



2020 Addendum - Mallee Horticulture Crop Report

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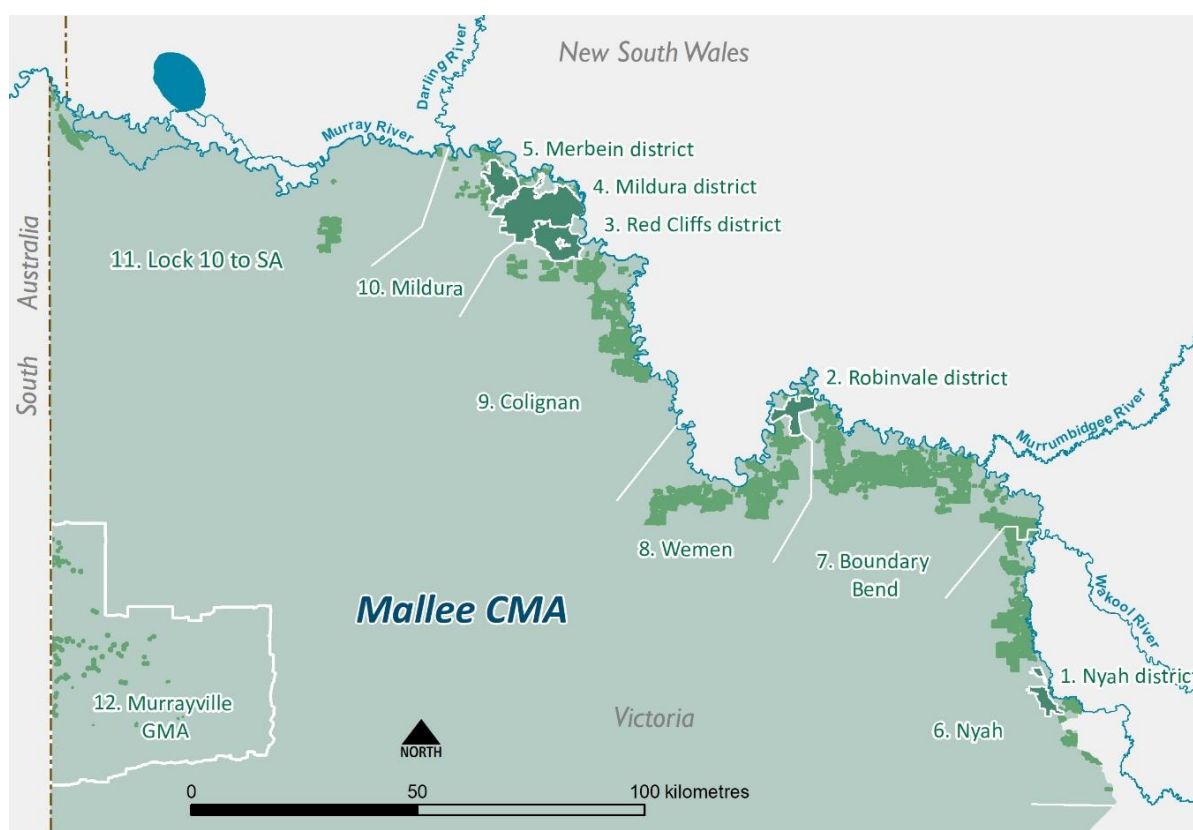
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Executive summary

This report is an addendum to the 2018 Crop Report¹ and the 2019 Addendum² prepared by SunRISE Mapping for the Mallee Catchment Management Authority (Mallee CMA).

The 2018 Crop Report tracked irrigation development from 1997 to 2018 and evidenced renewed activity in redevelopment and expansion in the period from 2015 to 2018. The 2019 and 2020 addendums track the extent of further expansion and redevelopment from mid-2018 to mid-2020.

The study area for this report is the Mallee catchment, being irrigated horticulture along the Murray River from Woorinen to the South Australian border and irrigation in the Murrayville Groundwater Management Area (Murrayville GMA) as shown in Map 1. There are five pumped irrigation districts, six river reaches of private diverters and the Murrayville GMA.



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

This 2020 Addendum is the first of the Mallee Horticulture Crop Reports to include information on water-use in addition to the standard land-use data. Future reports will continue to build on water-use data to provide additional insights into the nature of irrigation in the Mallee catchment.

Overview 2018 to 2020

The irrigable area (area covered by a Water Use Licence) across the Mallee catchment increased by 3% (2,755 ha), from 81,455 ha in 2018 to 84,210 ha in 2020. While the irrigable area increased, the area irrigated decreased by 3% (2,140 ha). This was the net result of an increase in irrigated permanent

¹ Mallee CMA, 2018 Mallee Horticulture Crop Report, November 2018

² Mallee CMA, 2019 Addendum, Mallee Horticulture Crop Report, September 2019

plantings by 2,515 ha and a decrease in seasonal cropping by 4,655 ha, largely due to low water allocations in 2019-20 (66% at 30 June 2020).

Key findings

Crop type changes 2018 to 2020

Almond trees remained the dominant crop type across the Mallee catchment from 2018 to 2020.

In each of the twelve study areas, the dominant crop remained the same in 2020 as it was in 2018, except for the Red Cliffs and Merbein irrigation districts. The dominant crop in the Red Cliffs district changed from wine grape plantings in 2018 to table grapes by 2019 and the Merbein district changed from dried grapes in 2018 to table grapes by 2019.

Table 1 summarises the change in crop types across the Mallee catchment from 2018 to 2020.

Table 1: Crop type change across the Mallee catchment from 2018 to 2020*

Crop type		2018	2019	2020	% of 2020 total	Change (ha) 2018 - 2020	% Change 2018 - 2020
Permanent	Grape Dried	3,055	2,955	2,555	3%	-500	-16%
	Grape Table	8,965	9,420	10,010	12%	+1,045	+12%
	Grape Wine	8,100	8,170	8,250	10%	+150	+2%
	Citrus	4,120	4,295	4,410	5%	+290	+7%
	Fruit Olive	3,815	3,790	3,765	4%	-50	-1%
	Fruit Other	1,760	1,885	1,850	2%	+90	+5%
	Nut Almond	24,485	25,355	25,695	31%	+1,210	+5%
	Nut Other	540	650	810	1%	+270	+50%
	Other	585	605	595	1%	+10	+2%
Seasonal	Field Crop	5,775	5,785	3,465	4%	-2,310	-40%
	Veg. Carrot	1,505	1,300	975	1%	-530	-35%
	Veg. Potato	3,465	2,895	2,170	3%	-1,295	-37%
	Veg. Other	2,555	2,540	2,035	2%	-520	-20%
	Vacant P	6,525	6,060	6,120	7%	-405	-6%
	Vacant S	6,205	7,595	11,505	14%	+5,300	+85%
Total (ha)		81,455	83,300	84,210	100%	+2,755	+3%
Dominant		almonds					

* Please note that some data values representing 2018 and 2019 may have changed from previously published Mallee Horticultural Crop Reports as continuous data accuracy is maintained via ongoing ground truthing and increased image analysis.

There was a substantial reduction in irrigated seasonal cropping in 2019-20, likely associated with low water allocations for Victorian Murray High Reliability Water Shares (66%) and across the southern Murray-Darling Basin.

1. Field crops decreased by 2,310 ha, a 40% decrease from 5,775 ha in 2018 to 3,465 ha in 2020; and
2. Vegetable crops decreased by 2,345 ha, a 31% decrease from 7,525 ha in 2018 to 5,180 ha in 2020.

Key findings continued...

The main changes in permanent plantings from 2018 to 2020 were:

3. Almond plantings increased by 1,210 ha, a 5% increase from 24,485 ha to 25,695 ha. The net increase of 1,210 ha was the balance of 240 ha removed and 1,450 ha of new plantings predominantly in the Wemen river reach.
4. Table grape plantings increased by 1,045 ha, a 12% increase from 8,965 ha to 10,010 ha. The net increase of 1,045 ha was the balance of approximately 555 ha removed and 1,600 ha of new or redeveloped plantings predominantly in the Mildura, Red Cliffs and Merbein irrigation districts.
5. Dried grape plantings decreased by 500 ha, a 16% decrease from 3,055 ha to 2,555 ha. The net decrease of 500 ha was the balance of 625 ha removed and 125 ha of new or redeveloped plantings predominantly in the Mildura, Red Cliffs and Merbein irrigation districts and the Colignan river reach.
6. Citrus plantings increased by 290 ha, a 7% increase from 4,120 ha to 4,410 ha. The net increase of 290 ha was the balance of 260 ha removed and 550 ha of new or redeveloped plantings predominantly in the Colignan and Boundary Bend river reaches and the Mildura irrigation district.
7. Nut trees other than almonds, mainly pistachios, increased by 270 ha, a 50% increase from 540 to 810 ha. New plantings were predominantly in the Nyah, Boundary Bend and Wemen river reaches.
8. Wine grape plantings increased by 150 ha, a 2% increase from 8,100 ha to 8,250 ha. The net increase of 150 ha was the balance of 600 ha removed and 750 ha of new or redeveloped plantings predominantly in the Colignan, Lock 10 to SA and Nyah river reaches.

Irrigation development - new and retired areas 2018 to 2020

From mid-2018 to mid-2020, the irrigable area in the Mallee catchment increased by 2,755 ha, a 3% increase from 81,455 ha to 84,210 ha. The net increase of 2,755 ha was the balance of 2,935 ha of expansion and 180 ha retired from irrigation, see Map 3 page 28.

99% of expansion occurred in the private diverter river reaches, predominantly the Wemen, Boundary Bend and Nyah reaches.

In 2018-19, the rate of irrigation expansion was 1,845 ha/year, the highest since 2009, however the upward trend did not follow through to 2019-20 with the rate slowing to 910 ha/year.

Planting trends - permanent plantings, seasonal crops and vacant areas

The trend in permanent and seasonal cropping areas from 2018 to 2020 is summarised in **Error! Reference source not found.** Permanent plantings increased by 2,515 ha, through expansion as well as redevelopment of vacant/not irrigated areas. Irrigated seasonal cropping decreased with a subsequent increase in vacant/not irrigated areas.

Changes in the area of permanent plantings, seasonal crops and vacant (not irrigated) areas from 2018 to 2020 were as follows:

- Permanent plantings increased by 2,515 ha, a 5% increase from 55,425 ha to 57,940 ha. The increase in permanent plantings was mainly in the Wemen river reach (895 ha), Nyah reach (515 ha) and Boundary Bend reach (420 ha).
- Seasonal crops decreased by 4,655 ha, a 35% decrease from 13,300 ha to 8,645 ha.

- Vacant, previously irrigated permanent plantings, decreased by 405 ha, a 6% decrease from 6,525 ha to 6,120 ha. The decrease comprised 320 ha in the private diverter river reaches and 85 ha in the irrigation districts.

Key findings continued...

- Vacant, previously irrigated seasonal cropping, increased by 5,300 ha, an 85% increase from 6,205 ha to 11,505 ha.

In 2020, the proportion of permanent plantings, seasonal cropping and vacant areas in the private diverter river reaches and the irrigation districts was as follows:

- 80% of permanent plantings were in private diverter areas, 20% in the irrigation districts.
- 70% of seasonal crops were in private diverter areas, 10% in the irrigation districts and 20% in the Murrayville GMA.
- 43% of vacant, previously permanent plantings, were in private diverter areas and 57% in the irrigation districts.
- 80% of vacant, previously seasonal crops, were in private diverter areas, 10% in the irrigation districts and 10% in the Murrayville GMA.

Table 2: Planting trends from 2018 to 2020 across the Mallee catchment

	2018	2019	2020	% of 2020 total	Change (ha) 2018 - 2020	% Change 2018 - 2020
Permanent - irrigated	55,425	57,125	57,940	69%	+2,515	+5%
Seasonal - irrigated	13,300	12,520	8,645	10%	-4,655	-35%
Vacant - permanent	6,525	6,060	6,120	7%	-405	-6%
Vacant - seasonal	6,205	7,595	11,505	14%	+5,300	+85%
Total hectares	81,455	83,300	84,210	100%	+2,755	+3%
% Permanent	68%	69%	69%			
% Seasonal	16%	15%	10%			
% Vacant ex. permanent	8%	7%	7%			
% Vacant ex. seasonal	8%	9%	14%			

Irrigation methods 2018 to 2020

Drippers remained the dominant irrigation method from 2018 to 2020 in each of the twelve study areas, except for the Robinvale district where low level sprinklers were dominant and the Murrayville GMA where overhead pivots were dominant.

Drip irrigation increased by 3,125 ha; a 7% increase from 46,715 ha to 49,840 ha while gravity systems (furrow and flood) decreased by 1,270 ha, a 56% decrease from 2,280 ha to 1,010 ha.

Lowlevel and overhead sprinklers also decreased; by 7% (605 ha) and 31% (3,390 ha) respectively.

The decreases in furrow and overhead irrigation were influenced by low water allocations and reduced irrigation of seasonal cropping.

Salinity impact zones 2018 to 2020

The dominant irrigable salinity impact zone across the Murray Mallee (Murrayville GMA not included) was the lowest impact zone, L1, where 85% of the irrigation expansion occurred. From 2018 to 2020, the irrigable area in HIZ decreased by 110 ha, a 1% decrease from 10,495 ha to 10,385 ha. The net decrease of 110 ha was the balance of 115 ha retired from irrigation and 5 ha of new HIZ areas (expansion on existing irrigation properties). Areas retired from HIZ were mainly in the pumped irrigation districts.

The irrigable area in the low salinity impact zones (L1, L2, L3 and L4) increased by 2,855 ha, a 4% increase from 68,075 ha in 2018 to 70,930 ha in 2020.

Key findings continued...

Irrigation properties

From 2018 to 2020, the number of irrigation properties in the Mallee catchment decreased by 72, a 4% decrease from 1,905 to 1,833 properties and average property size (irrigable area) increased from 43 ha to 46 ha.

In the pumped irrigation districts, property numbers decreased by 56, a 3% decrease from 1,508 to 1,452 properties and average property size (irrigable area) increased from 11 ha to 12 ha.

In the private diverter river reaches, property numbers decreased by 16, a 4% decrease from 427 to 411 properties and average property size (irrigable area) increased from 144 ha to 156 ha.

Water-use in 2020

This 2020 Addendum is the first of the Mallee Horticulture Crop Reports to include information on water-use in addition to the standard land-use data. Analysis of water use data was undertaken where alignment between water-use, water-use licence (WUL) and property description was available. The method for matching land parcels with WULs and water use is explained on page 13.

Water use data was matched to 97% (62,744 ha) of irrigated horticulture in the Murray Mallee (Murrayville GMA not included) for the 2019-20 season. The 62,744 ha of crops were irrigated with 512,802 ML, at an overall average of 8.2 ML/ha applied over the course of the irrigation season.

Water-use across the Mallee catchment in 2020 was identified by river reach and districts, see Figure 1 below and Figure 7 on page 27 for more details on water use distribution. In summary water-use across the Mallee catchment in 2020 was:

- 17% in the pumped irrigation districts;
- 81% in the private diverter river reaches; and
- 2% in the Murrayville GMA.

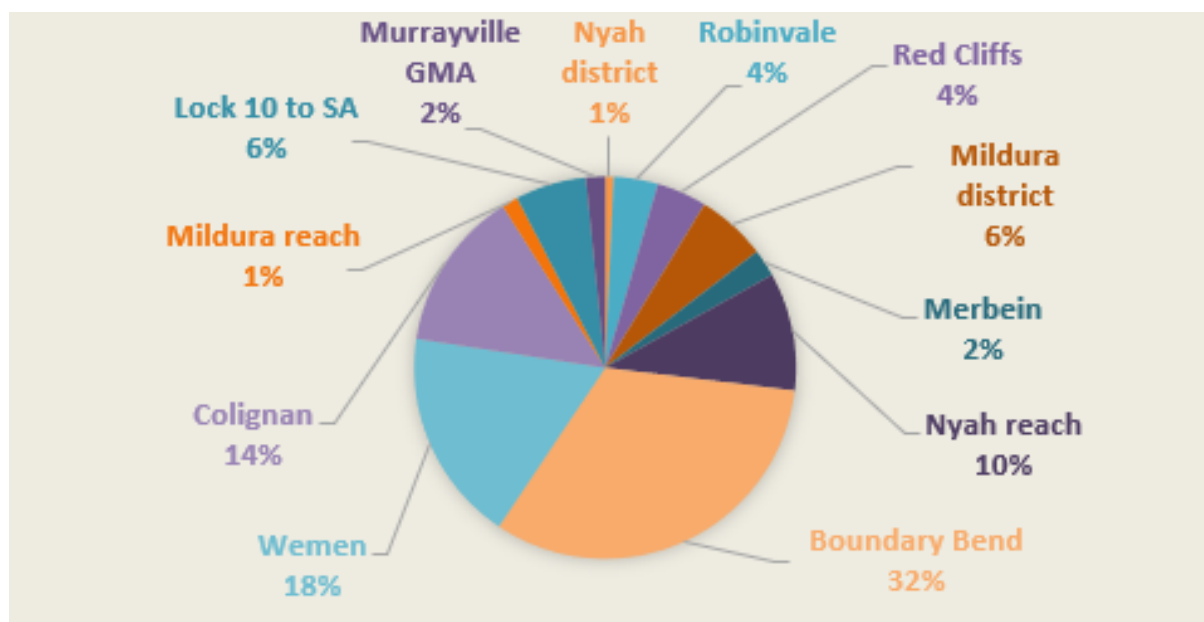


Figure 1: Mallee catchment – percentage of irrigation water-use in river reaches and district, 2020

Method

SunRISE Mapping and Research - crop mapping and imagery sources

SunRISE crop mapping is based on scale accurate aerial or satellite imagery, along with input from irrigators and industry, and an October 2020 ground truthing program as described below.

Imagery for mapping irrigated horticulture is ideally, high-resolution, aerial photography, captured in January or February of the season represented. The 2018 crop mapping, representing the 2017-18 season, was from aerial photography captured January 2018.

The 2020 crop mapping was from several imagery sources that ranged in quality and resolution:

- MetroMap, high-resolution aerial imagery, captured 6th December 2019 and 17th January 2020 was available for the Mildura, Red Cliffs and Merbein districts, Mildura private diverters, and the northern end of the Colignan to Koorlong river reach. The imagery enabled detailed interpretation of 2020 status of irrigated areas.
- Google Earth satellite imagery, captured late 2019 or early 2020, was used across areas outside the MetroMap coverage, except for the Robinvale irrigation district and the Boundary Bend and Wemen river reaches where only 2016 Google Earth was available. Google Earth enabled interpretation of 2020 irrigation status for large areas, the imagery resolution was generally not suited to interpreting the status of small areas.
- Sentinel satellite imagery was the only 2020 imagery readily available from Boundary Bend to Wemen. It enabled coarse interpretation of irrigation status. 2020 results for the Robinvale district and the Boundary Bend and Wemen river reaches are not complete.
- Decipher biomass mapping provided monthly snap shots that assisted in assessing the status of seasonal cropping in 2020 i.e. from July 2019 to June 2020.

Ground truthing

In October 2020, the Mallee CMA³ employed staff to conduct field surveys of crop types and irrigation methods across the Mallee catchment. Staff engaged in the program received training to ensure consistency of reporting and quality assurance. Crops visible from public roads were observed at Murrayville and along the Murray River from Nyah to the South Australian border.

Results from the field surveys were used to correct data in the 2020 crop mapping and earlier mapping where applicable:

- 45% of the 2020 crop area was observed;
- 3% of crop types in the area observed were corrected and a further 2% of crop types were new plantings that will be applied to 2021 crop mapping (i.e. crops planted after June 2020); and
- 5% of irrigation methods in the area observed were corrected, mostly lowlevel corrected to drip as well as drip corrected to lowlevel. There was also detail on dual systems, e.g. drip with overhead sprinklers or cooling sprays, which was added to the crop mapping database.

³ Working for Victoria, Employment Program – Ground truthing crop data

Method continued....

Water-use mapping, alignment process and limitations

This 2020 Addendum is the first of the Mallee Horticulture Crop Reports to include information on water-use. Analysis of water-use was identified as an action within the Victorian Mallee Irrigation Region Land and Water Management Plan 2020-29.

Water-use data, from the Victorian Water Register, attributed to a Water-use Licence (WUL) was matched to land parcels (cadastre) which was aligned to crop data. 97% (64,580 ha) of the irrigated area in the Mallee catchment was aligned to the water-use data. Approximately 3% of water use was unable to accurately matched to specific property data. The WUL mapping and assistance to align it to the SunRISE mapping of crop areas was provided by Andy McAllister, Senior Research Scientist, Agriculture Victoria.

Anomalies in the alignment process included:

- One private diverter irrigator comprising twelve separate properties with an excess of twelve WULs had actual water-use recorded against only one WUL, although clearly most if not all properties had received irrigation water.
- In some instances, there was no water use recorded for irrigated crop areas, but proportionate water use recorded against an associated house lot with a WUR (water use registration). It was assumed that the house lot water use applied to the irrigated horticulture.

The alignment process led to adjustment of the crop mapping with respect to:

- Irrigation status of some seasonal crops such as vegetables and field crops. Where irrigation activity was unclear from the imagery and there was no water-use, the area was recorded as 'vacant', and vice versa. Reduced irrigating of seasonal cropping was noticeable in 2020 and reflected a season of low water allocations.
- The extent of private diverter river reaches. The Nyah and Boundary Bend river reaches were adjusted by 650 ha; 650 ha of almonds removed from the Boundary Bend reach and added to the Nyah reach as the WUL clarified diversion down-stream of the Murray - Wakool junction, not upstream as previously mapped.
- 145 ha irrigated in the 1990's, but vacant since early 2000 and with no WUL. These areas were mostly in the floodplain and were removed from the crop mapping and recorded as 'retired' in the 1997 or 2003 crop mapping.

This first, 2020, alignment of water-use to irrigated crop areas highlighted anomalies and a number of different situations that required different approaches to the analyses and information outputs. A review of the alignment process will be undertaken to develop a standardised approach.

Definitions

The following definitions apply in this report.

Irrigable area Irrigable area is the irrigated area and vacant, not irrigated areas that were irrigated and still could be irrigated. Some vacant areas may eventually be retired or they may be in redevelopment. An increase in irrigable area can arise from new ‘greenfield’ development and/or from an increase in the area irrigated following redevelopment and the removal of furrow irrigation, drying racks etc.

Retired Areas ‘retired’ from irrigation have undergone a change in land use that precludes them from being 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. Areas set aside for conservation purposes are also ‘retired’ from the crop mapping. ‘Retired’ areas are excluded from the ‘irrigable’ area.

Vacant The crop mapping includes a crop type of ‘vacant’. Vacant areas were irrigated, but not in the season that the crop mapping refers to. Where the vacant area was previously a permanent planting, it is termed **Vacant P**. Where the vacant area was previously a seasonal planting, such as pasture or vegetables, it is termed **Vacant S**.

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).

Table 3 shows the relationship between salinity offset charging zones and salinity accountability zones.

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

Crop type descriptions

Table 4 describes the main crops irrigated in the Mallee catchment and how they are classed for reporting.

Table 4: Description of irrigated crop types and categories

	Crop type	Category	Description
Permanent plantings	Grapevine	Dried	
		Table	
	Citrus	Wine	Includes a very small proportion of juiced grapes
			Grapefruit, lemon, lime, mandarin, navel, blood orange, other, pummelo, tangelo, valencia
	Fruit tree	Olive	
		Other	Avocado, date palm, fig, jujube, mango, persimmon, pome fruit, pomegranate, stone fruit
	Nut tree	Almond	
Other		Pistachio, walnut	
Other	Miscellaneous	Aquaculture, flowers, herbs, mushroom, native plants, nursery, passionfruit, strawberry, tree plantation	
Seasonal crops	Field crop		Canola, cereal, cover crop, lucerne, lupin, maize, pasture, turf etc.
	Vegetable	Carrot	
		Potato	
		Other	Asparagus, bean, beetroot, broccoli, cabbage, capsicum, cauliflower, chili, cucumber, eggplant, garlic, lettuce, melon, onion, pea, pumpkin, salad greens, sweet corn, tomato, zucchini
	Vacant P		Vacant (not irrigated), previously an irrigated permanent planting
	Vacant S		Vacant (not irrigated), previously an irrigated seasonal crop

Irrigation type descriptions

Irrigation methods are grouped as drip, lowlevel, overhead and furrow as described in Table 5.

Many irrigators use dual systems, such as drip with overhead sprinklers or cooling sprays; however, only the main irrigation method is used in this report.

Table 5: Description of irrigation methods

Irrigation method	Description
Drip	Including; subsurface-drip, trickle
Lowlevel	Including; micro jet, micro sprinkler, sprinkler, waterbird
Overhead	Including; 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 as shown in Map 2. All references to the 'Mallee catchment' in this report refer to the twelve study areas.

Pumped irrigation districts

All pumped irrigation districts are serviced by Lower Murray Water (LMW) except Nyah.

1. Nyah irrigation district (Goulburn Murray Water (GMW))
2. Robinvale irrigation district
3. Red Cliffs irrigation district
4. Mildura irrigation district
5. Merbein irrigation district

River reaches (private diverters)

All reaches of private diverters are serviced by LMW except Nyah river reach upstream of Nyah.

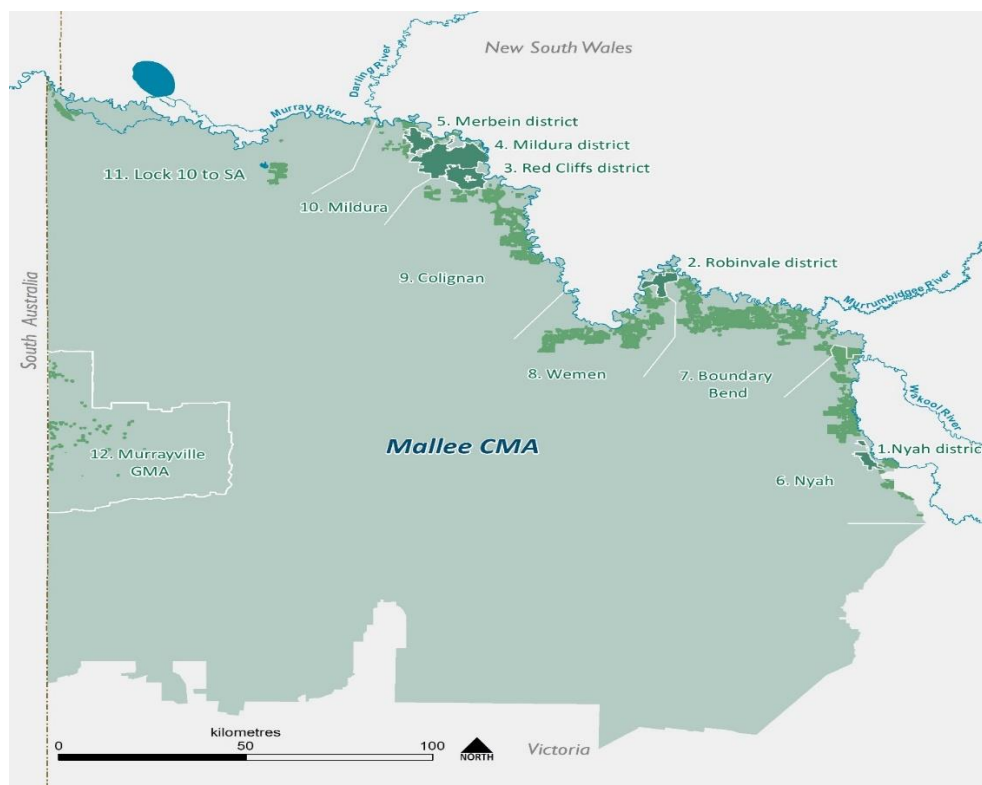
- | | |
|-------------------------------|---|
| 6. Nyah river reach | - Woorinen South to the Wakool River junction |
| 7. Boundary Bend river reach | - Wakool River junction to the Euston weir |
| 8. Wemen river reach | - Euston weir to Liparoo |
| 9. Colignan river reach | - Colignan to Yatpool |
| 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)

The Murrayville GMA is serviced by Grampians Wimmera Mallee Water (GWM Water).

12. Murrayville GMA

Map of the study area



Map 2: Map of the twelve study areas in the Mallee catchment

1. Mallee catchment summary

In summary for irrigated horticulture in the Mallee catchment from 2018 to 2020

Change in crop types from 2018 to 2020

Almond trees remained the dominant crop type across the Mallee catchment from 2018 to 2020.

Low water allocations in 2019-20 (66% at 30 June 2020) influenced a reduction in irrigated seasonal cropping:

1. Field crops decreased by 2,310 ha, a 40% decrease from 5,775 ha in 2018 to 3,465 ha in 2020; and
2. Vegetable crops decreased by 2,345 ha, a 31% decrease from 7,525 ha in 2018 to 5,180 ha in 2020.

Other changes from 2018 to 2020 were:

3. Almond plantings increased by 1,210 ha, a 5% increase from 24,485 ha to 25,695 ha. The net increase of 1,210 ha was the balance of 240 ha removed and 1,450 ha of new plantings predominantly in the Wemen river reach.
4. Table grape plantings increased by 1,045 ha, a 12% increase from 8,965 ha to 10,010 ha. The net increase of 1,045 ha was the balance of approximately 555 ha removed and 1,600 ha of new or redeveloped plantings predominantly in the Mildura, Red Cliffs and Merbein irrigation districts.
5. Dried grape plantings decreased by 500 ha, a 16% decrease from 3,055 ha to 2,555 ha. The net decrease of 500 ha was the balance of 625 ha removed and 125 ha of new or redeveloped plantings predominantly in the Mildura, Red Cliffs and Merbein irrigation districts and the Colignan river reach.
6. Citrus plantings increased by 290 ha, a 7% increase from 4,120 ha to 4,410 ha. The net increase of 290 ha was the balance of 260 ha removed and 550 ha of new or redeveloped plantings predominantly in the Colignan and Boundary Bend river reaches and the Mildura irrigation district.
7. Nut trees other than almonds, mainly pistachios, increased by 270 ha, a 50% increase from 540 to 810 ha. New plantings were predominantly in the Nyah, Boundary Bend and Wemen river reaches.
8. Wine grape plantings increased by 150 ha, a 2% increase from 8,100 ha to 8,250 ha. The net increase of 150 ha was the balance of 600 ha removed and 750 ha of new or redeveloped plantings predominantly in the Colignan, Lock 10 to SA and Nyah river reaches.

Irrigation development - new and retired areas 2018 to 2020

From mid-2018 to mid-2020, the irrigable area in the Mallee catchment increased by 2,755 ha, a 3% increase from 81,455 ha to 84,210 ha. The net increase of 2,755 ha was the balance of 2,935 ha of expansion and 180 ha retired from irrigation.

99% of expansion occurred in the private diverter river reaches, predominantly the Wemen, Boundary Bend and Nyah reaches.

In 2018-19, the rate of irrigation expansion was 1,845 ha/year, the highest since 2009, however the upward trend did not follow through to 2019-20 with the rate slowing to 910 ha/year.

In summary for irrigated horticulture in the Mallee catchment

Planting trends - permanent plantings, seasonal crops and vacant areas

The irrigable area across the Mallee catchment increased by 3% (2,755 ha), from 81,455 ha in 2018 to 84,210 ha in 2020. While the irrigable area increased, the area irrigated decreased by 3% (2,140 ha). This was the net result of an increase in irrigated permanent plantings by 2,515 ha and a decrease in seasonal cropping by 4,655 ha, likely associated with low water allocations for Victorian Murray High Reliability Water Shares (66% at 30 June 2020) and across the southern Murray-Darling Basin.

The trend from 2018 to 2020 was an increase in permanent plantings from expansion as well as redevelopment of vacant/not irrigated areas. The decrease in irrigated seasonal cropping meant a subsequent increase in vacant/not irrigated areas.

Changes in the area of permanent plantings, seasonal crops and vacant (not irrigated) areas from 2018 to 2020 were as follows:

- Permanent plantings increased by 2,515 ha, a 5% increase from 55,425 ha to 57,940 ha. The increase in permanent plantings was mainly in the Wemen river reach (895 ha), Nyah reach (515 ha) and Boundary Bend reach (420 ha).
- Seasonal crops decreased by 4,655 ha, a 35% decrease from 13,300 ha to 8,645 ha.
- Vacant, previously irrigated permanent plantings, decreased by 405 ha, a 6% decrease from 6,525 ha to 6,120 ha. The decrease comprised 320 ha in the private diverter river reaches and 85 ha in the irrigation districts.
- Vacant, previously irrigated seasonal cropping, increased by 5,300 ha, an 85% increase from 6,205 ha to 11,505 ha.

In 2020, the proportion of permanent plantings, seasonal cropping and vacant areas in the private diverter river reaches and the irrigation districts was as follows:

- 80% of permanent plantings were in private diverter areas, 20% in the irrigation districts.
- 70% of seasonal crops were in private diverter areas, 10% in the irrigation districts and 20% in the Murrayville GMA.
- 43% of vacant, previously permanent plantings, were in private diverter areas and 57% in the irrigation districts.
- 80% of vacant, previously seasonal crops, were in private diverter areas, 10% in the irrigation districts and 10% in the Murrayville GMA.

Irrigation methods 2018 to 2020

Drippers remained the dominant irrigation method from 2018 to 2020 in each of the twelve study areas, except for the Robinvale district where low level sprinklers were dominant and the Murrayville GMA where overhead pivots were dominant.

From 2018 to 2020:

- Drip irrigation increased by 3,125 ha; a 7% increase from 46,715 ha to 49,840 ha;
- Lowlevel irrigation decreased by 605 ha; a 7% decrease from 8,670 ha to 8,065 ha;
- Overhead irrigation decreased by 3,390 ha; a 31% decrease from 11,060 ha to 7,670 ha; and
- Furrow/flood irrigation decreased by 1,270 ha, a 56% decrease from 2,280 ha to 1,010 ha.

In summary for irrigated horticulture in the Mallee catchment

Salinity impact zones 2018 to 2020

The dominant salinity impact zone across the Murray Mallee (Murrayville GMA not included) was the lowest impact zone, L1, where 85% of the irrigation expansion occurred.

From 2018 to 2020 the irrigable area in:

- L1 increased by 2,475 ha, a 6% increase from 40,475 ha to 42,950 ha. Irrigation expansion was primarily in the lowest salinity impact zone, L1.
- L2 increased by 220 ha, a 1% increase from 15,400 ha to 15,620 ha.
- L3 increased by 40 ha, a 2% increase from 2,475 ha to 2,515 ha.
- L4 increased by 120 ha, a 1% increase from 9,725 ha to 9,845 ha.
- HIZ decreased by 110 ha, a 1% decrease from 10,495 ha to 10,385 ha. The net decrease of 110 ha was the balance of 115 ha retired from irrigation and 5 ha of new HIZ areas (expansion on existing irrigation properties). Areas retired from HIZ were mainly in the pumped irrigation districts.

Irrigation properties

From 2018 to 2020, the number of irrigation properties in the Mallee catchment decreased by 72, a 4% decrease from 1,905 to 1,833 properties and average property size (irrigable area) increased from 43 ha to 46 ha.

In the pumped irrigation districts, property numbers decreased by 56, a 3% decrease from 1,508 to 1,452 properties and average property size (irrigable area) increased from 11 ha to 12 ha.

In the private diverter river reaches, property numbers decreased by 16, a 4% decrease from 427 to 411 properties and average property size (irrigable area) increased from 144 ha to 156 ha.

Water-use in 2020

Analysis of water use data was undertaken where alignment between water-use, water-use licence and property description was available. Overall a 97% alignment of water-use to irrigated crop area was achieved across all areas in the Mallee catchment. This equates to 521,062 ML of water applied to 64,580 ha of irrigated area. Specifically, for the Murray Mallee (not including Murrayville) 512,802ML was applied to 62,744 ha at an overall average of 8.2 ML/ha during the course of the 2019-20 irrigation season.

In pumped districts, during the course of the 2019-20 irrigation season 88,203 ML of water was applied to 12,287 ha of irrigated crops at an average of 7.2ML/ha. A much larger volume of water, 424,599 ML was applied in the private diverter river reaches on 50,457 ha at an average of 10.4ML/ha.

For the Murrayville GMA, 8,260 ML of water was applied to 1,836 ha of irrigated crops at an average of 4.5ML/ha during the course of the 2019-20 season.

1.1 Mallee catchment - crop types from 2018 to 2020

Figure summarises the change in irrigated crops across the Mallee catchment from 2018 to 2020.

Almond trees were the dominant planting from 2018 to 2020. The main changes from 2018 to 2020 were:

1. Field crops decreased by 2,310 ha, a 40% decrease from 5,775 ha to 3,465 ha.
2. Vegetable crops decreased by 2,345 ha, a 31% decrease from 7,525 ha to 5,180 ha.
3. Almond trees increased by 1,210 ha, a 5% increase from 24,485 ha to 25,695 ha.
4. Table grape plantings increased by 1,045 ha, a 12% increase from 8,965 ha to 10,010 ha.
5. Dried grape plantings decreased by 500 ha, a 16% decrease from 3,055 ha to 2,555 ha.
6. Citrus plantings increased by 290 ha, a 7% increase from 4,120 ha to 4,410 ha.
7. Nut trees other than almonds, mainly pistachios, increased by 270 ha, a 50% increase from 540 to 810 ha.
8. Wine grape plantings increased by 150 ha, a 2% increase from 8,100 ha to 8,250 ha.

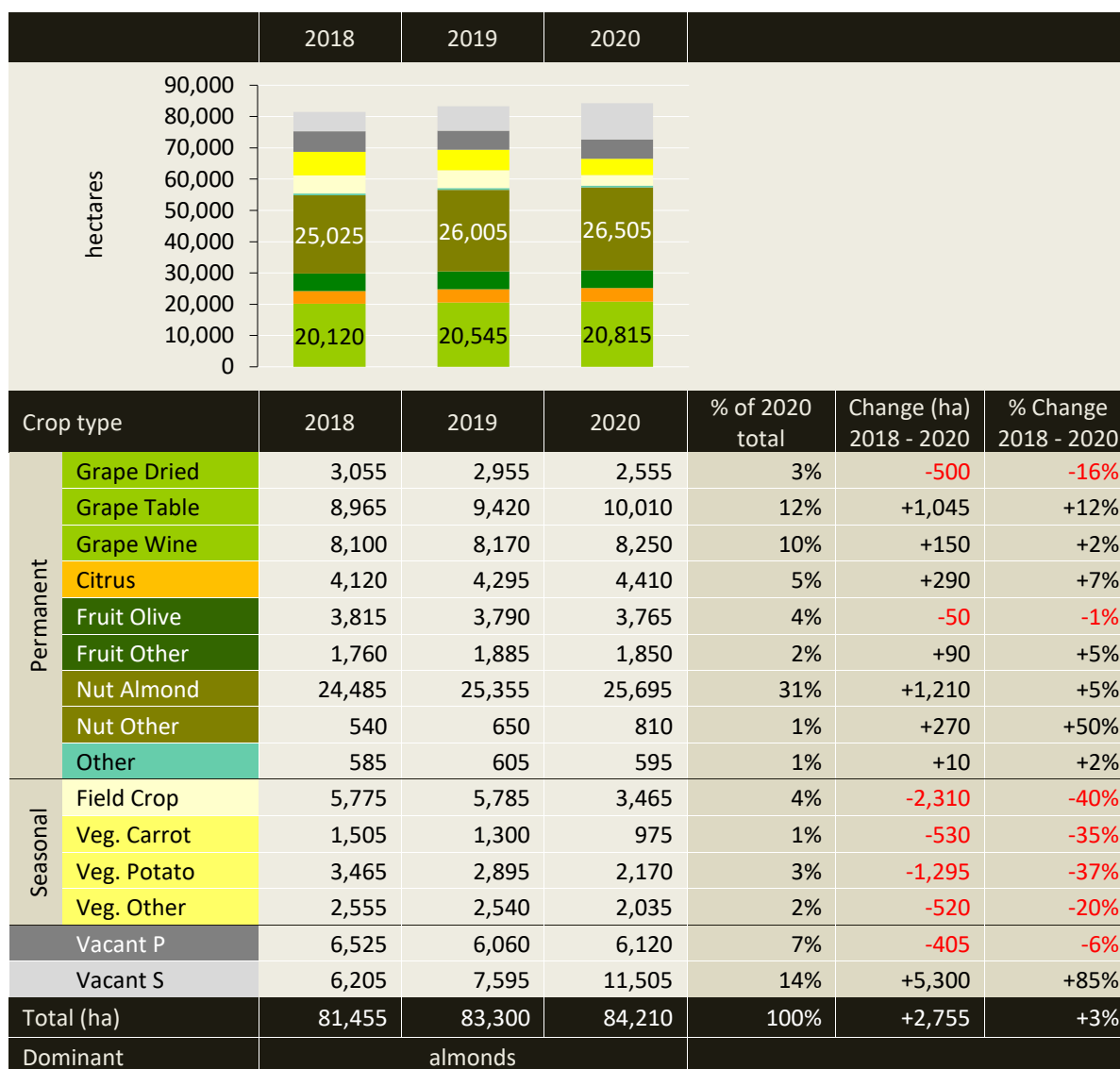


Figure 2: Mallee catchment - change in crop types from 2018 to 2020

1.2 Mallee catchment - planting trends

Figure summarises planting trends across the Mallee catchment from 2018 to 2020. Changes in the area of permanent plantings, seasonal crops and vacant (not irrigated) areas from 2018 to 2020 were as follows:

- Permanent plantings increased by 2,515 ha, a 5% increase from 55,425 ha to 57,940 ha. The increase in permanent plantings was mainly in the Wemen river reach (895 ha), Nyah reach (515 ha) and Boundary Bend reach (420 ha).
- Seasonal crops decreased by 4,655 ha, a 35% decrease from 13,300 ha to 8,645 ha.
- Vacant, previously irrigated permanent plantings, decreased by 405 ha, a 6% decrease from 6,525 ha to 6,120 ha. The decrease comprised 320 ha in the private diverter river reaches and 85 ha in the irrigation districts.
- Vacant, previously irrigated seasonal cropping, increased by 5,300 ha, an 85% increase from 6,205 ha to 11,505 ha.

In 2020, the proportion of permanent plantings, seasonal cropping and vacant areas in the private diverter river reaches and the irrigation districts was as follows:

- 80% of permanent plantings were in private diverter areas, 20% in the irrigation districts.
- 70% of seasonal crops were in private diverter areas, 10% in the irrigation districts and 20% in the Murrayville GMA.
- 43% of vacant, previously permanent plantings, were in private diverter areas and 57% in the irrigation districts.
- 80% of vacant, previously seasonal crops, were in private diverter areas, 10% in the irrigation districts and 10% in the Murrayville GMA.

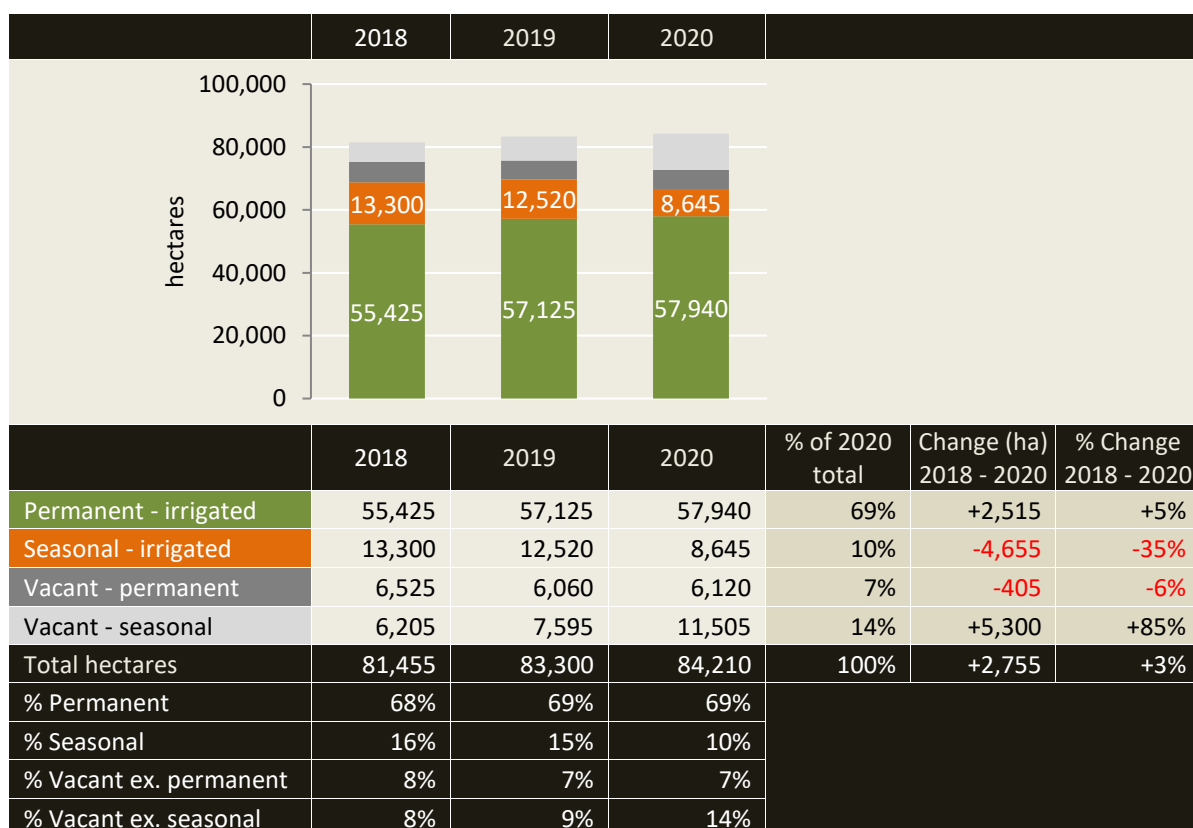


Figure 3: Mallee catchment - planting trends from 2018 to 2020

1.3 Mallee catchment - irrigation development

From mid-2018 to mid-2020, the net irrigable area in the Mallee catchment increased by 2,755 ha, a 3% increase from 81,455 ha to 84,210 ha. This equates to an average rate of expansion of 1,378 ha/year.

Table 6 summarises annual rates of expansion across the Mallee catchment from 1997 to 2020. The 2018-19 rate of expansion, 1,845 ha/year, was the highest rate since 2009, however the 2019-20 rate of 910 ha/year indicates a slowing of expansion. Permanent plantings are generally the biggest contributor to expansion, and the rate of expansion dropped from 1,700 ha/year in 2018-19 to 815 ha/year in 2019-20.

Table 6: Mallee catchment - average rate of expansion from 1997 to 2020

Average rate of expansion	1997 to 2003	2003 to 2006	2006 to 2009	2009 to 2012	2012 to 2015	2015 to 2018	2018 to 2019	2019 to 2020
Irrigable area (ha/year)	+1,838	+2,700	+4,268	+1,008	+323	+1,735	+1,845	+910
Permanent plantings (ha/year)	+1,352	+2,030	+3,098	-190	+80	+1,432	+1,700	+815

Table 7 summarises irrigation development with respect to new development (expansion) and areas retired from irrigation in each of the irrigation districts and private diverter river reaches from 2018 to 2020. The net increase in the irrigable area of 2,755 ha was the balance of 2,935 ha expansion and 180 ha retired from irrigation.

Across the pumped districts, the irrigable area decreased by 95 ha, a less than 1% decrease from 17,220 ha in 2018 to 17,125 ha in 2020. The net increase was the balance of 45 ha expansion and 140 ha retired from irrigation. In the private diverter areas, the irrigable area increased by 2,840 ha, a 5% increase from 61,350 ha in 2018 to 64,190 ha in 2020. The net increase of 2,840 ha was the balance of 2,880 ha expansion and 40 ha retired from irrigation.

Table 7: Mallee catchment - irrigation development from 2018 to 2020

	Study area	2018 (ha)	2018 to 2020		2020 (ha)	Change 2018-2020	Growth % 2018-2020
			Retired	New			
Pumped irrigation districts	Nyah	1,540	-10	+15	1,545	+5	+<1%
	Robinvale	2,420	0	0	2,420	0	0%
	Red Cliffs	4,435	-20	0	4,415	-20	-<1%
	Mildura	5,825	-70	+30	5,785	-40	-1%
	Merbein	3,000	-40	0	2,960	-40	-1%
	Sub-total	17,220	-140	+45	17,125	-95	-1%
Private diverters	Nyah	10,610	-10	+505	11,105	+495	+5%
	Boundary Bend	21,180	-5	+770	21,945	+765	+4%
	Wemen	12,700	-5	+885	13,580	+880	+7%
	Colignan	11,825	-10	+325	12,140	+315	+3%
	Mildura	1,960	-10	+65	2,015	+55	+3%
	Lock10 to SA	3,075	0	+330	3,405	+330	+11%
	Sub-total	61,350	-40	+2,880	64,190	+2,840	+5%
Murrayville GMA	2,885	0	+10	2,895	+10	+<1%	
Mallee catchment total	81,455	-180	+2,935	84,210	+2,755	+3%	

1.4 Mallee catchment - irrigation methods

Figure summarises the change in irrigation methods across the Mallee catchment from 2018 to 2020.

Drippers remained the dominant irrigation method from 2018 to 2020 in each of the twelve study areas, except for the Robinvale district where low level sprinklers were dominant and the Murrayville GMA where overhead pivots were dominant.

From 2018 to 2020:

- Drip irrigation increased by 3,125 ha; a 7% increase from 46,715 ha to 49,840 ha;
- Lowlevel irrigation decreased by 605 ha; a 7% decrease from 8,670 ha to 8,065 ha;
- Overhead irrigation decreased by 3,390 ha; a 31% decrease from 11,060 ha to 7,670 ha; and
- Furrow/flood irrigation decreased by 1,270 ha, a 56% decrease from 2,280 ha to 1,010 ha.

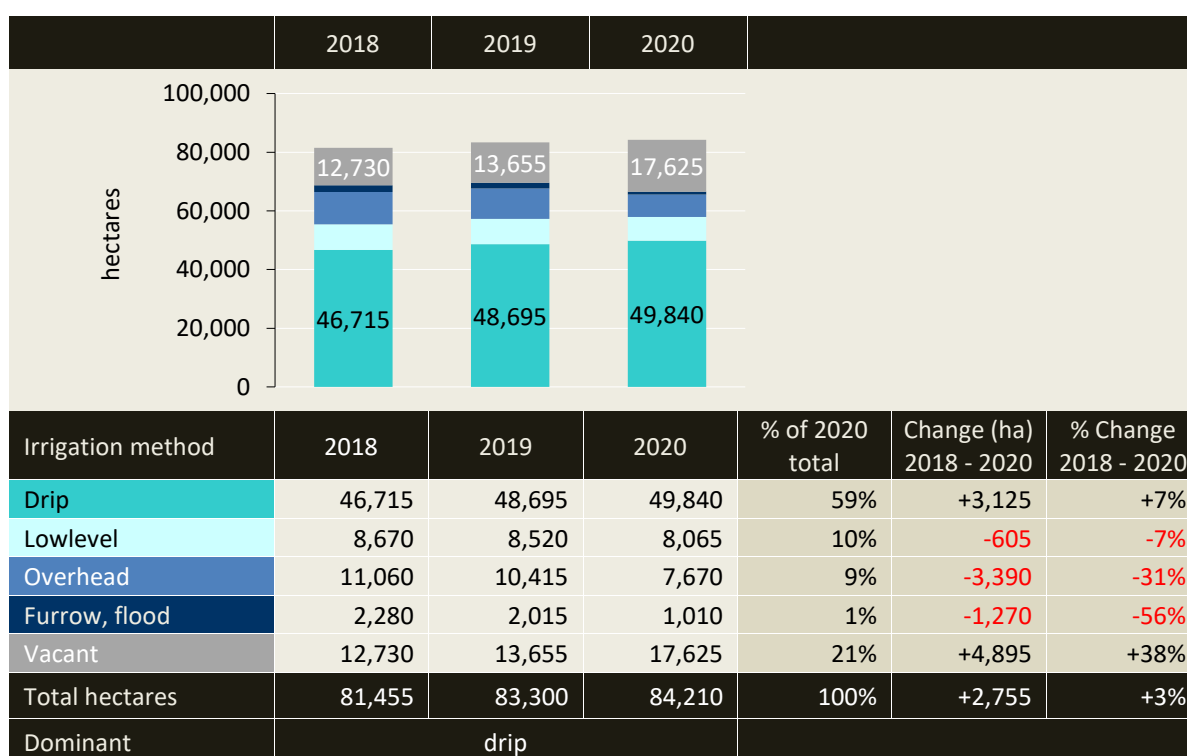


Figure 4: Mallee catchment - irrigation methods from 2018 to 2020

1.5 Murray Mallee - salinity impact zones

Figure summarises the irrigable area in each salinity impact zone across the Murray Mallee from 2018 to 2020. (Note that areas do not include the Murrayville GMA where the salinity zones do not apply.)

From 2018 to 2020, the area irrigated in:

- Low impact zones decreased by 1,290 ha, a 2% decrease from 59,000 ha to 57,710 ha.
- The high impact zone, HIZ, decreased by 325 ha, a 4% decrease from 7,350 ha to 7,025 ha.

From 2018 to 2020, the irrigable area in:

- L1 increased by 2,475 ha, a 6% increase from 40,475 ha to 42,950 ha. Irrigation expansion was primarily in the lowest salinity impact zone, L1.
- L2 increased by 220 ha, a 1% increase from 15,400 ha to 15,620 ha.
- L3 increased by 40 ha, a 2% increase from 2,475 ha to 2,515 ha.
- L4 increased by 120 ha, a 1% increase from 9,725 ha to 9,845 ha.
- HIZ decreased by 110 ha, a 1% decrease from 10,495 ha to 10,385 ha. The net decrease of 110 ha was the balance of 115 ha retired from irrigation and 5 ha of new HIZ areas (expansion on existing irrigation properties). Areas retired from HIZ were mainly in the pumped irrigation districts.

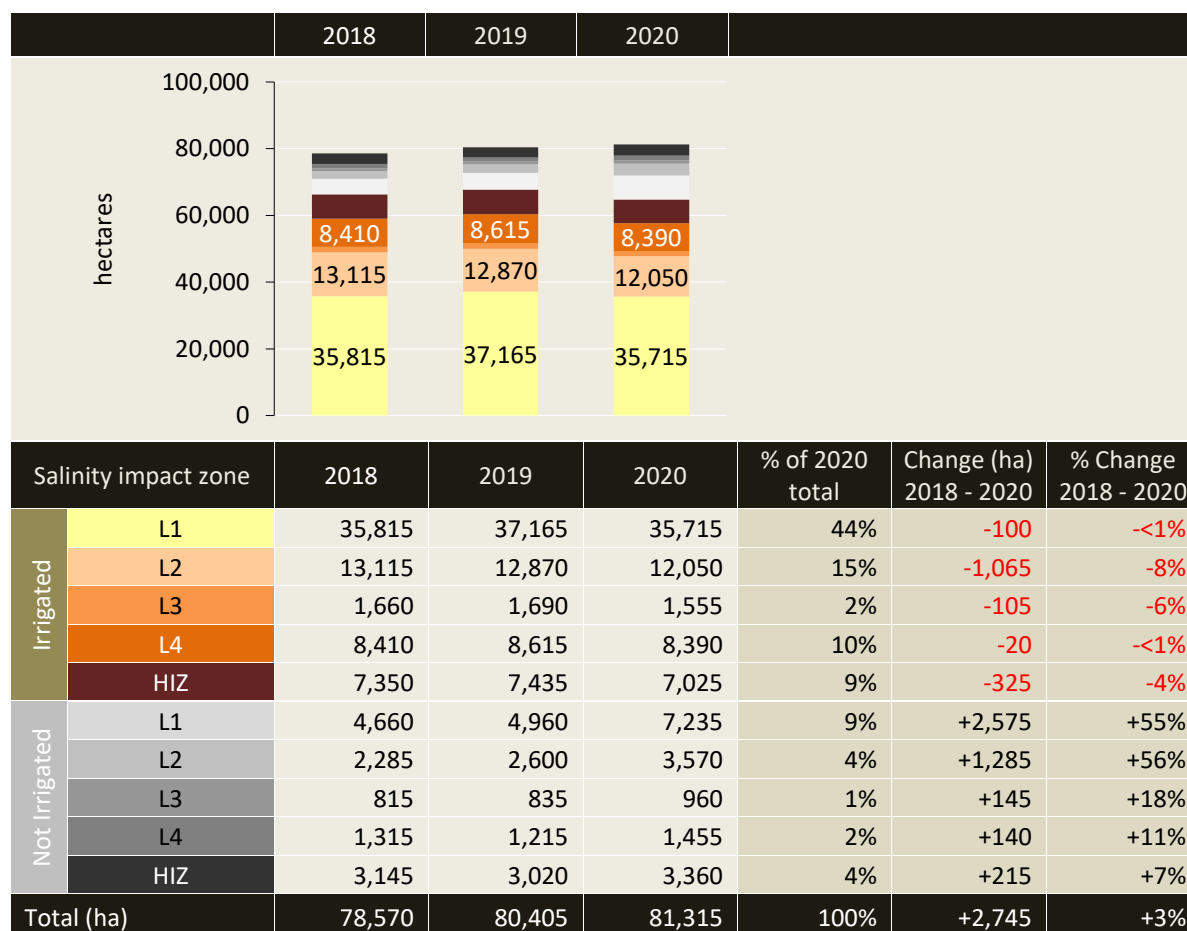


Figure 5: Murray Mallee - change in salinity zones from 2018 to 2020

1.6 Mallee catchment - property change

Figure provides estimates of property numbers and average property size (irrigable area) in the Mallee catchment from 2018-2020.

In 2020:

- there were approximately 1,833 irrigation properties;
- most properties (77%) had an irrigable area less than 20 ha; and
- 77% of properties were in the pumped districts, 22% were private diverters and 1% Murrayville irrigators. Average property size was 12 ha, 156 ha and 170 ha respectively.

From 2018-2020:

- the number of properties decreased by 72; a 4% decrease from 1,905 to 1,833 properties;
- properties with an irrigable area less than 20 ha decreased by 57, while the number over 20 ha decreased by 15; and
- average property size (irrigable area) increased from 43 ha to 46 ha.

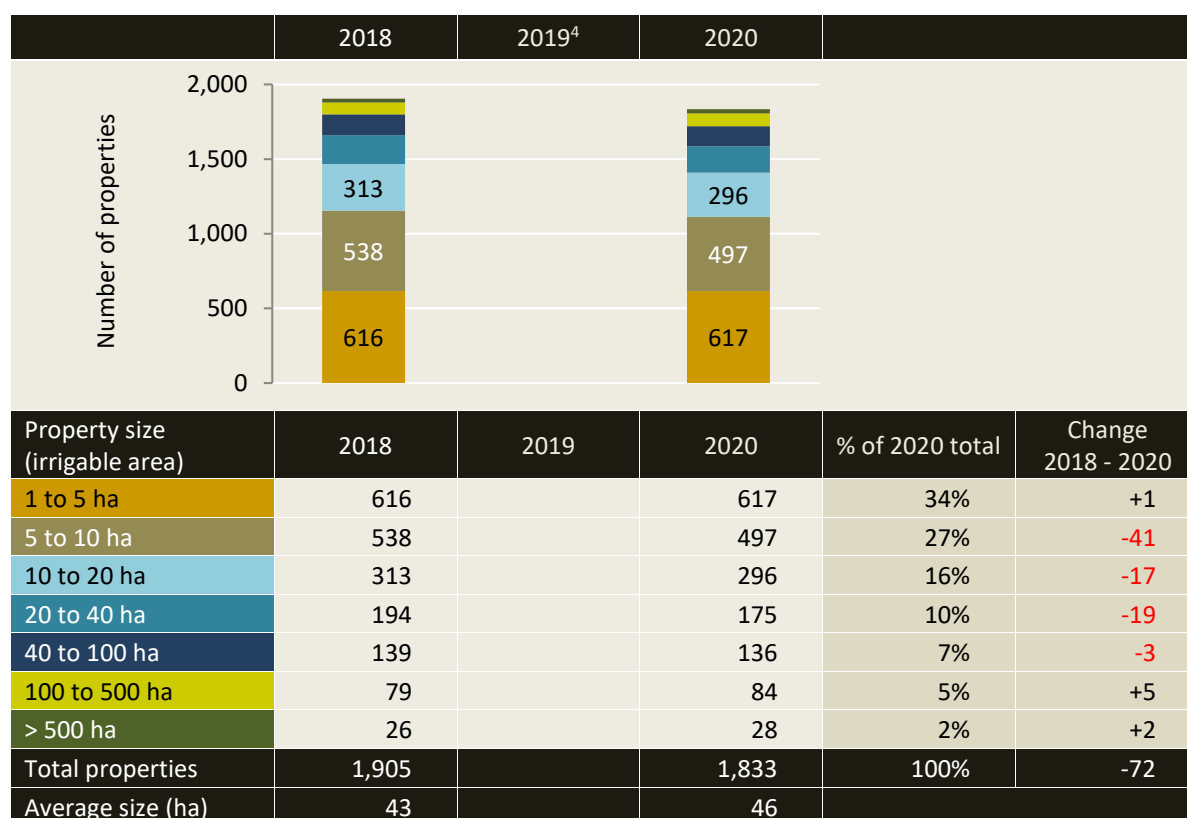


Figure 6: Mallee catchment - property numbers and sizes from 2018 to 2020

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

⁴ Property data was not maintained in 2019

1.7 Mallee catchment - water-use in 2020

Figure shows irrigation water-use in each of the Mallee catchment's irrigation districts, river reaches and Murrayville GMA in 2020 (i.e. the 2019-2020 water year).

97% (64,580 ha) of irrigated horticulture in the Mallee catchment was aligned to 521,062 ML of water-use for 2019-20. Alignment of the remaining 3% of irrigated horticulture was not resolved, and resolution may affect the water-use figures presented.

Also, low-resolution imagery was used across some areas and new plantings or dried-off areas may have been missed in the 2020 crop mapping. Figures should be treated with caution.

Water-use across the Mallee catchment in 2020 was:

- 17% in the pumped irrigation districts;
- 81% in the private diverter river reaches; and
- 2% in the Murrayville GMA.

