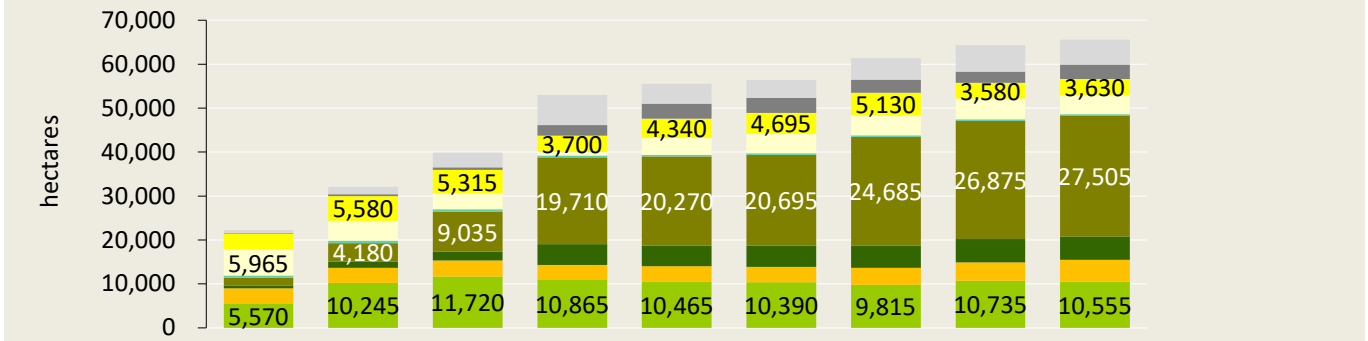
3.1.2 Private diverters summary - crop types from 1997 to 2024

Figure 54 summarises crop types across the six private diverter river reaches from 1997 to 2024.

The dominant crop type changed from field crops in 1997 to wine grapes from 2003 to 2006 then almonds from 2009 to 2024.

From 1997 to 2024, the main planting changes were:

- almond trees increased by 24,570 ha, a 1,507% increase from 1,630 to 26,200 ha;
- olive trees increased by 3,570 ha, a 5,492% increase from 65 to 3,635 ha;
- table grape plantings increased by 3,540 ha, a 319% increase from 1,110 to 4,650 ha;
- field crops decreased by 1,640 ha, a 27% decrease from 5,965 to 4,325 ha;
- other fruit trees (mainly stone fruit and avocados) increased by 1,175 ha, a 204% increase from 575 to 1,750 ha; and
- other nuts (mainly pistachios) increased by 1,160 ha, an 800% increase from 145 to 1,305 ha.



Crop type		1997	2003	2006	2009	2012	2015	2018	2021	2024	% of 2024	Change 1997-2024
Permanent	Grape Dried	370	790	820	735	840	950	1,270	1,190	870	1%	+500
	Grape Table	1,110	1,830	1,915	1,795	2,165	2,555	3,385	4,100	4,650	7%	+3,540
	Grape Wine	4,090	7,625	8,985	8,335	7,460	6,885	5,160	5,445	5,035	8%	+945
	Citrus	3,435	3,435	3,645	3,445	3,560	3,515	3,815	4,195	4,895	7%	+1,460
	Fruit Olive	65	630	1,170	3,945	3,645	3,510	3,670	3,640	3,635	6%	+3,570
	Fruit Other	575	760	840	800	1,085	1,245	1,435	1,640	1,750	3%	+1,175
	Nut Almond	1,630	4,015	8,870	19,520	20,050	20,455	24,300	26,240	26,200	40%	+24,570
	Nut Other	145	165	165	190	220	240	385	635	1,305	2%	+1,160
	Other	470	575	605	470	360	370	405	375	310	<1%	-160
Seasonal	Field Crop	5,965	4,580	3,605	820	3,865	4,455	4,540	4,730	4,325	7%	-1,640
	Veg. Carrot	1,565	2,580	2,510	2,460	2,370	2,520	1,440	670	650	1%	-915
	Veg. Potato	1,185	1,715	1,510	610	875	905	1,795	1,435	1,570	2%	+385
	Veg. Other	775	1,285	1,295	630	1,095	1,270	1,895	1,475	1,410	2%	+635
Vacant P		185	420	565	2,355	3,420	3,460	2,955	2,545	3,305	5%	+3,120
Vacant S		690	1,680	3,380	6,850	4,505	4,080	4,900	6,070	5,650	9%	+4,960
Total (ha)		22,255	32,085	39,880	52,960	55,515	56,415	61,350	64,385	65,560	100%	+43,305
Dominant		field	wine grape		almond							

Figure 54: Private diverters - crop types from 1997 to 2024

3.1.3 Private diverters summary - rate of change

Table 13 summarises the net change in planted area by crop type for private diverters in the Mallee catchment. There are eight change periods from 1997 to 2024. Each change period spans three years except for the first period from 1997 to 2003, hence, an average change per year figure is provided so that figures can be compared across the change periods.

Cells shaded blue in the table below denote the permanent planting with the highest net **increase** within the specified change period and red shading denotes the permanent planting with the highest net **decrease**.

Figures highlight the growth periods for almond, olive and table grape plantings, and periods of removal of wine and dried grape plantings. They also highlight fluctuations in seasonal cropping in response to water availability, particularly from 2003 to 2009 in the Millennium drought.

On average, the irrigated area across the private diverter reaches increased by 1,305 ha per year from 1997 to 2024. And the area of permanent plantings increased by an average of 1,361 ha per year in the twenty-seven-year period.

The highest growth period for permanent plantings was from 2006 to 2009 with an increase in plantings of 12,220 ha. The net increase was the result of a decrease in all plantings except for almonds, olives and pistachios.

Almond plantings increased in every change period until 2021 to 2024 when there was a net decrease of 40 ha. There were few new almond plantings from 2021 to 2024 and there were losses in some low-lying areas due to wet conditions associated with the 2022 Murray River flood event.

Table 13: Private diverters - rate of change in crop types from 1997 to 2024

Crop type	Change period								Total 1997-24
	1997-03	2003-06	2006-09	2009-12	2012-15	2015-18	2018-21	2021-24	
Grape Dried	+420	+30	-85	+105	+110	+320	-80	-320	+500
Grape Table	+720	+85	-120	+370	+390	+830	+715	+550	+3,540
Grape Wine	+3,535	+1,360	-650	-875	-575	-1,725	+285	-410	+945
Citrus	0	+210	-200	+115	-45	+300	+380	+700	+1,460
Fruit Olive	+565	+540	+2,775	-300	-135	+160	-30	-5	+3,570
Fruit Other	+185	+80	-40	+285	+160	+190	+205	+110	+1,175
Nut Almond	+2,385	+4,855	+10,650	+530	+405	+3,845	+1,940	-40	+24,570
Nut Other	+20	0	+25	+30	+20	+145	+250	+670	+1,160
Miscellaneous	+105	+30	-135	-110	+10	+35	-30	-65	-160
Change: permanent crops	+7,935	+7,190	+12,220	+150	+340	+4,100	+3,635	+1,190	+36,760
Ave. change/year perm.	+1,323	+2,397	+4,073	+50	+113	+1,367	+1,212	+397	+1,361
Field Crop	-1,385	-975	-2,785	+3,045	+590	+85	+190	-405	-1,640
Vegetable	2,055	-265	-1,615	+640	+355	+435	-1,550	+50	+105
Change: seasonal crops	+670	-1,240	-4,400	+3,685	+945	+520	-1,360	-355	-1,535
Ave. change/year seas.	+112	-207	-733	+614	+158	+87	-227	-59	-57
Change: irrigated area (ha)	+8,605	+5,950	+7,820	+3,835	+1,285	+4,620	+2,275	+835	+35,225
Ave. change/year irrigated	+1,434	+1,983	+2,607	+1,278	+428	+1,540	+758	+278	+1,305
Vacant P	+235	+145	+1,790	+1,065	+40	-505	-410	+760	+3,120
Vacant S	+990	+1,700	+3,470	-2,345	-425	+820	+1,170	-420	+4,960
Change: irrigable area (ha)	+9,830	+7,795	+13,080	+2,555	+900	+4,935	+3,035	+1,175	+43,305
Ave. change/year irrigable	+1,638	+2,598	+4,360	+852	+300	+1,645	+1,012	+392	+1,604

3.1.4 Private diverters summary - new permanent plantings

Figure 55 shows the proportion of permanent crops planted or top-worked in the previous three years by private diverters from 1997 to 2024.

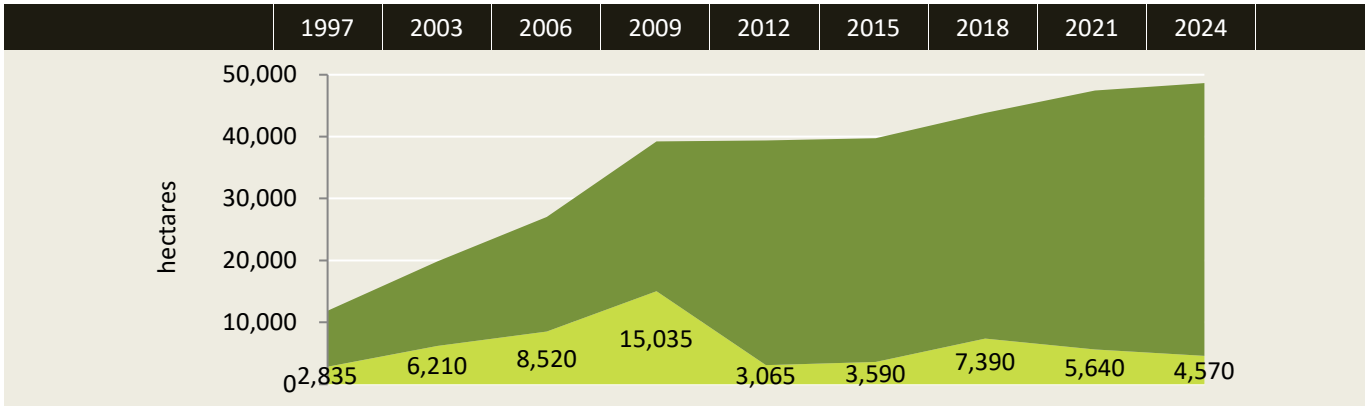
The information provides an indication of development activity that doesn't necessarily involve a change in area or crop type as it includes replanting or top working to different varieties. The figures are conservative, as top worked plantings can be difficult to interpret from the three-yearly aerial imagery, particularly for grapevines.

In 2024:

- 4,570 ha (9%) of permanent crops were planted or top-worked within the previous three years.
- These new plantings were:
    1. table grapes (1,175 ha);
    2. citrus (980 ha);
    3. pistachios (675 ha);
    4. almonds (600 ha);
    5. olives (335 ha);
    6. fruit trees other than olives (310 ha, mainly stone fruit and avocados);
    7. dried grapes (270 ha);
    8. wine grapes (205 ha); and
    9. miscellaneous (20 ha).
- New plantings by river reach were: Colignan 1,510 ha, Wemen 1,065 ha, Nyah 750 ha, Boundary Bend 600 ha, Mildura 340 ha and Lock 10 to South Australia 305 ha.

From 1997 to 2024:

- The proportion of new permanent plantings was at its lowest in 2012 with 8% (3,065 ha) planted in the previous three years and highest in 2009 with 38% (15,035 ha) planted in the previous three years.



Permanent plantings	1997	2003	2006	2009	2012	2015	2018	2021	2024	% of 2024
≤3yr old plantings	2,835	6,210	8,520	15,035	3,065	3,590	7,390	5,640	4,570	9%
>3yr old plantings	9,055	13,615	18,495	24,200	36,320	36,135	36,435	41,820	44,080	91%
Total (ha)	11,890	19,825	27,015	39,235	39,385	39,725	43,825	47,460	48,650	100%
% 3year development	24%	31%	32%	38%	8%	9%	17%	12%	9%	
Average 3-year dev.	20%									

Figure 55: Private diverters - three-year old permanent plantings from 1997 to 2024

3.1.5 Private diverters summary - planting trends

Figure 56 summarises planting trends with respect to permanent crops, seasonal crops and vacant areas in the private diverter river reaches from 1997 to 2024.

The proportion of permanent plantings, seasonal cropping and vacant areas changed from:

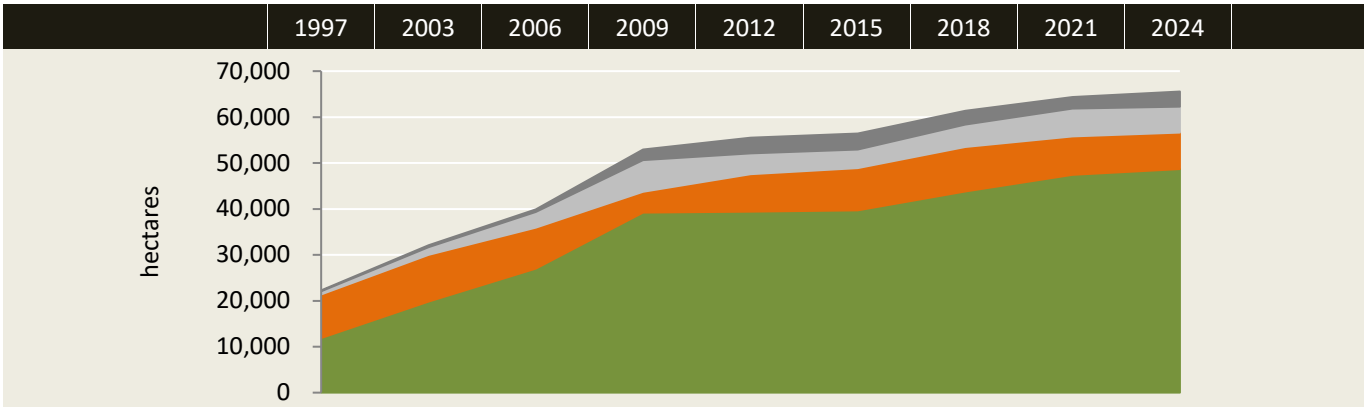
- 53% permanent, 43% seasonal and 4% vacant in 1997; to
- 74% permanent, 12% seasonal and 14% vacant in 2024.

In 2024, the irrigable area of 65,560 ha comprised:

- 74% (48,650 ha) irrigated permanent plantings;
- 12% (7,955 ha) irrigated seasonal crops;
- 5% (3,305 ha) vacant, previously an irrigated permanent planting; and
- 9% (5,650 ha) vacant, previously an irrigated seasonal crop.

From 1997 to 2024:

- irrigated permanent crops increased by 36,760 ha, from 11,890 to 48,650 ha;
- irrigated seasonal crops decreased by 1,535 ha, from 9,490 to 7,955 ha;
- vacant areas, previously irrigated permanent plantings increased by 3,120 ha, from 185 to 3,305 ha; and
- vacant areas, previously irrigated seasonal crops increased by 4,960 ha, from 690 to 5,650 ha.



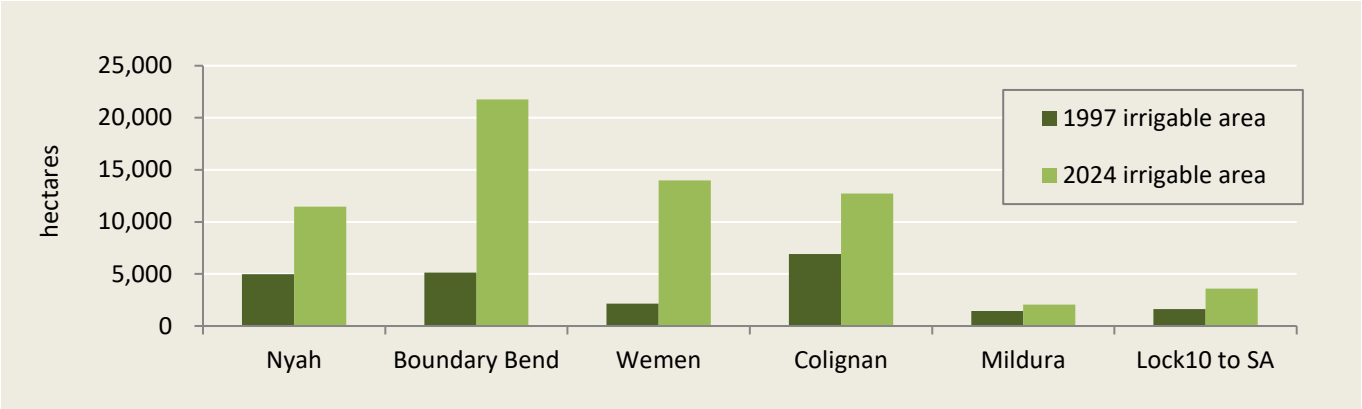
	1997	2003	2006	2009	2012	2015	2018	2021	2024	Change 1997-2024
Permanent - irrigated	11,890	19,825	27,015	39,235	39,385	39,725	43,825	47,460	48,650	+36,760
Seasonal - irrigated	9,490	10,160	8,920	4,520	8,205	9,150	9,670	8,310	7,955	-1,535
Total irrigated (ha)	21,380	29,985	35,935	43,755	47,590	48,875	53,495	55,770	56,605	+35,225
Vacant - permanent	185	420	565	2,355	3,420	3,460	2,955	2,545	3,305	+3,120
Vacant - seasonal	690	1,680	3,380	6,850	4,505	4,080	4,900	6,070	5,650	+4,960
Total irrigable (ha)	22,255	32,085	39,880	52,960	55,515	56,415	61,350	64,385	65,560	+43,305
% Permanent	53%	62%	68%	74%	71%	71%	71%	74%	74%	
% Seasonal	43%	32%	22%	9%	15%	16%	16%	13%	12%	
% Vacant P	1%	1%	1%	4%	6%	6%	5%	4%	5%	
% Vacant S	3%	5%	9%	13%	8%	7%	8%	9%	9%	

Figure 56: Private diverters - planting trends from 1997 to 2024

3.1.6 Private diverters summary - irrigation development

Figure 57 summarises irrigation development with respect to new development (expansion) and areas retired[18] from irrigation in the private diverter river reaches from 1997 to 2024.

- The irrigable area increased by 43,305 ha, a 195% increase from 22,255 ha in 1997 to 65,560 ha in 2024. The net increase of 43,305 ha was the balance of 1,630 ha retired from irrigation and 44,935 ha of expansion.
- Expansion occurred in all six river reaches. The largest growth areas from 1997 to 2024 were:
  - the Boundary Bend river reach with a 324% increase in irrigable area of 16,630 ha; and
  - the Wemen river reach with a 551% increase in irrigable area of 11,845 ha.



River reach	1997 irrigable area (ha)	1997 to 2024		2024 irrigable area (ha)	Change 1997-2024	Growth 1997-2024
		Retired	New			
Nyah	4,970	-80	+6,560	11,450	+6,480	+130%
Boundary Bend	5,125	-665	+17,295	21,755	+16,630	+324%
Wemen	2,150	-175	+12,020	13,995	+11,845	+551%
Colignan	6,925	-285	+6,070	12,710	+5,785	+84%
Mildura	1,445	-125	+740	2,060	+615	+43%
Lock 10 to South Aus.	1,640	-300	+2,250	3,590	+1,950	+119%
Total	22,255	-1,630	+44,935	65,560	+43,305	+195%

Figure 57: Private diverters - irrigation development from 1997 to 2024

[18] Retired areas were previously irrigated but have undergone a change in land use and no longer have irrigation infrastructure e.g. urban development, sheds, dams, land set aside for conservation or returned to dryland agriculture.

3.1.7 Private diverters summary - salinity impact zones

Figure 58 summarises river salinity impact zones of irrigated areas in the private diverter river reaches from 1997 to 2024. Irrigation development was predominantly in the lowest salinity impact zone, L1, from 2003 to 2024. The dominant zone changed from L2 to L1 between 1997 and 2003.

In 2024, the irrigable area of 65,560 ha comprised:

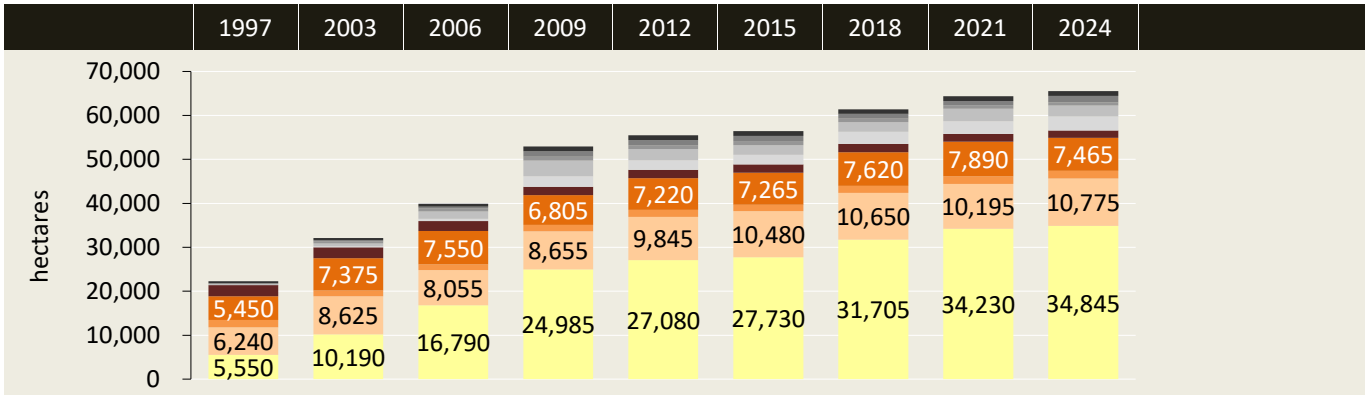
- 58% (37,990 ha) in the lowest salinity impact zone, L1;
- 20% (13,310 ha) in L2;
- 4% (2,495 ha) in L3;
- 14% (8,935 ha) in L4; and
- 4% (2,830 ha) in the high salinity impact zone, HIZ.

From 1997 to 2024, the area irrigated in:

- L1 to L4 increased by 36,010 ha, a 191% increase from 18,875 to 54,885 ha; and
- HIZ decreased by 785 ha, a 31% decrease from 2,505 to 1,720 ha.

From 1997 to 2024, the irrigable area in:

- L1 to L4 increased by 43,410 ha, a 225% increase from 19,320 to 62,730 ha; and
- HIZ decreased by 105 ha, a 4% decrease from 2,935 to 2,830 ha.



Salinity impact zone		1997	2003	2006	2009	2012	2015	2018	2021	2024	% in 2024	Change 1997-2024
Irrigated	L1	5,550	10,190	16,790	24,985	27,080	27,730	31,705	34,230	34,845	53%	+29,295
	L2	6,240	8,625	8,055	8,655	9,845	10,480	10,650	10,195	10,775	16%	+4,535
	L3	1,635	1,350	1,320	1,435	1,595	1,495	1,650	1,720	1,800	3%	+165
	L4	5,450	7,375	7,550	6,805	7,220	7,265	7,620	7,890	7,465	11%	+2,015
	HIZ	2,505	2,445	2,220	1,875	1,850	1,905	1,870	1,735	1,720	3%	-785
Not Irrigated	L1	20	220	510	2,390	2,215	2,195	2,820	2,905	3,145	5%	+3,125
	L2	225	690	1,735	3,550	2,515	2,125	2,150	2,875	2,535	4%	+2,310
	L3	55	390	635	915	910	960	805	770	695	1%	+640
	L4	145	285	400	1,265	1,170	1,205	1,065	940	1,470	2%	+1,325
	HIZ	430	515	665	1,085	1,115	1,055	1,015	1,125	1,110	2%	+680
Total (ha)		22,255	32,085	39,880	52,960	55,515	56,415	61,350	64,385	65,560	100%	+43,305
Dominant zone		L2	L1									

Figure 58: Private diverters - irrigable area in each salinity impact zone from 1997 to 2024

Salinity zones of retired and expansion areas

Table 14 shows the salinity impact zones of areas retired from irrigation and expansion areas from 1997 to 2024.

From 1997 to 2024 in the private diverter river reaches:

- 28% (450 ha) of areas retired from irrigation were in the high impact zone (HIZ); and
- 73% of expansion areas were in the lowest salinity impact zone (L1), 26% were in zones L2 to L4 and 1% were in the high impact zone, HIZ. (Expansion in the HIZ was development on existing irrigation properties.)

Table 14: Private diverters - salinity impact zones of retired and expansion areas

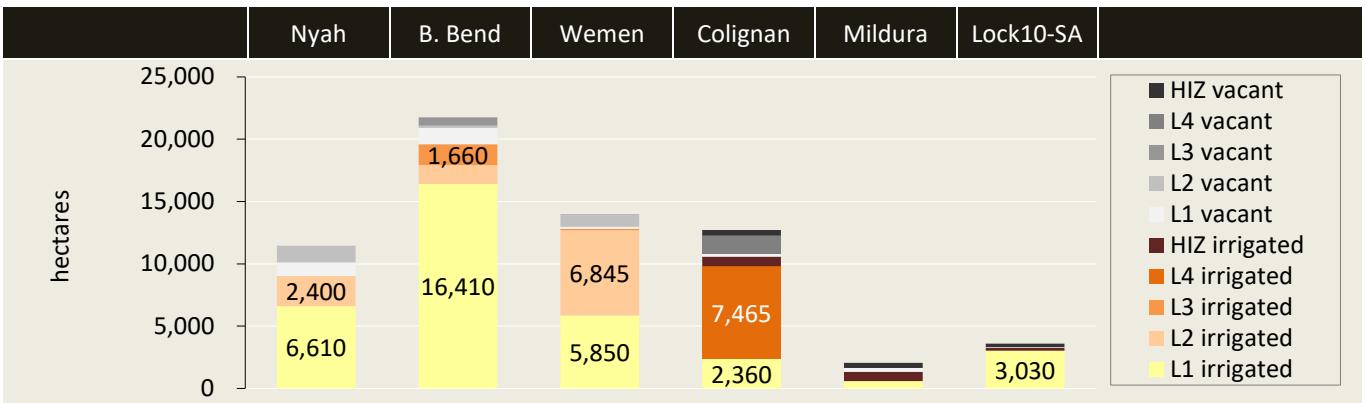
Salinity Impact Zone	1997	Retired		Expansion		2024	Net change 1997-2024	% Change
	irrigable ha	ha	%	ha	%	irrigable ha		
L1	5,570	-505	31%	+32,925	73%	37,990	+32,420	+582%
L2	6,465	-380	23%	+7,225	16%	13,310	+6,845	+106%
L3	1,690	-190	12%	+995	2%	2,495	+805	+48%
L4	5,595	-105	6%	+3,445	8%	8,935	+3,340	+60%
HIZ	2,935	-450	28%	+345	1%	2,830	-105	-4%
Total	22,255	-1,630	100%	+44,935	100%	65,560	+43,305	+195%

Salinity zones in each of the private diverter river reaches

Figure 59 compares salinity impact zones in each of the private diverter river reaches in 2024.

Three of the six river reaches have irrigation areas in high salinity impact zones: Colignan, Mildura and the Lock 10 to South Australia river reach. However, Mildura was the only reach where the high salinity zone, HIZ, was dominant.

The lowest salinity impact zone, L1, was the dominant zone across irrigable areas in the Nyah, Boundary Bend and Lock 10 to South Australia river reaches. L2 was dominant in the Wemen reach and L4 in the Colignan to Yatpool reach.



Private diverters	Nyah	B. Bend	Wemen	Colignan	Mildura	Lock10-SA	2024 total
2024 HIZ (ha)	-	-	-	1,175	1,170	485	2,830
% of HIZ total	-	-	-	42%	41%	17%	100%
Dominant zone	L1	L1	L2	L4	HIZ	L1	L1

Figure 59: Private diverters - salinity impact zones in each river reach in 2024

3.1.8 Private diverters summary - irrigation methods

Figure 60 summarises irrigation methods for Murray River private diverters in the Mallee catchment from 1997 to 2024.

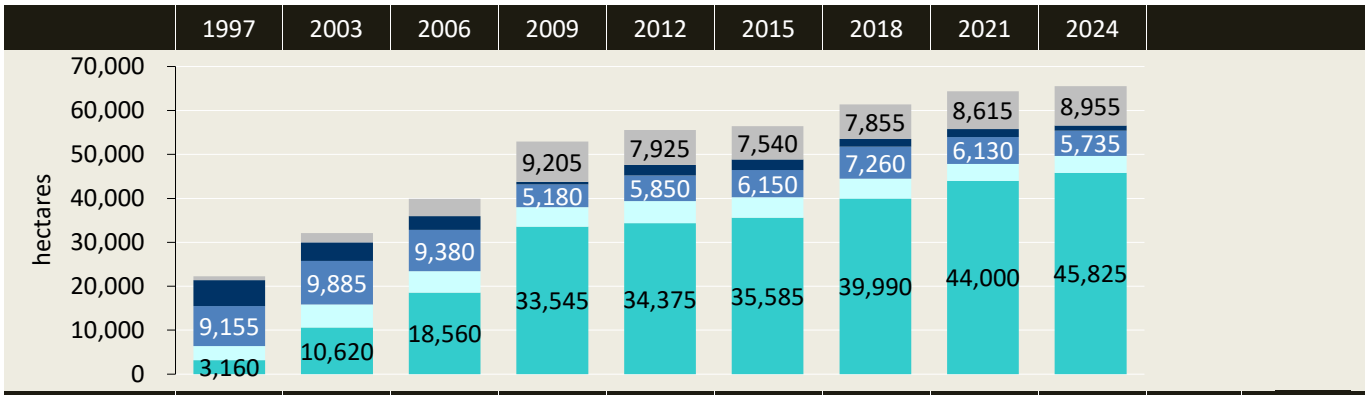
The dominant irrigation method in the private diverter river reaches changed from overhead in 1997 to drip irrigation from 2003 to 2024.

In 2024, the irrigable area of 65,560 ha comprised:

- 70% (45,825 ha) drip irrigation;
- 6% (3,845 ha) low level irrigation;
- 9% (5,735 ha) overhead sprinklers;
- 2% (1,200 ha) furrow irrigation; and
- 14% (8,955 ha) vacant, not irrigated.

From 1997 to 2024:

- drip irrigation increased by 42,665 ha, a 1,350% increase from 3,160 to 45,825 ha;
- low level irrigation increased by 630 ha, a 20% increase from 3,215 to 3,845 ha;
- overhead irrigation decreased by 3,420 ha, a 37% decrease from 9,155 to 5,735 ha; and
- furrow irrigation decreased by 4,650 ha, a 79% decrease from 5,850 to 1,200 ha.



Irrigation method[19]	1997	2003	2006	2009	2012	2015	2018	2021	2024	% in 2024	Change 1997-2024
Drip	3,160	10,620	18,560	33,545	34,375	35,585	39,990	44,000	45,825	70%	+42,665
Low level	3,215	5,230	4,865	4,480	5,005	4,690	4,500	3,835	3,845	6%	+630
Overhead	9,155	9,885	9,380	5,180	5,850	6,150	7,260	6,130	5,735	9%	-3,420
Furrow	5,850	4,250	3,130	550	2,360	2,450	1,745	1,805	1,200	2%	-4,650
Vacant	875	2,100	3,945	9,205	7,925	7,540	7,855	8,615	8,955	14%	+8,080
Total (ha)	22,255	32,085	39,880	52,960	55,515	56,415	61,350	64,385	65,560	100%	+43,305
Dominant	o/head	drip									

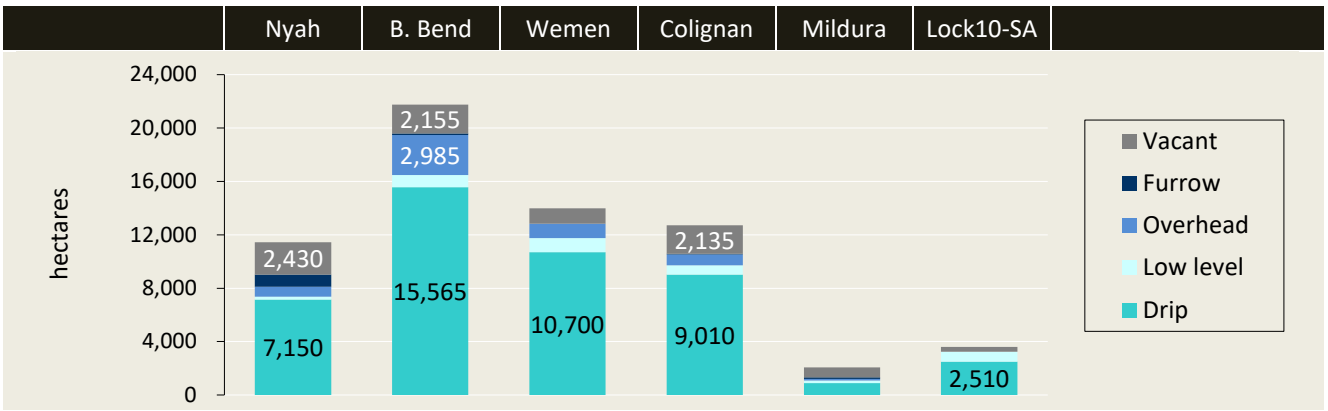
Figure 60: Private diverters - irrigation methods from 1997 to 2024

[19] Overhead irrigation includes pivots and lateral move systems. Furrow includes flood irrigation. (Refer to Table 4.)

Irrigation methods in each of the private diverter reaches in 2024

Figure 61 compares irrigation methods in each of the private diverter river reaches in 2024.

Drip irrigation was the dominant method in each of the reaches.



