Grape and Wine Practice Survey 2019

SURVEY REPORT

Coutts J&R / **October 2019**

Australian Government
Wine Australia

COUTTS J&R
MANAGING AND EVALUATING CHANGE

ACKNOWLEDGEMENTS

This report would not have been possible without the time willingly given by the Grape Growers and Wine Producers to respond to this survey and provide further information for the case studies. The Wine Australia staff members who helped source contacts were also integral to the process.

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SUMMARY

Summary Statement

Overall results were similar to 2018 with survey respondents indicating they were quite aware of Wine Australia activities and information (*2018: 7.1 avg[1]. and 2019: 7.2 avg.*). Wine Australia extension activities were again rated as highly useful (*2018: 8.0 avg. and 2019: avg. 8.1*) and there was a solid increase in the percentage of respondents indicating an awareness of promoted topics (*e.g. 28% increase in those aware of adapting to difficulty vintages*). The percentage of respondents accessing information online/mobile has also increased since 2018 (*e.g. online resources (+21%), mobile apps (+21%*)). Wine Australia continues to be viewed as moderately influential on Grape Growers (*2018: 5.9 avg. and 2019: 5.8 avg.*) and Wine Producers (*2018: 4.9/10 avg. and 2019: 5.7 avg.*) successfully implementing changes.

Key messages

1 Wine Australia continues to play a key role in providing R&D support to the Australian Grape and Wine community with its information viewed as useful. Online and mobile resources/tools are increasingly becoming important sources of information.

2 Most respondents could recall specific information promoted by Wine Australia in recent years indicating that material and activities have been well targeted and communicated. More than half of respondents (*2018: 56% and 2019: 60%*) continued to take action as a result of information promoted by Wine Australia. Biosecurity and pest/disease management were the areas most mentioned in relation to change which could potentially be linked to Grape Growers in 2018 indicating they needed more help with challenges in this area.

3 In the 2018 survey report it was noted that increased effort could be put into tailoring information/tools to different regions. It could be significant then that 2019 survey respondents indicated an 11 point increase of their awareness of regionally specific information.

4 More **Grape Growers** are implementing a range of practices to deal with changes in climate and variability with irrigation management being the most common viticulture practice introduced or changed in the last two to three years.

5 **Wine Producers** are focusing practice change around fermentation practices which is also the area found to be most challenging and where more help was indicated to be needed – along with business management and productivity.

[1] Note that all average ratings are based on scales of 0 – 10.

Findings

DEMOGRAPHICS - WINE PRODUCERS AND GRAPE GROWERS

Respondent Businesses

- 87 respondents
- 42 Wine Producers and 45 Grape Growers;
- Majority of businesses family owned (63%);
- Most businesses either stable (43%) or expanding (52%); and
- Located in South Australia (41%), Western Australia (22%), Victoria (20%) and New South Wales (17%).

WINE AUSTRALIA INFORMATION & EXTENSION (n=87)

Awareness of information and activities

7.2

Overall there was a fairly high level of awareness of activities and information provided by Wine Australia (7.2 avg.).

2018 comparison: There was little change in overall awareness compared to the 2018 survey (2018: 7.1 avg.).

Information resources accessed

The three most popular information resources accessed were Email newsletter (89%), Online resources (86%), and Wine Australia website (84%).

2018 comparison: A larger percentage of respondents were accessing information online and through mobile – e.g. online resources (+21%), mobile apps (+21%), and email newsletter (+12%).

Usefulness of information (n=86)

7.6

Information available from Wine Australia sources was rated overall as quite useful (7.6 avg.).

2018 comparison: Wine Australia information continued to remain useful with little change in the overall average rating (2018: 7.4 avg.).

Promoted information

The majority of respondents recalled most topics that had been promoted in recent years – including smoke taint (71%), biosecurity (70%), phylloxera (68%), sustainability (68%), and adapting to difficult vintages (67%).

2018 comparison: There was a noticeable increase in respondents' awareness of most promoted topics – e.g. 28% increase in those aware of adapting to difficulty vintages information.

Actions resulting from promoted information

The majority (60%) of respondents indicated they had acted on information promoted by Wine Australia – the most common related to biosecurity and pest/disease management (18 mentions), irrigation in dry winters (10 mentions), rootstocks (7 mentions), and smoke taint (7 mentions).

2018 comparison: There was a similar overall percentage acting on information (+4% change) – though looking at business type, the percentage of Grape Growers acting had increased (+28%) and Wine Producers decreased (-19%).

Activity participation

Workshops (79%) and Roadshows (63%) were the two most common extension activities respondents had participated in over the last 2-3 years. Most respondents (83%) were aware of who was funding/organising activities they had participated in – mostly Wine Australia (74%) and the Australian Wine Research Institute (61%).

2018 comparison: Participation in Workshops (+21%) and Roadshows (+14%) had increased since 2018 – though webinar participation had decreased (-16%).

Usefulness of activities (n=77)

8.1

Wine Australia extension activities were rated overall as highly useful (8.1 avg.).

Preferred way to learn about new R&D

Workshops were the most preferred way to learn about new findings from R&D (46%).