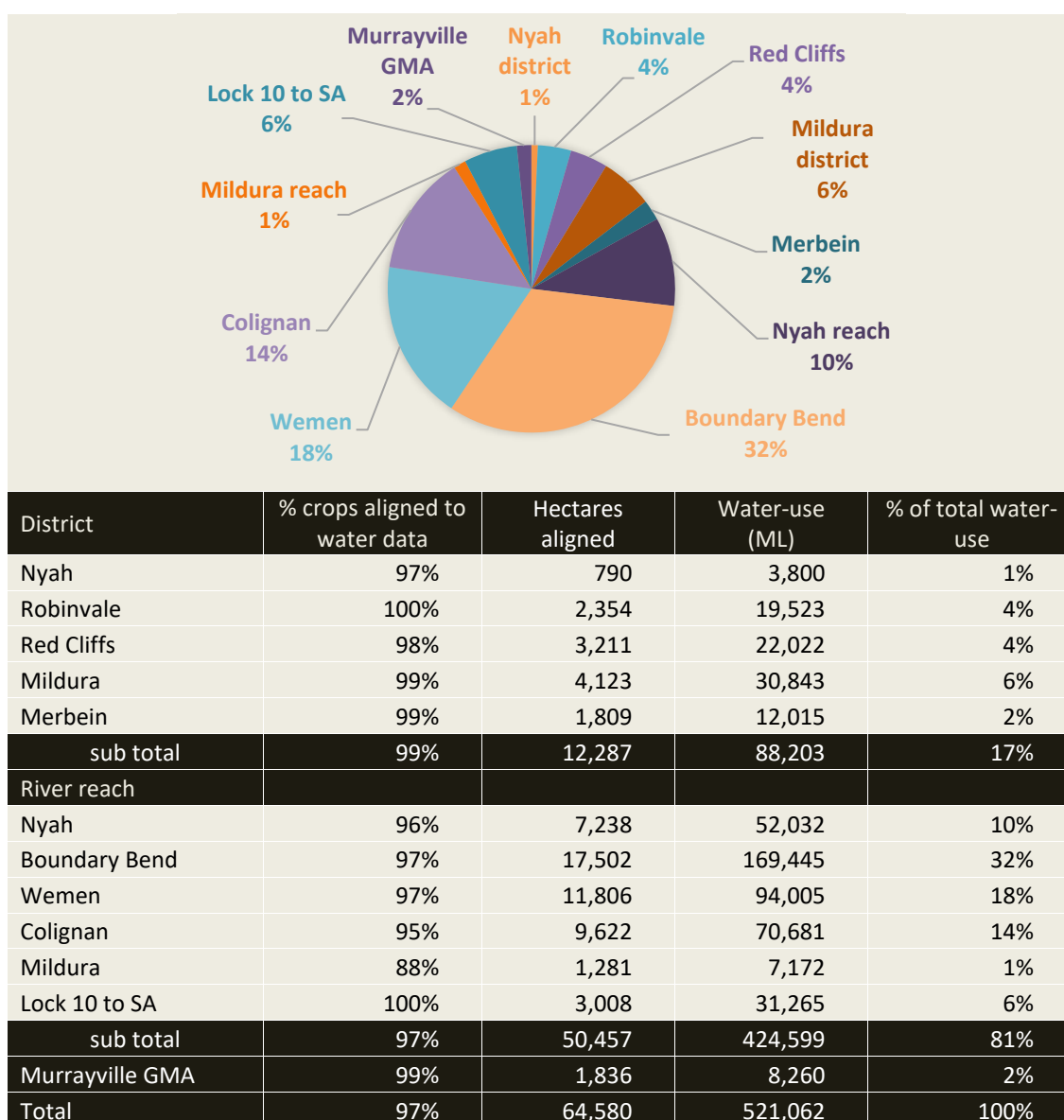


Figure 7: Mallee catchment - irrigation water-use in each river reach and district in 2020

1.8 Murray Mallee - potential development

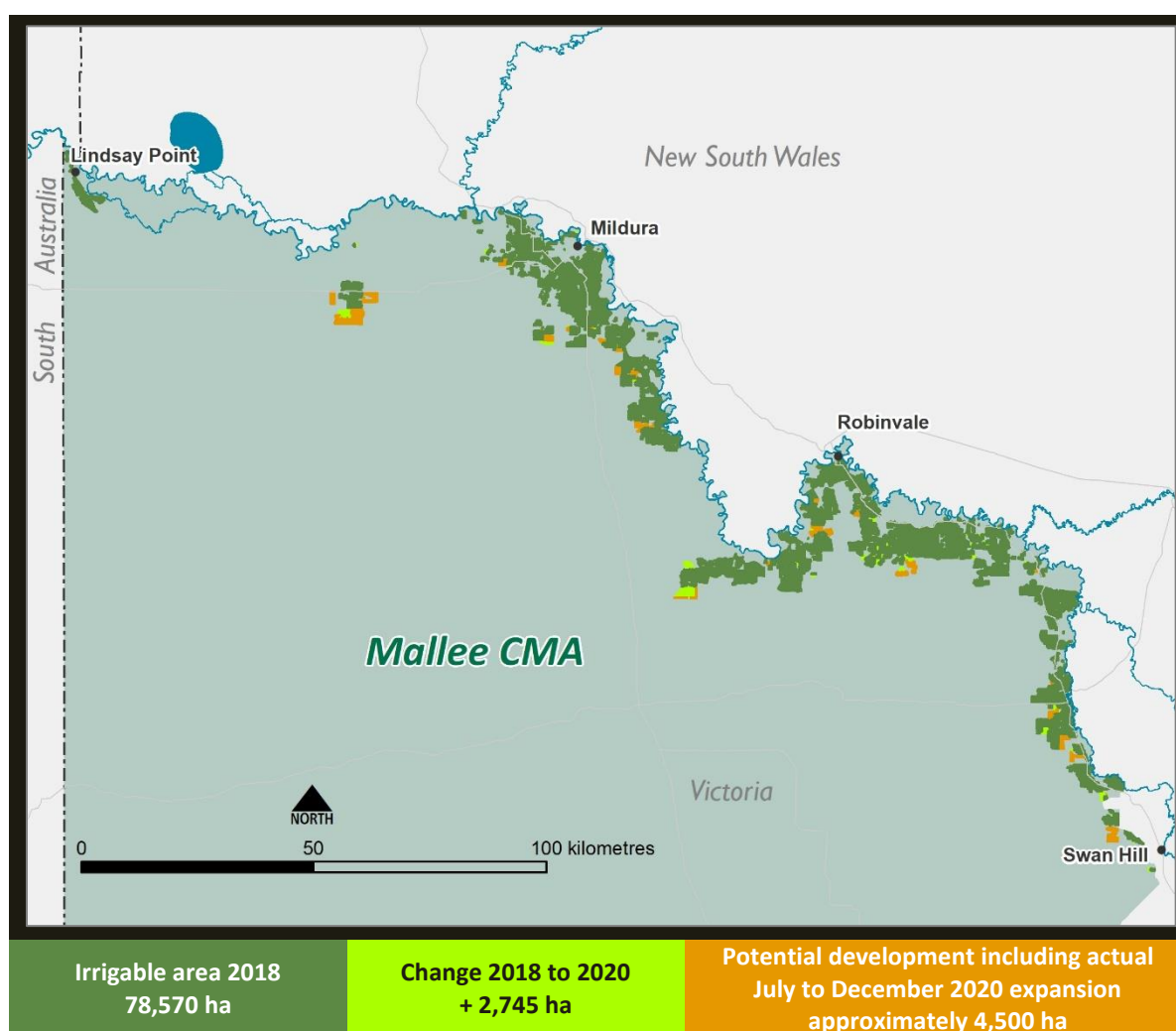
Map 3 shows irrigation expansion from mid-2018 to mid-2020 along the Murray River in the Victorian Mallee catchment and potential future development areas. Areas do not include the Murrayville GMA.

The rate of development slowed in 2019-20:

- From 2015 to 2018, the irrigable area increased by an average of 1,530 ha/year;
- From 2018 to 2019, the irrigable area increased by 1,835 ha; and
- From 2019 to 2020, the irrigable area increased by 910 ha.

Mapping of expansion areas from July to December 2020 comprises 545 ha, predominantly almonds and table grapes in the Wemen and Colignan river reaches. Potential further expansion, based on observation of soil survey pits in aerial and satellite imagery, is around 3,955 ha, predominantly in the Lock 10 to SA, Colignan and Nyah river reaches.

The potential expansion areas were mapped using typical planting layouts with headlands, native vegetation retained and farming infrastructure removed.



Map 3: Potential irrigation development areas based on observation of soil survey pits

2. Pumped irrigation districts

2.1 Pumped irrigation districts summary

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

Change in crop types from 2018 to 2020

Table grape plantings remained the dominant crop type across the irrigation districts from 2018 to 2020.

The main changes in crop types from 2018 to 2020 were:

1. Table grape plantings increased by 585 ha, a 10% increase from 5,580 ha to 6,165 ha. The net increase of 585 ha was the balance of approximately 345 ha removed (likely being redeveloped) and 930 ha of new or redeveloped plantings.
2. Dried grape plantings decreased by 440 ha, a 25% decrease from 1,785 ha to 1,345 ha. The net decrease of 440 ha was the balance of 530 ha removed and 90 ha of new or redeveloped plantings.
3. Field crops (e.g. pasture, lucerne and irrigated cereal crops) decreased by 230 ha, a 40% decrease from 575 ha to 345 ha.
4. Vegetable crops decreased by 195 ha, a 27% decrease from 725 to 530 ha.
5. Wine grape plantings decreased by 140 ha, a 5% decrease from 2,940 ha to 2,800 ha. The net decrease of 140 ha was the balance of approximately 255 ha removed and 115 ha of new or redeveloped plantings.

Planting trends - permanent plantings, seasonal crops and vacant areas

Changes in the area of permanent plantings, seasonal crops and vacant (not irrigated) areas from 2018 to 2020 were as follows:

- Permanent plantings increased by 30 ha; a less than 1% increase from 11,560 ha to 11,590 ha. The increase in permanent plantings was in the Robinvale district (15 ha), Red Cliffs district (50 ha) and Mildura district (20 ha). Permanent plantings decreased by 45 ha in the Merbein district and 10 ha in the Nyah district.
- Seasonal crops decreased by 425 ha; a 33% decrease from 1,300 ha to 875 ha. Decreases in seasonal cropping mainly occurred in the Nyah, Red Cliffs and Mildura districts.
- Vacant areas, previously permanent plantings, decreased by 85 ha; a 2% decrease from 3,565 ha to 3,480 ha. The decrease mainly occurred in the Red Cliffs district.
- Vacant areas, previously seasonal crops, increased by 385 ha; a 48% increase from 795 ha to 1,180 ha. The increase mainly occurred in the Mildura and Red Cliffs districts.

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

Irrigation development - new and retired areas

The irrigable area across the pumped irrigation districts decreased by 95 ha, a 1% decrease from 17,220 ha in 2018 to 17,125 ha in 2020. The net decrease of 95 ha was the balance of 45 ha of expansion and 140 ha retired from irrigation, predominantly for urban development.

Expansion occurred in the Nyah district (15 ha), Mildura district (30 ha), while areas retired were in the Nyah district (10 ha), Mildura district (70 ha), Red Cliffs district (20 ha) and Merbein district (40 ha).

Irrigation methods 2018 to 2020

Drippers remained the dominant irrigation method from 2018 to 2020 in each of the five irrigation districts, except for the Robinvale district where lowlevel sprinklers were dominant from 2018 to 2020.

From 2018 to 2020:

- Drip irrigation increased by 500 ha; an 7% increase from 6,705 ha to 7,205 ha.
- Lowlevel irrigation decreased by 205 ha; a 5% decrease from 4,160 ha to 3,955 ha.
- Overhead irrigation decreased by 475 ha; a 33% decrease from 1,455 ha to 980 ha.
- Furrow irrigation decreased by 215 ha; a 40% decrease from 540 ha to 325 ha.

Salinity impact zones 2018 to 2020

The irrigable area across the irrigation districts was predominantly in the high river salinity impact zone, HIZ, from 2018 to 2020.

From 2018 to 2020, the irrigable area in:

- L1 increased by 5 ha, a less than 1% increase from 5,950 ha to 5,955 ha.
- L2 to L4 increased by 5 ha, remained at 3,660 ha.
- HIZ decreased by 100 ha (areas retired from irrigation), a 1% decrease from 7,610 ha to 7,510 ha.

Irrigation properties

In 2020 there were approximately 1,452 irrigation properties with an average irrigable area of 12 ha. From 2018 to 2020:

- the number of properties decreased by 56; a 3% decrease from 1,508 to 1,452 properties;
- properties with an irrigable area less than 20 ha decreased by 55, while the number over 20 ha decreased by 1; and
- average property size (irrigable area) increased from 11 ha to 12 ha.

Water-use in 2020

Analysis of water use data estimates that 88,203 ML of water was applied to crops in the pumped districts in the 2019-20 season.

2.1.1 Pumped districts summary - crop types from 2018 to 2020

Figure summarises change in crop types across the pumped districts from 2018 to 2020. Plantings of table grapes were the dominant crop from 2018 to 2020.

The main changes from 2018 to 2020 were:

1. Table grape plantings increased by 585 ha, a 10% increase from 5,580 ha to 6,165 ha.
2. Dried grape plantings decreased by 440 ha, a 25% decrease from 1,785 ha to 1,345 ha.
3. Field crops (e.g. pasture & lucerne) decreased by 230 ha, a 40% decrease from 575 to 345 ha.
4. Vegetable crops decreased by 195 ha, a 27% decrease from 725 to 530 ha.
5. Wine grape plantings decreased by 140 ha, a 5% decrease from 2,940 ha to 2,800 ha.
6. Citrus plantings increased by 75 ha, a 25% increase from 300 ha to 375 ha.

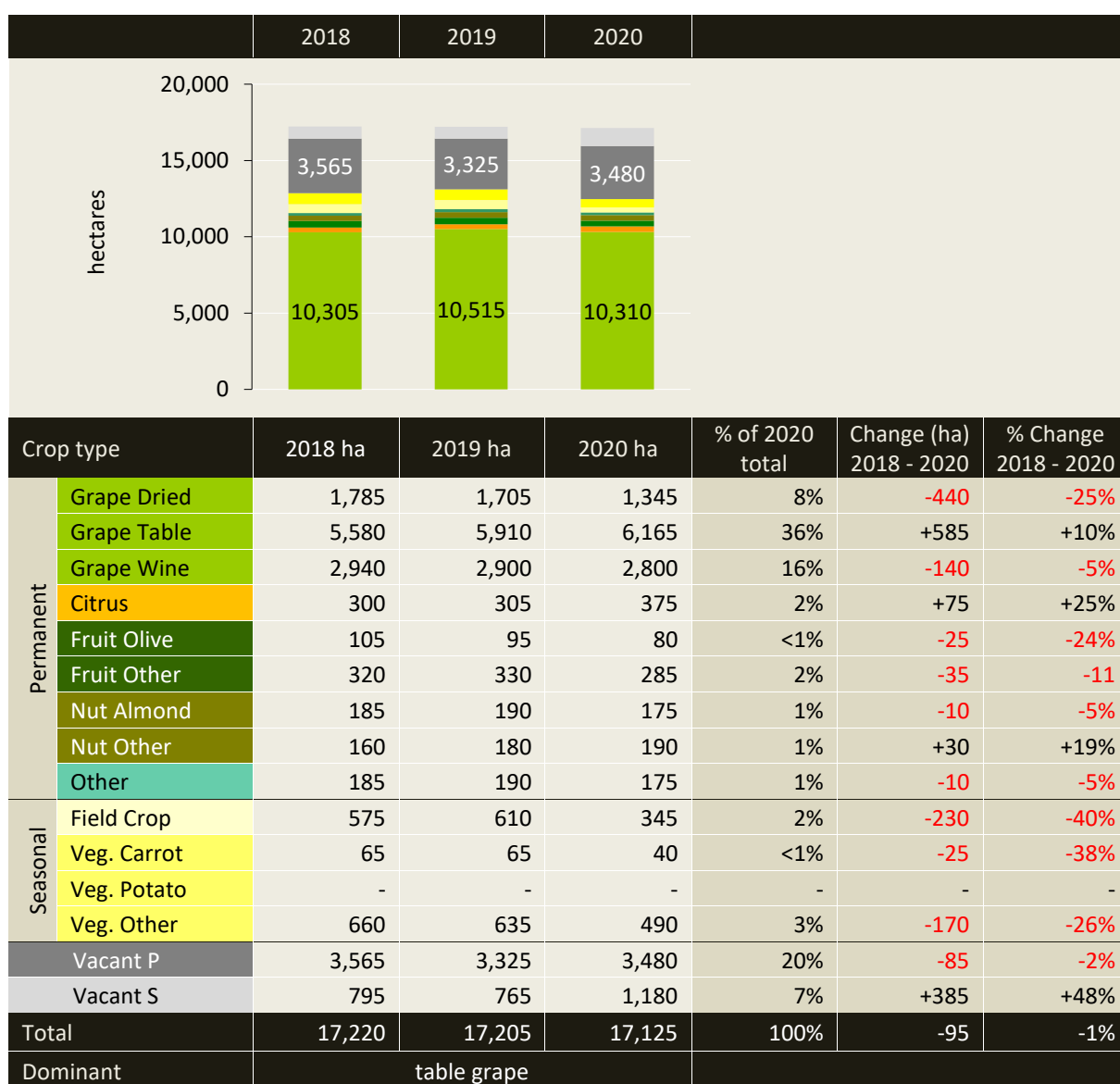


Figure 8: Pumped irrigation districts - change in crop types from 2018 to 2020

2.1.2 Pumped irrigation districts - planting trends

Figure summarises planting trends across the irrigation districts from 2018 to 2020.

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

- 67% permanent, 8% seasonal and 25% vacant in 2018; to
- 68% permanent, 5% seasonal and 27% vacant in 2020.

From 2018 to 2020:

- Permanent plantings increased by 30 ha; a less than 1% increase from 11,560 ha to 11,590 ha.
- Seasonal crops decreased by 425 ha; a 33% decrease from 1,300 ha to 875 ha.
- Vacant areas, previously permanent plantings, decreased by 85 ha; a 2% decrease from 3,565 ha to 3,480 ha.
- Vacant areas, previously seasonal crops, increased by 385 ha; a 48% increase from 795 ha to 1,180 ha.

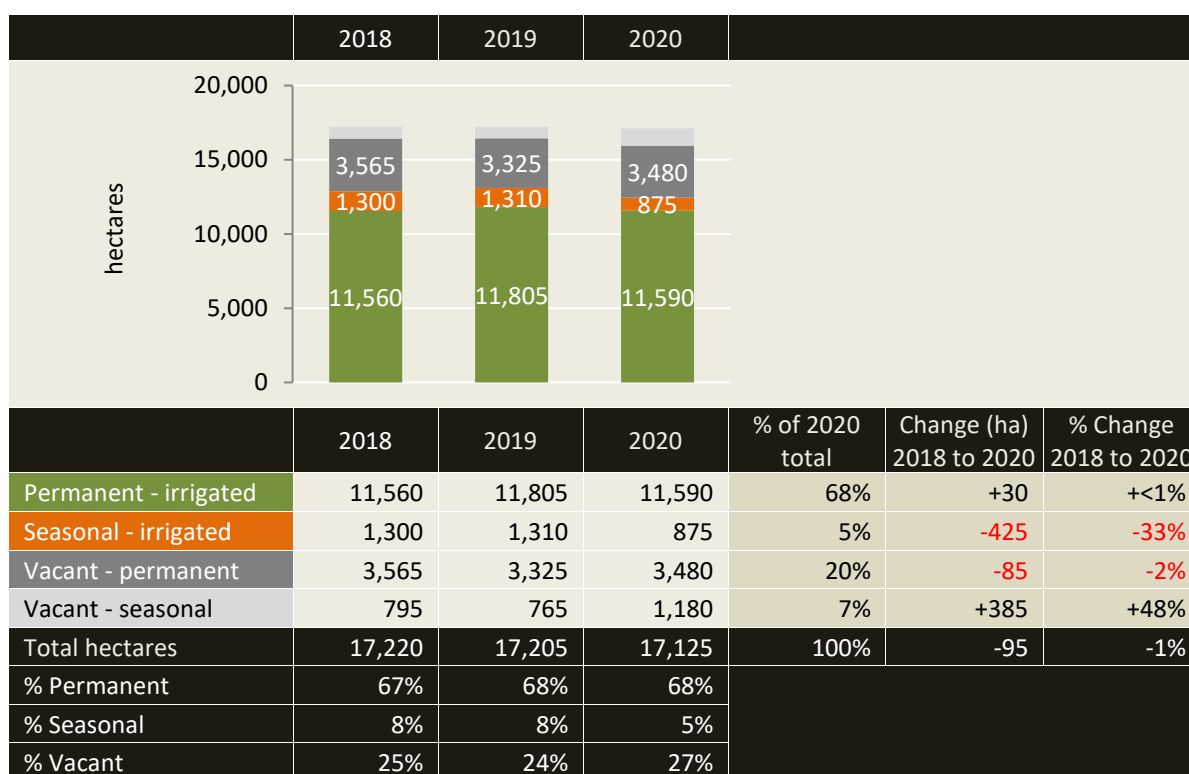


Figure 9: Pumped irrigation districts - planting trends from 2018 to 2020

2.1.3 Pumped districts summary - irrigation development

Figure summarises irrigation development with respect to new development (expansion) and areas retired⁵ from irrigation across the pumped irrigation districts from 2018 to 2020.

The irrigable area across the irrigation districts decreased by 95 ha, a less than 1% decrease from 17,220 ha in 2018 to 17,125 ha in 2020.

The net decrease of 95 ha was the balance of 45 ha of expansion and 140 ha retired from irrigation, predominantly urban development.

Expansion occurred in the Nyah district (15 ha) and Mildura district (30 ha), along with areas retired in the Mildura district (70 ha), Merbein district (40 ha), Red Cliffs district (20 ha) and Nyah district (10 ha).

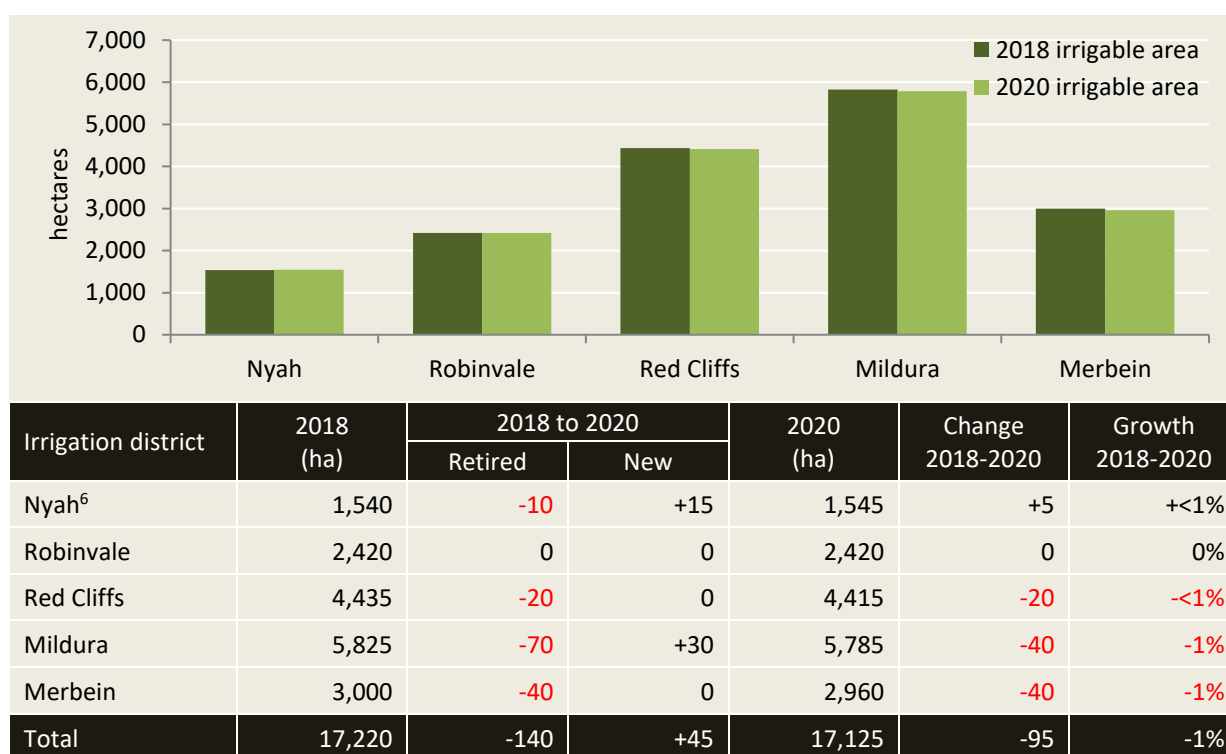


Figure 10: Pumped irrigation districts - irrigation development from 2018 to 2020

⁵ Retired areas have undergone a change in land use that precludes use for irrigation e.g. urban development, housing, sheds, dams and land set aside for conservation purposes.

⁶ Hectares for the Nyah irrigation district include areas outside the district but supplied with water from the district, whereas figures for the other districts are areas inside the district boundary.

2.1.4 Pumped districts summary - irrigation methods

Figure summarises the change in irrigation methods across the pumped irrigation districts from 2018 to 2020.

Drip irrigation remained the dominant irrigation method from 2018 to 2020 across the irrigation districts. Drip irrigation also remained dominant in each of the five irrigation districts, except for Robinvale where lowlevel sprinklers were dominant.

From 2018 to 2020:

- Drip irrigation increased by 500 ha; a 7% increase from 6,705 ha to 7,205 ha.
- Lowlevel irrigation decreased by 205 ha; a 5% decrease from 4,160 ha to 3,955 ha.
- Overhead irrigation decreased by 475 ha; a 33% decrease from 1,455 ha to 980 ha.
- Furrow irrigation decreased by 215 ha; a 40% decrease from 540 ha to 325 ha.

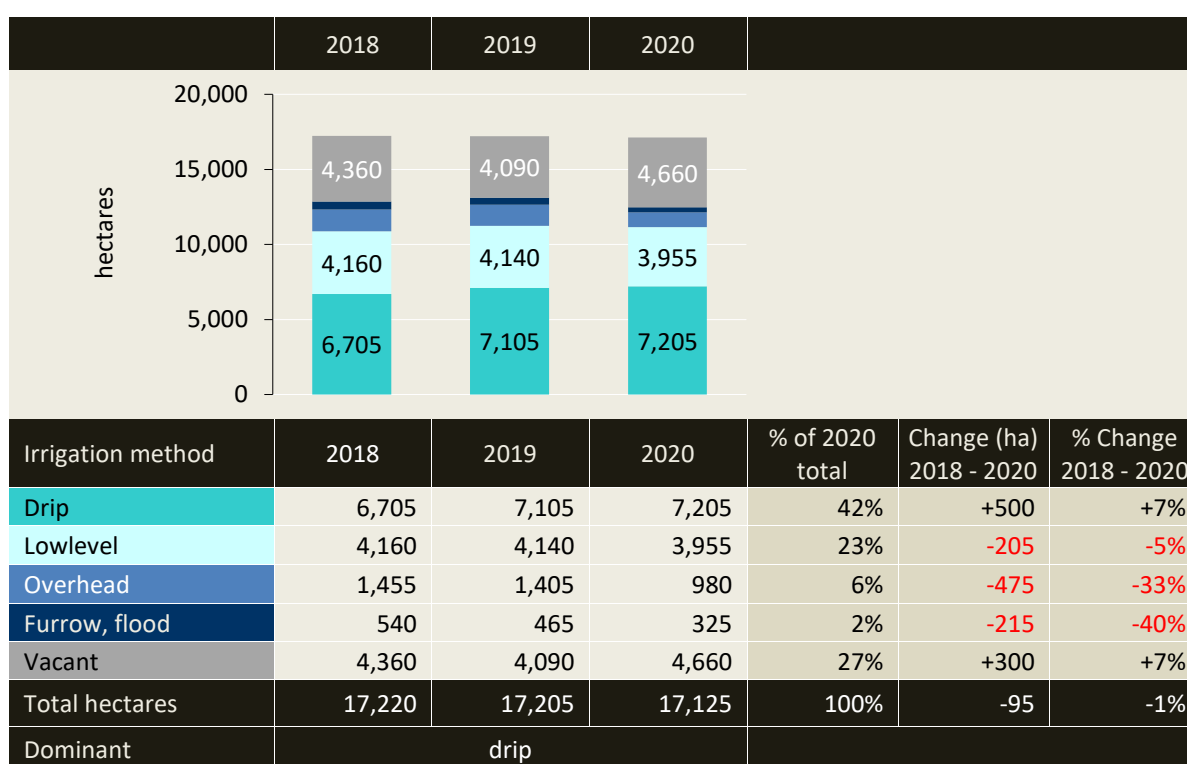


Figure 11: Pumped irrigation districts - irrigation methods from 2018 to 2020

2.1.5 Pumped districts summary - salinity impact zones

Figure 1 summarises the irrigable area in each salinity impact zone across the five pumped irrigation districts from 2018 to 2020.

From 2018 to 2020, the area irrigated in:

- L1 decreased by 165 ha, a 4% decrease from 4,115 ha to 3,950 ha.
- L2 to L4 decreased by 25 ha, a 1% decrease from 3,265 ha to 3,240 ha.
- HIZ decreased by 205 ha, a 4% decrease from 5,480 ha to 5,275 ha.

From 2018 to 2020, the irrigable area in:

- L1 increased by 5 ha, a less than 1% increase from 5,950 ha to 5,955 ha.
- L2 to L4 increased remained at 3,660 ha.
- HIZ decreased by 100 ha, a 1% decrease from 7,610 ha to 7,510 ha. The decrease was areas retired from irrigation. The net decrease of 100 ha was the balance of 105 ha retired from irrigation and 5 ha of new HIZ areas (expansion on existing irrigation properties).

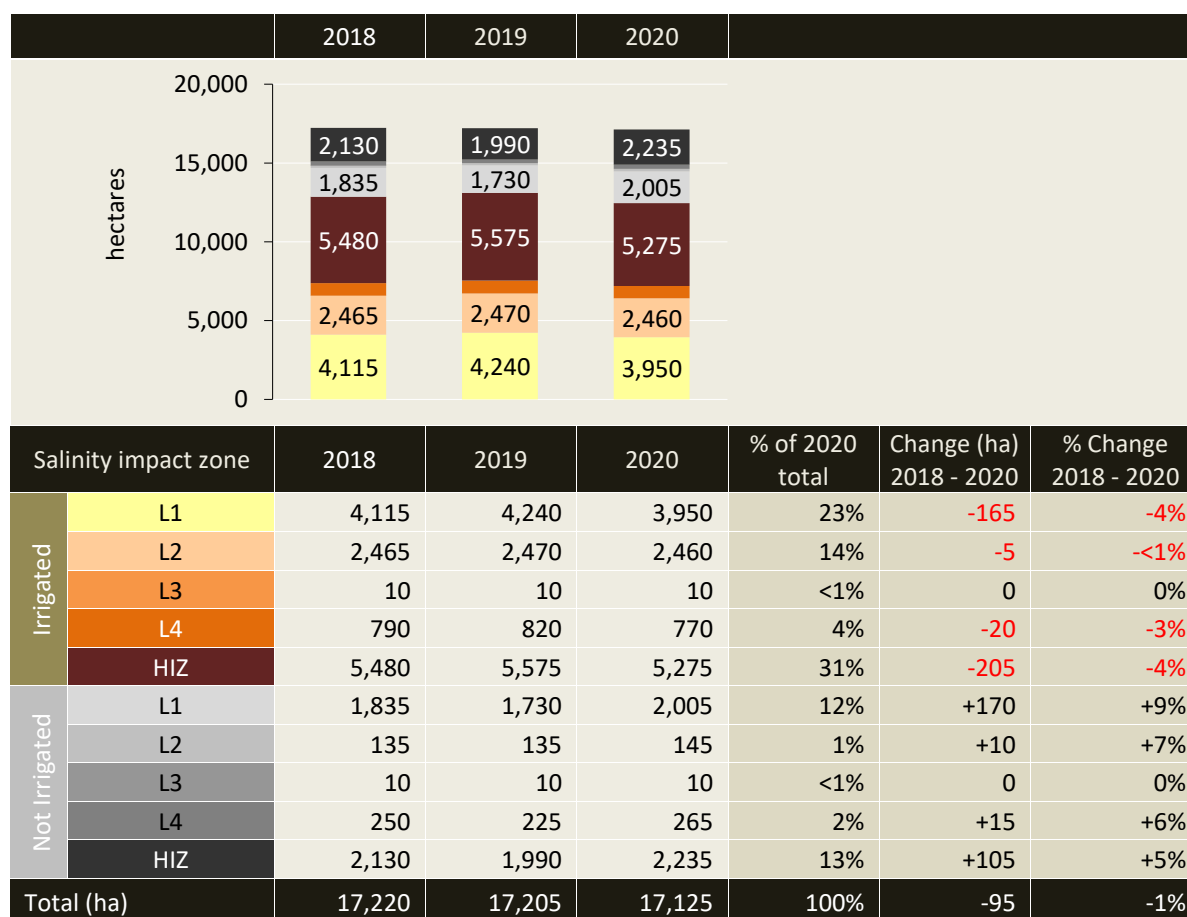


Figure 12: Pumped irrigation districts - irrigable area in each salinity impact zone from 2018 to 2020

2.1.6 Pumped districts summary - property change

Figure 1 provides an estimate of property numbers and average property size (irrigable area) across the five pumped irrigation districts from 2018 to 2020.

In 2020:

- There were approximately 1,452 irrigation properties; and
- most properties (86%) had an irrigable area less than 20 ha.

From 2018 to 2020:

- the number of properties decreased by 56; a 3% decrease from 1,508 to 1,452 properties;
- properties with an irrigable area less than 20 ha decreased by 55, while the number over 20 ha decreased by 1; and
- average property size (irrigable area) increased from 11 ha to 12 ha.

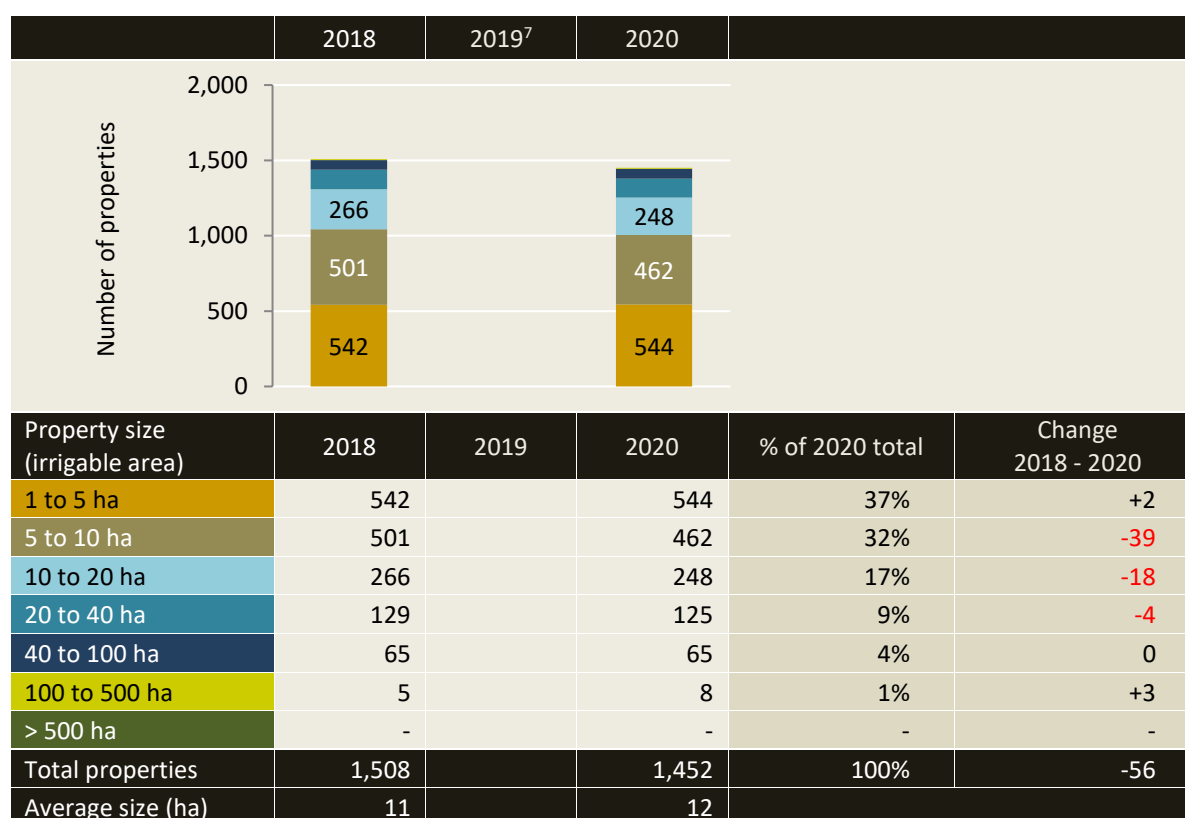


Figure 1: Pumped irrigation districts - property numbers and sizes from 2018 to 2020

⁷ Property data was not maintained in 2019

2.1.7 Pumped districts summary – water-use in 2020

Figure 1 shows irrigation water-use in the pumped irrigation districts in 2020 (i.e. the 2019-20 water year).

99% (12,287 ha) of irrigated horticulture in the pumped districts was aligned to 88,203 ML of water-use for 2019-2020. Alignment for the remaining 1% of irrigated horticulture was not resolved, and resolution may affect the water-use figures presented.

Also, low-resolution imagery was used across some areas and new plantings or dried-off areas may have been missed in the 2020 crop mapping. Figures should be treated with caution.

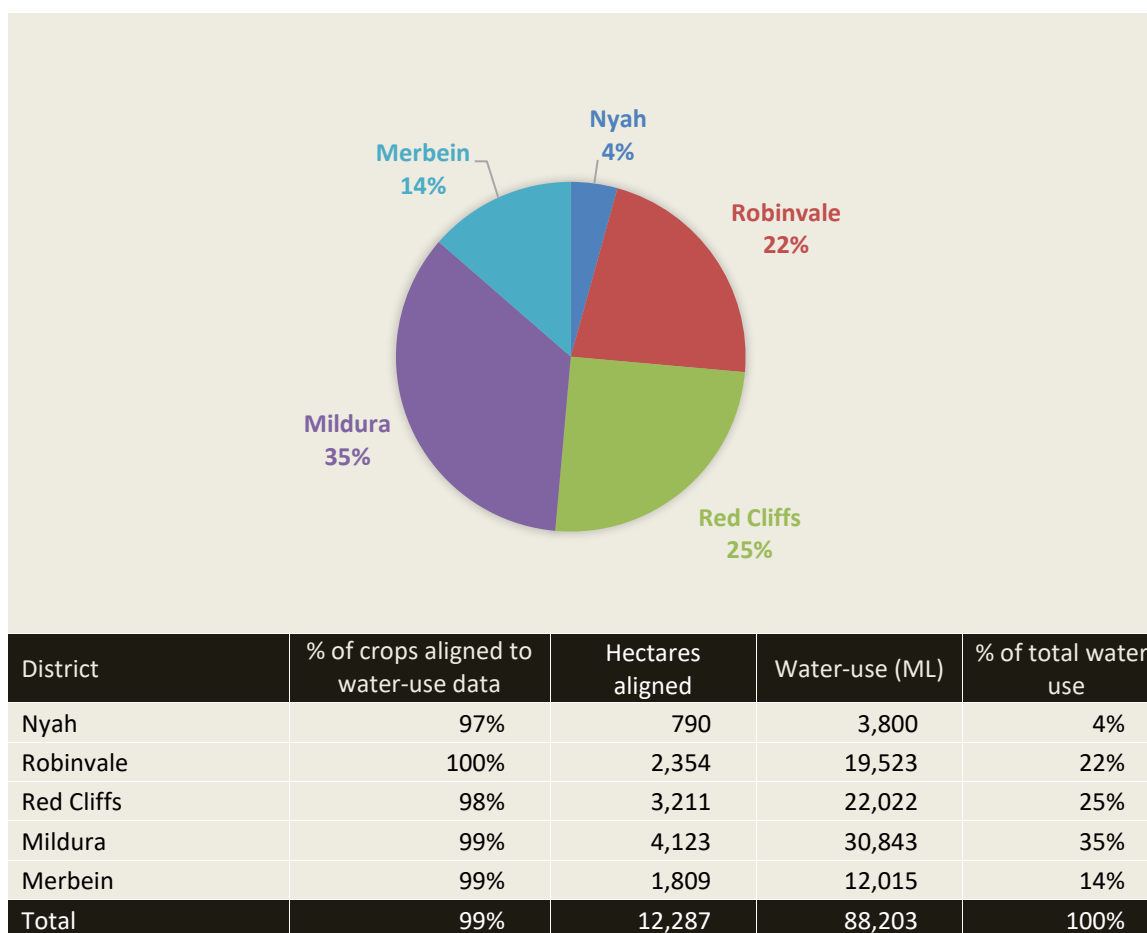


Figure 14: Pumped irrigation districts - irrigation water-use in 2020

2.2 Nyah irrigation district

In summary for the Nyah irrigation district

Change in crop types from 2018 to 2020

Wine grape plantings were the dominant crop in the Nyah irrigation district from 2018 to 2020. The main changes in crop types from 2018 to 2020 were:

1. Wine grape plantings increased by 35 ha; a 7% increase from 480 ha to 515 ha.
2. Dried grape plantings decreased by 40 ha; a 44% decrease from 90 ha to 50 ha.
3. Seasonal cropping decreased by 85 ha, 50 ha of vegetables and 35 ha of field crops such as pasture and lucerne.

Planting trends - permanent plantings, seasonal crops and vacant areas

From 2018 to 2020:

- Permanent plantings decreased by 10 ha; a 1% decrease from 675 ha to 665 ha.
- Seasonal crops decreased by 85 ha; a 36% decrease from 235 ha to 150 ha.
- Vacant areas, previously permanent plantings, increased by 25 ha; a 10% increase from 260 ha to 285 ha.
- Vacant, previously seasonal crops, increased by 75 ha; a 20% increase from 370 ha to 445 ha.

Irrigation development - new and retired areas

The irrigable area in the Nyah irrigation district increased by 5 ha, a less than 1% increase from 1,540 ha in 2018 to 1,545 ha in 2020. The increase was mainly new plantings of wine grapes.

Irrigation methods 2018 to 2020

Drip irrigation remained the dominant irrigation method in the Nyah irrigation district from 2018 to 2020. Change in irrigation methods was as follows:

- Drip irrigation increased by 15 ha, a 2% increase from 625 ha to 640 ha;
- Lowlevel irrigation decreased by 45 ha, a 28% decrease from 160 ha to 115 ha;
- Overhead irrigation decreased by 25 ha, a 56% decrease from 45 ha to 20 ha; and
- Furrow irrigation decreased by 40 ha, a 50% decrease from 80 ha to 40 ha.

Salinity impact zones 2018 to 2020

From 2018 to 2020, the irrigable area in L1 remained the same and L2 increased by 5 ha.

Irrigation properties

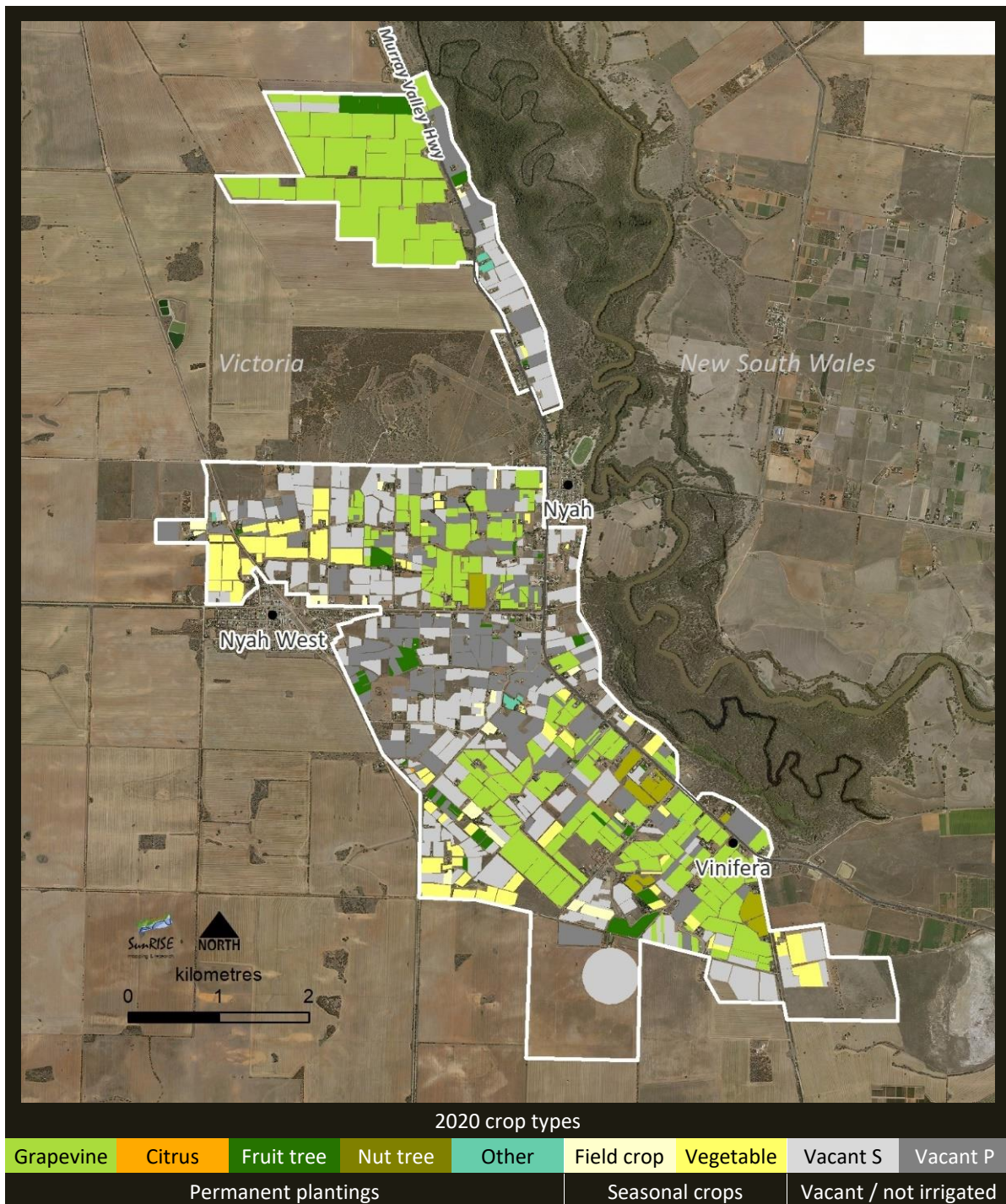
In 2020, there were approximately 143 irrigation properties with an average irrigable area of 11 ha. The number of properties decreased from 144 in 2018 to 143 in 2020.

Water-use in 2020

Analysis of water use data estimates that 3,800 ML of water was applied to 790 ha of crops in the Nyah pumped district in the 2019-20 season.

2.2.1 Nyah irrigation district - crop types in 2020

Map 4 shows the Nyah irrigation district with crop types in 2020.



Map 4: Nyah irrigation district showing crop types in 2020

2.2.2 Nyah irrigation district - crop types from 2018 to 2020

Figure 1 summarises the change in irrigated crops in the Nyah irrigation district from 2018 to 2020.

Wine grape plantings were the dominant crop type from 2018 to 2020.

The main changes in crop types from 2018 to 2020 were:

1. Wine grape plantings increased by 35 ha; a 7% increase from 480 ha to 515 ha.
2. Dried grape plantings decreased by 40 ha; a 44% decrease from 90 ha to 50 ha.
3. Seasonal cropping decreased by 85 ha, 50 ha of vegetables and 35 ha of field crops such as pasture and lucerne.

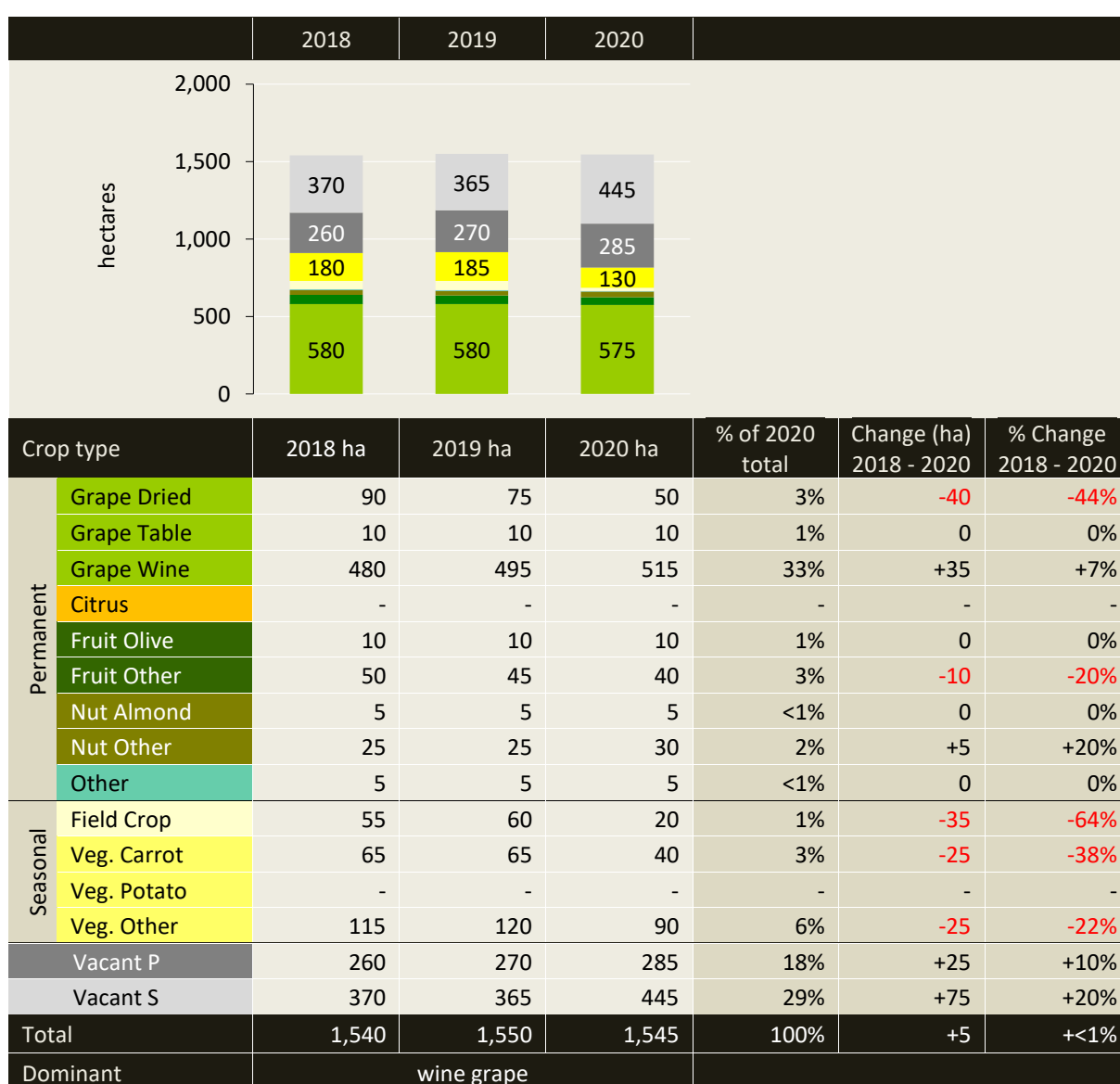


Figure 15: Nyah irrigation district - change in crop types from 2018 to 2020

2.2.3 Nyah irrigation district - planting trends

Figure 2 summarises planting trends in the Nyah irrigation district from 2018 to 2020.

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

- 44% permanent, 15% seasonal and 41% vacant in 2018; to
- 43% permanent, 10% seasonal and 47% vacant in 2020.

From 2018 to 2020:

- Permanent plantings decreased by 10 ha; a 1% decrease from 675 ha to 665 ha.
- Seasonal crops decreased by 85 ha; a 36% decrease from 235 ha to 150 ha.
- Vacant areas, previously permanent plantings, increased by 25 ha; a 10% increase from 260 ha to 285 ha.
- Vacant areas, previously seasonal crops, increased by 75 ha; a 20% increase from 370 ha to 445 ha.

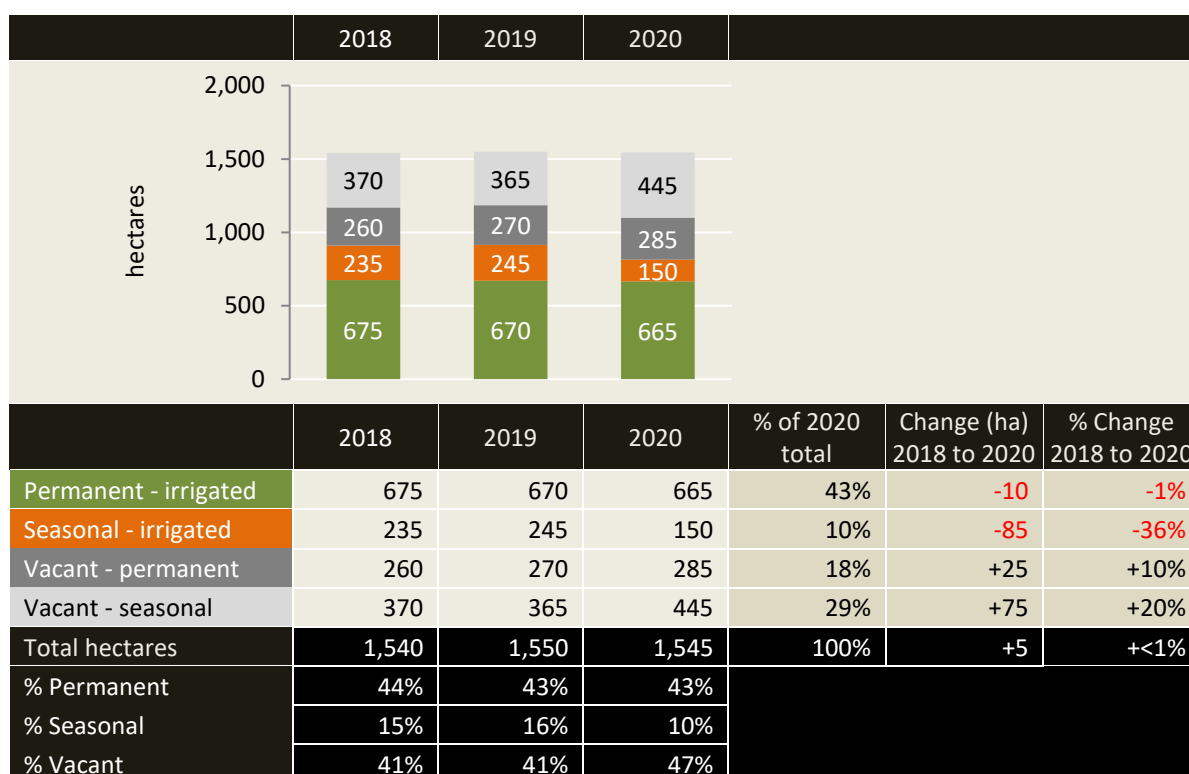
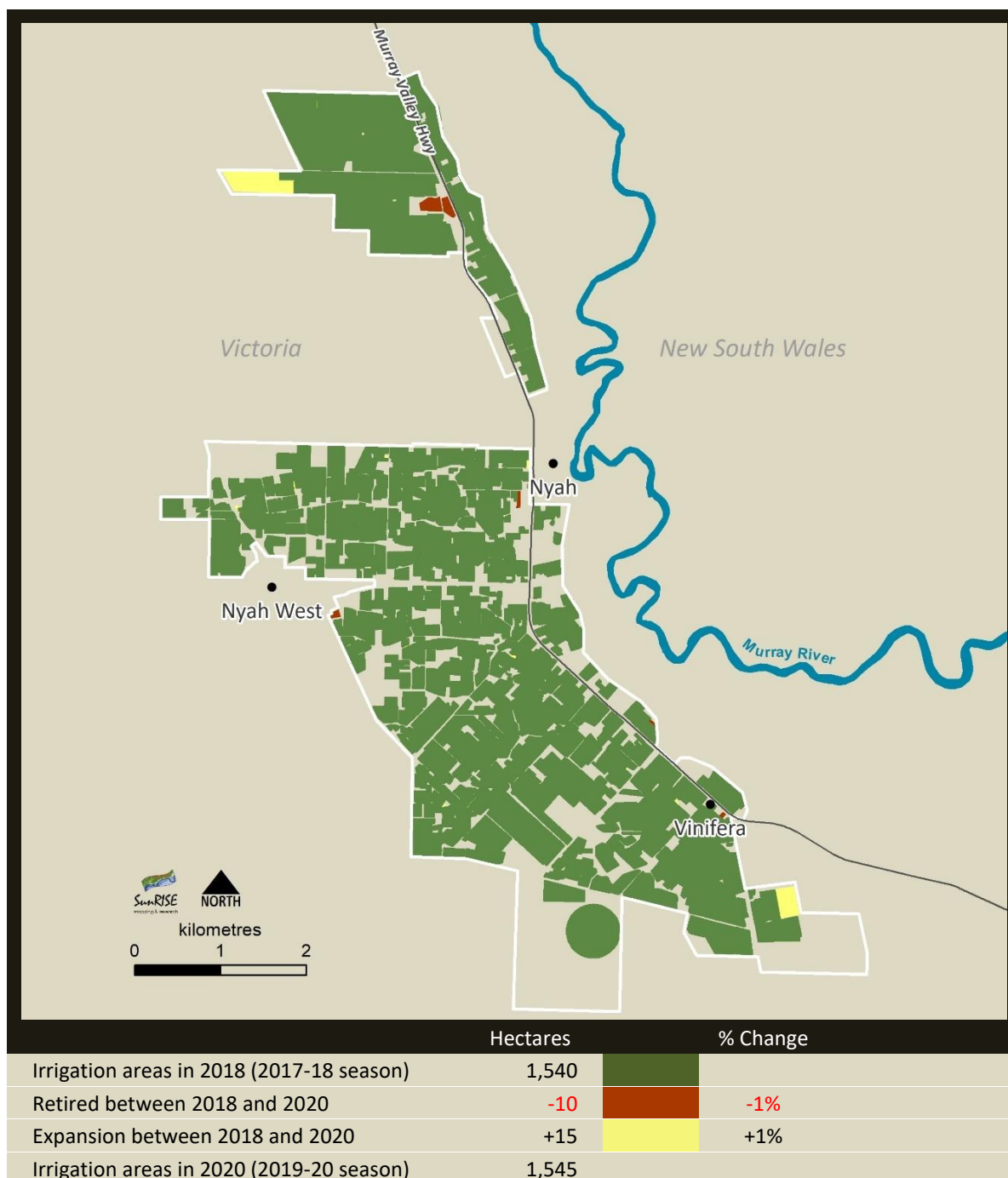


Figure 2: Nyah irrigation district - planting trends from 2018 to 2020

2.2.4 Nyah irrigation district - irrigation development

Map 5 shows irrigation development from 2018 to 2020 in the Nyah irrigation district with respect to new development (expansion) and areas retired⁸ from irrigation.

- The irrigable area increased by 5 ha, a less than 1% increase from 1,540 ha in 2018 to 1,545 ha in 2020.
- The net increase of 5 ha was the balance of 15 ha of expansion and 10 ha retired from irrigation.



Map 5: Nyah irrigation district - irrigation development from 2018 to 2020

⁸ Retired areas have undergone a change in land use that precludes use for irrigation e.g. urban development, housing, sheds, dams and land set aside for conservation purposes.

2.2.5 Nyah irrigation district - irrigation methods

Figure 3 summarises the change in irrigation methods in the Nyah irrigation district from 2018 to 2020.

Drippers remained the dominant irrigation method from 2018 to 2020.

From 2018 to 2020:

- Drip irrigation increased by 15 ha, a 2% increase from 625 ha to 640 ha;
- Lowlevel irrigation decreased by 45 ha, a 28% decrease from 160 ha to 115 ha;
- Overhead irrigation decreased by 25 ha, a 56% decrease from 45 ha to 20 ha; and
- Furrow irrigation decreased by 40 ha, a 50% decrease from 80 ha to 40 ha.

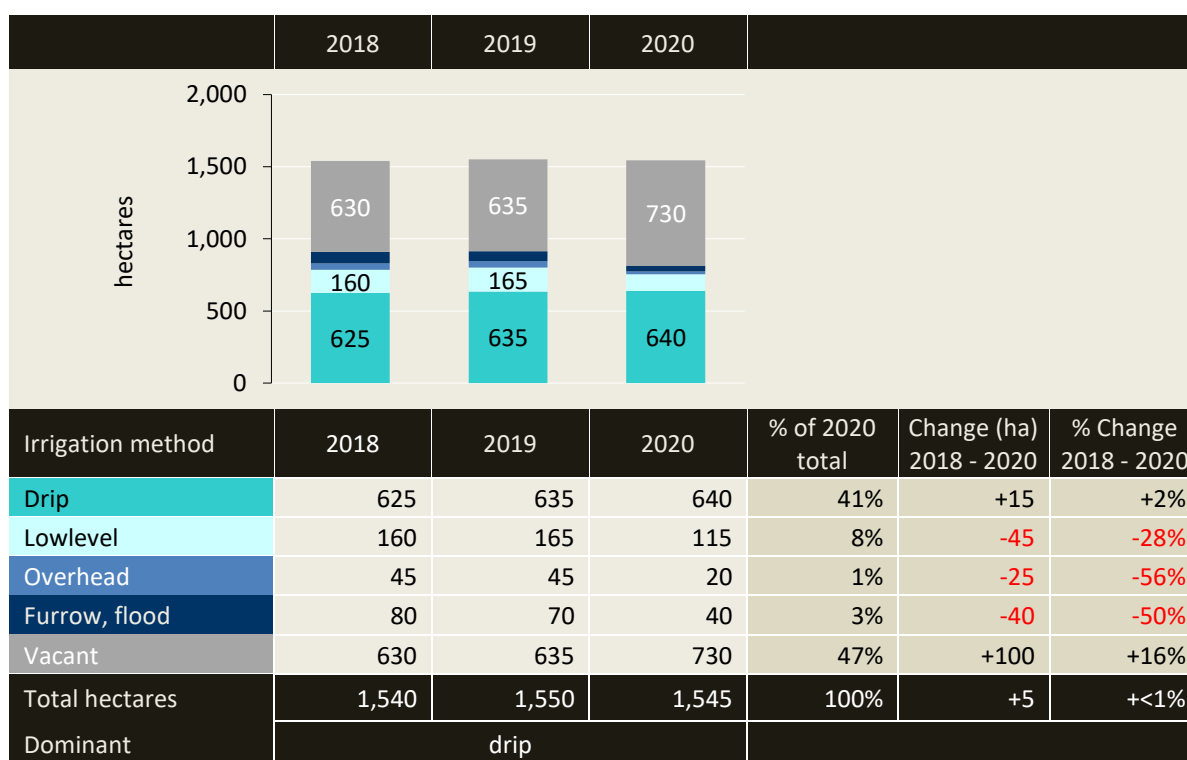


Figure 3: Nyah irrigation district - irrigation methods from 2018 to 2020

2.2.6 Nyah irrigation district - salinity impact zones

Figure 4 summarises the irrigable area in each salinity impact zone in the Nyah irrigation district from 2018 to 2020.