	Nyah	B. Bend	Wemen	Colignan	Mildura	Lock10-SA	2024 Total
2024 hectares	11,450	21,775	13,995	12,710	2,060	3,590	65,560
% of 2024 total	17%	33%	21%	19%	3%	5%	100%
Dominant	drip	drip	drip	drip	drip	drip	drip

Figure 61: Private diverters - irrigation methods in each river reach in 2024

3.1.9 Private diverters summary - property change

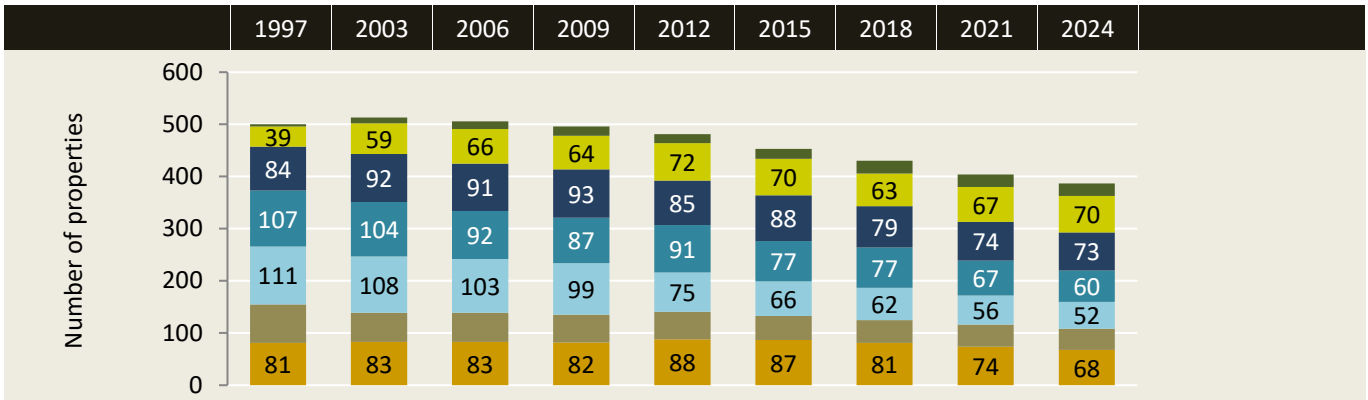
Figure 62 provides an estimate of property numbers and average property size (irrigable area) in the private diverter river reaches from 1997 to 2024.

In 2024:

- there were approximately 387 irrigation properties; and
- 59% of properties had an irrigable area over 20 ha.

From 1997 to 2024:

- the number of properties decreased by 113, a 23% decrease from 500 to 387 properties;
- properties with an irrigable area less than 100 ha decreased by 164, while the number over 100 ha increased by 51; and
- average property size (irrigable area) increased from 45 to 169 ha per property.



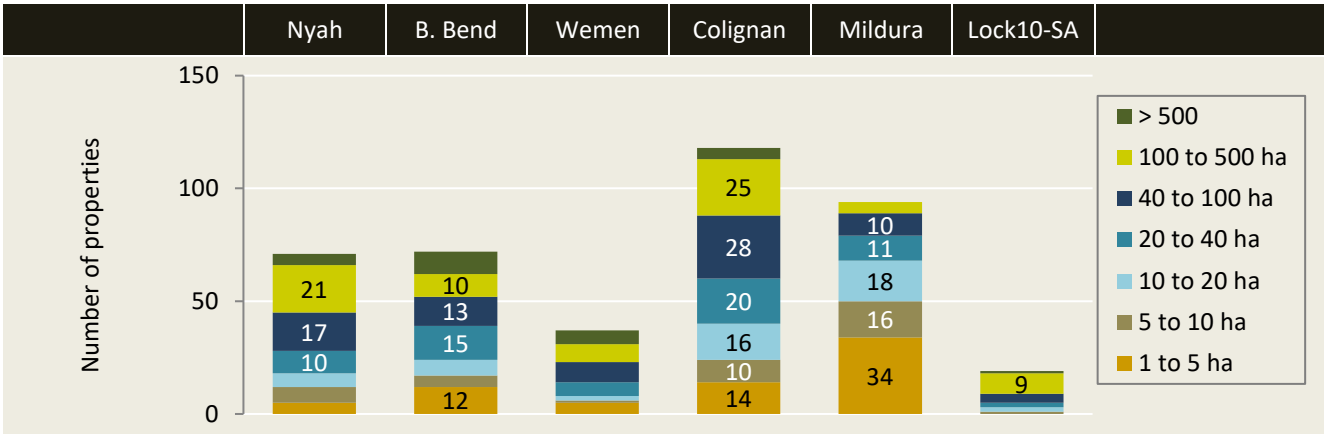
Property size (irrigable area)	1997	2003	2006	2009	2012	2015	2018	2021	2024	% in 2024	Change 1997-2024
1 to 5 ha	81	83	83	82	88	87	81	74	68	18%	-13
5 to 10 ha	74	56	56	53	53	46	44	42	40	10%	-34
10 to 20 ha	111	108	103	99	75	66	62	56	52	13%	-59
20 to 40 ha	107	104	92	87	91	77	77	67	60	16%	-47
40 to 100 ha	84	92	91	93	85	88	79	74	73	19%	-11
100 to 500 ha	39	59	66	64	72	70	63	67	70	18%	+31
> 500 ha	4	11	15	18	17	19	24	24	24	6%	+20
Total properties	500	513	506	496	481	453	430	404	387	100%	-113
Average size (ha)	45	63	79	107	115	125	143	159	169		

Figure 62: Private diverters - property numbers and sizes from 1997 to 2024

Irrigation properties in each of the private diverter reaches in 2024

Figure 63 provides an estimate of property numbers and average property size (irrigable area) in each of the private diverter river reaches in 2024.

- The Colignan to Yatpool river reach had the highest number of private diverters (118 properties).
- Boundary Bend, Wemen and Lock 10 to South Australia river reaches had average property sizes greater than the private diverter's average of 169 ha (**Figure 62**).



River reach	Nyah	B. Bend	Wemen	Colignan	Mildura	Lock10-SA	2024 total
Total properties	71	72	37	118	94	19	411[20]
% of 2024 total	17%	18%	9%	29%	23%	5%	100%
Ave. property size irrigable area (ha)	161	302	378	108	22	189	

Figure 63: Private diverters - property numbers and average size in each river reach in 2024

[20] The total number of private diverters in each river reach (411 properties, Figure 63) is greater than the total across the private diverter reaches (387 properties, Figure 62) as some properties irrigate in more than one river reach.

3.2 Nyah river reach (Woorinen South to the Wakool junction)

In summary for the Nyah river reach[21]

Crop types in 2024

The main plantings in the Nyah river reach in 2024 were:

1. almond trees, 3,700 ha (32% of the irrigable area);
2. field crops, 2,100 ha (18% of the irrigable area); and
3. wine grapes, 1,100 ha (10% of the irrigable area).

Crop type changes from 1997 to 2024

Almonds were the dominant crop from 2009 to 2024. They replaced field crops which were dominant from 1997 to 2006. The main crop type changes from 1997 to 2024 were:

- almonds increased by 3,700 ha, from no plantings in 1997 to 3,700 ha in 2024;
- field crops decreased by 1,585 ha, a 43% decrease from 3,685 to 2,100 ha;
- wine grape plantings increased by 975 ha, a 780% increase from 125 to 1,100 ha; and
- fruit trees, mostly stone fruit, increased by 745 ha, a 452% increase from 165 to 910 ha.

New permanent plantings (planted or top-worked in the previous three years)

In 2024, 750 ha (11%) of permanent crops were planted or top-worked in the previous three years. These new plantings were:

1. pistachios (320 ha); and
2. stone fruit (195 ha);
3. citrus (100 ha);
4. wine grapes (75 ha);
5. table grapes (40 ha); and
6. nurseries (20 ha).

From 1997 to 2024, the area of new permanent plantings was at its lowest in 1997 with 130 ha (22%) planted in the previous three years, and highest in 2009 with 2,810 ha (61%) planted in the previous three years.

Planting trends - permanent plantings, seasonal crops and vacant areas

In 2024, the irrigable area of 11,450 ha comprised:

- 58% (6,635 ha) irrigated permanent plantings;
- 21% (2,385 ha) irrigated seasonal crops; and
- 21% (2,430 ha) vacant, not irrigated areas.

The proportion of permanent plantings, seasonal cropping and vacant areas changed from:

- 12% permanent, 85% seasonal and 3% vacant in 1997; to
- 58% permanent, 21% seasonal and 21% vacant in 2024.

[21] The boundary between the Nyah and Boundary Bend river reaches was adjusted in 2021 based on water use licence extents. Areas for the Nyah river reach are greater in the 2021 and 2024 reports than in earlier reports.

In summary for the Nyah river reach

Irrigation development - new development (expansion) and retired areas

The irrigable area in the Nyah river reach increased by 6,480 ha, a 130% increase from 4,970 ha in 1997 to 11,450 ha in 2024.

The net increase of 6,480 ha was the balance of 80 ha retired from irrigation and 6,560 ha of expansion.

Salinity impact zones

The Nyah river reach is in low salinity impact zones: L1, L2 and L3.

In 2024, the irrigable area of 11,450 ha comprised:

- 67% (7,700 ha) in the lowest salinity impact zone, L1;
- 33% (3,740 ha) in L2; and
- <1% (10 ha) in L3.

From 1997 to 2024 the irrigable area in:

- L1 increased by 5,845 ha, a 315% increase from 1,855 ha to 7,700 ha;
- L2 increased by 635 ha, a 20% increase from 3,105 ha to 3,740 ha; and
- L3 was 10 ha in 1997 and 2024.

Irrigation methods

The dominant irrigation method in the Nyah river reach was furrow irrigation from 1997 to 2006, then drip irrigation from 2009 to 2024.

In 2024, the irrigable area of 11,450 ha comprised:

- 62% (7,150 ha) drip irrigation;
- 2% (215 ha) low level irrigation;
- 7% (755 ha) overhead sprinklers;
- 8% (900 ha) furrow irrigation; and
- 21% (2,430 ha) vacant, not irrigated.

Irrigation properties

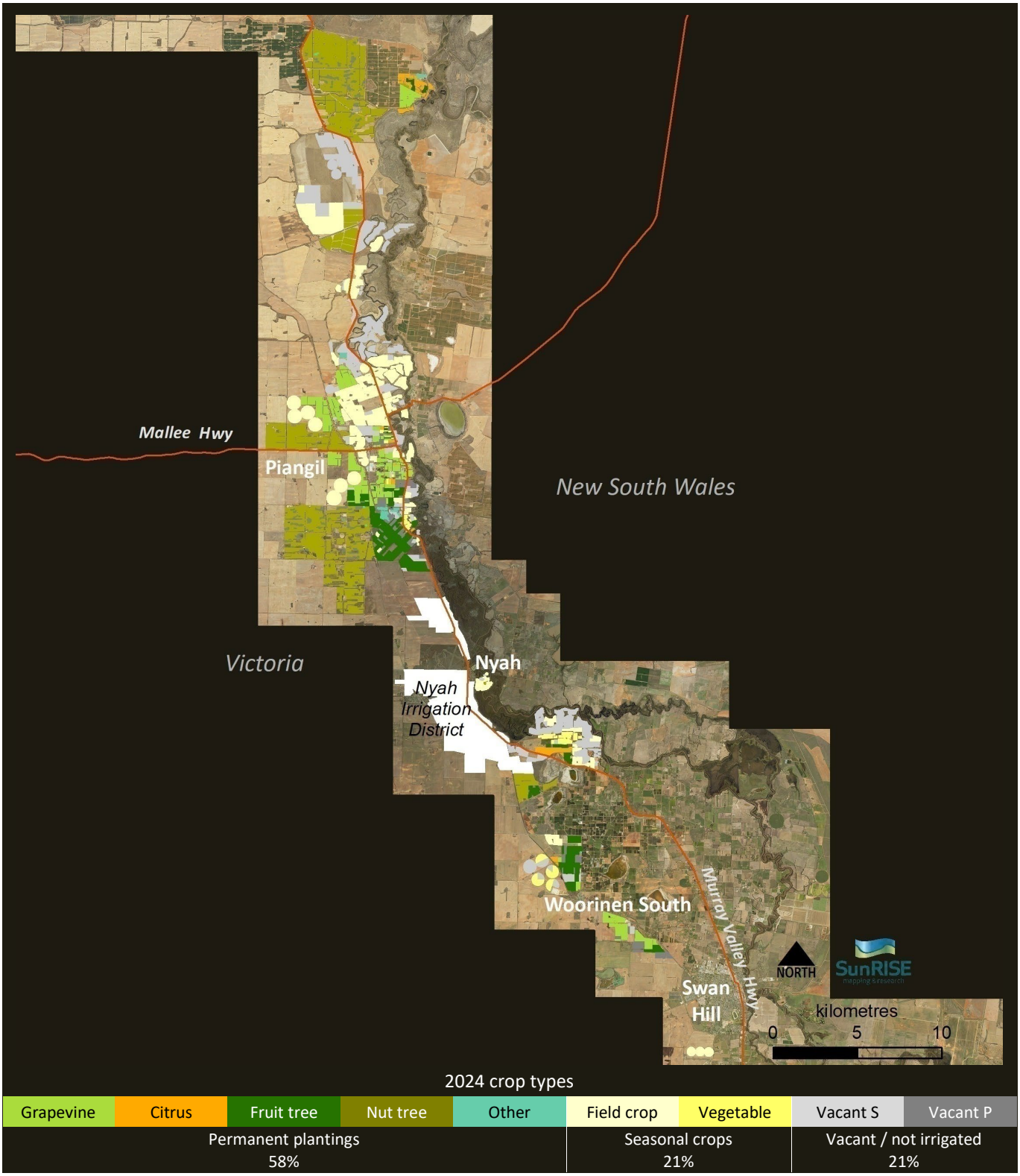
In 2024, there were approximately 71 irrigation properties with an average property size (irrigable area) of 161 ha.

From 1997 to 2024:

- the number of properties decreased by 14, a 16% decrease from 85 to 71 properties;
- properties with an irrigable area less than 100 ha decreased by 30, while the number over 100 ha increased by 16; and
- average property size (irrigable area) increased from 58 to 161 ha per property.

3.2.1 Nyah river reach - crop types in 2024

Map 12 shows the Nyah river reach with crop types in 2024. The aerial photography was flown in December 2023 and January 2024 (*source: Coordinated Imagery Program, DTP Victoria*).



Map 12: Nyah river reach showing crop types in 2024

3.2.2 Nyah river reach - crop types from 1997 to 2024

Figure 64 summarises crop types in the Nyah river reach from 1997 to 2024.

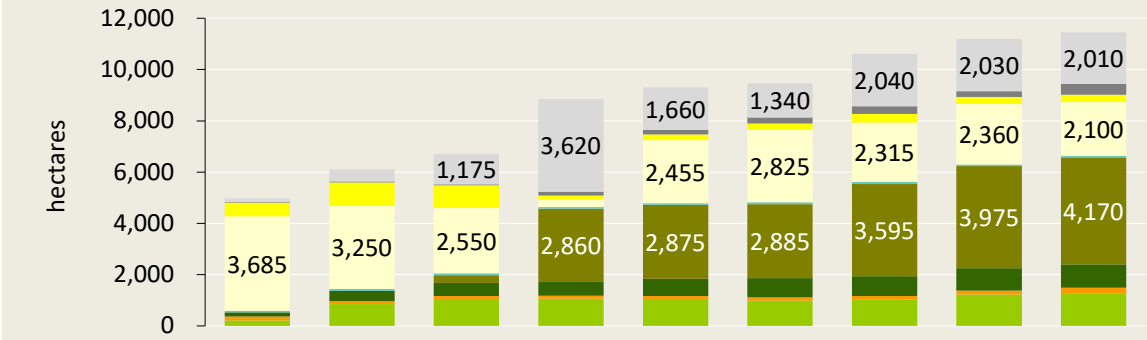
The dominant crop type was field crops from 1997 to 2006, then almonds from 2009 to 2024.

In 2024, the main plantings were:

1. almond trees, 3,700 ha (32% of the irrigable area);
2. field crops, 2,100 ha (18% of the irrigable area); and
3. wine grapes, 1,100 ha (10% of the irrigable area).

From 1997 to 2024, the main planting changes were:

- almonds increased by 3,700 ha, from no plantings in 1997 to 3,700 ha in 2024;
- field crops decreased by 1,585 ha, a 43% decrease from 3,685 to 2,100 ha;
- wine grapes increased by 975 ha, a 780% increase from 125 to 1,100 ha; and
- fruit trees, mostly stone fruit, increased by 745 ha, a 452% increase from 165 to 910 ha.



Crop type		1997	2003	2006	2009	2012	2015	2018	2021	2024	% of 2024	Change 1997-2024
Permanent	Grape Dried	5	0	0	0	0	0	0	0	0	0%	-5
	Grape Table	90	140	125	120	120	120	145	145	155	1%	+65
	Grape Wine	125	710	930	945	930	865	890	1,085	1,100	10%	+975
	Citrus	140	115	110	110	115	130	135	145	230	2%	+90
	Fruit Olive	5	5	5	5	5	5	5	5	5	<1%	0
	Fruit Other	165	395	510	535	675	740	770	875	910	8%	+745
	Nut Almond	0	0	295	2,860	2,875	2,880	3,590	3,825	3,700	32%	+3,700
	Nut Other	0	0	0	0	0	5	5	150	470	4%	+470
	Other	55	70	75	60	65	80	80	60	65	1%	+10
Seasonal	Field Crop	3,685	3,250	2,550	300	2,455	2,825	2,315	2,360	2,100	18%	-1,585
	Veg. Carrot	100	190	190	60	80	90	140	150	100	1%	0
	Veg. Potato	360	575	580	0	0	0	0	0	0	0%	-360
	Veg. Other	80	145	120	85	145	155	195	125	185	2%	+105
Vacant P		20	40	30	160	180	230	300	235	420	4%	+400
Vacant S		140	475	1,175	3,620	1,660	1,340	2,040	2,030	2,010	17%	+1,870
Total (ha)		4,970	6,110	6,695	8,860	9,305	9,465	10,610	11,190	11,450	100%	+6,480
Dominant		field crop			almond							

Figure 64: Nyah river reach - crop types from 1997 to 2024

3.2.3 Nyah river reach - new permanent plantings

Figure 65 shows the proportion of permanent crops planted or top-worked in the previous three years in the Nyah river reach from 1997 to 2024.

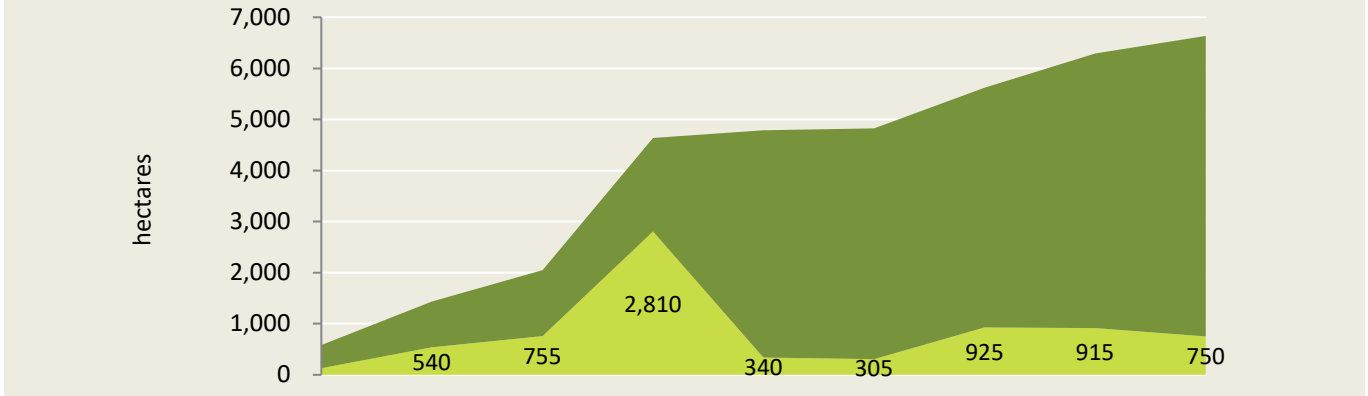
The information provides an indication of development activity that doesn't necessarily involve a change in area or crop type as it includes replanting or top working to different varieties. The figures are conservative, as top worked plantings can be difficult to interpret from the three-yearly aerial imagery, particularly for grapevines.

In 2024:

- 750 ha (11%) of permanent crops were planted or top-worked within the previous three years.
- These new plantings were:
    1. pistachios (320 ha);
    2. stone fruit (195 ha);
    3. citrus (100 ha);
    4. wine grapes (75 ha);
    5. table grapes (40 ha); and
    6. nurseries (20 ha).

From 1997 to 2024:

- The proportion of new permanent plantings was at its lowest in 2015 with 6% (305 ha) planted in the previous three years and highest in 2009 with 61% (2,810 ha) planted in the previous three years.



Permanent plantings	1997	2003	2006	2009	2012	2015	2018	2021	2024	% of 2024
≤3yr old plantings	130	540	755	2,810	340	305	925	915	750	11%
>3yr old plantings	455	895	1,295	1,825	4,445	4,520	4,695	5,375	5,885	89%
Total (ha)	585	1,435	2,050	4,635	4,785	4,825	5,620	6,290	6,645	100%
% 3year development	22%	38%	37%	61%	7%	6%	16%	15%	11%	
Average 3-year dev.	24%									

Figure 65: Nyah river reach - three-year old permanent plantings from 1997 to 2024

3.2.4 Nyah river reach - planting trends

Figure 66 summarises planting trends with respect to permanent crops, seasonal crops and vacant areas in the Nyah river reach from 1997 to 2024.

The proportion of permanent plantings, seasonal cropping and vacant areas changed from:

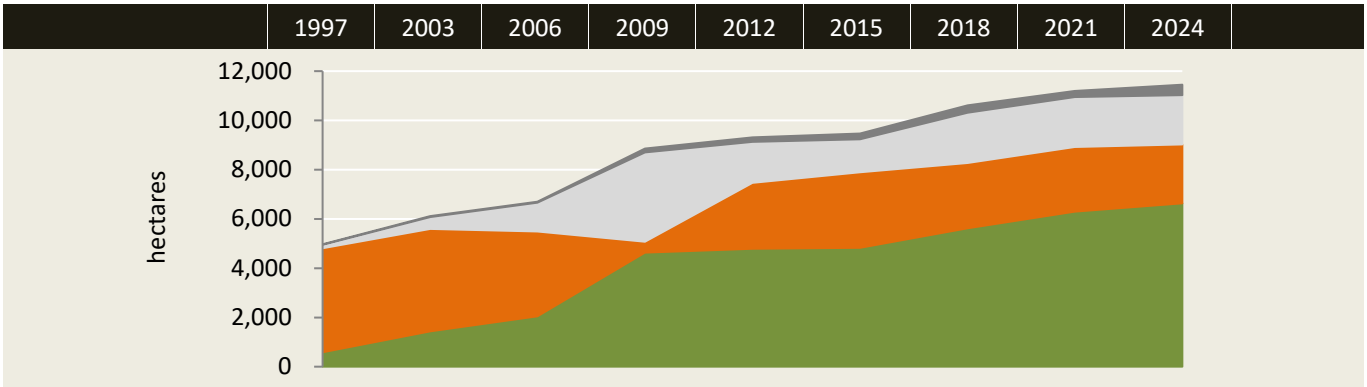
- 12% permanent, 85% seasonal and 3% vacant in 1997; to
- 58% permanent, 21% seasonal and 21% vacant in 2024.

In 2024, the irrigable area of 11,450 ha comprised:

- 58% (6,635 ha) irrigated permanent plantings;
- 21% (2,385 ha) irrigated seasonal crops;
- 4% (420 ha) vacant, previously an irrigated permanent planting; and
- 17% (2,010 ha) vacant, previously an irrigated seasonal crop.

From 1997 to 2024:

- irrigated permanent crops increased by 6,050 ha, from 585 to 6,635 ha;
- irrigated seasonal crops decreased by 1,840 ha, from 4,225 to 2,385 ha;
- vacant areas, previously irrigated permanent plantings increased by 400 ha, from 20 to 420 ha; and
- vacant areas, previously irrigated seasonal crops increased by 1,870 ha, from 140 to 2,010 ha.



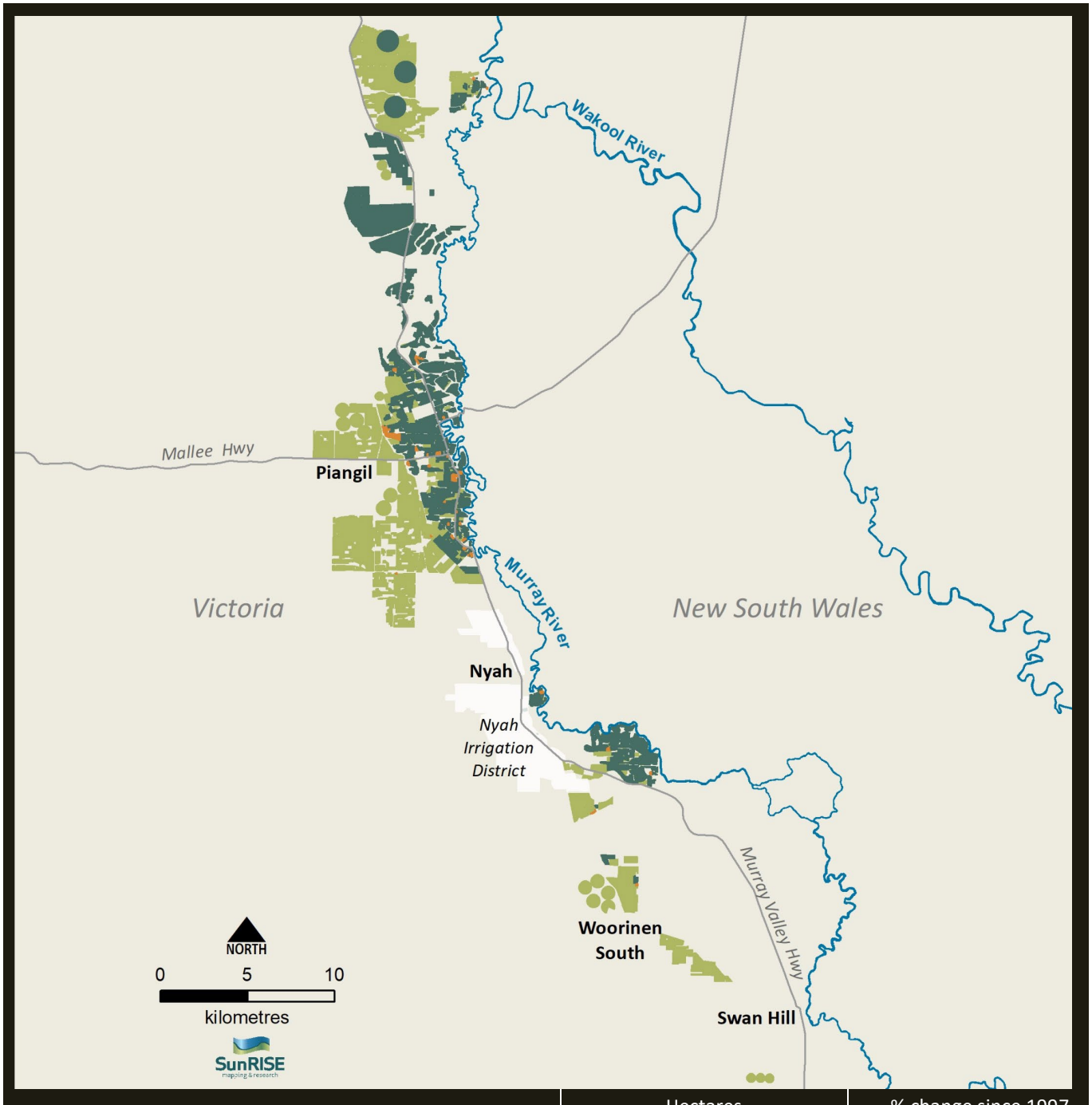
	1997	2003	2006	2009	2012	2015	2018	2021	2024	Change 1997-2024
Permanent - irrigated	585	1,435	2,050	4,635	4,785	4,825	5,620	6,290	6,635	+6,050
Seasonal - irrigated	4,225	4,160	3,440	445	2,680	3,070	2,650	2,635	2,385	-1,840
Total irrigated (ha)	4,810	5,595	5,490	5,080	7,465	7,895	8,270	8,925	9,020	+4,210
Vacant - permanent	20	40	30	160	180	230	300	235	420	+400
Vacant - seasonal	140	475	1,175	3,620	1,660	1,340	2,040	2,030	2,010	+1,870
Total irrigable (ha)	4,970	6,110	6,695	8,860	9,305	9,465	10,610	11,190	11,450	+6,480
% Permanent	12%	23%	31%	52%	51%	51%	53%	56%	58%	
% Seasonal	85%	68%	51%	5%	29%	32%	25%	24%	21%	
% Vacant P	<1%	1%	<1%	2%	2%	2%	3%	2%	4%	
% Vacant S	3%	8%	18%	41%	18%	14%	19%	18%	17%	

Figure 66: Nyah river reach - planting trends from 1997 to 2024

3.2.5 Nyah river reach - irrigation development

Map 13 shows irrigation development, from 1997 to 2024, in the Nyah river reach with respect to new development (expansion) and areas retired from irrigation.

- The irrigable area increased by 6,480 ha, a 130% increase from 4,970 ha in 1997 to 11,450 ha in 2024.
- The net increase of 6,480 ha was the balance of 80 ha retired from irrigation and 6,560 ha of expansion.



		Hectares			% change since 1997
Irrigable area in 1997 (1996-97 season)		4,970			
Retired between 1997 and 2024			-80		-2%
Expansion between 1997 and 2024			+6,560		+132%
Net change from 1997 to 2024				+6,480	+130%
Irrigable area in 2024 (2023-24 season)				11,450	

Map 13: Nyah river reach - irrigation development from 1997 to 2024

3.2.6 Nyah river reach - salinity impact zones

Figure 67 summarises river salinity impact zones of irrigated areas in the Nyah river reach from 1997 to 2024. Nyah private diverters are in low salinity impact zones L1, L2 and L3. There are no high salinity impact zones. Irrigation development from 1997 to 2024 occurred predominantly in L1.

In 2024, the irrigable area of 11,450 ha comprised:

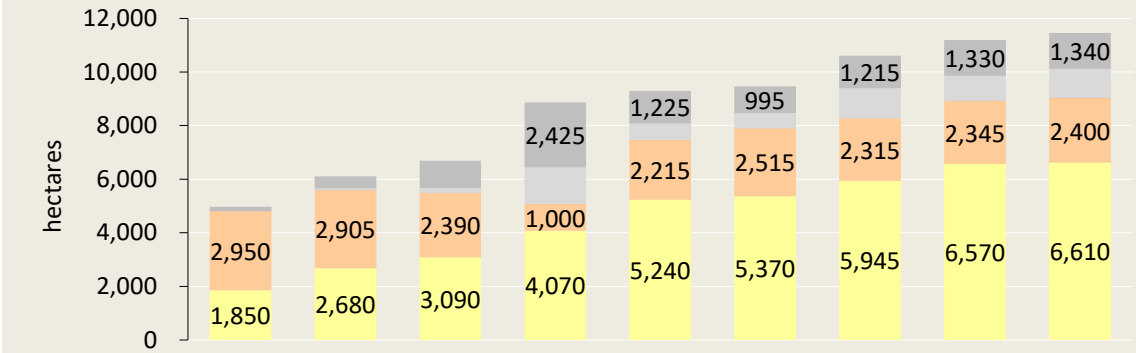
- 67% (7,700 ha) in the lowest salinity impact zone, L1;
- 33% (3,740 ha) in L2; and
- <1% (10 ha) in L3.

From 1997 to 2024, the area irrigated in:

- L1 increased by 4,760 ha, a 257% increase from 1,850 to 6,610 ha;
- L2 decreased by 550 ha, a 19% decrease from 2,950 to 2,400 ha; and
- L3 was 10 ha in 1997 and 2024.

From 1997 to 2024, the irrigable area in:

- L1 increased by 5,845 ha, a 315% increase from 1,855 to 7,700 ha;
- L2 increased by 635 ha, a 20% increase from 3,105 to 3,740 ha; and
- L3 was 10 ha in 1997 and 2024.



Salinity impact zone		1997	2003	2006	2009	2012	2015	2018	2021	2024	% in 2024	Change 1997-2024
Irrigated	L1	1,850	2,680	3,090	4,070	5,240	5,370	5,945	6,570	6,610	58%	+4,760
	L2	2,950	2,905	2,390	1,000	2,215	2,515	2,315	2,345	2,400	21%	-550
	L3	10	10	10	10	10	10	10	10	10	<1%	0
	L4	-	-	-	-	-	-	-	-	-	-	-
	HIZ	-	-	-	-	-	-	-	-	-	-	-
Not Irrigated	L1	5	60	185	1,355	610	575	1,125	935	1,090	9%	+1,085
	L2	155	455	1,020	2,425	1,225	995	1,215	1,330	1,340	12%	+1,185
	L3	0	0	0	0	5	0	0	0	0	0%	0
	L4	-	-	-	-	-	-	-	-	-	-	-
	HIZ	-	-	-	-	-	-	-	-	-	-	-
Total (ha)		4,970	6,110	6,695	8,860	9,305	9,465	10,610	11,190	11,450	100%	+6,480
Dominant zone		L2		L1								

Figure 67: Nyah river reach - irrigable area in each salinity impact zone from 1997 to 2024

3.2.7 Nyah river reach - irrigation methods

Figure 68 summarises irrigation methods in the Nyah river reach from 1997 to 2024.