GRAPEGROWER PRACTICES (n=45)

Pest and disease

The majority of Grape Grower respondents were:

- Aware of best practice treatment of pruning wounds to prevent trunk disease infection (98%);
- Referred to the eutypa dieback best management practice guide (78%);
- Employed remediation strategies for trunk diseases (78%); and
- Were aware of changes made in 2017 to the footwear and small hand tools disinfestation protocol for phylloxera (67%).

Just under half of Grape Growers had a copy of the Biosecurity Manual (47%) and only 20% had used PMapp for the assessment of powdery mildew (or anything else).

2018 comparison: Awareness and use of these pest and disease practices had increased since 2018 – e.g. +15% referring to the eutypa dieback best management practice guide, +15% employing remediation strategies for trunk diseases, and +10% aware of best practice treatment of pruning wounds to prevent trunk disease infection

Rootstocks

The majority of Grape Grower respondents (71%) selected rootstocks specifically for their vineyard relevant properties, with most selecting those appropriate to the planting site (81%) and for their pest resistant properties (78%).

2018 comparison: a higher percentage of respondents were selecting rootstocks for their vineyard relevant properties (+15%) and also experiencing factors limiting their choice of rootstocks (+18%).

Spray application

All Grape Grower respondents were aware of spray drift technologies (100%) and almost all actively take steps to minimise spray drift (98%) – nozzle selection (77%) was the most common practice used.

2018 comparison: There was an increase in the percentage of Growers both aware of spray drift technologies (+19%) and those actively taking steps to

	minimise drift (+10%) – no spray buffer zones (+16%) and use of contemporary sprayer technologies (+10%) had the largest usage gains.
Vine balance/grape quality measures	Around two-thirds of Grape Growers used bunch and shoot thinning to manage their canopy – Leaf plucking was also used by around a third. **2018 comparison:** there was a small increase in the percentage of respondents who were not using any canopy management practices (+9%) – this was reflected in the decreasing percentage using bunch and shoot thinning (-14%) and leaf plucking (-14%).
Adaption to climate change	Most Grape Growers (80%) had implemented practices to deal with changes in climate and variability – the most common included delayed pruning (49%), variety selection (47%), and vineyard cooling (38%). **2018 comparison:** there was an increase in Grape Growers implementing climate practices (+11%) with all types of practices seeing increases in usage – e.g. vineyard cooling (+19%), variety selection (+16%), clonal trials + 13%), and delayed pruning (+11%).
Practices introduced/ changed in the last 2-3 years	The most common practices changes included irrigation management, pruning, canopy management, soil/health management, and under-vine/vineyard flood management. **2018 comparison:** Practices were similar to those being implemented in 2018, though there was a noticeable increase in the percentage of respondents specifically mentioning irrigation management (+14%) and decrease in those mentioning pruning (-14%).
Most challenging viticulture practices	Practices around adapting to climate change – particularly managing irrigation and heat stress – were the most challenging viticulture practices identified by Grape Growers. **2018 comparison:** These remained consistent from 2018 with weather/climate and pest/disease issues continuing to impact Grape Growers.
Management help required	Grape Growers felt they needed more help managing issues such as pest/disease/weed control, climate variability/extremes and irrigation/water management. **2018 comparison:** Practices were similar to 2018 with Growers still needing help for issues particularly relating to pest/disease/weed control, staffing, and climate variability.
Influence of Wine Australia on changes (n=40)	**5.8** Wine Australia information, tools and extension activities were overall rated as moderately influential in helping Grape Growers successfully make changes (5.8 avg.). **2018 comparison:** There was little change in the overall average rating with Wine Australia continuing to be moderately influential on Growers ability to successfully make changes (2018: 5.9 avg.)

WINE PRODUCER PRACTICES (n=52)

Clarification and filtration

a. Juice clarification techniques: Cold settling (86%) and flotation (43%) were the two most common white juice clarification techniques - increased efficiency and cost savings were the main benefits observed.

2018 comparison: Cold settling and flotation remained the two most popular techniques from 2018.

b. Reprocessing method: Cross-flow filtration was the most common method used – the most common benefits observed were increased efficiency and speed, reduced waste and loses, and improved wine quality.

2018 comparison: There was noticeable decrease in the percentage of producers using RDV reprocessing (white juice -25%, red ferment -38% and white lees -48%) – there was a subsequent increase in the percentage using Other methods (white juice +22%, red ferment +36% and white lees +33%).

c. Proteins: Almost half of Wine Producer respondents had used plant-derived fining proteins (45%), almost all had used bentonite to remove proteins (95%), and most were aware of pasteurisation plus enzyme as a method for heat/protein stabilising (86%).

2018 comparison: A higher percentage of producers were both using plant-derived fining proteins (+7%) and using bentonite to remove proteins (+16%).

Cold stabilisation

Chilling with tartrate seeding (43%) was the most common cold stabilisation method used by wine producers. All were aware of the energy costs associated (100%) and around half used additives to prevent tartrate precipitation (45%) and had taken steps to manage risk around calcium tartrate instability (48%) – monitoring and testing were most common steps taken.