The Nyah district is in low salinity impact zones L1 and L2. No irrigable areas are in the high salinity impact zone.

From 2018 to 2020, the area irrigated in:

- L1 decreased by 75 ha, a 10% decrease from 775 ha to 700 ha.
- L2 decreased by 20 ha, a 15% decrease from 135 ha to 115 ha.

From 2018 to 2020, the irrigable area in:

- L1 remained at 1,340 ha from 2018 to 2020.
- L2 increased by 5 ha, a 2% increase from 200 ha to 205 ha.

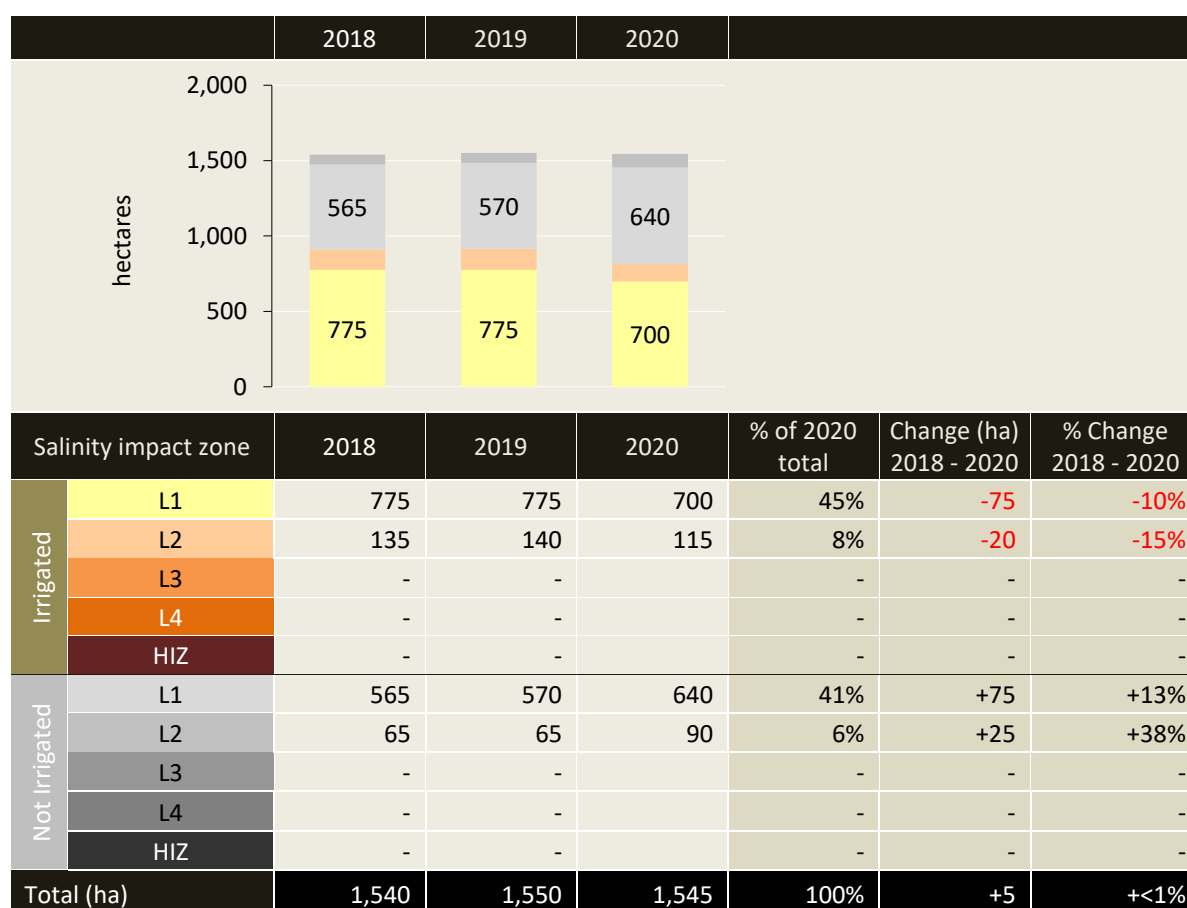


Figure 4: Nyah irrigation district - irrigable area in each salinity impact zone from 2018 to 2020

2.2.7 Nyah irrigation district - property change

Figure 5 provides estimates of property numbers and average property size (irrigable area) in the Nyah irrigation district from 2018 to 2020.

In 2020:

- There were approximately 143 irrigation properties; and
- most properties (87%) had an irrigable area less than 20 ha.

From 2018 to 2020:

- the number of properties decreased by 1; a 1% decrease from 144 to 143 properties; and
- average property size (irrigable area) remained at 11 ha per property.

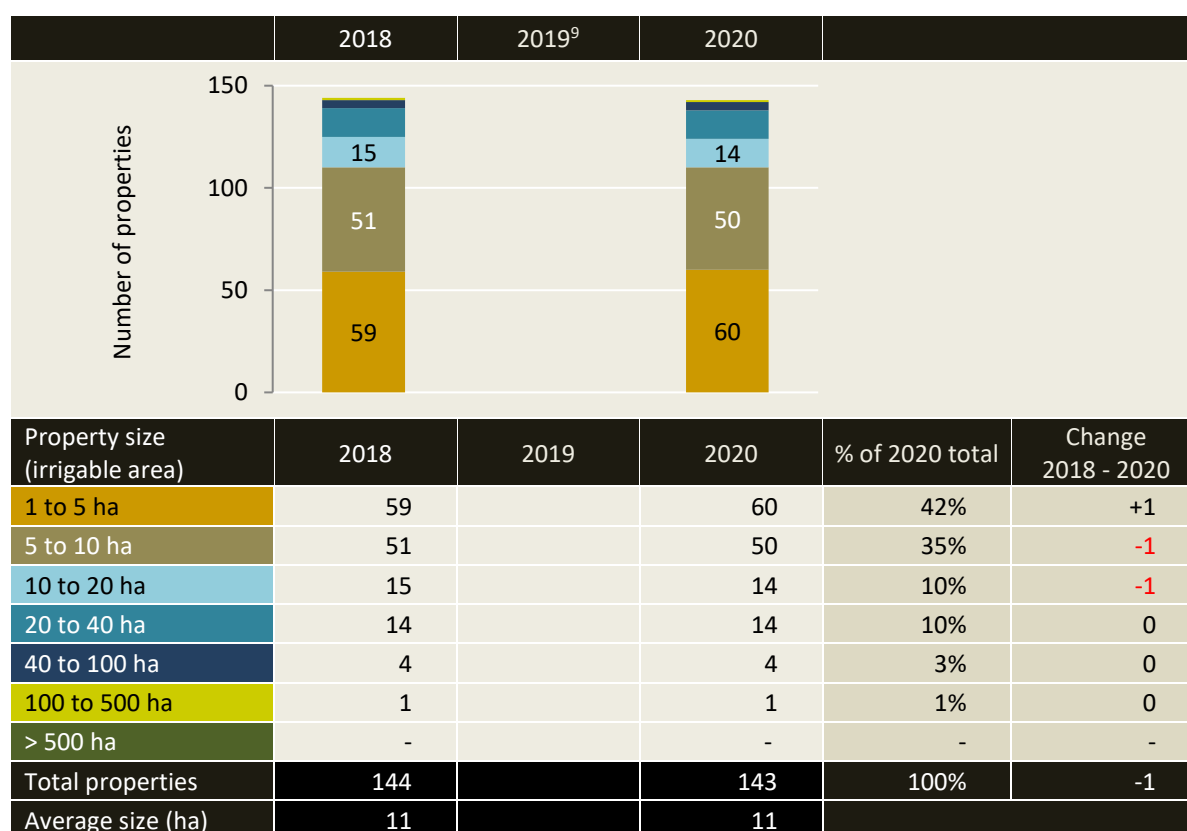


Figure 5: Nyah irrigation district – property numbers and average size from 2018 to 2020

⁹ Property data was not maintained in 2019

2.2.8 Nyah irrigation district – water-use in 2020

97% (790 ha) of irrigated horticulture in the Nyah irrigation district was aligned to 3,800 ML of water-use for 2019-2020. Alignment for the remaining 3% of irrigated horticulture was not resolved, and resolution may affect the water-use figures presented.

Water use in the Nyah irrigation district accounted for 4% of total irrigation water use in the pumped districts in 2019-2020 (see Figure 14). Wine grape plantings were the dominant crop irrigated in the Nyah irrigation district in 2020 (33%) and drip irrigation was the dominant irrigation method used (41%).

2.3 Robinvale irrigation district

In summary for the Robinvale irrigation district

Change in crop types from 2018 to 2020

Table grape plantings remained the dominant crop type from 2018 to 2020. The main change in crop types from 2018 to 2020 was:

1. Table grape plantings increased by 30 ha; a 1% increase from 2,085 ha to 2,115 ha; and
2. Dried grape plantings decreased by 20 ha; a 67% decrease from 30 ha to 10 ha.

Planting trends - permanent plantings, seasonal crops and vacant areas

From 2018 to 2020:

- Permanent plantings increased by 15 ha; a 1% increase from 2,330 ha to 2,345 ha and vacant areas, previously permanent plantings, decreased by 15 ha.
- Seasonal cropping remained at 10 ha and vacant areas, previously seasonal cropping, remained at 5 ha.

Irrigation development - new and retired areas

The irrigable area in the Robinvale irrigation district remained at 2,420 ha from 2018 to 2020. New or retired areas were negligible, less than 2 ha.

Irrigation methods 2018 to 2020

Lowlevel sprinklers were the dominant irrigation method in the Robinvale district from 2018 to 2020, and there was no furrow irrigation. Irrigation method changes were:

- Drip irrigation increased by 145 ha, a 20% increase from 725 ha to 870 ha;
- Lowlevel irrigation decreased by 125 ha, an 8% decrease from 1,610 ha to 1,485 ha; and
- Overhead irrigation decreased by 5 ha, a 100% decrease from 5 ha to 0 ha.

Salinity impact zones 2018 to 2020

The Robinvale irrigation district is in low salinity impact zones L2 and L3. The irrigable area was 2,400 ha in L2 and 20 ha in L3 from 2018 to 2020.

Irrigation properties

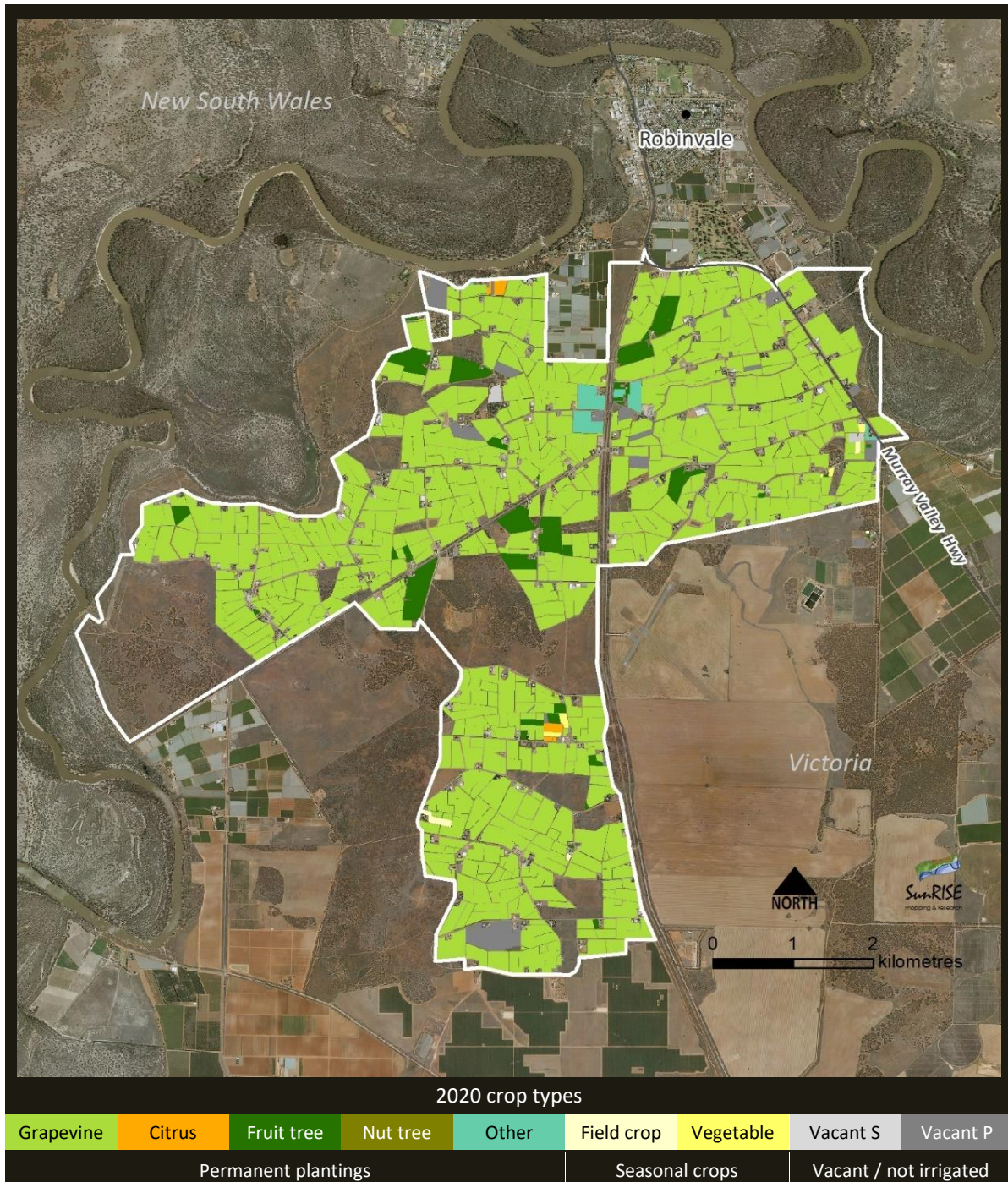
In 2020 there were approximately 97 irrigation properties with an average irrigable area of 25 ha in the Robinvale irrigation district. From 2018 to 2020 the number of properties decreased by 7; a 7% decrease from 104 to 97 properties.

Water-use 2020

Analysis of water use data estimates that 19,523 ML of water was applied to 2,355 ha of crops in the Robinvale pumped district in the 2019-20 season.

2.3.1 Robinvale irrigation district - crop types in 2020

Map 6 shows the Robinvale irrigation district with crop types in 2020.



Map 6: Robinvale irrigation district showing crop types in 2020

2.3.2 Robinvale irrigation district - crop types from 2018 to 2020

Figure 6 summarises the change in irrigated crops in the Robinvale irrigation district from 2018 to 2020.

Table grape plantings were the dominant crop type from 2018 and 2020.

The main change in crop types from 2018 to 2020 was:

1. Table grape plantings increased by 30 ha; a 1% increase from 2,085 ha to 2,115 ha.
2. Dried grape plantings decreased by 20 ha; a 67% decrease from 30 ha to 10 ha.

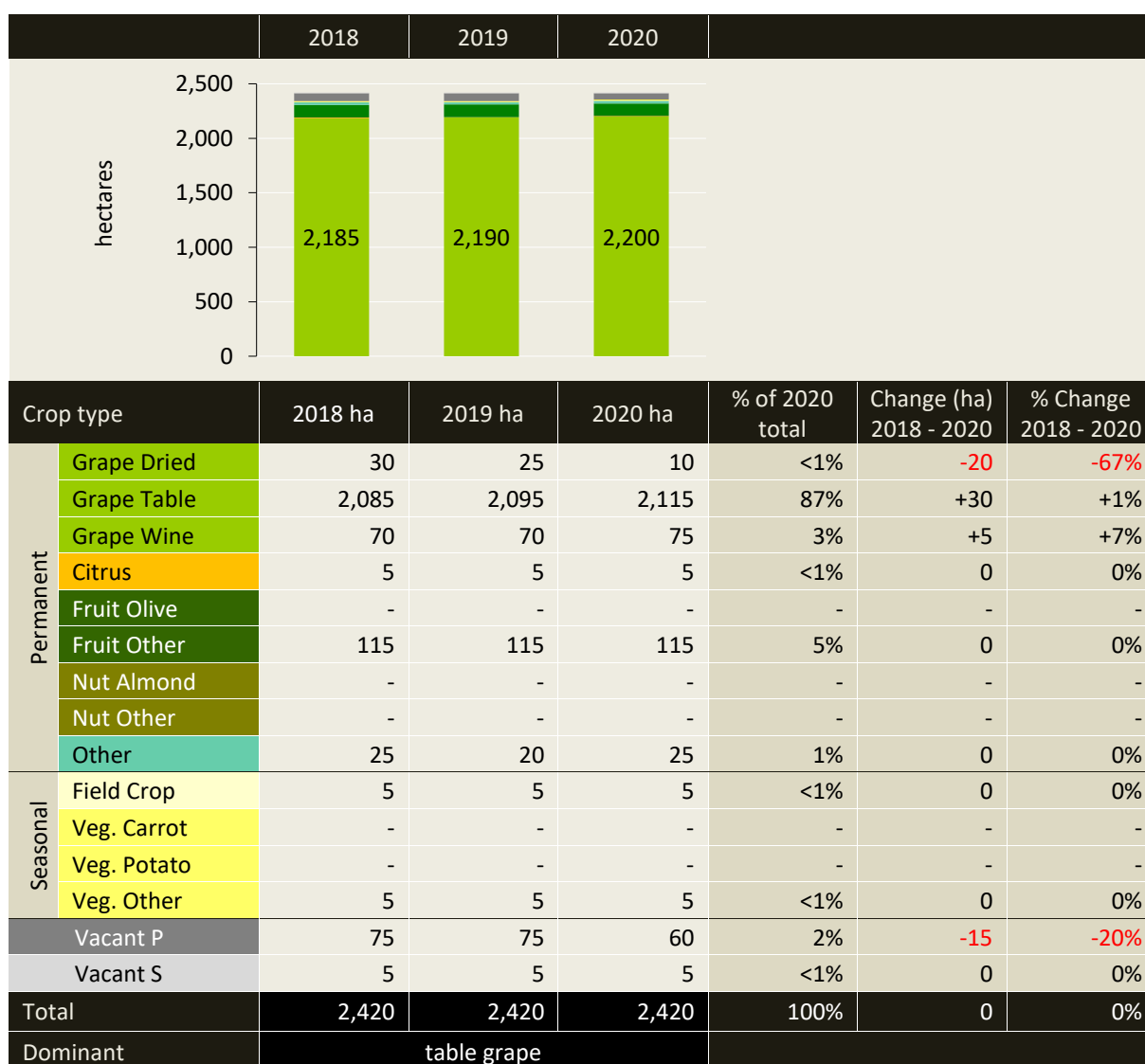


Figure 6: Robinvale irrigation district - crop types from 2018 to 2020

2.3.3 Robinvale irrigation district - planting trends

Figure 7 summarises planting trends in the Robinvale irrigation district from 2018 to 2020.

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

- 96% permanent, <1% seasonal and 3% vacant in 2018; to
- 97% permanent, <1% seasonal and 3% vacant in 2020.

From 2018 to 2020:

- Permanent plantings increased by 15 ha; a 1% increase from 2,330 ha to 2,345 ha.
- Seasonal cropping remained at 10 ha.
- Vacant areas, previously permanent plantings, decreased by 15 ha; a 20% decrease from 75 ha to 60 ha.
- Vacant areas, previously seasonal crops, remained at 5 ha.

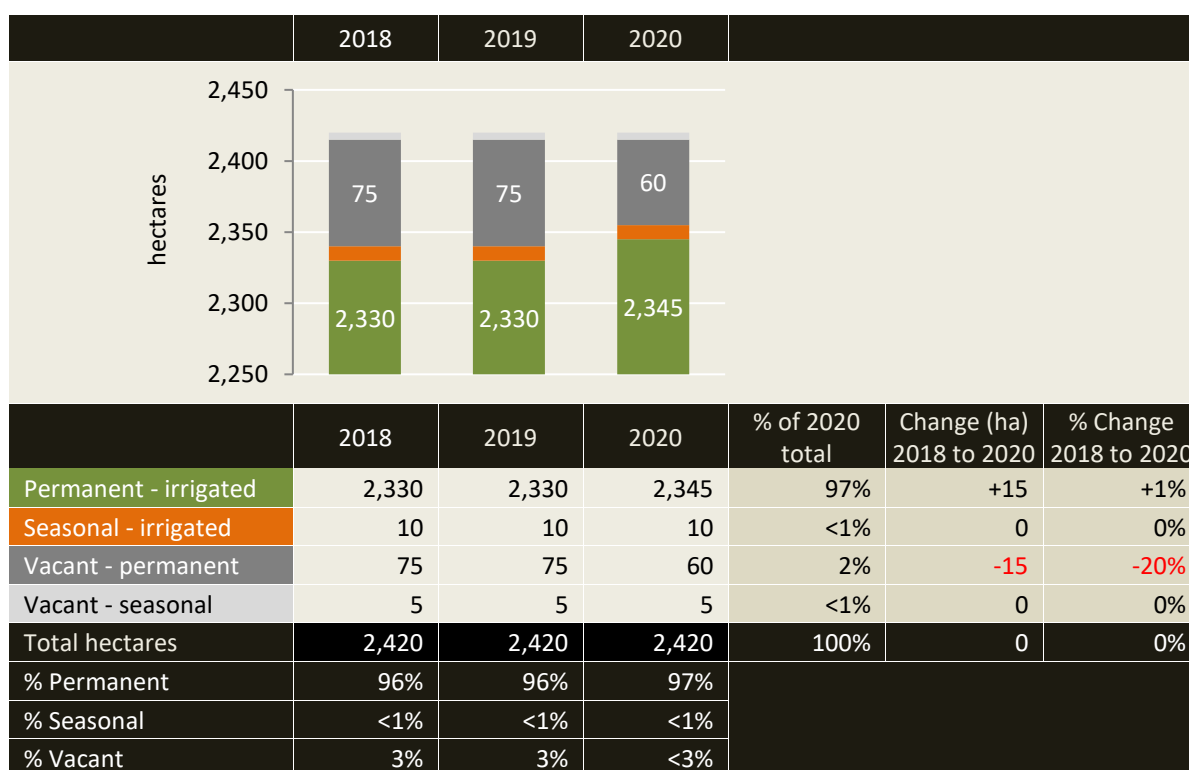
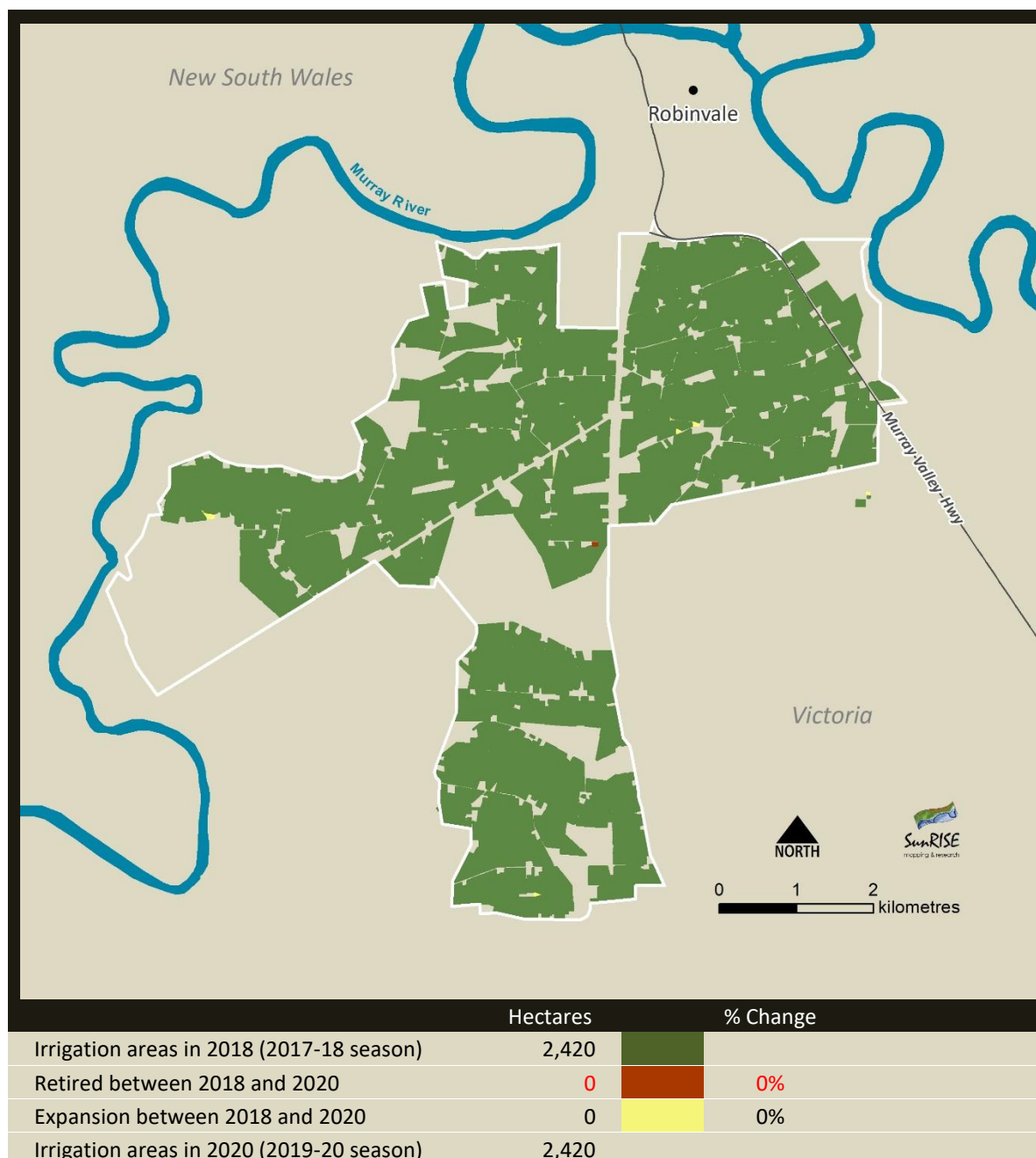


Figure 7: Robinvale irrigation district - planting trends from 2018 to 2020

2.3.4 Robinvale irrigation district - irrigation development

Map 7 shows irrigation development from 2018 to 2020 in the Robinvale irrigation district with respect to new development (expansion) and areas retired¹⁰ from irrigation.

- The irrigable area remained at 2,420 ha from 2018 to 2020.
- Areas retired totalled less than 2.5 ha (i.e. 0 ha when rounded to the nearest 5 ha).



Map 7: Robinvale irrigation district - irrigation development from 2018 to 2020

¹⁰ Retired areas have undergone a change in land use that precludes use for irrigation e.g. urban development, housing, sheds, dams and land set aside for conservation purposes.

2.3.5 Robinvale irrigation district - irrigation methods

Figure 8 summarises the change in irrigation methods in the Robinvale irrigation district from 2018 to 2020.

Lowlevel sprinklers remained the dominant irrigation method from 2018 to 2020.

From 2018 to 2020:

- Drip irrigation increased by 145 ha, a 20% increase from 725 ha to 870 ha.
- Lowlevel irrigation decreased by 125 ha, an 8% decrease from 1,610 ha to 1,485 ha.
- Overhead irrigation decreased by 5 ha, a 100% decrease from 5 ha to 0 ha.
- There was no furrow irrigation from 2018 to 2020.

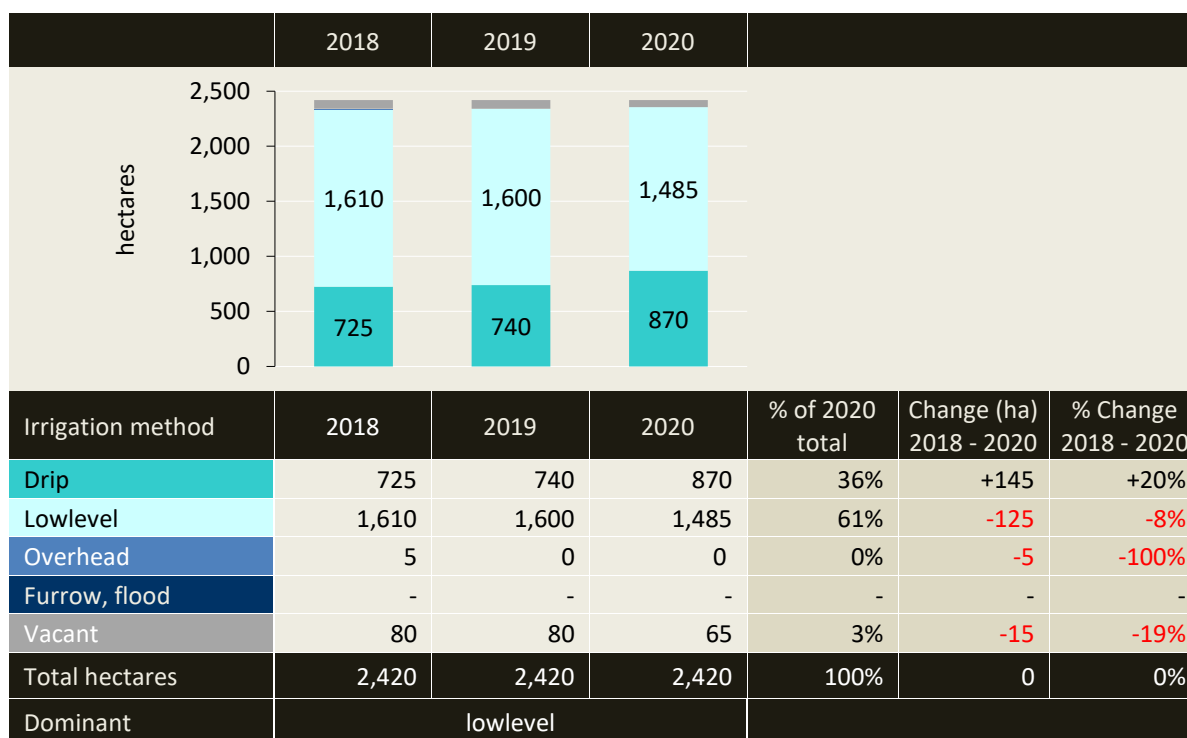


Figure 8: Robinvale irrigation district - irrigation methods from 2018 to 2020

2.3.6 Robinvale irrigation district - salinity impact zones

Figure 9 summarises the irrigable area in each salinity impact zone in the Robinvale irrigation district from 2018 to 2020.

The Robinvale district is in low salinity impact zones L2 and L3. No irrigable areas are in the high salinity impact zone.

From 2018 to 2020, the area irrigated in:

- L2 increased by 15 ha, a 1% increase from 2,330 ha to 2,345 ha.
- L3 was 10 ha from 2018 to 2020.

The irrigable area in:

- L2 was 2,400 ha from 2018 to 2020.
- L3 was 20 ha from 2018 to 2020.

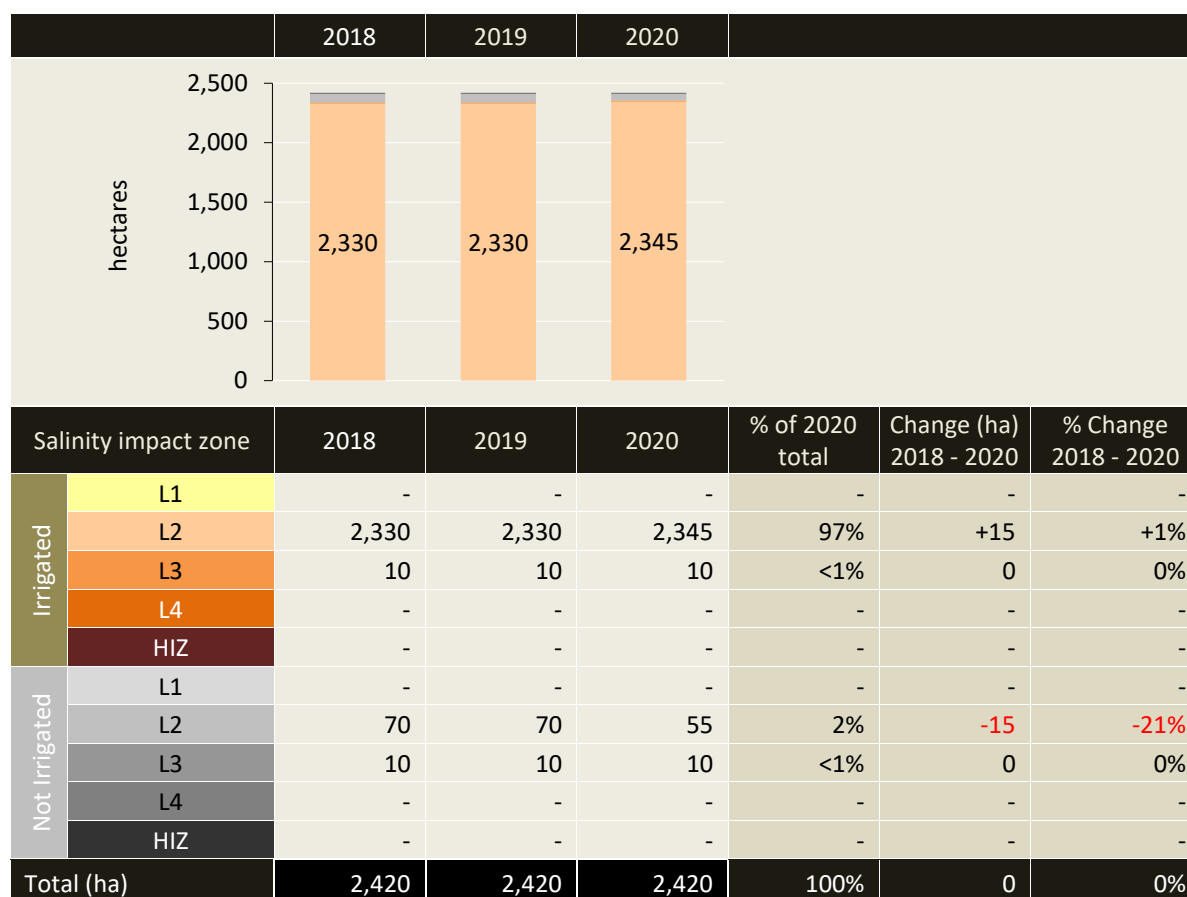


Figure 9: Robinvale irrigation district - irrigable area in each salinity impact zone 2018 to 2020

2.3.7 Robinvale irrigation district - property change

Figure 10 provides estimates of property numbers and average property size (irrigable area) in the Robinvale irrigation district from 2018 to 2020.

In 2020:

- There were approximately 97 irrigation properties; and
- most properties (62%) had an irrigable area less than 20 ha.

From 2018 to 2020:

- the number of properties decreased by 7; a 7% decrease from 104 to 97 properties;
- properties with an irrigable area less than 20 ha decreased by 7, while the number over 20 ha remained the same; and
- average property size (irrigable area) increased from 23 ha to 25 ha.

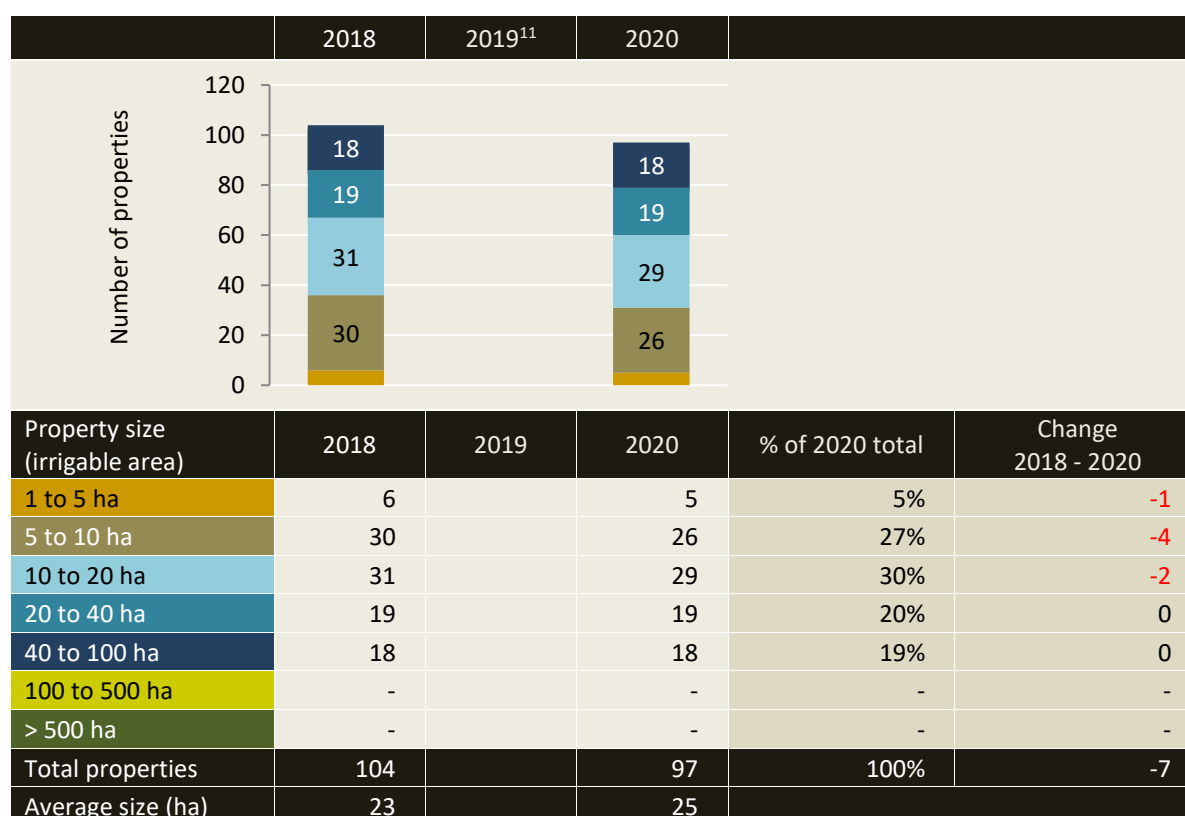


Figure 10: Robinvale irrigation district - property numbers and sizes from 2018 to 2020

¹¹ Property data was not maintained in 2019

2.3.8 Robinvale irrigation district – water-use in 2020

100% (2,355 ha) of irrigated horticulture in the Robinvale irrigation district was aligned to 19,523 ML of water-use.

Water use in the Robinvale irrigation district accounted for 22% of total irrigation water use in the pumped districts in 2019-2020 (see Figure 14). Table grape plantings were the dominant crop irrigated in the Robinvale irrigation district in 2020 (87%) and low-level irrigation was the dominant irrigation method used (61%).

2.4 Red Cliffs irrigation district

In summary for the Red Cliffs irrigation district

Change in crop types from 2018 to 2020

The dominant crop type in the Red Cliffs district changed from wine grape plantings in 2018 to table grapes by 2019. The main changes from 2018 to 2020 were:

1. Table grape plantings increased by 175 ha, an 18% increase from 985 ha to 1,160 ha.
2. Wine grape plantings decreased by 85 ha, an 8% decrease from 1,115 ha to 1,030 ha.
3. Field crops decreased by 80 ha, a 47% decrease from 170 ha to 90 ha.
4. Vegetables decreased by 45 ha, a 15% decrease from 305 ha to 260 ha.
5. Dried grape plantings decreased by 40 ha, a 12% decrease from 335 ha to 295 ha.

Planting trends - permanent plantings, seasonal crops and vacant areas

From 2018 to 2020:

- Permanent plantings increased by 50 ha; a 2% increase from 2,875 ha to 2,925 ha and vacant areas, previously permanent plantings, decreased by 65 ha.
- Seasonal cropping decreased by 125 ha; a 26% decrease from 475 ha to 350 ha and vacant areas, previously seasonal crops, increased by 120 ha.

Irrigation development - new and retired areas

The irrigable area in the Red Cliffs irrigation district decreased by 20 ha, a less than 1% decrease from 4,435 ha in 2018 to 4,415 ha in 2020. The decrease was due to areas retired from irrigation.

Irrigation methods 2018 to 2020

Drippers remained the dominant irrigation method from 2018 to 2020. Drip irrigation increased by 100 ha, a 5% increase from 2,060 ha in 2018 to 2,160 ha in 2020. Lowlevel, overhead and furrow irrigation all decreased in area; by 15 ha, 150 ha and 10 ha respectively.

Salinity impact zones 2018 to 2020

The Red Cliffs irrigation district is in salinity zones: L1, L4 and HIZ. From 2018 to 2020 the irrigable area in L1 decreased by 5 ha, L4 decreased by 5 ha and HIZ decreased by 10 ha.

Irrigation properties

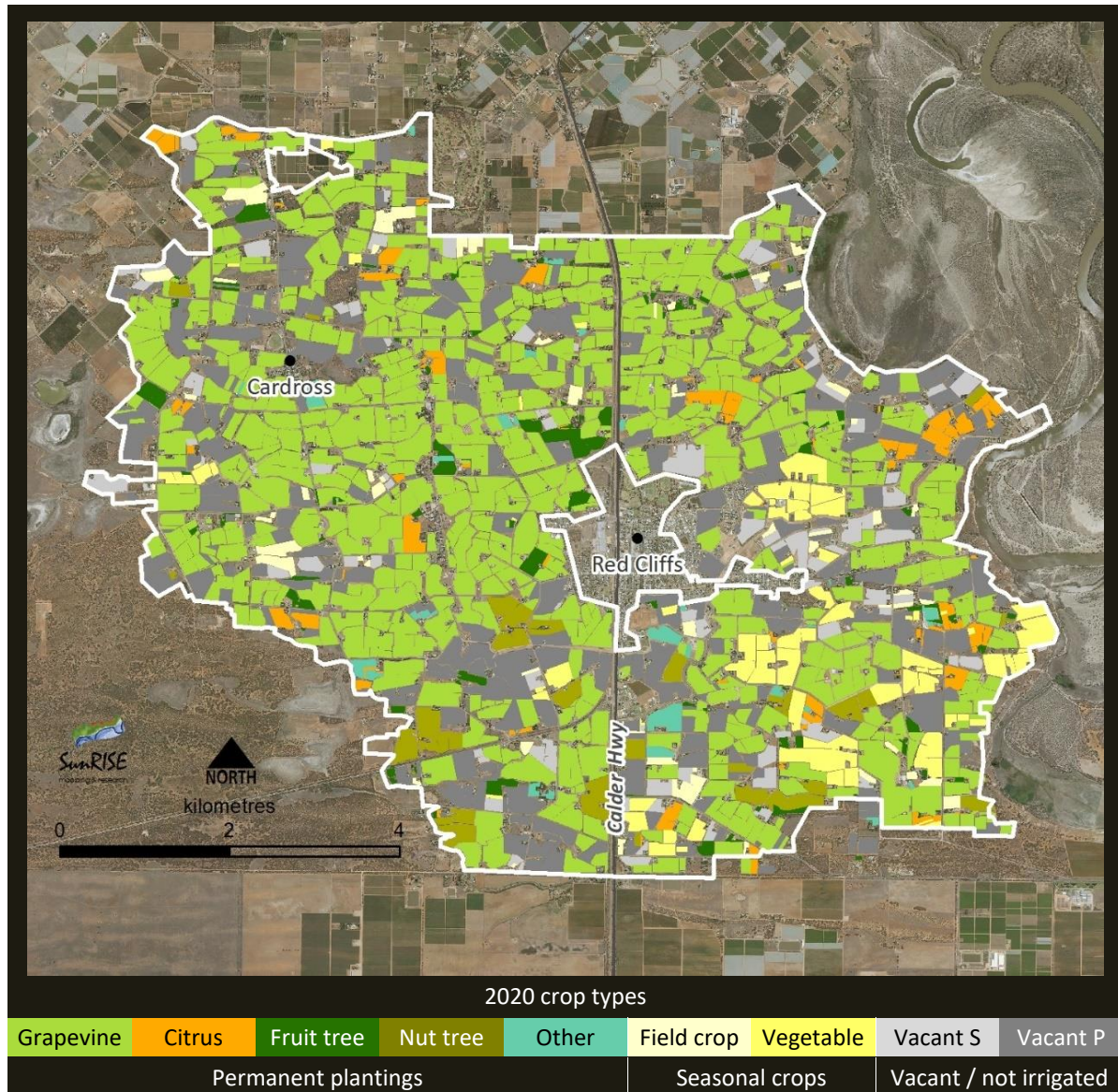
In 2020 there were approximately 400 irrigation properties with an average irrigable area of 11 ha in the Red Cliffs irrigation district. From 2018 to 2020 the number of properties decreased by 5; a 1% decrease from 405 to 400 properties.

Water-use 2020

Analysis of water use data estimates that 22,022 ML of water was applied to 3,211 ha of crops in the Red Cliffs irrigation pumped district in the 2019-20 season.

2.4.1 Red Cliffs irrigation district - crop types in 2020

Map 8 shows the Red Cliffs irrigation district with crop types in 2020.



Map 8: Red Cliffs irrigation district showing crop types in 2020

2.4.2 Red Cliffs irrigation district - crop types from 2018 to 2020

Figure 11 summarises the change in irrigated crops in the Red Cliffs irrigation district from 2018 to 2020.

The dominant crop type changed from wine grape plantings in 2018 to table grapes in 2019 and 2020.

The main changes from 2018 to 2020 were:

1. Table grape plantings increased by 175 ha, an 18% increase from 985 ha to 1,160 ha.
2. Wine grape plantings decreased by 85 ha, an 8% decrease from 1,115 ha to 1,030 ha.
3. Field crops decreased by 80 ha, a 47% decrease from 170 ha to 90 ha.
4. Vegetables decreased by 45 ha, a 15% decrease from 305 ha to 260 ha.
5. Dried grape plantings decreased by 40 ha, a 12% decrease from 335 ha to 295 ha.

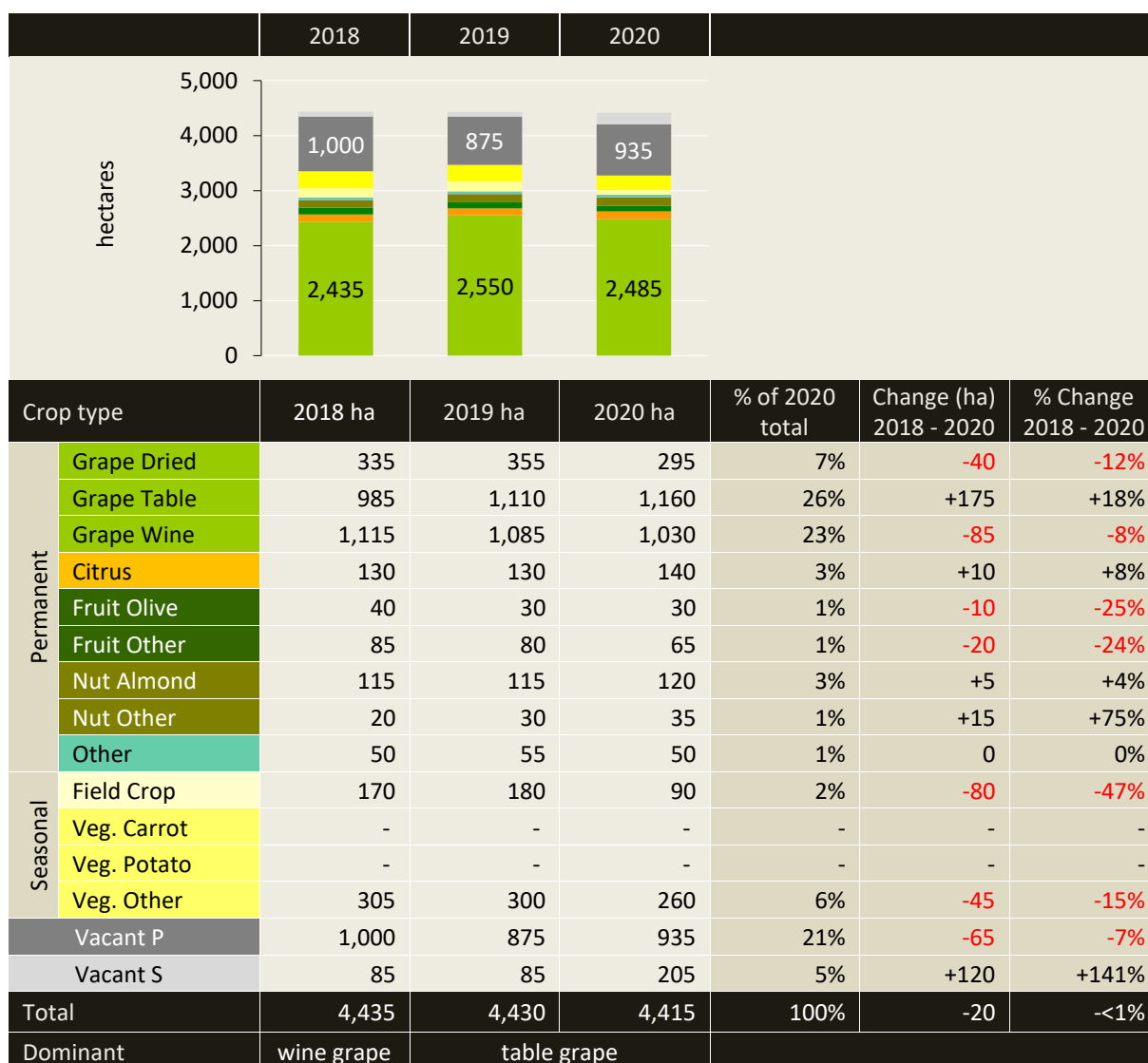


Figure 11: Red Cliffs irrigation district - change in crop types from 2018 to 2020

2.4.3 Red Cliffs irrigation district - planting trends

Figure 12 summarises planting trends in the Red Cliffs irrigation district from 2018 to 2020.

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

- 65% permanent, 11% seasonal and 24% vacant in 2018; to
- 66% permanent, 8% seasonal and 26% vacant in 2020.

From 2018 to 2020:

- Permanent plantings increased by 50 ha; a 2% increase from 2,875 ha to 2,925 ha.
- Seasonal cropping decreased by 125 ha; a 26% decrease from 475 ha to 350 ha.
- Vacant areas, previously permanent plantings, decreased by 65 ha; a 7% decrease from 1,000 ha to 935 ha.
- Vacant areas, previously seasonal crops, increased by 120 ha; a 141% increase from 85 ha to 205 ha.

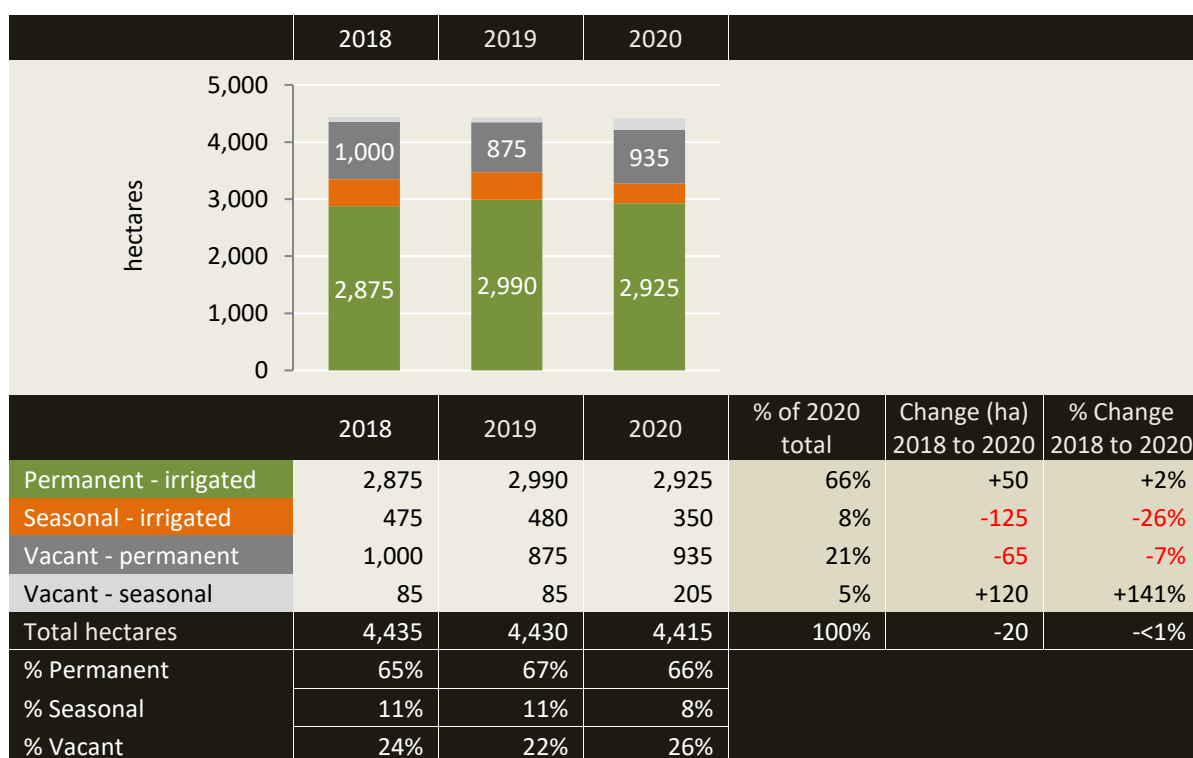
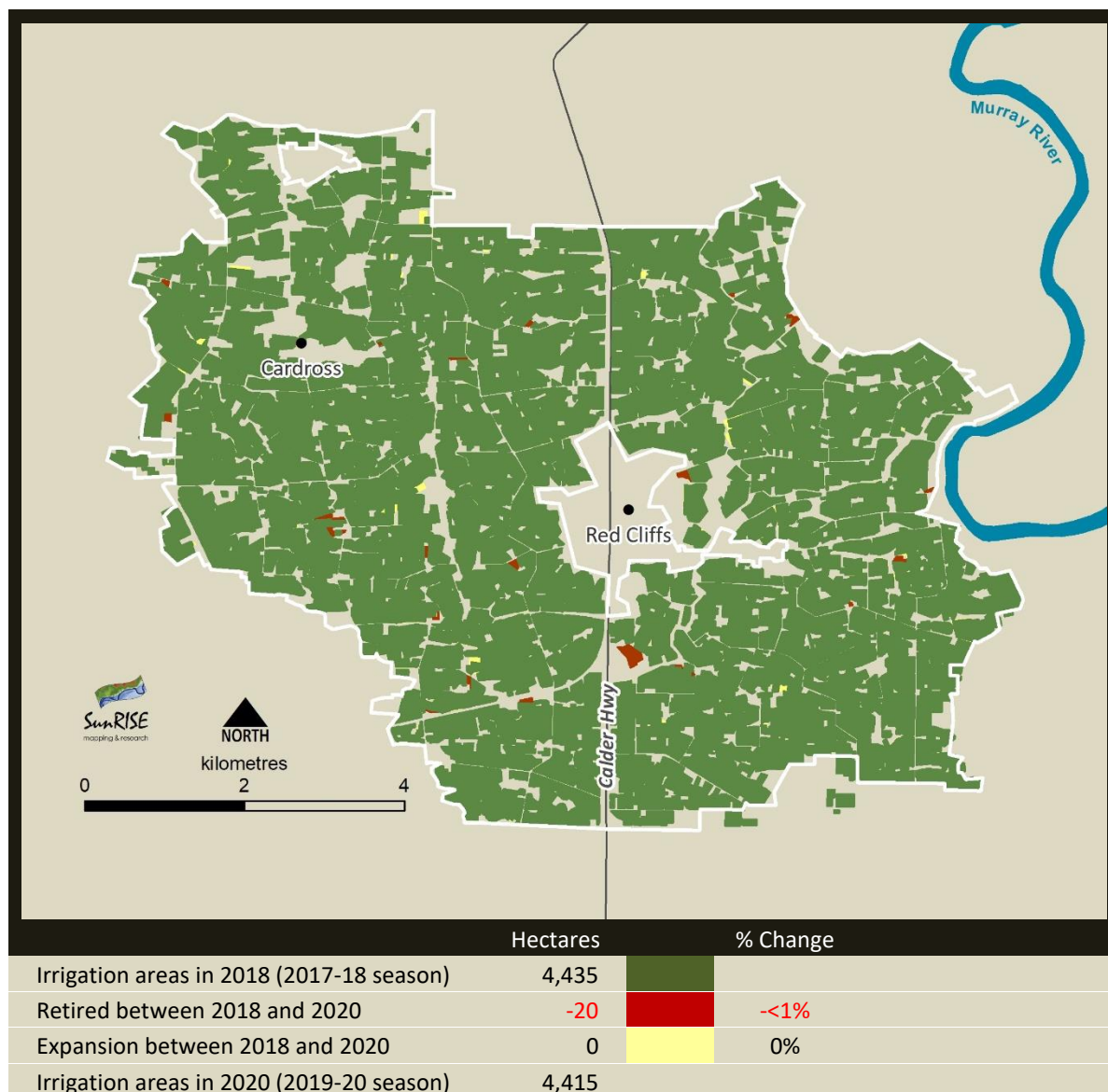


Figure 12: Red Cliffs irrigation district - planting trends from 2018 to 2020

2.4.4 Red Cliffs irrigation district - irrigation development

Map 9 shows irrigation development from 2018 to 2020 in the Red Cliffs irrigation district with respect to new development (expansion) and areas retired¹² from irrigation.

- The irrigable area decreased by 20 ha, a less than 1% decrease from 4,435 ha in 2018 to 4,415 ha in 2020.
- The decrease of 20 ha was due to areas retired from irrigation.



Map 9: Red Cliffs irrigation district - irrigation development from 2018 to 2020

¹² Retired areas have undergone a change in land use that precludes use for irrigation e.g. urban development, housing, sheds, dams and land set aside for conservation purposes.

2.4.5 Red Cliffs irrigation district - irrigation methods

Figure 13 summarises the change in irrigation methods in the Red Cliffs irrigation district from 2018 to 2020.

Drippers remained the dominant irrigation method in 2018 and 2019.

From 2018 to 2020:

- Drip irrigation increased by 100 ha, a 5% increase from 2,060 ha to 2,160 ha.
- Lowlevel irrigation decreased by 15 ha, a 2% decrease from 660 ha to 645 ha.
- Overhead irrigation decreased by 150 ha, a 25% decrease from 600 ha to 450 ha.
- Furrow irrigation decreased by 10 ha, a 33% decrease from 30 ha to 20 ha.

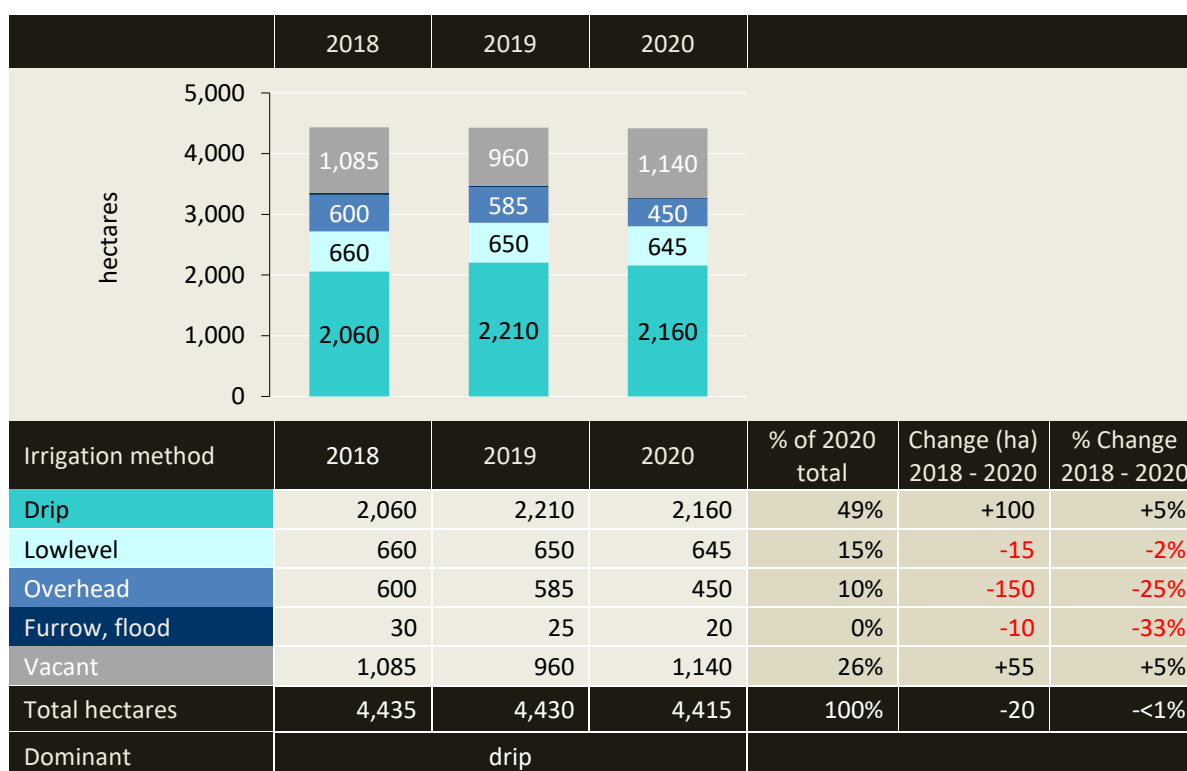


Figure 13: Red Cliffs irrigation district - irrigation methods from 2018 to 2020

2.4.6 Red Cliffs irrigation district - salinity impact zones

Figure 14 summarises the irrigable area in each salinity impact zone in the Red Cliffs irrigation district from 2018 to 2020.