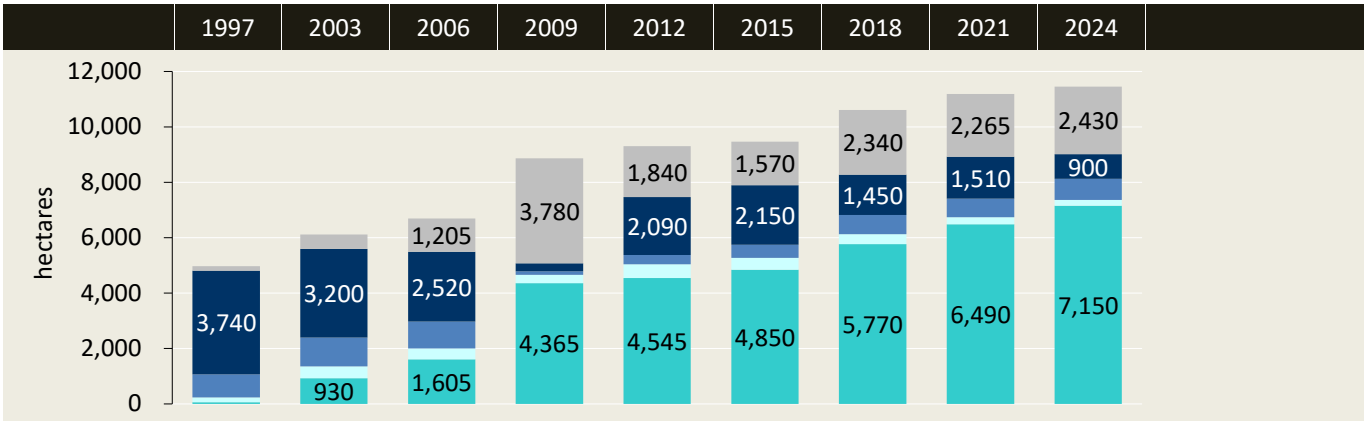
The dominant irrigation method in the Nyah river reach was furrow irrigation from 1997 to 2006, then drip irrigation from 2009 to 2024.

In 2024, the irrigable area of 11,450 ha comprised:

- 62% (7,150 ha) drip irrigation;
- 2% (215 ha) low level irrigation;
- 7% (755 ha) overhead sprinklers;
- 8% (900 ha) furrow irrigation; and
- 21% (2,430 ha) vacant, not irrigated.

From 1997 to 2024:

- drip irrigation increased by 7,085 ha, a 10,900% increase from 65 to 7,150 ha;
- low level irrigation increased by 50 ha, a 30% increase from 165 to 215 ha;
- overhead irrigation decreased by 85 ha, a 10% decrease from 840 to 755 ha; and
- furrow irrigation decreased by 2,840 ha, a 76% decrease from 3,740 to 900 ha.



Irrigation method[22]	1997	2003	2006	2009	2012	2015	2018	2021	2024	% in 2024	Change 1997-2024
Drip	65	930	1,605	4,365	4,545	4,850	5,770	6,490	7,150	62%	+7,085
Low level	165	430	395	290	500	425	355	250	215	2%	+50
Overhead	840	1,035	970	135	330	470	695	675	755	7%	-85
Furrow	3,740	3,200	2,520	290	2,090	2,150	1,450	1,510	900	8%	-2,840
Vacant	160	515	1,205	3,780	1,840	1,570	2,340	2,265	2,430	21%	+2,270
Total (ha)	4,970	6,110	6,695	8,860	9,305	9,465	10,610	11,190	11,450	100%	+6,480
Dominant	furrow			drip							

Figure 68: Nyah river reach - irrigation methods from 1997 to 2024

[22] Overhead irrigation includes pivots and lateral move systems. Furrow includes flood irrigation. (Refer to Table 4.)

3.2.8 Nyah river reach - property change

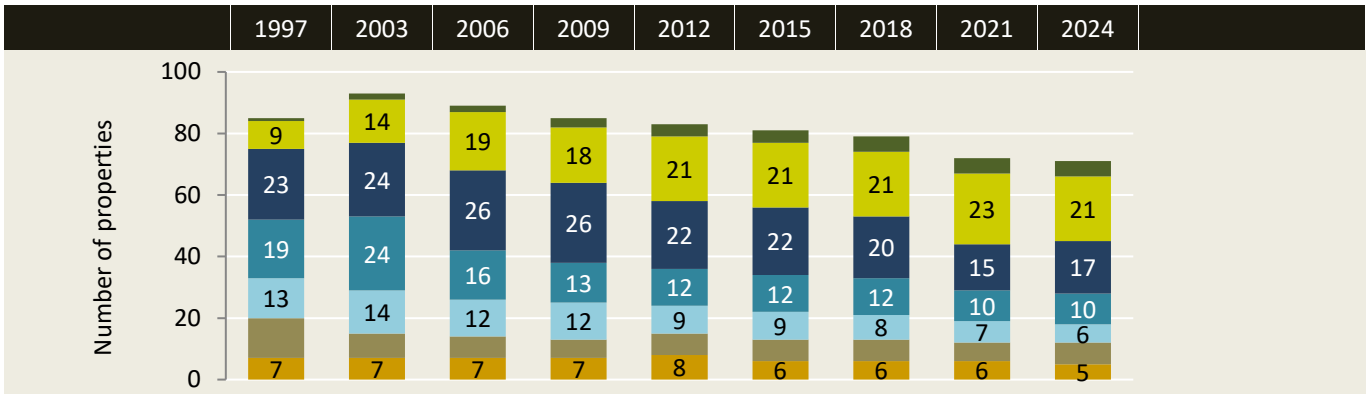
Figure 69 provides estimates of property numbers and average property size (irrigable area) in the Nyah river reach from 1997 to 2024.

In 2024:

- there were approximately 71 irrigation properties; and
- 61% of properties had an irrigable area over 40 ha.

From 1997 to 2024:

- the number of properties decreased by 14, a 16% decrease from 85 to 71 properties;
- properties with an irrigable area less than 100 ha decreased by 30, while the number over 100 ha increased by 16; and
- average property size (irrigable area) increased from 58 to 161 ha per property.



Property size (irrigable area)	1997	2003	2006	2009	2012	2015	2018	2021	2024	% in 2024	Change 1997-2024
1 to 5 ha	7	7	7	7	8	6	6	6	5	7%	-2
5 to 10 ha	13	8	7	6	7	7	7	6	7	10%	-6
10 to 20 ha	13	14	12	12	9	9	8	7	6	8%	-7
20 to 40 ha	19	24	16	13	12	12	12	10	10	14%	-9
40 to 100 ha	23	24	26	26	22	22	20	15	17	24%	-6
100 to 500 ha	9	14	19	18	21	21	21	23	21	30%	+12
> 500 ha	1	2	2	3	4	4	5	5	5	7%	+4
Total properties	85	93	89	85	83	81	79	72	71	100%	-14
Average size (ha)	58	66	75	104	112	117	134	155	161		

Figure 69: Nyah river reach - property numbers and sizes from 1997 to 2024

3.3 Boundary Bend river reach (*Wakool to Euston weir*)

In summary for the Boundary Bend river reach[23]

Crop types in 2024

The main plantings in the Boundary Bend river reach in 2024 were:

1. almond trees, 10,380 ha (48% of the irrigable area);
2. olive trees, 2,765 ha (13% of the irrigable area);
3. table grapes, 1,875 ha (9% of the irrigable area); and
4. potatoes, 1,570 ha (7% of the irrigable area).

Crop type changes from 1997 to 2024

The dominant crop changed from field crops in 1997 to potatoes in 2003 then almonds from 2006 to 2024.

The main crop type changes from 1997 to 2024 were:

- almonds increased by 9,755 ha, a 1,561% increase from 625 to 10,380 ha;
- olives increased by 2,715 ha, a 5,430% increase from 50 to 2,765 ha;
- table grape plantings increased by 1,330 ha, a 244% increase from 545 to 1,875 ha; and
- potatoes increased by 745 ha, a 90% increase from 825 to 1,570 ha.

New permanent plantings (planted or top-worked in the previous three years)

In 2024, 600 ha (4%) of permanent crops were planted or top-worked within the previous three years. This was the lowest area of new plantings since 2003.

The new plantings were:

1. table grapes (285 ha);
2. pistachios (100 ha);
3. almonds (95 ha);
4. avocados (65 ha);
5. citrus (35 ha); and
6. stone fruit (20 ha).

Planting trends - permanent plantings, seasonal crops and vacant areas

In 2024, the irrigable area of 21,755 ha comprised:

- 76% (16,570 ha) irrigated permanent plantings;
- 14% (3,030 ha) irrigated seasonal crops; and
- 10% (2,155 ha) vacant, not irrigated areas.

The proportion of permanent plantings, seasonal cropping and vacant areas changed from:

- 47% permanent, 51% seasonal and 2% vacant in 1997; to
- 76% permanent, 14% seasonal and 10% vacant in 2024.

[23] The boundary between the Nyah and Boundary Bend river reaches was adjusted in 2021 based on water use licence extents. Areas for the Boundary Bend river reach in the 2021 and 2024 reports are less than in earlier reports.

In summary for the Boundary Bend river reach

Irrigation development - new development (expansion) and retired areas

The irrigable area in the Boundary Bend river reach increased by 16,630 ha, a 324% increase from 5,125 ha in 1997 to 21,755 ha in 2024.

The net increase of 16,630 ha was the balance of 665 ha retired from irrigation and 17,295 ha of expansion.

Salinity impact zones

The Boundary Bend river reach is in low salinity impact zones L1, L2 and L3. Irrigation development from 1997 to 2024 occurred predominantly in L1.

In 2024, the irrigable area of 21,755 ha comprised:

- 81% (17,710 ha) in the lowest salinity impact zone, L1;
- 8% (1,710 ha) in L2; and
- 11% (2,335 ha) in L3.

From 1997 to 2024 the irrigable area in:

- L1 increased by 15,650 ha, a 760% increase from 2,060 to 17,710 ha;
- L2 increased by 205 ha, a 14% increase from 1,505 to 1,710 ha; and
- L3 increased by 775 ha, a 50% increase from 1,560 to 2,335 ha.

Irrigation methods

The dominant irrigation method in the Boundary Bend river reach was overhead irrigation from 1997 to 2003, then drip irrigation from 2006 to 2024.

In 2024, the irrigable area of 21,755 ha comprised:

- 72% (15,565 ha) drip irrigation;
- 4% (925 ha) low level irrigation;
- 14% (2,985 ha) overhead sprinklers;
- 1% (125 ha) furrow irrigation; and
- 10% (2,155 ha) vacant, not irrigated.

Irrigation properties

In 2024, there were approximately 72 irrigation properties with an average property size (irrigable area) of 302 ha.

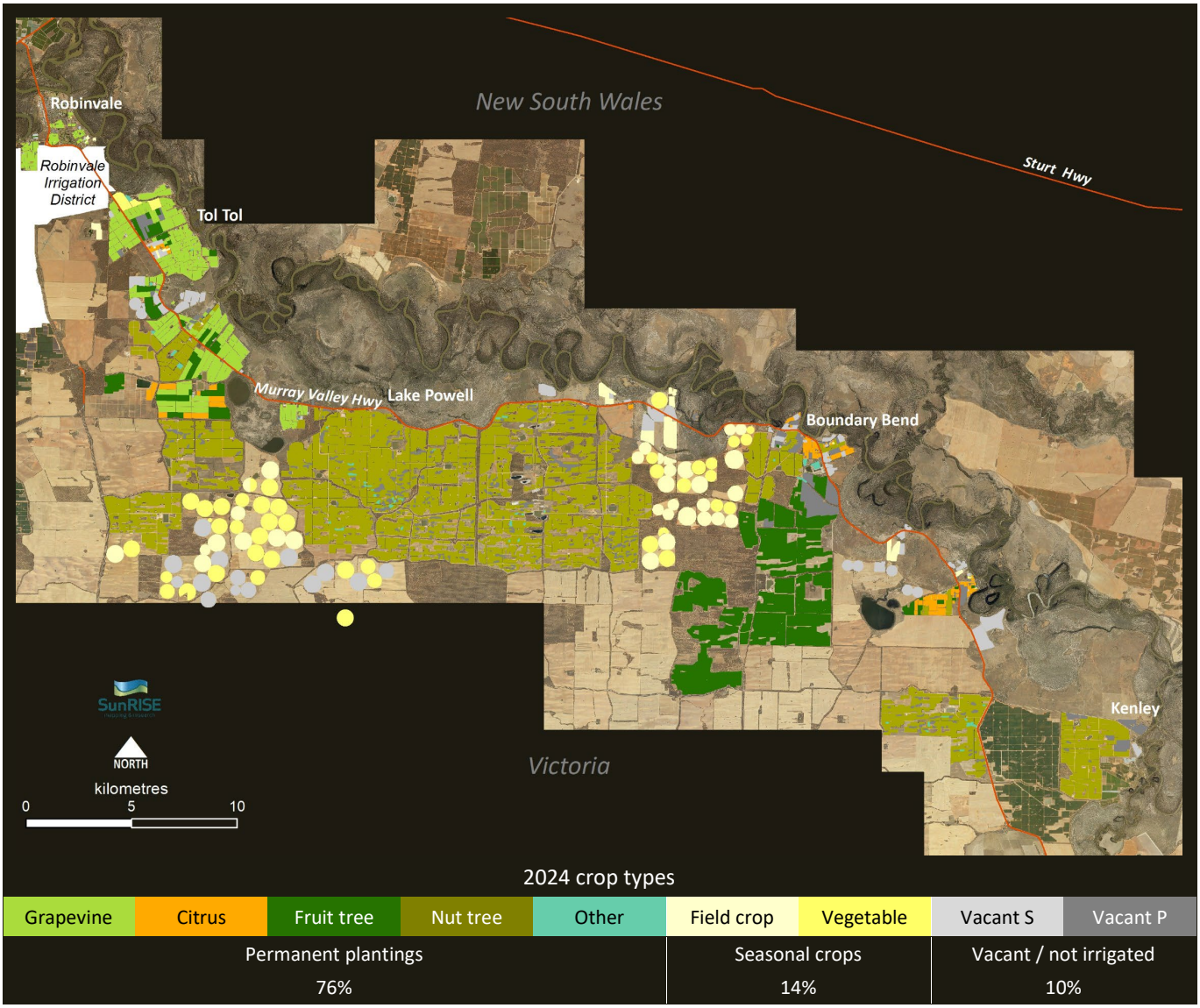
From 1997 to 2024:

- the number of properties decreased by 39, a 35% decrease from 111 to 72 properties;
- properties with an irrigable area less than 40 ha decreased by 53, while the number over 40 ha increased by 14; and
- average property size (irrigable area) increased from 46 to 302 ha per property.

3.3.1 Boundary Bend river reach - crop types in 2024

Map 14 shows the Boundary Bend river reach with crop types in 2024.

The aerial photography was flown in December 2023 (*source: Coordinated Imagery Program, DTP Victoria*).



Map 14: Boundary Bend river reach showing crop types in 2024

3.3.2 Boundary Bend river reach - crop types from 1997 to 2024

Figure 70 summarises crop types in the Boundary Bend river reach from 1997 to 2024.

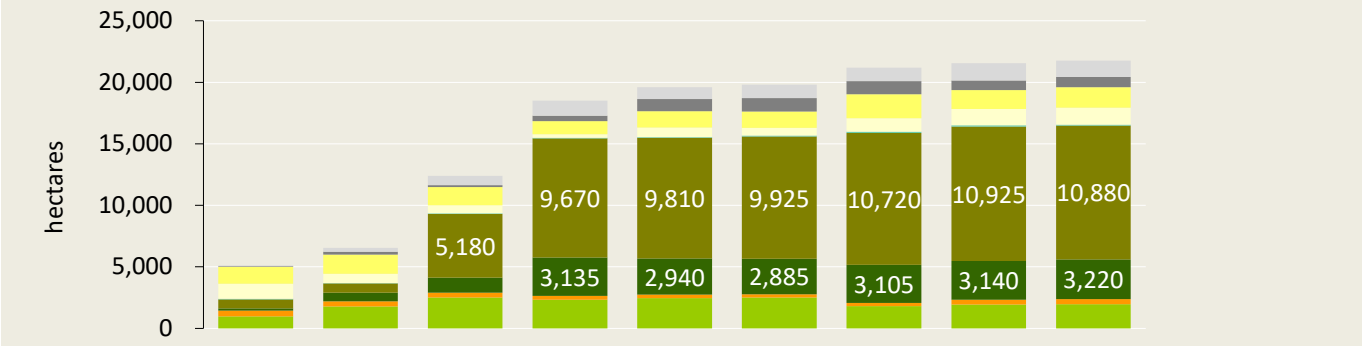
The dominant crop type changed from field crops in 1997 to potatoes in 2003 then almonds from 2006 to 2024.

In 2024, the main plantings were:

1. almond trees, 10,380 ha (48% of the irrigable area);
2. olive trees, 2,765 ha (13% of the irrigable area);
3. table grapes, 1,875 ha (9% of the irrigable area); and
4. potatoes, 1,570 ha (7% of the irrigable area).

From 1997 to 2024, the main planting changes were:

- almond trees increased by 9,755 ha, a 1,561% increase from 625 to 10,380 ha;
- olive trees increased by 2,715 ha, a 5,430% increase from 50 to 2,765 ha; and
- table grapes increased by 1,330 ha, a 244% increase from 545 to 1,875 ha.



Crop type		1997	2003	2006	2009	2012	2015	2018	2021	2024	% of 2024	Change 1997-2024
Permanent	Grape Dried	45	10	10	10	0	0	0	0	0	0%	-45
	Grape Table	545	810	820	795	1,010	1,265	1,605	1,810	1,875	9%	+1,330
	Grape Wine	380	965	1,685	1,530	1,460	1,245	195	140	105	<1%	-275
	Citrus	475	415	380	305	275	275	270	390	410	2%	-65
	Fruit Olive	50	610	1,145	3,065	2,765	2,630	2,790	2,765	2,765	13%	+2,715
	Fruit Other	125	95	85	70	175	255	315	375	455	2%	+330
	Nut Almond	625	620	5,040	9,530	9,645	9,720	10,390	10,525	10,380	48%	+9,755
	Nut Other	125	140	140	140	165	205	330	400	500	2%	+375
	Other	35	30	50	50	45	75	85	90	80	<1%	+45
Seasonal	Field Crop	1,240	745	660	280	790	640	1,090	1,335	1,370	6%	+130
	Veg. Carrot	370	280	260	380	320	260	60	0	0	0%	-370
	Veg. Potato	825	1,105	930	610	820	905	1,795	1,435	1,570	7%	+745
	Veg. Other	170	180	280	90	170	140	95	100	90	<1%	-80
Vacant P		55	230	160	440	990	1,105	1,085	785	835	4%	+780
Vacant S		60	320	755	1,210	975	1,095	1,075	1,390	1,320	6%	+1,260
Total (ha)		5,125	6,555	12,400	18,505	19,605	19,815	21,180	21,540	21,755	100%	+16,630
Dominant		f.crop	potato	almond								

Figure 70: Boundary Bend river reach - crop types from 1997 to 2024

3.3.3 Boundary Bend river reach - new permanent plantings

Figure 71 shows the proportion of permanent crops planted or top-worked in the previous three years in the Boundary Bend river reach from 1997 to 2024.

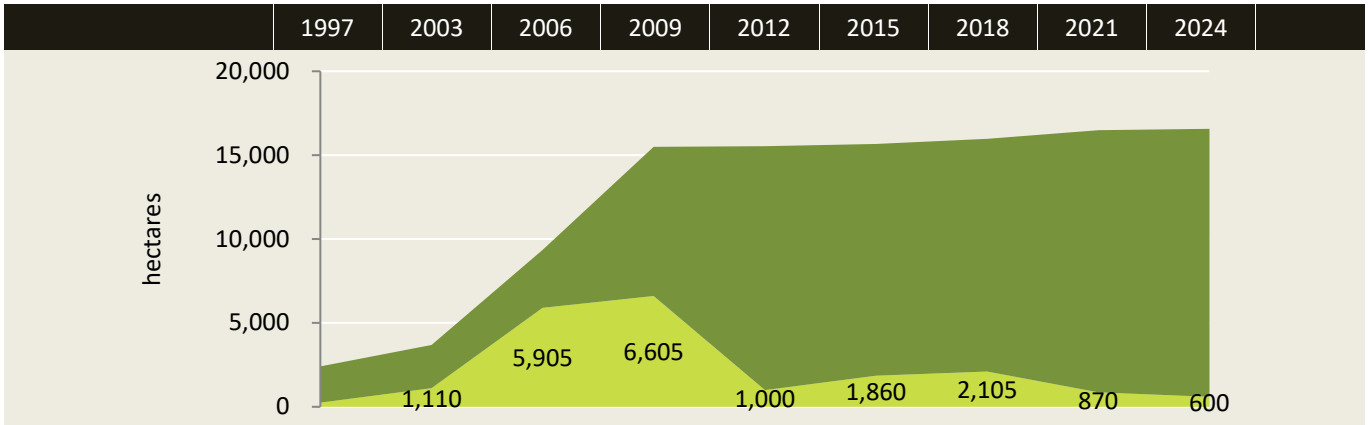
The information provides an indication of development activity that doesn't necessarily involve a change in area or crop type as it includes replanting or top working to different varieties. The figures are conservative, as top worked plantings can be difficult to interpret from the three-yearly aerial imagery, particularly for grapevines.

In 2024:

- 600 ha (4%) of permanent crops were planted or top-worked within the previous three years.
- These new plantings were:
    1. table grapes (285 ha);
    2. pistachios (100 ha);
    3. almonds (95 ha);
    4. avocados (65 ha);
    5. citrus (35 ha); and
    6. stone fruit (20 ha).

From 1997 to 2024:

- The proportion of new permanent plantings was at its lowest in 2024 with 4% (600 ha) planted in the previous three years and highest in 2006 with 63% (5,905 ha) planted in the previous three years.



Permanent plantings	1997	2003	2006	2009	2012	2015	2018	2021	2024	% of 2024
≤3yr old plantings	250	1,110	5,905	6,605	1,000	1,860	2,105	870	600	4%
>3yr old plantings	2,155	2,585	3,450	8,890	14,540	13,810	13,875	15,625	15,970	96%
Total (ha)	2,405	3,695	9,355	15,495	15,540	15,670	15,980	16,495	16,570	100%
% 3year development	10%	30%	63%	43%	6%	12%	13%	5%	4%	
Average 3-year dev.	21%									

Figure 71: Boundary Bend river reach - three-year old permanent plantings from 1997 to 2024

3.3.4 Boundary Bend river reach - planting trends

Figure 72 summarises planting trends with respect to permanent crops, seasonal crops and vacant areas in the Boundary Bend river reach from 1997 to 2024.

The proportion of permanent plantings, seasonal cropping and vacant areas changed from:

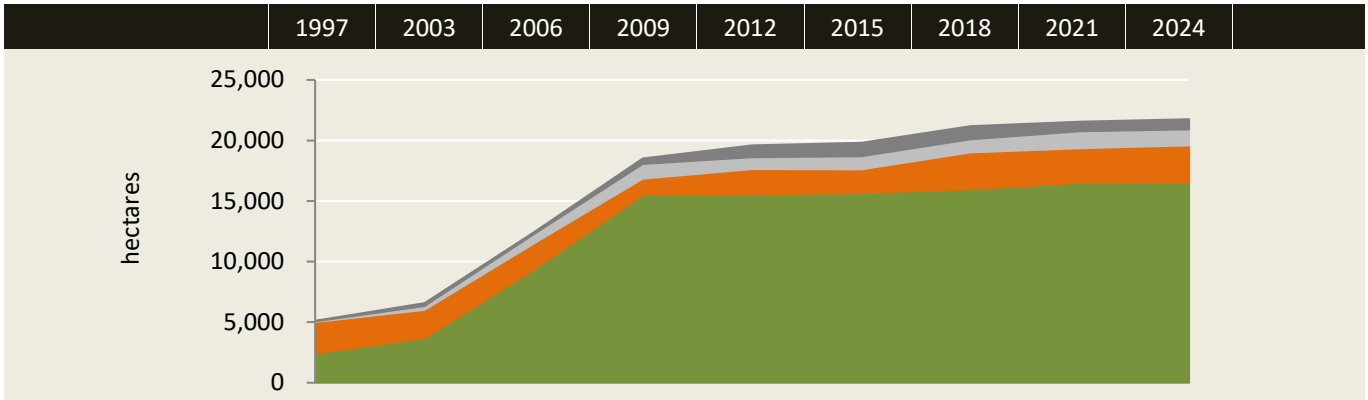
- 47% permanent, 51% seasonal and 2% vacant in 1997; to
- 76% permanent, 14% seasonal and 10% vacant in 2024.

In 2024, the irrigable area of 21,755 ha comprised:

- 76% (16,570 ha) irrigated permanent plantings;
- 14% (3,030 ha) irrigated seasonal crops;
- 4% (835 ha) vacant, previously an irrigated permanent planting; and
- 6% (1,320 ha) vacant, previously an irrigated seasonal crop.

From 1997 to 2024:

- irrigated permanent crops increased by 14,165 ha, from 2,405 to 16,570 ha;
- irrigated seasonal crops increased by 425 ha from 2,605 to 3,030 ha;
- vacant areas, previously irrigated permanent plantings increased by 780 ha, from 55 to 835 ha; and
- vacant areas, previously irrigated seasonal crops increased by 1,260 ha, from 60 to 1,320 ha.



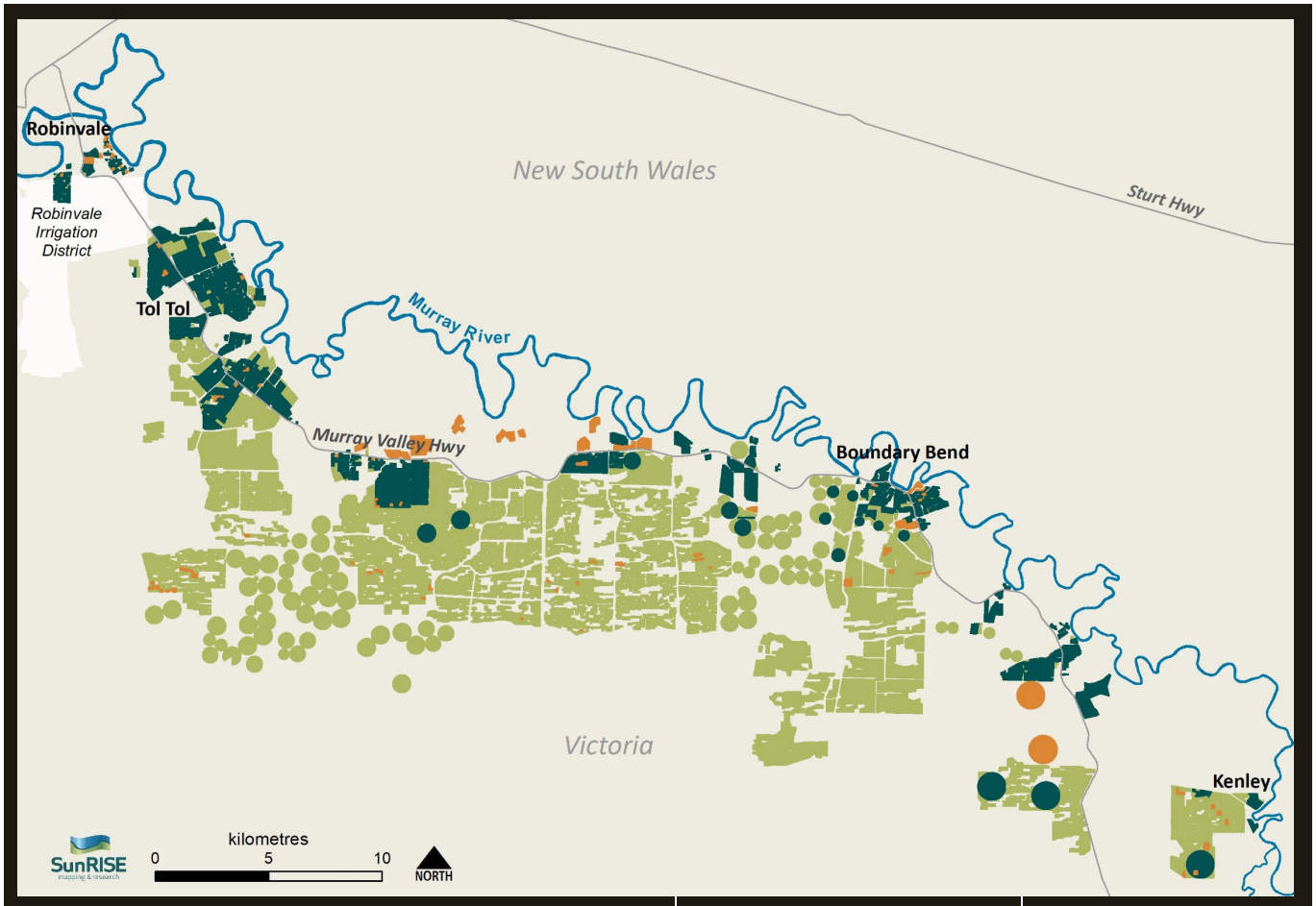
	1997	2003	2006	2009	2012	2015	2018	2021	2024	Change 1997-2024
Permanent - irrigated	2,405	3,695	9,355	15,495	15,540	15,670	15,980	16,495	16,570	+14,165
Seasonal - irrigated	2,605	2,310	2,130	1,360	2,100	1,945	3,040	2,870	3,030	+425
Total irrigated (ha)	5,010	6,005	11,485	16,855	17,640	17,615	19,020	19,365	19,600	+14,590
Vacant - permanent	55	230	160	440	990	1,105	1,085	785	835	+780
Vacant - seasonal	60	320	755	1,210	975	1,095	1,075	1,390	1,320	+1,260
Total irrigable (ha)	5,125	6,555	12,400	18,505	19,605	19,815	21,180	21,540	21,755	+16,630
% Permanent	47%	56%	75%	84%	79%	79%	75%	77%	76%	
% Seasonal	51%	35%	17%	7%	11%	10%	14%	13%	14%	
% Vacant P	1%	4%	1%	2%	5%	6%	5%	4%	4%	
% Vacant S	1%	5%	6%	7%	5%	6%	5%	6%	6%	

Figure 72: Boundary Bend river reach - planting trends from 1997 to 2024

3.3.5 Boundary Bend river reach - irrigation development

Map 15 shows irrigation development from 1997 to 2024 in the Boundary Bend river reach with respect to new development (expansion) and areas retired[24] from irrigation.

- The irrigable area increased by 16,630 ha, a 324% increase from 5,125 ha in 1997 to 21,755 ha in 2024.
- The net increase of 16,630 ha was the balance of 665 ha retired from irrigation and 17,295 ha of expansion.



		Hectares			% change since 1997
Irrigable area in 1997 (1996-97 season)		5,125			
Retired between 1997 and 2024			-665		-13%
Expansion between 1997 and 2024			+17,295		+337%
Net change from 1997 to 2024				+16,630	+324%
Irrigable area in 2024 (2023-24 season)				21,755	

Map 15: Boundary Bend river reach - irrigation development from 1997 to 2024

[24] Retired areas were previously irrigated but have undergone a change in land use and no longer have irrigation infrastructure e.g. urban development, sheds, dams, land set aside for conservation or returned to dryland agriculture.

3.3.6 Boundary Bend river reach - salinity impact zones

Figure 73 summarises river salinity impact zones of irrigated areas in the Boundary Bend river reach from 1997 to 2024. Boundary Bend private diverters are in low salinity impact zones L1, L2 and L3. Irrigation development from 1997 to 2024 occurred predominantly in L1.

In 2024, the irrigable area of 21,755 ha comprised:

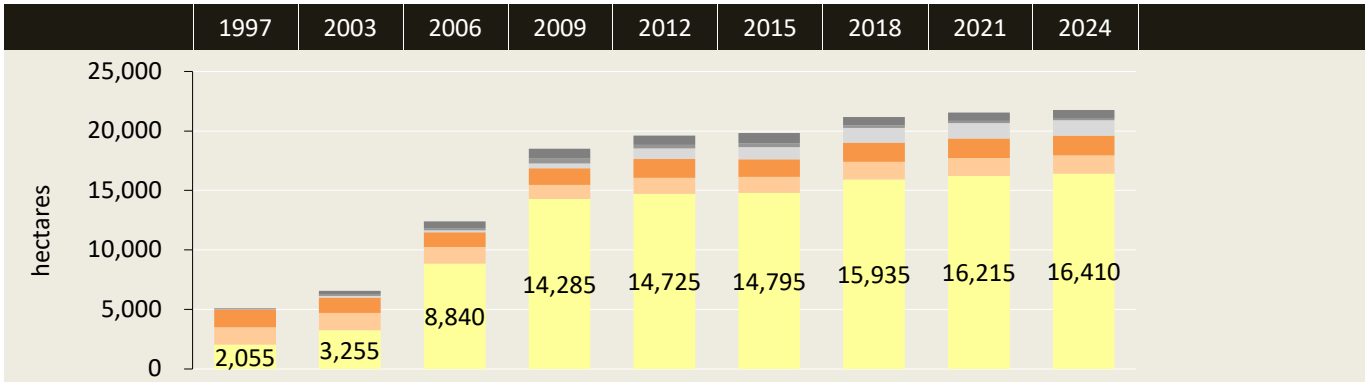
- 81% (17,710 ha) in the lowest salinity impact zone, L1;
- 8% (1,710 ha) in L2; and
- 11% (2,335 ha) in L3.