2018 comparison: Cold stabilisation methods used remained similar to 2018 (+/-4 to 8%), with respondents continuing to be aware of the energy costs (2018: 97%). A similar percentage had taken steps to manage risk around calcium tartrate instability and there was a 17% increase the percentage of those who had used additives to prevent tartrate precipitation.

Awareness of wine efficiency research (n=40)

4.6

Wine Producers were moderately aware of research being undertaken on wine efficiency (4.6 avg.).

2018 comparison: Respondents remained only moderately aware of wine efficiency research with overall average awareness slightly decreasing (-0.4 avg.).

Fermentation monitoring

The three most common tools and practices used to monitor fermentation were malolactic fermentation monitoring (67%), plotting of ferment sugar/density measurements (62%), and measuring pre-harvest YAN (45%).

2018 comparison: There was a large increase in the percentage of respondents using malolactic fermentation monitoring (+54%) – noticeable increases were also seen in the use of measuring pre-harvest YAN (+22%) and monitoring fermentation progress by sensors (+14%).

Faults and taints

The majority of Wine Producer respondents indicated copper additions were used on site (74%) and oxygen was used during fermentation to manage stinky sulfur compounds, flavour and colour (69%) – the majority using copper (n=31), based the dose on fining trial (81%) and made additions during or soon after ferment (68%).

2018 comparison: Wine Producers continued managing faults and taints using similar methods.

Practice change

The most common practice changes made by Wine Producers over the last three years related to fermentation practices – including yeast changes (e.g. wild fermentation) and changes to managing faults and taints (e.g. oxygen during fermentation).

Most challenging wine making practices

The most challenging wine making practices identified by Wine Producers were varied with the most common relating to fermentation (7 mentions), producing specific wine varieties (5 mentions), clarification and filtration (4 mentions), and seasonal variations (4 mentions).

Areas were more help is needed

Business management and productivity (8 mentions) and fermentation (6 mentions) were the two most common areas Wine Producers felt they need more help to manage.

Influence of Wine Australia on changes

5.7

Wine Australia information, tools and extension activities were overall rated as moderately influential in helping Wine Producers successfully make changes (5.7 avg.).

2018 comparison: There was a slight increase in the average rating of Wine Australia's influence (+0.8).

OTHER/FINAL COMMENTS (n=87)

Other sources of advice/information

Input suppliers (72% – e.g. rootstock, fertiliser, or chemical suppliers) were the most common other source of advice and information used by respondents to support their business needs. Also commonly used were private advisers/consultants (55%), state government advisers (34%) and wine companies (31%).

2018 comparison: The popularity of other sources of advice/information remained similar – there was though a 13% decrease in those using wine companies.

Other comments on practices/ information needs

Given the opportunity to provide any other comments about practices and/or research or information needs, many respondents provided general positive praising the value of Wine Australia (8 mentions – e.g. very good source of information for the industry).

The value and importance of peer to peer learning and networking with others was noted (6 mentions), as was the importance of Wine Australia continuing to provide timely and easy access to the latest relevant information, research, and practices (6 mentions).

Recommendations

1 The recommendations from the 2018 survey remain relevant for 2019 and should continue to be worked towards – including a need for strong engagement with input suppliers. There is some evidence based on the results of the two surveys that over the last 18 months some gains have been made around specific topics focused on by Wine Australia (e.g. biosecurity and pest management) in terms of increased industry awareness and areas of practice change.

2 The contact lists made over the last two adoption surveys should be combined and cleaned up to be used as the basis of a database of grape and wine enterprises for future surveys which can be added to over time. As noted in the last report this will help facilitate consistent benchmarking.

3 There is a need to further focus on providing information to Grape Growers in the areas of weather and climate (e.g. managing irrigation and heat stress) as these are continuing to be seen as the most challenging areas of viticulture practice.

4 In addition to focusing on its online and mobile offerings, Wine Australia should continue its efforts to run timely and relevant workshops across the regions and facilitate peer-to-peer learning opportunities as the value of these were highlighted by survey respondents.

CONTENTS

1. INTRODUCTION

1.1 About this report

This is the second survey report by Coutts J&R for Wine Australia aimed at gaining responses from wine producers and grape growers about adoption of selected winemaking and viticultural practices. The first survey was undertaken between January and March 2018 and the second between August and September 2019.

The purpose of the second survey is to continue monitoring the adoption of selected winemaking and viticultural practices. Initially co-developed with Wine Australia, the survey questions have remained as similar as possible to facilitate comparisons, however some updates have been made in response to feedback from the 2018 survey and to reflect the extension and communication focus over the last 18 months. Changes have been noted in the Findings section. Where possible the 2019 survey report provides comparisons between the two years to start building trend data.

Case studies
Coutts J&R also developed four two page case studies to demonstrate practice change being implemented on the ground. These are provided as a separate document with summaries at the end of this section.

1.2 The process

With a goal of 200 completed randomly selected surveys, Coutts J&R and Wine Australia were aiming to exceed the 71 interviews from 2018 (plus 8 interviews with industry stakeholders). Overall 87 surveys across grape growers and wine makers were completed.