The Red Cliffs district is in low salinity impact zones L1 and L4, and in the high salinity impact zone, HIZ.

From 2018 to 2020, the area irrigated in:

- L1 decreased by 10 ha, a 1% decrease from 1,085 ha to 1,075 ha.
- L4 decreased by 20 ha, a 3% decrease from 790 ha to 770 ha.
- HIZ decreased by 45 ha, a 3% decrease from 1,475 ha to 1,430 ha.

From 2018 to 2020, the irrigable area in:

- L1 decreased by 5 ha from 1,480 ha in 2018 to 1,475 in 2020.
- L4 decreased by 5 ha from 1,040 ha in 2018 to 1,035 in 2020.
- HIZ decreased by 10 ha (areas retired from irrigation), a less than 1% decrease from 1,915 ha to 1,905 ha.

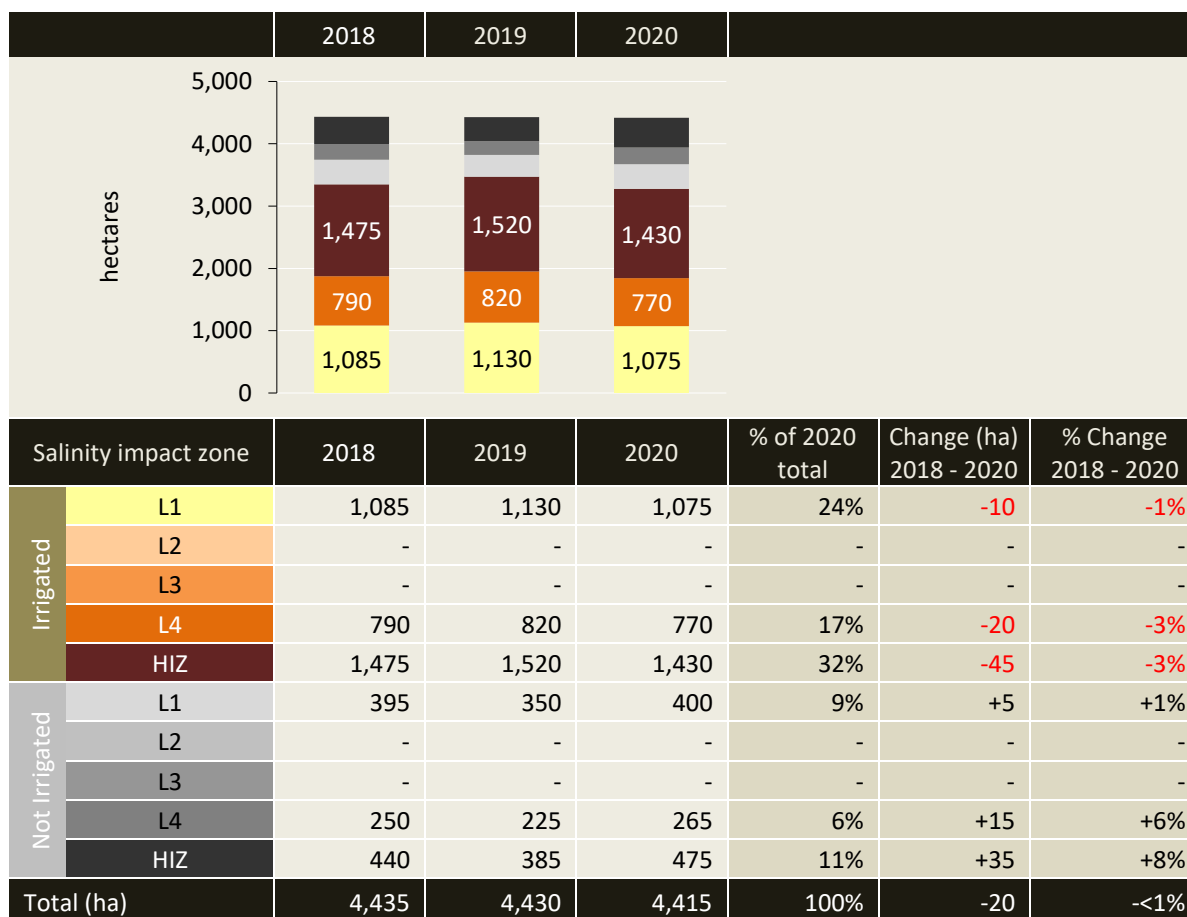


Figure 14: Red Cliffs irrigation district - irrigable area in each salinity impact zone from 2018 to 2020

2.4.7 Red Cliffs irrigation district - property change

Figure 15 provides estimates of property numbers and average property size (irrigable area) in the Red Cliffs irrigation district from 2018 to 2020.

In 2020:

- There were approximately 400 irrigation properties; and
- most properties (87%) had an irrigable area less than 20 ha.

From 2018 to 2020:

- The number of properties decreased by 5; a 1% decrease from 405 to 400 properties;
- properties with an irrigable area less than 20 ha decreased by 4, while the number over 20 ha decreased by 1; and
- average property size (irrigable area) remained at 11 ha.

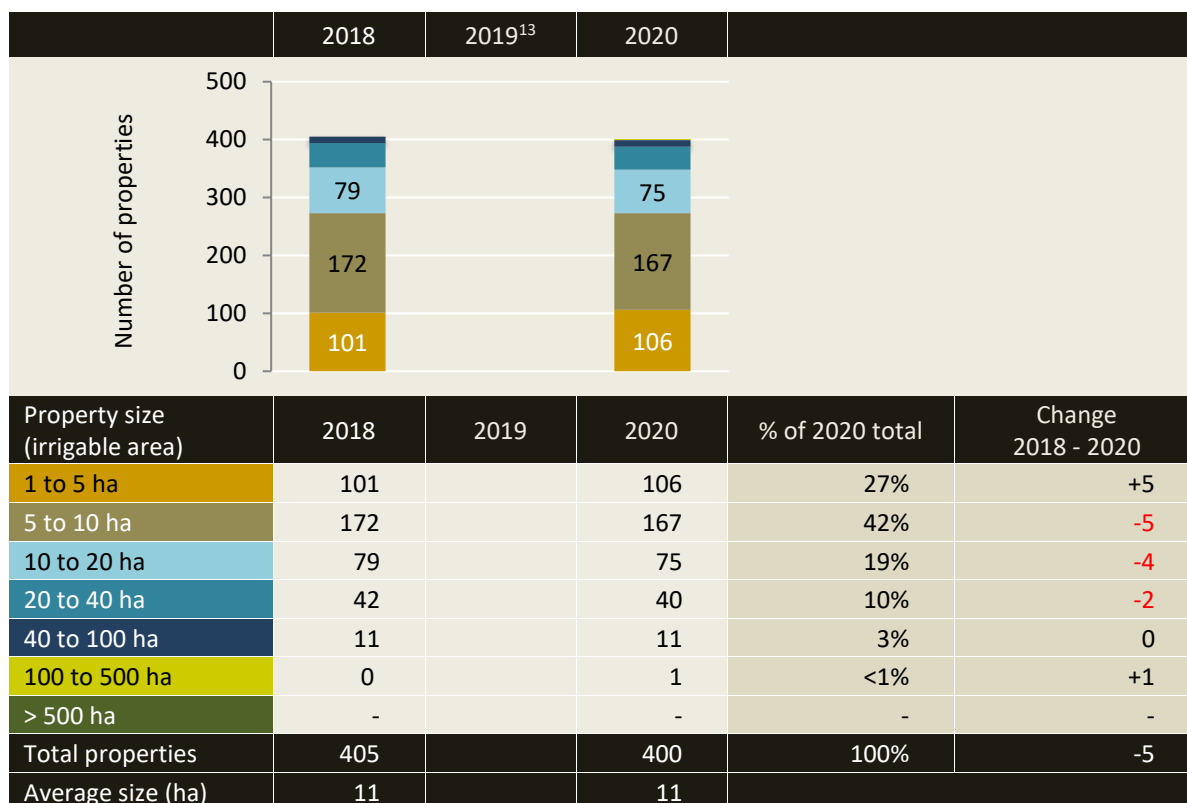


Figure 15: Red Cliffs irrigation district - property numbers and sizes from 2018 to 2020

¹³ Property data was not maintained in 2019

2.4.8 Red Cliffs irrigation district – water-use in 2020

98% (3,211 ha) of irrigated horticulture in the Red Cliffs irrigation district was aligned to 22,022 ML of water-use. Alignment for the remaining 2% of irrigated horticulture was not resolved, and resolution may affect the water-use figures presented.

Water use in the Red Cliffs irrigation district accounted for 25% of total irrigation water use in the pumped districts in 2019-2020 (see Figure 14). Table grape plantings were the dominant crop irrigated in the Red Cliffs irrigation district in 2020 (26%) and drip irrigation was the dominant irrigation method used (49%).

2.5 Mildura irrigation district

In summary for the Mildura irrigation district

Change in crop types from 2018 to 2020

Table grape plantings were the dominant crop from 2018 to 2020. The main changes from 2018 to 2020 were:

1. Table grape plantings increased by 220 ha, an 11% increase from 1,950 ha to 2,170 ha.
2. Dried grape plantings decreased by 170 ha, a 24% decrease from 710 ha to 540 ha.
3. Citrus plantings increased by 60 ha, a 55% increase from 110 ha to 170 ha.
4. Wine grape plantings decreased by 50 ha, a 5% decrease from 970 ha to 920 ha.
5. Field crops decreased by 105 ha, a 40% decrease from 260 ha to 155 ha.

Planting trends - permanent plantings, seasonal crops and vacant areas

From 2018 to 2020:

- Permanent plantings increased by 20 ha; a 1% increase from 3,955 ha to 3,975 ha and vacant areas, previously permanent plantings, decreased by 10 ha.
- Seasonal cropping decreased by 180 ha; a 46% decrease from 390 ha to 210 ha and vacant areas, previously seasonal crops, increased by 130 ha.

Irrigation development - new and retired areas

The irrigable area in the Mildura irrigation district decreased by 40 ha from 2018 to 2020. There were 70 ha retired from irrigation and 30 ha of expansion.

Irrigation methods 2018 to 2020

Drippers remained the dominant irrigation method between 2018 and 2020. Drip irrigation increased by 155 ha, a 7% increase from 2,305 ha in 2018 to 2,460 ha in 2020. Lowlevel irrigation remained at 1,200 ha from 2018 to 2020 while overhead and furrow irrigation decreased by 260 ha and 55 ha respectively.

Salinity impact zones 2018 to 2020

The Mildura irrigation district is in the lowest salinity impact zone, L1 and in the high impact zone, HIZ. From 2018 to 2020, the irrigable area in L1 increased by 15 ha, a 1% increase from 2,115 ha to 2,130 ha, while HIZ decreased by 55 ha, a 1% decrease from 3,710 ha to 3,655 ha.

Irrigation properties

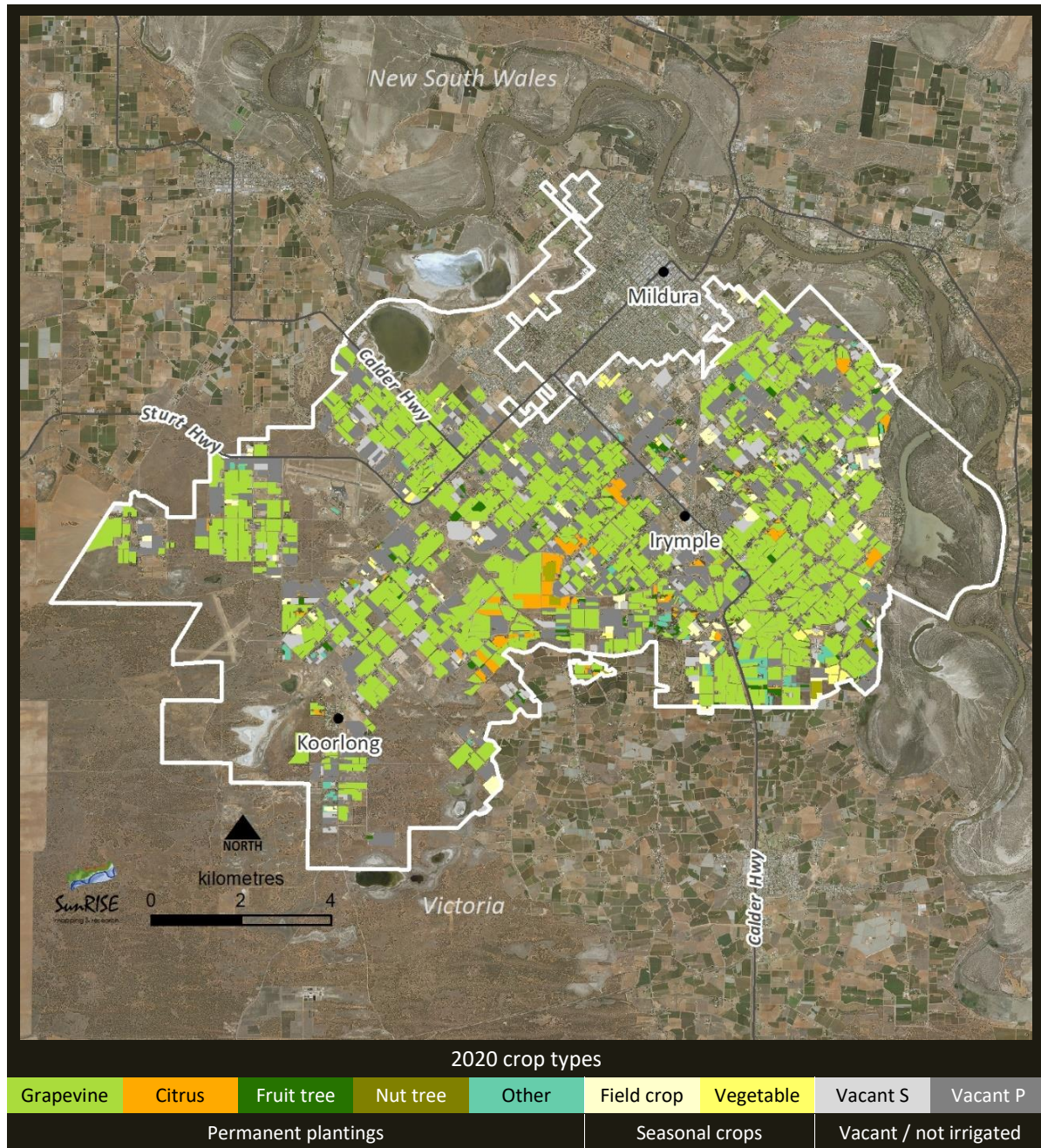
In 2020 there were approximately 585 irrigation properties in the Mildura district with an average irrigable area of 10 ha. From 2018 to 2020 the number of properties decreased by 28; a 5% decrease from 613 to 585 properties;

Water-use in 2020

Analysis of water use data estimates that 30,843 ML of water was applied to 4,123 ha of crops in the Mildura irrigation district in the 2019-20 season.

2.5.1 Mildura irrigation district - crop types in 2020

Map 10 shows the Mildura irrigation district with crop types in 2020.



Map 10: Mildura irrigation district showing crop types in 2020

2.5.2 Mildura irrigation district - crop types from 2018 to 2020

Figure 16 summarises the change in irrigated crops in the Mildura irrigation district from 2018 to 2020.

Table grape plantings were the dominant crop from 2018 to 2020.

The main changes from 2018 to 2020 were:

1. Table grape plantings increased by 220 ha, an 11% increase from 1,950 ha to 2,170 ha.
1. Dried grape plantings decreased by 170 ha, a 24% decrease from 710 ha to 540 ha.
2. Field crops decreased by 105 ha, a 40% decrease from 260 ha to 155 ha.
3. Vegetables decreased by 75 ha, a 58% decrease from 130 ha to 55 ha.
4. Citrus plantings increased by 60 ha, a 55% increase from 110 ha to 170 ha.
5. Wine grape plantings decreased by 50 ha, a 5% decrease from 970 ha to 920 ha.

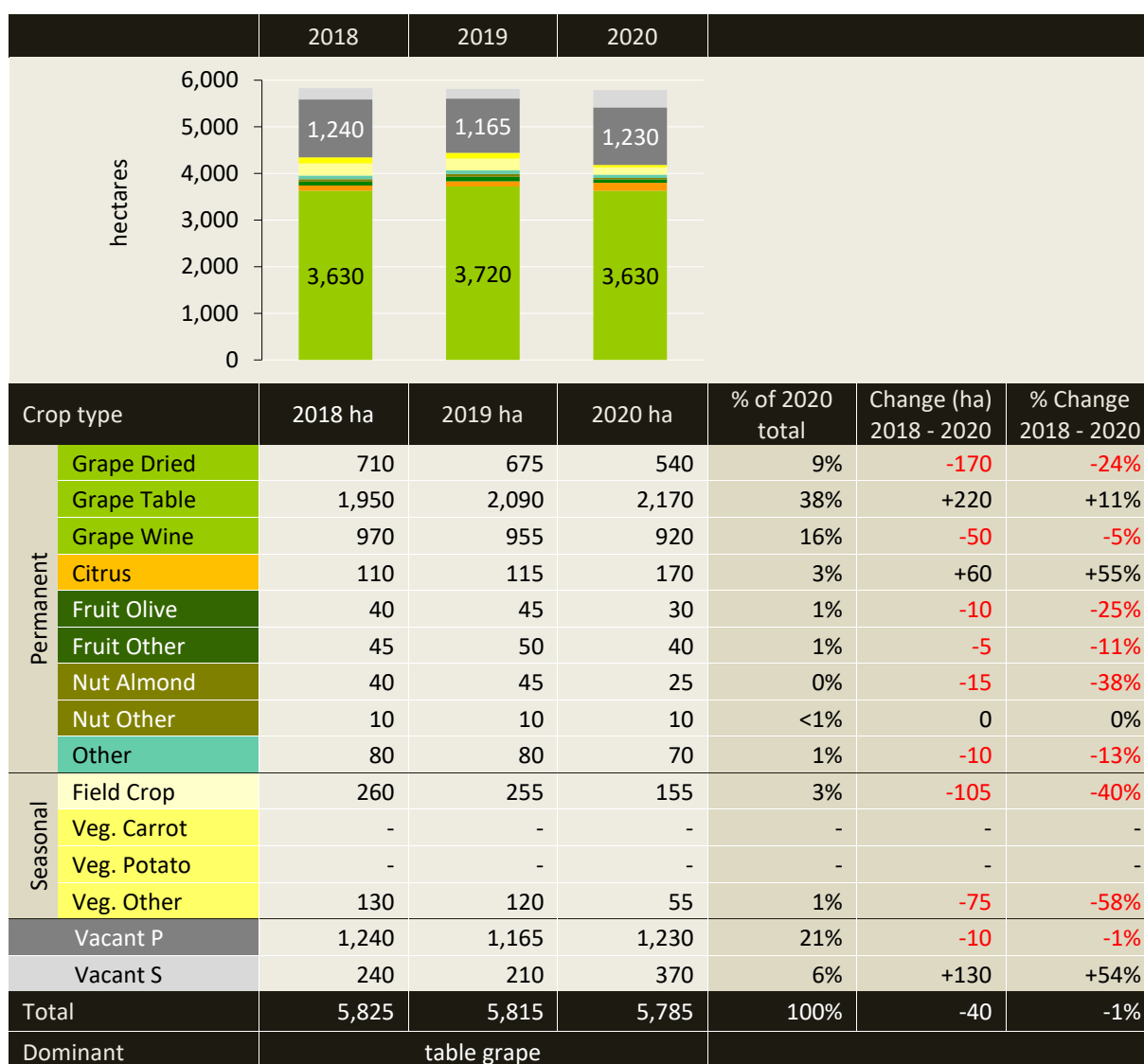


Figure 16: Mildura irrigation district - crop types from 2018 to 2020

2.5.3 Mildura irrigation district - planting trends

Figure 17 summarises planting trends in the Mildura irrigation district from 2018 to 2020.

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

- 68% permanent, 7% seasonal and 25% vacant in 2018; to
- 69% permanent, 4% seasonal and 27% vacant in 2020.

From 2018 to 2020:

- Permanent plantings increased by 20 ha; a 1% increase from 3,955 ha to 3,975 ha.
- Seasonal cropping decreased by 180 ha; a 46% decrease from 390 ha to 210 ha.
- Vacant areas, previously permanent plantings, decreased by 10 ha; a 1% decrease from 1,240 ha to 1,230 ha.
- Vacant areas, previously seasonal crops, increased by 130 ha; a 54% increase from 240 ha to 370 ha.

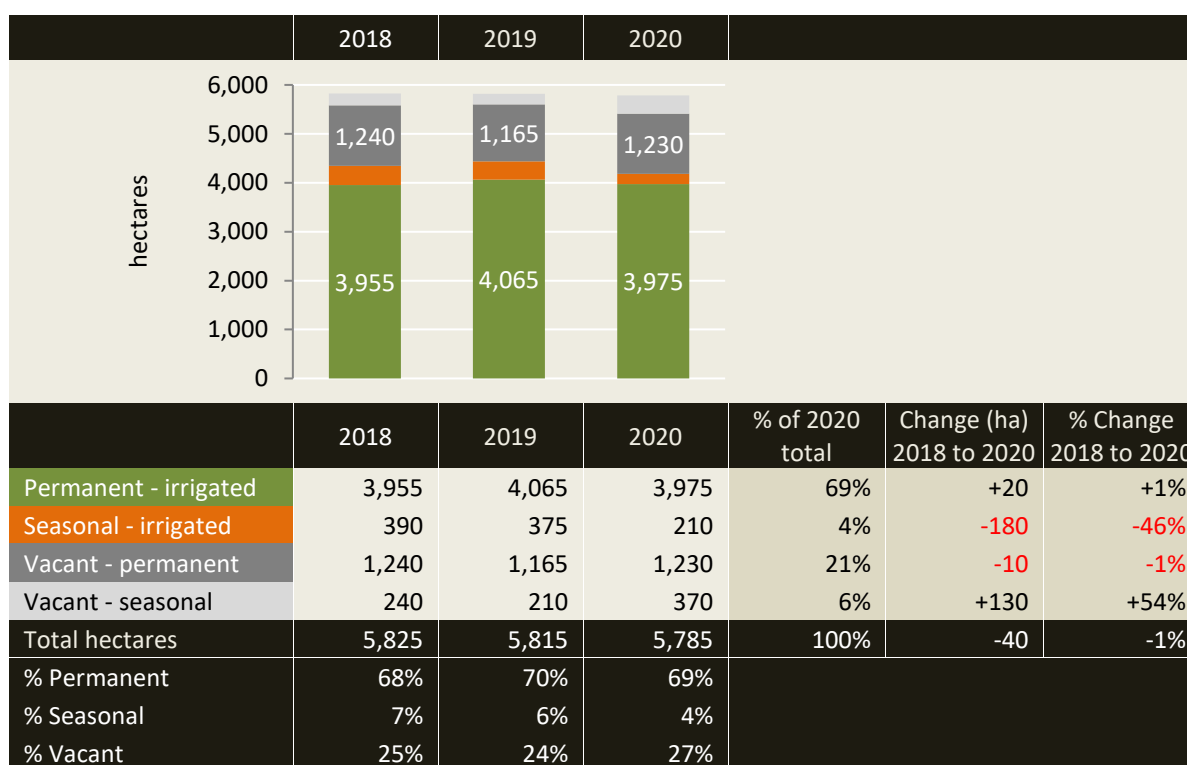
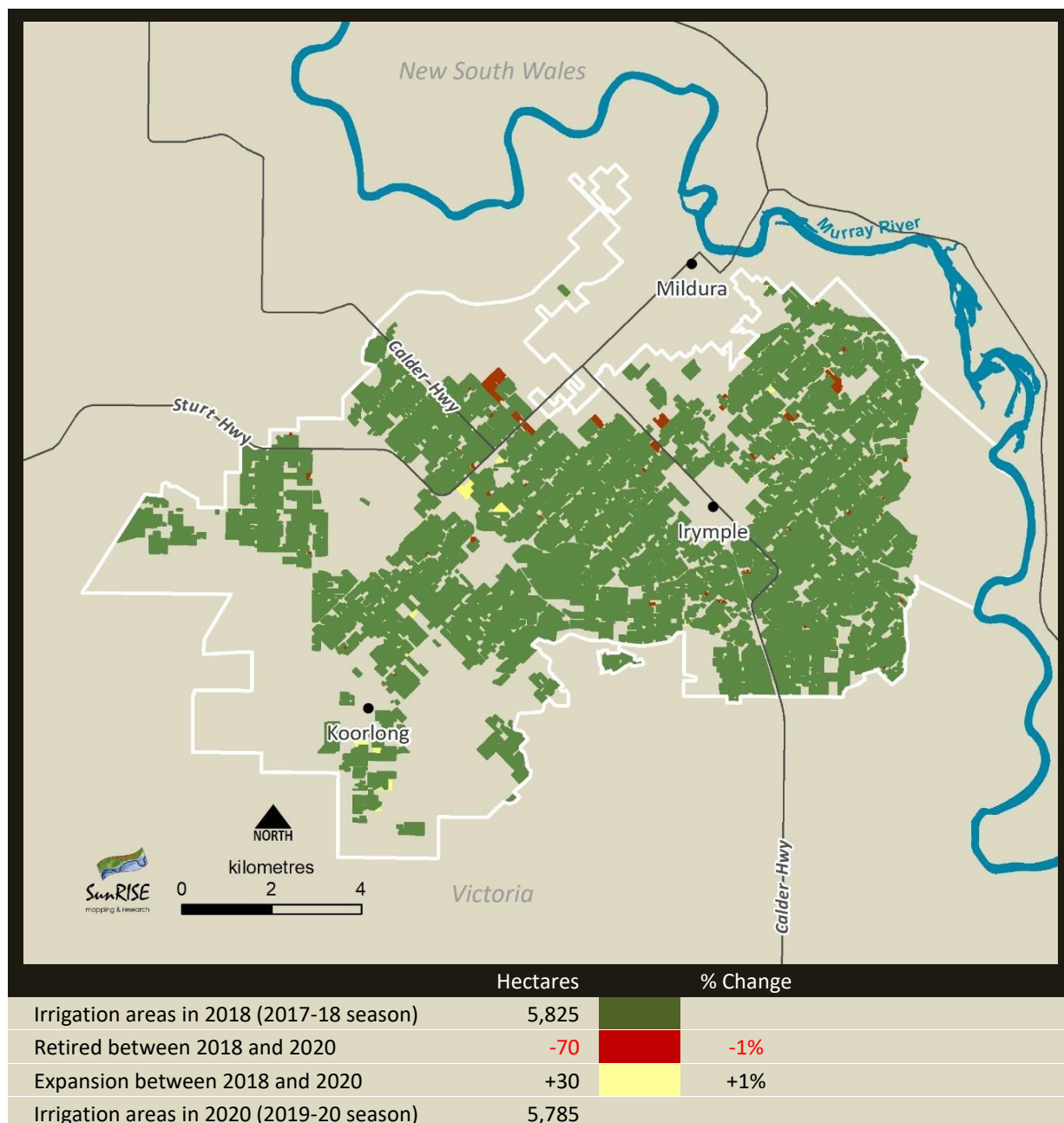


Figure 17: Mildura irrigation district - planting trends from 2018 to 2020

2.5.4 Mildura irrigation district - irrigation development

Map 11 shows irrigation development from 2018 to 2020 in the Mildura irrigation district with respect to new development (expansion) and areas retired¹⁴ from irrigation.

- The irrigable area decreased by 40 ha, a 1% decrease from 5,825 ha in 2018 to 5,785 ha in 2020.
- The net decrease of 40 ha was the balance of 30 ha of expansion and 70 ha retired from irrigation. Areas retired were predominantly for urban development.



Map 11: Mildura irrigation district - irrigation development from 2018 to 2020

¹⁴ Retired areas have undergone a change in land use that precludes use for irrigation e.g. urban development, housing, sheds, dams and land set aside for conservation purposes.

2.5.5 Mildura irrigation district - irrigation methods

Figure 18 summarises the change in irrigation methods in the Mildura irrigation district from 2018 to 2020.

Drippers remained the dominant irrigation method from 2018 to 2020.

From 2018 to 2020:

- Drip irrigation increased by 155 ha, a 7% increase from 2,305 ha to 2,460 ha.
- Lowlevel irrigation remained at 1,200 ha from 2018 to 2020.
- Overhead irrigation decreased by 260 ha, a 42% decrease from 620 ha to 360 ha.
- Furrow irrigation decreased by 55 ha, a 25% decrease from 220 ha to 165 ha.

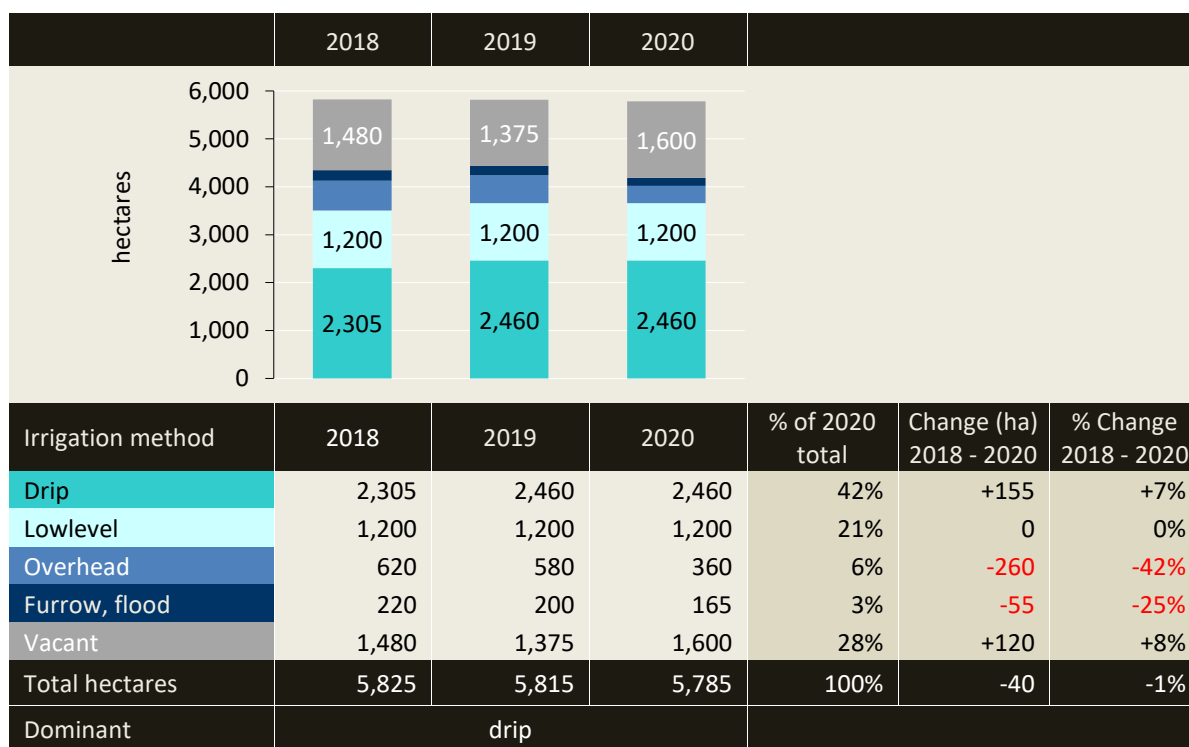


Figure 18: Mildura irrigation district - irrigation methods from 2018 to 2020

2.5.6 Mildura irrigation district - salinity impact zones

Figure 19 summarises the irrigable area in each salinity impact zone in the Mildura irrigation district from 2018 to 2020.

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

From 2018 to 2020, the area irrigated in:

- L1 decreased by 90 ha, a 6% decrease from 1,570 ha to 1,480 ha.
- HIZ decreased by 70 ha, a 3% decrease from 2,775 ha to 2,705 ha.

From 2018 to 2020, the irrigable area in:

- L1 increased by 15 ha, a 1% increase from 2,115 ha to 2,130 ha.
- HIZ decreased by 55 ha (retired from irrigation), a 1% decrease from 3,710 ha to 3,655 ha.

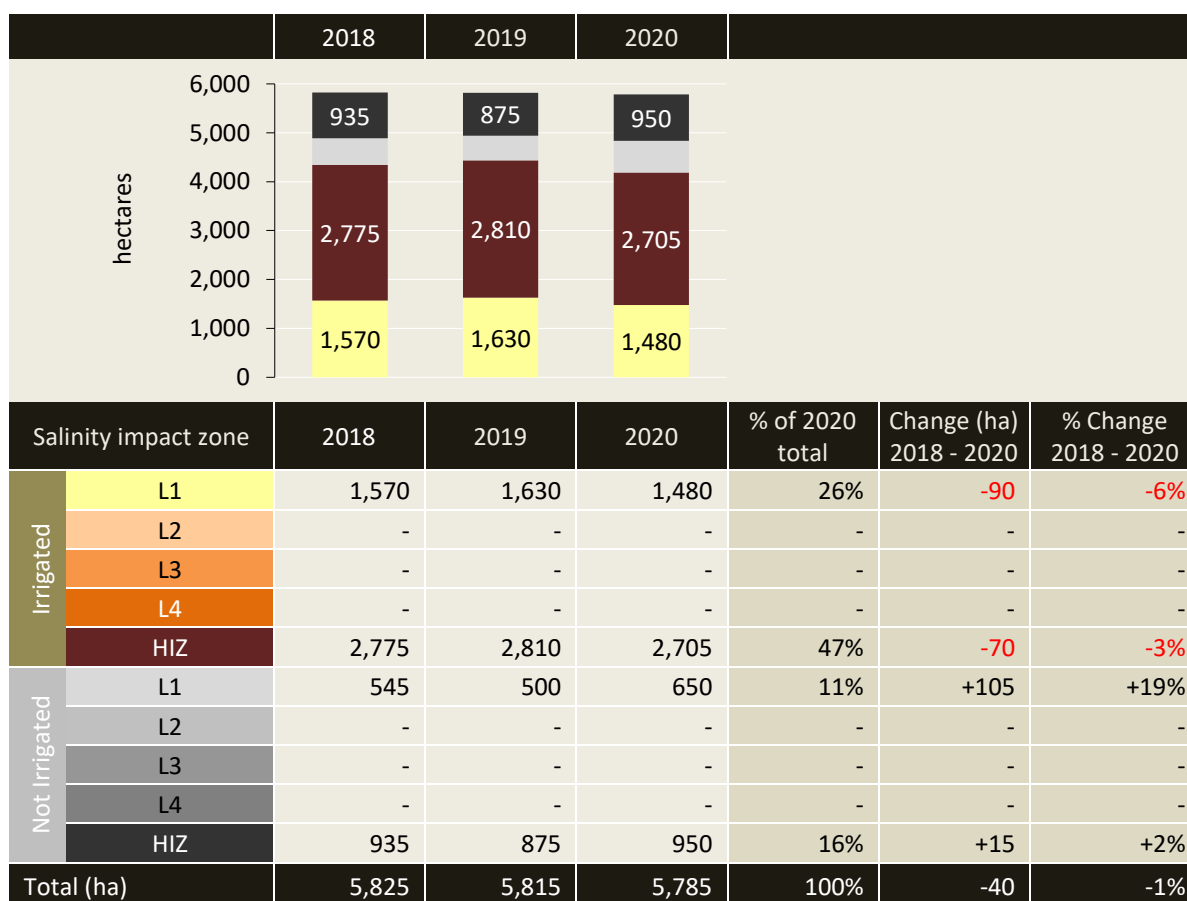


Figure 19: Mildura irrigation district - irrigable area in each salinity impact zone from 2018 to 2020

2.5.7 Mildura irrigation district - property change

Figure 20 provides estimates of property numbers and average property size (irrigable area) in the Mildura irrigation district from 2018 to 2020.

In 2020:

- There were approximately 585 irrigation properties; and
- most properties (91%) had an irrigable area less than 20 ha.

From 2018 to 2020:

- the number of properties decreased by 28; a 5% decrease from 613 to 585 properties;
- properties with an irrigable area less than 20 ha decreased by 26, while the number over 20 ha decreased by 2; and
- average property size (irrigable area) remained at 10 ha.

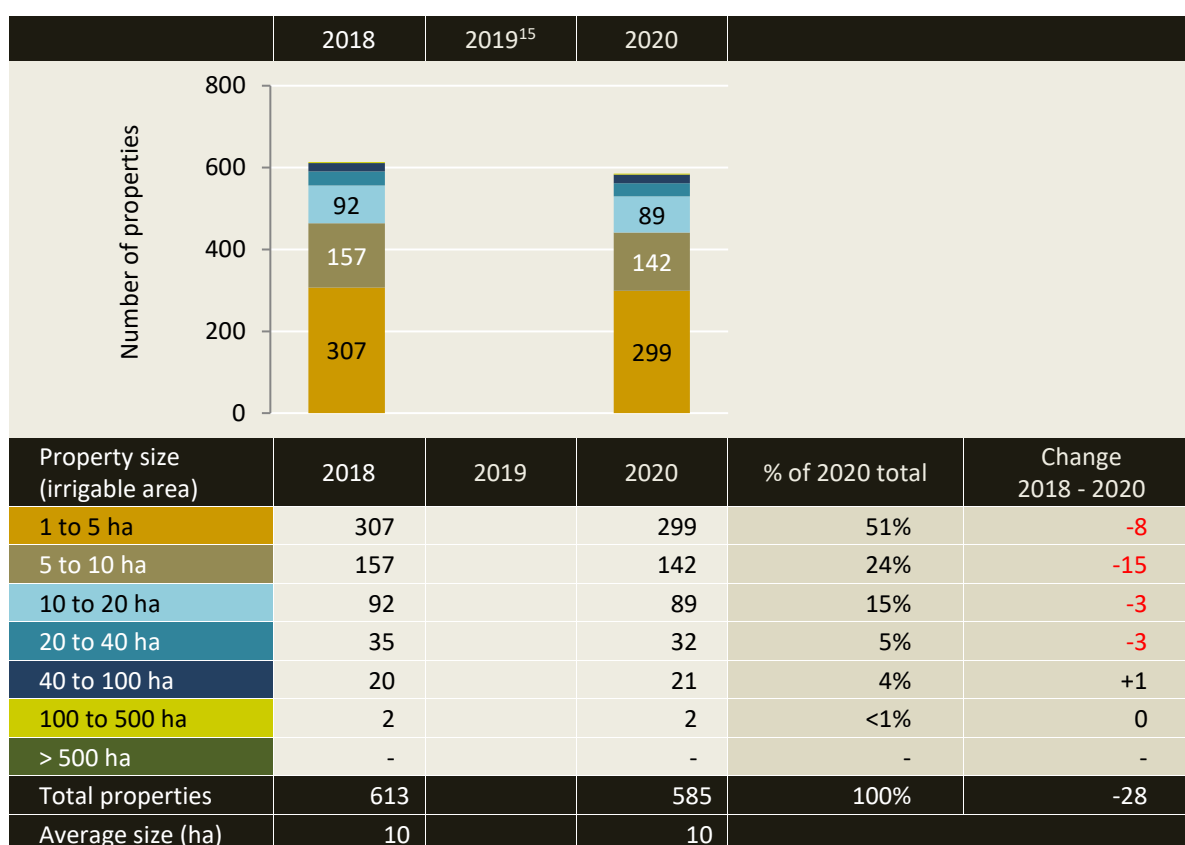


Figure 20: Mildura irrigation district - property numbers and sizes from 2018 to 2020

¹⁵ Property data was not maintained in 2019

2.5.8 Mildura irrigation district – water-use in 2020

99% (4,123 ha) of irrigated horticulture in the Mildura irrigation district was aligned to 30,843 ML of water-use for 2019-2020. Alignment for the remaining 1% of irrigated horticulture was not resolved, and resolution may affect the water-use figures presented.

Water use in the Mildura irrigation district accounted for 35% of total irrigation water use in the pumped districts in 2019-2020 (see Figure 14). Table grape plantings were the dominant crop irrigated in the Mildura irrigation district in 2020 (38%) and drip irrigation was the dominant irrigation method used (42%).

2.6 Merbein irrigation district

In summary for the Merbein irrigation district

Change in crop types from 2018 to 2020

The dominant crop type changed from dried grape plantings in 2018 to table grapes by 2019. The main changes from 2018 to 2020 were:

1. Dried grape plantings decreased by 170 ha, a 27% decrease from 620 ha to 450 ha.
2. Table grape plantings increased by 160 ha, a 29% increase from 550 ha to 710 ha.
3. Wine grapes decreased by 45 ha, a 15% decrease from 305 ha to 260 ha.
4. Vegetable crops decreased by 25 ha, a 24% decrease from 105 ha to 80 ha.
5. Nut trees, other than almonds, increased by 10 ha, a 10% increase from 105 ha to 115 ha.

Planting trends - permanent plantings, seasonal crops and vacant areas

From 2018 to 2020:

- Permanent plantings decreased by 45 ha; a 3% decrease from 1,725 ha to 1,680 ha and vacant areas, previously permanent plantings, decreased by 20 ha.
- Seasonal cropping decreased by 35 ha; an 18% decrease from 190 ha to 155 ha and vacant areas, previously seasonal crops, increased by 60 ha.

Irrigation development - new and retired areas

The irrigable area in the Merbein irrigation district decreased by 40 ha, a 1% decrease from 3,000 ha in 2018 to 2,960 ha in 2020. There were 40 ha retired from irrigation.

Irrigation methods 2018 to 2020

Drippers remained the dominant irrigation method between 2018 and 2020. Drip irrigation increased by 85 ha, a 9% increase from 990 ha to 1,075 ha. Lowlevel, overhead and furrow irrigation decreased by 20 ha, 35 ha and 110 ha respectively.

Salinity impact zones 2018 to 2020

The Merbein district is in the lowest salinity impact zone, L1 and in the high salinity impact zone, HIZ. From 2018 to 2020, the irrigable area in L1 decreased by 5 ha and HIZ decreased by 35 ha, a 2% decrease from 1,985 ha to 1,950 ha.

Irrigation properties

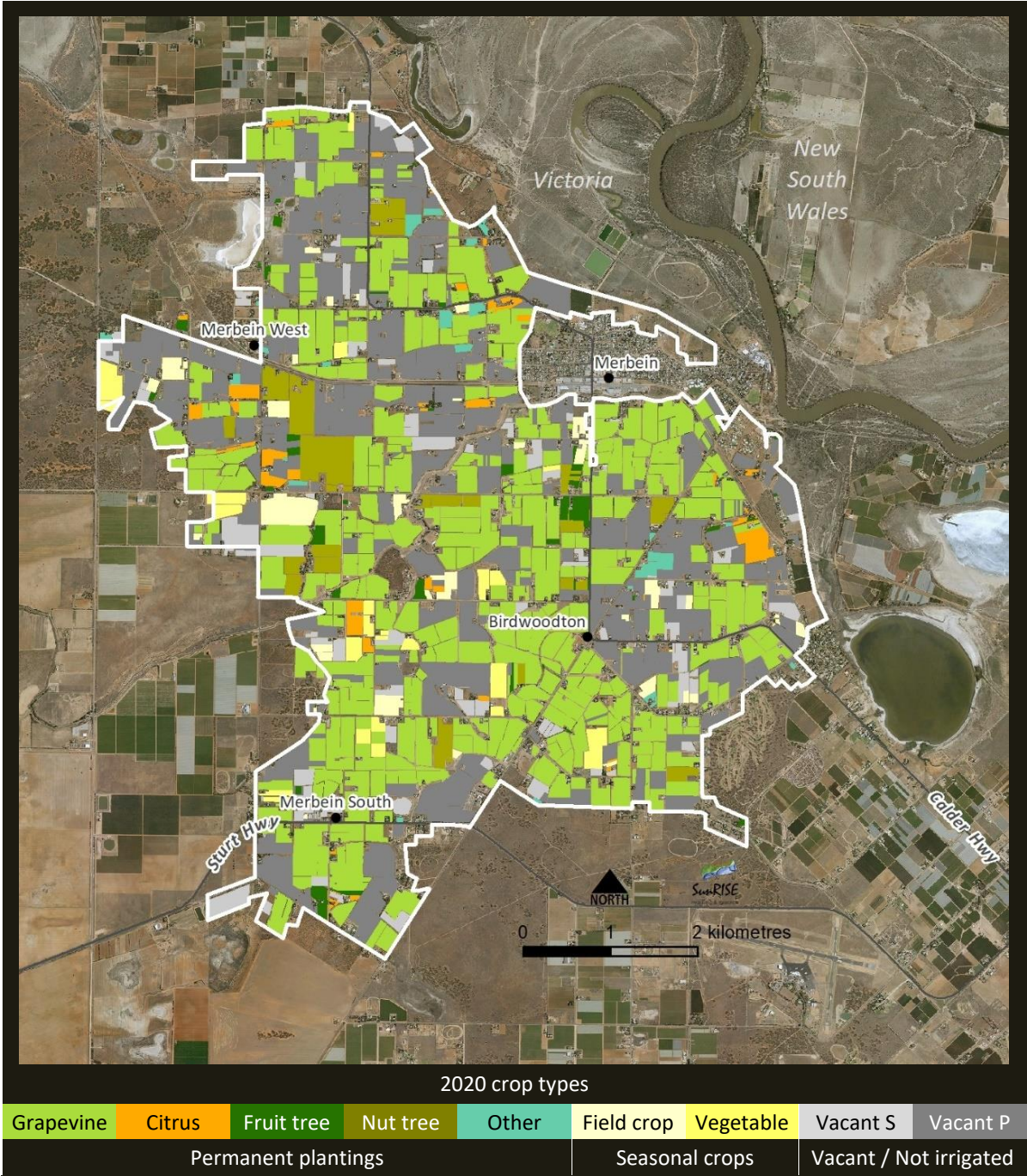
In 2020 there were approximately 261 irrigation properties in the Merbein district with an average irrigable area of 11 ha. From 2018 to 2020 the number of properties decreased by 13; a 5% decrease from 274 to 261 properties.

Water-use in 2020

Analysis of water use data estimates that 12,015 ML of water was applied to 1,809 ha of crops in the Merbein irrigation district in the 2019-20 season.

2.6.1 Merbein irrigation district - crop types in 2020

Map 12 shows the Merbein irrigation district with crop types in 2020.



Map 12: Merbein irrigation district showing crop types in 2020

2.6.2 Merbein irrigation district - crop types from 2018 to 2020

Figure 21 summarises the change in irrigated crops in the Merbein irrigation district from 2018 to 2020.

The dominant crop type changed from dried grape plantings in 2018 to table grapes in 2020.

The main changes from 2018 to 2020 were:

1. Dried grape plantings decreased by 170 ha, a 27% decrease from 620 ha to 450 ha.
1. Table grape plantings increased by 160 ha, a 29% increase from 550 ha to 710 ha.
2. Wine grapes decreased by 45 ha, a 15% decrease from 305 ha to 260 ha.
3. Vegetable crops decreased by 25 ha, a 24% decrease from 105 ha to 80 ha.
4. Nut trees, other than almonds, increased by 10 ha, a 10% increase from 105 ha to 115 ha.

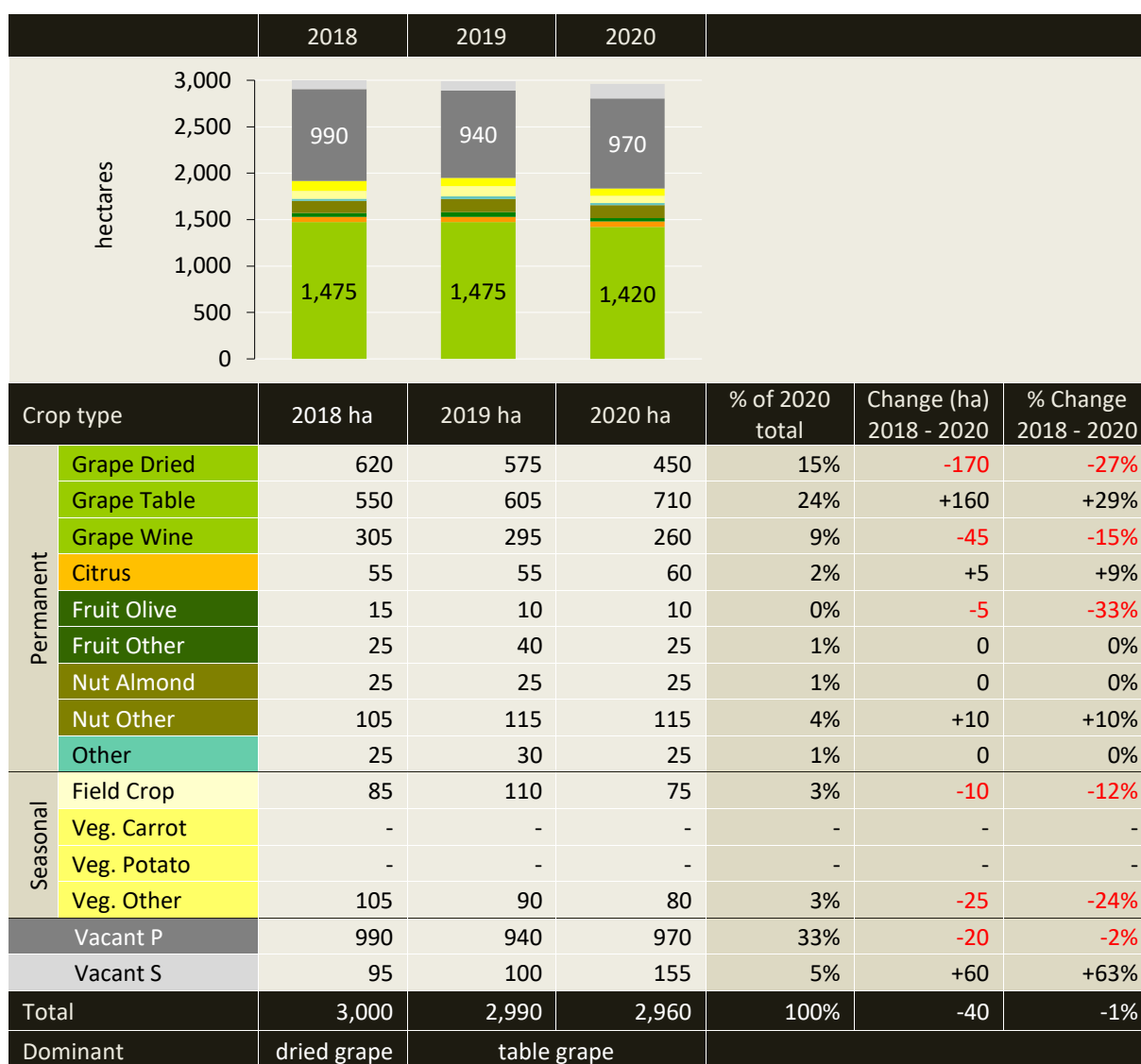


Figure 21: Merbein irrigation district - crop types from 2018 to 2020

2.6.3 Merbein irrigation district - planting trends

Figure 22 summarises planting trends in the Merbein irrigation district from 2018 to 2020.

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

- 58% permanent, 6% seasonal and 36% vacant in 2018; to
- 57% permanent, 5% seasonal and 38% vacant in 2020.

From 2018 to 2020:

- Permanent plantings decreased by 45 ha; a 3% decrease from 1,725 ha to 1,680 ha.
- Seasonal cropping decreased by 35 ha; an 18% decrease from 190 ha to 155 ha.
- Vacant areas, previously permanent plantings, decreased by 20 ha; a 2% decrease from 990 ha to 970 ha.
- Vacant areas, previously seasonal crops, increased by 60 ha; a 63% increase from 95 ha to 155 ha.

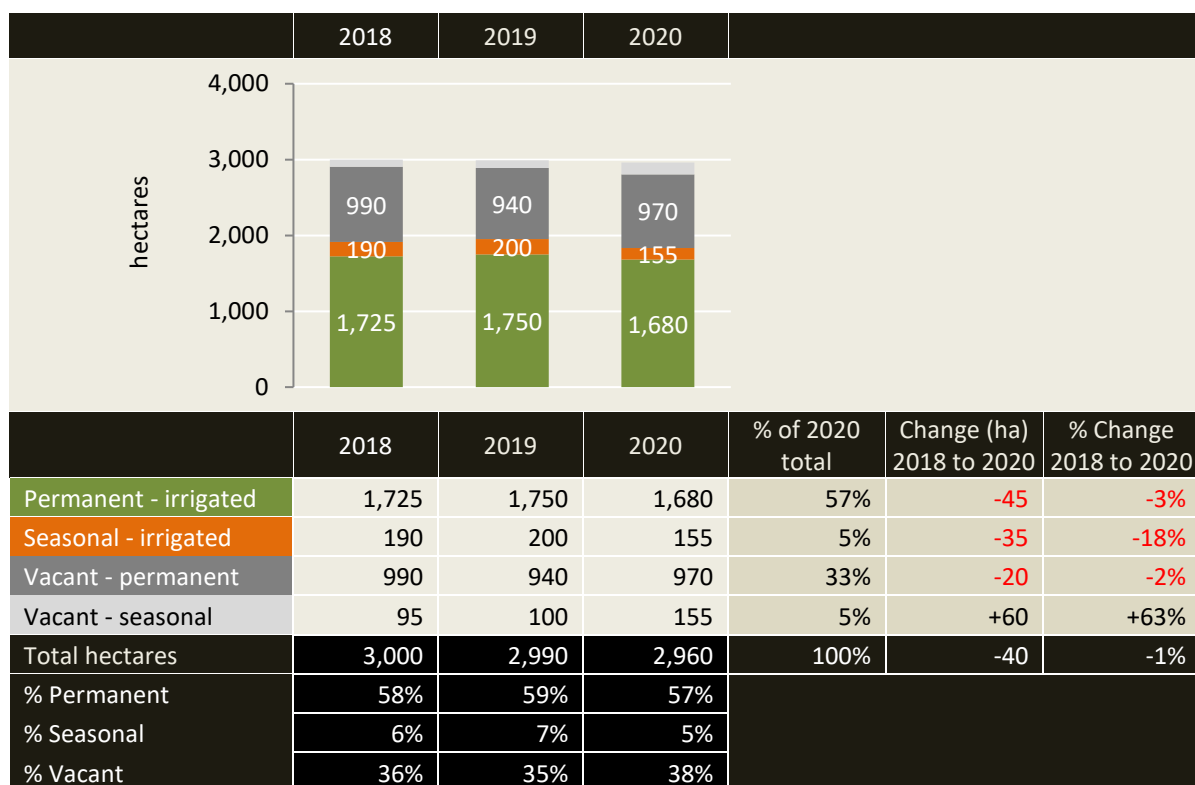
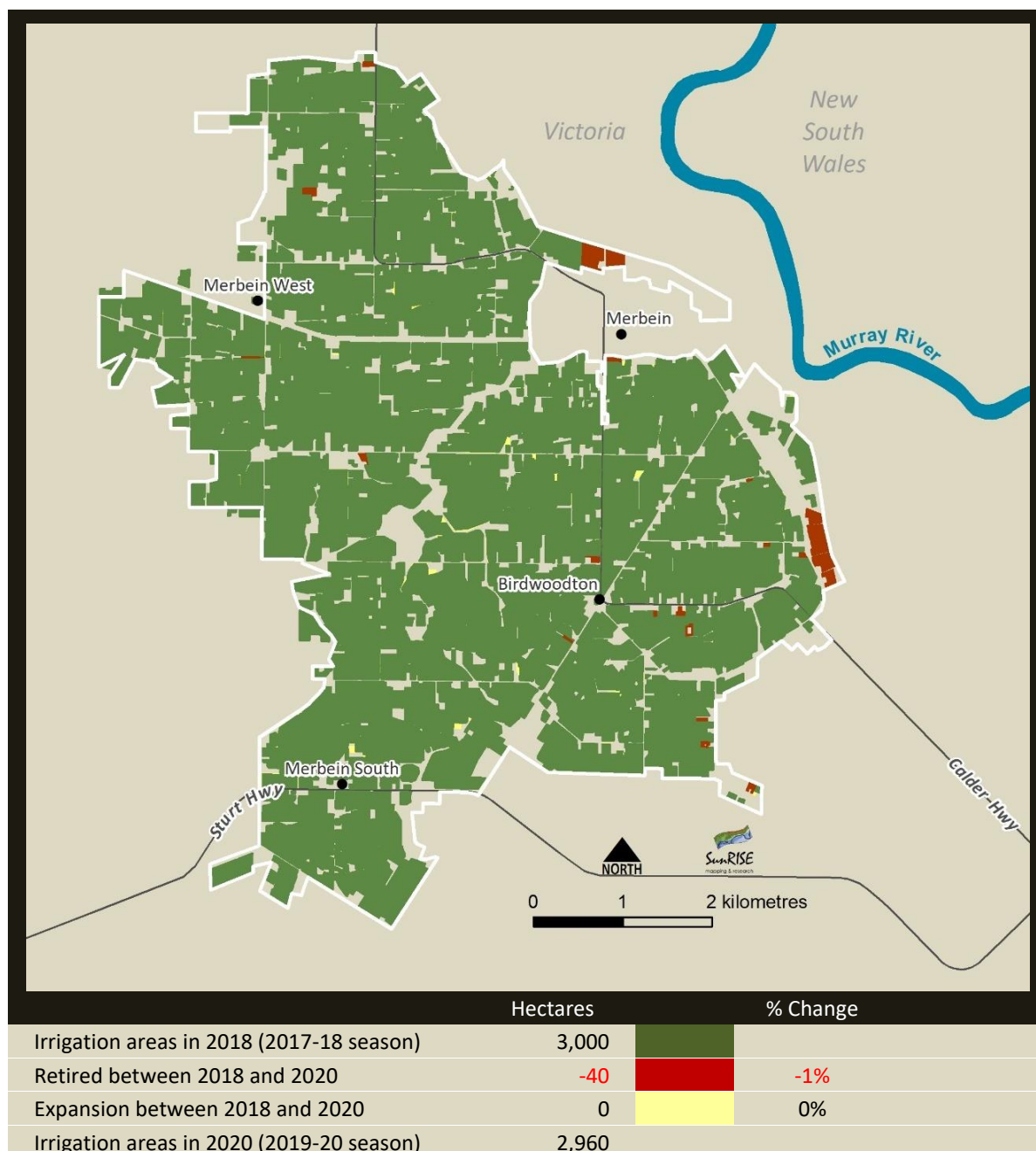


Figure 22: Merbein irrigation district - planting trends from 2018 to 2020

2.6.4 Merbein irrigation district - irrigation development

Map 13 shows irrigation development from 2018 to 2020 in the Merbein irrigation district with respect to new development (expansion) and areas retired¹⁶ from irrigation.

- The irrigable area decreased by 40 ha, a 1% decrease from 3,000 ha in 2018 to 2,960 ha in 2020.
- The decrease of 40 ha was land retired from irrigation.



Map 13: Merbein irrigation district - irrigation development from 2018 to 2020

¹⁶ Retired areas have undergone a change in land use that precludes use for irrigation e.g. urban development, housing, sheds, dams and land set aside for conservation purposes.

2.6.5 Merbein irrigation district - irrigation methods

Figure 23 summarises the change in irrigation methods in the Merbein irrigation district from 2018 to 2020.

Drippers remained the dominant irrigation method from 2018 to 2020.

From 2018 to 2020:

- Drip irrigation increased by 85 ha, a 9% increase from 990 ha to 1,075 ha;
- Lowlevel irrigation decreased by 20 ha, a 4% decrease from 530 ha to 510 ha;
- Overhead irrigation decreased by 35 ha, a 19% decrease from 185 ha to 150 ha; and
- Furrow irrigation decreased by 110 ha, a 52% decrease from 210 ha to 100 ha.

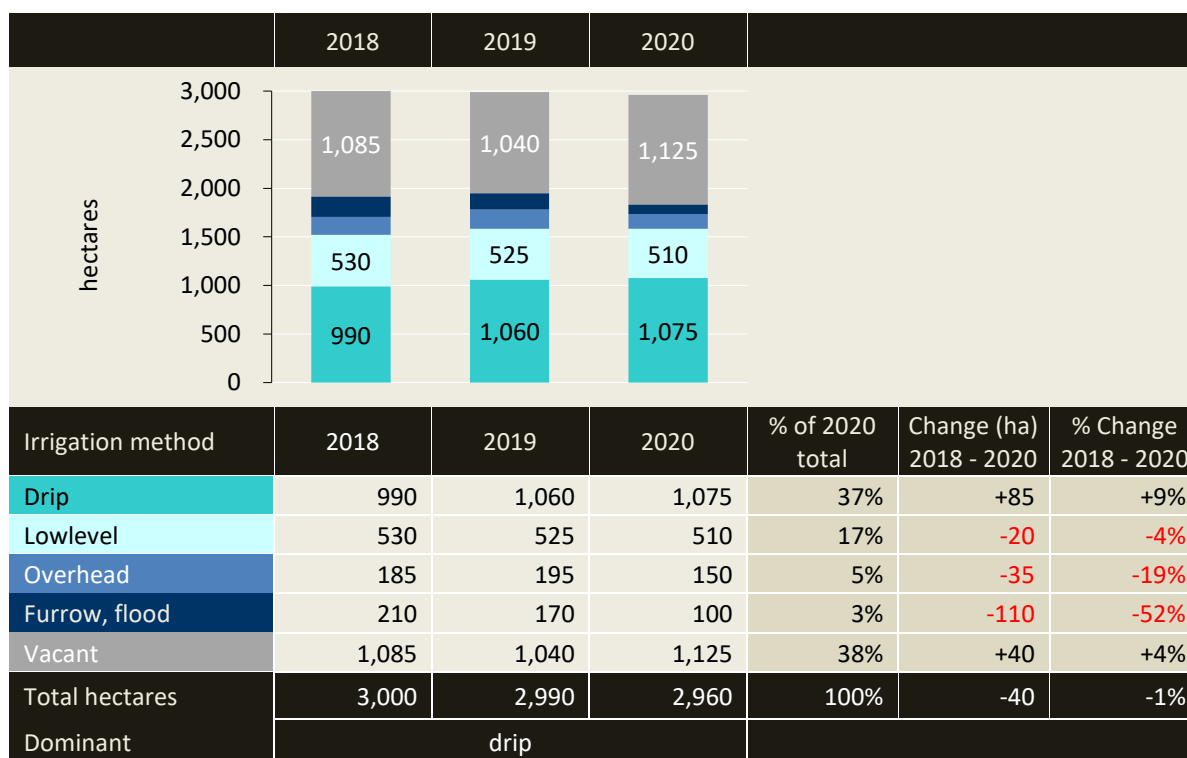


Figure 23: Merbein irrigation district - irrigation methods from 2018 to 2020

2.6.6 Merbein irrigation district - salinity impact zones

Figure 24 summarises the irrigable area in each salinity impact zone in the Merbein irrigation district from 2018 to 2020.