From 1997 to 2024, the area irrigated in:

- L1 increased by 14,355 ha, a 699% increase from 2,055 to 16,410 ha;
- L2 increased by 95 ha, a 7% increase from 1,435 to 1,530 ha; and
- L3 increased by 140 ha, an 9% increase from 1,520 to 1,660 ha.

From 1997 to 2024, the irrigable area in:

- L1 increased by 15,650 ha, a 760% increase from 2,060 to 17,710 ha;
- L2 increased by 205 ha, a 14% increase from 1,505 to 1,710 ha; and
- L3 increased by 775 ha, a 50% increase from 1,560 to 2,335 ha.



Salinity impact zone		1997	2003	2006	2009	2012	2015	2018	2021	2024	% in 2024	Change 1997-2024
Irrigated	L1	2,055	3,255	8,840	14,285	14,725	14,795	15,935	16,215	16,410	75%	+14,355
	L2	1,435	1,455	1,400	1,185	1,330	1,350	1,460	1,525	1,530	7%	+95
	L3	1,520	1,295	1,245	1,385	1,585	1,470	1,625	1,625	1,660	8%	+140
	L4	-	-	-	-	-	-	-	-	-	-	-
	HIZ	-	-	-	-	-	-	-	-	-	-	-
Not Irrigated	L1	5	120	175	415	895	1,030	1,225	1,285	1,300	6%	+1,295
	L2	70	115	170	405	290	320	240	185	180	1%	+110
	L3	40	315	570	830	780	850	695	705	675	3%	+635
	L4	-	-	-	-	-	-	-	-	-	-	-
	HIZ	-	-	-	-	-	-	-	-	-	-	-
Total (ha)		5,125	6,555	12,400	18,505	19,605	19,815	21,180	21,540	21,755	100%	+16,630
Dominant zone		L1										

Figure 73: Boundary Bend river reach - irrigable area in each salinity impact zone, 1997 to 2024

3.3.7 Boundary Bend river reach - irrigation methods

Figure 74 summarises irrigation methods in the Boundary Bend river reach from 1997 to 2024.

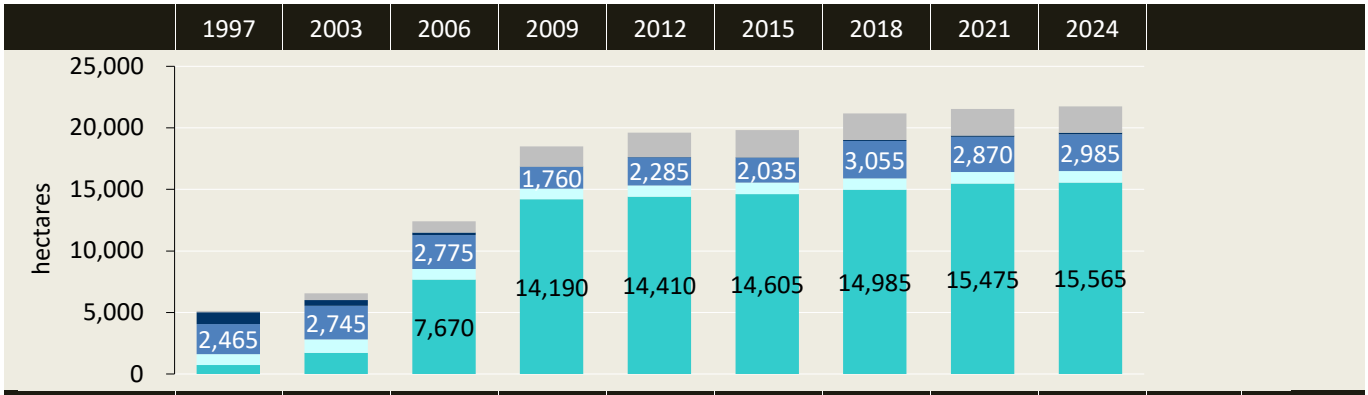
The dominant irrigation method in the Boundary Bend river reach was overhead irrigation from 1997 to 2003, then drip irrigation from 2006 to 2024.

In 2024, the irrigable area of 21,755 ha comprised:

- 72% (15,565 ha) drip irrigation;
- 4% (925 ha) low level irrigation;
- 14% (2,985 ha) overhead sprinklers;
- 1% (125 ha) furrow irrigation; and
- 10% (2,155 ha) vacant, not irrigated.

From 1997 to 2024:

- drip irrigation increased by 14,840 ha, a 2,047% increase from 725 to 15,565 ha;
- low level irrigation increased by 45 ha, a 5% increase from 880 to 925 ha;
- overhead irrigation increased by 520 ha, a 21% increase from 2,465 to 2,985 ha; and
- furrow irrigation decreased by 815 ha, an 87% decrease from 940 to 125 ha.



Irrigation method[25]	1997	2003	2006	2009	2012	2015	2018	2021	2024	% in 2024	Change 1997-2024
Drip	725	1,720	7,670	14,190	14,410	14,605	14,985	15,475	15,565	72%	+14,840
Low level	880	1,080	855	870	910	940	905	935	925	4%	+45
Overhead	2,465	2,745	2,775	1,760	2,285	2,035	3,055	2,870	2,985	14%	+520
Furrow	940	460	185	35	35	35	75	85	125	1%	-815
Vacant	115	550	915	1,650	1,965	2,200	2,160	2,175	2,155	10%	+2,040
Total (ha)	5,125	6,555	12,400	18,505	19,605	19,815	21,180	21,540	21,755	100%	+16,630
Dominant	overhead		drip								

Figure 74: Boundary Bend river reach - irrigation methods from 1997 to 2024

[25] Overhead irrigation includes pivots and lateral move systems. Furrow includes flood irrigation. (Refer to Table 4.)

3.3.8 Boundary Bend river reach - property change

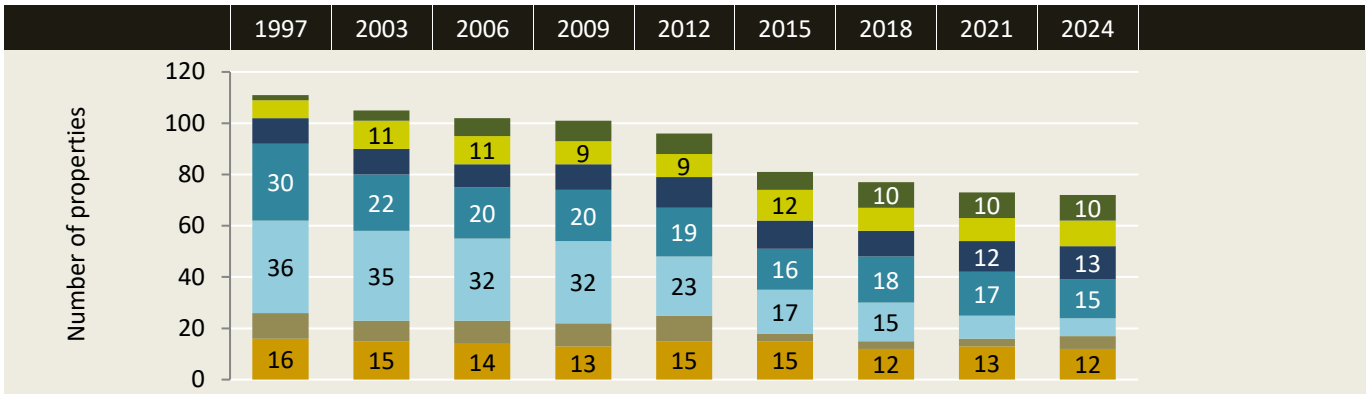
Figure 75 provides estimates of property numbers and average property size (irrigable area) in the Boundary Bend river reach from 1997 to 2024.

In 2024:

- there were approximately 72 irrigation properties; and
- 67% of properties had an irrigable area over 20 ha.

From 1997 to 2024:

- the number of properties decreased by 39, a 35% decrease from 111 to 72 properties;
- properties with an irrigable area less than 40 ha decreased by 53, and the number over 40 ha increased by 14; and
- average property size (irrigable area) increased from 46 to 302 ha per property.



Property size (irrigable area)	1997	2003	2006	2009	2012	2015	2018	2021	2024	% in 2024	Change 1997-2024
1 to 5 ha	16	15	14	13	15	15	12	13	12	17%	-4
5 to 10 ha	10	8	9	9	10	3	3	3	5	7%	-5
10 to 20 ha	36	35	32	32	23	17	15	9	7	10%	-29
20 to 40 ha	30	22	20	20	19	16	18	17	15	21%	-15
40 to 100 ha	10	10	9	10	12	11	10	12	13	18%	+3
100 to 500 ha	7	11	11	9	9	12	9	9	10	14%	+3
> 500 ha	2	4	7	8	8	7	10	10	10	14%	+8
Total properties	111	105	102	101	96	81	77	73	72	100%	-39
Average size (ha)	46	62	122	183	204	245	275	295	302		

Figure 75: Boundary Bend river reach - property numbers and sizes from 1997 to 2024

3.4 Wemen river reach (Euston weir to Liparoo)

In summary for the Wemen river reach

Crop types in 2024

The main plantings in the Wemen river reach in 2024 were:

1. almond trees, 8,265 ha (59% of the irrigable area);
2. olives, 855 ha (6% of the irrigable area);
3. vegetables other than carrots and potatoes, 845 ha (6% of the irrigable area); and
4. table grapes, 800 ha (6% of the irrigable area).

Crop type changes from 1997 to 2024

The dominant crop in the Wemen river reach changed from carrots in 1997 to almonds from 2003 to 2024.

The main crop type changes from 1997 to 2024 were:

- almond trees increased by 8,095 ha, a 4,762% increase from 170 to 8,265 ha;
- olive trees increased by 855 ha, from no plantings in 1997 to 855 ha in 2024; and
- vegetables other than carrots and potatoes increased by 590 ha, a 231% increase from 255 to 845 ha.

New permanent plantings (planted or top-worked in the previous three years)

In 2024, 1,065 ha (10%) of permanent crops were planted or top-worked in the previous three years. These new plantings were:

1. olives (335 ha);
2. pistachios (255 ha);
3. table grapes (215 ha);
4. citrus (200 ha);
5. dried grapes (40 ha);
6. avocados (15 ha); and
7. wine grapes (5 ha).

Planting trends - permanent plantings, seasonal crops and vacant areas

In 2024, the irrigable area of 13,995 ha comprised:

- 79% (11,095 ha) irrigated permanent plantings;
- 12% (1,730 ha) irrigated seasonal crops;
- 2% (335 ha) vacant, previously an irrigated permanent planting; and
- 6% (835 ha) vacant, previously an irrigated seasonal crop.

The proportion of permanent plantings, seasonal cropping and vacant areas changed from:

- 39% permanent, 60% seasonal and 1% vacant in 1997; to
- 79% permanent, 12% seasonal and 8% vacant in 2024.

In summary for the Wemen river reach

Irrigation development - new development (expansion) and retired areas

The irrigable area in the Wemen river reach increased by 11,845 ha, a 551% increase from 2,150 ha in 1997 to 13,995 ha in 2024.

The net increase of 11,845 ha was the balance of 175 ha retired from irrigation and 12,020 ha of expansion.

Salinity impact zones

The Wemen river reach is in the low salinity impact zones L1, L2 and L3. Irrigation development from 1997 to 2024 occurred predominantly in L1 and L2.

In 2024, the irrigable area of 13,995 ha comprised:

- 43% (5,985 ha) in the lowest salinity impact zone, L1;
- 56% (7,860 ha) in L2; and
- 1% (150 ha) in L3.

From 1997 to 2024 the irrigable area in:

- L1 increased by 5,810 ha, a 3,320% increase from 175 to 5,985 ha;
- L2 increased by 6,005 ha, a 324% increase from 1,855 to 7,860 ha; and
- L3 increased by 30 ha, a 25% increase from 120 to 150 ha.

Irrigation methods

The dominant irrigation method in the Wemen river reach changed from overheads in 1997 to drip irrigation from 2003 to 2024.

In 2024, the irrigable area of 13,995 ha comprised:

- 76% (10,700 ha) drip irrigation;
- 8% (1,050 ha) low level irrigation;
- 8% (1,075 ha) overhead sprinklers;
- 0% (0 ha) furrow irrigation; and
- 8% (1,170 ha) vacant, not irrigated.

Irrigation properties

In 2024, there were approximately 37 irrigation properties with an average property size (irrigable area) of 378 ha.

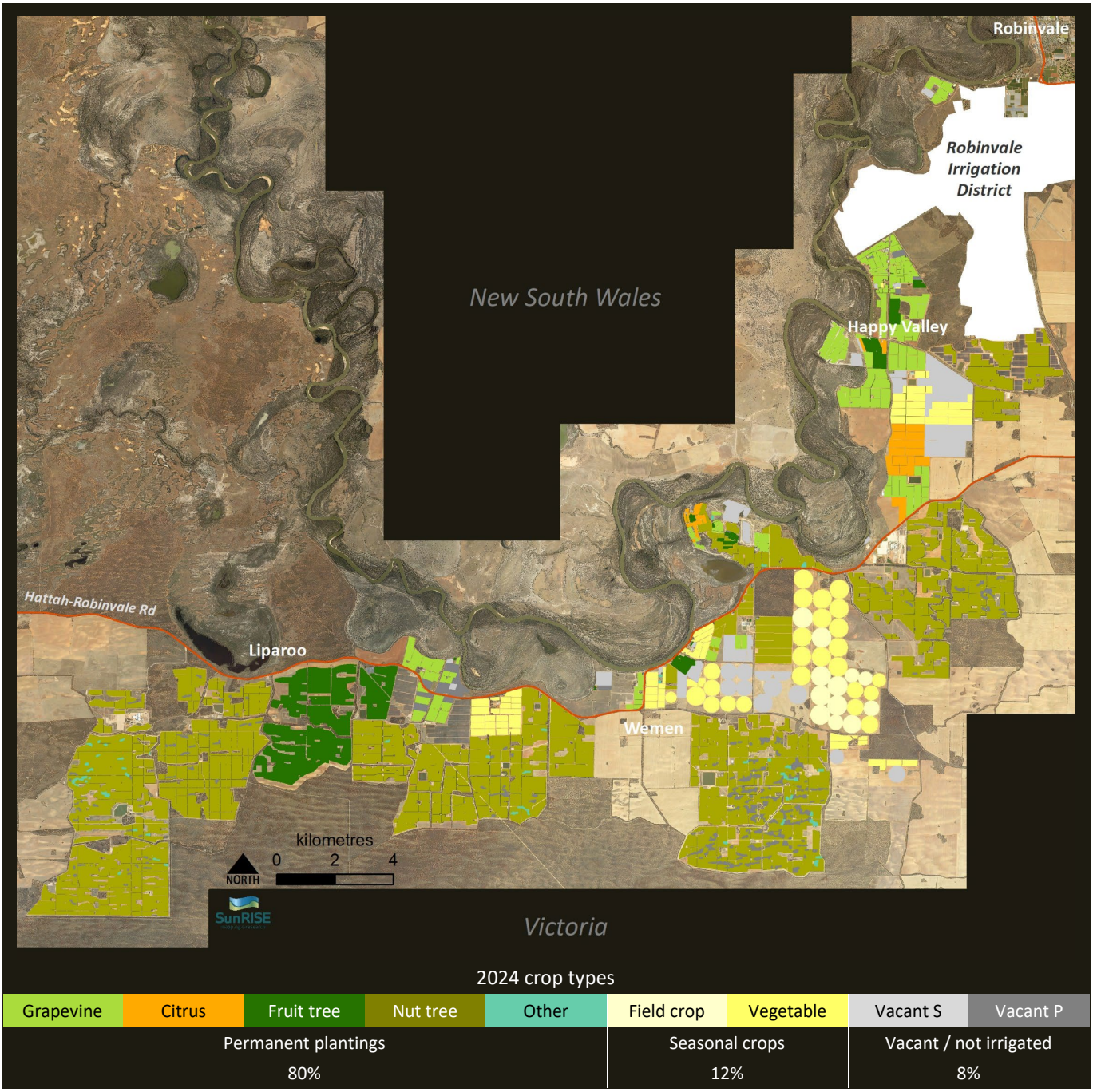
From 1997 to 2024:

- the number of properties decreased by 3, an 8% decrease from 40 to 37 properties;
- properties with an irrigable area less than 100 ha decreased by 13, while the number over 100 ha increased by 10; and
- average property size (irrigable area) increased from 54 to 378 ha per property.

3.4.1 Wemen river reach - crop types in 2024

Map 16 shows the Wemen river reach with crop types in 2024.

The aerial photography was flown in December 2023 (*source: Coordinated Imagery Program, DTP, Victoria*).



Map 16: Wemen river reach showing crop types in 2024

3.4.2 Wemen river reach - crop types from 1997 to 2024

Figure 76 summarises crop types in the Wemen river reach from 1997 to 2024.

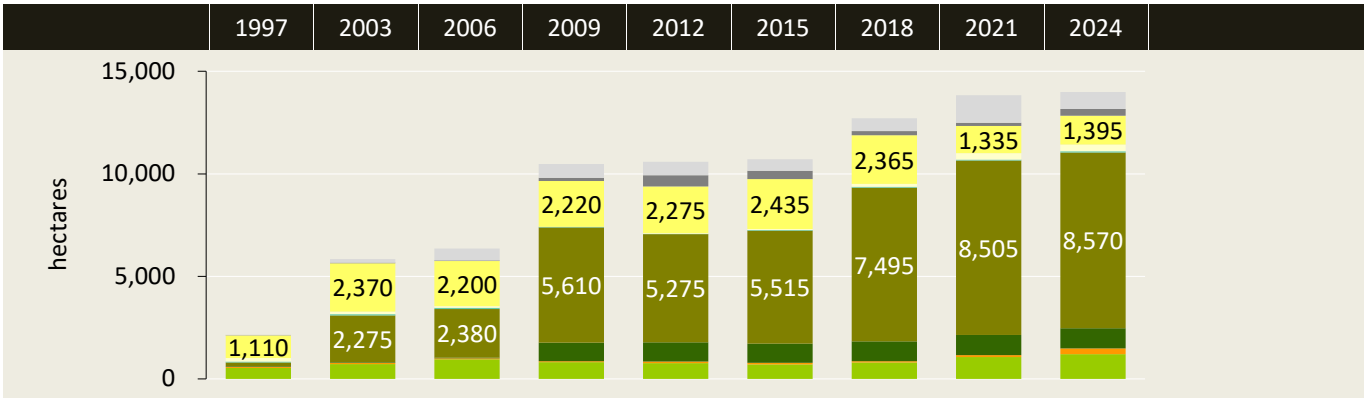
The dominant crop type changed from carrots in 1997 to almonds from 2003 to 2024.

In 2024, the main plantings were:

1. almond trees, 8,265 ha (59% of the irrigable area);
2. olives, 855 ha (6% of the irrigable area);
3. vegetables other than carrots and potatoes, 845 ha (6% of the irrigable area); and
4. table grapes, 800 ha (6% of the irrigable area).

From 1997 to 2024, the main planting changes were:

- almond trees increased by 8,095 ha, a 4,762% increase from 170 to 8,265 ha;
- olive trees increased by 855 ha, from no plantings in 1997 to 855 ha in 2024;
- vegetables other than carrots and potatoes increased by 590 ha, a 231% increase from 255 to 845 ha; and
- table grapes increased by 565 ha, a 240% increase from 235 to 800 ha.



Crop type		1997	2003	2006	2009	2012	2015	2018	2021	2024	% of 2024	Change 1997-2024
Permanent	Grape Dried	30	80	95	90	90	95	115	135	170	1%	+140
	Grape Table	235	270	250	185	190	195	340	635	800	6%	+565
	Grape Wine	275	380	605	540	485	420	340	300	235	2%	-40
	Citrus	65	60	55	55	80	75	70	90	280	2%	+215
	Fruit Olive	0	0	0	855	855	855	855	855	855	6%	+855
	Fruit Other	25	25	25	45	85	80	105	130	135	1%	+110
	Nut Almond	170	2,275	2,380	5,595	5,260	5,515	7,480	8,450	8,265	59%	+8,095
	Nut Other	0	0	0	15	15	0	15	55	305	2%	+305
	Other	40	60	60	35	15	30	45	50	50	<1%	+10
Seasonal	Field Crop	180	125	70	10	30	40	145	300	335	2%	+155
	Veg. Carrot	855	1,870	1,830	1,845	1,880	2,000	1,240	520	550	4%	-305
	Veg. Potato	-	-	-	-	-	-	-	-	-	-	-
	Veg. Other	255	500	370	375	395	435	1,125	815	845	6%	+590
Vacant P		5	20	45	165	545	405	210	160	335	2%	+330
Vacant S		15	175	565	665	660	565	615	1,330	835	6%	+820
Total (ha)		2,150	5,840	6,350	10,475	10,585	10,710	12,700	13,825	13,995	100%	+11,845
Dominant		carrot	almond									

Figure 76: Wemen river reach - crop types from 1997 to 2024

3.4.3 Wemen river reach - new permanent plantings

Figure 77 shows the proportion of permanent crops planted or top-worked in the previous three years in the Wemen river reach from 1997 to 2024.

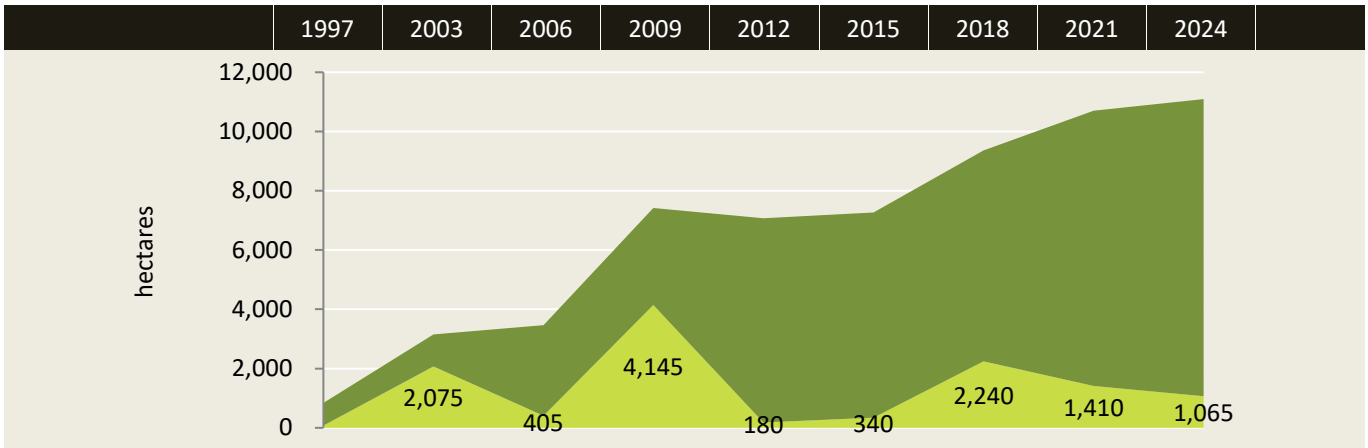
The information provides an indication of development activity that doesn't necessarily involve a change in area or crop type as it includes replanting or top working to different varieties. The figures are conservative, as top worked plantings can be difficult to interpret from the three-yearly aerial imagery, particularly for grapevines.

In 2024:

- 1,065 ha (10%) of permanent crops were planted or top-worked within the previous three years.
- These new plantings were:
    1. olives (335 ha);
    2. pistachios (255 ha);
    3. table grapes (215 ha);
    4. citrus (200 ha);
    5. dried grapes (40 ha);
    6. avocados (15 ha); and
    7. wine grapes (5 ha).

From 1997 to 2024:

- The proportion of new permanent plantings was at its lowest in 2012 with 3% (180 ha) planted in the previous three years and highest in 2003 with 66% (2,075 ha) planted in the previous three years.



Permanent plantings	1997	2003	2006	2009	2012	2015	2018	2021	2024	% of 2024
≤3yr old plantings	75	2,075	405	4,145	180	340	2,240	1,410	1,065	10%
>3yr old plantings	765	1,075	3,065	3,270	6,895	6,925	7,125	9,290	10,030	90%
Total (ha)	840	3,150	3,470	7,415	7,075	7,265	9,365	10,700	11,095	100%
% 3year development	9%	66%	12%	56%	3%	5%	24%	13%	10%	
Average 3-year dev.	22%									

Figure 77: Wemen river reach - three-year old permanent plantings from 1997 to 2024

3.4.4 Wemen river reach - planting trends

Figure 78 summarises planting trends with respect to permanent crops, seasonal crops and vacant areas in the Wemen river reach from 1997 to 2024.

The proportion of permanent plantings, seasonal cropping and vacant areas changed from:

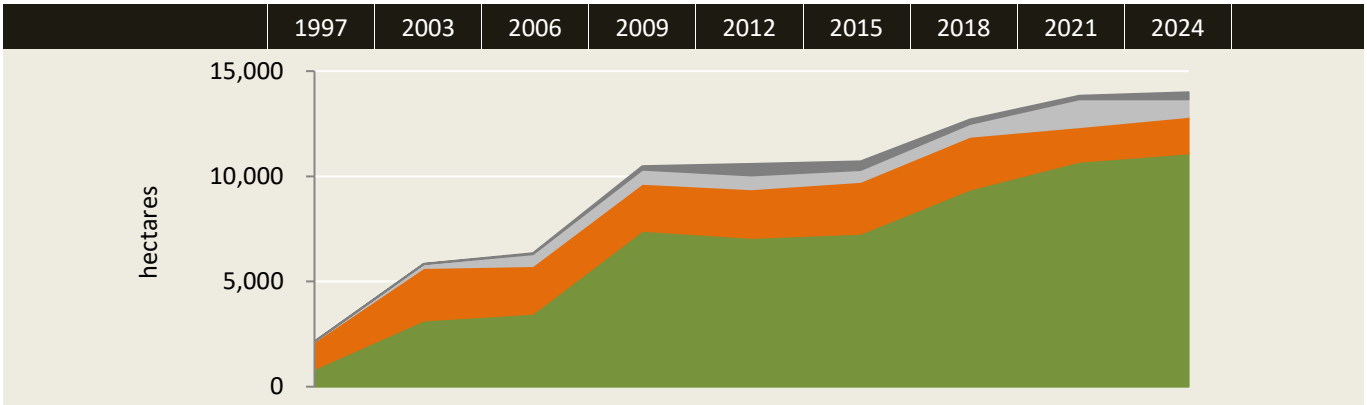
- 39% permanent, 60% seasonal and 1% vacant in 1997; to
- 79% permanent, 12% seasonal and 8% vacant in 2024.

In 2024, the irrigable area of 13,995 ha comprised:

- 79% (11,095 ha) irrigated permanent plantings;
- 12% (1,730 ha) irrigated seasonal crops;
- 2% (335 ha) vacant, previously an irrigated permanent planting; and
- 6% (835 ha) vacant, previously an irrigated seasonal crop.

From 1997 to 2024:

- irrigated permanent crops increased by 10,255 ha, from 840 to 11,095 ha;
- irrigated seasonal crops increased by 440 ha, from 1,290 to 1,730 ha;
- vacant areas, previously irrigated permanent plantings increased by 330 ha, from 5 to 335 ha; and
- vacant areas, previously irrigated seasonal crops increased by 820 ha, from 15 to 835 ha.



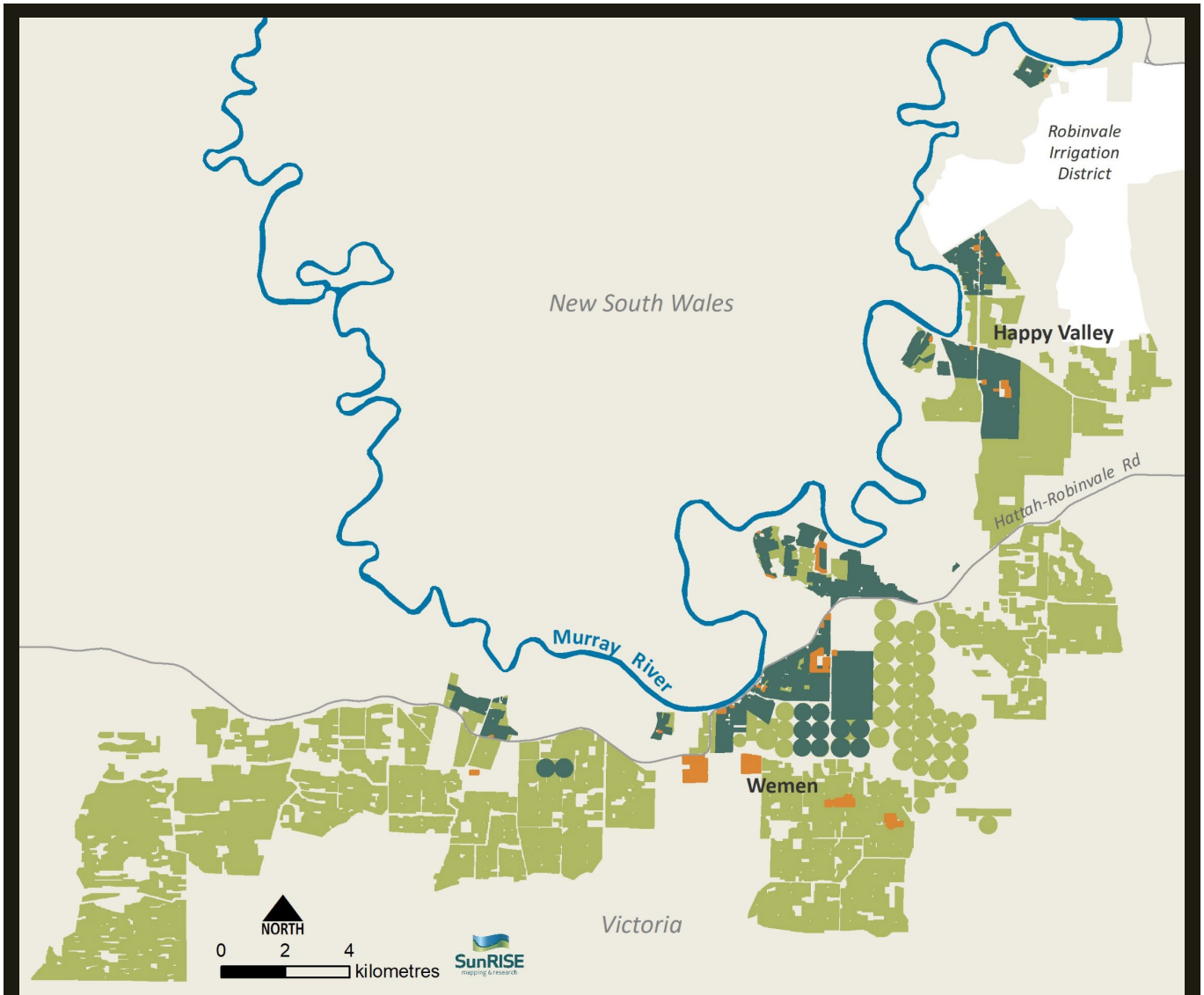
	1997	2003	2006	2009	2012	2015	2018	2021	2024	Change 1997-2024
Permanent - irrigated	840	3,150	3,470	7,415	7,075	7,265	9,365	10,700	11,095	+10,255
Seasonal - irrigated	1,290	2,495	2,270	2,230	2,305	2,475	2,510	1,635	1,730	+440
Total irrigated (ha)	2,130	5,645	5,740	9,645	9,380	9,740	11,875	12,335	12,825	+10,695
Vacant - permanent	5	20	45	165	545	405	210	160	335	+330
Vacant - seasonal	15	175	565	665	660	565	615	1,330	835	+820
Total irrigable (ha)	2,150	5,840	6,350	10,475	10,585	10,710	12,700	13,825	13,995	+11,845
% Permanent	39%	54%	55%	71%	67%	68%	74%	77%	79%	
% Seasonal	60%	43%	36%	21%	22%	23%	20%	12%	12%	
% Vacant P	<1%	<1%	1%	2%	5%	4%	2%	1%	2%	
% Vacant S	1%	3%	9%	6%	6%	5%	5%	10%	6%	

Figure 78: Wemen river reach - planting trends from 1997 to 2024

3.4.5 Wemen river reach - irrigation development

Map 17 shows irrigation development from 1997 to 2024 in the Wemen river reach with respect to new development (expansion) and areas retired[26] from irrigation.

- The irrigable area increased by 11,845 ha, a 551% increase from 2,150 ha in 1997 to 13,995 ha in 2024.
- The net increase of 11,845 ha was the balance of 175 ha retired from irrigation and 12,020 ha of expansion.



		Hectares			% change since 1997
Irrigable area in 1997 (1996-97 season)		2,150			
Retired between 1997 and 2024			-175		-8%
Expansion between 1997 and 2024			+12,020		+559%
Net change from 1997 to 2024				+11,845	+551%
Irrigable area in 2024 (2023-24 season)				13,995	

Map 17: Wemen river reach - irrigation development from 1997 to 2024

[26] Retired areas were previously irrigated but have undergone a change in land use and no longer have irrigation infrastructure e.g. urban development, sheds, dams, land set aside for conservation or returned to dryland agriculture.