Wine Australia built the 2019 survey contact list[2] through its regional contacts and also an opt in process via newsletters. Early August 2019, emails were sent by Wine Australia to potential respondents reminding them of the survey and providing an opportunity to opt out if they did not wish to participate. Any opt outs were removed from the list. The survey was conducted over August and September 2019 with an excellent response rate out of the contacts provided (87 completed interviews out of 101 contacts). This is not surprising given the selective nature of the list.

Potential case study participants were indicated by Wine Australia on the survey contact list. These respondents were asked if they were happy for further follow up. Of the nine potential case study participants, seven agreed. Of these seven, four pulled out necessitating Wine Australia to source another possibility to enable the completion of four case studies.

[2] NB: The 2018 survey contact list contained many out of date details and general business numbers which meant there was difficulty accessing the decision-makers. It was also undertaken during the busy season (January/February 2018) which contributed to a low response rate. An ‘opt in’ approach was undertaken by Wine Australia where already established tools including the R&D newsletter and other industry communications (as well as contacting state wine associations) were used to inform the industry about the survey. People were able to ‘opt in’ by leaving their details via an online form. This was quite a successful approach.

Statistical note

As per the 2018 survey, had the 87 participants been a true random selection, there would have been 95% confidence that the true mean of the whole population would have fallen between plus/minus 12% of the sample mean (for example, if 50% of the sample said they had made a practice chance, then the extent of practice change in the whole population could have fallen between 38% and 62%).

However, given the situation of regions nominating contacts and self-selection (opt-in) for all of the participants, the confidence interval may be greater than this (it is difficult to estimate what this may be – but as per 2018 – the bias is likely to favour Grape Growers and Wine Producers who are more likely to seek information and make changes). The results should therefore be treated with caution due to the biased nature and size of the sample. The 2019 results however add to the picture provided in 2018 and provide a valuable window into starting to see trends in industry practices.

Case study summaries

The four case studies focused on different practices or research being implemented from four different perspectives including a consultant, a grape grower/agronomist, a wine maker/process engineer and a technical person involved with extension. A summary of each is included below and full versions are an attachment to this report. Case study recipients were provided a draft to comment on and approve. They were also asked for photos to accompany the text if possible. Wine Australia will contact participants further if they wish to use their information more broadly.

Case study 1: **When it comes to managing eutypa – "just do it!"**

Dr Kerry DeGaris, Chair of the technical sub-committee of the Limestone Coast Grape and Wine Council Inc

Dr Kerry DeGaris has been facilitating local research, extending aspects of Wine Australia funded research and raising grower awareness of practices around managing eutypa in the Coonawarra region. Outcomes are expected to include improved yield and a reduction in the prevalence of the disease. Further insights around adoption and impacts on productivity and profitability will emerge through a survey undertaken in November 2019. Her advice about managing eutypa is to "just do it" as there are proven and viable reasons for doing the hard work early on.

Case study 2: **How one McLaren Vale vineyard is keeping its cool during heatwaves**

James Hook, Agronomist and Grape Grower

Modifying his irrigation strategy and mulching during winter and spring, means that James Hook is better able to operate under heatwave conditions (with minimal losses) across a 20 ha vineyard he manages in McLaren Vale, South Australia. Since making the first of ongoing changes ten years ago, more vines are surviving extreme conditions in terms of resilience and yield with an overall dollar impact improvement of $400 to $500 per hectare.

Case study 3: **Sunscreen is helping to keep the grapes cool and the wines bright**

Liz Riley, Consultant across 25 properties

The benefits of vineyards using sunscreen as a climate change adaptation strategy (when necessary) over the last seven seasons are becoming more than apparent. Hunter Valley based viticultural consultant, Liz Riley, is working with growers who are increasingly adopting the use of sunscreen as a risk and crop management tool. As a result, they have been able to see differences between the treated and untreated parcels of their vineyard. The blocks using sunscreen are ripening earlier (i.e. not delayed) with less sunburn and winemakers are seeing cleaner and brighter wines in the winery.

Case study 4: **Adding oxygen during fermentation allows a more natural winemaking process**

Luke Wilson, Senior Process Engineer at the Yalumba Wine Company

Work undertaken at Yalumba Family Winemakers 1849 by senior process engineer Luke Wilson and winemaker Matt Zadow, proves the benefits of adding oxygen during fermentation for a minimal intervention approach to winemaking. The work is focusing on trialling different fermenter designs to reduce yeast stress by adding air at different fermentation stages. The aim is to prevent reductive aromas and reduce the addition of compounds they are trying to avoid (i.e. diammonium phosphate (DAP)). As a result of the trials so far, Luke said that the wines with added oxygen have had a reduced requirement for adding DAP. “It’s changing the way we think about nutrient addition. And it’s further challenging us to think about the whole wine making practice.”

2. SURVEY RESULTS

2.1 Demographics

87 Respondents:

- 42 Wine Producers and 45 Grape Growers
- Majority of businesses family owned (63%)
- Most businesses either stable (43%) or expanding (52%)
- Located in South Australia (41%), Western Australia (22%), Victoria (20%) and New South Wales (17%).