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

From 2018 to 2020, the area irrigated in:

- L1 increased by 10 ha, a 1% increase from 685 ha to 695 ha.
- HIZ decreased by 90 ha, a 7% decrease from 1,230 ha to 1,140 ha.

From 2018 to 2020, the irrigable area in:

- L1 decreased by 5 ha, from 1,015 ha in 2018 to 1,010 ha in 2020.
- HIZ decreased by 35 ha, a 2% decrease from 1,985 ha to 1,950 ha.

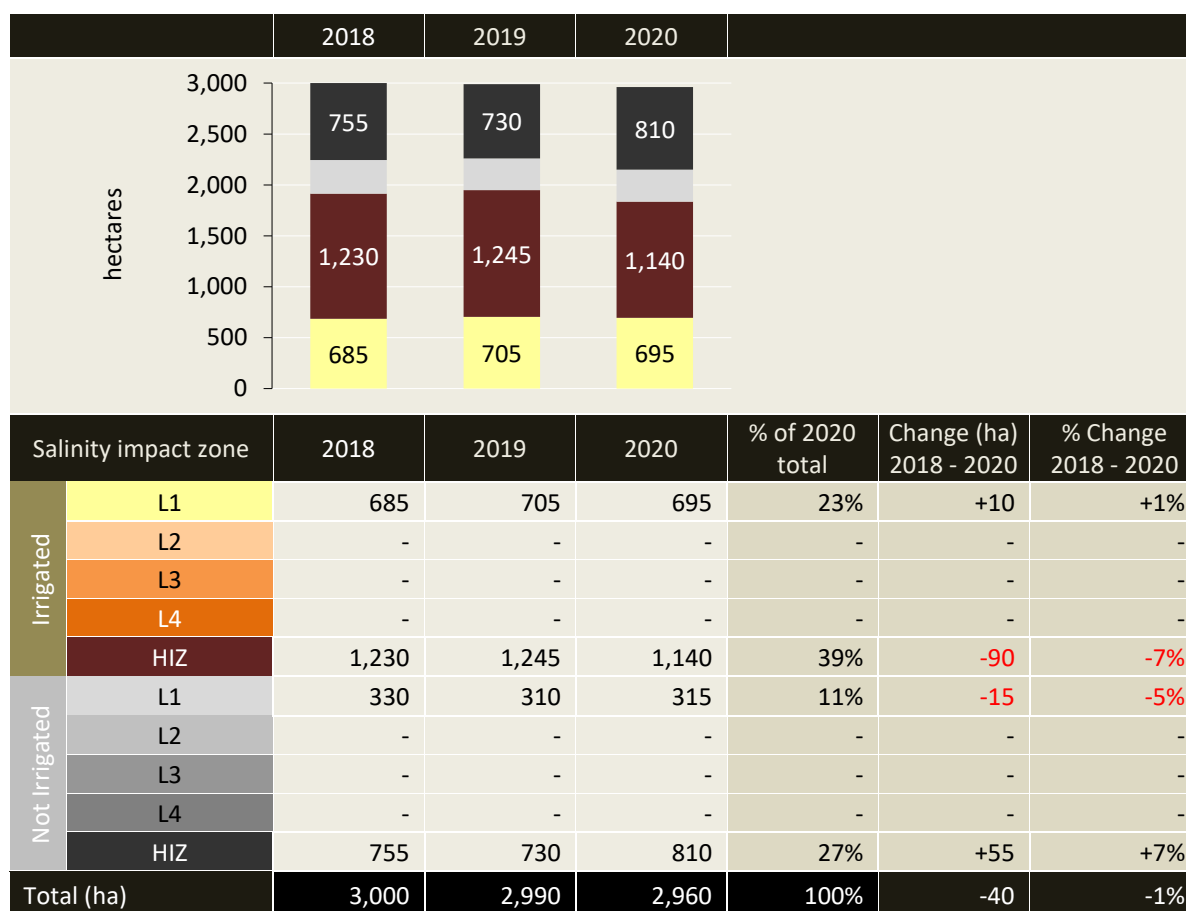


Figure 24: Merbein irrigation district - irrigable area in each salinity impact zone from 2018 to 2020

2.6.7 Merbein irrigation district - property change

Figure 25 provides estimates of property numbers and average property size (irrigable area) in the Merbein irrigation district from 2018 to 2020.

In 2020:

- There were approximately 261 irrigation properties; and
- most properties (88%) had an irrigable area less than 20 ha.

From 2018 to 2020:

- the number of properties decreased by 13; a 5% decrease from 274 to 261 properties;
- properties with an irrigable area less than 20 ha decreased by 13, while the number over 20 ha remained the same; and
- average property size (irrigable area) remained at 11 ha.

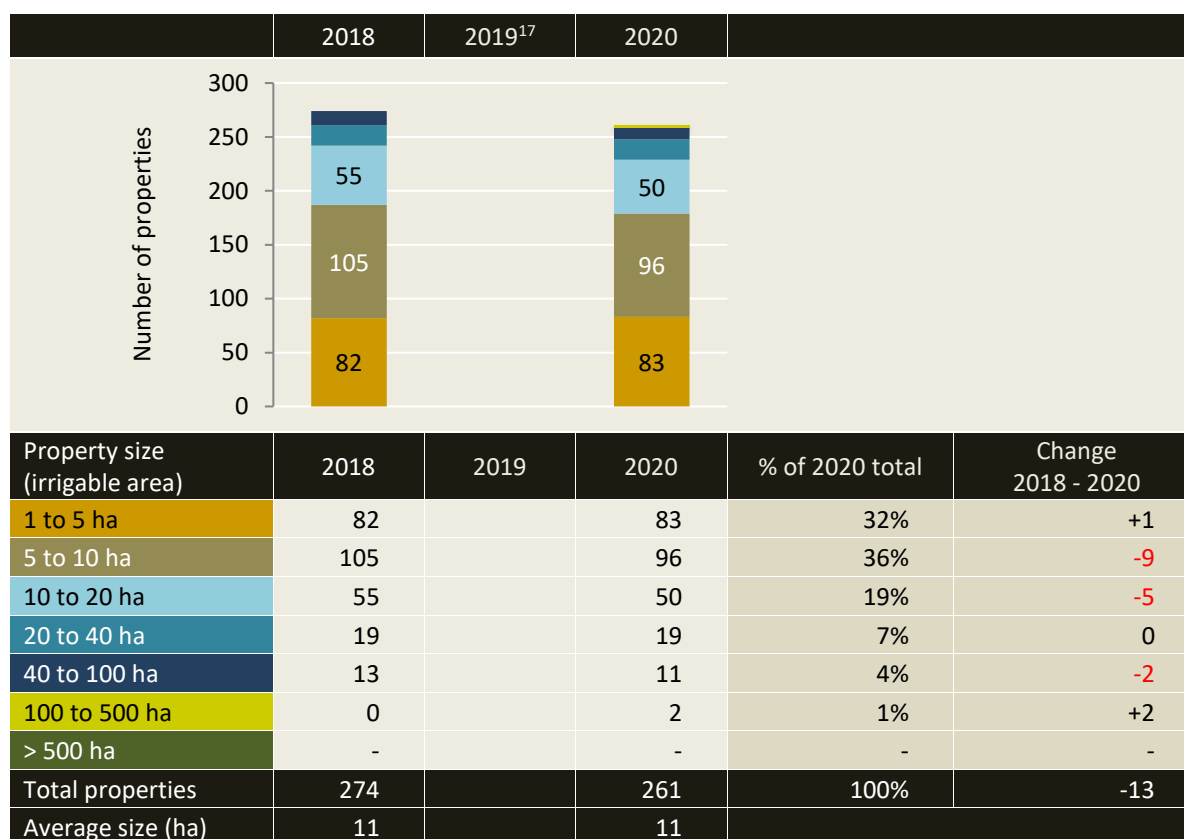


Figure 25: Merbein irrigation district - property numbers and sizes from 2018 to 2020

¹⁷ Property data was not maintained in 2019

2.6.8 Merbein irrigation district – water-use in 2020

99% (1,809 ha) of irrigated horticulture in the Merbein irrigation district was aligned to 12,015 ML of water-use. Alignment for the remaining 1% of irrigated horticulture was not resolved, and resolution may affect the water-use figures presented.

Water use in the Merbein irrigation district accounted for 14% of total irrigation water use in the pumped districts in 2019-2020 (see Figure 14). Table grape plantings were the dominant crop irrigated in the Merbein irrigation district in 2020 (24%) and drip irrigation was the dominant irrigation method used (37%).

3. Private diverters

3.1 Private diverters summary

In summary for private diverters, Nyah to South Australia

Change in crop types from 2018 to 2020

Almond trees were the dominant crop type from 2018 to 2020.

The main changes from 2018 to 2020 were:

1. Almond plantings increased by 1,220 ha, a 5% increase from 24,300 ha to 25,520 ha.
2. Field crops decreased by 2,070 ha, a 46% decrease from 4,540 ha to 2,470 ha.
3. Potato crops decreased by 780 ha, a 43% decrease from 1,795 ha to 1,015 ha.
4. Carrots decreased by 505 ha, a 35% decrease from 1,440 ha to 935 ha.
5. Table grape plantings increased by 460 ha, a 14% increase from 3,385 ha to 3,845 ha.
6. Wine grape plantings increased by 290 ha, a 6% increase from 5,160 ha to 5,450 ha.
7. Other nut trees, mainly pistachios, increased by 240 ha, a 63% increase from 380 to 620 ha.
8. Citrus plantings increased by 215 ha, a 6% increase from 3,820 ha to 4,035 ha.

Planting trends - permanent plantings, seasonal crops and vacant areas

From 2018 to 2020:

- Permanent plantings increased by 2,485 ha; a 6% increase from 43,820 ha to 46,305 ha.
- Seasonal cropping decreased by 3,705 ha; a 38% decrease from 9,670 ha to 5,965 ha.
- Vacant areas, previously permanent plantings, decreased by 320 ha; an 11% decrease from 2,960 ha to 2,640 ha.
- Vacant areas, previously seasonal crops, increased by 4,380 ha; an 89% increase from 4,900 ha to 9,280 ha.

Irrigation development - expansion and retired areas

Across the private diverter river reaches, the irrigable area increased by 2,840 ha, a 5% increase from 61,350 ha in 2018 to 64,190 ha in 2020.

The net increase of 2,840 ha was the balance of 2,880 ha of expansion and 40 ha retired from irrigation.

Expansion occurred in each of the six river reaches from 2018 to 2020, predominantly:

- the Wemen river reach with a net increase in irrigable area of 880 ha;
- the Boundary Bend river reach with a net increase in irrigable area of 765 ha; and
- the Nyah reach with a net increase in irrigable area of 495 ha.

In summary for private diverters, Nyah to South Australia

Irrigation methods 2018 to 2020

Drip irrigation remained the dominant irrigation method in the private diverter areas from 2018 to 2020.

From 2018 to 2020:

- Drip irrigation increased by 2,625 ha, a 7% increase from 39,965 ha to 42,590 ha.
- Lowlevel irrigation decreased by 400 ha, a 9% decrease from 4,510 ha to 4,110 ha.
- Overhead irrigation decreased by 2,385 ha, a 33% decrease from 7,275 ha to 4,890 ha.
- Furrow irrigation decreased by 1,060 ha, a 61% decrease from 1,740 ha to 680 ha.

Salinity impact zones 2018 to 2020

Irrigable areas across the private diverter river reaches were predominantly in the lowest salinity impact zone, L1, from 2018 to 2020.

From 2018 to 2020, the irrigable area in:

- L1 increased by 2,470 ha, a 7% increase from 34,525 ha to 36,995 ha.
- L2 to L4 increased by 380 ha, a 2% increase from 23,940 ha to 24,320 ha.
- HIZ decreased by 10 ha (retired areas), a less than 1% decrease from 2,885 ha to 2,875 ha.

Irrigation properties

In 2020, there were approximately 411 irrigation properties in the private diverter river reaches with an average irrigable area of 156 ha.

From 2018 to 2020, property numbers decreased by 16, a 4% decrease from 427 to 411 properties and average property size (irrigable area) increased from 144 ha to 156 ha.

Water-use in 2020

Analysis of water use data estimates that 424,599 ML of water was applied to 50,457 ha of crops in the Private diverter river reaches district in the 2019-20 season.

3.1.1 Private diverters summary - crop types from 2018 to 2020

Figure 26 summarises the change in irrigated crops across the six private diverter river reaches from 2018 to 2020.

From 2018 to 2020, almond trees were the dominant crop and the main changes were:

1. Almond plantings increased by 1,220 ha, a 5% increase from 24,300 ha to 25,520 ha.
1. Field crops decreased by 2,070 ha, a 46% decrease from 4,540 ha to 2,470 ha.
2. Potato crops decreased by 780 ha, a 43% decrease from 1,795 ha to 1,015 ha.
3. Carrots decreased by 505 ha, a 35% decrease from 1,440 ha to 935 ha.
4. Table grape plantings increased by 460 ha, a 14% increase from 3,385 ha to 3,845 ha.
5. Wine grape plantings increased by 290 ha, a 6% increase from 5,160 ha to 5,450 ha.
6. Other nut trees, mainly pistachios, increased by 240 ha, a 63% increase from 380 to 620 ha.
7. Citrus plantings increased by 215 ha, a 6% increase from 3,820 ha to 4,035 ha.

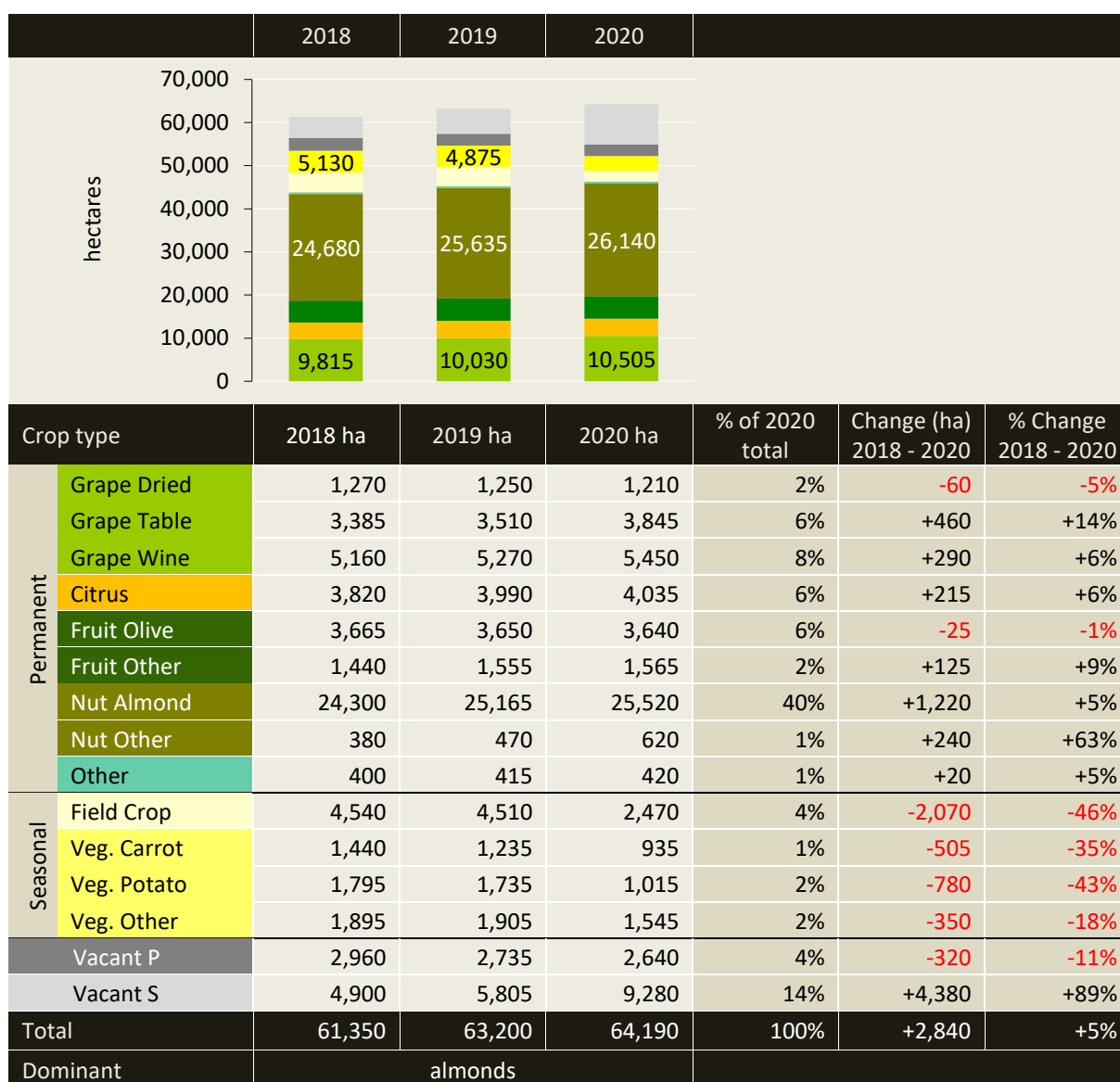


Figure 26: Private diverters - crop types from 2018 to 2020

3.1.2 Private diverters summary - planting trends

Figure 27 summarises planting trends of private diverters 2018 to 2020.

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

- 71% permanent, 16% seasonal and 13% vacant in 2018; to
- 72% permanent, 9% seasonal and 19% vacant in 2020.

From 2018 to 2020:

- Permanent plantings increased by 2,485 ha; a 6% increase from 43,820 ha to 46,305 ha.
- Seasonal cropping decreased by 3,705 ha; a 38% decrease from 9,670 ha to 5,965 ha.
- Vacant areas, previously permanent plantings, decreased by 320 ha; an 11% decrease from 2,960 ha to 2,640 ha.
- Vacant areas, previously seasonal crops, increased by 4,380 ha; an 89% increase from 4,900 ha to 9,280 ha.

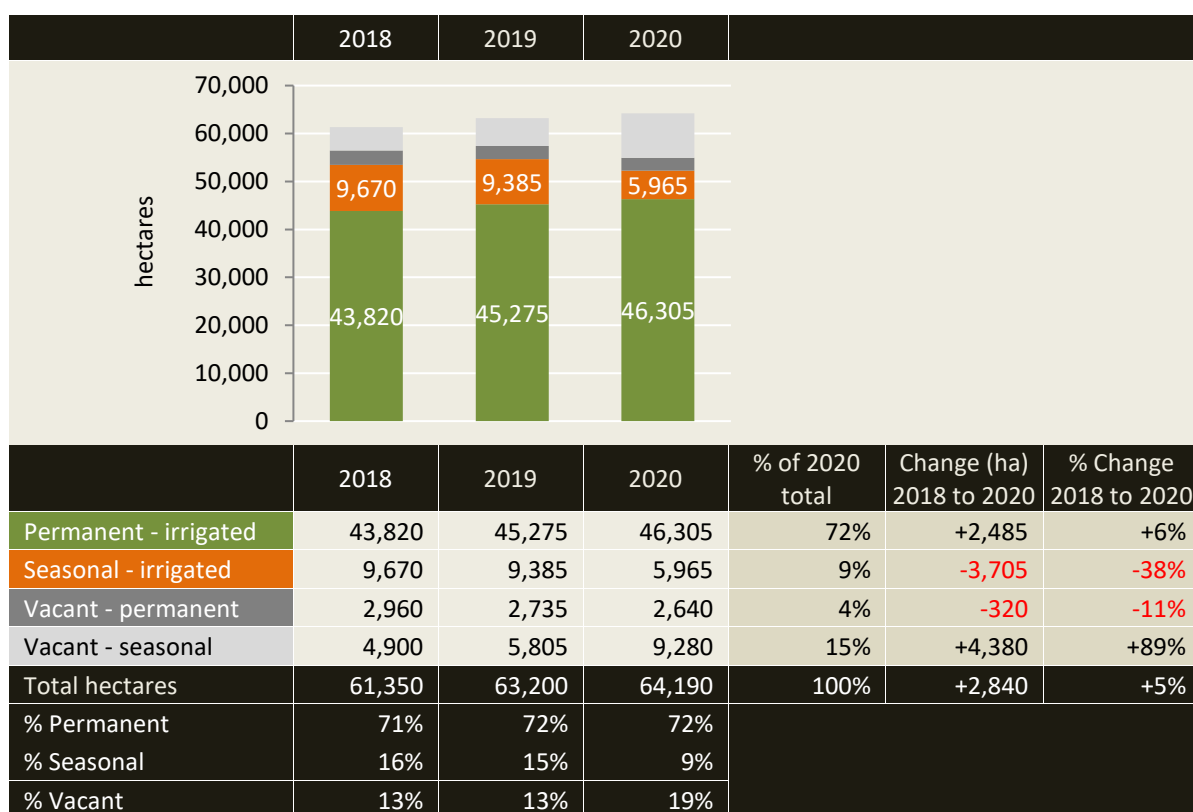


Figure 27: Private diverters - planting trends from 2018 to 2020

3.1.3 Private diverters summary - irrigation development

Figure 28 summarises irrigation development with respect to new development (expansion) and areas retired¹⁸ from irrigation in the private diverter river reaches from 2018 to 2020.

- The irrigable area increased by 2,840 ha, a 5% increase from 61,350 ha in 2018 to 64,190 ha in 2020.
- The net increase of 2,840 ha was the balance of 2,880 ha of expansion and 40 ha retired from irrigation.
- Expansion occurred in all six river reaches. The largest growth areas from 2018 to 2020 were:
 - the Wemen river reach with a net increase in irrigable area of 880 ha;
 - the Boundary Bend reach with a net increase of 765 ha; and
 - the Nyah reach with a net increase of 495 ha.

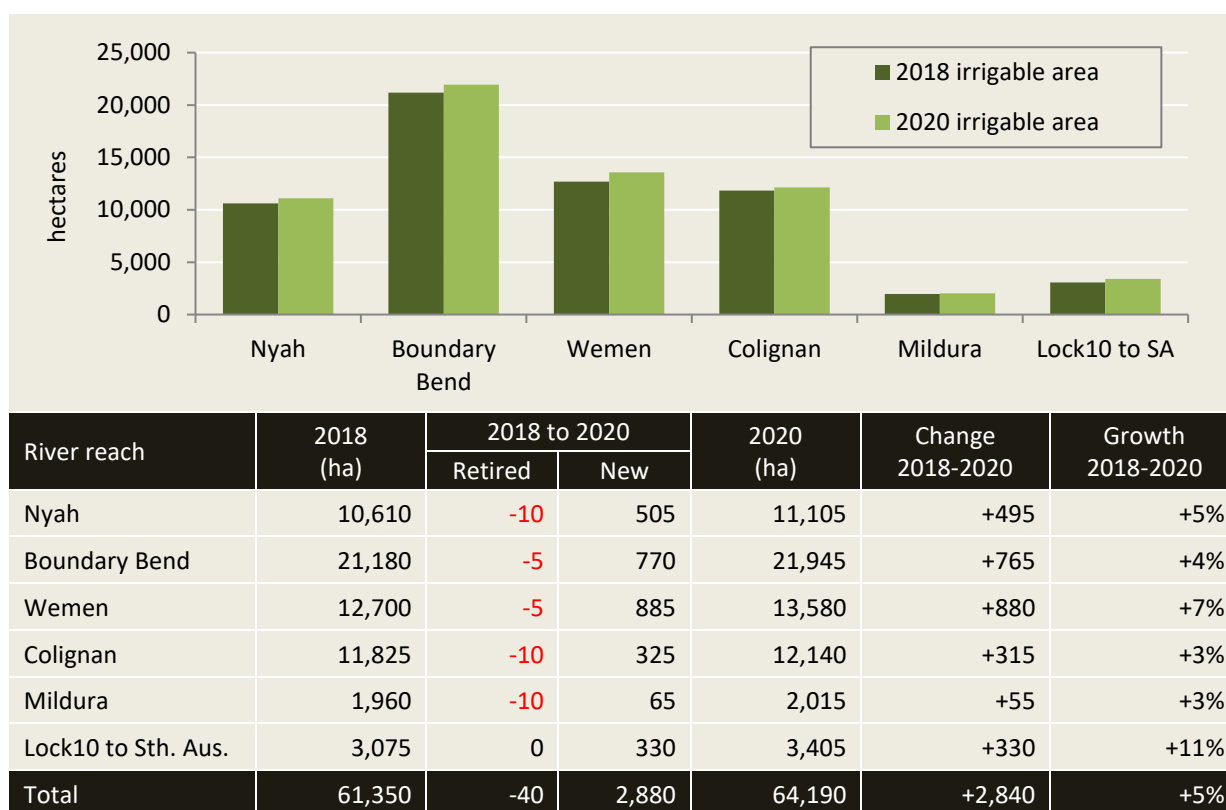


Figure 28: Private diverters - irrigation development from 2018 to 2020

¹⁸ Retired areas have undergone a change in land use that precludes use for irrigation e.g. urban development, housing, sheds, dams and land set aside for conservation purposes.

3.1.4 Private diverters summary - irrigation methods

Figure 29 summarises the change in irrigation methods for Murray River private diverters in the Mallee catchment from 2018 to 2020.

Drippers remained the dominant irrigation method from 2018 to 2020.

From 2018 to 2020:

- Drip irrigation increased by 2,625 ha, a 7% increase from 39,965 ha to 42,590 ha.
- Lowlevel irrigation decreased by 400 ha, a 9% decrease from 4,510 ha to 4,110 ha.
- Overhead irrigation decreased by 2,385 ha, a 33% decrease from 7,275 ha to 4,890 ha.
- Furrow irrigation decreased by 1,060 ha, a 61% decrease from 1,740 ha to 680 ha.

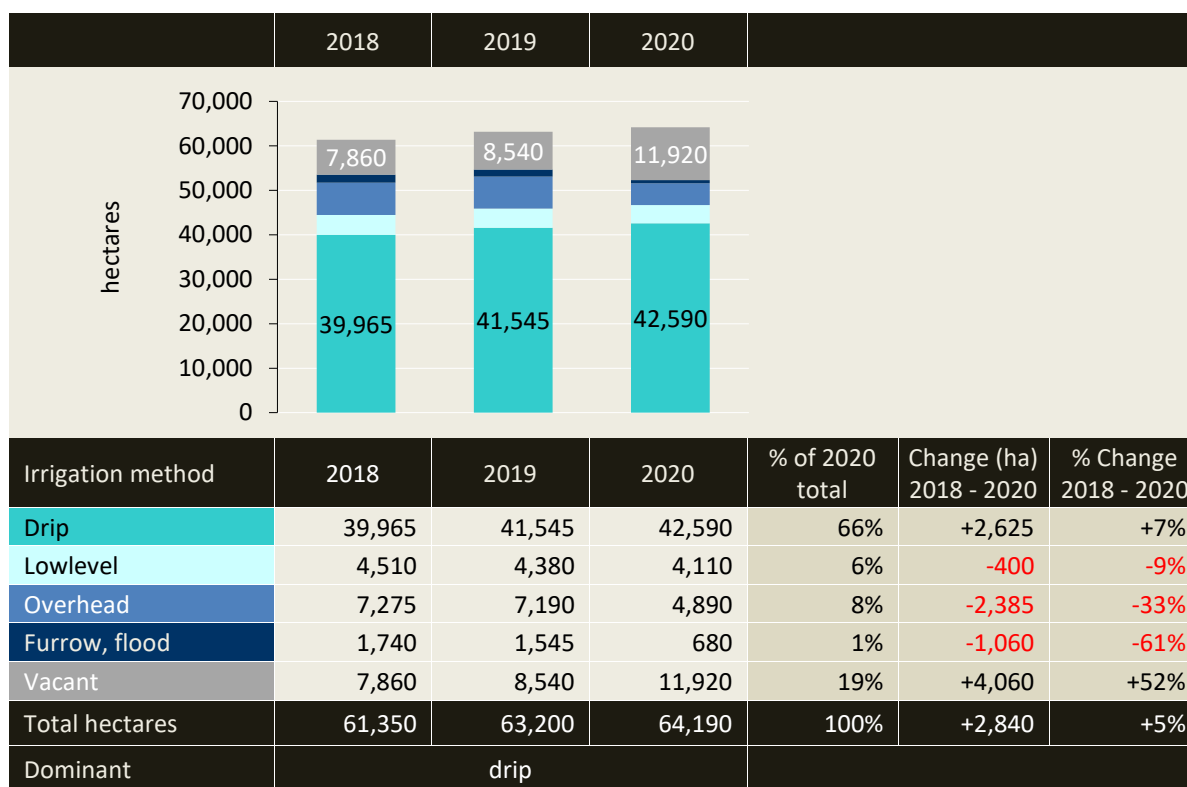


Figure 29: Private diverters - irrigation methods from 2018 to 2020

3.1.5 Private diverters summary - salinity impact zones

Figure 30 summarises the irrigable area in each salinity impact zone across the private diverter river reaches from 2018 to 2020.

The dominant salinity impact zone was the lowest salinity impact zone, L1, from 2018 to 2020.

From 2018 to 2020, the area irrigated in:

- L1 increased by 65 ha, a less than 1% increase from 31,700 ha to 31,765 ha.
- L2 to L4 decreased by 1,165 ha, a 6% decrease from 19,920 ha to 18,755 ha.
- HIZ decreased by 120 ha, a 6% decrease from 1,870 ha to 1,750 ha.

From 2018 to 2020, the irrigable area in:

- L1 increased by 2,470 ha, a 7% increase from 34,525 ha to 36,995 ha.
- L2 to L4 increased by 380 ha, a 2% increase from 23,940 ha to 24,320 ha.
- HIZ decreased by 10 ha (retired areas), a less than 1% decrease from 2,885 ha to 2,875 ha.

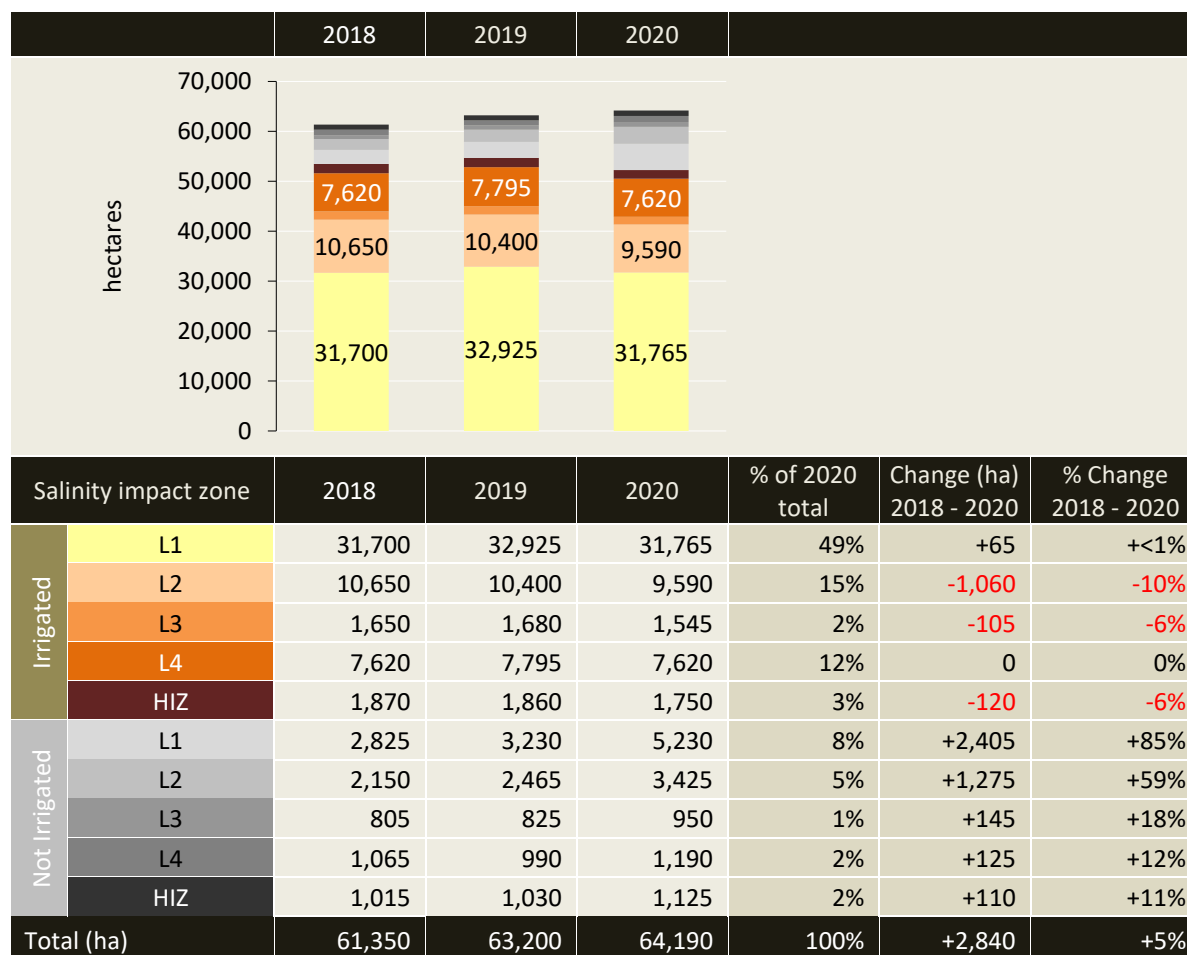


Figure 30: Private diverters - irrigable area in each salinity impact zone from 2018 to 2020

3.1.6 Private diverters summary - property change

Figure 31 provides an estimate of property numbers and average property size (irrigable area) in the private diverter river reaches from 2018 to 2020.

In 2020:

- There were approximately 156 irrigation properties; and
- most properties (57%) had an irrigable area greater than 20 ha.

From 2018 to 2020:

- The number of properties decreased by 16; a 4% decrease from 427 to 411 properties;
- Properties with an irrigable area less than 20 ha decreased by 8, and the number over 20 ha decreased by 8; and
- Average property size (irrigable area) increased from 144 ha to 156 ha.

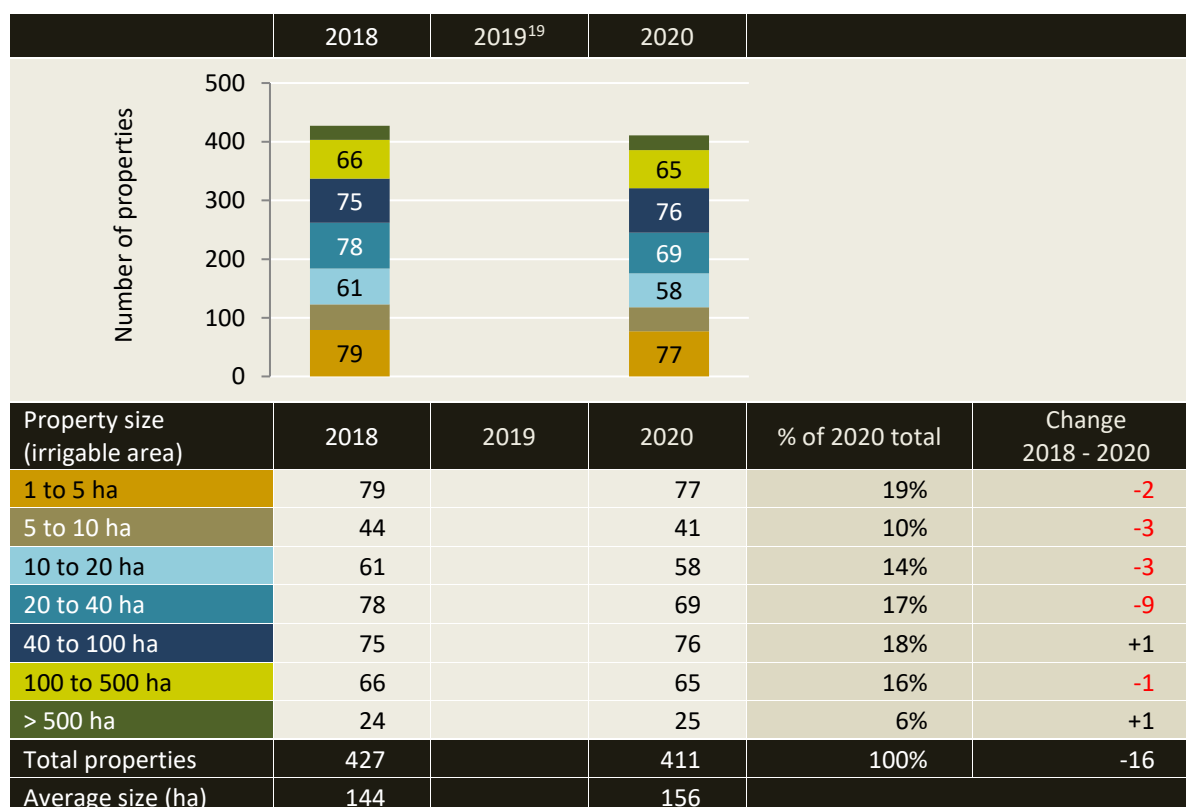


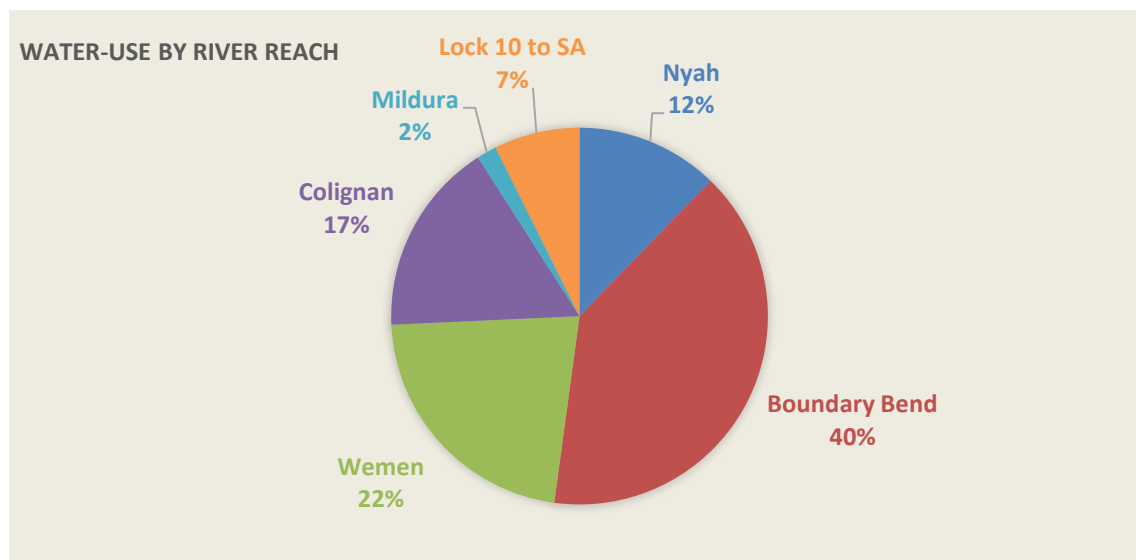
Figure 31: Private diverters - property numbers and sizes from 2018 to 2020

¹⁹ Property data was not maintained in 2019

3.1.7 Private diverters summary – water-use in 2020

Figure 32 shows irrigation water-use for private diverters in the Mallee catchment in 2020 (i.e. 2019-2020).

97% (50,457 ha) of irrigated horticulture in the private diverter river reach was aligned to 424,599 ML for 2019-2020. Alignment for the remaining 3% of irrigated horticulture was not resolved, and resolution may affect the water-use figures presented.



River reach	% of crops aligned to water-use data	Hectares aligned	Water-use (ML)	% of total water-use
Nyah	96%	7,238	52,032	12%
Boundary Bend	97%	17,502	169,445	40%
Wemen	97%	11,806	94,005	22%
Colignan	95%	9,622	70,681	17%
Mildura	88%	1,281	7,172	2%
Lock 10 to SA	100%	3,008	31,265	7%
Total	97%	50,457	424,599	100%

Figure 32: Private diverters - irrigation water-use in each river reach in 2020

3.2 Nyah river reach (Woorinen to the Wakool junction)

In summary for the Nyah river reach

Change in crop types from 2018 to 2020

Almonds were the dominant crop from 2018 to 2020. The main changes from 2018 to 2020 were:

1. Field crops decreased by 1,140 ha, a 49% decrease from 2,315 to 1,175 ha.
2. Almond plantings increased by 200 ha, a 6% increase from 3,590 to 3,790 ha.
3. Wine grape plantings increased by 170 ha, a 19% increase from 890 to 1,060 ha.
4. Vegetables decreased by 130 ha, a 39% decrease from 335 to 205 ha.
5. Other nut trees, pistachios, increased by 120 ha, a 2,400% increase from 5 to 125 ha.
6. Fruit trees, other than olives, increased by 40 ha, an 5% increase from 765 to 805 ha.

Planting trends - permanent plantings, seasonal crops and vacant areas

From 2018 to 2020:

- Permanent plantings increased by 515 ha; a 9% increase from 5,620 ha to 6,135 ha and vacant areas, previously permanent plantings, decreased by 35 ha.
- Seasonal cropping decreased by 1,270 ha; a 48% decrease from 2,650 ha to 1,380 ha and vacant areas, previously seasonal crops, increased by 1,285 ha.

Irrigation development - new and retired areas

The irrigable area in the Nyah river reach increased by 495 ha; a 5% increase from 10,610 ha in 2018 to 11,105 ha in 2020. The net increase of 495 ha was the balance of 505 ha expansion and 10 ha retired from irrigation.

Irrigation methods 2018 to 2020

Drippers remained the dominant irrigation method from 2018 to 2020. Drip irrigation increased by 530 ha, a 9% increase from 5,755 ha to 6,285 ha. Lowlevel, overhead and furrow irrigation decreased by 170 ha, 105 ha and 1,010 ha respectively.

Salinity impact zones 2018 to 2020

The Nyah river reach is in the low salinity impact zones: L1, L2 and L3. From 2018 to 2020, the irrigable area in L1 increased by 400 ha, a 6% increase from 7,070 ha to 7,470 ha, L2 increased by 95 ha and L3 remained at 10 ha from 2018 to 2020.

Irrigation properties

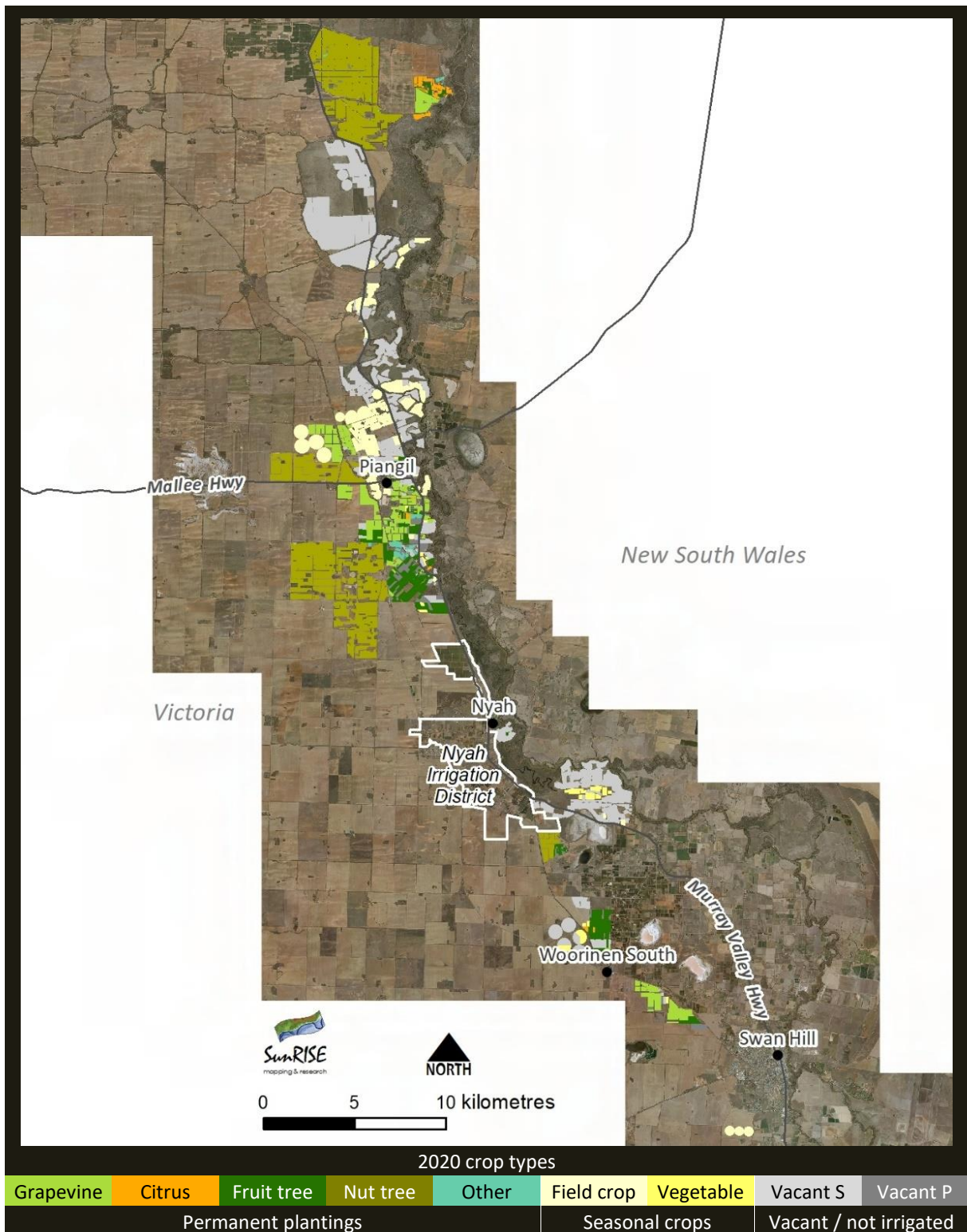
In 2020 there were approximately 76 irrigation properties in the Nyah river reach with an average irrigable area of 146 ha. From 2018 to 2020 the number of properties decreased by 5, from 81 to 76 properties.

Water-use in 2020

Analysis of water use data estimates that 52,032 ML of water was applied to 7,238 ha of crops in the Nyah river reach in the 2019-20 season.

3.2.1 Nyah river reach - crop types in 2020

Map 14 shows the Nyah river reach with crop types in 2020.



Map 14: Nyah river reach showing crop types in 2020

3.2.2 Nyah river reach - crop types from 2018 to 2020

Figure 33 summarises the change in irrigated crops in the Nyah river reach from 2018 to 2020.

Almond trees were the dominant crop from 2018 to 2020.

The main changes from 2018 to 2020 were:

1. Field crops decreased by 1,140 ha, a 49% decrease from 2,315 to 1,175 ha.
2. Almond plantings increased by 200 ha, a 6% increase from 3,590 to 3,790 ha.
3. Wine grape plantings increased by 170 ha, a 19% increase from 890 to 1,060 ha.
4. Vegetables decreased by 130 ha, a 39% decrease from 335 to 205 ha.
5. Other nut trees, pistachios, increased by 120 ha, a 2,400% increase from 5 to 125 ha.
6. Fruit trees, other than olives, increased by 40 ha, a 5% increase from 765 to 805 ha.

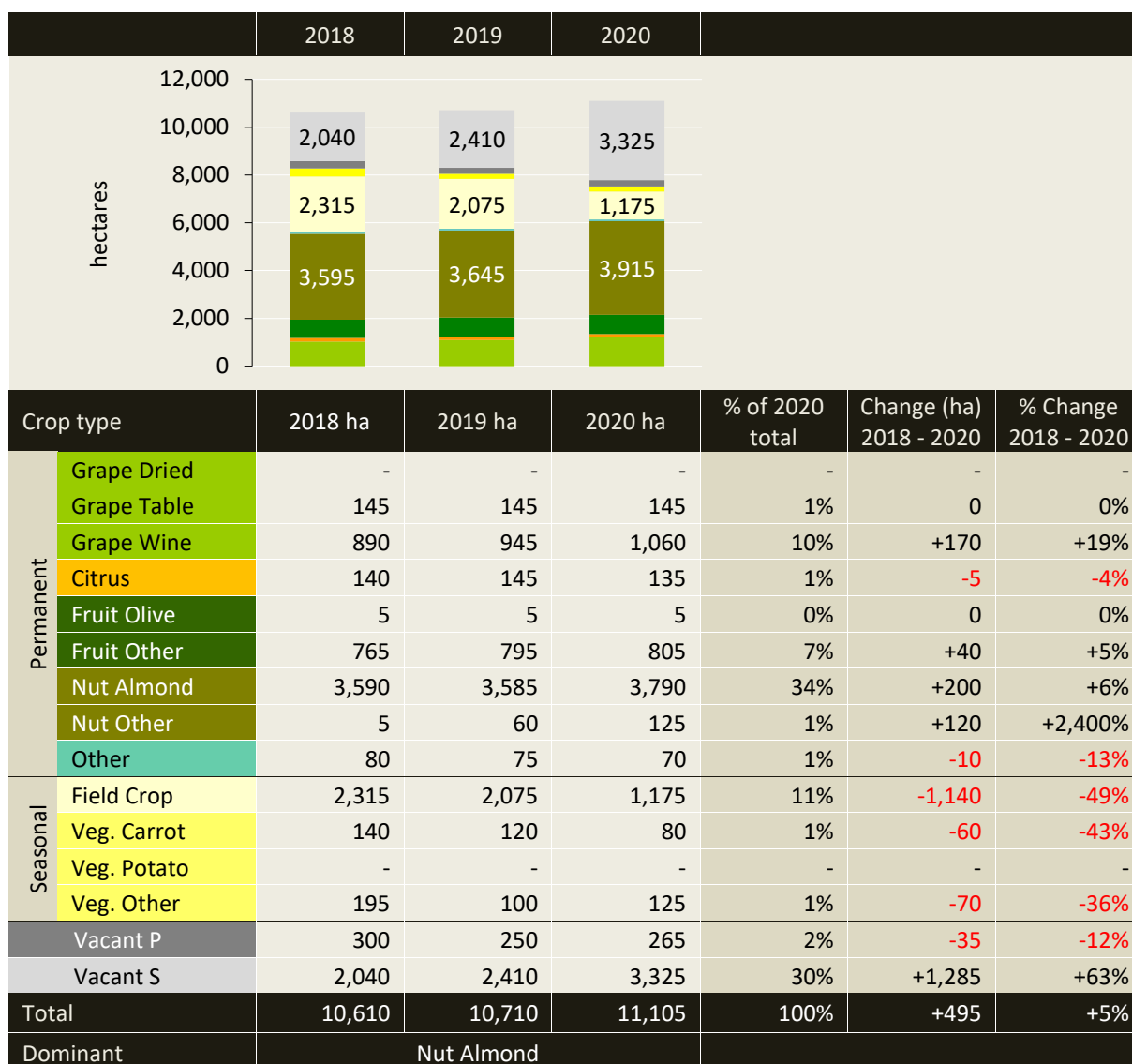


Figure 33: Nyah river reach - crop types from 2018 to 2020

3.2.3 Nyah river reach - planting trends

Figure 34 summarises planting trends in the Nyah river reach from 2018 to 2020.

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

- 53% permanent, 25% seasonal and 22% vacant in 2018; to
- 55% permanent, 13% seasonal and 32% vacant in 2020.

From 2018 to 2020:

- Permanent plantings increased by 515 ha; an 9% increase from 5,620 to 6,135 ha.
- Seasonal cropping decreased by 1,270 ha; a 48% decrease from 2,650 to 1,380 ha.
- Vacant areas, previously permanent plantings, decreased by 35 ha; a 12% decrease from 300 to 265 ha.
- Vacant areas, previously seasonal crops, increased by 1,285 ha; a 63% increase from 2,040 to 3,325 ha.

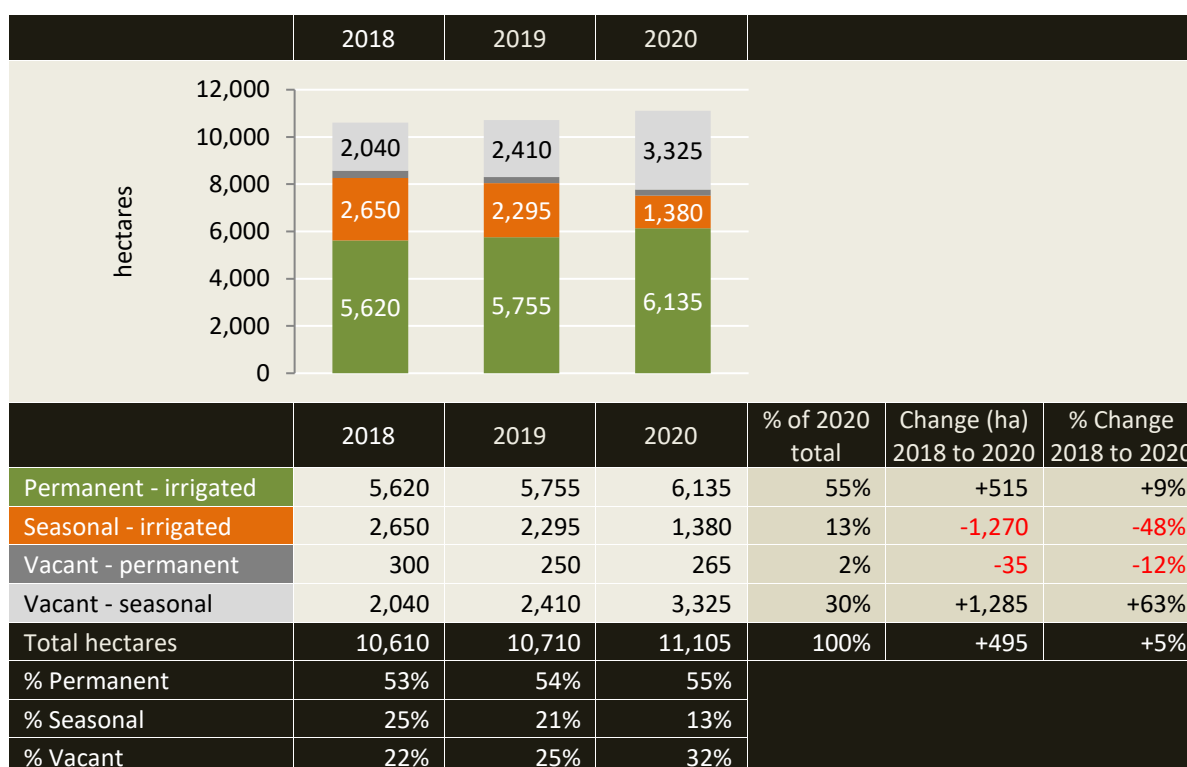
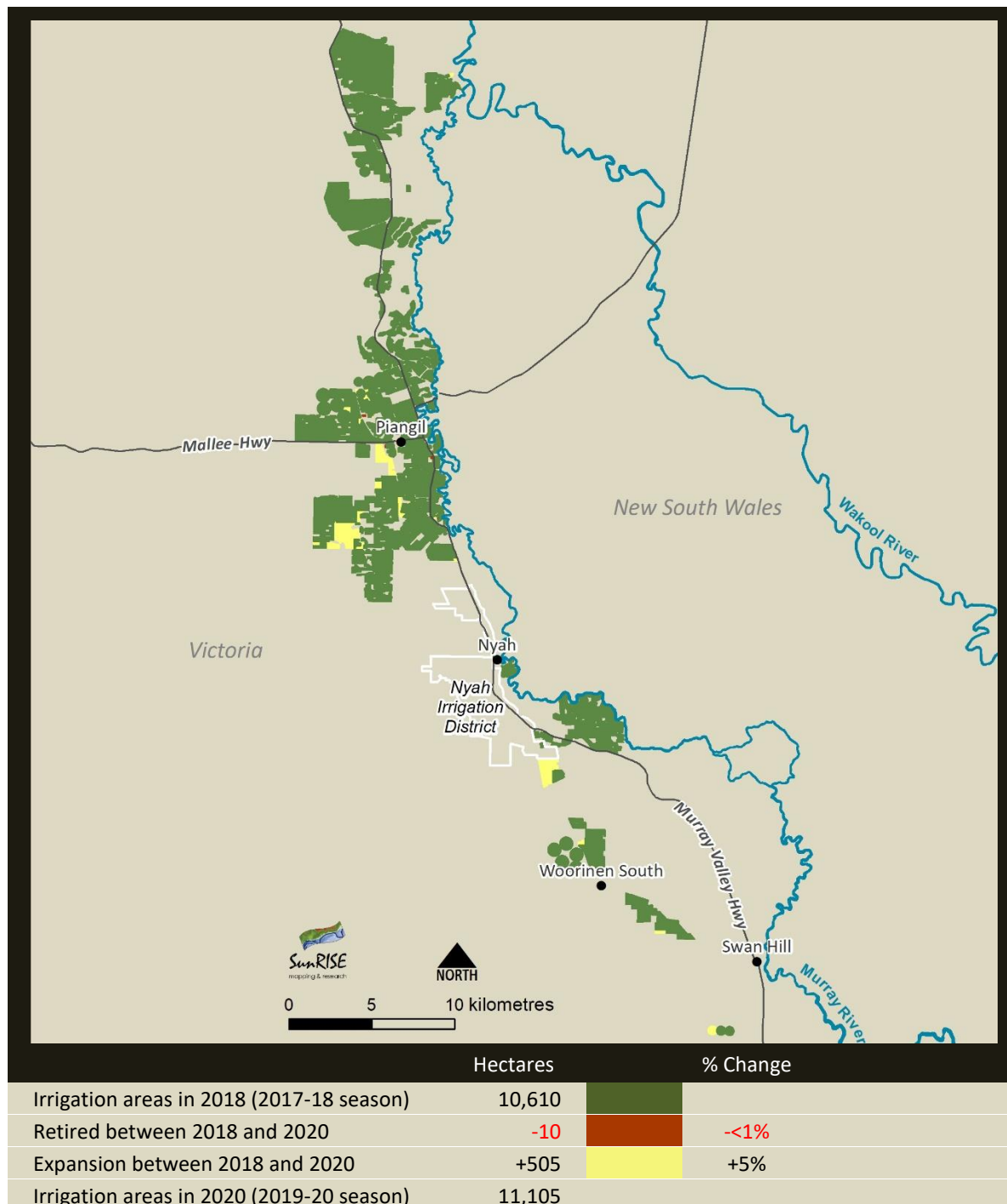


Figure 34: Nyah river reach - planting trends from 2018 to 2020

3.2.4 Nyah river reach - irrigation development

Map 15 shows irrigation development, from 2018 to 2020, in the Nyah river reach with respect to new development (expansion) and areas retired²⁰ from irrigation.

- The irrigable area increased by 495 ha; a 5% increase from 10,610 ha in 2018 to 11,105 ha in 2020.
- The net increase of 495 ha was the balance of 505 ha expansion and 10 ha retired from irrigation.



Map 15: Nyah river reach - irrigation development from 2018 to 2020

²⁰ Retired areas have undergone a change in land use that precludes use for irrigation e.g. urban development, housing, sheds, dams and land set aside for conservation purposes.

3.2.5 Nyah river reach - irrigation methods

Figure 35 summarises the change in irrigation methods in the Nyah river reach from 2018 to 2020.

Drippers remained the dominant irrigation method from 2018 to 2020.

From 2018 to 2020:

- Drip irrigation increased by 530 ha, an 9% increase from 5,755 ha to 6,285 ha.
- Lowlevel irrigation decreased by 170 ha, a 48% decrease from 355 ha to 185 ha.
- Overhead irrigation decreased by 105 ha, a 15% decrease from 710 ha to 605 ha.
- Furrow irrigation decreased by 1,010 ha, a 70% decrease from 1,450 ha to 440 ha.