3.4.6 Wemen river reach - salinity impact zones

Figure 79 summarises river salinity impact zones of irrigated areas in the Wemen river reach from 1997 to 2024. Wemen private diverters are in low salinity impact zones L1, L2 and L3. There are no high salinity impact zones. Irrigation development from 1997 to 2024 occurred predominantly in L1 and L2.

In 2024, the irrigable area of 13,995 ha comprised:

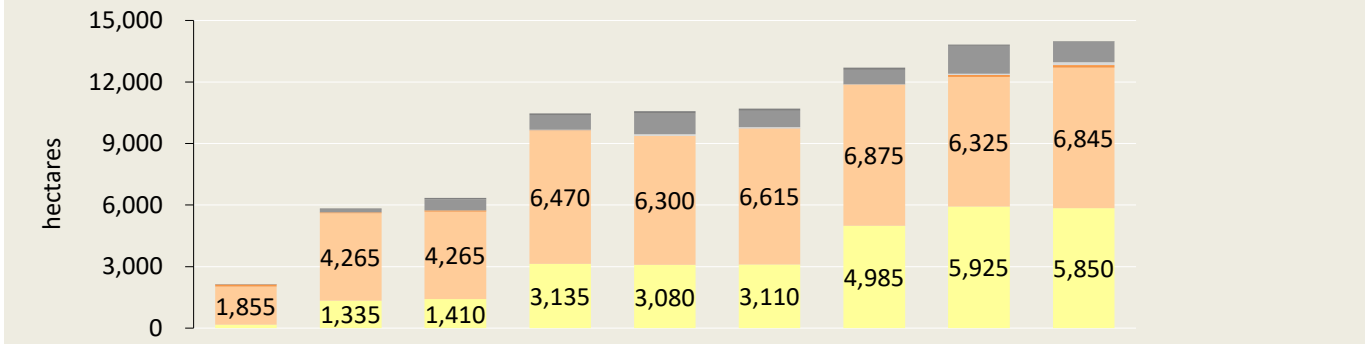
- 43% (5,985 ha) in the lowest salinity impact zone, L1;
- 56% (7,860 ha) in L2; and
- 1% (150 ha) in L3.

From 1997 to 2024, the area irrigated in:

- L1 increased by 5,680 ha, a 3,341% increase from 170 to 5,850 ha;
- L2 increased by 4,990 ha, a 269% increase from 1,855 to 6,845 ha; and
- L3 increased by 25 ha, a 24% increase from 105 to 130 ha.

From 1997 to 2024, the irrigable area in:

- L1 increased by 5,810 ha, a 3,320% increase from 175 to 5,985 ha;
- L2 increased by 6,005 ha, a 324% increase from 1,855 to 7,860 ha; and
- L3 increased by 30 ha, a 25% increase from 120 to 150 ha.



Salinity impact zone		1997	2003	2006	2009	2012	2015	2018	2021	2024	% in 2024	Change 1997-2024
Irrigated	L1	170	1,335	1,410	3,135	3,080	3,110	4,985	5,925	5,850	42%	+5,680
	L2	1,855	4,265	4,265	6,470	6,300	6,615	6,875	6,325	6,845	49%	+4,990
	L3	105	45	65	40	0	15	15	85	130	1%	+25
	L4	-	-	-	-	-	-	-	-	-	-	-
	HIZ	-	-	-	-	-	-	-	-	-	-	-
Not Irrigated	L1	5	0	0	25	80	50	20	65	135	1%	+130
	L2	0	120	545	720	1,000	810	695	1,360	1,015	7%	+1,015
	L3	15	75	65	85	125	110	110	65	20	<1%	+5
	L4	-	-	-	-	-	-	-	-	-	-	-
	HIZ	-	-	-	-	-	-	-	-	-	-	-
Total (ha)		2,150	5,840	6,350	10,475	10,585	10,710	12,700	13,825	13,995	100%	+11,845
Dominant zone		L2										

Figure 79: Wemen river reach - irrigable area in each salinity impact zone from 1997 to 2024

3.4.7 Wemen river reach - irrigation methods

Figure 80 summarises irrigation methods in the Wemen river reach from 1997 to 2024.

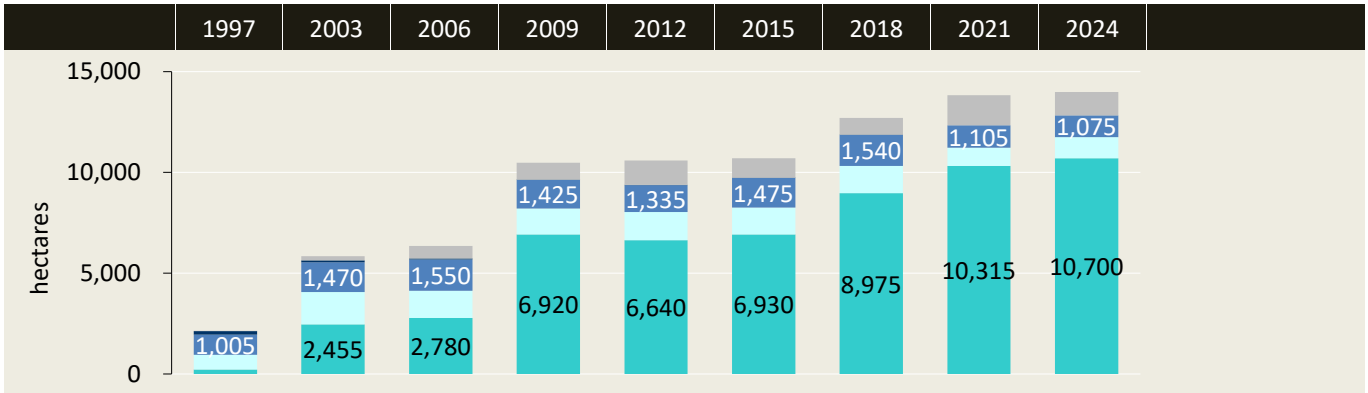
The dominant irrigation method in the Wemen river reach changed from overheads in 1997 to drip irrigation from 2003 to 2024.

In 2024, the irrigable area of 13,995 ha comprised:

- 76% (10,700 ha) drip irrigation;
- 8% (1,050 ha) low level irrigation;
- 8% (1,075 ha) overhead sprinklers;
- 0% (0 ha) furrow irrigation; and
- 8% (1,170 ha) vacant, not irrigated.

From 1997 to 2024:

- drip irrigation increased by 10,470 ha, a 4,552% increase from 230 to 10,700 ha;
- low level irrigation increased by 330 ha, a 46% increase from 720 to 1,050 ha;
- overhead irrigation increased by 70 ha, a 7% increase from 1,005 to 1,075 ha; and
- furrow irrigation decreased by 175 ha, a 100% decrease from 175 to 0 ha.



Irrigation method[27]	1997	2003	2006	2009	2012	2015	2018	2021	2024	% in 2024	Change 1997-2024
Drip	230	2,455	2,780	6,920	6,640	6,930	8,975	10,315	10,700	76%	+10,470
Low level	720	1,615	1,355	1,290	1,400	1,325	1,355	915	1,050	8%	+330
Overhead	1,005	1,470	1,550	1,425	1,335	1,475	1,540	1,105	1,075	8%	+70
Furrow	175	105	55	10	5	10	5	0	0	0%	-175
Vacant	20	195	610	830	1,205	970	825	1,490	1,170	8%	+1,150
Total (ha)	2,150	5,840	6,350	10,475	10,585	10,710	12,700	13,825	13,995	100%	+11,845
Dominant	o/head	drip									

Figure 80: Wemen river reach - irrigation methods from 1997 to 2024

[27] Overhead irrigation includes pivots and lateral move systems. Furrow includes flood irrigation. (Refer to Table 4.)

3.4.8 Wemen river reach - property change

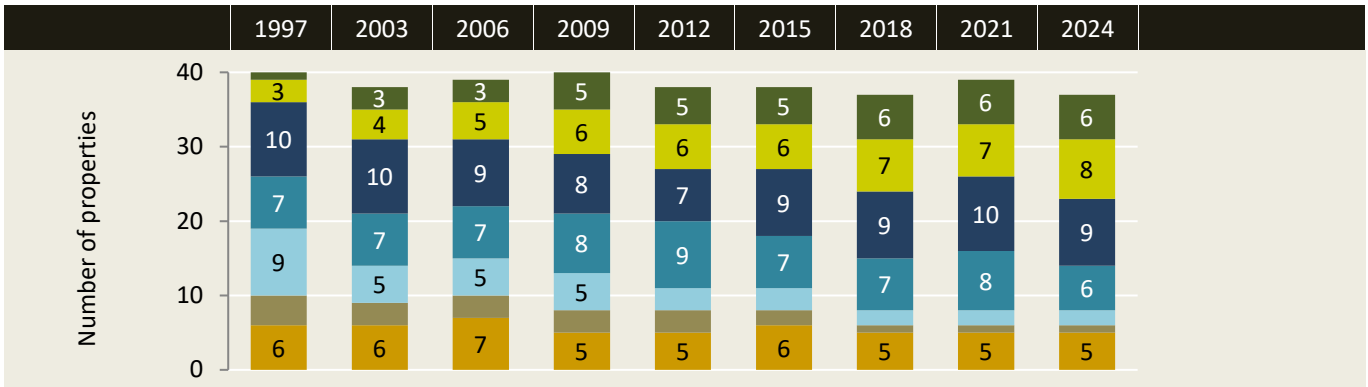
Figure 81 provides estimates of property numbers and average property size (irrigable area) in the Wemen river reach from 1997 to 2024.

In 2024:

- there were approximately 37 irrigation properties; and
- 78% of properties had an irrigable area over 20 ha.

From 1997 to 2024:

- the number of properties decreased by 3, an 8% decrease from 40 to 37 properties;
- properties with an irrigable area less than 100 ha decreased by 13, while the number over 100 ha increased by 10; and
- average property size (irrigable area) increased from 54 to 378 ha per property.



Property size (irrigable area)	1997	2003	2006	2009	2012	2015	2018	2021	2024	% in 2024	Change 1997-2024
1 to 5 ha	6	6	7	5	5	6	5	5	5	14%	-1
5 to 10 ha	4	3	3	3	3	2	1	1	1	3%	-3
10 to 20 ha	9	5	5	5	3	3	2	2	2	5%	-7
20 to 40 ha	7	7	7	8	9	7	7	8	6	16%	-1
40 to 100 ha	10	10	9	8	7	9	9	10	9	24%	-1
100 to 500 ha	3	4	5	6	6	6	7	7	8	22%	+5
> 500 ha	1	3	3	5	5	5	6	6	6	16%	+5
Total properties	40	38	39	40	38	38	37	39	37	100%	-3
Average size (ha)	54	154	163	262	279	282	343	354	378		

Figure 81: Wemen river reach - property numbers and sizes from 1997 to 2024

3.5 Colignan river reach (*Colignan to Yatpool*)

In summary for the Colignan to Yatpool river reach

Crop types in 2024

The main plantings in the Colignan to Yatpool river reach in 2024 were:

1. citrus, 3,605 ha (28% of the irrigable area);
2. wine grapes, 2,525 ha (20% of the irrigable area);
3. almonds, 1,845 ha (15% of the irrigable area);
4. table grapes, 1,130 ha (9% of the irrigable area); and
5. dried grapes, 560 ha (4% of the irrigable area).

Crop type changes from 1997 to 2024

The dominant crop type in the Colignan to Yatpool river reach was wine grapes from 1997 to 2015, then citrus from 2018 to 2024.

The main crop type changes from 1997 to 2024 were:

- almonds increased by 1,660 ha, an 897% increase from 185 to 1,845 ha;
- citrus increased by 1,070 ha, a 42% increase from 2,535 to 3,605 ha;
- table grapes increased by 955 ha, a 546% increase from 175 to 1,130 ha; and
- dried grapes increased by 515 ha, a 1,144% increase from 45 to 560 ha.

New permanent plantings (planted or top-worked in the previous three years)

In 2024, at least 1,510 ha (15%) of permanent crops were planted or top-worked in the previous three years.

These new plantings were:

1. citrus (520 ha);
2. almonds (410 ha);
3. table grapes (335 ha);
4. dried grapes (140 ha);
5. wine grapes (95 ha); and
6. stone fruit and avocados (10 ha).

From 1997 to 2024, the proportion of new permanent plantings was at its lowest in 2015 with 7% (600 ha) planted in the previous three years and highest in 1997 with 30% (1,795 ha) planted in the previous three years. The 1997 development was predominantly wine grapes.

Planting trends - permanent plantings, seasonal crops and vacant areas

In 2024, the irrigable area of 12,710 ha comprised:

- 78% (9,960 ha) irrigated permanent plantings;
- 5% (615 ha) irrigated seasonal crops;
- 10% (1,310 ha) vacant, previously an irrigated permanent planting; and
- 7% (825 ha) vacant, previously an irrigated seasonal crop.

In summary for the Colignan to Yatpool river reach

The proportion of permanent plantings, seasonal cropping and vacant areas changed from:

- 87% permanent, 10% seasonal and 3% vacant in 1997; to
- 78% permanent, 5% seasonal and 17% vacant in 2024.

Irrigation development - new development (expansion) and retired areas

The irrigable area in the Colignan river reach increased by 5,785 ha, an 84% increase from 6,925 ha in 1997 to 12,710 ha in 2024. The net increase of 5,785 ha was the balance of 285 ha retired from irrigation and 6,070 ha of expansion.

Salinity impact zones

The Colignan river reach is in low salinity impact zones L1 and L4 and in the high impact zone, HIZ. Irrigation development from 1997 to 2024 occurred mainly in L4.

In 2024, the irrigable area of 12,710 ha comprised:

- 20% (2,600 ha) in the lowest salinity impact zone, L1;
- 71% (8,935 ha) in L4; and
- 9% (1,175 ha) in the high salinity impact zone, HIZ.

From 1997 to 2024 the irrigable area in:

- L1 increased by 2,305 ha, a 781% increase from 295 to 2,600 ha;
- L4 increased by 3,340 ha, a 60% increase from 5,595 to 8,935 ha; and
- HIZ increased by 140 ha, a 14% increase from 1,035 to 1,175 ha.

Irrigation methods

The dominant irrigation method in the Colignan river reach changed from overheads in 1997 to drip irrigation from 2003 to 2024. In 2024, the irrigable area of 12,710 ha comprised:

- 71% (9,010 ha) drip irrigation;
- 6% (710 ha) low level irrigation;
- 6% (800 ha) overhead sprinklers;
- <1% (55 ha) furrow irrigation; and
- 17% (2,135 ha) vacant, not irrigated.

Irrigation properties

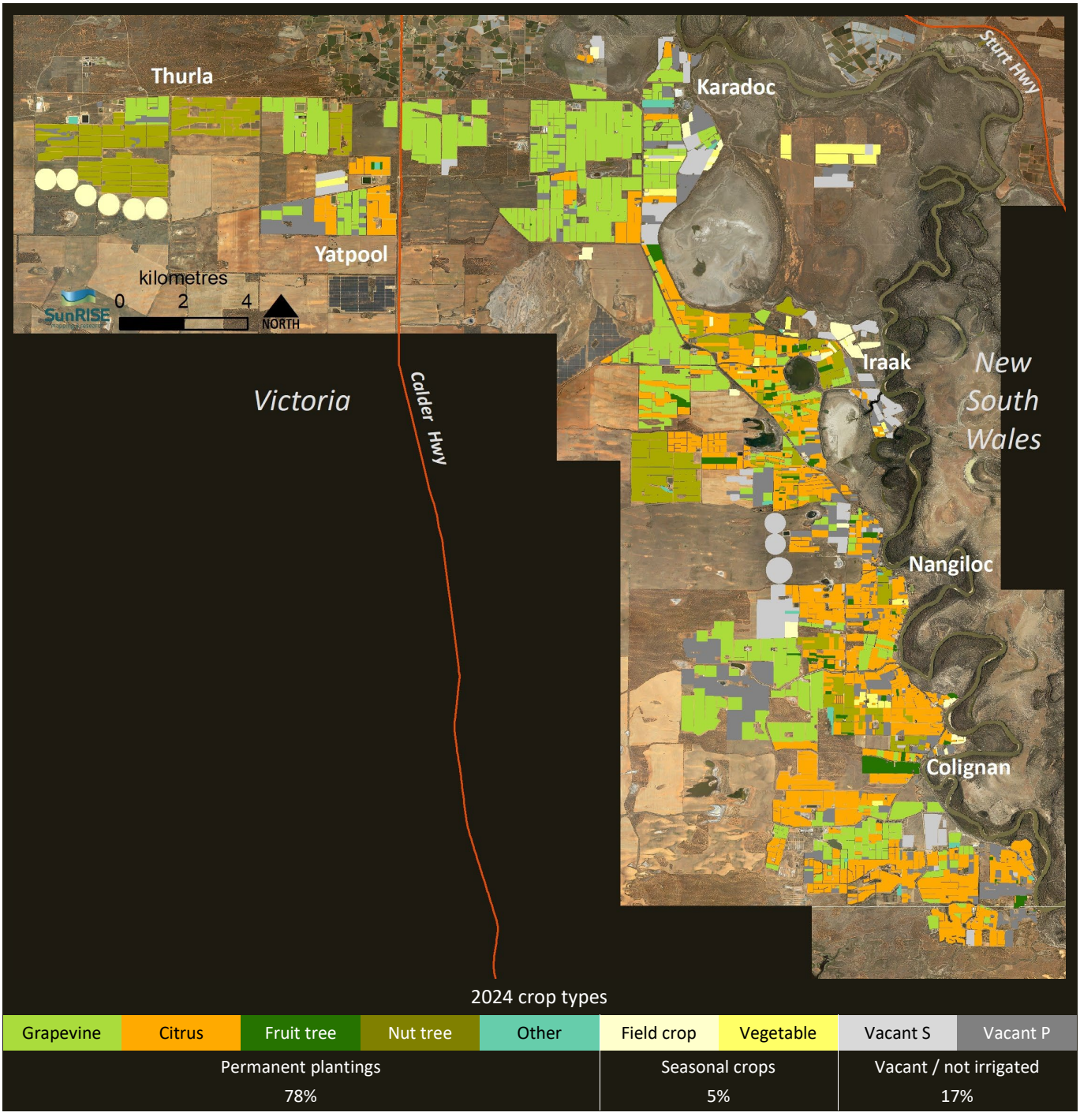
In 2024, there were approximately 118 irrigation properties with an average property size (irrigable area) of 108 ha. From 1997 to 2024:

- the number of properties decreased by 27, a 19% decrease from 145 to 118 properties;
- properties with an irrigable area less than 100 ha decreased by 39, while the number over 100 ha increased by 12; and
- average property size (irrigable area) increased from 48 to 108 ha per property.

3.5.1 Colignan river reach - crop types in 2024

Map 18 shows the Colignan to Yatpool river reach with crop types in 2024.

The aerial photography was flown in December 2023 and January 2024 (*source: Coordinated Imagery Program, DTP Victoria*).



Map 18: Colignan river reach showing crop types in 2024

3.5.2 Colignan river reach - crop types from 1997 to 2024

Figure 82 summarises crop types in the Colignan river reach from 1997 to 2024.

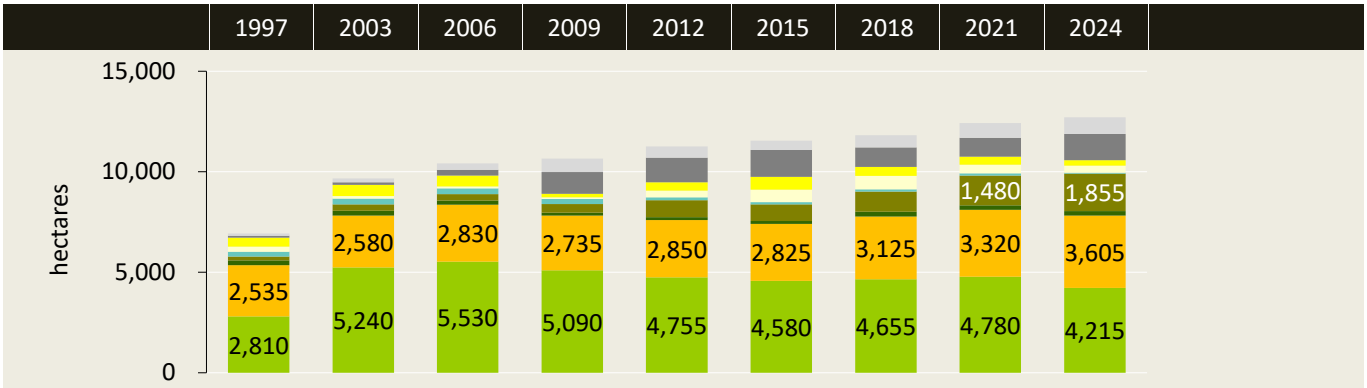
The dominant crop type was wine grapes from 1997 to 2015, then citrus from 2018 to 2024.

In 2024, the main plantings were:

1. citrus, 3,605 ha (28% of the irrigable area);
2. wine grapes, 2,525 ha (20% of the irrigable area);
3. almonds, 1,845 ha (15% of the irrigable area);
4. table grapes, 1,130 ha (9% of the irrigable area); and
5. dried grapes, 560 ha (4% of the irrigable area).

From 1997 to 2024, the main planting changes were:

- almonds increased by 1,660 ha, an 897% increase from 185 to 1,845 ha;
- citrus increased by 1,070 ha, a 42% increase from 2,535 to 3,605 ha.
- table grapes increased by 955 ha, a 546% increase from 175 to 1,130 ha; and
- dried grapes increased by 515 ha, a 1,144% increase from 45 to 560 ha;



Crop type		1997	2003	2006	2009	2012	2015	2018	2021	2024	% of 2024	Change 1997-2024
Permanent	Grape Dried	45	530	525	525	615	720	1,035	970	560	4%	+515
	Grape Table	175	460	560	535	635	685	855	1,005	1,130	9%	+955
	Grape Wine	2,590	4,250	4,445	4,030	3,505	3,175	2,765	2,805	2,525	20%	-65
	Citrus	2,535	2,580	2,830	2,735	2,850	2,825	3,125	3,320	3,605	28%	+1,070
	Fruit Olive	5	5	5	5	5	5	5	0	0	0%	-5
	Fruit Other	245	230	205	130	135	145	220	230	225	2%	-20
	Nut Almond	185	320	310	420	815	805	995	1,470	1,845	15%	+1,660
	Nut Other	5	10	10	20	25	15	15	10	10	<1%	+5
	Other	240	280	290	245	140	110	110	110	60	<1%	-180
Seasonal	Field Crop	250	125	95	85	330	630	665	430	350	3%	+100
	Veg. Carrot	240	240	230	175	90	170	0	0	0	0%	-240
	Veg. Potato	0	35	0	0	35	0	0	0	0	0%	0
	Veg. Other	210	285	300	0	300	460	445	400	265	2%	+55
Vacant P		95	120	290	1,080	1,225	1,345	975	945	1,310	10%	+1,215
Vacant S		105	200	325	665	550	450	615	735	825	7%	+720
Total (ha)		6,925	9,670	10,420	10,650	11,255	11,540	11,825	12,430	12,710	100%	+5,785
Dominant		wine grape						citrus				

Figure 82: Colignan river reach - crop types from 1997 to 2024

3.5.3 Colignan river reach - new permanent plantings

Figure 83 shows the proportion of permanent crops planted or top-worked in the previous three years in the Colignan river reach from 1997 to 2024.

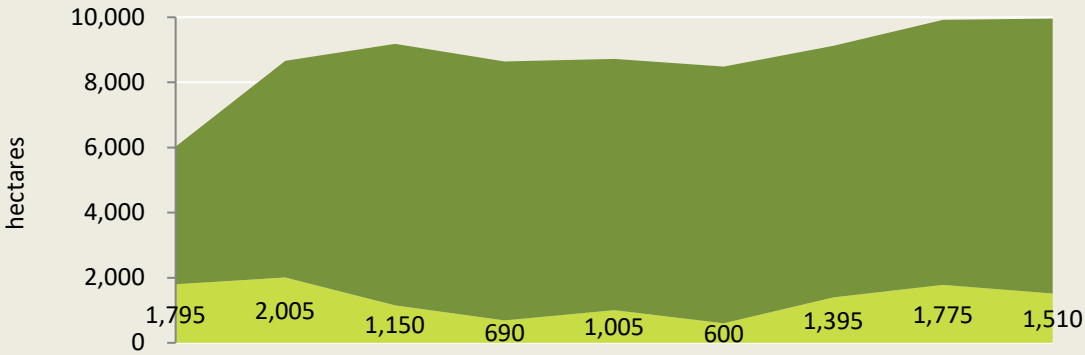
The information provides an indication of development activity that doesn't necessarily involve a change in area or crop type as it includes replanting or top working to different varieties. The figures are conservative, as top worked plantings can be difficult to interpret from the three-yearly aerial imagery, particularly for grapevines.

In 2024:

- 1,510 ha (15%) of permanent crops were planted or top-worked within the previous three years.
- These new plantings were:
    1. citrus (520 ha);
    2. almond (410 ha);
    3. table grapes (335 ha);
    4. dried grapes (140 ha);
    5. wine grapes (95 ha); and
    6. stone fruit and avocados (10 ha).

From 1997 to 2024:

- The proportion of new permanent plantings was at its lowest in 2015 with 7% (600 ha) planted in the previous three years and highest in 1997 with 30% (1,795 ha) planted in the previous three years.



Permanent plantings	1997	2003	2006	2009	2012	2015	2018	2021	2024	% of 2024
≤3yr old plantings	1,795	2,005	1,150	690	1,005	600	1,395	1,775	1,510	15%
>3yr old plantings	4,230	6,660	8,030	7,955	7,720	7,885	7,730	8,145	8,450	85%
Total (ha)	6,025	8,665	9,180	8,645	8,725	8,485	9,125	9,920	9,960	100%
% 3year development	30%	23%	13%	8%	12%	7%	15%	18%	15%	
Average 3-year dev.	16%									

Figure 83: Colignan river reach - three-year old permanent plantings from 1997 to 2024

3.5.4 Colignan river reach - planting trends

Figure 84 summarises planting trends with respect to permanent crops, seasonal crops and vacant areas in the Colignan river reach from 1997 to 2024.

The proportion of permanent plantings, seasonal cropping and vacant areas changed from:

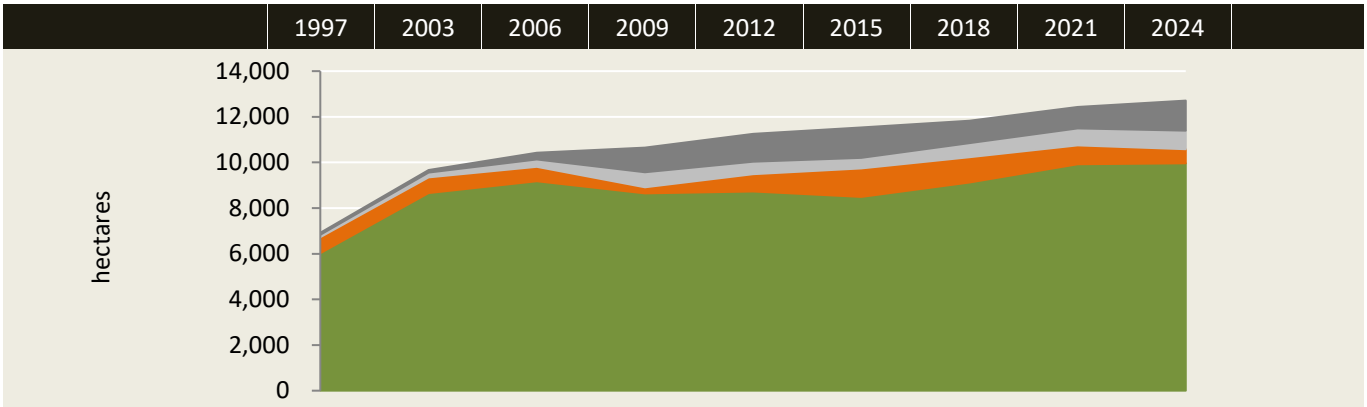
- 87% permanent, 10% seasonal and 3% vacant in 1997; to
- 78% permanent, 5% seasonal and 17% vacant in 2024.

In 2024, the irrigable area of 12,710 ha comprised:

- 78% (9,960 ha) irrigated permanent plantings;
- 5% (615 ha) irrigated seasonal crops;
- 10% (1,310 ha) vacant, previously an irrigated permanent planting; and
- 7% (825 ha) vacant, previously an irrigated seasonal crop.

From 1997 to 2024:

- irrigated permanent crops increased by 3,935 ha, from 6,025 to 9,960 ha;
- irrigated seasonal crops decreased by 85 ha, from 700 to 615 ha;
- vacant areas, previously irrigated permanent plantings increased by 1,215 ha, from 95 to 1,310 ha; and
- vacant areas, previously irrigated seasonal crops increased by 720 ha, from 105 to 825 ha.



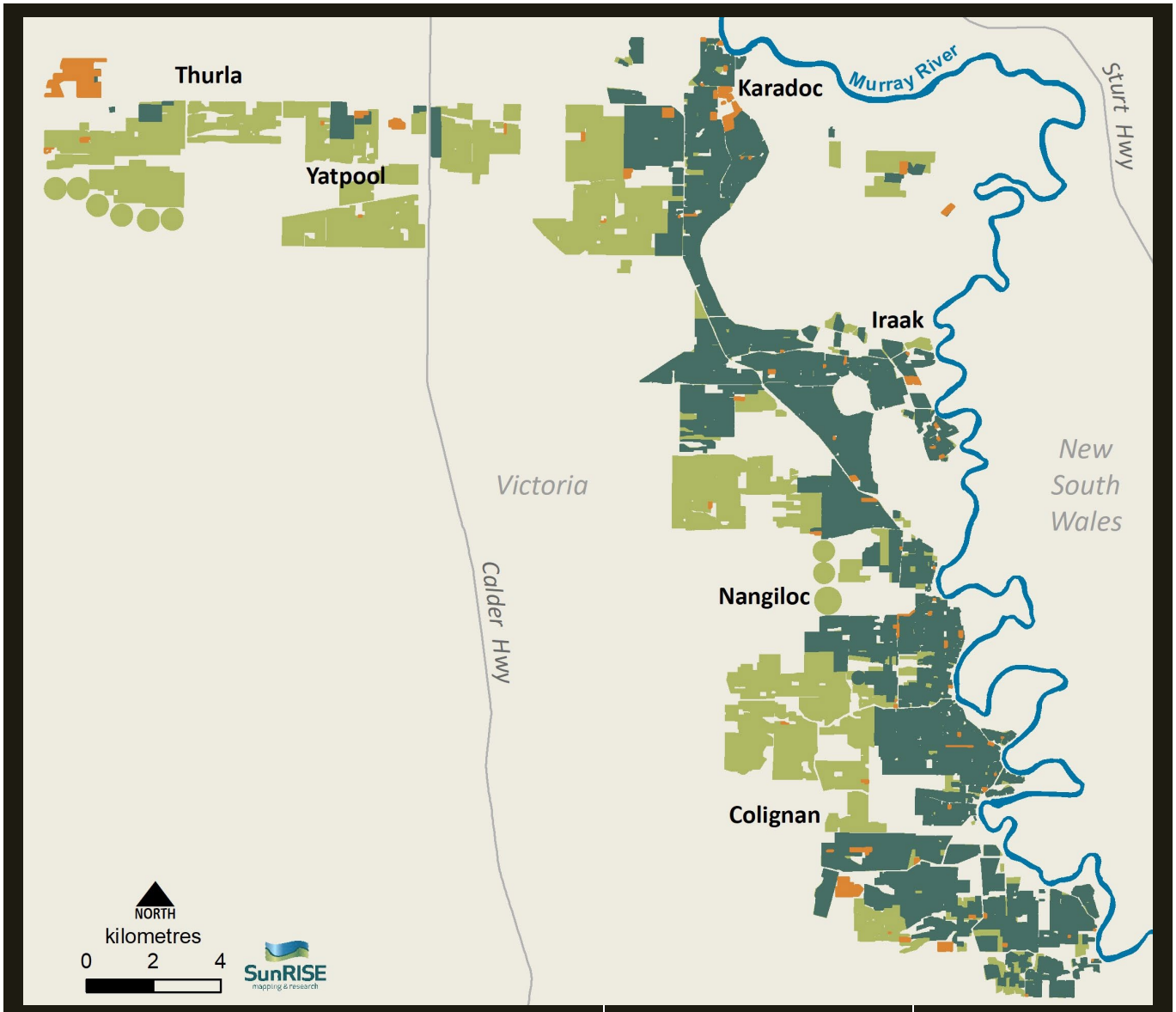
	1997	2003	2006	2009	2012	2015	2018	2021	2024	Change 1997-2024
Permanent - irrigated	6,025	8,665	9,180	8,645	8,725	8,485	9,125	9,920	9,960	+3,935
Seasonal - irrigated	700	685	625	260	755	1,260	1,110	830	615	-85
Total irrigated (ha)	6,725	9,350	9,805	8,905	9,480	9,745	10,235	10,750	10,575	+3,850
Vacant - permanent	95	120	290	1,080	1,225	1,345	975	945	1,310	+1,215
Vacant - seasonal	105	200	325	665	550	450	615	735	825	+720
Total irrigable (ha)	6,925	9,670	10,420	10,650	11,255	11,540	11,825	12,430	12,710	+5,785
% Permanent	87%	90%	88%	81%	78%	74%	77%	80%	78%	
% Seasonal	10%	7%	6%	2%	7%	11%	9%	6%	5%	
% Vacant P	1%	1%	3%	10%	11%	12%	8%	8%	10%	
% Vacant S	2%	2%	3%	6%	5%	4%	5%	6%	7%	

Figure 84: Colignan river reach - planting trends from 1997 to 2024

3.5.5 Colignan river reach - irrigation development

Map 19 shows irrigation development from 1997 to 2024 in the Colignan river reach with respect to new development (expansion) and areas retired[28] from irrigation.