2.1.1 Businesses

Figure 1: Breakdown of respondent businesses

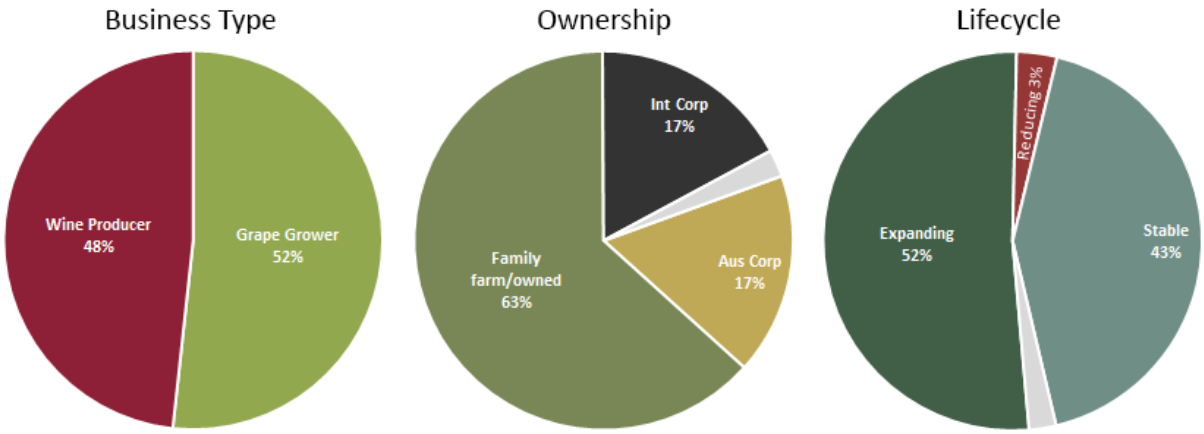


Table 1: Farm size by business type

Wine Producers Tonnes crushed last vintage*		**Grape Growers** Tonnes harvested last vintage	
Average	12,393	**Average**	1,362
Total	520,485	**Total**	51,756
Range	7 – 200,000	**Range**	35 – 17,453
By Ownership	• **Family** 57,068 (11%) • **Aus corp** 60,241 (12%) • **Int corp** 403,169 (77%)	**By Ownership**	• **Family** 26,036 (50%) • **Aus corp** 21,383 (31%) • **Int corp** 4,337 (8%)
Respondents	42 (10 respondents did not provide data)	**Respondents**	38 (7 respondents did not provide data)

**(including contract processing for other people)*

Table 2: Demographic comparisons to 2018 survey

	2019 (n=87)	2018 (n=71)	Change
Business Type			
Grape Grower	52%	45%	+7%
Wine Producer	48%	55%	-7%
Ownership			
Family farm/owned	63%	72%	-9%
Australian corporate	17%	18%	-1%
International corporate	17%	10%	+7%
Unknown	2%	-	-
Lifecycle			
Expanding	52%	75%	**-23%**
Stable	43%	23%	**+20%**
Reducing	3%	3%	0%
Unknown	2%	-	-
Location			
SA	41%	38%	+3%
Vic	20%	31%	**-11%**
NSW	17%	20%	-3%
WA	22%	8%	**+14%**
Other	-	2%	-

Table 3: Tonnes crushed/harvested last vintage comparisons to 2018 survey

	2019	2018	Change
Tonnes crushed (Wine Producers)			
Average	1,362	3,038	-1,676
Total	51,756	69,871	**-18,115**
% providing data (n=87)	44%	32%	**+12%**
Tonnes harvested (Grape Growers)			
Average	12,393	12,983	-591
Total	520,485	480,372	**+40,113**
% providing data (n=71)	48%	52%	-4%

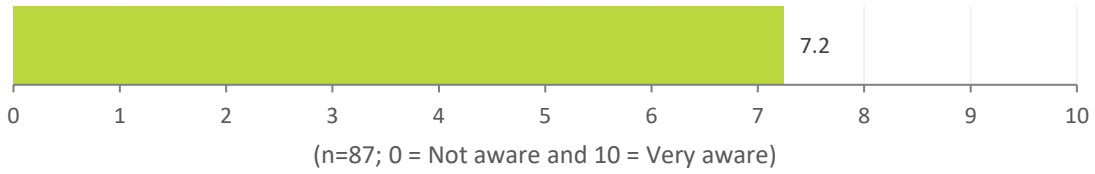
2.1.2 Location by region

Table 4: Respondents by region

Regions	Wine Producer	Grape Grower	Overall
SA	17	19	36
17 McLaren Vale	6	4	10
26 Coonawarra	4	2	6
12 Barossa Valley	1	4	5
16 Adelaide Hills	2	3	5
11 Clare Valley	1	2	3
21 Langhorne Creek	1	2	3
14 Riverland		1	1
22 Padthaway	1		1
23 Mount Benson		1	1
Other	1		1
WA	**8**	**11**	**19**
5 Margaret River	6	5	11
1 Swan District		3	3
4 Geographe	1	2	3
6 Blackwood Valley		1	1
2 Perth Hills	1		1
Vic	**8**	**9**	**17**
61 Geelong		3	3
63 Mornington Peninsula	1	2	3
44 Murray Darling	1	2	3
50 King Valley	1	1	2
45 Swan Hill	1		1
62 Yarra Valley	1		1
55 Bendigo	1		1
59 Grampians		1	1
56 Pyrenees	1		1
Other	1		1
NSW	**12**	**3**	**15**
36 Riverina	5		5
Other	4		4
32 Hunter	2		2
34 Orange	1	1	2
33 Mudgee		1	1
42 Tumbarumba		1	1

2.2 Wine Australia Information & Extension

2.2.1 Awareness of information and activities



Overall there was a fairly high level of awareness of activities and information provided by Wine Australia (7.2 avg.).