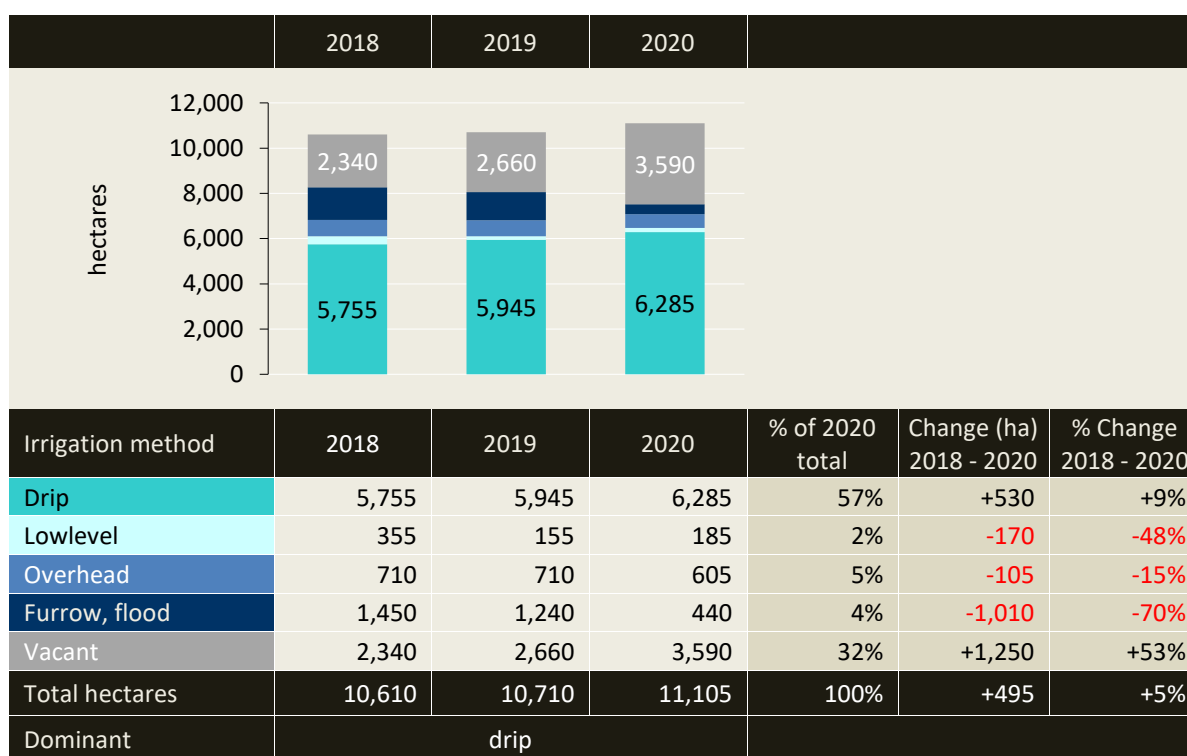


Figure 35: Nyah river reach - irrigation methods from 2018 to 2020

3.2.6 Nyah river reach - salinity impact zones

Figure 36 summarises the irrigable area in each salinity impact zone in the Nyah river reach from 2018 to 2020. Nyah private diverters are in low salinity impact zones L1, L2 and L3. There are no high salinity impact zones.

From 2018 to 2020, the area irrigated in:

- L1 decreased by 155 ha, a 3% decrease from 5,945 ha to 5,790 ha.
- L2 decreased by 600 ha, a 26% decrease from 2,315 ha to 1,715 ha.
- L3 remained at 10 ha from 2018 to 2020.

From 2018 to 2020, the irrigable area in:

- L1 increased by 400 ha, a 6% increase from 7,070 ha to 7,470 ha.
- L2 increased by 95 ha, a 3% increase from 3,530 ha to 3,625 ha.
- L3 remained at 10 ha from 2018 to 2020.

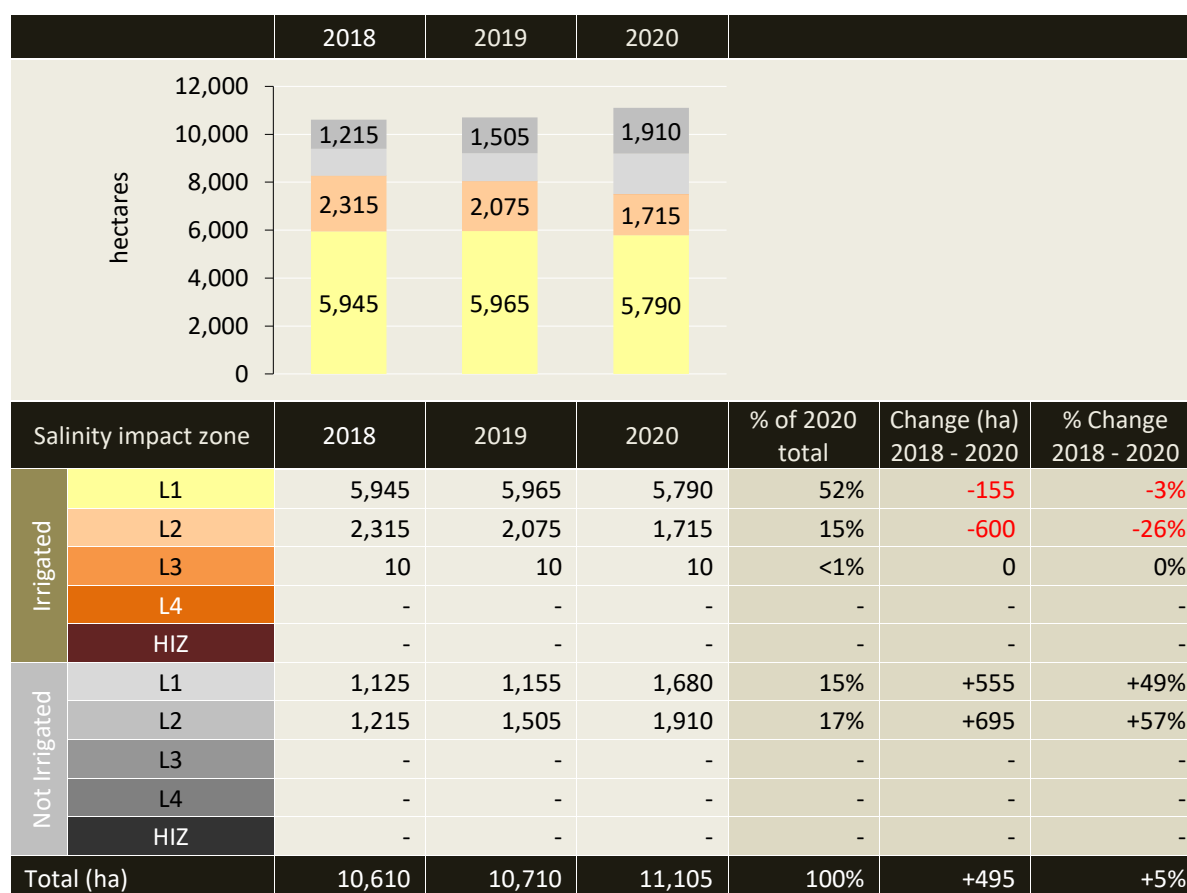


Figure 36: Nyah river reach - irrigable area in each salinity impact zone from 2018 to 2020

3.2.7 Nyah river reach - property change

Figure 37 provides estimates of property numbers and average property size (irrigable area) in the Nyah river reach from 2018 to 2020.

In 2020:

- There were approximately 76 irrigation properties; and
- most properties (75%) had an irrigable area greater than 20 ha.

From 2018 to 2020:

- the number of properties decreased by 5; a 6% decrease from 81 to 76 properties;
- properties with an irrigable area less than 20 ha decreased by 3, while the number over 20 ha decreased by 2; and
- average property size (irrigable area) increased from 131 ha to 146 ha.

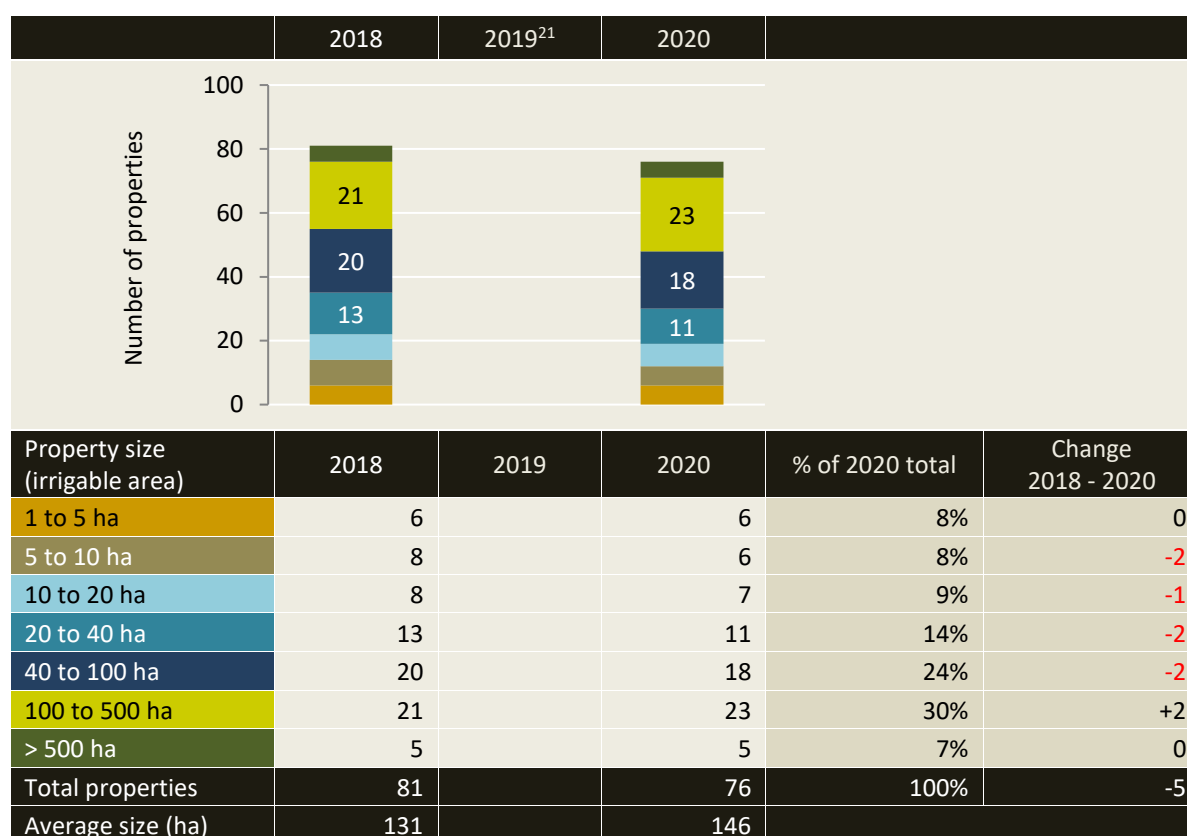


Figure 37: Nyah river reach - property numbers and sizes from 2018 to 2020

²¹ Property data was not maintained in 2019

3.2.8 Nyah river reach – water-use in 2020

96% (7,238 ha) of irrigated horticulture in the Nyah river reach was aligned to 52,032 ML of water-use for 2019-2020. Alignment for the remaining 4% of irrigated horticulture was not resolved, and resolution may affect the water-use figures presented.

Water use in the Nyah river reach accounted for 12% of total irrigation water-use for private diverters in the Mallee catchment in 2019-2020 (see Figure 47). Almond plantings were the dominant crop irrigated in the Nyah river reach in 2020 (34%) and drip irrigation was the dominant irrigation method used (57%).

3.3 Boundary Bend river reach (*Wakool to Euston weir*)

In summary for the Boundary Bend river reach

Change in crop types from 2018 to 2020

Almond trees were the dominant crop from 2018 to 2020. The main changes from 2018 to 2020 were:

1. Potato crops decreased by 780 ha, a 43% decrease from 1,795 ha to 1,015 ha.
2. Field crops decreased by 595 ha, a 55% decrease from 1,090 ha to 495 ha.
3. Table grape plantings increased by 160 ha, a 10% increase from 1,605 ha to 1,765 ha.
4. Almond plantings increased by 130 ha, a 1% increase from 10,390 ha to 10,520 ha.
5. Citrus plantings increased by 80 ha, a 30% increase from 270 to 350 ha.
6. Nut trees other than almonds increased by 80 ha, a 25% increase from 325 ha to 405 ha.

Planting trends - permanent plantings, seasonal crops and vacant areas

From 2018 to 2020:

- Permanent plantings increased by 420 ha; a 3% increase from 15,980 ha to 16,400 ha and vacant areas, previously permanent plantings, decreased by 230 ha.
- Seasonal cropping decreased by 1,430 ha; a 47% decrease from 3,040 ha to 1,610 ha and vacant areas, previously seasonal crops, increased by 2,005 ha.

Irrigation development - new and retired areas

The irrigable area in the Boundary Bend river reach increased by 765 ha, a 4% increase from 21,180 ha in 2018 to 21,945 ha in 2020. The net increase of 765 ha was the balance of 770 ha expansion and 5 ha retired from irrigation.

Irrigation methods 2018 to 2020

Drippers were the dominant irrigation method between 2018 and 2020. Drip irrigation increased by 395 ha, a 3% increase from 14,985 ha in 2018 to 15,380 ha in 2020. Lowlevel irrigation increased by 25 ha, while overhead and furrow irrigation decreased by 1,405 ha and 25 ha respectively.

Salinity impact zones 2018 to 2020

The Boundary Bend river reach is in the low salinity impact zones: L1, L2 and L3. From 2018 to 2020 the irrigable area in L1 increased by 695 ha, a 4% increase from 17,160 ha to 17,855 ha, L2 increased by 20 ha, a 1% increase from 1,700 ha to 1,720 ha and L3 increased by 50 ha, a 2% increase from 2,320 ha to 2,370 ha.

Irrigation properties

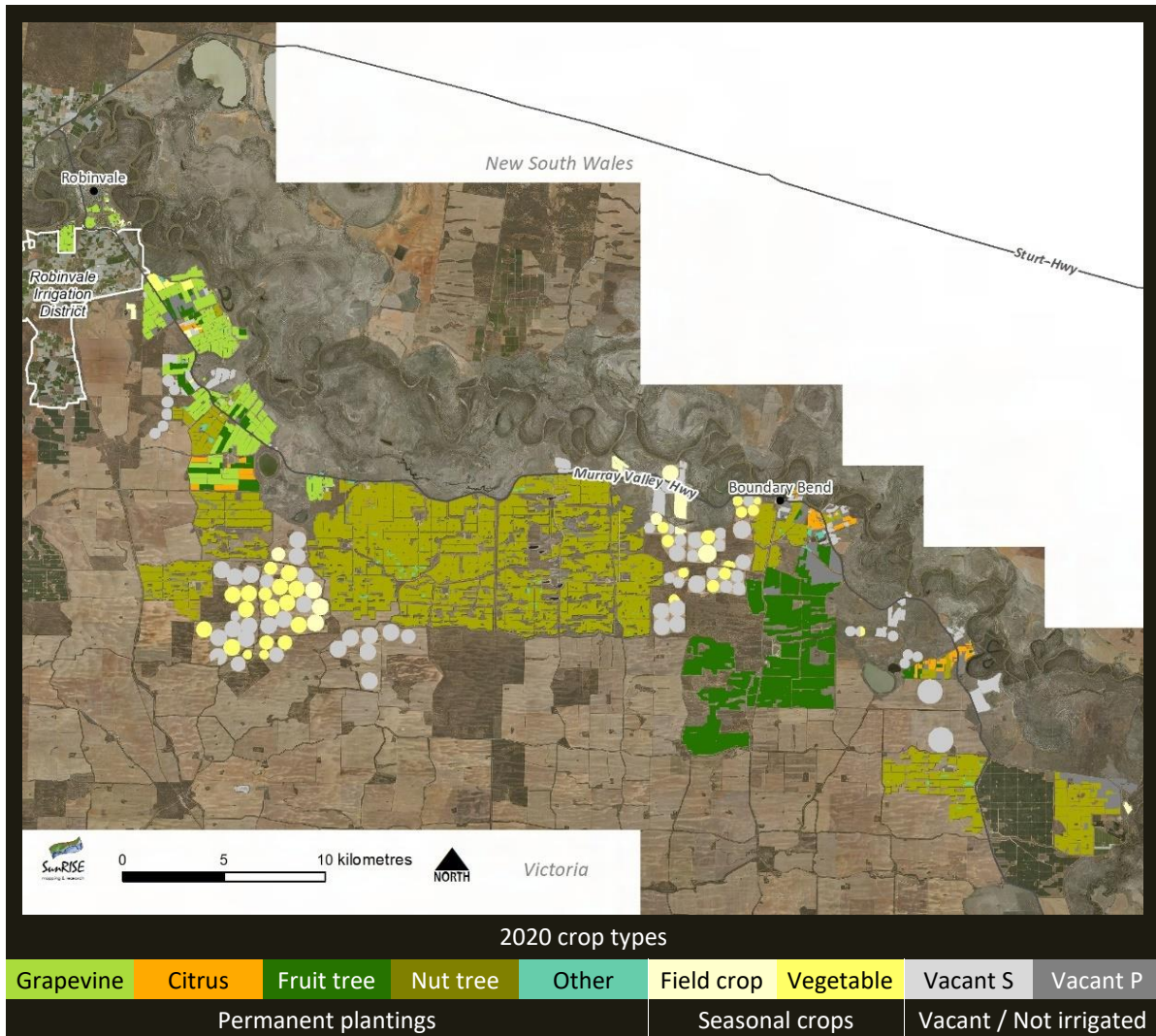
In 2020 there were approximately 74 irrigation properties in the Boundary Bend river reach with an average irrigable area of 297 ha. From 2018 to 2020 the number of properties decreased by 4; a 5% decrease from 78 to 74 properties.

Water-use in 2020

Analysis of water use data estimates that 169,445 ML of water was applied to 17,502 ha of crops in the Boundary Bend river reach in the 2019-20 season.

3.3.1 Boundary Bend river reach - crop types in 2020

Map 16 shows the Boundary Bend river reach with crop types in 2020.



Map 16: Boundary Bend river reach showing crop types in 2020

3.3.2 Boundary Bend river reach - crop types from 2018 to 2020

Figure 38 summarises the change in irrigated crops in the Boundary Bend river reach from 2018 to 2020.

Almond trees were the dominant crop from 2018 to 2020.

The main changes from 2018 to 2020 were:

1. Potato crops decreased by 780 ha, a 43% decrease from 1,795 ha to 1,015 ha.
2. Field crops decreased by 595 ha, a 55% decrease from 1,090 ha to 495 ha.
3. Table grape plantings increased by 160 ha, a 10% increase from 1,605 ha to 1,765 ha.
4. Almond plantings increased by 130 ha, a 1% increase from 10,390 ha to 10,520 ha.
5. Citrus plantings increased by 80 ha, a 30% increase from 270 to 350 ha.
6. Nut trees other than almonds increased by 80 ha, a 25% increase from 325 ha to 405 ha.

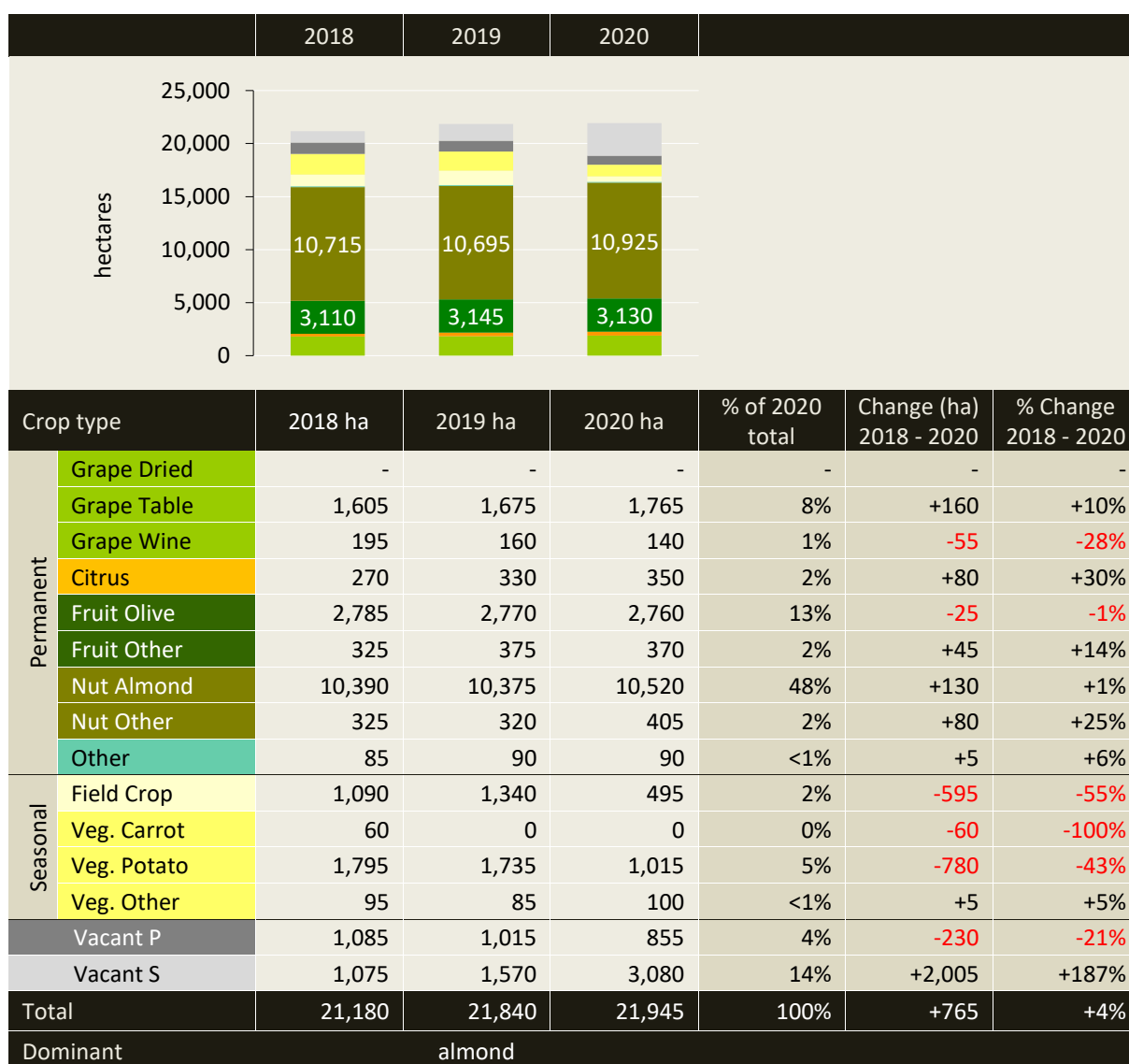


Figure 38: Boundary Bend river reach - crop types from 2018 to 2020

3.3.3 Boundary Bend river reach - planting trends

Figure 39 summarises planting trends in the Boundary Bend river reach from 2018 to 2020.

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

- 76% permanent, 14% seasonal and 10% vacant in 2018; to
- 75% permanent, 7% seasonal and 18% vacant in 2020.

From 2018 to 2020:

- Permanent plantings increased by 420 ha; a 3% increase from 15,980 ha to 16,400 ha.
- Seasonal cropping decreased by 1,430 ha; a 47% decrease from 3,040 ha to 1,610 ha.
- Vacant areas, previously permanent plantings, decreased by 230 ha; a 21% decrease from 1,085 ha to 855 ha.
- Vacant areas, previously seasonal crops, increased by 2,005 ha; a 187% increase from 1,075 ha to 3,080 ha.

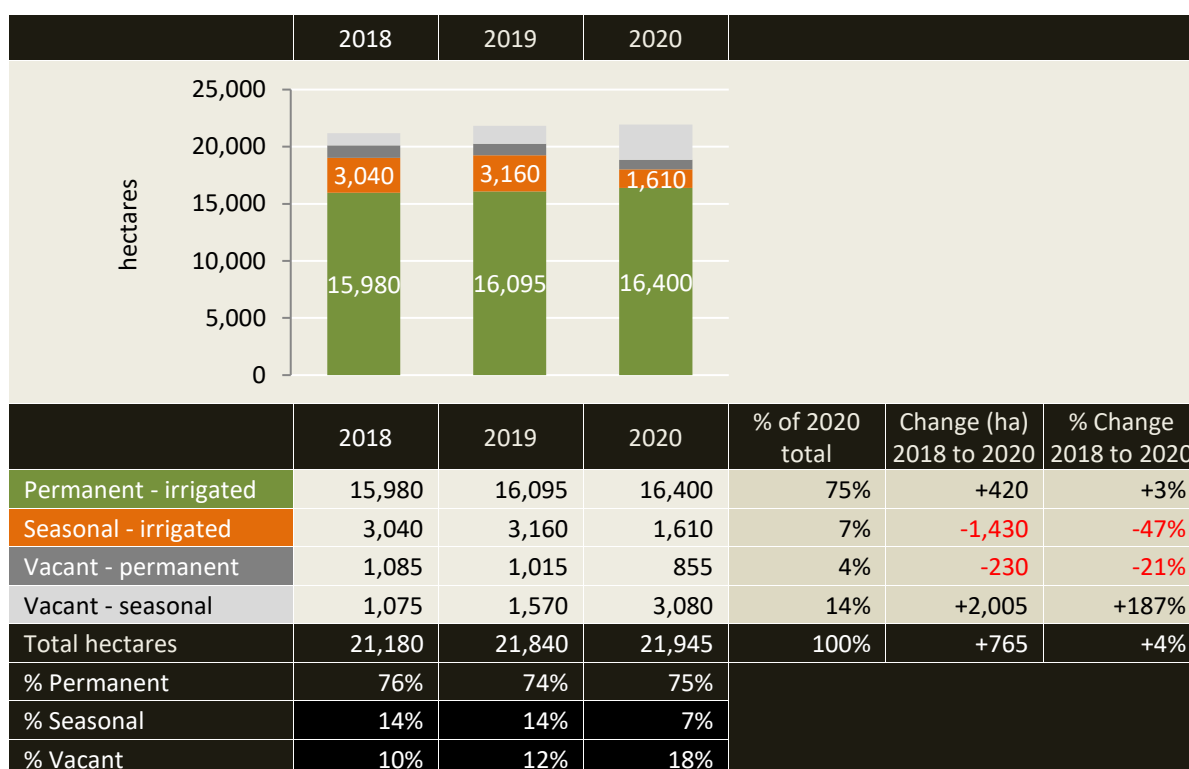
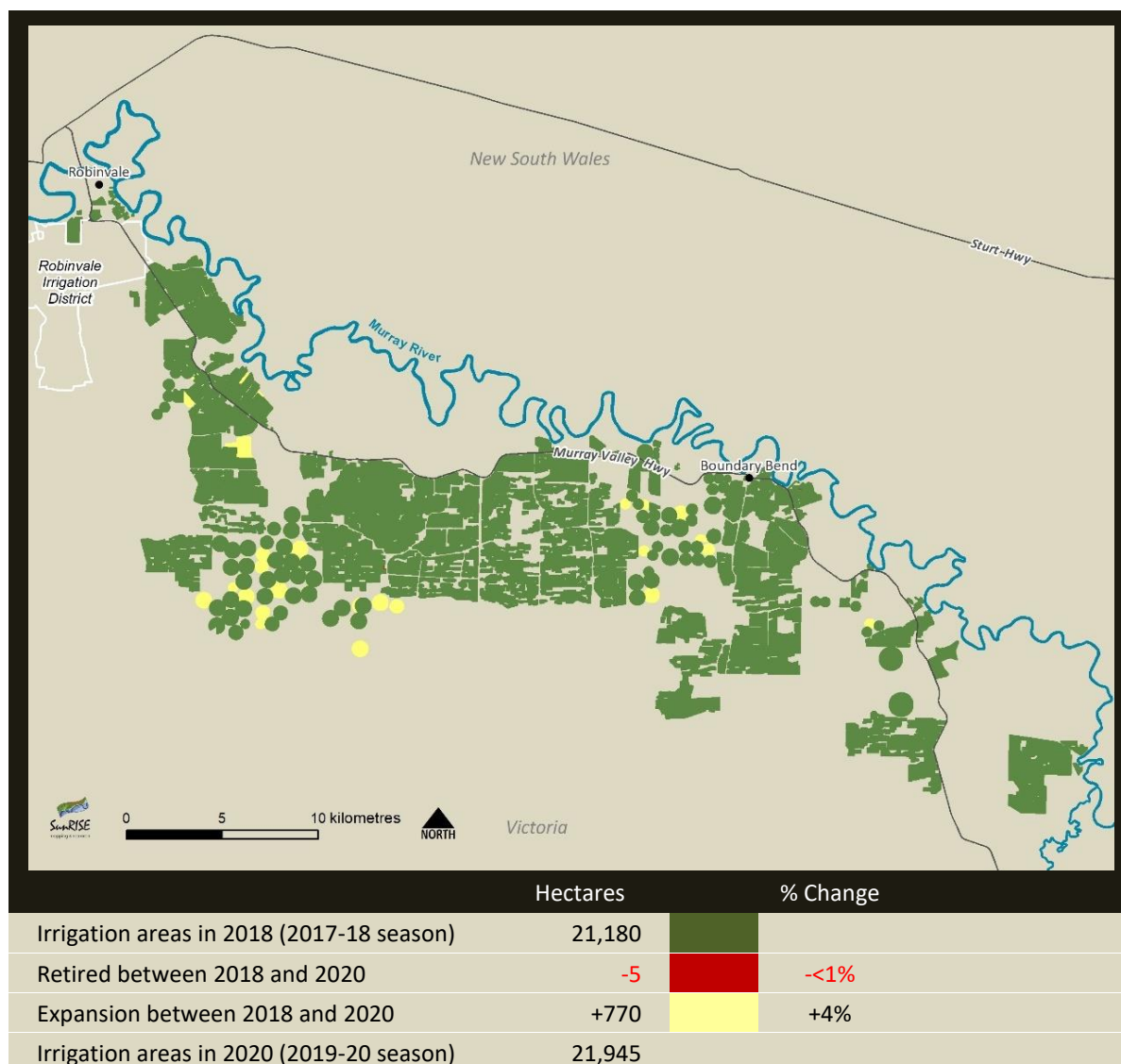


Figure 39: Boundary Bend river reach - planting trends from 2018 to 2020

3.3.4 Boundary Bend river reach - irrigation development

Map 17 shows irrigation development from 2018 to 2020 in the Boundary Bend river reach with respect to new development (expansion) and areas retired²² from irrigation.

- The irrigable area increased by 765 ha, a 4% increase from 21,180 ha in 2018 to 21,945 ha in 2020.
- The net increase of 765 ha was the balance of 5 ha retired from irrigation and 770 ha of expansion.



Map 17: Boundary Bend river reach - irrigation development from 2018 to 2020

²² Retired areas have undergone a change in land use that precludes use for irrigation e.g. urban development, housing, sheds, dams and land set aside for conservation purposes.

3.3.5 Boundary Bend river reach - irrigation methods

Figure 40 summarises the change in irrigation methods in the Boundary Bend river reach from 2018 to 2020.

Drippers remained the dominant irrigation method between 2018 and 2020.

From 2018 to 2020:

- Drip irrigation increased by 395 ha, a 3% increase from 14,985 ha to 15,380 ha.
- Lowlevel irrigation increased by 25 ha, a 3% increase from 905 ha to 930 ha.
- Overhead and pivot irrigation decreased by 1,405 ha, a 46% decrease from 3,055 ha to 1,650 ha.
- Furrow irrigation decreased by 25 ha, a 33% decrease from 75 ha to 50 ha.

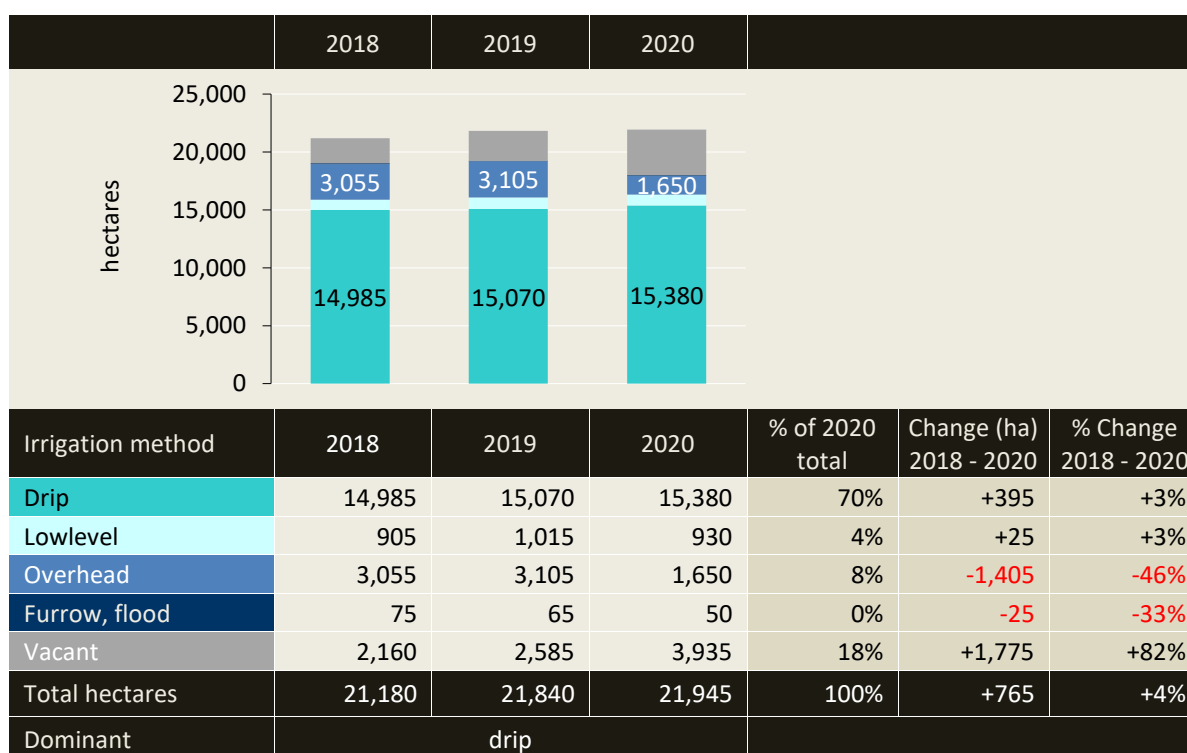


Figure 40: Boundary Bend river reach - irrigation methods from 2018 to 2020

3.3.6 Boundary Bend river reach - salinity impact zones

Figure 41 summarises the irrigable area in each salinity impact zone in the Boundary Bend river reach from 2018 to 2020.

Boundary Bend private diverters are in low salinity impact zones L1, L2 and L3. There are no high salinity impact zones.

From 2018 to 2020, the area irrigated in:

- L1 decreased by 915 ha, a 6% decrease from 15,935 ha to 15,020 ha.
- L2 increased by 45 ha, a 3% increase from 1,460 ha to 1,505 ha.
- L3 decreased by 140 ha, a 9% decrease from 1,625 ha to 1,485 ha.

From 2018 to 2020, the irrigable area in:

- L1 increased by 695 ha, a 4% increase from 17,160 ha to 17,855 ha.
- L2 increased by 20 ha, a 1% increase from 1,700 ha to 1,720 ha; and
- L3 increased by 50 ha, a 2% increase from 2,320 ha to 2,370 ha.

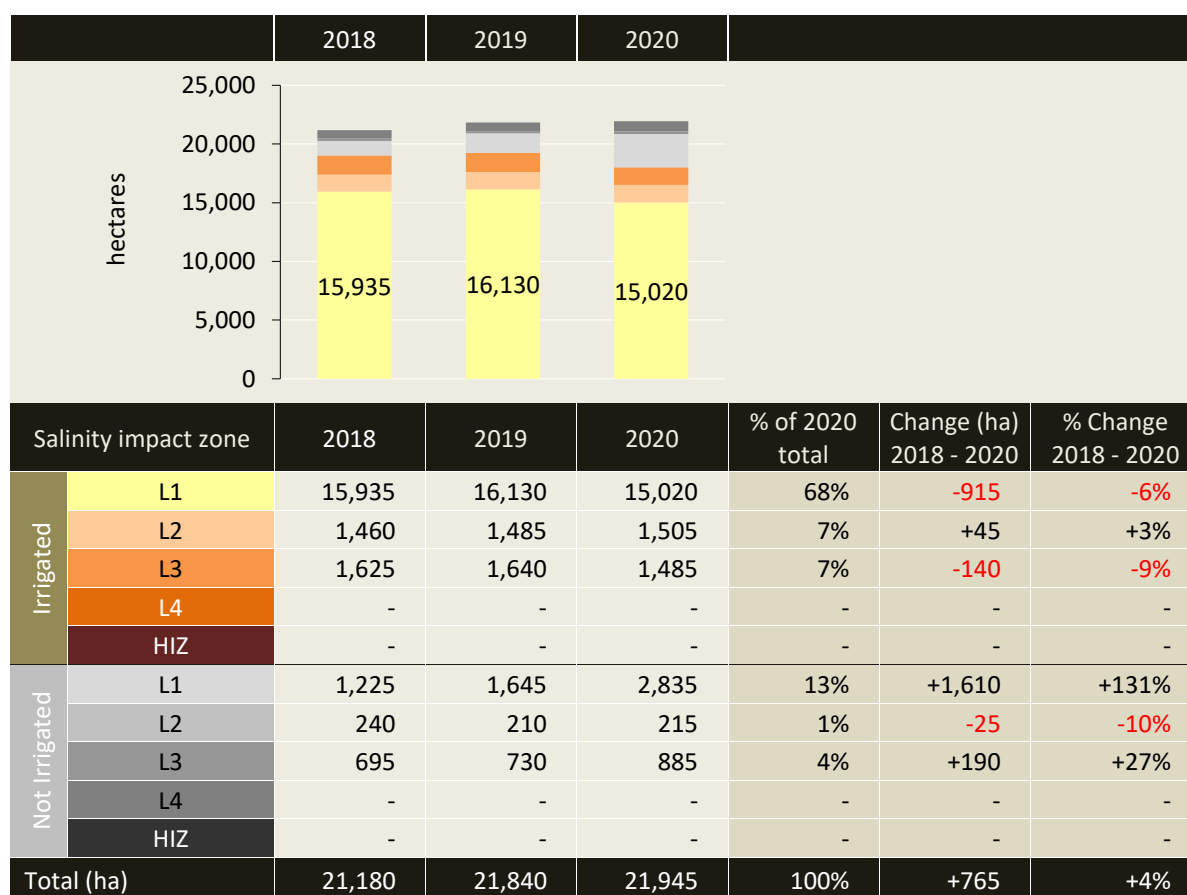


Figure 41: Boundary Bend river reach - irrigable area in each salinity impact zone 2018 to 2020

3.3.7 Boundary Bend river reach - property change

Figure 42 provides estimates of property numbers and average property size (irrigable area) in the Boundary Bend river reach from 2018 to 2020.

In 2020:

- There were approximately 74 irrigation properties; and
- most properties (64%) had an irrigable area greater than 20 ha.

From 2018 to 2020:

- the number of properties decreased by 4, a 5% decrease from 78 to 74 properties;
- properties with an irrigable area less than 20 ha decreased by 4, while the number over 20 ha remained the same; and
- average property size (irrigable area) increased from 272 ha to 297 ha.

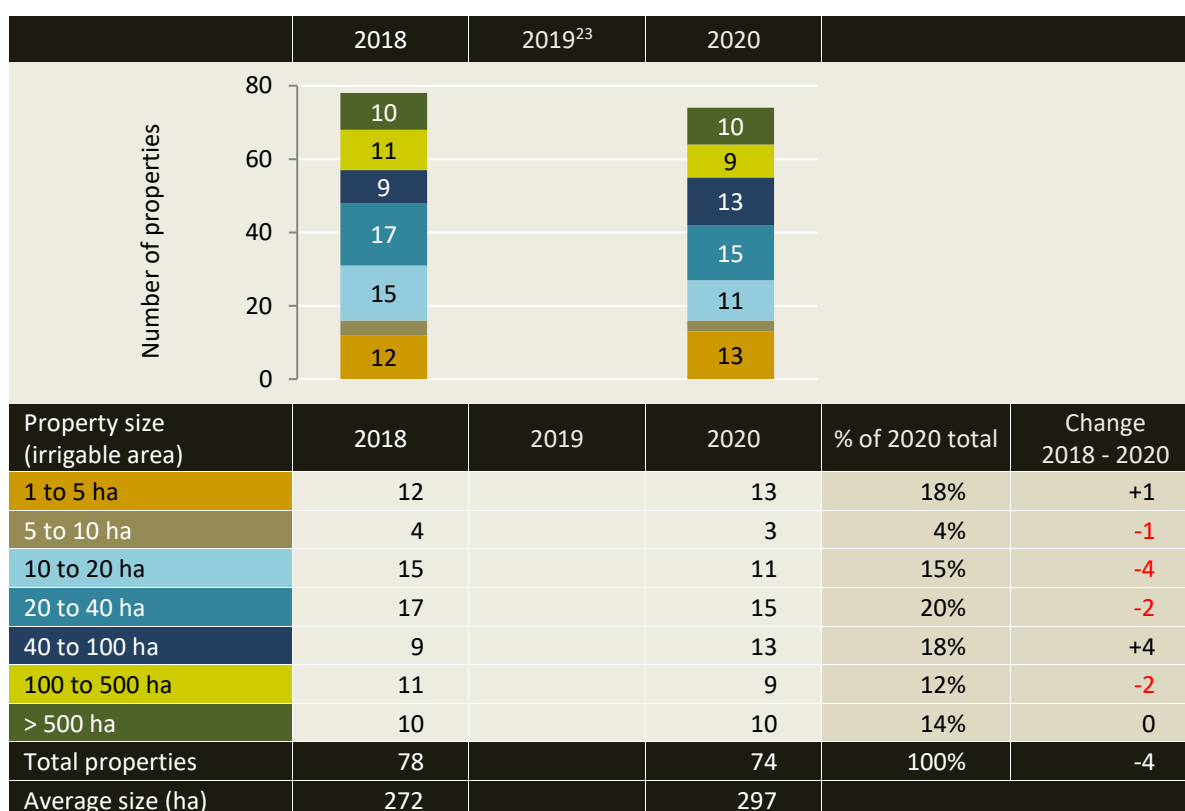


Figure 42: Boundary Bend river reach - property numbers and sizes from 2018 to 2020

²³ Property data was not maintained in 2019

3.3.8 Boundary Bend river reach – water-use in 2020

97% (17,502 ha) of irrigated horticulture in the Boundary Bend river reach was aligned to 169,445 ML of water-use for 2019-2020. Alignment for the remaining 3% of irrigated horticulture was not resolved, and resolution may affect the water-use figures presented.

Water use in the Boundary Bend river reach accounted for 40% of total irrigation water-use for private diverters in the Mallee catchment in 2019-2020 (see Figure 47). Almond plantings were the dominant crop irrigated in the Boundary Bend river reach in 2020 (48%) and drip irrigation was the dominant irrigation method used (70%).

3.4 Wemen river reach (*Euston weir to Liparoo*)

In summary for the Wemen river reach

Change in crop types from 2018 to 2020

Almond trees were the dominant crop from 2018 to 2020. The main changes from 2018 to 2020 were:

1. Almond tree plantings increased by 740 ha, a 10% increase from 7,480 ha to 8,220 ha.
2. Carrot plantings decreased by 385 ha, a 31% decrease from 1,240 ha to 855 ha.
3. Vegetables other than carrots decreased by 190 ha, a 17% decrease from 1,125 ha to 935 ha.
4. Table grape plantings increased by 130 ha, a 38% increase from 340 ha to 470 ha.
5. Nut trees other than almonds increased by 50 ha, a 333% increase from 15 ha to 65 ha.

Planting trends - permanent plantings, seasonal crops and vacant areas

From 2018 to 2020:

- Permanent plantings increased by 895 ha; a 10% increase from 9,365 ha to 10,260 ha and vacant areas, previously permanent plantings, remained at 210 ha.
- Seasonal cropping decreased by 615 ha; a 25% decrease from 2,510 ha to 1,895 ha and vacant areas, previously seasonal crops, increased by 600 ha.

Irrigation development - new and retired areas

The irrigable area in the Wemen river reach increased by 880 ha, a 7% increase from 12,700 ha in 2018 to 13,580 ha in 2020. The net increase of 880 ha was the balance of 885 ha expansion and 5 ha retired from irrigation.

Irrigation methods 2018 to 2020

Drippers remained the dominant irrigation method from 2018 to 2020. Drip irrigation increased by 960 ha, an 11% increase from 8,975 ha to 9,935 ha. Lowlevel and overhead irrigation decreased by 275 ha and 405 ha respectively, while furrow irrigation remained at 5 ha from 2018 to 2020.

Salinity impact zones 2018 to 2020

The Wemen river reach is in the low salinity impact zones: L1, L2 and L3. From 2018 to 2020, the irrigable area in L1 increased by 790 ha, a 16% increase from 5,005 ha to 5,795 ha, L2 increased by 100

ha, a 1% increase from 7,570 ha to 7,670 ha and L3 decreased by 10 ha, a 9% decrease from 125 ha to 115 ha.

Irrigation properties

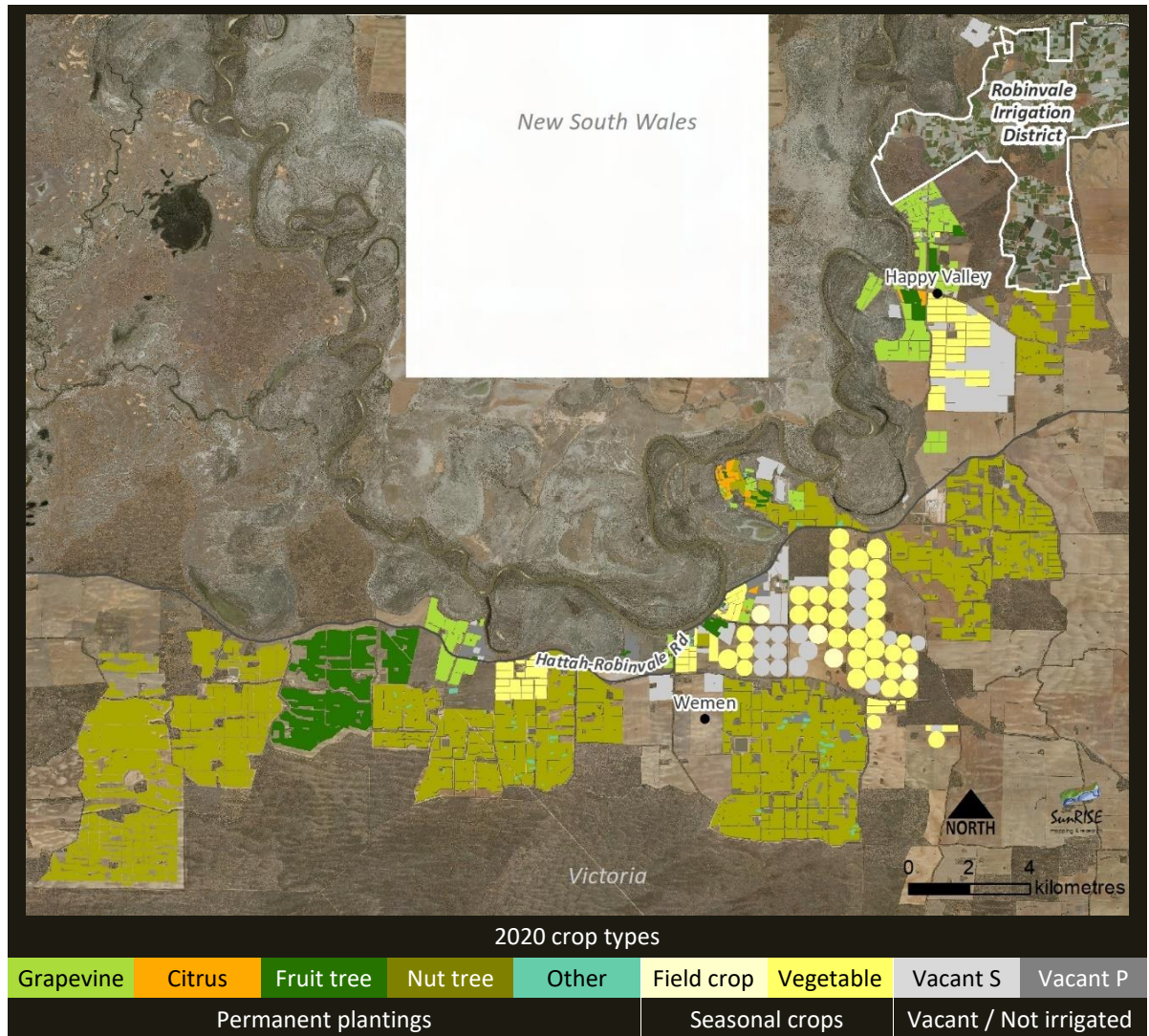
In 2020 there were approximately 38 irrigation properties in the Wemen river reach with an average irrigable area of 357 ha. From 2018 to 2020 the number of properties increased by 1, from 37 to 38 properties.

Water-use in 2020

Analysis of water use data estimates that 94,005 ML of water was applied to 11,806 ha of crops in the Wemen river reach in the 2019-20 season.

3.4.1 Wemen river reach - crop types in 2020

Map 18 shows the Wemen river reach with crop types in 2020.



Map 18: Wemen river reach showing crop types in 2020

3.4.2 Wemen river reach - crop types from 2018 to 2020

Figure 43 summarises the change in irrigated crops in the Wemen river reach from 2018 to 2020.

Almond trees were the dominant crop type from 2018 to 2020.

The main changes from 2018 to 2020 were:

1. Almond tree plantings increased by 740 ha, a 10% increase from 7,480 ha to 8,220 ha.
2. Carrot plantings decreased by 385 ha, a 31% decrease from 1,240 ha to 855 ha.
3. Vegetables other than carrots decreased by 190 ha, a 17% decrease from 1,125 ha to 935 ha.
4. Table grape plantings increased by 130 ha, a 38% increase from 340 ha to 470 ha.
5. Nut trees other than almonds increased by 50 ha, a 333% increase from 15 ha to 65 ha.

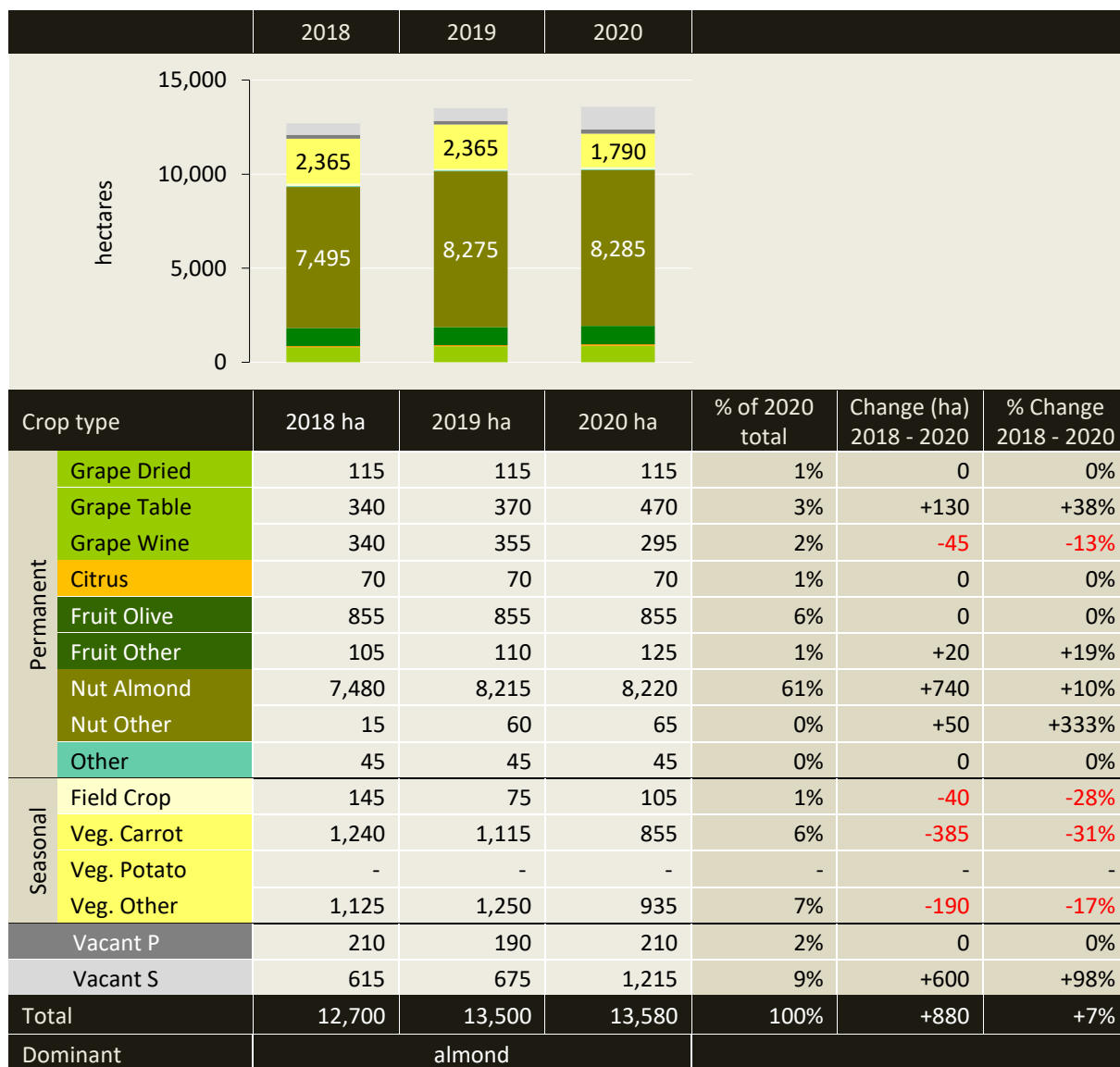


Figure 43: Wemen river reach - crop types from 2018 to 2020

3.4.3 Wemen river reach - planting trends

Figure 44 summarises planting trends in the Wemen river reach from 2018 to 2020.

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

- 74% permanent, 20% seasonal and 6% vacant in 2018; to
- 76% permanent, 14% seasonal and 10% vacant in 2020.

From 2018 to 2020:

- Permanent plantings increased by 895 ha; a 10% increase from 9,365 ha to 10,260 ha.
- Seasonal cropping decreased by 615 ha; a 25% decrease from 2,510 ha to 1,895 ha.
- Vacant areas, previously permanent plantings remained at 210 ha.
- Vacant areas, previously seasonal crops, increased by 600 ha; a 98% increase from 615 ha to 1,215 ha.

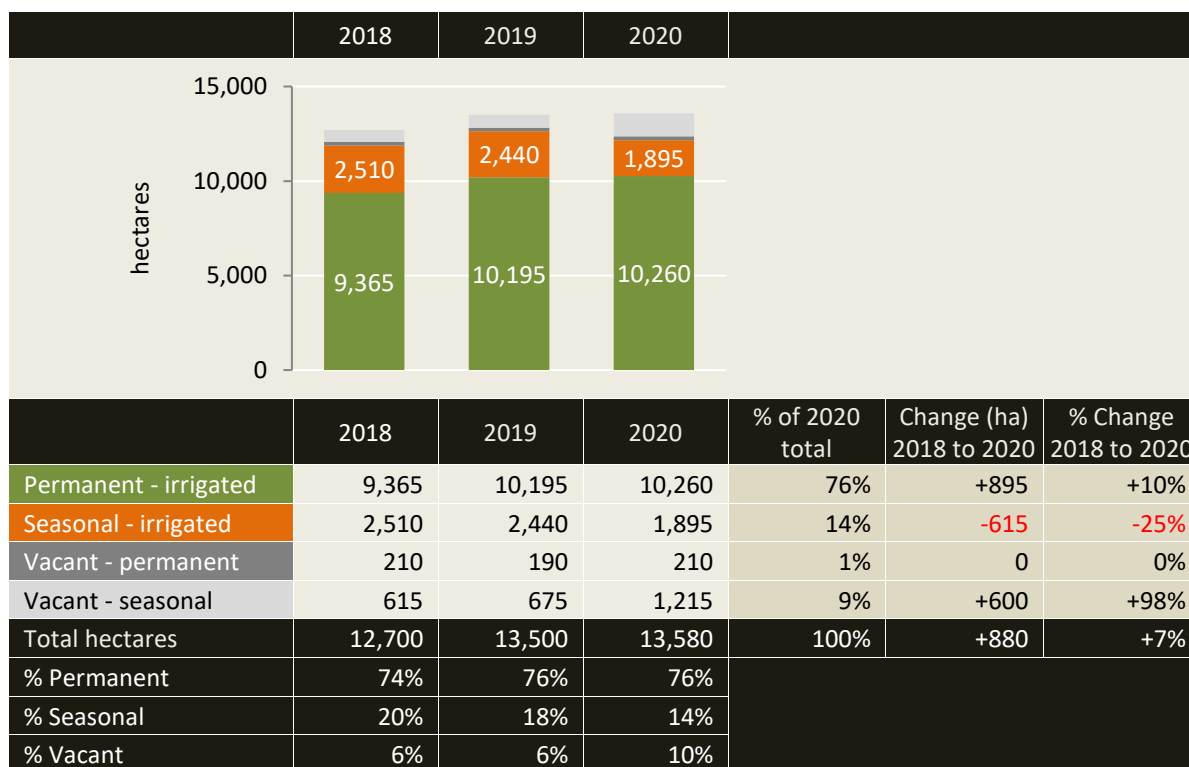
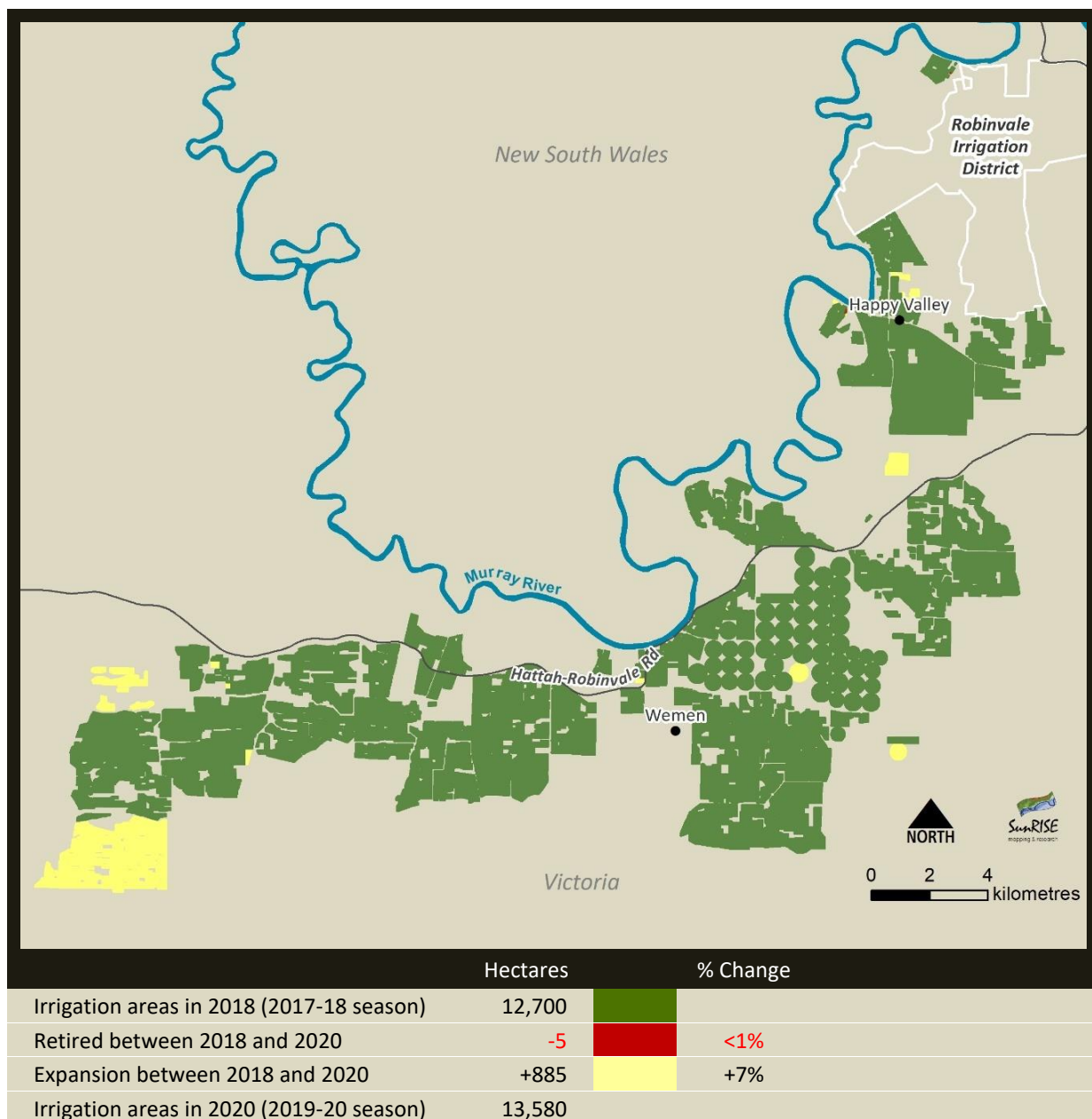


Figure 44: Wemen river reach - planting trends from 2018 to 2020

3.4.4 Wemen river reach - irrigation development

Map 19 shows irrigation development from 2018 to 2020 in the Wemen river reach with respect to new development (expansion) and areas retired²⁴ from irrigation.

- The irrigable area increased by 880 ha, a 7% increase from 12,700 ha in 2018 to 13,580 ha in 2020.
- The net increase of 880 ha was the balance of 5 ha retired from irrigation and 885 ha of expansion.



Map 19: Wemen river reach - irrigation development from 2018 to 2020

²⁴ Retired areas have undergone a change in land use that precludes use for irrigation e.g. urban development, housing, sheds, dams and land set aside for conservation purposes.

3.4.5 Wemen river reach - irrigation methods

Figure 45 summarises the change in irrigation methods in the Wemen river reach from 2018 to 2020.

Drippers remained the dominant irrigation method from 2018 to 2020.

From 2018 to 2020:

- Drip irrigation increased by 960 ha, an 11% increase from 8,975 ha to 9,935 ha.
- Lowlevel irrigation decreased by 275 ha, a 20% decrease from 1,355 ha to 1,080 ha.
- Overhead irrigation decreased by 405 ha, a 26% decrease from 1,540 ha to 1,135 ha.
- Furrow irrigation remained at 5 ha from 2018 to 2020.