- The irrigable area increased by 5,785 ha, an 84% increase from 6,925 ha in 1997 to 12,710 ha in 2024.
- The net increase of 5,785 ha was the balance of 285 ha retired from irrigation and 6,070 ha of expansion.



		Hectares			% change since 1997
Irrigable area in 1997 (1996-97 season)		6,925			
Retired between 1997 and 2024			-285		-4%
Expansion between 1997 and 2024			+6,070		+88%
Net change from 1997 to 2024				+5,785	+84%
Irrigable area in 2024 (2023-24 season)				12,710	

Map 19: Colignan river reach - irrigation development from 1997 to 2024

[28] Retired areas were previously irrigated but have undergone a change in land use and no longer have irrigation infrastructure e.g. urban development, sheds, dams, land set aside for conservation or returned to dryland agriculture.

3.5.6 Colignan river reach - salinity impact zones

Figure 85 summarises river salinity impact zones of irrigated areas in the Colignan river reach from 1997 to 2024. Colignan private diverters are in low salinity impact zones L1 and L4, and the high salinity impact zone, HIZ. Irrigation development from 1997 to 2024 occurred predominantly in L4.

In 2024, the irrigable area of 12,710 ha comprised:

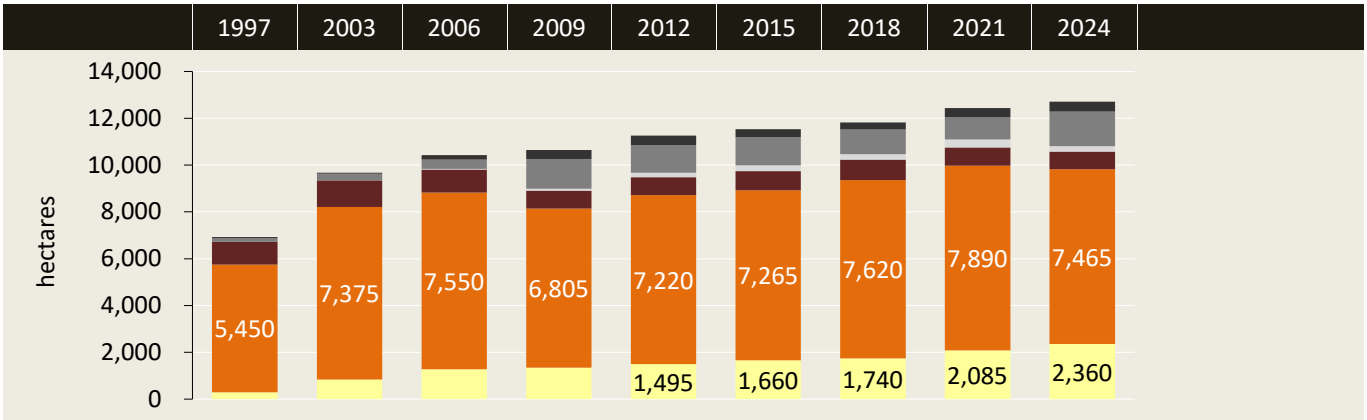
- 20% (2,600 ha) in the lowest salinity impact zone, L1;
- 71% (8,935 ha) in L4; and
- 9% (1,175 ha) in the high salinity impact zone, HIZ.

From 1997 to 2024, the area irrigated in:

- L1 increased by 2,065 ha, a 700% increase from 295 to 2,360 ha;
- L4 increased by 2,015 ha, a 37% increase from 5,450 to 7,465 ha; and
- HIZ decreased by 230 ha, a 23% decrease from 980 to 750 ha.

From 1997 to 2024, the irrigable area in:

- L1 increased by 2,305 ha, a 781% increase from 295 to 2,600 ha;
- L4 increased by 3,340 ha, a 60% increase from 5,595 to 8,935 ha; and
- HIZ increased by 140 ha, a 14% increase from 1,035 to 1,175 ha.



Salinity impact zone		1997	2003	2006	2009	2012	2015	2018	2021	2024	% in 2024	Change 1997-2024
Irrigated	L1	295	835	1,275	1,340	1,495	1,660	1,740	2,085	2,360	18%	+2,065
	L2	-	-	-	-	-	-	-	-	-	-	-
	L3	-	-	-	-	-	-	-	-	-	-	-
	L4	5,450	7,375	7,550	6,805	7,220	7,265	7,620	7,890	7,465	59%	+2,015
	HIZ	980	1,140	980	760	765	820	875	775	750	6%	-230
Not Irrigated	L1	0	0	35	90	200	240	225	345	240	2%	+240
	L2	-	-	-	-	-	-	-	-	-	-	-
	L3	-	-	-	-	-	-	-	-	-	-	-
	L4	145	285	400	1,265	1,170	1,205	1,065	940	1,470	12%	+1,325
	HIZ	55	35	180	390	405	350	300	395	425	3%	+370
Total (ha)		6,925	9,670	10,420	10,650	11,255	11,540	11,825	12,430	12,710	100%	+5,785
Dominant zone		L4										

Figure 85: Colignan river reach - irrigable area in each salinity impact zone from 1997 to 2024

3.5.7 Colignan river reach - irrigation methods

Figure 86 summarises irrigation methods in the Colignan river reach from 1997 to 2024.

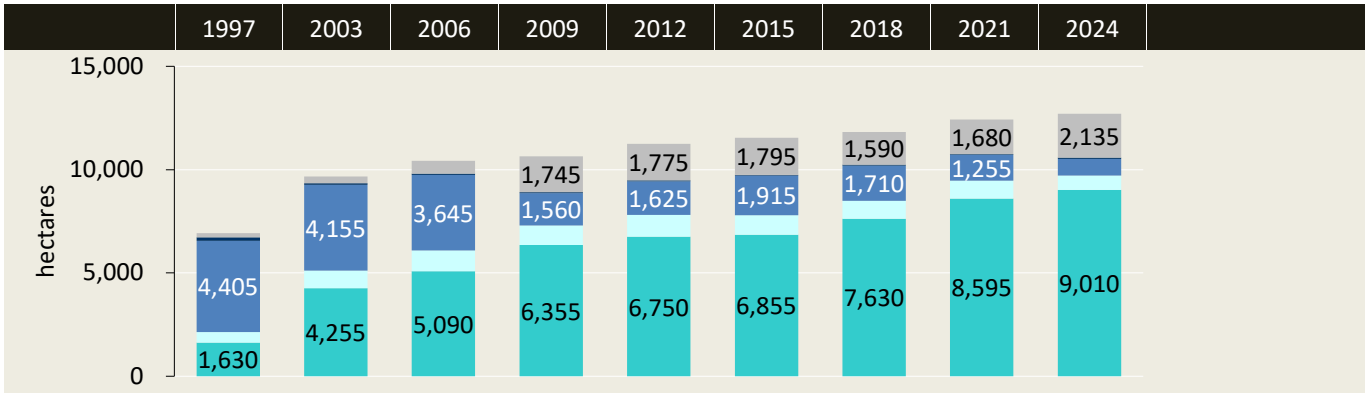
The dominant irrigation method in the Colignan river reach changed from overheads in 1997 to drip irrigation from 2003 to 2024.

In 2024, the irrigable area of 12,710 ha comprised:

- 71% (9,010 ha) drip irrigation;
- 6% (710 ha) low level irrigation;
- 6% (800 ha) overhead sprinklers;
- < 1% (55 ha) furrow irrigation; and
- 17% (2,135 ha) vacant, not irrigated.

From 1997 to 2024:

- drip irrigation increased by 7,380 ha, a 453% increase from 1,630 to 9,010 ha;
- low level irrigation increased by 195 ha, a 38% increase from 515 to 710 ha;
- overhead irrigation decreased by 3,605 ha, an 82% decrease from 4,405 to 800 ha; and
- furrow irrigation decreased by 120 ha, a 69% decrease from 175 to 55 ha.



Irrigation method[29]	1997	2003	2006	2009	2012	2015	2018	2021	2024	% in 2024	Change 1997-2024
Drip	1,630	4,255	5,090	6,355	6,750	6,855	7,630	8,595	9,010	71%	+7,380
Low level	515	860	1,005	950	1,065	945	860	865	710	6%	+195
Overhead	4,405	4,155	3,645	1,560	1,625	1,915	1,710	1,255	800	6%	-3,605
Furrow	175	80	65	40	40	30	35	35	55	<1%	-120
Vacant	200	320	615	1,745	1,775	1,795	1,590	1,680	2,135	17%	+1,935
Total (ha)	6,925	9,670	10,420	10,650	11,255	11,540	11,825	12,430	12,710	100%	+5,785
Dominant	o/head	drip									

Figure 86: Colignan river reach - irrigation methods from 1997 to 2024

[29] Overhead irrigation includes pivots and lateral move systems. Furrow includes flood irrigation. (Refer to Table 4.)

3.5.8 Colignan river reach - property change

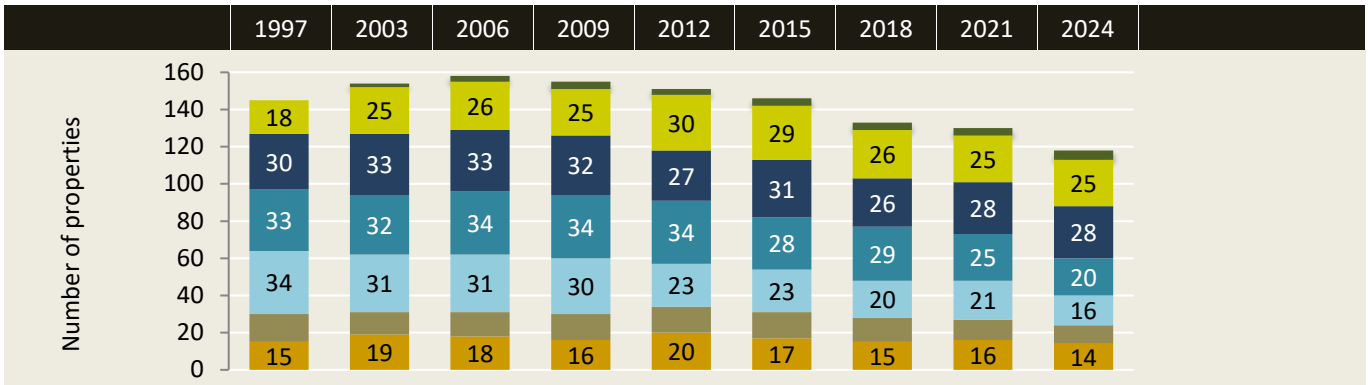
Figure 87 provides estimates of property numbers and average property size (irrigable area) in the Colignan river reach from 1997 to 2024.

In 2024:

- there were approximately 118 irrigation properties; and
- 66% of properties had an irrigable area over 20 ha.

From 1997 to 2024:

- the number of properties decreased by 27, a 19% decrease from 145 to 118 properties;
- properties with an irrigable area less than 100 ha decreased by 39, while the number over 100 ha increased by 12; and
- average property size (irrigable area) increased from 48 to 108 ha per property.



Property size (irrigable area)	1997	2003	2006	2009	2012	2015	2018	2021	2024	% in 2024	Change 1997-2024
1 to 5 ha	15	19	18	16	20	17	15	16	14	12%	-1
5 to 10 ha	15	12	13	14	14	14	13	11	10	8%	-5
10 to 20 ha	34	31	31	30	23	23	20	21	16	14%	-18
20 to 40 ha	33	32	34	34	34	28	29	25	20	17%	-13
40 to 100 ha	30	33	33	32	27	31	26	28	28	24%	-2
100 to 500 ha	18	25	26	25	30	29	26	25	25	21%	+7
> 500 ha	0	2	3	4	3	4	4	4	5	4%	+5
Total properties	145	154	158	155	151	146	133	130	118	100%	-27
Average size (ha)	48	63	66	69	75	79	89	96	108		

Figure 87: Colignan river reach - property numbers and sizes from 1997 to 2024

3.6 Mildura river reach (*Mildura to Lock 10*)

In summary for the Mildura river reach

Crop types in 2024

Dominant plantings in the Mildura river reach in 2024 were:

1. table grapes, 635 ha (31% of the irrigable area);
2. wine grapes, 230 ha (11% of the irrigable area);
3. field crops, 165 ha (8% of the irrigable area); and
4. citrus, 125 ha (6% of the irrigable area).

Crop type changes from 1997 to 2024

The dominant crop type was wine grapes from 1997 to 2015, then table grapes from 2018 to 2024.

The main crop type changes from 1997 to 2024 were:

- table grapes increased by 570 ha, an 877% increase from 65 to 635 ha;
- field crops decreased by 205 ha, a 55% decrease from 370 to 165 ha;
- wine grapes decreased by 200 ha, a 47% decrease from 430 to 230 ha; and
- dried grapes decreased by 185 ha, a 77% decrease from 240 to 55 ha.

New permanent plantings (planted or top-worked in the previous three years)

In 2024, 340 ha (30%) of permanent crops were planted or top-worked in the previous three years. These new plantings were:

1. table grapes (290 ha);
2. citrus (25 ha);
3. wine grapes (15 ha); and
4. dried grapes and fruit trees (a total of 10 ha).

From 1997 to 2024, the proportion of new permanent plantings was at its lowest in 2009 with 10% (90 ha) planted in the previous three years and highest in 2024 with 30% (340 ha) planted in the previous three years.

Planting trends - permanent plantings, seasonal crops and vacant areas

In 2024, the irrigable area of 2,060 ha comprised:

- 56% (1,150 ha) irrigated permanent plantings;
- 9% (185 ha) irrigated seasonal crops;
- 14% (285 ha) vacant, previously an irrigated permanent planting; and
- 21% (440 ha) vacant, previously an irrigated seasonal crop.

The proportion of permanent plantings, seasonal cropping and vacant areas changed from:

- 66% permanent, 30% seasonal and 4% vacant in 1997; to
- 56% permanent, 9% seasonal and 35% vacant in 2024.

In summary for the Mildura river reach

Irrigation development - new development (expansion) and retired areas

The irrigable area in the Mildura river reach increased by 615 ha, a 43% increase from 1,445 ha in 1997 to 2,060 ha in 2024.

The net increase of 615 ha was the balance of 125 ha retired from irrigation and 740 ha of expansion.

Salinity impact zones

The Mildura river reach is in the lowest salinity impact zone, L1 and the high impact zone, HIZ. Irrigation development from 1997 to 2024 occurred predominantly in L1.

In 2024, the irrigable area of 2,060 ha comprised:

- 43% (890 ha) in the lowest salinity impact zone, L1; and
- 57% (1,170 ha) in the high salinity impact zone, HIZ.

From 1997 to 2024 the irrigable area in:

- L1 increased by 710 ha, a 394% increase from 180 to 890 ha; and
- HIZ decreased by 95 ha, an 8% decrease from 1,265 to 1,170 ha. The decrease was mainly areas retired from irrigation for urban development.

Irrigation methods

The dominant irrigation method in the Mildura river reach changed from furrows in 1997 to overhead sprinklers in 2003, then to drip irrigation from 2006 to 2024.

In 2024, the irrigable area of 2,060 ha comprised:

- 43% (890 ha) drip irrigation;
- 10% (205 ha) low level irrigation;
- 6% (120 ha) overhead sprinklers;
- 6% (120 ha) furrow irrigation; and
- 35% (725 ha) vacant, not irrigated.

Irrigation properties

In 2024, there were approximately 94 irrigation properties with an average property size (irrigable area) of 22 ha.

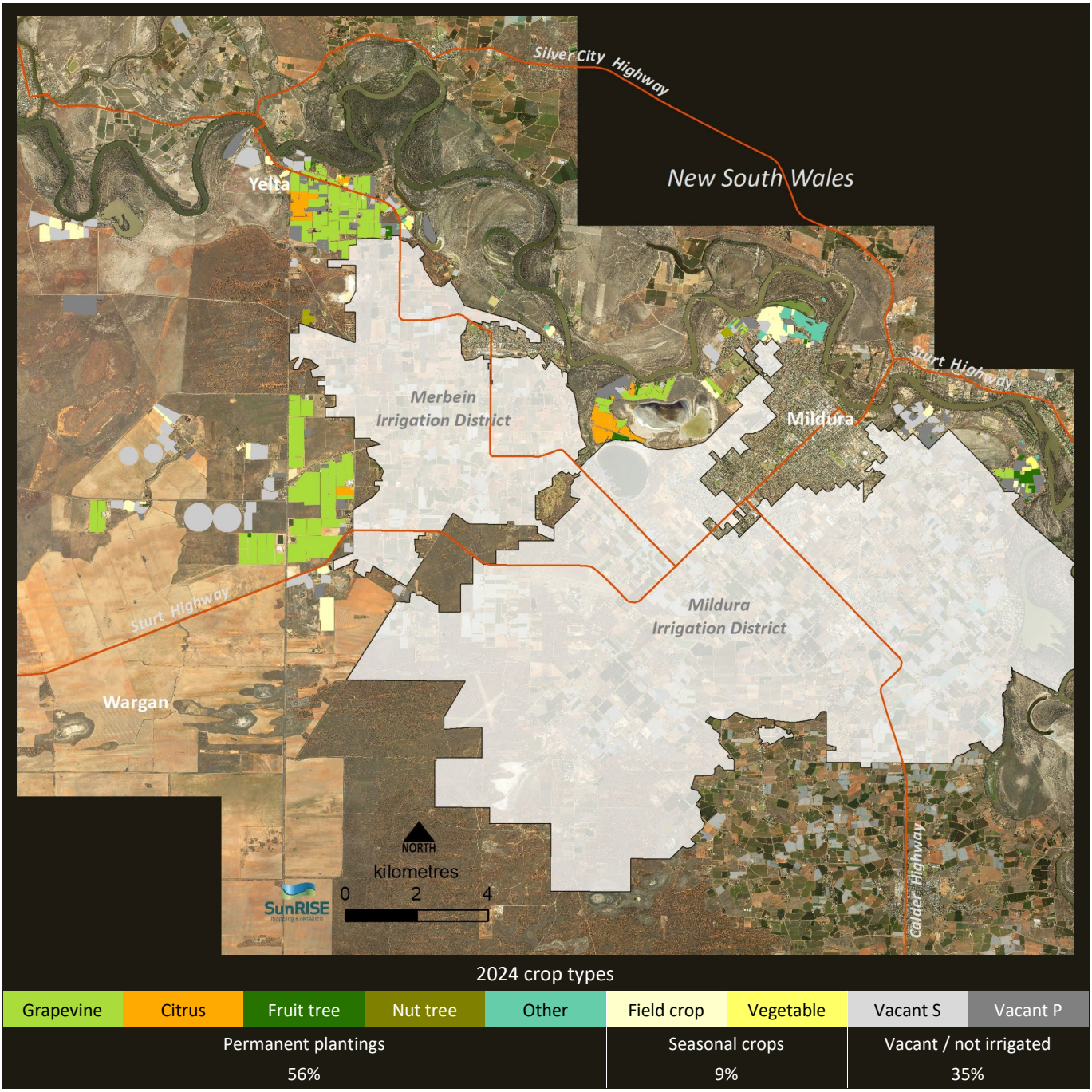
From 1997 to 2024:

- the number of properties decreased by 18, a 16% decrease from 112 to 94;
- properties with an irrigable area less than 40 ha decreased by 24, while the number over 40 ha increased by 6; and
- average property size (irrigable area) increased from 13 to 22 ha per property.

3.6.1 Mildura river reach - crop types in 2024

Map 20 shows the Mildura river reach with crop types in 2024.

The aerial photography was flown in January 2024 (*source: Coordinated Imagery Program, DTP Victoria*).



Map 20: Mildura river reach showing crop types in 2024

3.6.2 Mildura river reach - crop types from 1997 to 2024

Figure 88 summarises crop types in the Mildura river reach from 1997 to 2024.

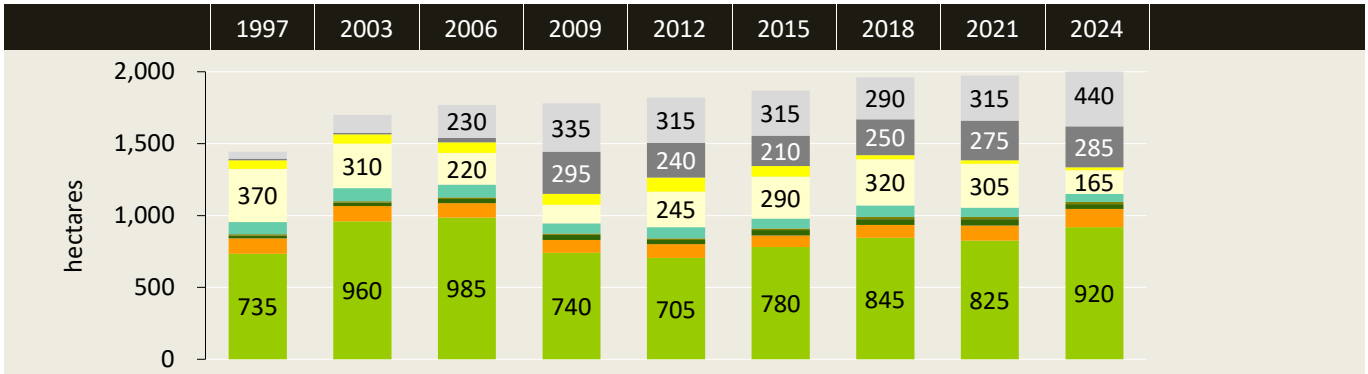
The dominant crop type was wine grapes from 1997 to 2015, then table grapes from 2018 to 2024.

In 2024, the main plantings were:

1. table grapes, 635 ha (31% of the irrigable area);
2. wine grapes, 230 ha (11% of the irrigable area);
3. field crops, 165 ha (8% of the irrigable area); and
4. citrus, 125 ha (6% of the irrigable area).

From 1997 to 2024, the main planting changes were:

- table grapes increased by 570 ha, an 877% increase from 65 to 635 ha;
- field crops decreased by 205 ha, a 55% decrease from 370 to 165 ha; and
- wine grapes decreased by 200 ha, a 47% decrease from 430 to 230 ha.



Crop type		1997	2003	2006	2009	2012	2015	2018	2021	2024	% of 2024	Change 1997-2024
Permanent	Grape Dried	240	170	185	110	120	115	105	85	55	3%	-185
	Grape Table	65	150	160	160	210	290	440	450	635	31%	+570
	Grape Wine	430	640	640	470	375	375	300	290	230	11%	-200
	Citrus	105	105	100	90	95	80	90	105	125	6%	+20
	Fruit Olive	5	10	15	15	15	15	15	15	10	<1%	+5
	Fruit Other	15	15	15	20	15	25	25	30	25	1%	+10
	Nut Almond	-	-	-	-	-	-	-	-	-	-	-
	Nut Other	10	10	10	10	10	10	15	15	15	1%	+5
	Other	85	90	90	70	80	70	80	65	55	3%	-30
Seasonal	Field Crop	370	310	220	130	245	290	320	305	165	8%	-205
	Veg. Carrot	-	-	-	-	-	-	-	-	-	-	-
	Veg. Potato	0	0	0	0	20	0	0	0	0	0%	0
	Veg. Other	60	65	75	75	80	75	30	25	20	1%	-40
Vacant P		10	10	30	295	240	210	250	275	285	14%	+275
Vacant S		50	125	230	335	315	315	290	315	440	21%	+390
Total (ha)		1,445	1,700	1,770	1,780	1,820	1,870	1,960	1,975	2,060	100%	+615
Dominant		wine grape						table grape				

Figure 88: Mildura river reach - crop types from 1997 to 2024

3.6.3 Mildura river reach - new permanent plantings

Figure 89 shows the proportion of permanent crops planted or top-worked in the previous three years in the Mildura river reach from 1997 to 2024.

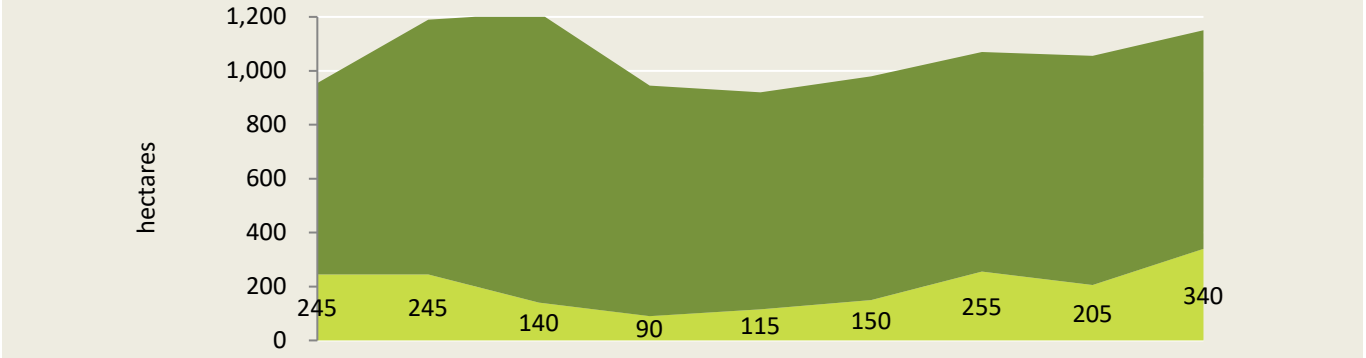
The information provides an indication of development activity that doesn't necessarily involve a change in area or crop type as it includes replanting or top working to different varieties. The figures are conservative, as top worked plantings can be difficult to interpret from the three-yearly aerial imagery, particularly for grapevines.

In 2024:

- 340 ha (30%) of permanent crops were planted or top-worked within the previous three years.
- These new plantings were:
    1. table grapes (290 ha);
    2. citrus (25 ha);
    3. wine grapes (15 ha);
    4. dried grapes (5 ha); and
    5. fruit trees (5 ha).

From 1997 to 2024:

- The proportion of new permanent plantings was at its lowest in 2009 with 10% (90 ha) planted in the previous three years and highest in 2024 with 30% (340 ha) planted in the previous three years.



Permanent plantings	1997	2003	2006	2009	2012	2015	2018	2021	2024	% of 2024
≤3yr old plantings	245	245	140	90	115	150	255	205	340	30%
>3yr old plantings	710	945	1,075	855	805	830	815	850	810	70%
Total (ha)	955	1,190	1,215	945	920	980	1,070	1,055	1,150	100%
% 3year development	26%	21%	12%	10%	13%	15%	24%	19%	30%	
Average 3-year dev.	19%									

Figure 89: Mildura river reach - three-year old permanent plantings from 1997 to 2024

3.6.4 Mildura river reach - planting trends

Figure 90 summarises planting trends with respect to permanent crops, seasonal crops and vacant areas in the Mildura river reach from 1997 to 2024.

The proportion of permanent plantings, seasonal cropping and vacant areas changed from:

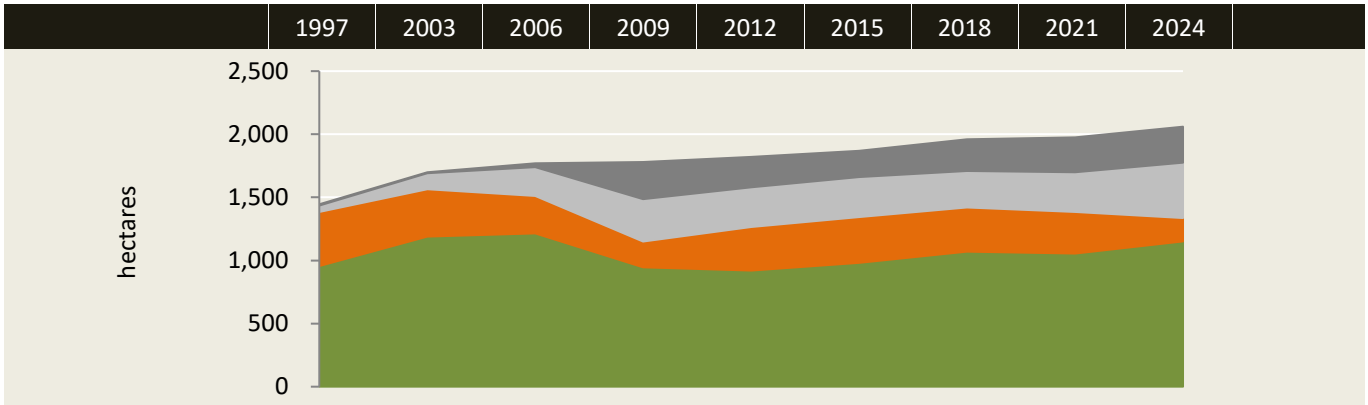
- 66% permanent, 30% seasonal and 4% vacant in 1997; to
- 56% permanent, 9% seasonal and 35% vacant in 2024.

In 2024, the irrigable area of 2,060 ha comprised:

- 56% (1,150 ha) irrigated permanent plantings;
- 9% (185 ha) irrigated seasonal crops;
- 14% (285 ha) vacant, previously an irrigated permanent planting; and
- 21% (440 ha) vacant, previously an irrigated seasonal crop.

From 1997 to 2024:

- irrigated permanent crops increased by 195 ha, from 955 to 1,150 ha;
- irrigated seasonal crops decreased by 245 ha, from 430 to 185 ha;
- vacant areas, previously irrigated permanent plantings increased by 275 ha, from 10 to 285 ha; and
- vacant areas, previously irrigated seasonal crops increased by 390 ha, from 50 to 440 ha.



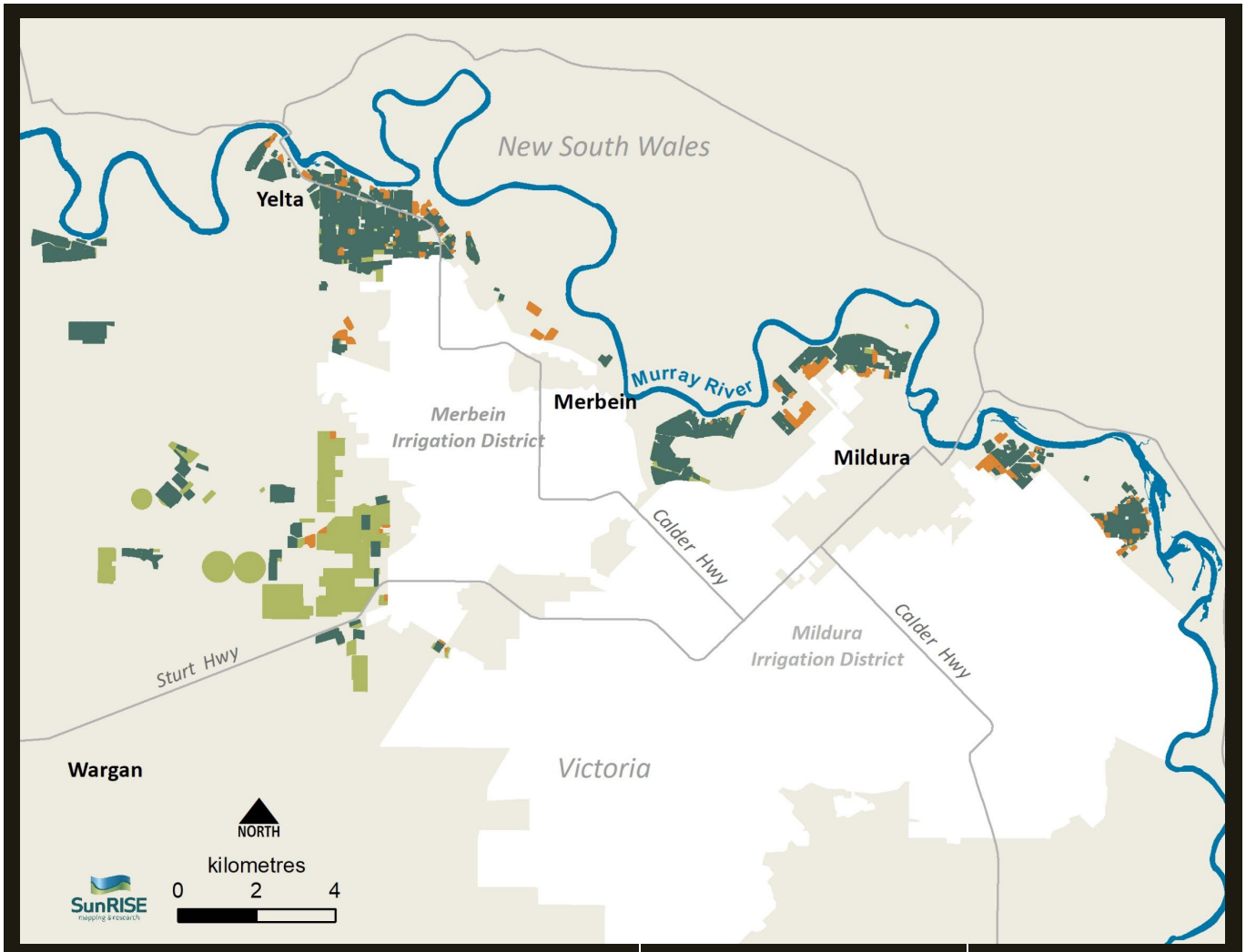
	1997	2003	2006	2009	2012	2015	2018	2021	2024	Change 1997-2024
Permanent - irrigated	955	1,190	1,215	945	920	980	1,070	1,055	1,150	+195
Seasonal - irrigated	430	375	295	205	345	365	350	330	185	-245
Total irrigated (ha)	1,385	1,565	1,510	1,150	1,265	1,345	1,420	1,385	1,335	-50
Vacant - permanent	10	10	30	295	240	210	250	275	285	+275
Vacant - seasonal	50	125	230	335	315	315	290	315	440	+390
Total irrigable (ha)	1,445	1,700	1,770	1,780	1,820	1,870	1,960	1,975	2,060	+615
% Permanent	66%	70%	69%	53%	51%	52%	55%	53%	56%	
% Seasonal	30%	22%	17%	12%	19%	20%	18%	17%	9%	
% Vacant P	1%	1%	2%	17%	13%	11%	13%	14%	14%	
% Vacant S	3%	7%	13%	19%	17%	17%	15%	16%	21%	

Figure 90: Mildura river reach - planting trends from 1997 to 2024

3.6.5 Mildura river reach - irrigation development

Map 21 shows irrigation development from 1997 to 2024 in the Mildura river reach with respect to new development (expansion) and areas retired[30] from irrigation.