- Grape Growers (7.4 avg.) were slightly more aware than Wine Producers (7.1 avg.).
- NSW respondents had the highest comparative awareness (7.7 avg.) and South Australians the lowest (6.9 avg.).
- Most comments reiterated respondents' level of awareness (23 mentions) – e.g. *very aware; fairly; quite; reasonably; average; somewhat; moderately; fair.*
- Many respondents with high awareness noted they received Wine Australia emails (10 mentions). Others were aware as a result of their industry involvement (6 mentions) or having previously worked with Wine Australia (5 mentions).
- There was little change in overall awareness compared to the 2018 survey.

Table 5: Average by demographic

	2019	2018	Change
Overall	7.2	7.1	+0.1
Business Type			
Grape Grower	7.4	6.9	+0.5
Wine Producer	7.1	7.3	-0.2
Ownership			
Family farm/owned	7.4	7.2	+0.3
Australian corporate	7.3	7.2	+0.2
International corporate	6.5	6.6	-0.1
Lifecycle			
Expanding	7.4	7.2	+0.2
Stable	7.4	6.8	+0.6
Location			
SA	6.9	7.2	-0.3
Vic	7.2	6.6	+0.6
NSW	7.7	7.6	+0.1
WA/Other	7.5	7.1	+0.4

COMMENTS

High to very high awareness (7-10 rating):

- [12] **General comments on awareness** *(e.g. very aware; fairly; quite; reasonably)*
- [10] **Receive Wine Australia emails/communications** *(e.g. get an email now and again; send quite a lot of information around through emails; on all the notification channels for Wine Australia)*
- [6] **More aware as a result of role/industry involvement** *(e.g. also involved in the consulting industry so I am probably a bit more aware than the average grower; active on the Margaret River Wine Association Board so I've most probably paid a bit more attention)*
- [6] **Aware but could be more aware - lack of time** *(e.g. I get too busy and I don't spend enough time on their website; would love to get more time to read them; try to keep abreast of what is going on I can't say that I am completely up to date all the time)*
- [5] **Have worked with Wine Australia** *(e.g. currently have projects in the pipeline with them; was involved with Wine Australia as I used to do projects using their funding; very actively involved with Wine Australia through that wine business)*
- [5] **Praise for Wine Australia/quality of information** *(e.g. in the last 2 years the information involved has improved considerably; Andreas is leading a good team; if we contact Wine Australia we can get the information readily; very happy with the research that is going on; get the information via email so I am really happy with it)*
- [3] **Awareness of Wine Australia activities - marketing/research/events** *(e.g. they present at various events - they do funding research and development and market research and marketing wine overseas)*
- **Single comments included:** Could be more direct correspondence with levy payer; Information overload - hard to differentiate/prioritise sources

Moderate awareness (4-6 rating):

- [9] **General comments on awareness** *(e.g. reasonably; average; somewhat; moderately; fair; a bit)*
- [3] **Access information when required** *(e.g. go on their website occasionally; look up things only if I need to; you check it out if something interesting pops up)*
- **Single comments included:** Aware they fund R&D; Recently discovered more information was available; More interested in grape growing

Little to no awareness (0-3 rating):

- [2] **General comments on awareness** *(e.g. mildly aware; don't see a lot of that info)*
- **Single comments included:** Get information from other sources; Unhappy with levy costs

2.2.2 Information resources accessed

The three most popular information resources accessed were *Email newsletter* (89%), *Online resources* (86%), and *Wine Australia website* (84%).

- Mobile apps (+38%), online tools (+25%) and publications/technical (+11%) notes were used more by Grape Growers – the Wine Australia website (+13%) and help desk service (+22%) more by Wine Producers.
- Compared to 2018 a larger percentage of respondents were accessing information online and through mobile – e.g. online resources (+21%), mobile apps (+21%), and email newsletter (+12%).

Figure 2:

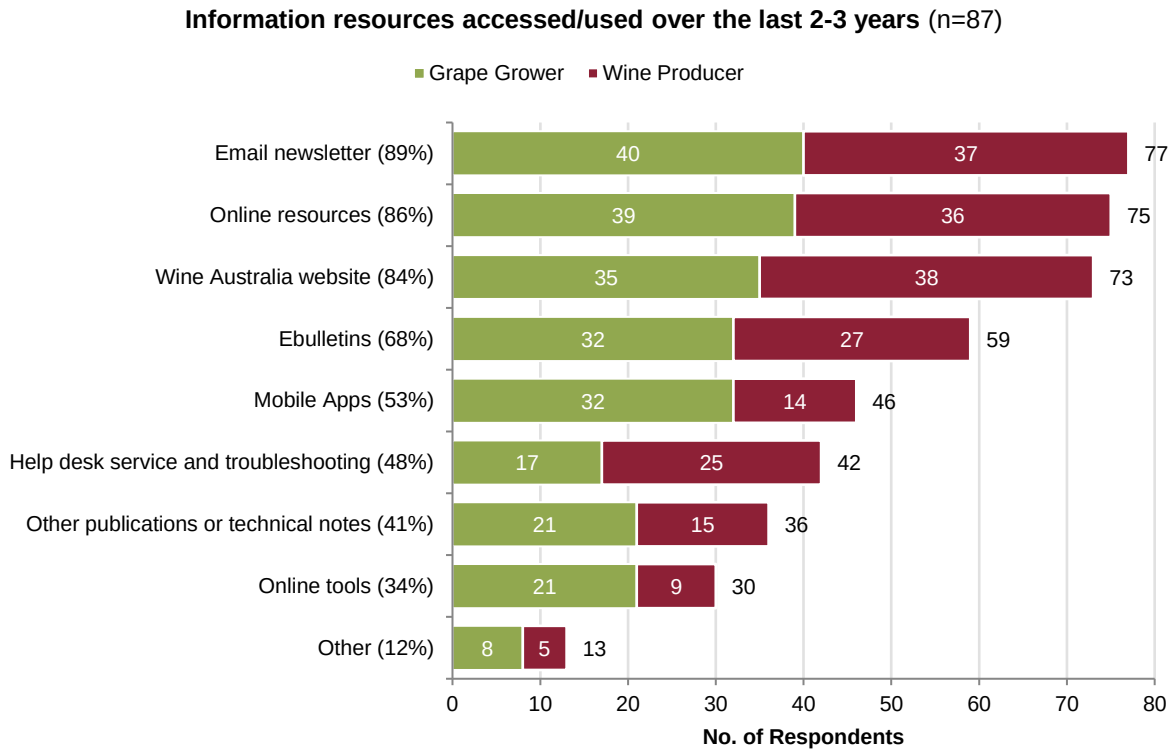
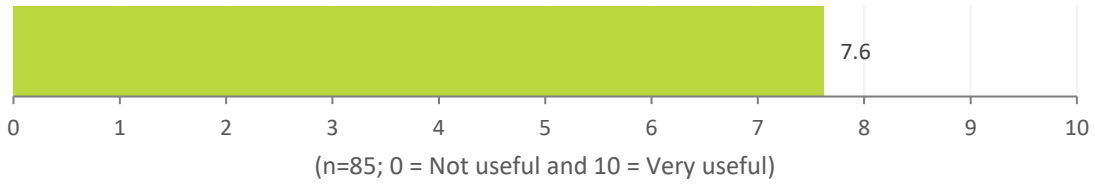


Table 6: Percentage by year

	2019 (n=87)	2018 (n=71)	Change
Email newsletter	89%	77%	**+12%**
Online resources	86%	65%	**+21%**
Wine Australia website	84%	90%	-6%
Ebulletins	68%	68%	0%
Mobile Apps	53%	32%	**+21%**
Help desk service and troubleshooting	48%	42%	+6%
Other publications or technical notes	41%	48%	-7%
On-line tools	34%	34%	0%
Other	15%	25%	**-10%**

2.2.3 Usefulness of information

Information available from Wine Australia sources was rated overall as quite useful (7.6 avg.).



- Wine Producers (7.9 avg.) found the information slightly more useful than Grape Growers (7.3 avg.).
- Many respondents who provided high ratings (7-10) described the information as: *excellent; very useful; magnificent resource; very informative; regularly helpful; so much information; great tool*.
- Some respondents who found the information less useful noted the information was not always relevant to their specific situations.
- Compared to 2018, Wine Australia information continued to remain useful with little change in the overall average rating.

Table 7: Average by demographic

	2019	2018	Change
Overall	7.6	7.4	+0.2
Business Type			
Grape Grower	7.3	6.8	+0.5
Wine Producer	7.9	7.8	+0.1
Ownership			
Family farm/owned	7.9	7.6	+0.3
Australian corporate	7.0	7.1	-0.1
International corporate	7.3	6.6	+0.7
Lifecycle			
Expanding	7.7	7.4	+0.3
Stable	7.7	7.3	+0.4
Location			
SA	7.5	7.8	-0.3
Vic	7.5	6.9	+0.6
NSW	7.4	6.7	+0.7
WA/Other	8.1	8.4	-0.3

COMMENTS

High to very high usefulness (7-10 rating):

Positive Comments

- [31] **General positive comments** *(e.g. excellent; very useful; magnificent resource; very informative; regularly helpful; so much information; great tool)*
- [7] **Praise for the quality/relevance/accessibility of the information** *(e.g. really accessible and relevant; well researched; quality evidence based; very high quality timely and precise)*
- [3] **Information useful if relevant** *(e.g. very topical and obviously quite targeted; depends on the subject)*
- [4] **Value ability to phone/talk to someone at Wine Australia** *(e.g. I can talk to someone at Wine Australia and get pretty good information quickly)*
- [3] **Usefulness/value of the export markets information/data** *(e.g. information about different markets is very helpful)*
- [3] **Positive but always room for improvement** *(e.g. only reason I would not say 10 is because nothing is perfect)*