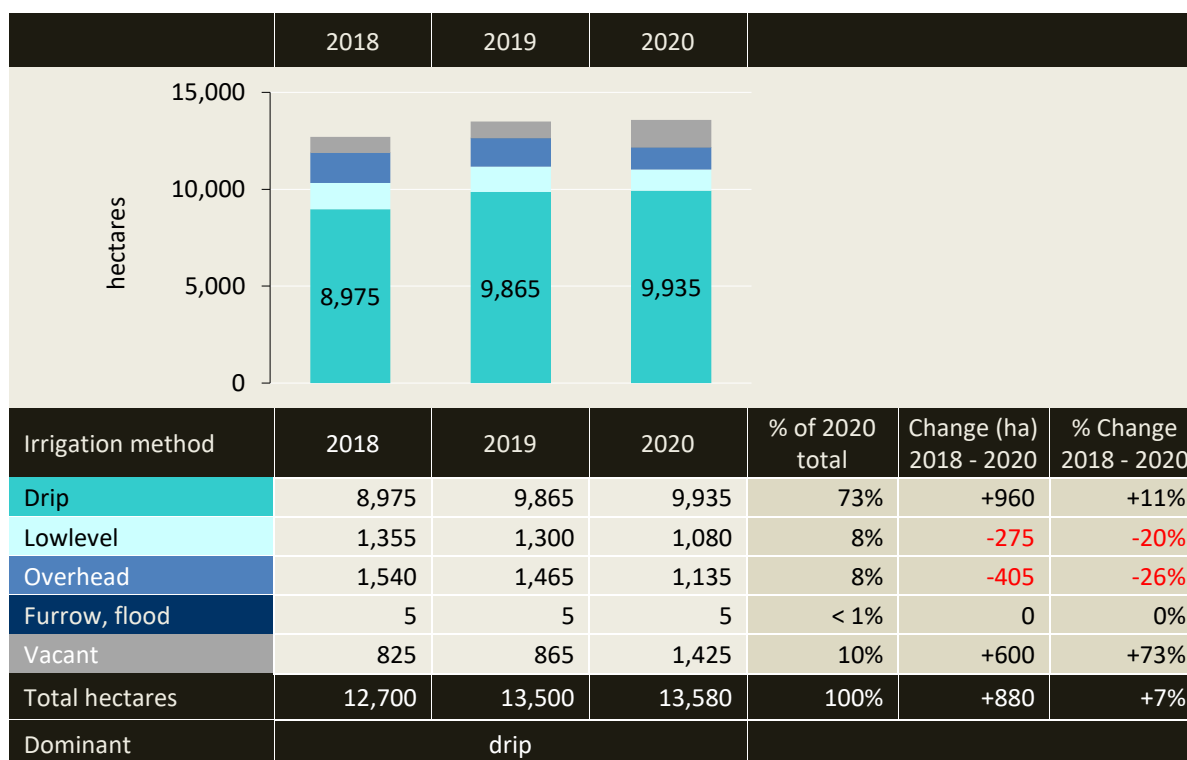


Figure 45: Wemen river reach - irrigation methods from 2018 to 2020

3.4.6 Wemen river reach - salinity impact zones

Figure 46 summarises the irrigable area in each salinity impact zone in the Wemen river reach from 2018 to 2020. Wemen private diverters are in low salinity impact zones L1, L2 and L3. There are no high salinity impact zones.

From 2018 to 2020, the area irrigated in:

- L1 increased by 750 ha, a 15% increase from 4,985 ha to 5,735 ha.
- L2 decreased by 505 ha, a 7% decrease from 6,875 ha to 6,370 ha.
- L3 increased by 35 ha, a 233% increase from 15 ha to 50 ha.

From 2018 to 2020, the irrigable area in:

- L1 increased by 790 ha, a 16% increase from 5,005 ha to 5,795 ha.
- L2 increased by 100 ha, a 1% increase from 7,570 ha to 7,670 ha.
- L3 decreased by 10 ha, an 8% decrease from 125 ha to 115 ha.

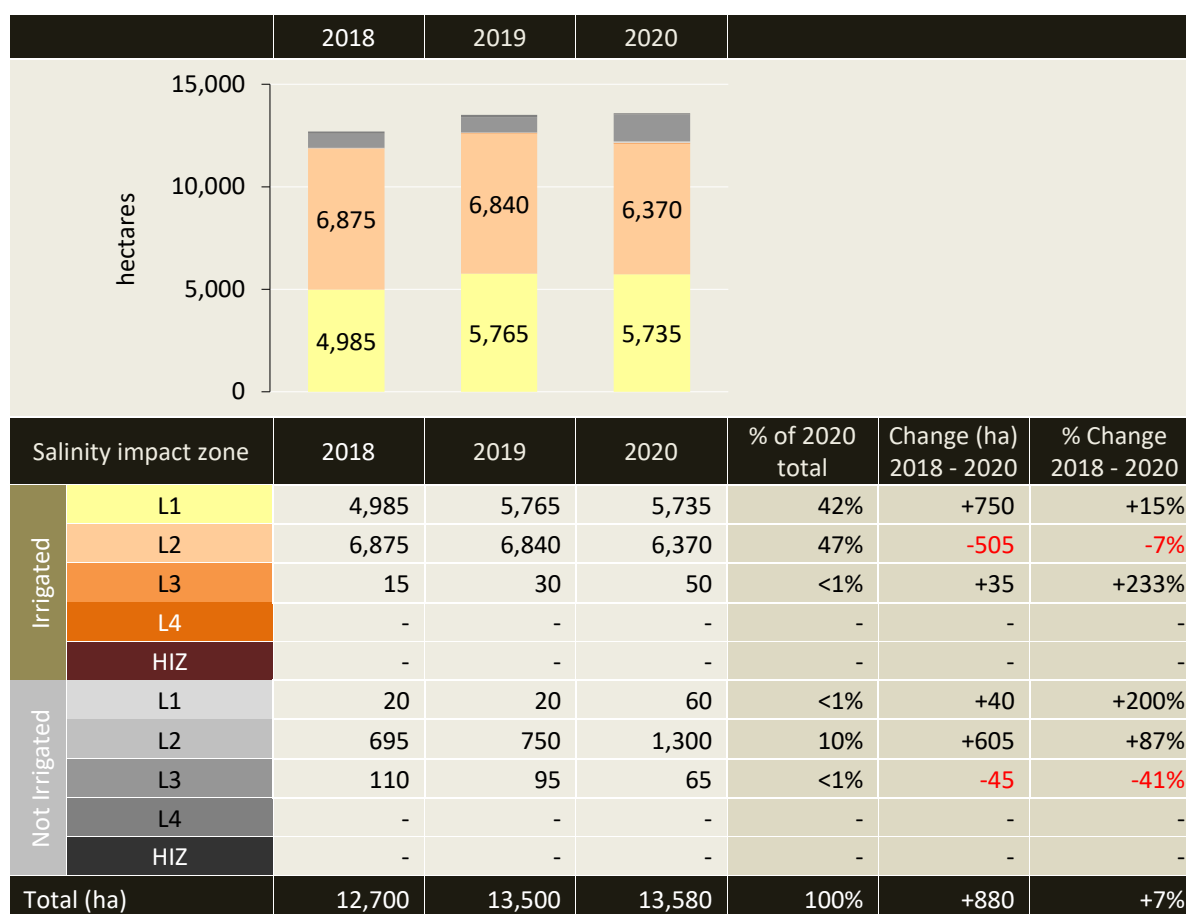


Figure 46: Wemen river reach - irrigable area in each salinity impact zone from 2018 to 2020

3.4.7 Wemen river reach - property change

Figure 47 provides estimates of property numbers and average property size (irrigable area) in the Wemen river reach from 2018 to 2020.

In 2020:

- There were approximately 38 irrigation properties; and
- most properties (79%) had an irrigable area greater than 20 ha.

From 2018 to 2020:

- The number of properties increased by 1; a 3% increase from 37 to 38 properties;
- properties with an irrigable area less than 20 ha remained at 8, while the number over 20 ha increased by 1; and
- average property size (irrigable area) increased from 343 ha to 357 ha.

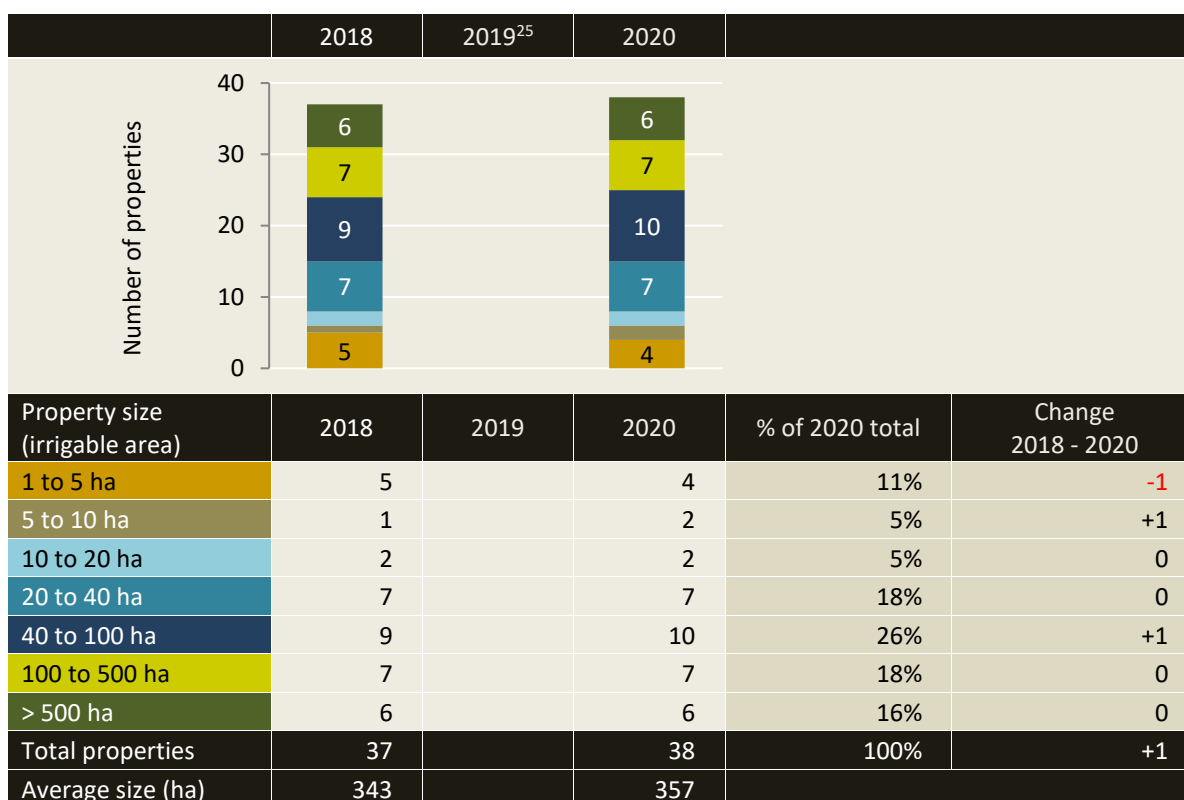


Figure 47: Wemen river reach - property numbers and sizes from 2018 to 2020

²⁵ Property data was not maintained in 2019

3.4.8 Wemen river reach – water-use in 2020

97% (11,806 ha) of irrigated horticulture in the Wemen river reach was aligned to 94,005 ML of water-use for 2019-2020. Alignment for the remaining 3% of irrigated horticulture was not resolved, and resolution may affect the water-use figures presented.

Water use in the Wemen river reach accounted for 22% of total irrigation water-use for private diverters in the Mallee catchment in 2019-2020 (see Figure 47). Almond plantings were the dominant crop irrigated in the Wemen river reach in 2020 (61%) and drip irrigation was the dominant irrigation method used (73%).

3.5 Colignan river reach (*Colignan to Yatpool*)

In summary for the Colignan river reach

Change in crop types from 2018 to 2020

Citrus plantings were the dominant crop from 2018 to 2020. The main changes from 2018 to 2020 were:

1. Field crops decreased by 325 ha, a 49% decrease from 665 ha to 340 ha.
2. Citrus plantings increased by 120 ha, a 4% increase from 3,125 ha to 3,245 ha.
3. Vegetables decreased by 80 ha, an 18% decrease from 445 ha to 365 ha.
4. Table grape plantings increased by 75 ha, a 9% increase from 855 ha to 930 ha.
5. Wine grape plantings increased by 70 ha, a 3% increase from 2,765 ha to 2,835 ha.

Planting trends - permanent plantings, seasonal crops and vacant areas

From 2018 to 2020:

- Permanent plantings increased by 305 ha; a 3% increase from 9,120 ha to 9,425 ha and vacant areas, previously permanent plantings, decreased by 55 ha.
- Seasonal cropping decreased by 405 ha; a 36% decrease from 1,110 ha to 705 ha and vacant areas, previously seasonal crops, increased by 470 ha.

Irrigation development - new and retired areas

The irrigable area in the Colignan river reach increased by 315 ha, a 3% increase from 11,825 ha in 2018 to 12,140 ha in 2020. The net increase of 315 ha was the balance of 325 ha expansion and 10 ha retired from irrigation.

Irrigation methods 2018 to 2020

Drippers remained the dominant irrigation method from 2018 to 2020. Drip irrigation increased by 330 ha, a 4% increase from 7,620 ha to 7,950 ha. Lowlevel irrigation increased by 35 ha, overhead irrigation decreased by 465 ha and furrow irrigation remained at 30 ha from 2018 to 2020.

Salinity impact zones 2018 to 2020

The Colignan river reach is in the low salinity impact zones, L1 and L4, and in the high impact zone, HIZ. Irrigation development from 2018 to 2020 occurred predominantly in L4. From 2018 to 2020, the irrigable area in L1 increased by 195 ha, L4 increased by 125 ha and HIZ decreased by 5 ha.

Irrigation properties

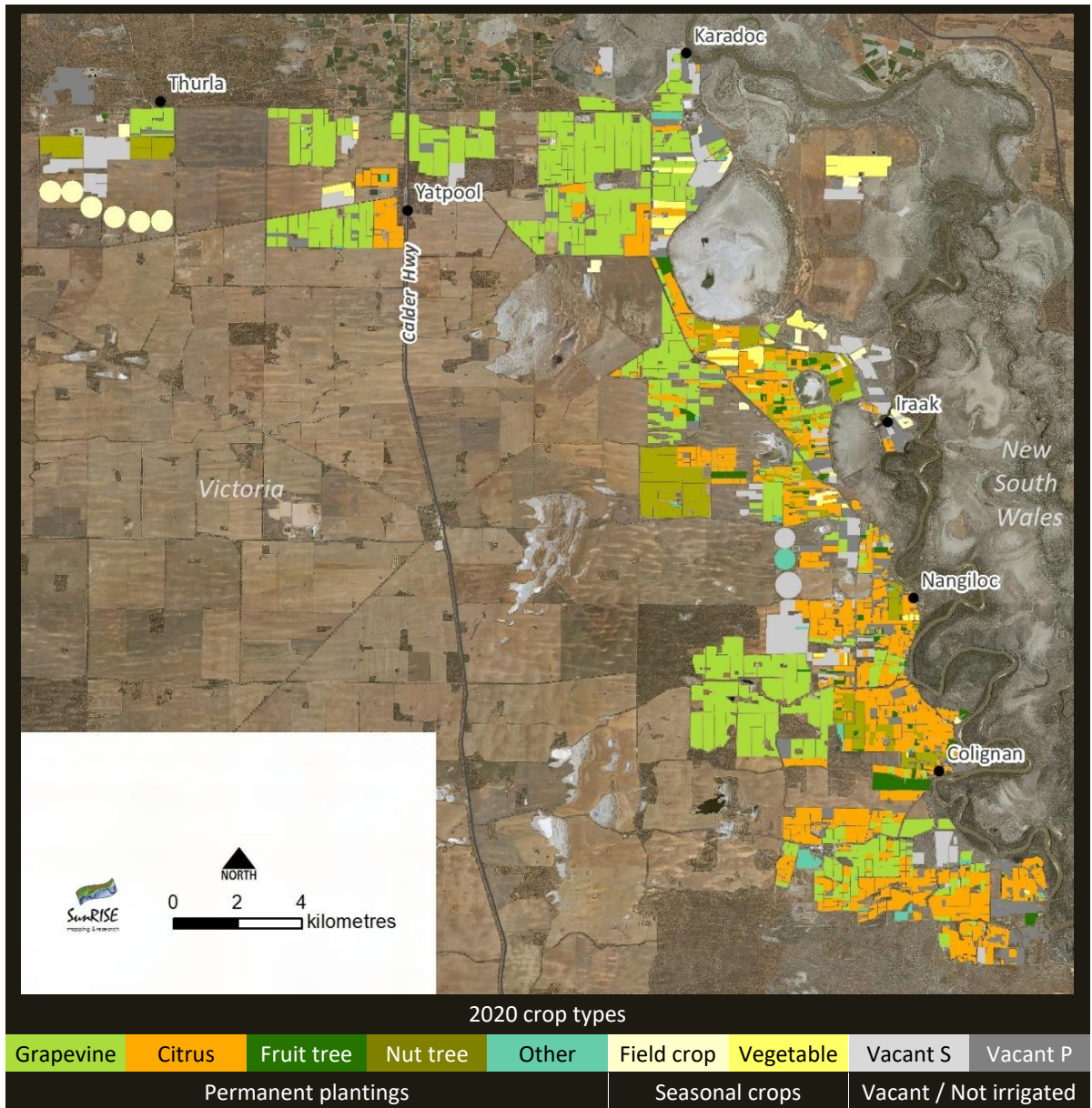
In 2020 there were approximately 130 irrigation properties in the Colignan river reach with an average irrigable area of 93 ha. From 2018 to 2020, the number of properties decreased by 3 from 133 to 130 properties.

Water-use in 2020

Analysis of water use data estimates that 70,681 ML of water was applied to 9,622 ha of crops in the Colignan river reach in the 2019-20 season.

3.5.1 Colignan river reach - crop types in 2020

Map 20 shows the Colignan river reach with crop types in 2020.



Map 20: Colignan river reach showing crop types in 2020

3.5.2 Colignan river reach - crop types from 2018 to 2020

Figure 48 summarises the change in irrigated crops in the Colignan river reach from 2018 to 2020.

Citrus plantings were the dominant crop from 2018 to 2020.

The main changes from 2018 to 2020 were:

1. Field crops decreased by 325 ha, a 49% decrease from 665 ha to 340 ha.
2. Citrus plantings increased by 120 ha, a 4% increase from 3,125 ha to 3,245 ha.
3. Vegetables decreased by 80 ha, an 18% decrease from 445 ha to 365 ha.
4. Table grape plantings increased by 75 ha, a 9% increase from 855 ha to 930 ha.
5. Wine grape plantings increased by 70 ha, a 3% increase from 2,765 ha to 2,835 ha.

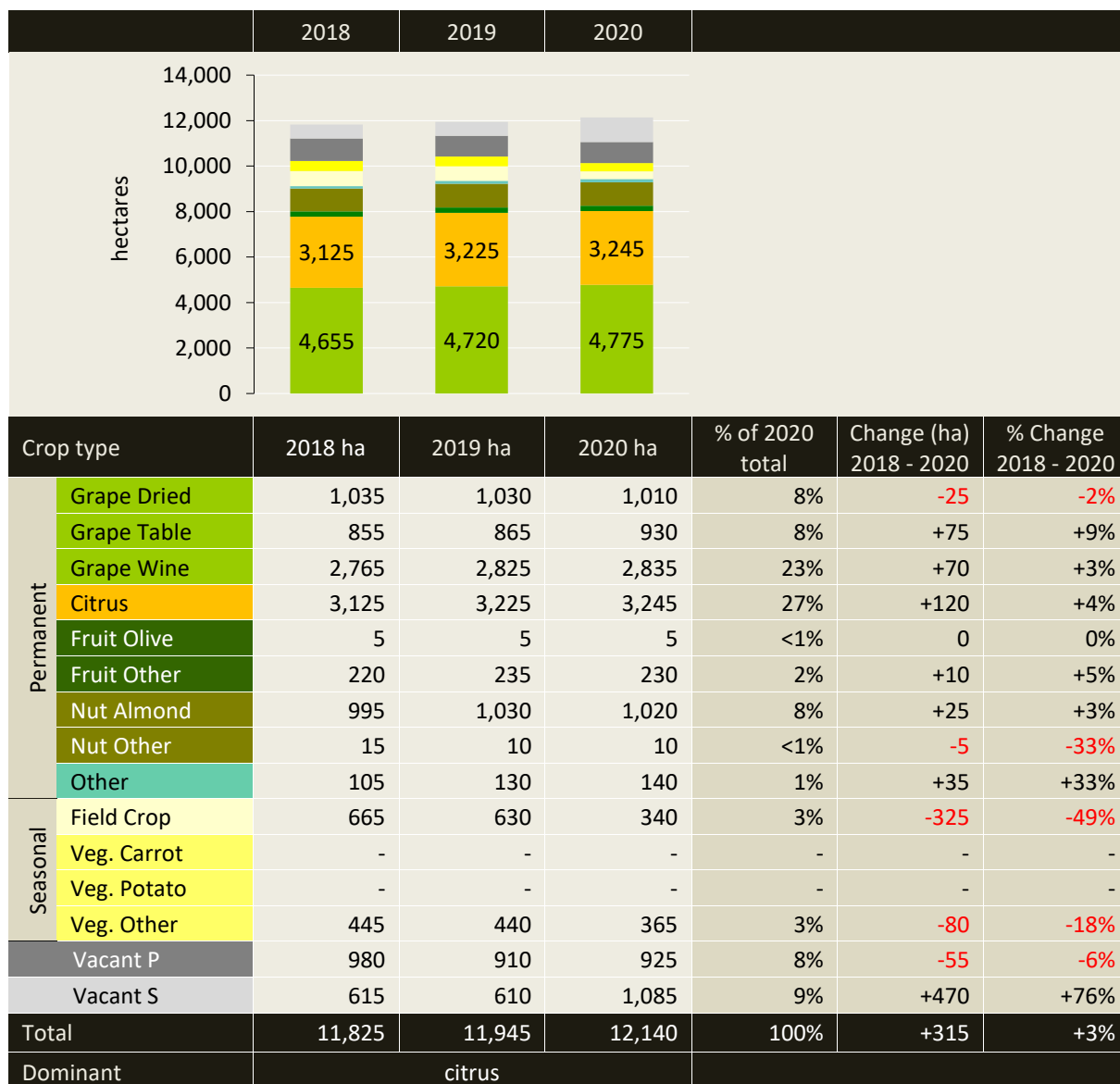


Figure 48: Colignan river reach - crop types from 2018 to 2020

3.5.3 Colignan river reach - planting trends

Figure 49 summarises planting trends in the Colignan river reach from 2018 to 2020.

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

- 77% permanent, 9% seasonal and 14% vacant in 2018; to
- 77% permanent, 6% seasonal and 17% vacant in 2020.

From 2018 to 2020:

- Permanent plantings increased by 305 ha; a 3% increase from 9,120 ha to 9,425 ha.
- Seasonal cropping decreased by 405 ha; a 36% decrease from 1,110 ha to 705 ha.
- Vacant areas, previously permanent plantings, decreased by 55 ha; a 6% decrease from 980 ha to 925 ha.
- Vacant areas, previously seasonal crops, increased by 470 ha; a 76% increase from 615 ha to 1,085 ha.

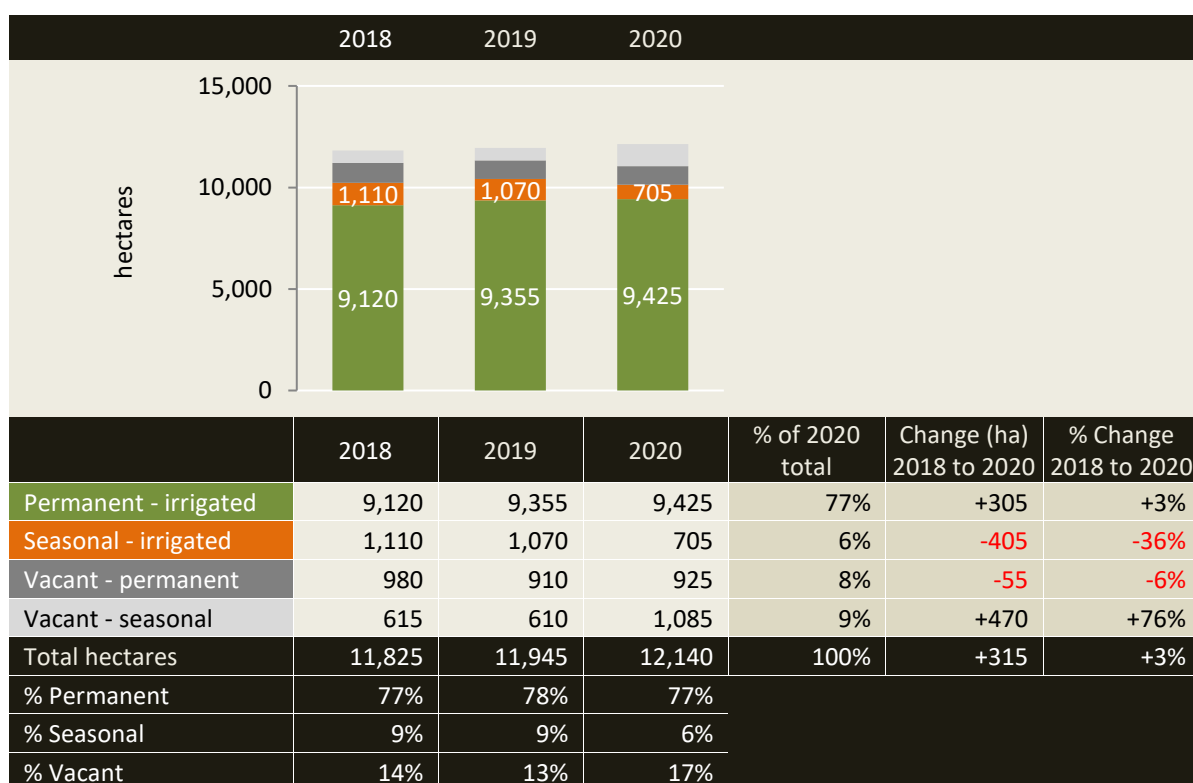
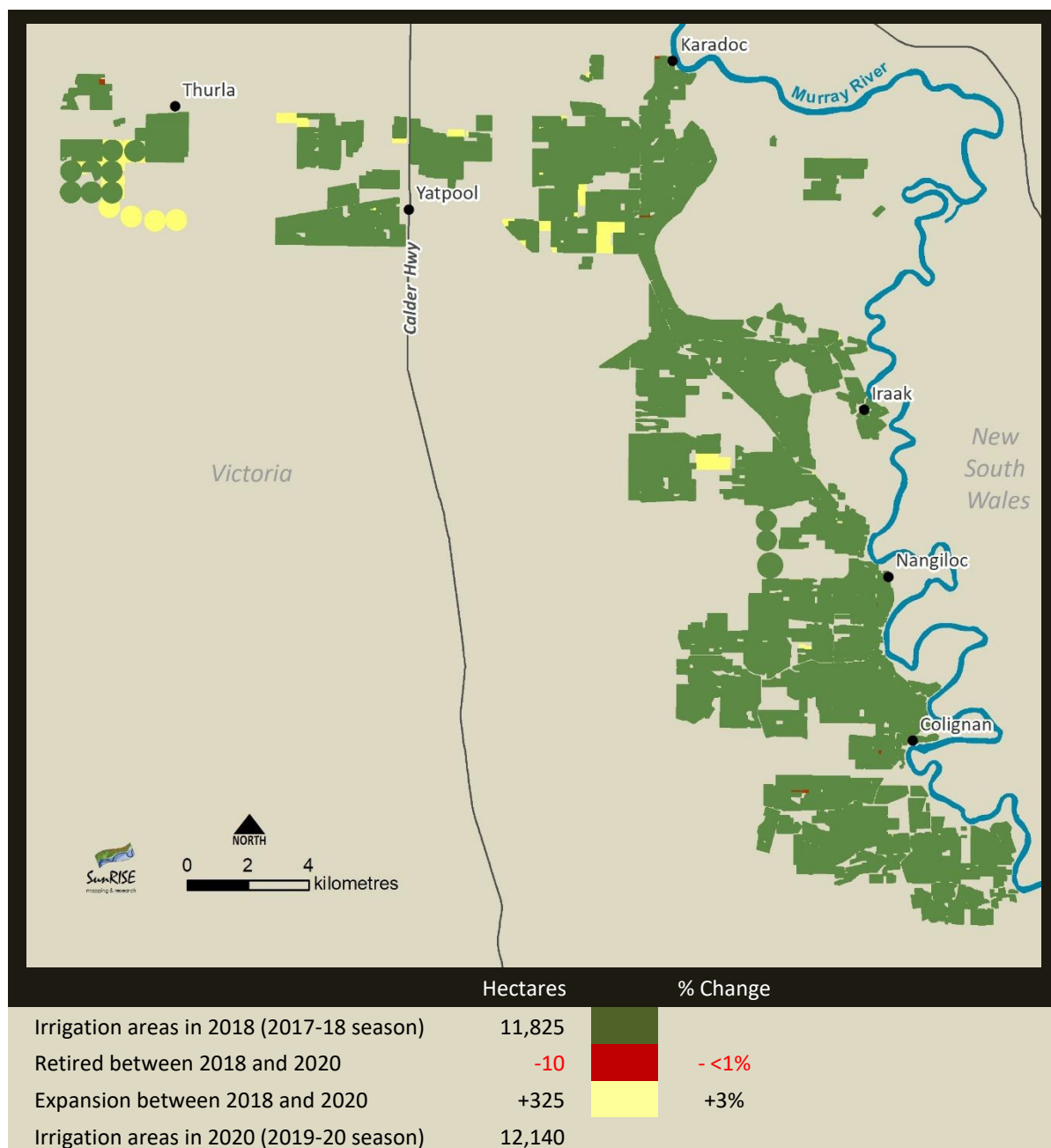


Figure 49: Colignan river reach - planting trends from 2018 to 2020

3.5.4 Colignan river reach - irrigation development

Map 21 shows irrigation development from 2018 to 2020 in the Colignan river reach with respect to new development (expansion) and areas retired²⁶ from irrigation.

- The irrigable area increased by 315 ha, a 3% increase from 11,825 ha in 2018 to 12,140 ha in 2020.
- The net increase of 315 ha was the balance of 10 ha retired from irrigation and 325 ha of expansion.



Map 21: Colignan river reach - irrigation development from 2018 to 2020

²⁶ Retired areas have undergone a change in land use that precludes use for irrigation e.g. urban development, housing, sheds, dams and land set aside for conservation purposes.

3.5.5 Colignan river reach - irrigation methods

Figure 50 summarises the change in irrigation methods in the Colignan river reach from 2018 to 2020.

Drippers remained the dominant irrigation method from 2018 to 2020.

From 2018 to 2020:

- Drip irrigation increased by 330 ha, a 4% increase from 7,620 ha to 7,950 ha.
- Lowlevel irrigation increased by 35 ha, a 4% increase from 870 ha to 905 ha.
- Overhead irrigation decreased by 465 ha, a 27% decrease from 1,710 ha to 1,245 ha.
- Furrow irrigation remained at 30 ha from 2018 to 2020.

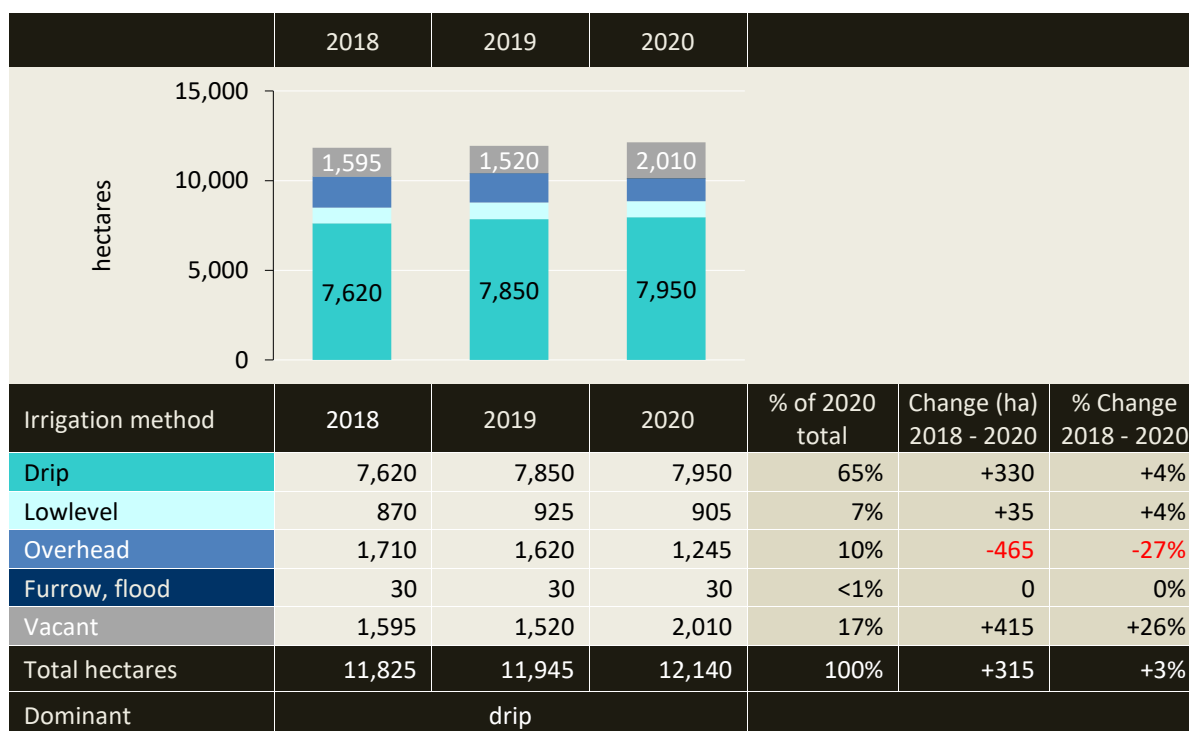


Figure 50: Colignan river reach - irrigation methods from 2018 to 2020

3.5.6 Colignan river reach - salinity impact zones

Figure 51 summarises the irrigable area in each salinity impact zone in the Colignan river reach from 2018 to 2020.

Colignan private diverters are in low salinity impact zones L1 and L4, and the high salinity impact zone, HIZ.

From 2018 to 2020, the area irrigated in:

- L1 decreased by 25 ha, a 1% decrease from 1,735 ha to 1,710 ha.
- L4 was 7,620 ha in 2018 and in 2020.
- HIZ decreased by 75 ha, a 9% decrease from 875 ha to 800 ha.

From 2018 to 2020, the irrigable area in:

- L1 increased by 195 ha, a 10% increase from 1,965 ha to 2,160 ha.
- L4 increased by 125 ha, a 1% increase from 8,685 ha to 8,810 ha.
- HIZ decreased by 5 ha, a less than 1% decrease from 1,175 ha to 1,170 ha.

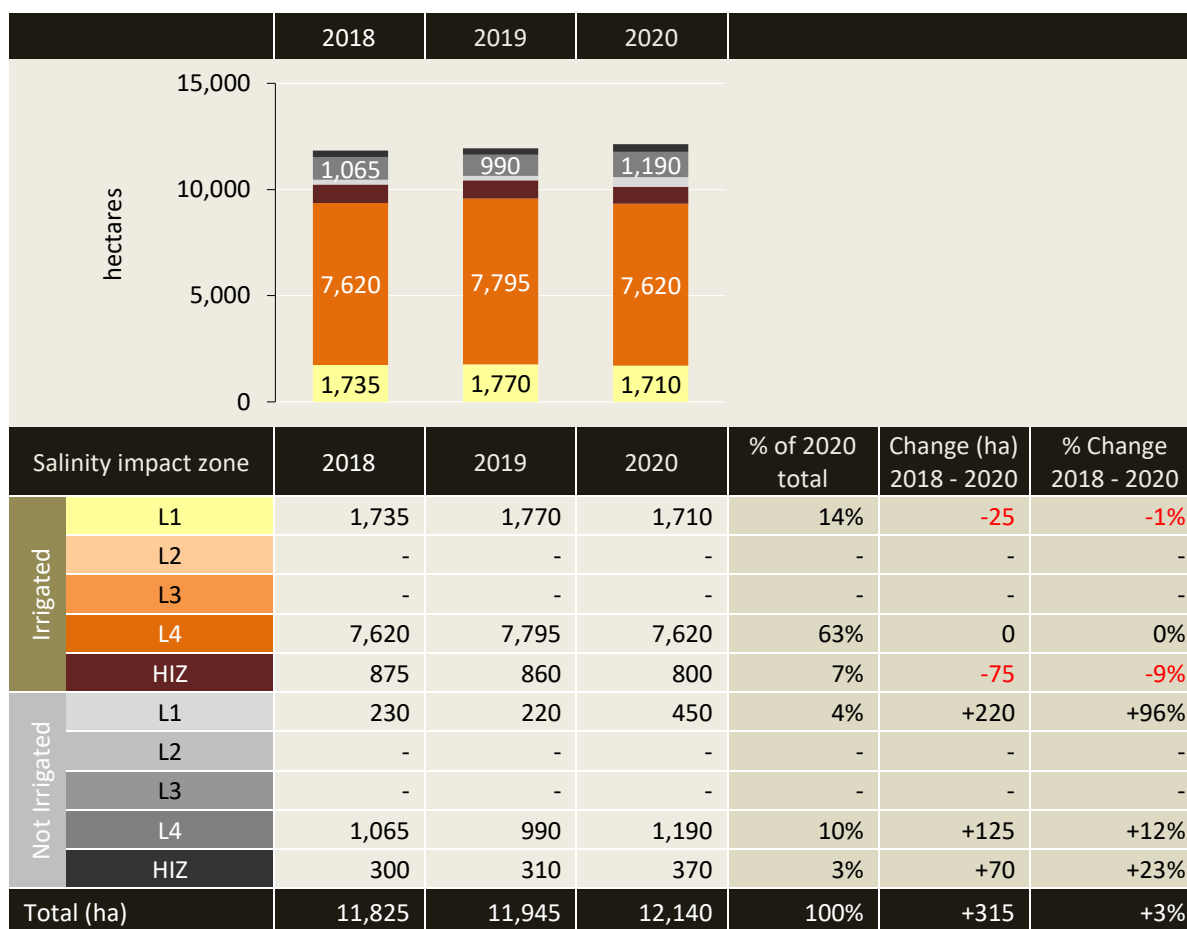


Figure 51: Colignan river reach - irrigable area in each salinity impact zone from 2018 to 2020

3.5.7 Colignan river reach - property change

Figure 52 provides estimates of property numbers and average property size (irrigable area) in the Colignan river reach from 2018 to 2020.

In 2020:

- There were approximately 130 irrigation properties; and
- most properties (62%) had an irrigable area greater than 20 ha.

From 2018 to 2020:

- The number of properties decreased by 3; a 2% decrease from 133 to 130 properties;
- properties with an irrigable area less than 20 ha increased by 1, while the number over 20 ha decreased by 4; and
- average property size (irrigable area) increased from 89 ha to 93 ha.

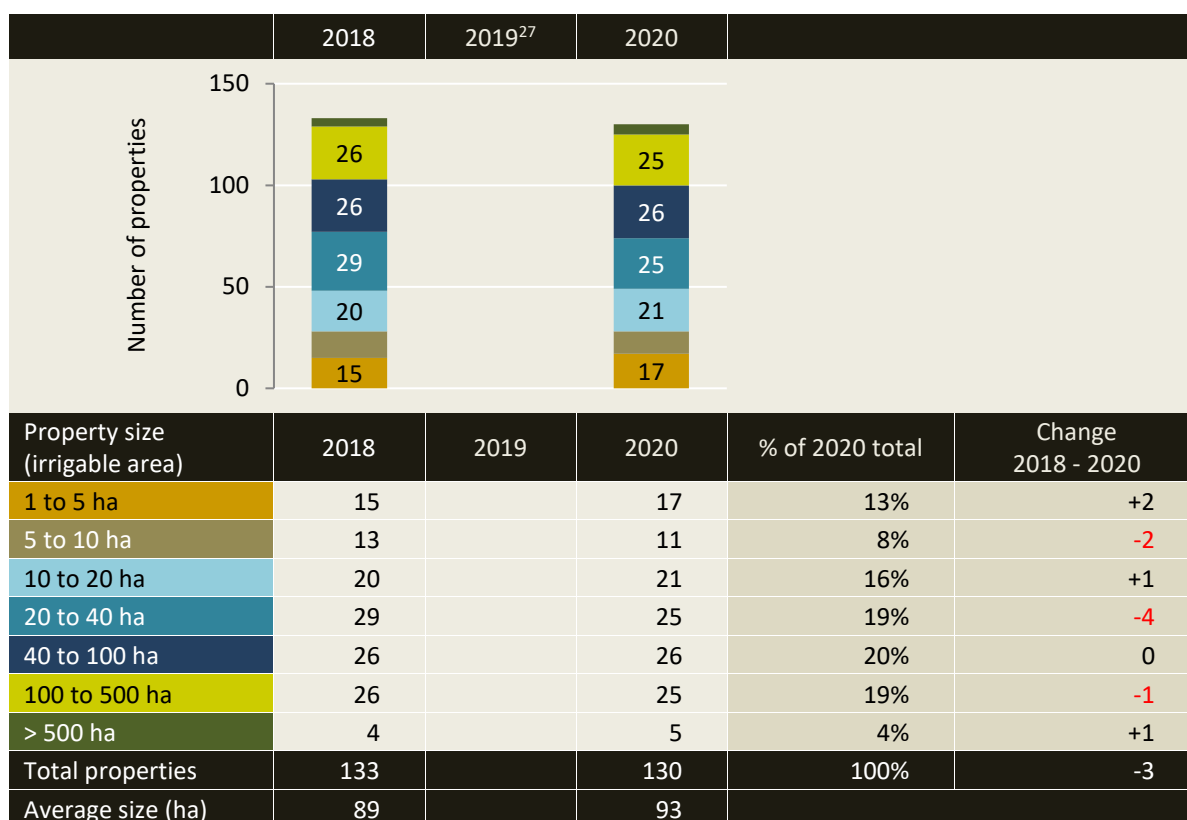


Figure 52: Colignan river reach - property numbers and sizes from 2018 to 2020

²⁷ Property data was not maintained in 2019

3.5.8 Colignan river reach – water-use in 2020

95% (9,622 ha) of irrigated horticulture in the Colignan river reach was aligned to 70,681 ML of water-use for 2019-2020. Alignment of the remaining 5% of irrigated horticulture was not resolved, and resolution may affect the water-use figures presented.

Water use in the Colignan river reach accounted for 17% of total irrigation water-use for private diverters in the Mallee catchment in 2019-2020 (see Figure 47). Citrus plantings were the dominant crop irrigated in the Colignan river reach in 2020 (27%) and drip irrigation was the dominant irrigation method used (65%).

3.6 Mildura river reach (*Mildura to Lock 10*)

In summary for the Mildura river reach

Change in crop types from 2018 to 2020

Table grape plantings were the dominant crop from 2018 to 2020. The main changes from 2018 to 2020 were:

1. Table grape plantings increased by 40 ha, a 9% increase from 440 ha to 480 ha.
2. Field crops increased by 30 ha, a 9% increase from 320 ha to 350 ha.
3. Dried grape plantings decreased by 20 ha, a 19% decrease from 105 ha to 85 ha.
4. Vegetables decreased by 15 ha, a 50% decrease from 30 ha to 15 ha.
5. Wine grape plantings decreased by 10 ha, a 3% decrease from 300 ha to 290 ha.
6. Fruit trees, other than olives, increased by 10 ha, a 40% increase from 25 ha to 35 ha.

Planting trends - permanent plantings, seasonal crops and vacant areas

From 2018 to 2020:

- Permanent plantings increased by 15 ha; a 1% increase from 1,070 ha to 1,085 ha and vacant areas, previously permanent plantings, increased by 10 ha.
- Seasonal cropping increased by 15 ha; a 4% increase from 350 ha to 365 ha and vacant areas, previously seasonal crops, increased by 15 ha.

Irrigation development - new and retired areas

The irrigable area in the Mildura river reach increased by 55 ha, a 3% increase from 1,960 ha in 2018 to 2,015 ha in 2020. The net increase of 55 ha was the balance of 65 ha expansion and 10 ha retired from irrigation.

Irrigation methods 2018 to 2020

Drippers remained the dominant irrigation method from 2018 to 2020. Drip irrigation increased by 35 ha, a 4% increase from 825 ha in 2018 to 860 ha in 2020. Lowlevel irrigation increased by 25 ha, while overhead and furrow irrigation decreased by 5 ha and 25 ha respectively.

Salinity impact zones 2018 to 2020

The Mildura river reach is in the lowest salinity impact zone, L1 and the high impact zone, HIZ. Irrigation development from 2018 to 2020 occurred predominantly in L1. From 2018 to 2020, the irrigable area in L1 increased by 60 ha and HIZ decreased by 5 ha, a less than 1% decrease from 1,225 ha to 1,220 ha.

Irrigation properties

In 2020 there were approximately 101 irrigation properties in the Mildura river reach with an average irrigable area of 20 ha. From 2018 to 2020 the number of properties decreased by 2; from 103 to 101 properties.

Water-use in 2020

Analysis of water use data estimates that 7,172 ML of water was applied to 1,281 ha of crops in the Mildura river reach in the 2019-20 season.

3.6.1 Mildura river reach - crop types in 2020

Map 22 shows the Mildura river reach with crop types in 2020.



Map 22: Mildura river reach showing crop types in 2020

3.6.2 Mildura river reach - crop types from 2018 to 2020

Figure 53 summarises the change in irrigated crops in the Mildura river reach from 2018 to 2020.

Table grape plantings were the dominant crop from 2018 to 2020.

The main changes from 2018 to 2020 were:

1. Table grape plantings increased by 40 ha, a 9% increase from 440 ha to 480 ha.
2. Field crops increased by 30 ha, a 9% increase from 320 ha to 350 ha.
3. Dried grape plantings decreased by 20 ha, a 19% decrease from 105 ha to 85 ha.
4. Vegetables decreased by 15 ha, a 50% decrease from 30 ha to 15 ha.
5. Wine grape plantings decreased by 10 ha, a 3% decrease from 300 ha to 290 ha.
6. Fruit trees, other than olives, increased by 10 ha, a 40% increase from 25 ha to 35 ha.

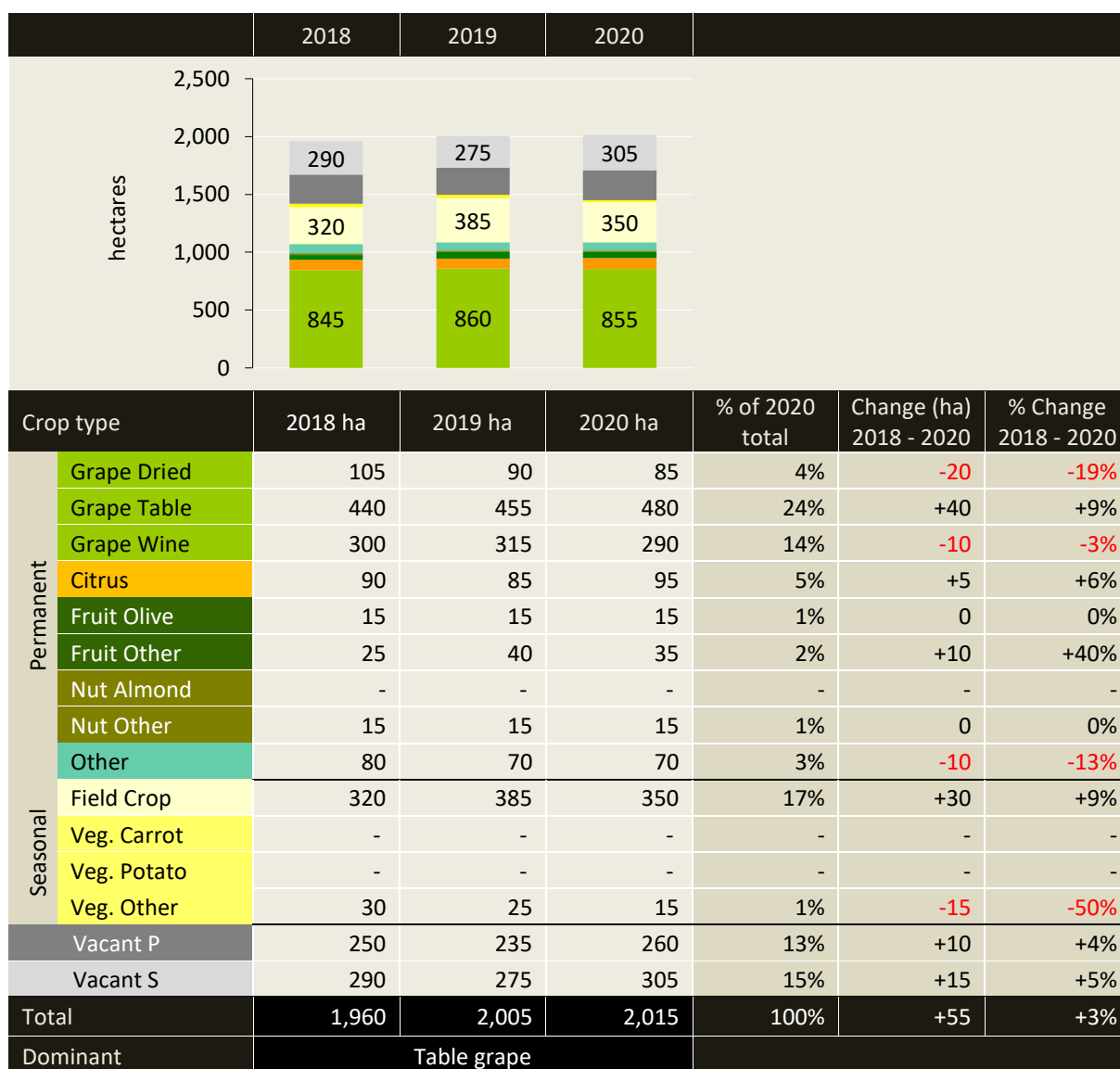


Figure 53: Mildura river reach - crop types from 2018 to 2020

3.6.3 Mildura river reach - planting trends

Figure 54 summarises planting trends in the Mildura river reach from 2018 to 2020.

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

- 55% permanent, 18% seasonal and 27% vacant in 2018; to
- 54% permanent, 18% seasonal and 28% vacant in 2020.

From 2018 to 2020:

- Permanent plantings increased by 15 ha; a 1% increase from 1,070 ha to 1,085 ha.
- Seasonal cropping increased by 15 ha; a 4% increase from 350 ha to 365 ha.
- Vacant areas, previously permanent plantings, increased by 10 ha; a 4% increase from 250 ha to 260 ha.
- Vacant areas, previously seasonal crops, increased by 15 ha; a 5% increase from 290 to 305 ha.

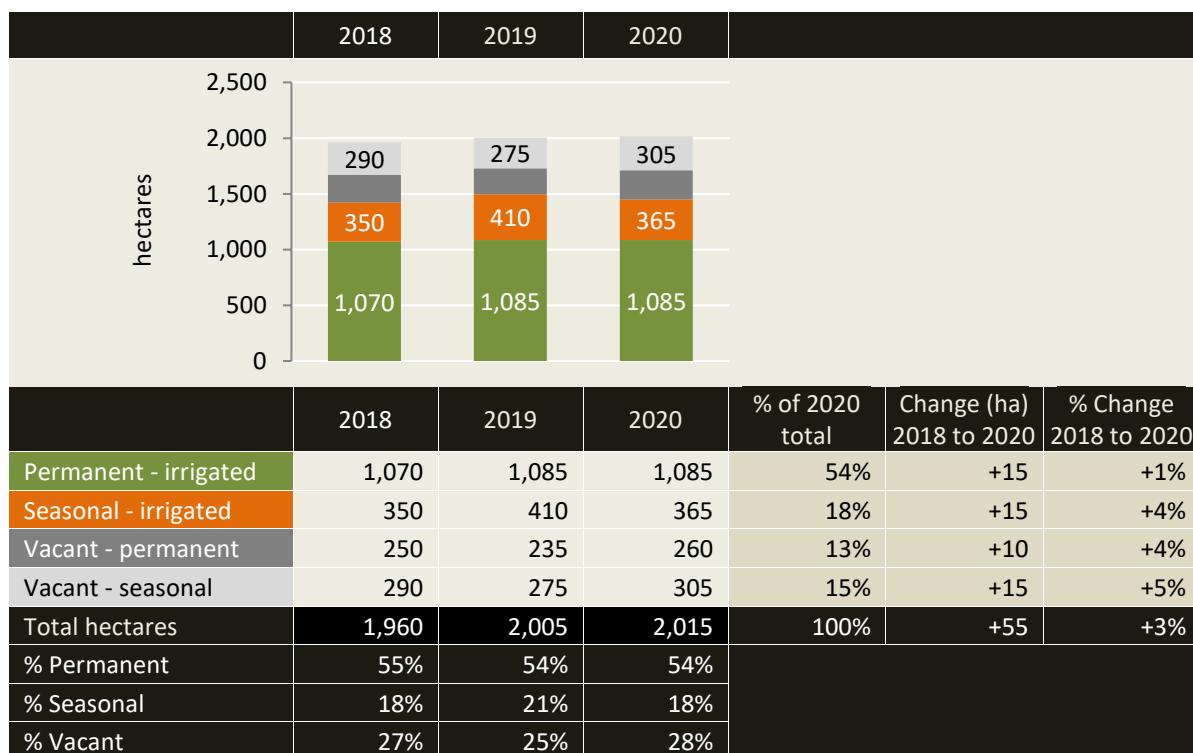
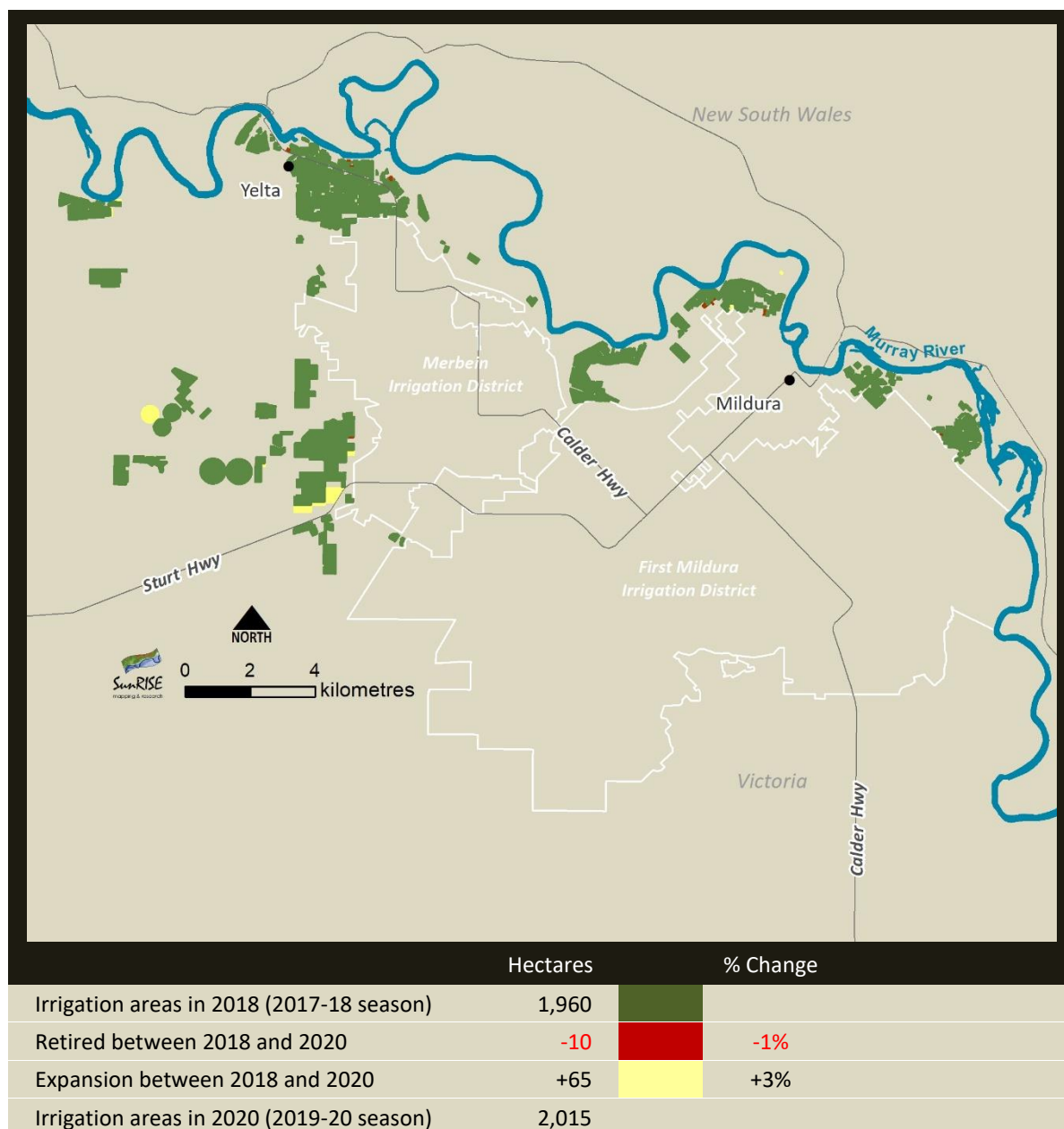


Figure 54: Mildura river reach - planting trends from 2018 to 2020

3.6.4 Mildura river reach - irrigation development

Map 23 shows irrigation development from 2018 to 2020 in the Mildura river reach with respect to new development (expansion) and areas retired²⁸ from irrigation.

- The irrigable area increased by 55 ha, a 3% increase from 1,960 ha in 2018 to 2,015 ha in 2020.
- The net increase of 55 ha was the balance of 10 ha retired from irrigation and 65 ha of expansion.



Map 23: Mildura river reach - irrigation development from 2018 to 2020

²⁸ Retired areas have undergone a change in land use that precludes use for irrigation e.g. urban development, housing, sheds, dams and land set aside for conservation purposes.

3.6.5 Mildura river reach - irrigation methods

Figure 55 summarises the change in irrigation methods in the Mildura river reach from 2018 to 2020.

Drippers remained the dominant irrigation method from 2018 to 2020.

From 2018 to 2020:

- Drip irrigation increased by 35 ha, a 4% increase from 825 ha to 860 ha.
- Lowlevel irrigation increased by 25 ha, a 16% increase from 160 ha to 185 ha.
- Overhead irrigation decreased by 5 ha, a 2% decrease from 255 ha to 250 ha.
- Furrow irrigation decreased by 25 ha, a 14% decrease from 180 ha to 155 ha.

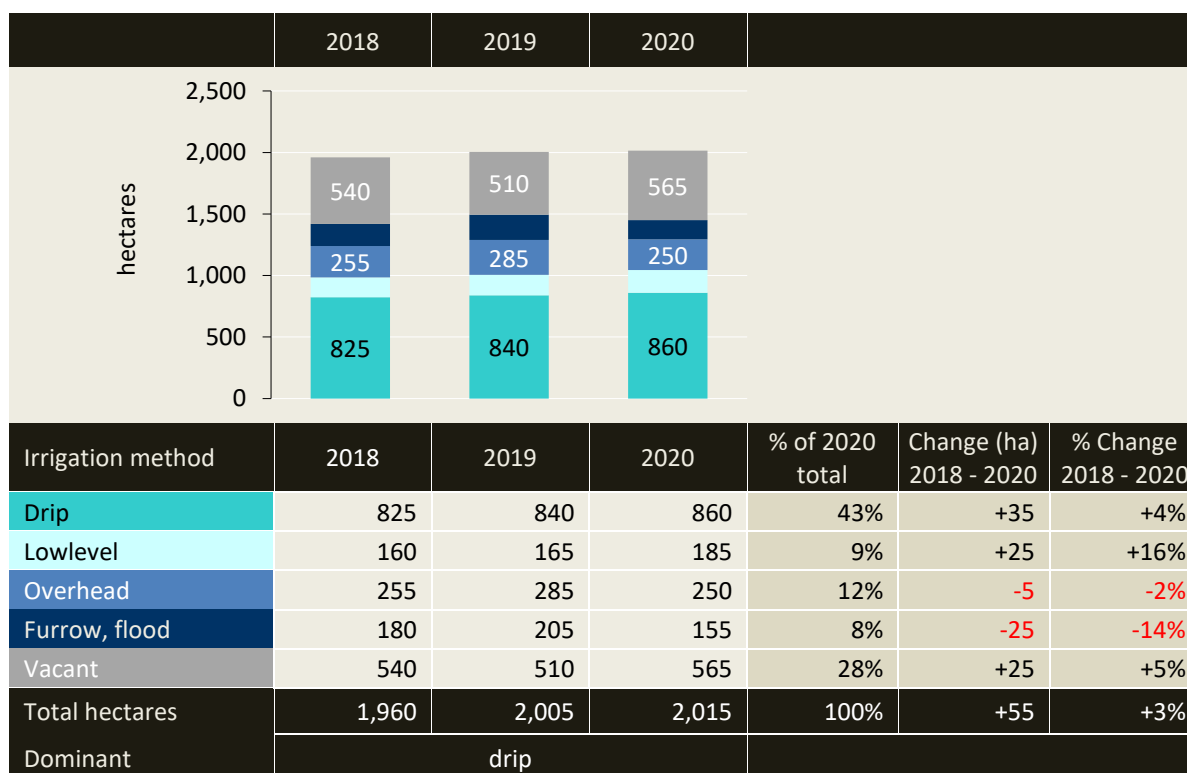


Figure 55: Mildura river reach - irrigation methods from 2018 to 2020

3.6.6 Mildura river reach - salinity impact zones

Figure 56 summarises the irrigable area in each salinity impact zone in the Mildura river reach from 2018 to 2020. Mildura private diverters are in the lowest salinity impact zone, L1 and the high salinity impact zone, HIZ.

From 2018 to 2020, the area irrigated in:

- L1 increased by 70 ha, a 12% increase from 605 ha to 675 ha.
- HIZ decreased by 40 ha, a 5% decrease from 815 ha to 775 ha.

From 2018 to 2020, the irrigable area in:

- L1 increased by 60 ha, an 8% increase from 735 ha to 795 ha.
- HIZ decreased by 5 ha, a less than 1% decrease from 1,225 ha to 1,220 ha.