- The irrigable area increased by 615 ha, a 43% increase from 1,445 ha in 1997 to 2,060 ha in 2024.
- The net increase of 615 ha was the balance of 125 ha retired from irrigation and 740 ha of expansion.



		Hectares			% change since 1997
Irrigable area in 1997 (1996-97 season)		1,445			
Retired between 1997 and 2024			-125		-9%
Expansion between 1997 and 2024			+740		+51%
Net change from 1997 to 2024				+615	+43%
Irrigable area in 2024 (2023-24 season)				2,060	

Map 21: Mildura river reach - irrigation development from 1997 to 2024

[30] Retired areas were previously irrigated but have undergone a change in land use and no longer have irrigation infrastructure e.g. urban development, sheds, dams, land set aside for conservation or returned to dryland agriculture.

3.6.6 Mildura river reach - salinity impact zones

Figure 91 summarises river salinity impact zones of irrigated areas in the Mildura river reach from 1997 to 2024. Mildura private diverters are in the lowest salinity impact zone, L1 and the high salinity impact zone, HIZ. Irrigation development from 1997 to 2024 predominantly occurred in L1.

In 2024, the irrigable area of 2,060 ha comprised:

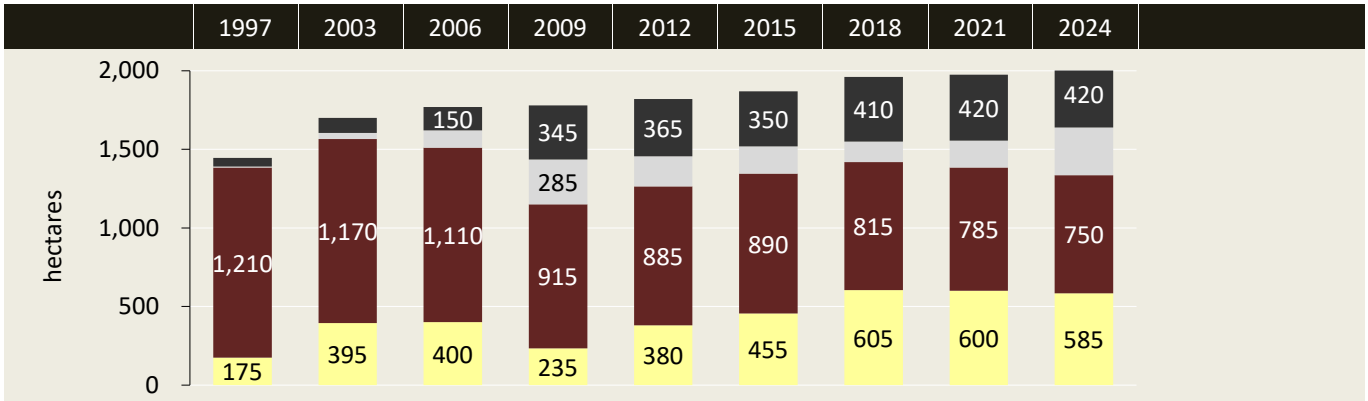
- 43% (890 ha) in the lowest salinity impact zone, L1; and
- 57% (1,170 ha) in the high salinity impact zone, HIZ.

From 1997 to 2024, the area irrigated in:

- L1 increased by 410 ha, a 234% increase from 175 to 585 ha; and
- HIZ decreased by 460 ha, a 38% decrease from 1,210 to 750 ha.

From 1997 to 2024, the irrigable area in:

- L1 increased by 710 ha, a 394% increase from 180 to 890 ha; and
- HIZ decreased by 95 ha, an 8% decrease from 1,265 to 1,170 ha. The decrease was mainly areas retired from irrigation for urban development.



Salinity impact zone		1997	2003	2006	2009	2012	2015	2018	2021	2024	% in 2024	Change 1997-2024
Irrigated	L1	175	395	400	235	380	455	605	600	585	28%	+410
	L2	-	-	-	-	-	-	-	-	-	-	-
	L3	-	-	-	-	-	-	-	-	-	-	-
	L4	-	-	-	-	-	-	-	-	-	-	-
	HIZ	1,210	1,170	1,110	915	885	890	815	785	750	36%	-460
Not Irrigated	L1	5	40	110	285	190	175	130	170	305	15%	+300
	L2	-	-	-	-	-	-	-	-	-	-	-
	L3	-	-	-	-	-	-	-	-	-	-	-
	L4	-	-	-	-	-	-	-	-	-	-	-
	HIZ	55	95	150	345	365	350	410	420	420	20%	+365
Total (ha)		1,445	1,700	1,770	1,780	1,820	1,870	1,960	1,975	2,060	100%	+615
Dominant zone		HIZ										

Figure 91: Mildura river reach - irrigable area in each salinity impact zone from 1997 to 2024

3.6.7 Mildura river reach - irrigation methods

Figure 92 summarises irrigation methods in the Mildura river reach from 1997 to 2024.

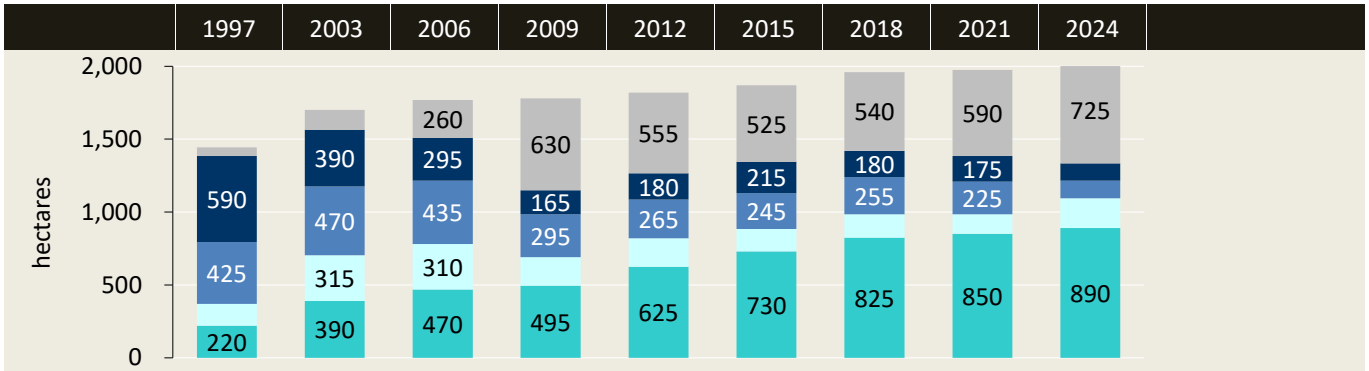
The dominant irrigation method in the Mildura river reach changed from furrows in 1997 to overhead sprinklers in 2003, then drip irrigation from 2006 to 2024.

In 2024, the irrigable area of 2,060 ha comprised:

- 43% (890 ha) drip irrigation;
- 10% (205 ha) low level irrigation;
- 6% (120 ha) overhead sprinklers;
- 6% (120 ha) furrow irrigation; and
- 35% (725 ha) vacant, not irrigated.

From 1997 to 2024:

- drip irrigation increased by 670 ha, a 305% increase from 220 to 890 ha;
- low level irrigation increased by 55 ha, a 37% increase from 150 to 205 ha;
- overhead irrigation decreased by 305 ha, a 72% decrease from 425 to 120 ha; and
- furrow irrigation decreased by 470 ha, an 80% decrease from 590 to 120 ha.



Irrigation method[31]	1997	2003	2006	2009	2012	2015	2018	2021	2024	% in 2024	Change 1997-2024
Drip	220	390	470	495	625	730	825	850	890	43%	+670
Low level	150	315	310	195	195	155	160	135	205	10%	+55
Overhead	425	470	435	295	265	245	255	225	120	6%	-305
Furrow	590	390	295	165	180	215	180	175	120	6%	-470
Vacant	60	135	260	630	555	525	540	590	725	35%	+665
Total (ha)	1,445	1,700	1,770	1,780	1,820	1,870	1,960	1,975	2,060	100%	+615
Dominant	furrow	o/head	drip								

Figure 92: Mildura river reach - irrigation methods from 1997 to 2024

[31] Overhead irrigation includes pivots and lateral move systems. Furrow includes flood irrigation. (Refer to Table 4.)

3.6.8 Mildura river reach - property change

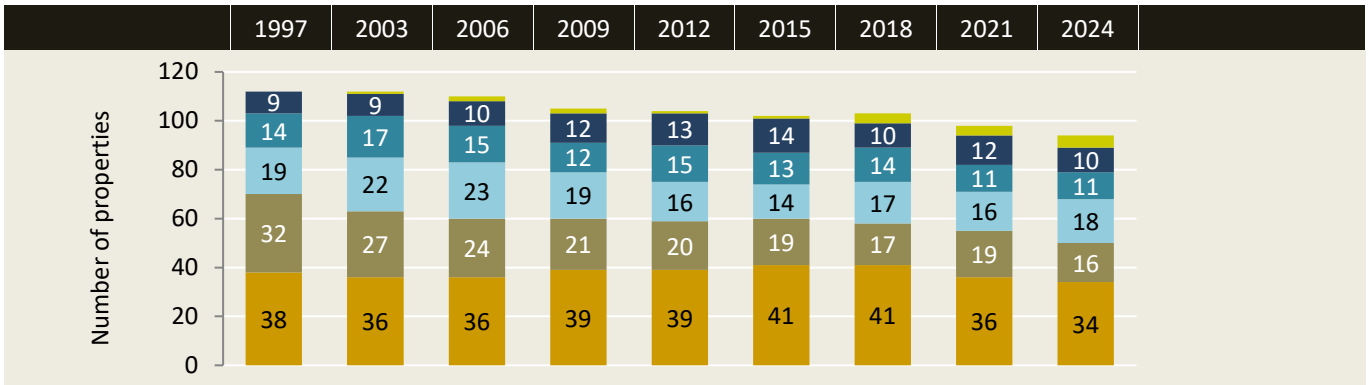
Figure 93 provides estimates of property numbers and average property size (irrigable area) in the Mildura river reach from 1997 to 2024.

In 2024:

- there were approximately 94 irrigation properties; and
- 84% of properties had an irrigable area less than 40 ha.

From 1997 to 2024:

- the number of properties decreased by 18, a 16% decrease from 112 to 94 properties;
- properties with an irrigable area less than 40 ha decreased by 24, while the number over 40 ha increased by 6; and
- average property size (irrigable area) increased from 13 to 22 ha per property.



Property size (irrigable area)	1997	2003	2006	2009	2012	2015	2018	2021	2024	% in 2024	Change 1997-2024
1 to 5 ha	38	36	36	39	39	41	41	36	34	36%	-4
5 to 10 ha	32	27	24	21	20	19	17	19	16	17%	-16
10 to 20 ha	19	22	23	19	16	14	17	16	18	19%	-1
20 to 40 ha	14	17	15	12	15	13	14	11	11	12%	-3
40 to 100 ha	9	9	10	12	13	14	10	12	10	11%	+1
100 to 500 ha	0	1	2	2	1	1	4	4	5	5%	+5
> 500 ha	-	-	-	-	-	-	-	-	-	-	-
Total properties	112	112	110	105	104	102	103	98	94	100%	-18
Average size (ha)	13	15	16	17	18	18	19	20	22		

Figure 93: Mildura river reach - property numbers and sizes from 1997 to 2024

3.7 Lock 10 to the South Australian Border

In summary for the Lock 10 to South Australia river reach

Crop types in 2024

Dominant plantings in the Lock 10 to South Australia river reach in 2024 were:

1. almond trees, 2,010 ha (56% of the irrigable area);
2. wine grapes, 840 ha (23% of the irrigable area); and
3. citrus, 245 ha (7% of the irrigable area).

Crop type changes from 1997 to 2024

Almonds were the dominant crop from 1997 to 2024.

The main crop type changes from 1997 to 2024 were:

- almonds increased by 1,360 ha, a 209% increase from 650 to 2,010 ha;
- wine grapes increased by 550 ha, a 190% increase from 290 to 840 ha;
- field crops decreased by 235 ha, a 98% decrease from 240 to 5 ha; and
- citrus increased by 130 ha, a 113% increase from 115 to 245 ha.

New permanent plantings (planted or top-worked in the previous three years)

In 2024, at least 305 ha (9%) of permanent crops were planted or top-worked in the previous three years.

These new plantings were:

1. citrus (100 ha);
2. almonds (95 ha);
3. dried grapes (85 ha);
4. wine grapes (15 ha); and
5. table grapes (10 ha).

From 1997 to 2024, the proportion of new permanent plantings was at its lowest in 2006 and 2024 with 9% planted in the previous three years and highest in 2009 with 33% (695 ha) planted in the previous three years.

Planting trends - permanent plantings, seasonal crops and vacant areas

In 2024, the irrigable area of 3,590 ha comprised:

- 90% (3,240 ha) irrigated permanent plantings;
- <1% (10 ha) irrigated seasonal crops; and
- 9% (340 ha) vacant, not irrigated.

The proportion of permanent plantings, seasonal cropping and vacant areas changed from:

- 66% permanent, 15% seasonal and 19% vacant in 1997; to
- 90% permanent, <1% seasonal and 9% vacant in 2024.

In summary for the Lock 10 to South Australia river reach

Irrigation development - new development (expansion) and retired areas

The irrigable area in the Lock 10 to South Australia river reach increased by 1,950 ha, a 119% increase from 1,640 ha in 1997 to 3,590 ha in 2024.

The net increase of 1,950 ha was the balance of 300 ha retired from irrigation and 2,250 ha of expansion.

Salinity impact zones

The Lock 10 to South Australia river reach is in the lowest salinity impact zone, L1 and in the high salinity impact zone, HIZ. Irrigation development from 1997 to 2024 predominantly occurred in L1.

In 2024, the irrigable area of 3,590 ha comprised:

- 86% (3,105 ha) in the lowest salinity impact zone, L1; and
- 14% (485 ha) in the high salinity impact zone, HIZ.

From 1997 to 2024 the irrigable area in:

- L1 increased by 2,100 ha, a 209% increase from 1,005 to 3,105 ha; and
- HIZ decreased by 150 ha, a 24% decrease from 635 to 485 ha.

Irrigation methods

The dominant irrigation method in the Lock 10 to South Australia river reach was low level sprinklers from 1997 to 2003, then drip irrigation from 2009 to 2024.

In 2024, the irrigable area of 3,590 ha comprised:

- 70% (2,510 ha) drip irrigation;
- 21% (740 ha) low level irrigation;
- 0% (0 ha) overhead sprinklers; and
- 9% (340 ha) vacant, not irrigated.

Irrigation properties

In 2024, there were approximately 19 irrigation properties with an average property size (irrigable area) of 189 ha.

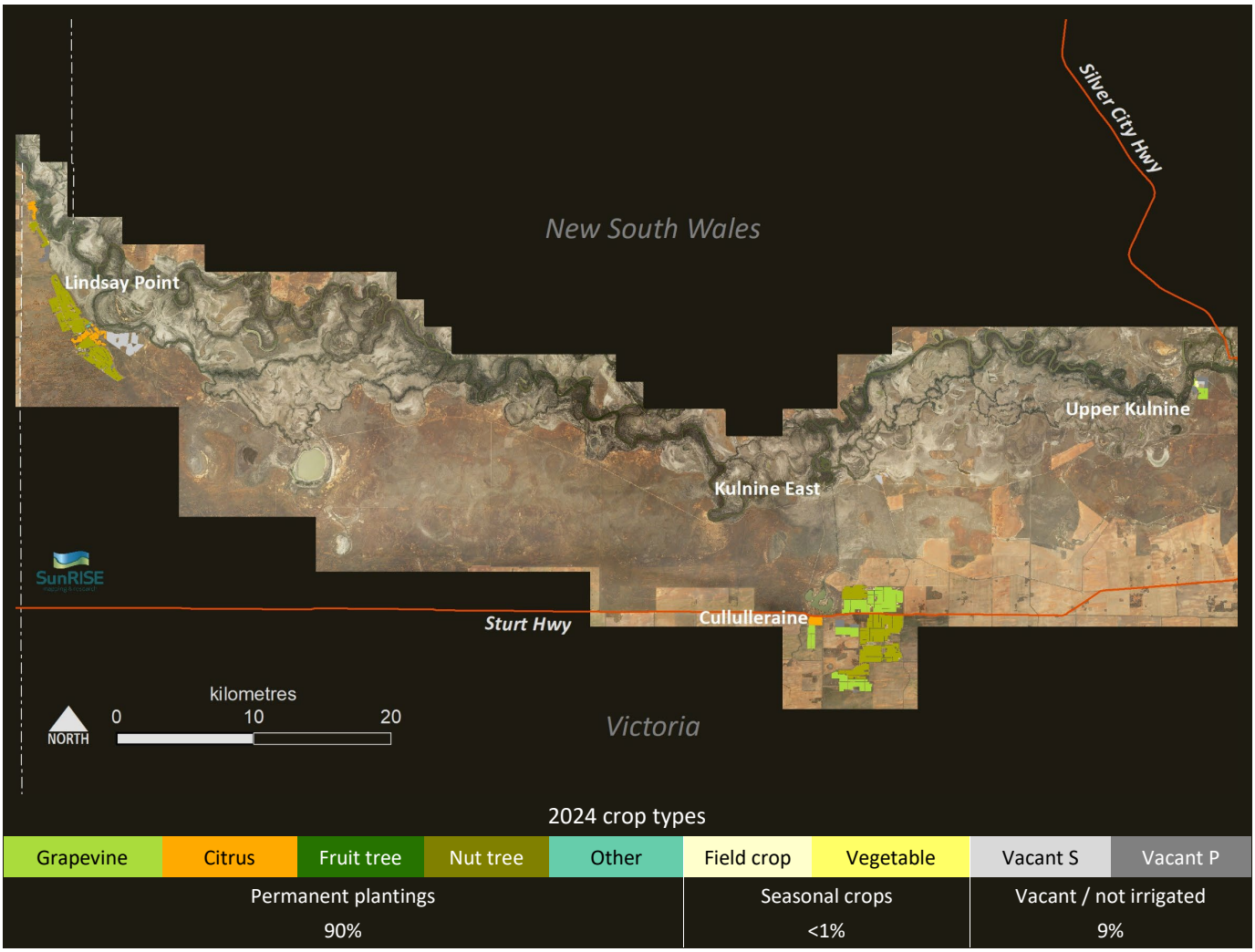
From 1997 to 2024:

- the number of properties increased by 2, a 12% increase from 17 to 19 properties;
- properties with an irrigable area of less than 40 ha decreased by 4 and the number over 40 ha increased by 6; and
- average property size (irrigable area) increased from 96 to 189 ha per property.

3.7.1 Lock 10 to South Australia - crop types in 2024

Map 22 shows the Lock 10 to South Australia river reach with crop types in 2024.

The aerial photography was flown in December 2023 and January 2024 (*source: Coordinated Imagery Program, DTP Victoria*).



Map 22: Lock 10 to South Australia showing crop types in 2024

3.7.2 Lock 10 to South Australia - crop types from 1997 to 2024

Figure 94 summarises crop types in the Lock 10 to South Australia river reach from 1997 to 2024.

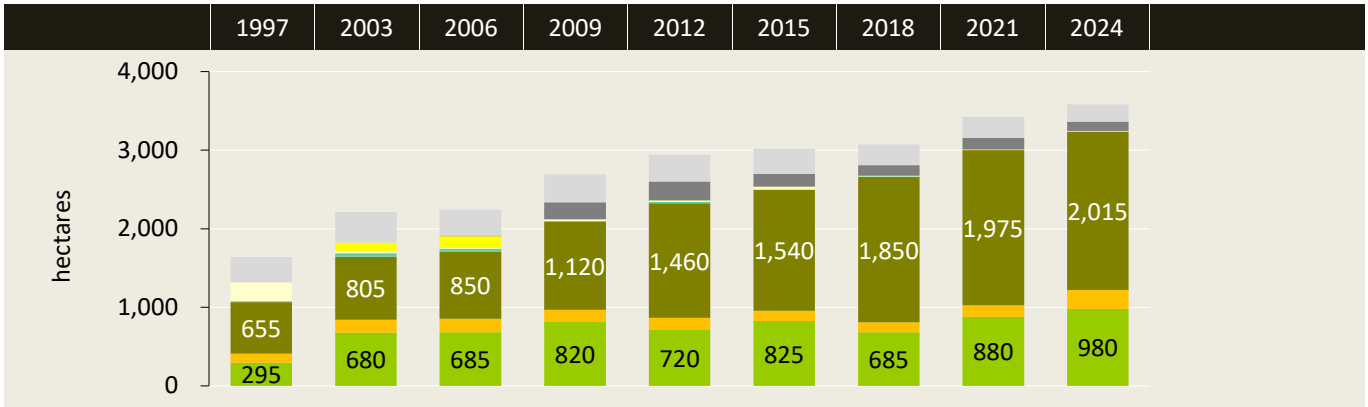
The dominant crop type was almonds from 1997 to 2024.

In 2024, the main plantings were:

1. almonds, 2,010 ha (56% of the irrigable area);
2. wine grapes, 840 ha (23% of the irrigable area); and
3. citrus, 245 ha (7% of the irrigable area).

From 1997 to 2024, the main planting changes were:

- almonds increased by 1,360 ha, a 209% increase from 650 to 2,010 ha;
- wine grapes increased by 550 ha, a 190% increase from 290 to 840 ha; and
- field crops decreased by 235 ha, a 98% decrease from 240 to 5 ha.



Crop type		1997	2003	2006	2009	2012	2015	2018	2021	2024	% of 2024	Change 1997-2024
Permanent	Grape Dried	5	0	5	0	15	20	15	0	85	2%	+80
	Grape Table	0	0	0	0	0	0	0	55	55	2%	+55
	Grape Wine	290	680	680	820	705	805	670	825	840	23%	+550
	Citrus	115	160	170	150	145	130	125	145	245	7%	+130
	Fruit Olive	-	-	-	-	-	-	-	-	-	-	-
	Fruit Other	-	-	-	-	-	-	-	-	-	-	-
	Nut Almond	650	800	845	1,115	1,455	1,535	1,845	1,970	2,010	56%	+1,360
	Nut Other	5	5	5	5	5	5	5	5	5	<1%	0
	Other	15	45	40	10	15	5	5	0	0	0%	-15
Seasonal	Field Crop	240	25	10	15	15	30	5	0	5	<1%	-235
	Veg. Carrot	-	-	-	-	-	-	-	-	-	-	-
	Veg. Potato	-	-	-	-	-	-	-	-	-	-	-
	Veg. Other	0	110	150	5	5	5	5	10	5	<1%	+5
Vacant P		0	0	10	215	240	165	135	145	120	3%	+120
Vacant S		320	385	330	355	345	315	265	270	220	6%	-100
Total (ha)		1,640	2,210	2,245	2,690	2,945	3,015	3,075	3,425	3,590	100%	+1,950
Dominant		almond										

Figure 94: Lock 10 to South Australia - crop types from 1997 to 2024

3.7.3 Lock 10 to South Australia - new permanent plantings

Figure 95 shows the proportion of permanent crops planted or top-worked in the previous three years in the Lock 10 to South Australia river reach from 1997 to 2024.

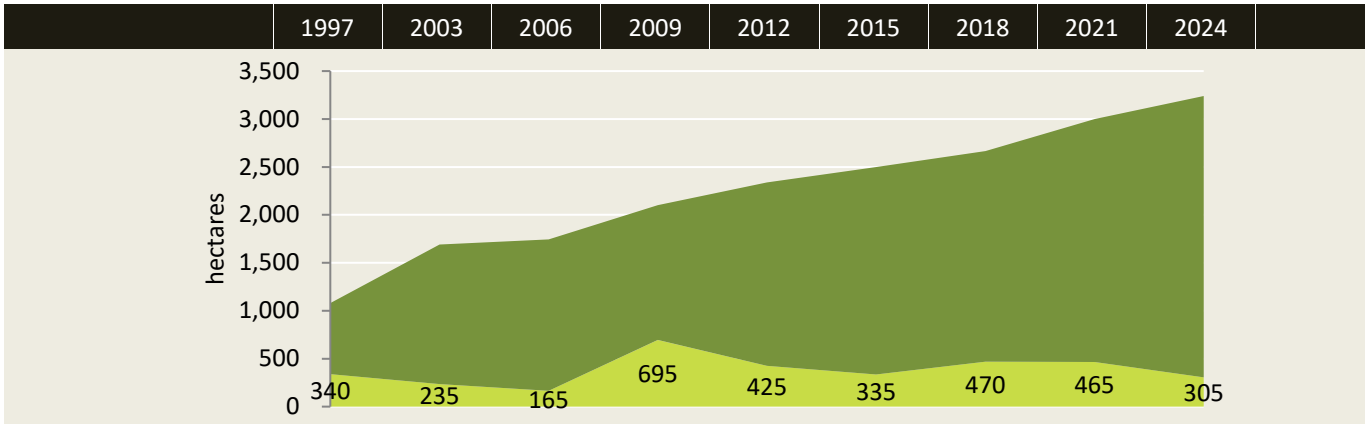
The information provides an indication of development activity that doesn't necessarily involve a change in area or crop type as it includes replanting or top working to different varieties. The figures are conservative, as top worked plantings can be difficult to interpret from the three-yearly aerial imagery, particularly for grapevines.

In 2024:

- 305 ha (9%) of permanent crops were planted or top-worked within the previous three years.
- These new plantings were:
    1. citrus (100 ha);
    2. almonds (95 ha);
    3. dried grapes (85 ha);
    4. wine grapes (15 ha); and
    5. table grapes (10 ha).

From 1997 to 2024:

- The proportion of new permanent plantings was at its lowest in 2006 and 2024 with 9% planted in the previous three years and highest in 2009 with 33% (695 ha) planted in the previous three years.



Permanent plantings	1997	2003	2006	2009	2012	2015	2018	2021	2024	% of 2024
≤3yr old plantings	340	235	165	695	425	335	470	465	305	9%
>3yr old plantings	740	1,455	1,580	1,405	1,915	2,165	2,195	2,535	2,935	91%
Total (ha)	1,080	1,690	1,745	2,100	2,340	2,500	2,665	3,000	3,240	100%
% 3year development	31%	14%	9%	33%	18%	13%	18%	16%	9%	
Average 3-year dev.	18%									

Figure 95: Lock 10 to South Australia river reach - age of permanent plantings 1997 to 2024

3.7.4 Lock 10 to South Australia - planting trends

Figure 96 summarises planting trends with respect to permanent crops, seasonal crops and vacant areas in the Lock 10 to South Australia river reach from 1997 to 2024.

The proportion of permanent plantings, seasonal cropping and vacant areas changed from:

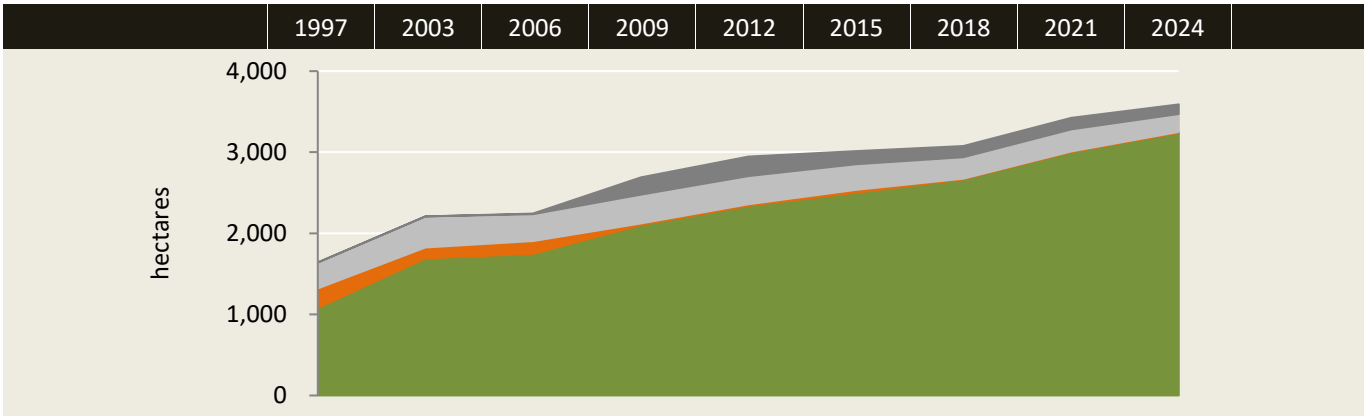
- 66% permanent, 15% seasonal and 19% vacant in 1997; to
- 90% permanent, <1% seasonal and 9% vacant in 2024.

In 2024, the irrigable area of 3,590 ha comprised:

- 90% (3,240 ha) irrigated permanent plantings;
- <1% (10 ha) irrigated seasonal crops;
- 3% (120 ha) vacant, previously an irrigated permanent planting; and
- 6% (220 ha) vacant, previously an irrigated seasonal crop.

From 1997 to 2024:

- irrigated permanent crops increased by 2,160 ha, from 1,080 to 3,240 ha;
- irrigated seasonal crops decreased by 230 ha, from 240 to 10 ha;
- vacant areas, previously irrigated permanent plantings increased by 120 ha, from 0 to 120 ha; and
- vacant areas, previously irrigated seasonal crops decreased by 100 ha, from 320 to 220 ha.



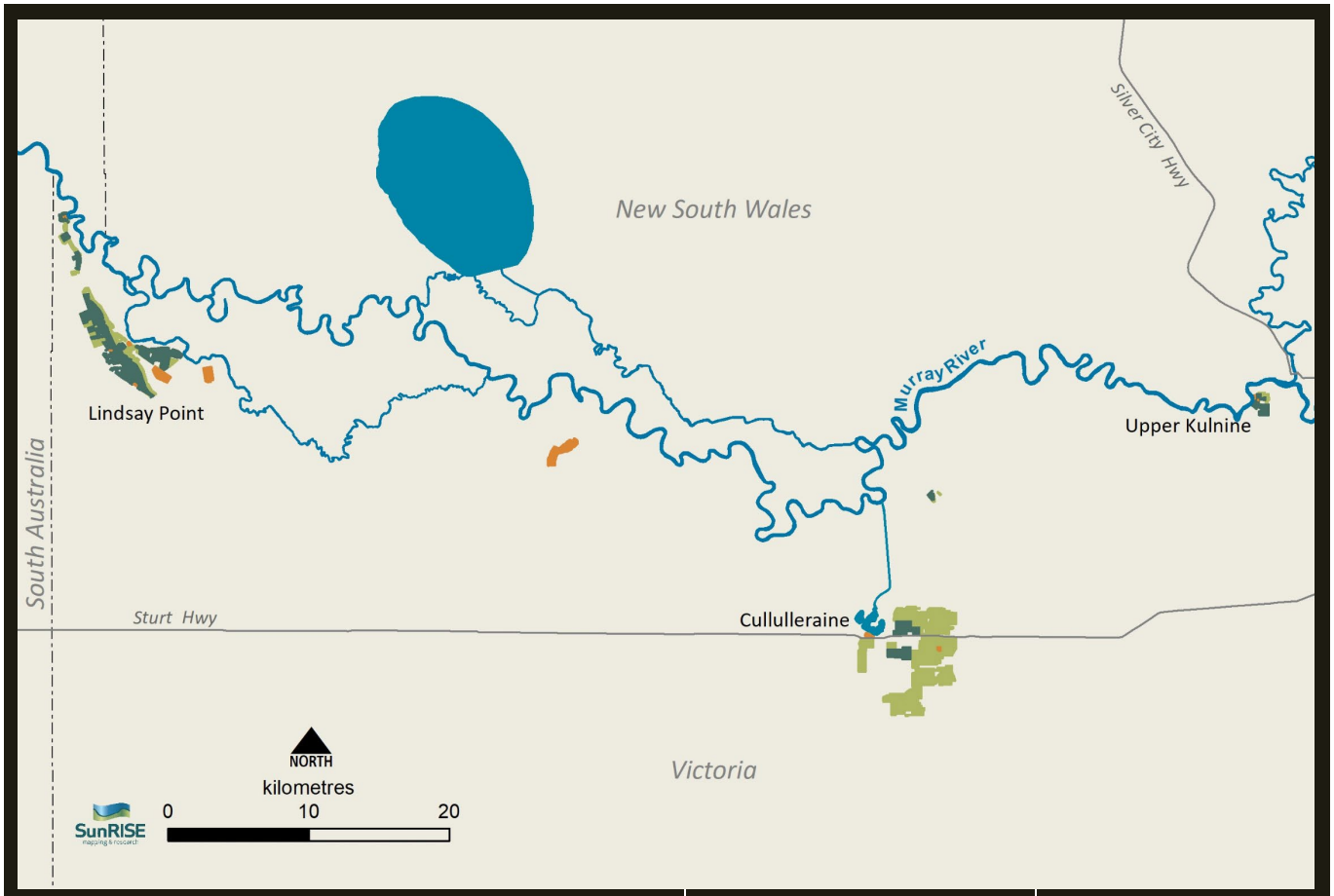
	1997	2003	2006	2009	2012	2015	2018	2021	2024	Change 1997-2024
Permanent - irrigated	1,080	1,690	1,745	2,100	2,340	2,500	2,665	3,000	3,240	+2,160
Seasonal - irrigated	240	135	160	20	20	35	10	10	10	-230
Total irrigated (ha)	1,320	1,825	1,905	2,120	2,360	2,535	2,675	3,010	3,250	+1,930
Vacant - permanent	0	0	10	215	240	165	135	145	120	+120
Vacant - seasonal	320	385	330	355	345	315	265	270	220	-100
Total irrigable (ha)	1,640	2,210	2,245	2,690	2,945	3,015	3,075	3,425	3,590	+1,950
% Permanent	66%	76%	78%	78%	79%	83%	87%	88%	90%	
% Seasonal	15%	6%	7%	1%	1%	1%	<1%	<1%	<1%	
% Vacant P	0%	0%	<1%	8%	8%	6%	4%	4%	3%	
% Vacant S	19%	17%	15%	13%	12%	10%	9%	8%	6%	

Figure 96: Lock 10 to South Australia river reach - planting trends from 1997 to 2024

3.7.5 Lock 10 to South Australia - irrigation development

Map 23 shows irrigation development in the Lock 10 to South Australia river reach with respect to new development (expansion) and areas retired[32] from irrigation from 1997 to 2024.