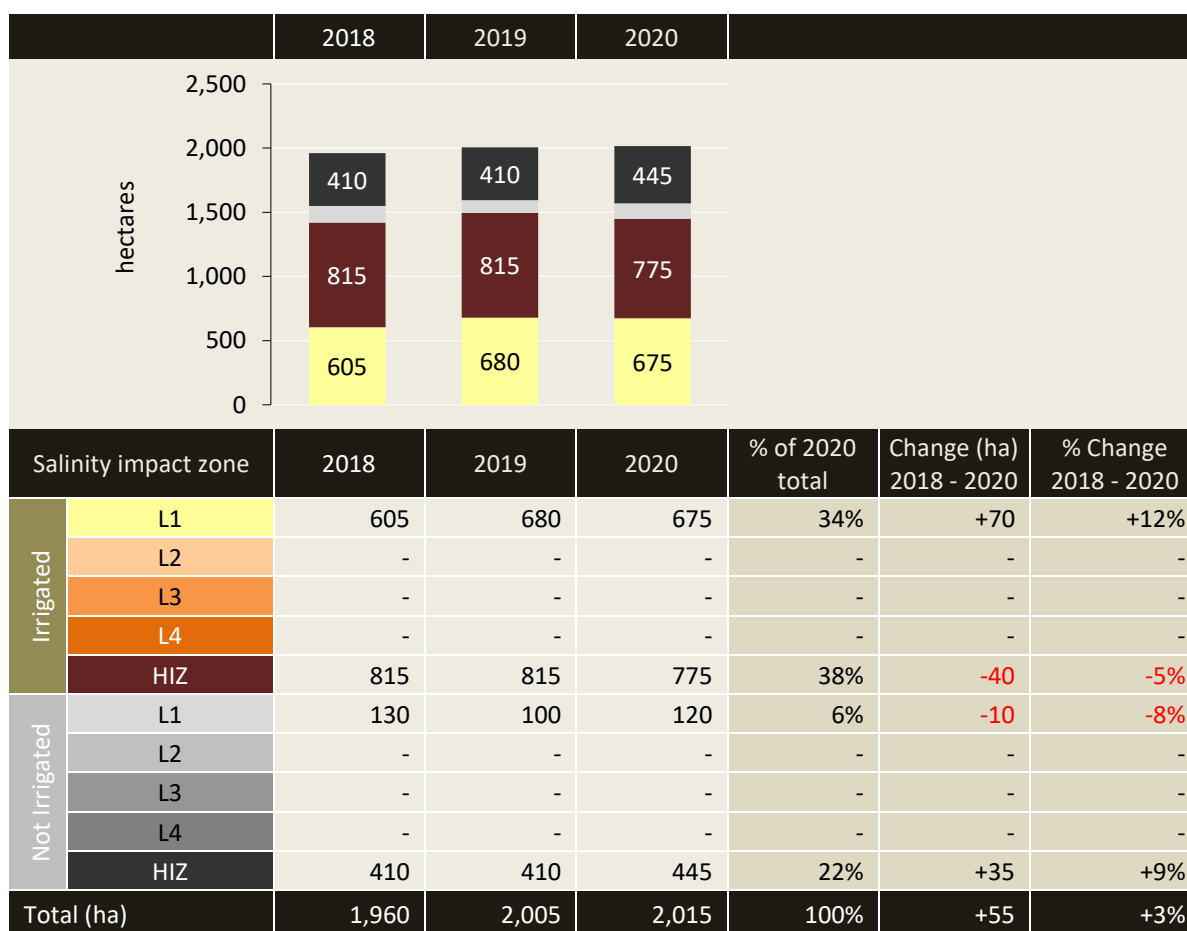


Figure 56: Mildura river reach - irrigable area in each salinity impact zone from 2018 to 2020

3.6.7 Mildura river reach - property change

Figure 57 provides estimates of property numbers and average property size (irrigable area) in the Mildura river reach from 2018 to 2020.

In 2020:

- There were approximately 101 irrigation properties; and
- most properties (73%) had an irrigable area less than 20 ha.

From 2018 to 2020:

- the number of properties decreased by 2; a 2% decrease from 103 to 101 properties;
- properties with an irrigable area less than 20 ha decreased by 1 and the number over 20 ha decreased by 1; and
- average property size (irrigable area) increased from 19 ha to 20 ha.

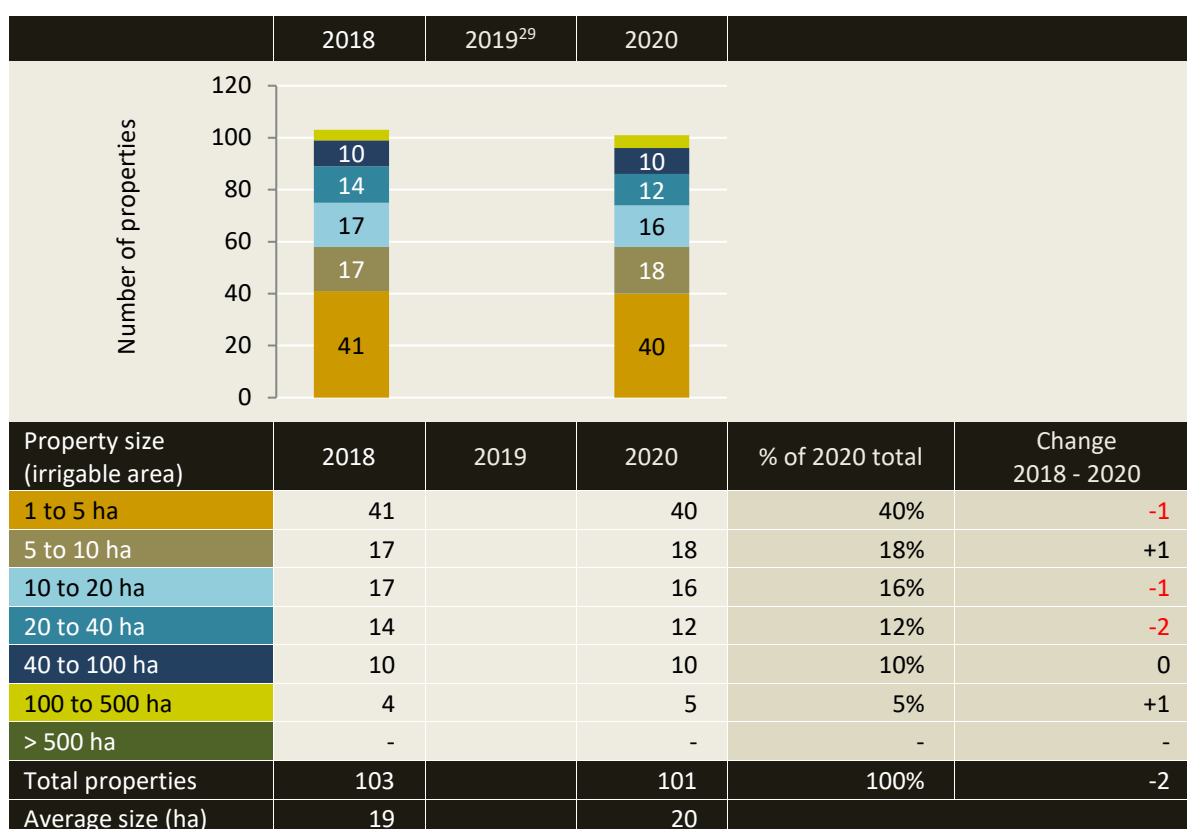


Figure 57: Mildura river reach - property numbers and sizes from 2018 to 2020

²⁹ Property data was not maintained in 2019

3.6.8 Mildura river reach – water-use in 2020

88% (1,281 ha) of irrigated horticulture in the Mildura river reach was aligned to 7,172 ML of water-use for 2019-2020. Alignment of the remaining 12% of irrigated horticulture was not resolved, and resolution may affect the water-use figures presented.

Water use in the Mildura river reach accounted for 2% of total irrigation water-use for private diverters in the Mallee catchment in 2019-2020 (see Figure 47). Table grape plantings were the dominant crop irrigated in the Mildura river reach in 2020 (24%) and drip irrigation was the dominant irrigation method used (43%).

3.7 Lock 10 to the South Australian Border

In summary for the Lock 10 to South Australia river reach

Change in crop types from 2018 to 2020

Almond plantings were the dominant crop from 2018 to 2020. The main changes from 2018 to 2020 were:

1. Wine grape plantings increased by 160 ha, a 24% increase from 670 ha to 830 ha.
2. Almond plantings increased by 125 ha, a 7% increase from 1,845 ha to 1,970 ha.
3. Table grape plantings increased by 55 ha, from 0 ha to 55 ha.

Planting trends - permanent plantings, seasonal crops and vacant areas

From 2018 to 2020:

- Permanent plantings increased by 335 ha; a 13% increase from 2,665 ha to 3,000 ha and vacant areas, previously permanent plantings, decreased by 10 ha.
- Seasonal cropping remained at 10 ha and vacant areas, previously seasonal crops, increased by 5 ha.

Irrigation development - new and retired areas

The irrigable area in the Lock 10 to SA river reach increased by 330 ha, an 11% increase from 3,075 ha in 2018 to 3,405 ha in 2020. There were no areas retired from irrigation.

Irrigation methods 2018 to 2020

Drippers remained the dominant irrigation method from 2018 to 2020. Drip irrigation increased by 375 ha; a 21% increase from 1,805 ha to 2,180 ha. Lowlevel irrigation decreased by 40 ha, overhead irrigation remained at 5 ha and there was no flood or furrow irrigation.

Salinity impact zones 2018 to 2020

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 2018 to 2020 occurred in L1.

From 2018 to 2020, the irrigable area in L1 increased by 330 ha, a 13% increase from 2,590 ha to 2,920 ha and HIZ remained at 485 ha.

Irrigation properties

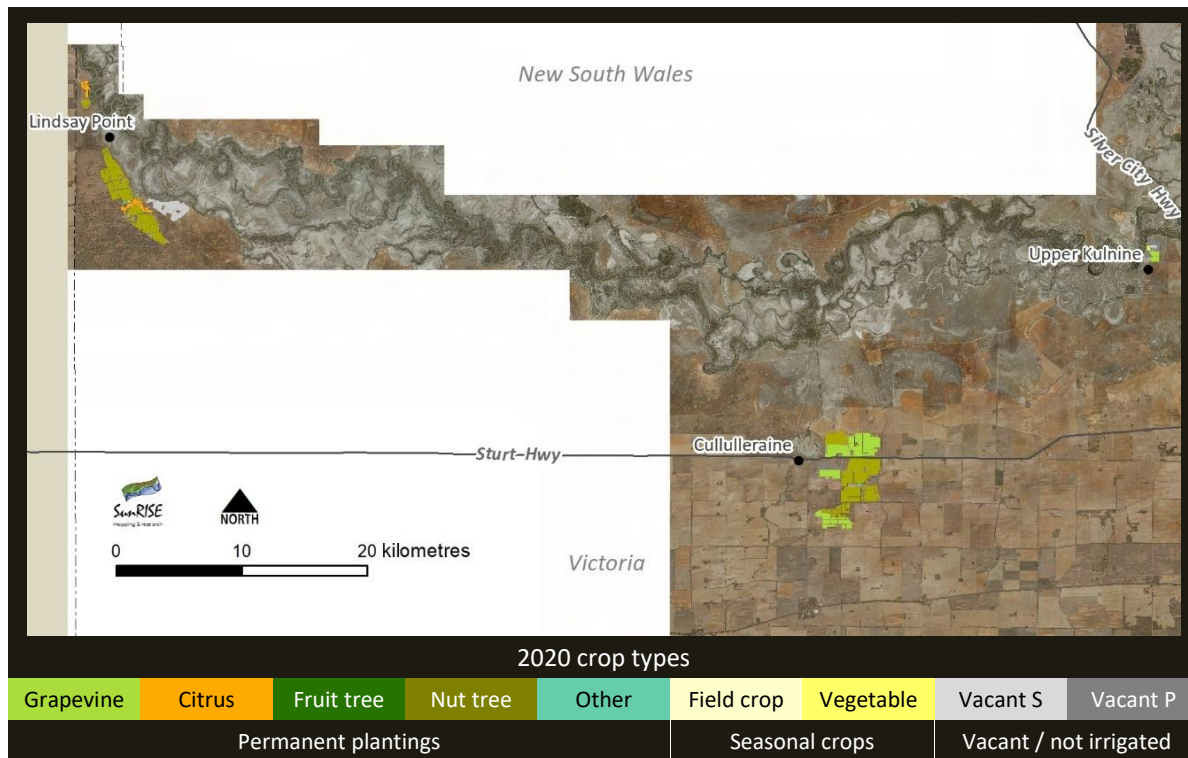
In 2020 there were approximately 17 irrigation properties in the Lock 10 to South Australia river reach with an average irrigable area of 200 ha. From 2018 to 2020 the number of properties remained at 17, but the average irrigable area increased from 181 ha to 200 ha.

Water-use in 2020

Analysis of water use data estimates that 31,264 ML of water was applied to 3,010 ha of crops in the Lock 10 to SA river reach in the 2019-20 season.

3.7.1 Lock 10 to South Australia - crop types in 2020

Map 24 shows the Lock 10 to South Australia river reach with crop types in 2020.



Map 24: Lock 10 to South Australia showing crop types in 2020

3.7.2 Lock 10 to South Australia - crop types from 2018 to 2020

Figure 58 summarises the change in irrigated crops in the Lock 10 to South Australia river reach from 2018 to 2020.

Almond plantings were the dominant crop from 2018 to 2020.

The main changes from 2018 to 2020 were:

1. Wine grape plantings increased by 160 ha, a 24% increase from 670 ha to 830 ha.
2. Almond plantings increased by 125 ha, a 7% increase from 1,845 ha to 1,970 ha.
3. Table grape plantings increased by 55 ha, from 0 ha to 55 ha.

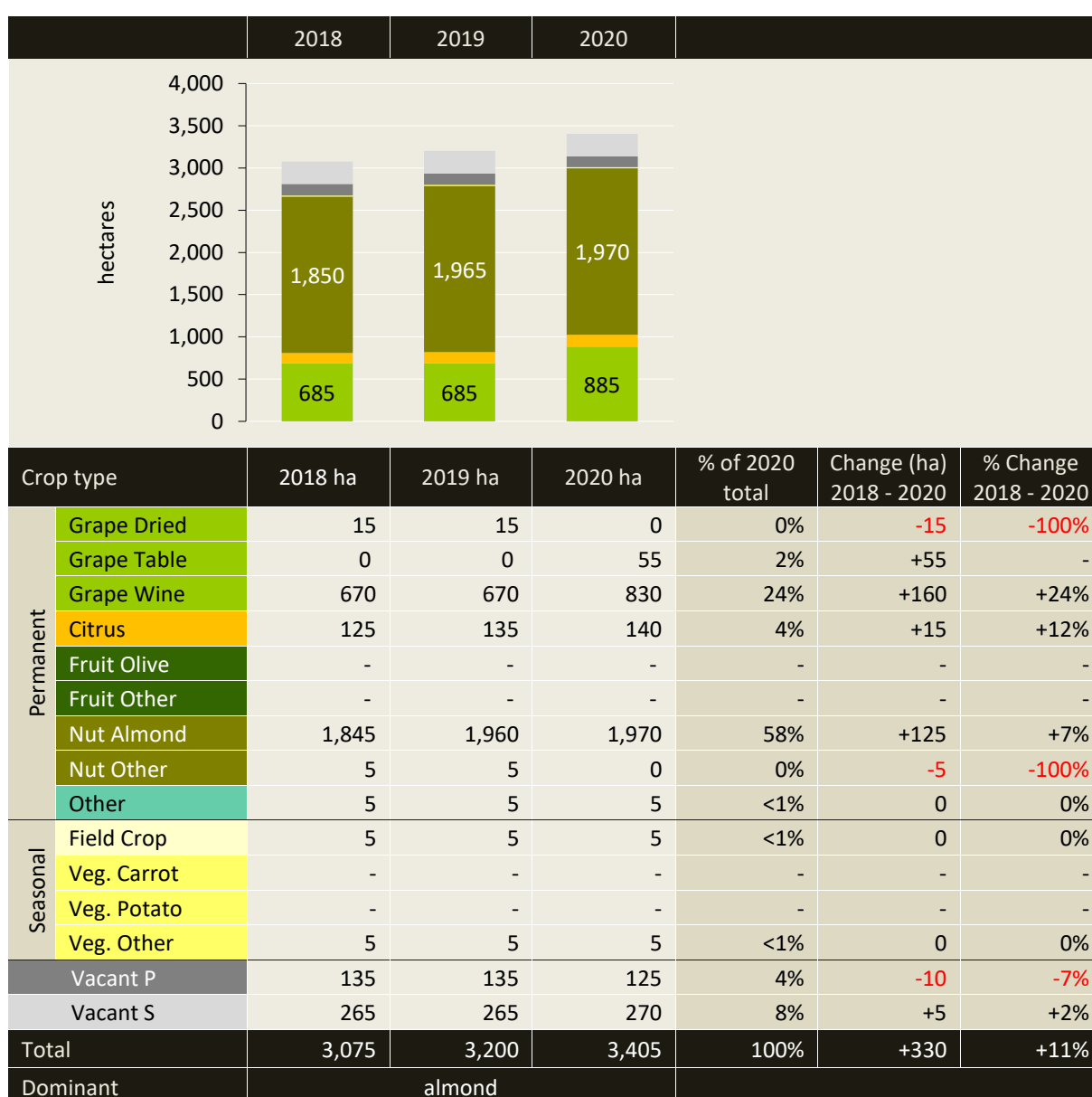


Figure 58: Lock 10 to South Australia - crop types from 2018 to 2020

3.7.3 Lock 10 to South Australia - planting trends

Figure 59 summarises planting trends in the Lock 10 to South Australia river reach from 2018 to 2020.

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

- 87% permanent, <1% seasonal and 13% vacant in 2018; to
- 88% permanent, <1% seasonal and 12% vacant in 2020.

From 2018 to 2020:

- Permanent plantings increased by 335 ha; a 13% increase from 2,665 ha to 3,000 ha.
- Seasonal cropping remained at 10 ha.
- Vacant areas, previously permanent plantings, decreased by 10 ha; a 7% decrease from 135 ha to 125 ha.
- Vacant areas, previously seasonal crops, increased by 5 ha; a 2% increase from 265 ha to 270 ha.

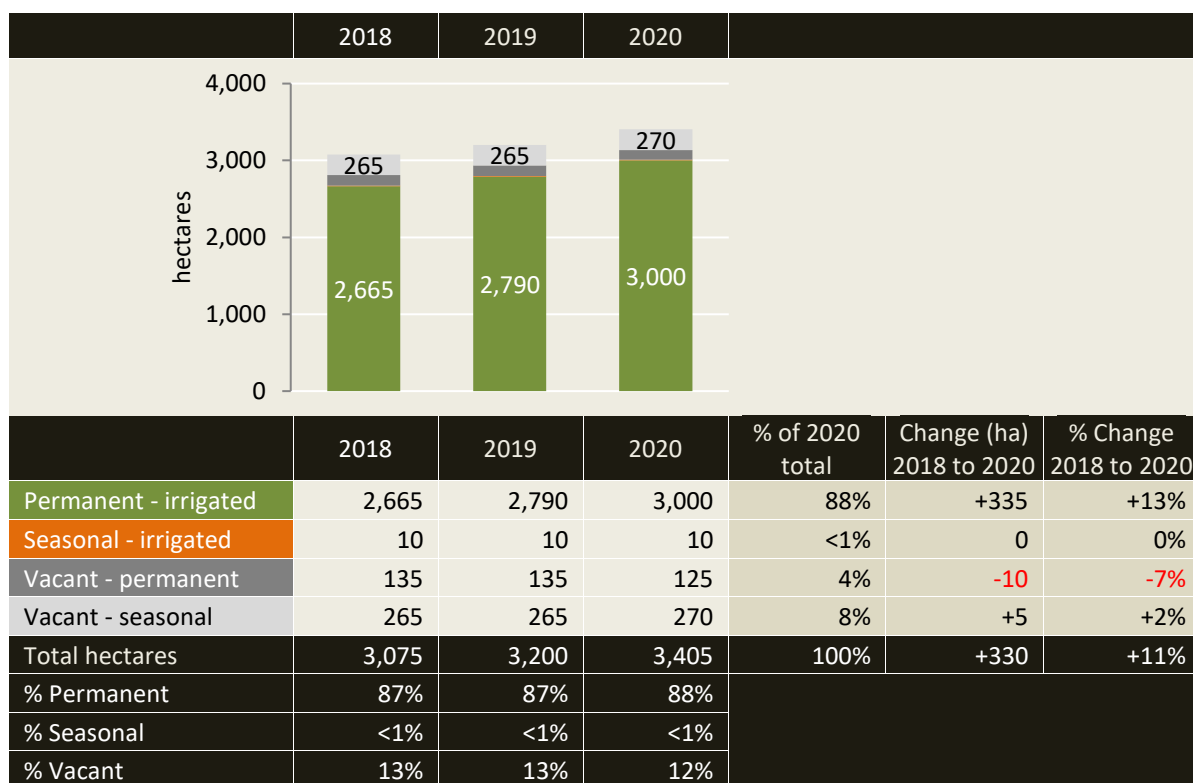
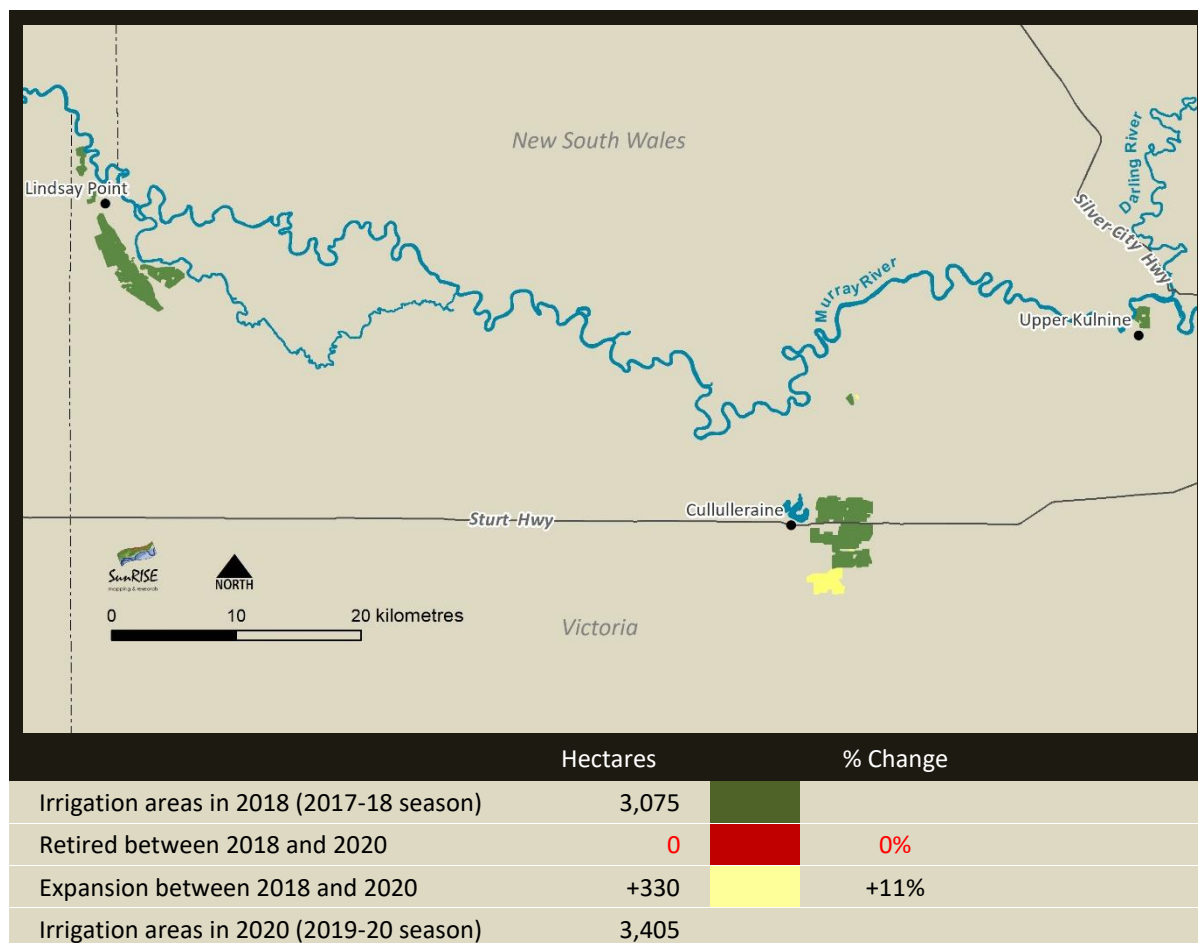


Figure 59: Lock 10 to South Australia - planting trends from 2018 to 2020

3.7.4 Lock 10 to South Australia - irrigation development

Map 25 shows irrigation development in the Lock 10 to South Australia river reach with respect to new development (expansion) and areas retired³⁰ from irrigation from 2018 to 2020.

- The irrigable area increased by 330 ha, an 11% increase from 3,075 ha in 2018 to 3,405 ha in 2020.
- No areas were retired from irrigation.



Map 25: Lock 10 to South Australia - irrigation development from 2018 to 2020

³⁰ Retired areas have undergone a change in land use that precludes use for irrigation e.g. urban development, housing, sheds, dams and land set aside for conservation purposes.

3.7.5 Lock 10 to South Australia - irrigation methods

Figure 60 summarises the change in irrigation methods in the Lock 10 to South Australia river reach from 2018 to 2020.

Drippers remained the dominant irrigation method from 2018 to 2020.

From 2018 to 2020:

- Drip irrigation increased by 375 ha; a 21% increase from 1,805 ha to 2,180 ha.
- Lowlevel irrigation decreased by 40 ha; a 5% decrease from 865 ha to 825 ha.
- Overhead irrigation remained at 5 ha.
- There was no flood or furrow irrigation.

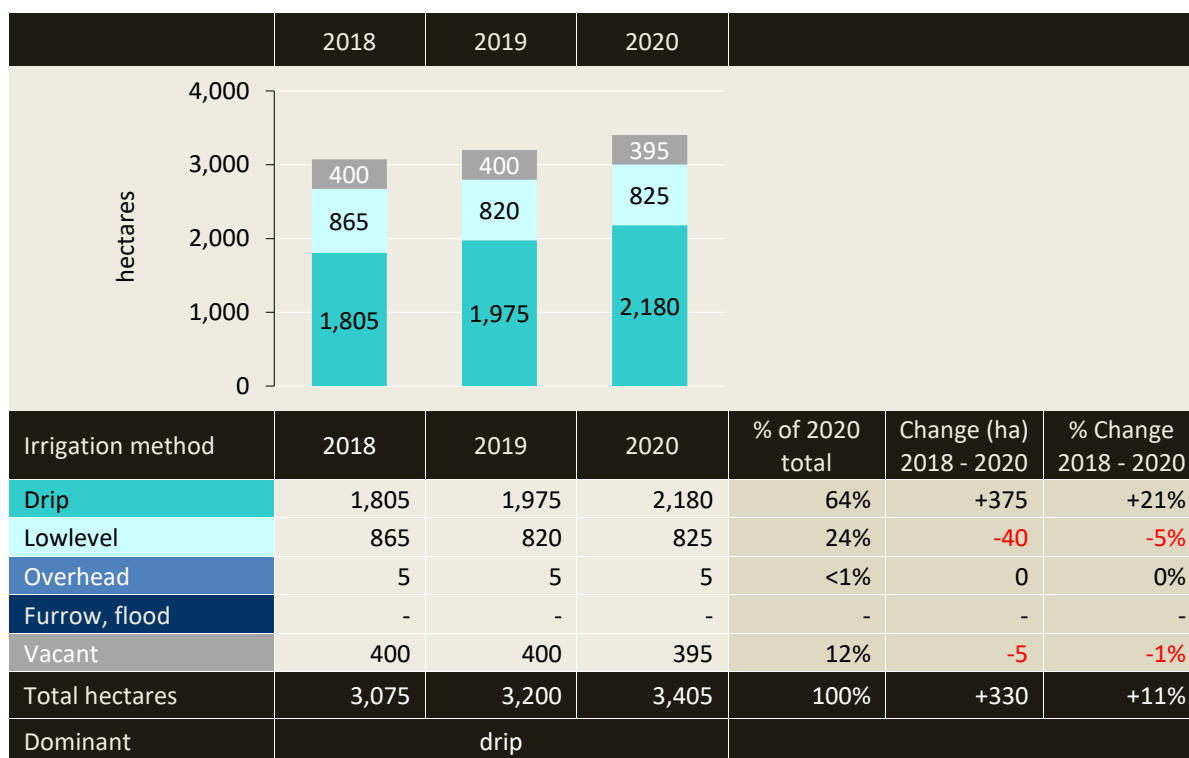


Figure 60: Lock 10 to South Australia - irrigation methods from 2018 to 2020

3.7.6 Lock 10 to South Australia - salinity impact zones

Figure 61 summarises the irrigable area in each salinity impact zone, in the Lock 10 to South Australia river reach, from 2018 to 2020.

From 2018 to 2020, the area irrigated in:

- L1 increased by 340 ha, a 14% increase from 2,495 ha to 2,835 ha.
- HIZ decreased by 5 ha, a 3% decrease from 180 ha to 175 ha.

From 2018 to 2020, the irrigable area in:

- L1 increased by 330 ha, a 13% increase from 2,590 ha to 2,920 ha.
- HIZ remained at 485 ha in 2018 and 2020.

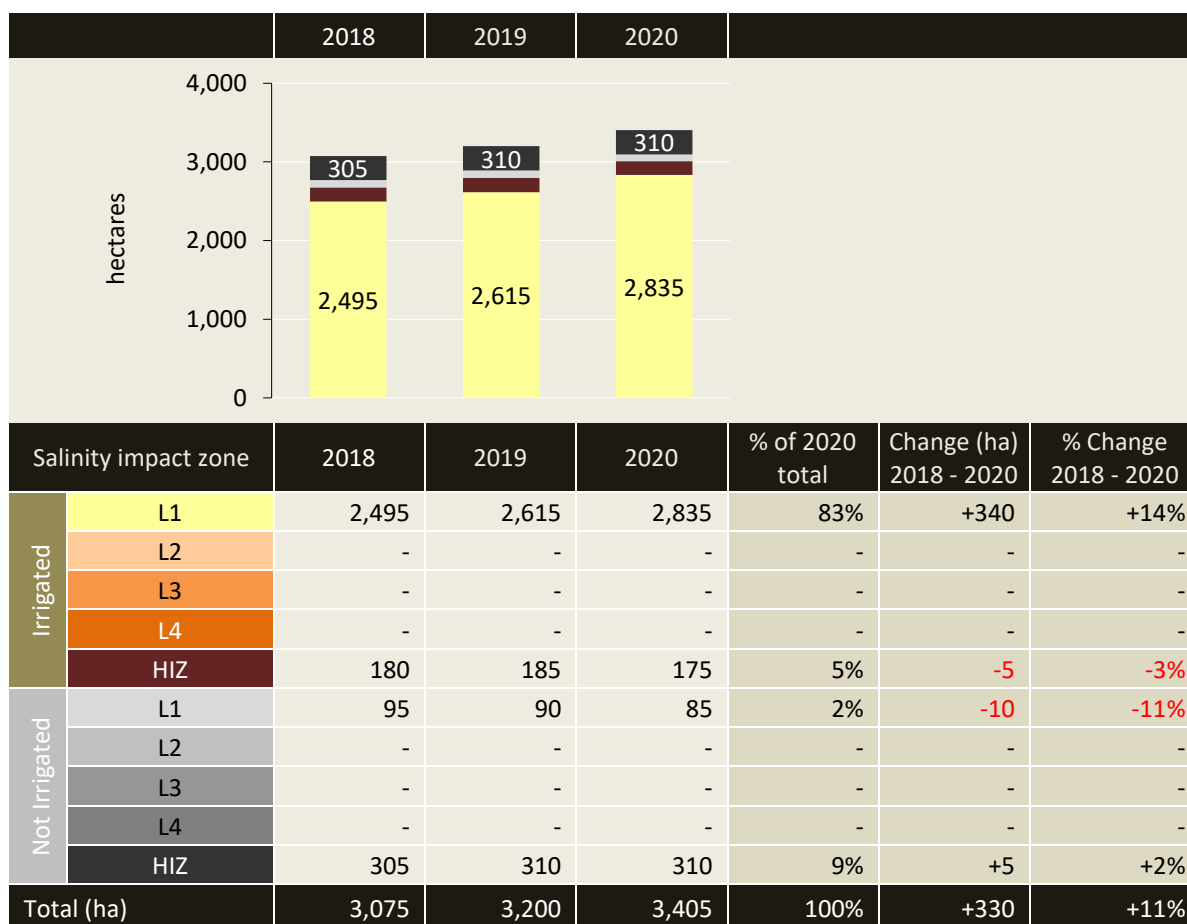


Figure 61: Lock 10 to South Australia - irrigable area in each salinity impact zone 2018 to 2020

3.7.7 Lock 10 to South Australia - property change

Figure 62 provides estimates of property numbers and average property size (irrigable area) in the Lock 10 to South Australia river reach from 2018 to 2020.

In 2020:

- There were approximately 17 irrigation properties; and
- most properties (88%) had an irrigable area greater than 20 ha.

From 2018 to 2020:

- the number of properties remained at 17;
- properties with an irrigable area less than 20 ha decreased by 1, while the number over 20 ha increased by 1; and
- average property size (irrigable area) increased from 181 ha to 200 ha.

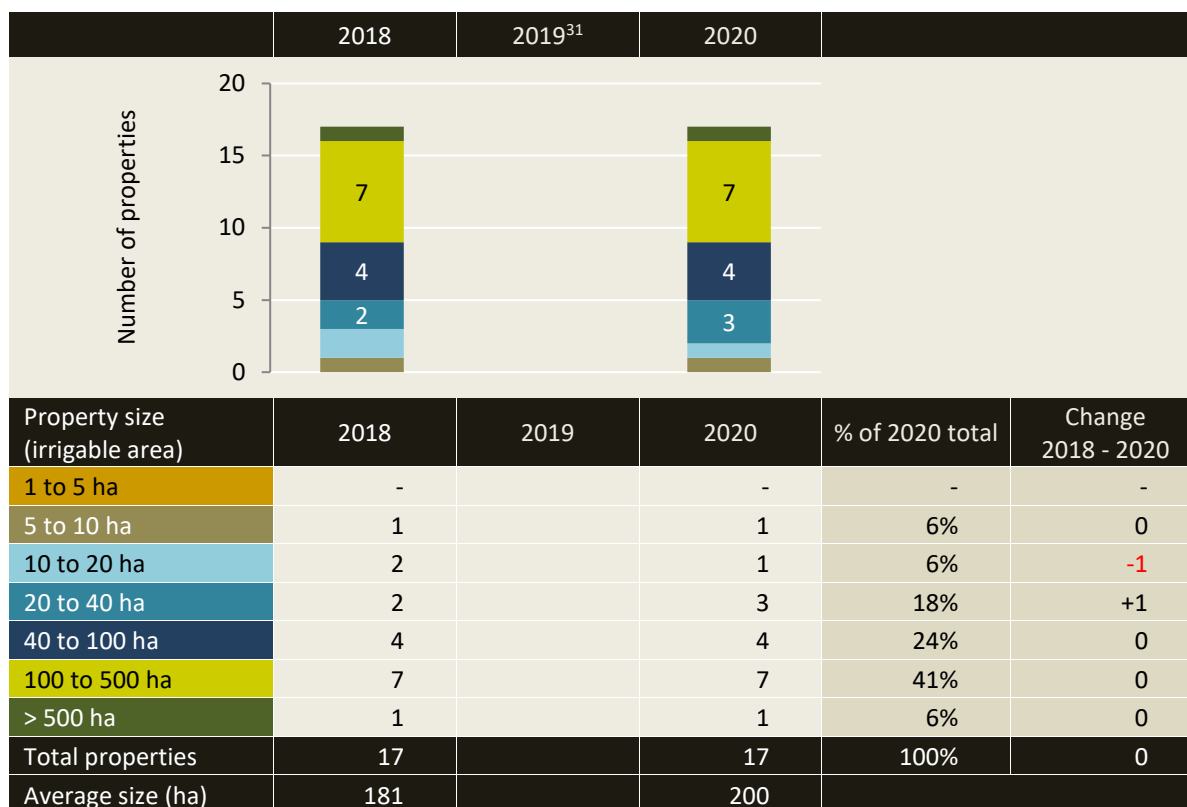


Figure 62: Lock 10 to South Australia - property numbers and sizes from 2018 to 2020

³¹ Property data was not maintained in 2019

3.7.8 Lock 10 to South Australia – water-use in 2020

100% (3,010 ha) of irrigated horticulture in the Lock 10 to SA river reach was aligned to 31,264 ML of water-use for 2019-2020.

Water use in the Lock 10 to SA river reach accounted for 7% of total irrigation water-use for private diverters in the Mallee catchment in 2019-2020 (see Figure 47). Almond plantings were the dominant crop irrigated in the Lock 10 to SA river reach in 2020 (58%) and drip irrigation was the dominant irrigation method used (64%).

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. Unlike permanent plantings, it is difficult to accurately determine irrigation activity for seasonal crops, such as potatoes and cereal crops, from aerial imagery with only one snapshot of the season. It was also difficult to differentiate field crops from potato crops. As 98% of irrigated crops in the Murrayville Groundwater Management Area (GMA) were seasonal, accuracy of the information is limited. Information should be treated as indicative only.

Crop types

Potatoes were the dominant irrigated crop in the Murrayville GMA from 2018 to 2020.

The main changes in crop types from 2018 to 2020 were:

- Potatoes decreased by 515 ha; a 31% decrease from 1,670 ha to 1,155 ha; and
- Field crops decreased by 10 ha; a 2% decrease from 660 ha to 650 ha.

Planting trends

From 2018 to 2020:

- Permanent plantings remained at 45 ha;
- Seasonal cropping decreased by 525 ha; a 23% decrease from 2,330 ha to 1,805 ha; and
- Vacant areas, previously seasonal crops, increased by 535 ha; a 105% increase from 510 ha to 1,045 ha.

Irrigation development - new and retired areas

From 2018 to 2020, the irrigable area in the Murrayville GMA increased by 10 ha, a less than 1% increase from 2,885 ha to 2,895 ha. No areas were retired from irrigation.

Irrigation methods

Pivots were the dominant irrigation method from 2018 to 2020. From 2018 to 2020:

- Drip irrigation remained at 45 ha.
- Pivot irrigation decreased by 530 ha, a 23% decrease from 2,330 ha to 1,800 ha.
- Furrow irrigation increased from 0 to 5 ha.

Irrigation properties

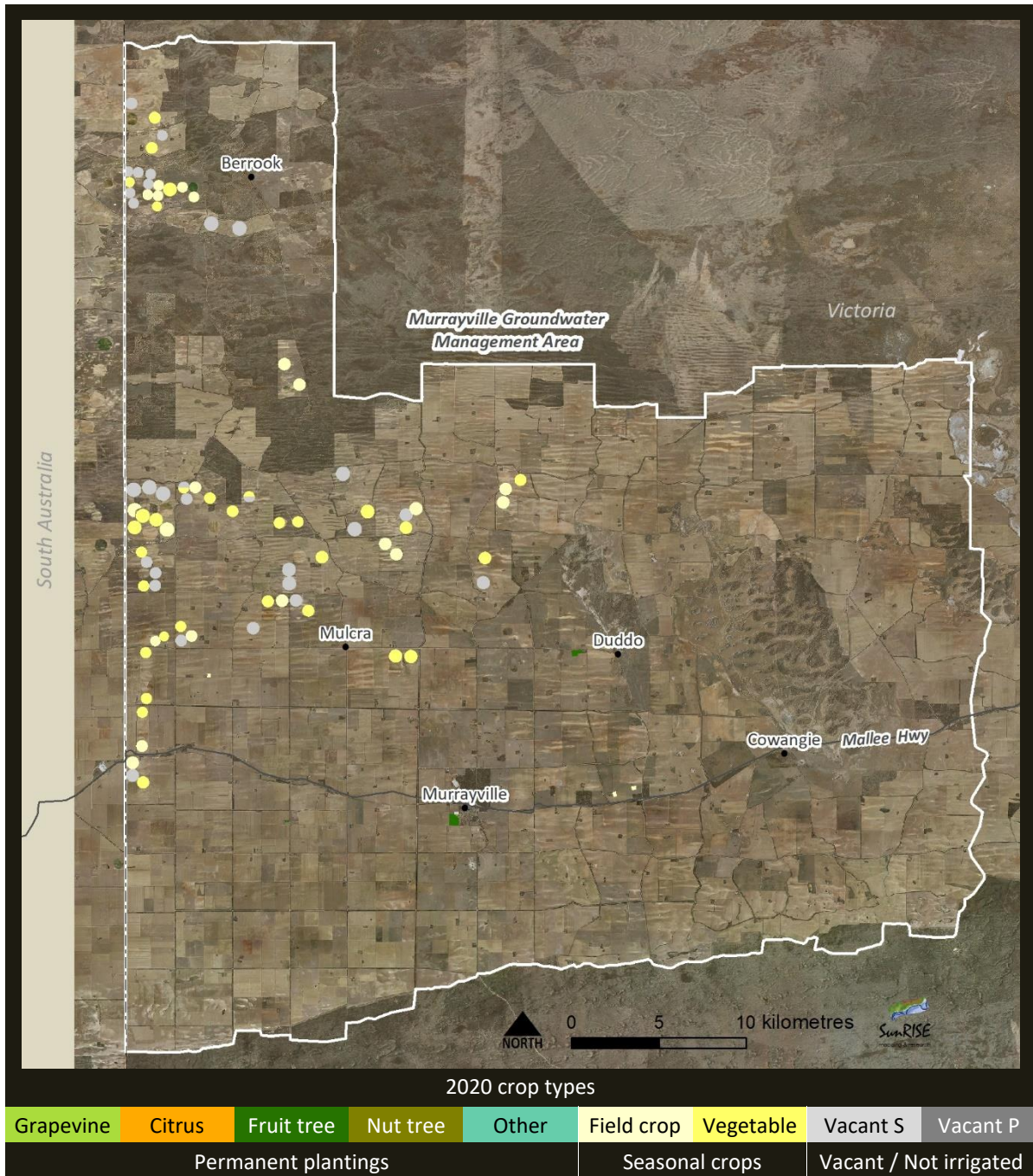
From 2018 to 2020, the number of properties increased by 1, a 6% increase from 16 to 17 properties and average property size (irrigable area) decreased from 180 ha to 170 ha.

Water-use in 2020

Analysis of water use data estimates that 8,260 ML of water was applied to 1,836 ha of crops in the Murrayville GMA in the 2019-20 season.

4.1.1 Murrayville GMA – crop types in 2020

Map 26 shows the Murrayville Groundwater Management Area (GMA) with crop types in 2020.



Map 26: Murrayville GMA showing 2020 crop types

4.1.2 Murrayville GMA - crop types from 2018 to 2020

Figure 63 summarises crop types in the Murrayville Groundwater Management Area (GMA) from 2018 to 2020.

Potatoes were the dominant crop from 2018 to 2020.

The main changes from 2018 to 2020 were:

1. Potato plantings decreased by 515 ha, a 31% decrease from 1,670 ha to 1,155 ha.
2. Field crops decreased by 10 ha, a 2% decrease from 660 ha to 650 ha.

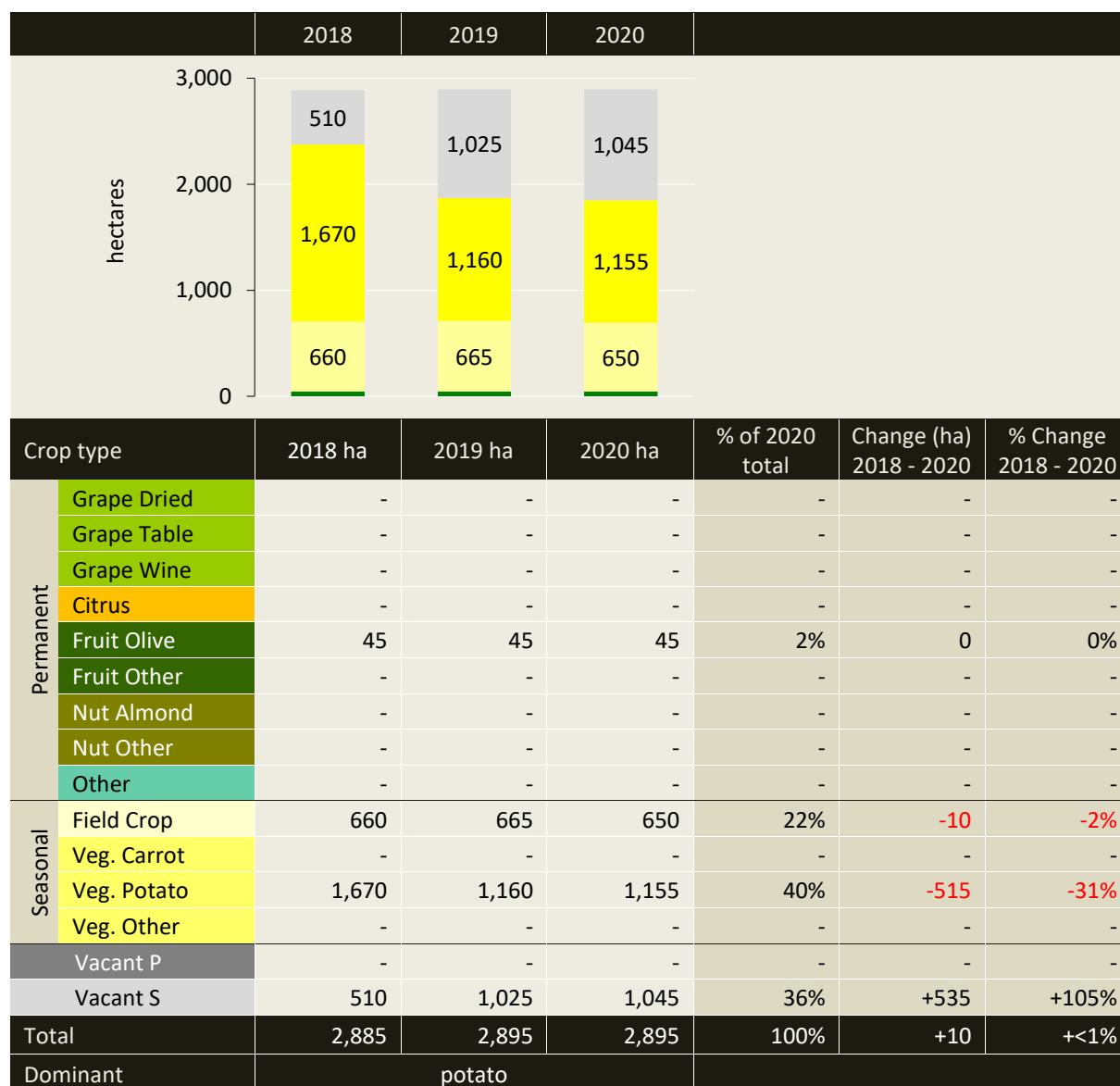


Figure 63: Murrayville GMA - crop types from 2018 to 2020

4.1.3 Murrayville GMA - planting trends

Figure 64 summarises planting trends in the Murrayville Groundwater Management Area (GMA) from 2018 to 2020.

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

- 2% permanent, 81% seasonal and 17% vacant in 2018; to
- 2% permanent, 62% seasonal and 36% vacant in 2020.

From 2018 to 2020:

- Permanent plantings remained at 45 ha.
- Seasonal cropping decreased by 525 ha; a 23% decrease from 2,330 ha to 1,805 ha.
- Vacant areas, previously seasonal crops, increased by 535 ha; a 105% increase from 510 ha to 1,045 ha.

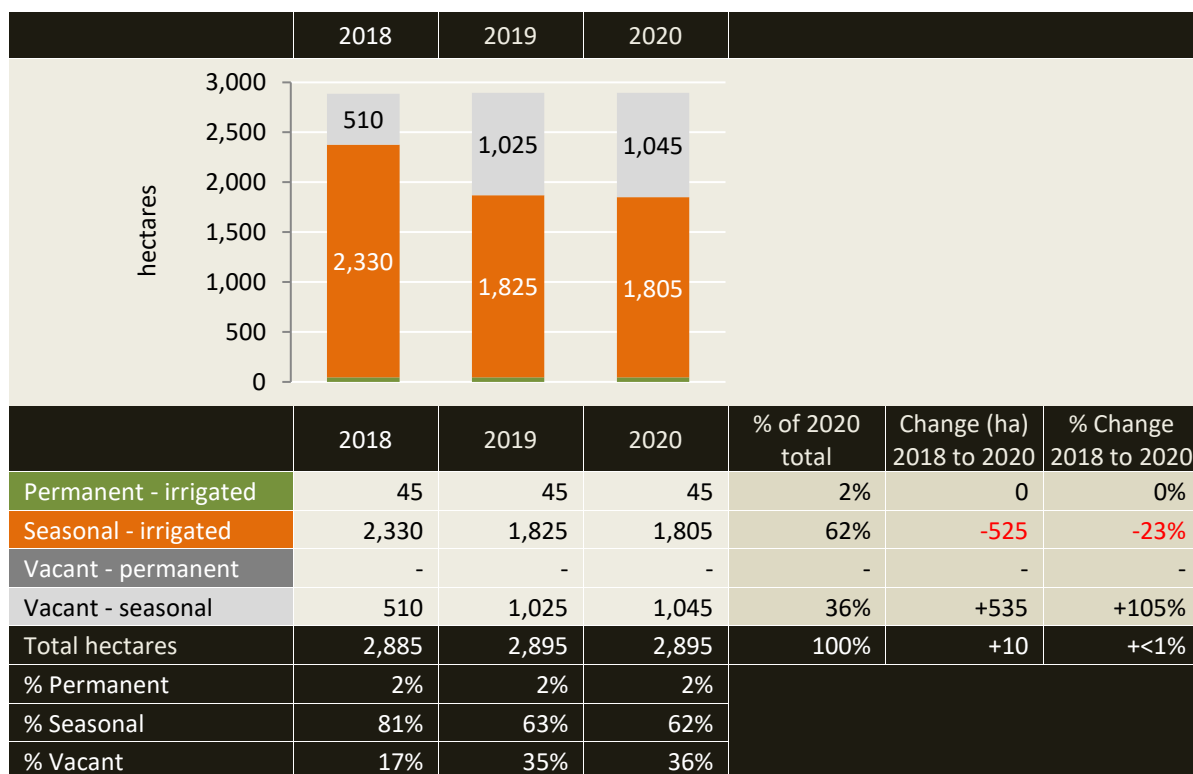
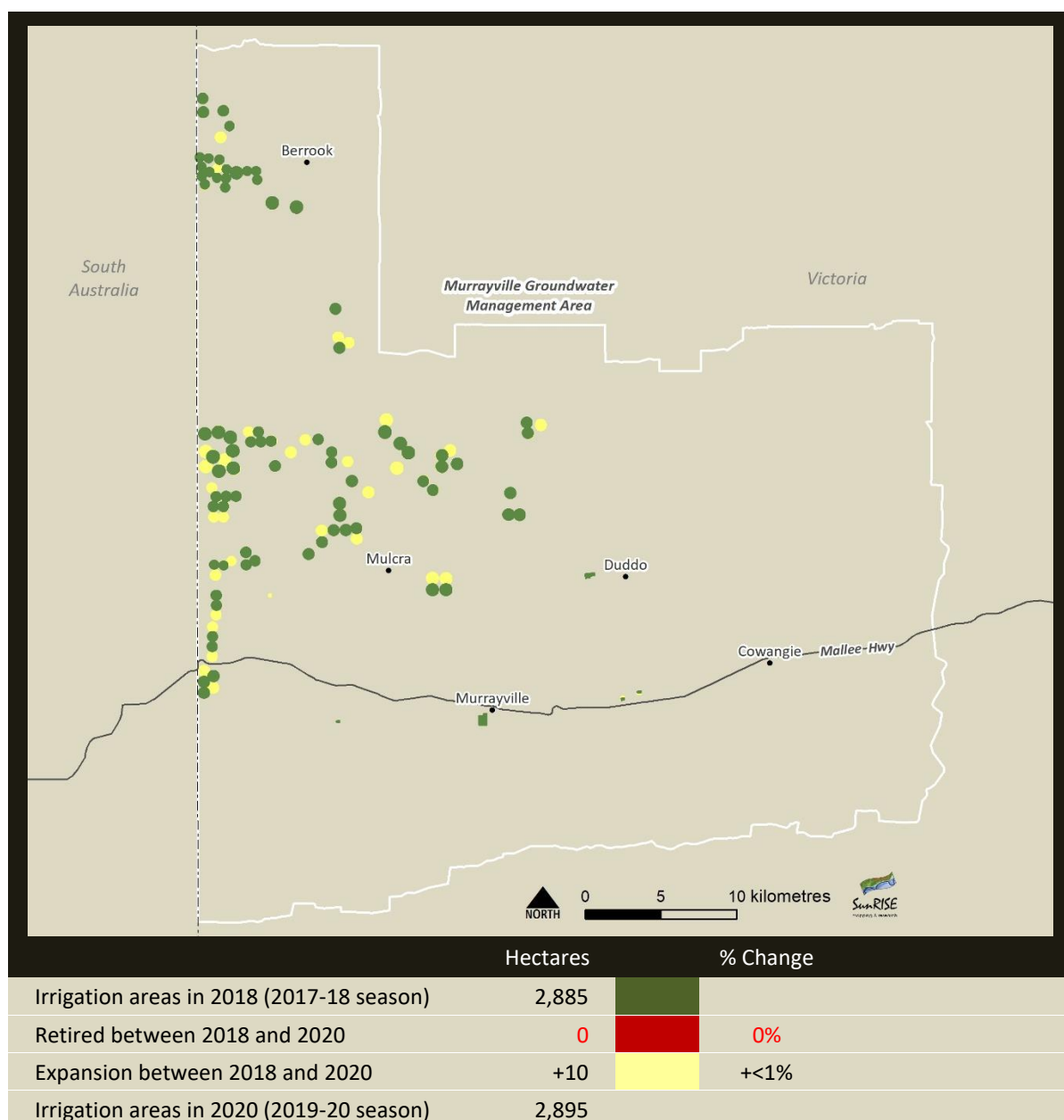


Figure 64: Murrayville GMA - planting trends from 2018 to 2020

4.1.4 Murrayville GMA - irrigation development

Map 27 shows irrigation development in the Murrayville Groundwater Management Area (GMA) with respect to new development (expansion) and areas retired from irrigation from 2018 to 2020.

- The irrigable area increased by 10 ha, a less than 1% increase from 2,885 ha in 2018 to 2,895 ha in 2020.
- No areas were retired from irrigation.



Map 27: Murrayville GMA - irrigation development from 2018 to 2020

4.1.5 Murrayville GMA - irrigation methods

Figure 65 summarises irrigation methods in the Murrayville Groundwater Management Area (GMA) from 2018 to 2020.

Pivot irrigation remained the dominant irrigation method from 2018 to 2020.

From 2018 to 2020:

- Drip irrigation remained at 45 ha.
- Pivot irrigation decreased by 530 ha, a 23% decrease from 2,330 ha to 1,800 ha.
- Furrow irrigation increased by 5 ha, from 0 to 5 ha.

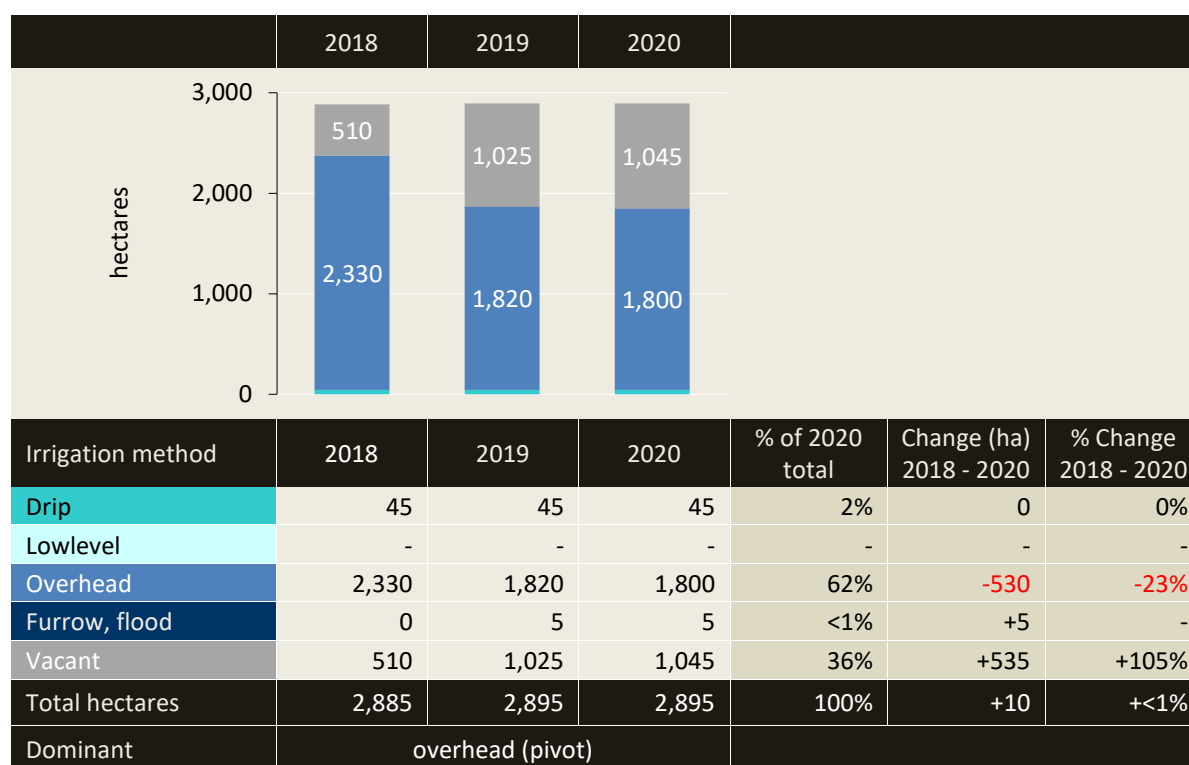


Figure 65: Murrayville GMA - irrigation methods from 2018 to 2020

4.1.6 Murrayville GMA - property change

Figure 66 provides estimates of property numbers and average property size (irrigable area) in the Murrayville Groundwater Management Area (GMA) from 2018 to 2020.

In 2020:

- There were approximately 17 irrigation properties; and
- Most properties (76%) had an irrigable area greater than 20 ha.

From 2018 to 2020:

- The number of properties increased by 1, from 16 to 17 properties;
- Properties with an irrigable area less than 20 ha increased by 1, while the number over 20 ha remained the same; and
- Average property size (irrigable area) decreased from 180 ha to 170 ha.

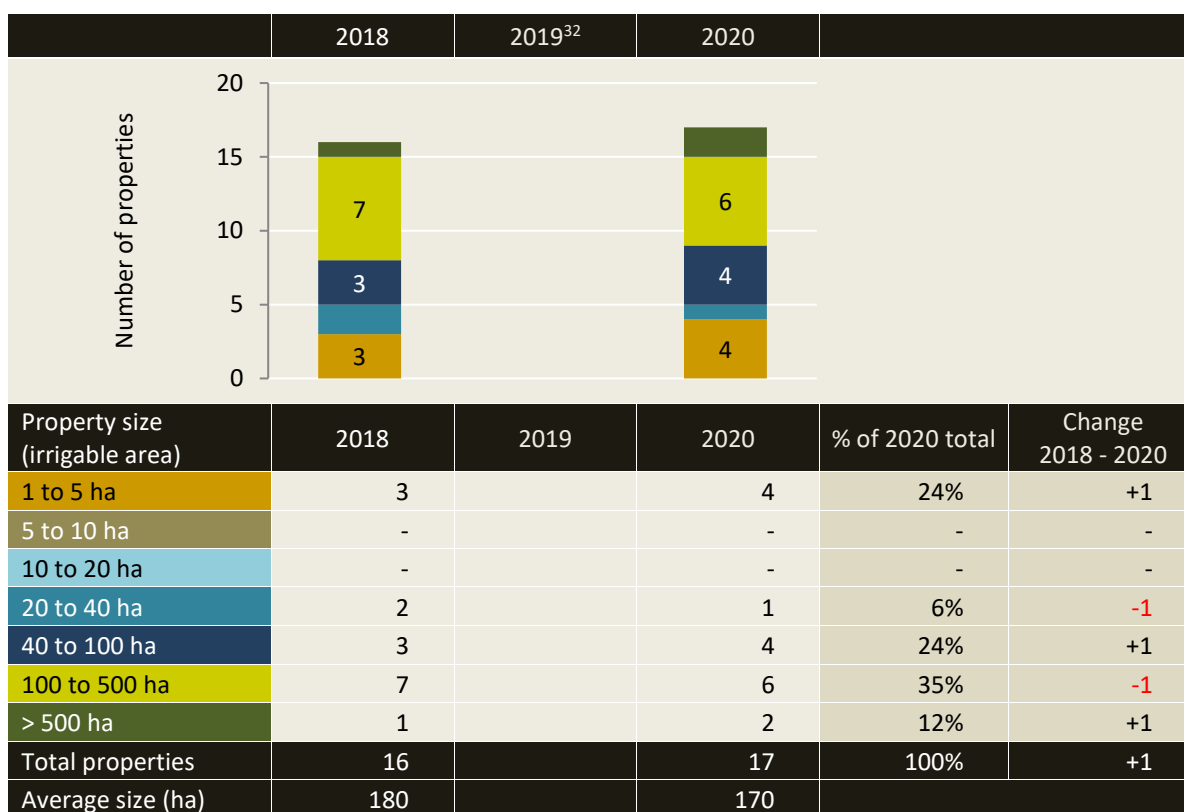


Figure 66: Murrayville GMA - property numbers and sizes from 2018 to 2020

³² Property data was not maintained in 2019

4.1.7 Murrayville GMA – water-use in 2020

99% (1,836 ha) of irrigated crops in the Murrayville GMA were aligned to 8,260 ML of water-use for 2019-2020. Alignment of the remaining 1% of irrigated horticulture was not resolved, and resolution may affect the water-use figures presented. Figures should be treated with caution.

Water use in the Murrayville GMA accounted for 2% of total irrigation water-use in the Mallee catchment in 2019-2020 (see Figure 7). Potatoes were the dominant crop irrigated in the Murrayville GMA in 2020 (40%) and overhead irrigation was the dominant irrigation method used (62%).