- The irrigable area increased by 1,950 ha, a 119% increase from 1,640 ha in 1997 to 3,590 ha in 2024.
- The net increase of 1,950 ha was the balance of 300 ha retired from irrigation and 2,250 ha of expansion.



		Hectares			% change since 1997
Irrigable area in 1997 (1996-97 season)		1,640			
Retired between 1997 and 2024			-300		-18%
Expansion between 1997 and 2024			+2,250		+137%
Net change from 1997 to 2024				+1,950	+119%
Irrigable area in 2024 (2023-24 season)				3,590	

Map 23: Lock 10 to South Australia - irrigation development from 1997 to 2024

[32] Retired areas were previously irrigated but have undergone a change in land use and no longer have irrigation infrastructure e.g. urban development, sheds, dams, land set aside for conservation or returned to dryland agriculture.

3.7.6 Lock 10 to South Australia - salinity impact zones

Figure 97 summarises river salinity impact zones of irrigated areas in the Lock 10 to South Australia river reach from 1997 to 2024. Lock 10 to SA private diverters are in the lowest salinity impact zone, L1 and the high salinity impact zone, HIZ. Irrigation development from 1997 to 2024 predominantly occurred in L1.

In 2024, the irrigable area of 3,590 ha comprised:

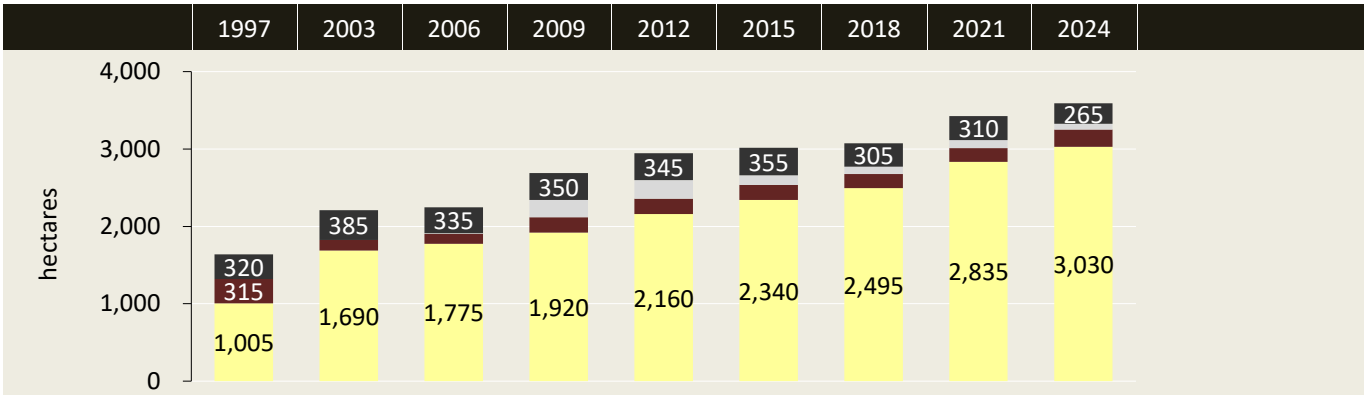
- 86% (3,105 ha) in the lowest salinity impact zone, L1; and
- 14% (485 ha) in the high salinity impact zone, HIZ.

From 1997 to 2024, the area irrigated in:

- L1 increased by 2,025 ha, a 201% increase from 1,005 to 3,030 ha; and
- HIZ decreased by 95 ha, a 30% decrease from 315 to 220 ha.

From 1997 to 2024, the irrigable area in:

- L1 increased by 2,100 ha, a 209% increase from 1,005 to 3,105 ha; and
- HIZ decreased by 150 ha, a 24% decrease from 635 to 485 ha.



Salinity impact zone		1997	2003	2006	2009	2012	2015	2018	2021	2024	% in 2024	Change 1997-2024
Irrigated	L1	1,005	1,690	1,775	1,920	2,160	2,340	2,495	2,835	3,030	84%	+2,025
	L2	-	-	-	-	-	-	-	-	-	-	-
	L3	-	-	-	-	-	-	-	-	-	-	-
	L4	-	-	-	-	-	-	-	-	-	-	-
	HIZ	315	135	130	200	200	195	180	175	220	6%	-95
Not Irrigated	L1	0	0	5	220	240	125	95	105	75	2%	+75
	L2	-	-	-	-	-	-	-	-	-	-	-
	L3	-	-	-	-	-	-	-	-	-	-	-
	L4	-	-	-	-	-	-	-	-	-	-	-
	HIZ	320	385	335	350	345	355	305	310	265	7%	-55
Total (ha)		1,640	2,210	2,245	2,690	2,945	3,015	3,075	3,425	3,590	100%	+1,950
Dominant zone		L1										

Figure 97: Lock 10 to South Australia - irrigable area in each salinity impact zone from 1997 to 2024

3.7.7 Lock 10 to South Australia - irrigation methods

Figure 98 summarises irrigation methods in the Lock 10 to South Australia river reach from 1997 to 2024.

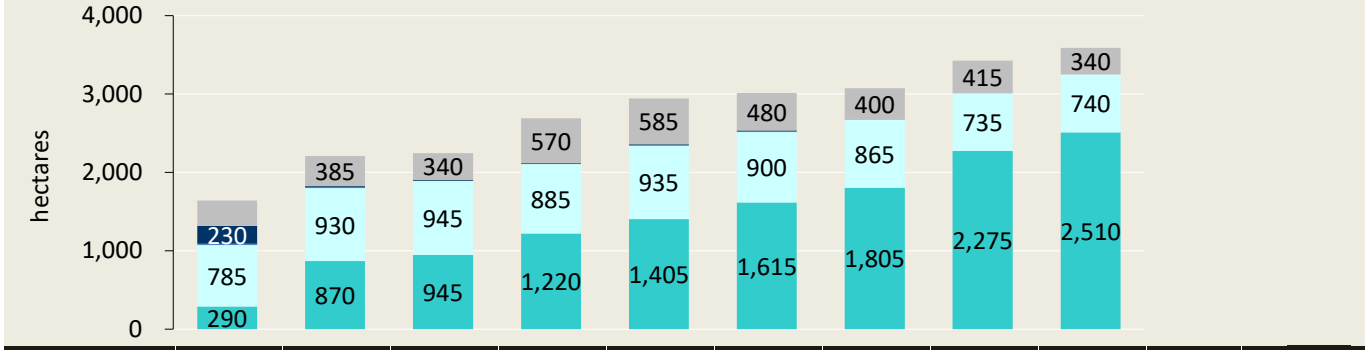
The dominant irrigation method in the Lock 10 to South Australia river reach was low level from 1997 to 2003, then drip from 2009 to 2024.

In 2024, the irrigable area of 3,590 ha comprised:

- 70% (2,510 ha) drip irrigation;
- 21% (740 ha) low level irrigation;
- 0% (0 ha) overhead sprinklers; and
- 9% (340 ha) vacant, not irrigated.

From 1997 to 2024:

- drip irrigation increased by 2,220 ha, a 766% increase from 290 to 2,510 ha;
- low level irrigation decreased by 45 ha, a 6% decrease from 785 to 740 ha;
- overhead irrigation decreased by 15 ha, a 100% decrease from 15 to 0 ha; and
- furrow irrigation decreased by 230 ha, a 100% decrease from 230 to 0 ha.



Irrigation method[33]	1997	2003	2006	2009	2012	2015	2018	2021	2024	% in 2024	Change 1997-2024
Drip	290	870	945	1,220	1,405	1,615	1,805	2,275	2,510	70%	+2,220
Low level	785	930	945	885	935	900	865	735	740	21%	-45
Overhead	15	10	5	5	10	10	5	0	0	0%	-15
Furrow	230	15	10	10	10	10	0	0	0	0%	-230
Vacant	320	385	340	570	585	480	400	415	340	9%	+20
Total (ha)	1,640	2,210	2,245	2,690	2,945	3,015	3,075	3,425	3,590	100%	+1,950
Dominant	low level			drip							

Figure 98: Lock 10 to South Australia - irrigation methods from 1997 to 2024

[33] Overhead irrigation includes pivots and lateral move systems. Furrow includes flood irrigation. (Refer to Table 4.)

3.7.8 Lock 10 to South Australia - property change

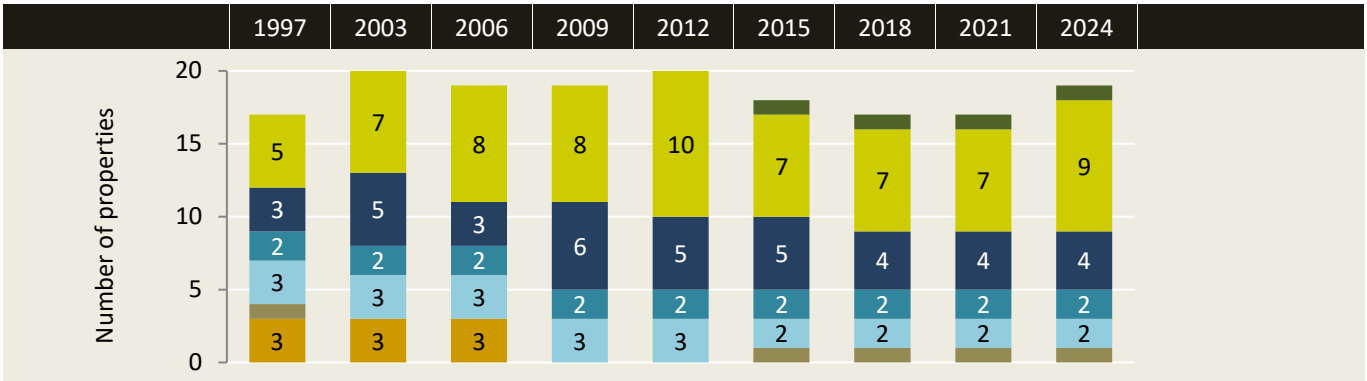
Figure 99 provides estimates of property numbers and average property size (irrigable area) in the Lock 10 to South Australia river reach from 1997 to 2024.

In 2024:

- there were approximately 19 irrigation properties; and
- 74% of properties had an irrigable area over 40 ha.

From 1997 to 2024:

- the number of properties increased by 2, a 12% increase from 17 to 19 properties;
- properties with an irrigable area of less than 40 ha decreased by 4 and the number over 40 ha increased by 6; and
- average property size (irrigable area) increased from 96 to 189 ha per property.



Property size (irrigable area)	1997	2003	2006	2009	2012	2015	2018	2021	2024	% in 2024	Change 1997-2024
1 to 5 ha	3	3	3	0	0	0	0	0	0	0%	-3
5 to 10 ha	1	0	0	0	0	1	1	1	1	5%	0
10 to 20 ha	3	3	3	3	3	2	2	2	2	11%	-1
20 to 40 ha	2	2	2	2	2	2	2	2	2	11%	0
40 to 100 ha	3	5	3	6	5	5	4	4	4	21%	+1
100 to 500 ha	5	7	8	8	10	7	7	7	9	47%	+4
> 500 ha	0	0	0	0	0	1	1	1	1	5%	+1
Total properties	17	20	19	19	20	18	17	17	19	100%	+2
Average size (ha)	96	111	118	142	147	168	181	201	189		

Figure 99: Lock 10 to South Australia - property numbers and sizes from 1997 to 2024

4. Murrayville GMA

In summary for the Murrayville Groundwater Management Area

Limitations of the information

Irrigated crops in the Murrayville GMA were mapped from a limited series of aerial imagery and information. Figures in this section should be treated as estimates only[34].

Unlike permanent plantings, it is difficult to accurately determine irrigation activity for seasonal crops, and to distinguish vegetables from field crops, such as potatoes and cereal crops. As 99% of irrigated areas in the Murrayville Groundwater Management Area (GMA) were seasonal, accuracy of the information is limited.

No imagery was available for 1997, however, information from the *Murrayville Area Groundwater Management Plan 2001* assisted with estimates.

Crop types

Potatoes were the dominant irrigated crop in the Murrayville GMA from 1997 to 2024.

Plantings in 2024 were:

- potatoes, 1,160 ha (17% of the irrigable area);
- field crops, 525 ha (8% of the irrigable area);
- olive trees, 45 ha (1% of the irrigable area); and
- vegetables other than potatoes, 25 ha (less than 1% of the irrigable area).

Changes in crop types from 1997 to 2024 were:

- potato crops increased by 540 ha, an 87% increase from 620 to 1,160 ha;
- field crops increased by 300 ha, a 133% increase from 225 to 525 ha; and
- olive trees increased by 15 ha, a 50% increase from 30 to 45 ha.

Irrigation methods

The dominant irrigation method in the Murrayville GMA was centre pivots from 1997 to 2024.

In 2024, the irrigable area of 6,750 ha comprised:

- 1% (45 ha) drip irrigation;
- 25% (1,710 ha) centre pivot (overhead) irrigation; and
- 74% (4,995 ha) vacant, not irrigated.

Irrigation properties

In 2024, there were approximately 19 irrigation properties with an average property size (irrigable area) of 355 ha.

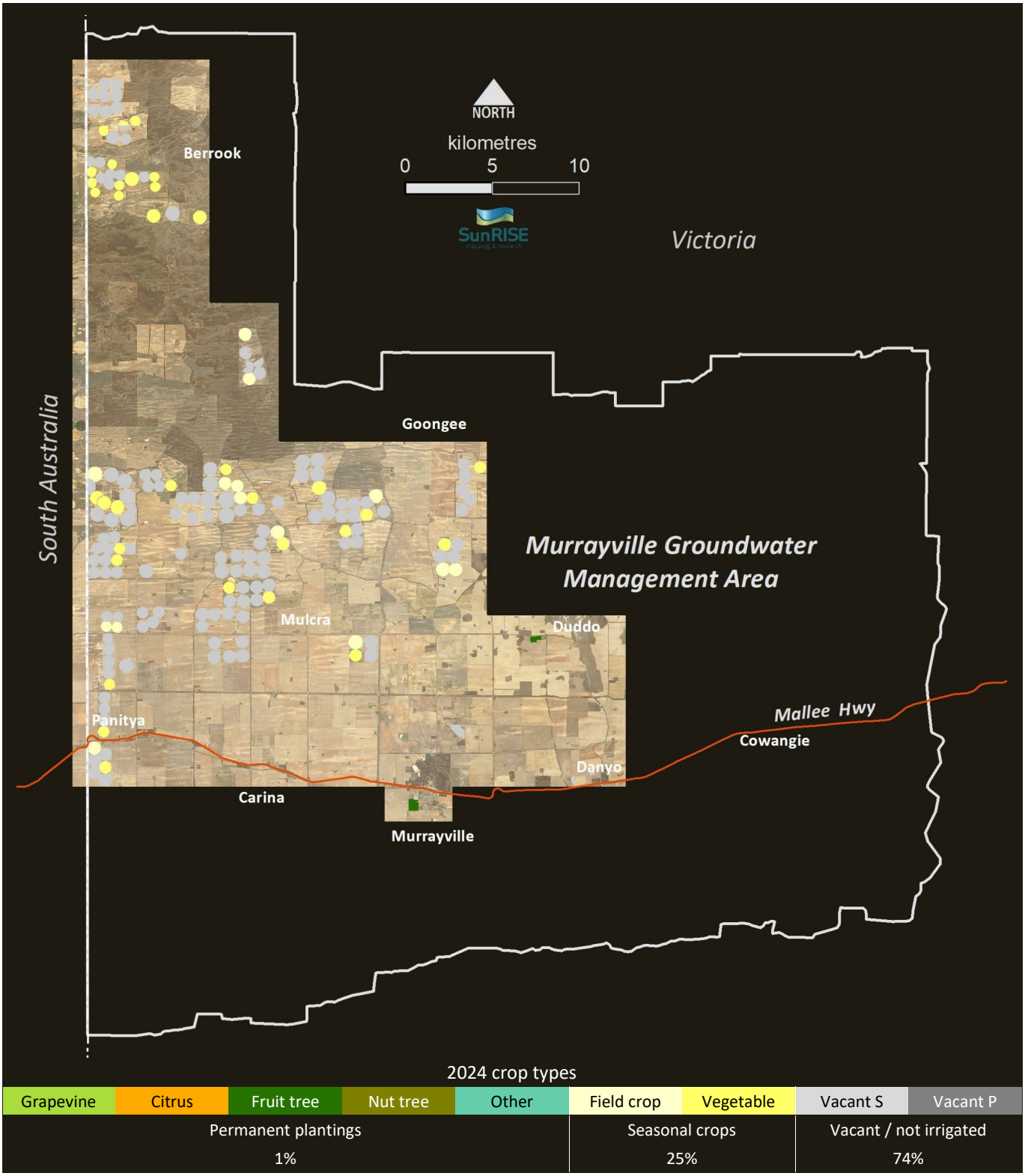
From 1997 to 2024 it is estimated that:

- the number of irrigation properties increased by 9, a 90% increase from 10 to 19; and
- average property size (irrigable area) increased from 121 to 355 ha per property.

[34] Refer to '*Limitations of mapping irrigated winter field crops*', page 15.

4.1.1 Murrayville GMA - crop types in 2024

Map 24 shows the Murrayville Groundwater Management Area (GMA) with crop types in 2024. The aerial photography was flown December 2023 to January 2024 (*source: Coordinated Imagery Program, DTP Victoria*).



Map 24: Murrayville GMA showing crop types in 2024

4.1.2 Murrayville GMA - crop types from 1997 to 2024

Figure 100 summarises crop types in the Murrayville GMA from 1997 to 2024.

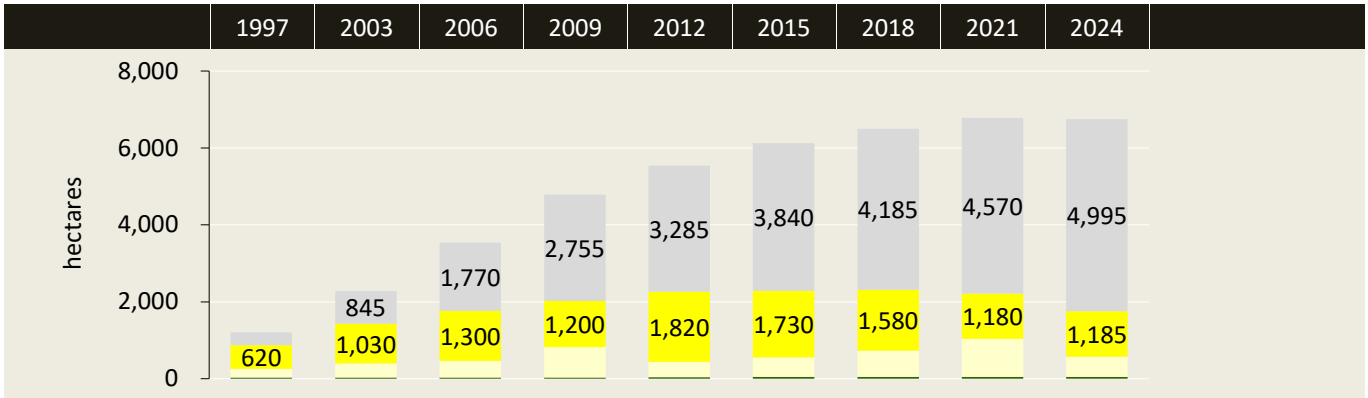
The dominant crop was potatoes from 1997 to 2024.

Plantings in 2024 were:

- potatoes, 1,160 ha (17% of the irrigable area);
- field crops, 525 ha (8% of the irrigable area);
- olive trees, 45 ha (1% of the irrigable area); and
- vegetables other than potatoes, 25 ha (less than 1% of the irrigable area).

From 1997 to 2024, the main planting changes were:

- potato crops increased by 540 ha, an 87% increase from 620 to 1,160 ha; and
- field crops increased by 300 ha, a 133% increase from 225 to 525 ha.



Crop type		1997	2003	2006	2009	2012	2015	2018	2021	2024	% of 2024	Change 1997-2024
Permanent	Grape Dried	-	-	-	-	-	-	-	-	-	-	-
	Grape Table	-	-	-	-	-	-	-	-	-	-	-
	Grape Wine	-	-	-	-	-	-	-	-	-	-	-
	Citrus	-	-	-	-	-	-	-	-	-	-	-
	Fruit Olive	30	30	35	35	40	45	45	45	45	1%	+15
	Fruit Other	-	-	-	-	-	-	-	-	-	-	-
	Nut Almond	-	-	-	-	-	-	-	-	-	-	-
	Nut Other	-	-	-	-	-	-	-	-	-	-	-
	Other	-	-	-	-	-	-	-	-	-	-	-
Seasonal	Field Crop	225	370	430	790	400	510	690	990	525	8%	+300
	Veg. Carrot	-	-	-	-	-	-	-	-	-	-	-
	Veg. Potato	620	1,030	1,300	1,200	1,820	1,730	1,580	1,180	1,160	17%	+540
	Veg. Other	0	0	0	0	0	0	0	0	25	<1%	+25
Vacant P		-	-	-	-	-	-	-	-	-	-	-
Vacant S		330	845	1,770	2,755	3,285	3,840	4,185	4,570	4,995	74%	+4,665
Total (ha)		1,205	2,275	3,535	4,780	5,545	6,125	6,500	6,785	6,750	100%	+5,545
Dominant		potato										

Figure 100: Murrayville GMA - crop types from 1997 to 2024

4.1.3 Murrayville GMA - planting trends

Figure 101 summarises planting trends with respect to permanent crops, seasonal crops and vacant areas in the Murrayville GMA from 1997 to 2024.

The proportion of permanent plantings, seasonal cropping and vacant areas changed from:

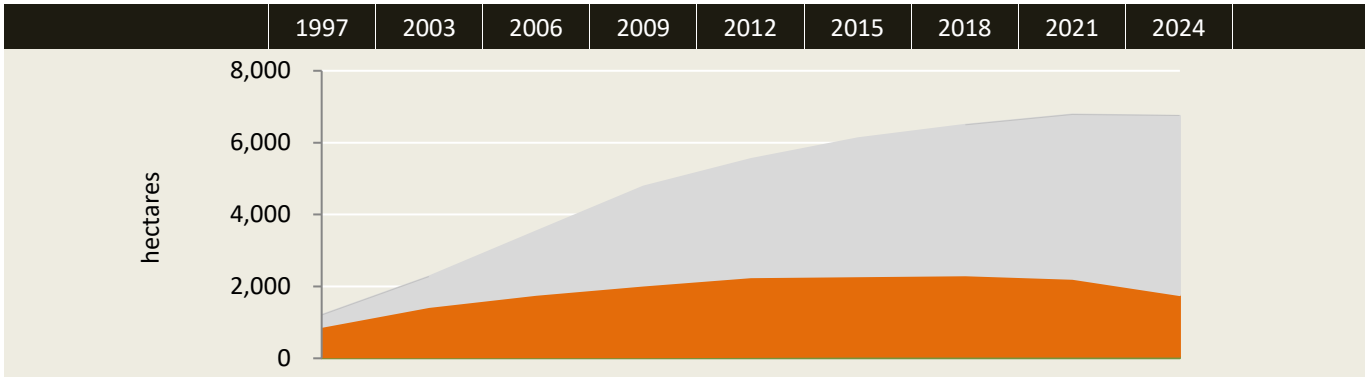
- 2% permanent, 70% seasonal and 27% vacant in 1997; to
- 1% permanent, 25% seasonal and 74% vacant in 2024.

In 2024, the irrigable area of 6,750 ha comprised:

- 1% (45 ha) irrigated permanent plantings (olives);
- 25% (1,710 ha) irrigated seasonal crops; and
- 74% (4,995 ha) vacant, previously irrigated seasonal crops.

From 1997 to 2024:

- irrigated permanent crops increased by 15 ha, from 30 to 45 ha;
- irrigated seasonal crops increased by 865 ha, from 845 to 1,710 ha; and
- vacant areas, previously irrigated seasonal crops increased by 4,665 ha, from 330 to 4,995 ha.



	1997	2003	2006	2009	2012	2015	2018	2021	2024	Change 1997-2024
Permanent - irrigated	30	30	35	35	40	45	45	45	45	+15
Seasonal - irrigated	845	1,400	1,730	1,990	2,220	2,240	2,270	2,170	1,710	+865
Total irrigated (ha)	875	1,430	1,765	2,025	2,260	2,285	2,315	2,215	1,755	+880
Vacant - permanent	-	-	-	-	-	-	-	-	-	-
Vacant - seasonal	330	845	1,770	2,755	3,285	3,840	4,185	4,570	4,995	+4,665
Total irrigable (ha)	1,205	2,275	3,535	4,780	5,545	6,125	6,500	6,785		
% Permanent	2%	1%	1%	1%	1%	1%	1%	1%	1%	
% Seasonal	70%	62%	49%	42%	40%	37%	35%	32%	25%	
% Vacant P	-	-	-	-	-	-	-	-	-	
% Vacant S	27%	37%	50%	58%	59%	63%	64%	67%	74%	

Figure 101: Murrayville GMA - planting trends from 1997 to 2024

4.1.4 Murrayville GMA - irrigation methods

Figure 102 summarises irrigation methods in the Murrayville GMA from 1997 to 2024.

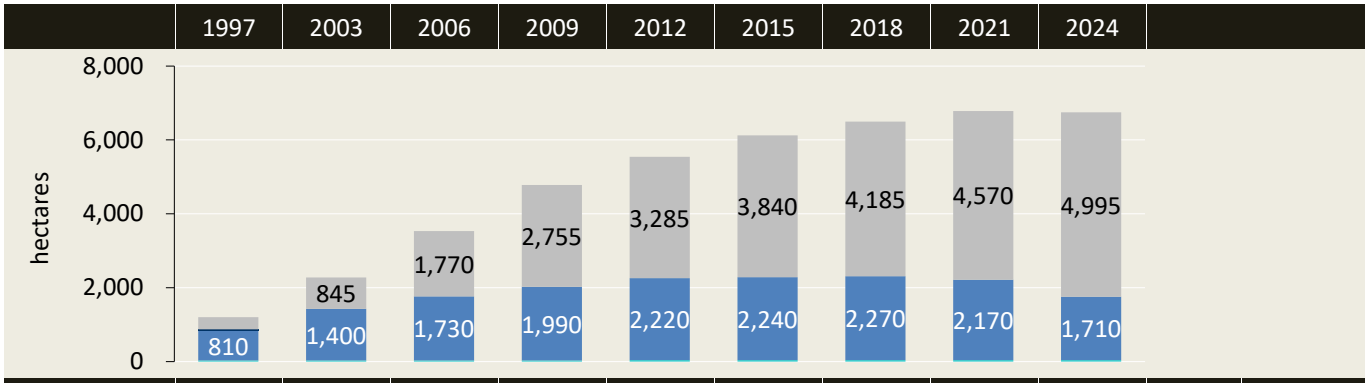
The dominant irrigation method in the Murrayville GMA was centre pivots from 1997 to 2024.

In 2024, the irrigable area of 6,750 ha comprised:

- 1% (45 ha) drip irrigation;
- 25% (1,710 ha) centre pivot (overhead) irrigation; and
- 74% (4,995 ha) vacant, not irrigated.

From 1997 to 2024:

- drip irrigation increased by 15 ha, a 50% increase from 30 to 45 ha;
- pivot irrigation increased by 900 ha, a 111% increase from 810 to 1,710 ha; and
- furrow irrigation ceased by 2003.



Irrigation method[35]	1997	2003	2006	2009	2012	2015	2018	2021	2024	% in 2024	Change 1997-2024
Drip	30	30	35	35	40	45	45	45	45	1%	+15
Low level	-	-	-	-	-	-	-	-	-	-	-
Overhead	810	1,400	1,730	1,990	2,220	2,240	2,270	2,170	1,710	25%	+900
Furrow	35	0	0	0	0	0	0	0	0	0%	-35
Vacant	330	845	1,770	2,755	3,285	3,840	4,185	4,570	4,995	74%	+4,665
Total (ha)	1,205	2,275	3,535	4,780	5,545	6,125	6,500	6,785	6,750	100%	+5,545
Dominant	overhead (pivot)										

Figure 102: Murrayville GMA - irrigation methods from 1997 to 2024

[35] Overhead irrigation includes pivots and lateral move systems. Furrow includes flood irrigation. (Refer to Table 4.)

4.1.5 Murrayville GMA - property change

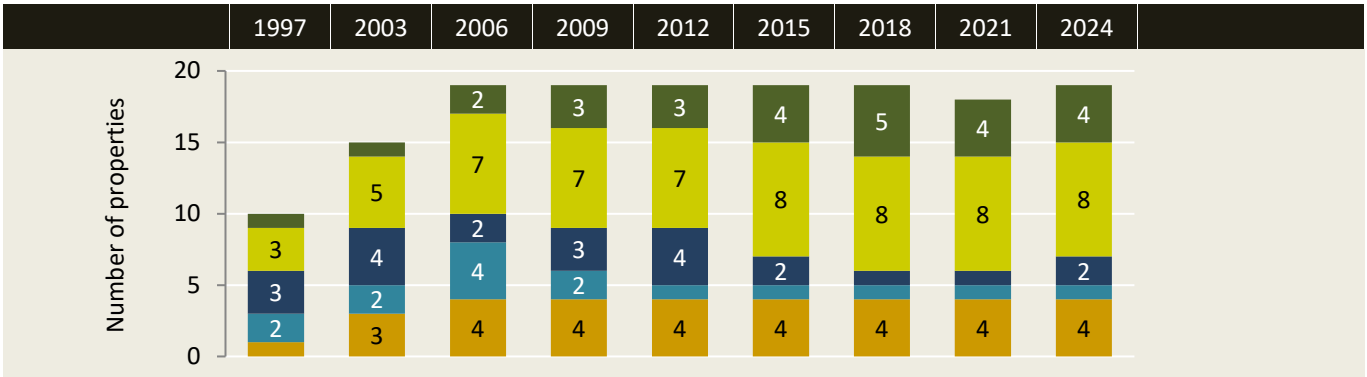
Figure 103 provides estimates of property numbers and average property size (irrigable area) in the Murrayville GMA from 1997 to 2024.

In 2024:

- there were approximately 19 irrigation properties; and
- 63% of properties had an irrigable area greater than 100 ha.

From 1997 to 2024:

- the number of properties increased by 9, a 90% increase from 10 to 19;
- properties with an irrigable area less than 100 ha increased by 1, while the number over 100 ha increased by 8; and
- average property size (irrigable area) increased from 121 to 355 ha per property.



Property size (irrigable area)	1997	2003	2006	2009	2012	2015	2018	2021	2024	% in 2024	Change 1997-2024
1 to 5 ha	1	3	4	4	4	4	4	4	4	21%	+3
5 to 10 ha	-	-	-	-	-	-	-	-	-	-	-
10 to 20 ha	-	-	-	-	-	-	-	-	-	-	-
20 to 40 ha	2	2	4	2	1	1	1	1	1	5%	-1
40 to 100 ha	3	4	2	3	4	2	1	1	2	11%	-1
100 to 500 ha	3	5	7	7	7	8	8	8	8	42%	+5
> 500 ha	1	1	2	3	3	4	5	4	4	21%	+3
Total properties	10	15	19	19	19	19	19	18	19	100%	+9
Average size (ha)	121	152	186	252	292	322	342	377	355		

Figure 103: Murrayville GMA - estimate of property numbers and sizes from 1997 to 2024

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