Issues/Suggestions

- [2] **Website functionality** *(e.g. website is a bit hard to navigate; not exactly user friendly)*
- [2] **Not all information relevant** *(e.g. only one or two items that are relevant at any given email; being a small family company there is not quite a lot of information which is applicable)*
- [2] **Lack of local/regionally relevant information/activities** *(e.g. A lot of the activities are not necessarily in the area that I live in - a lot of projects and research are undertaken in other areas; not applicable to your region as it is very strong SA information)*

Moderate usefulness (4-6 rating):

- [4] **Some information useful/interesting** *(e.g. PMap is useful and Viticanopy is useful; some parts are better than others; some interesting things amongst all that information)*
- [3] **General comments on moderate usefulness** *(e.g. moderately; somewhat)*
- [2] **Information too broad/nonspecific to be really useful** *(e.g. some of their information is fairly broad to be really useful; was looking for specific things and sometimes they touch on them but there are not enough details for what I was looking for)*
- [2] **Room for improvement** *(e.g. always one to see that there's possibilities for improvement)*
- **Single comments included:** lack of local/regionally relevant information; information is just being repeated

Low to no usefulness (0-3 rating):

- [3] **Limited usefulness** *(e.g. Not especially useful to me from day to day; get the RD&E emails but I don't tend to read them; find the Wine Australia website a bit difficult to navigate)*

2.2.4 Promoted information

The majority of respondents recalled most topics that had been promoted in recent years – including smoke taint (71%), biosecurity (70%), phylloxera (68%), sustainability (68%), and adapting to difficult vintages (67%).

- Grape Growers predictably were more likely to recall topics specific to growing grapes – e.g. irrigation in dry winters (+22%), sooty mould (+22%), and rootstocks (+13%)
- Compared to 2018 there was a noticeable increase in respondents' awareness of most promoted topics – e.g. 28% increase in those aware of *adapting to difficulty vintages* information.

Figure 3:

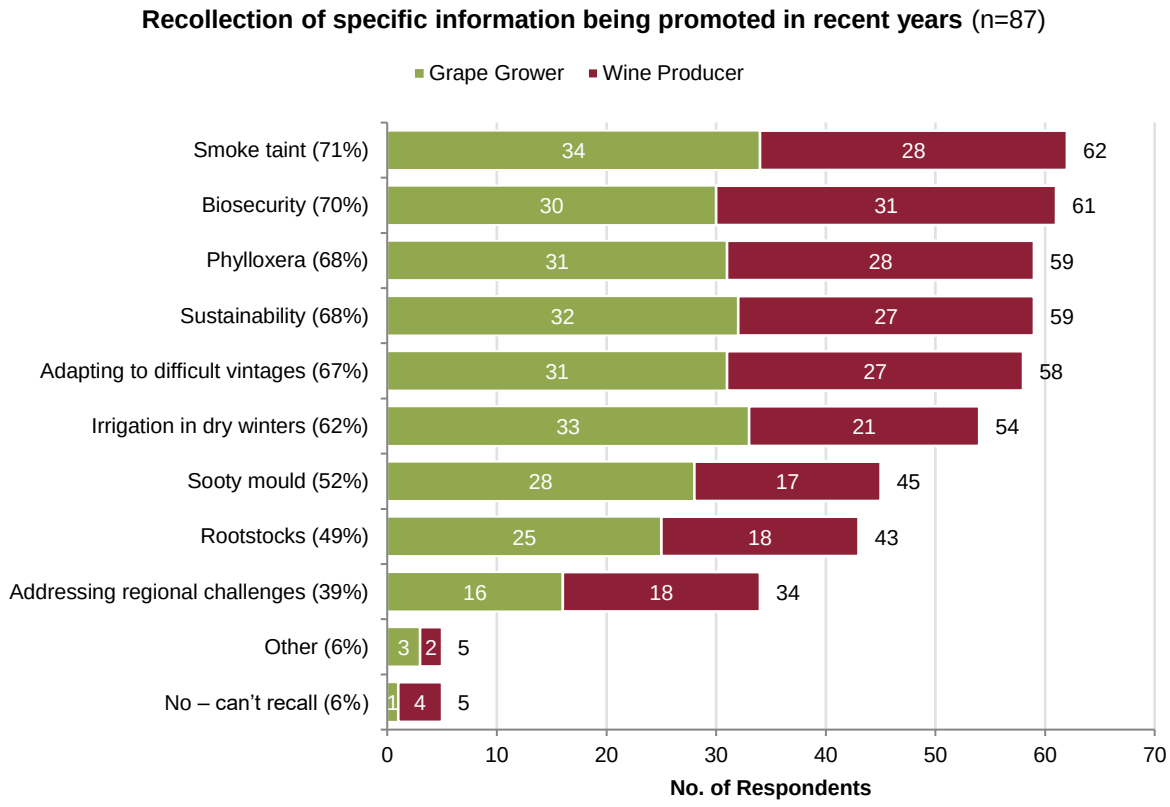


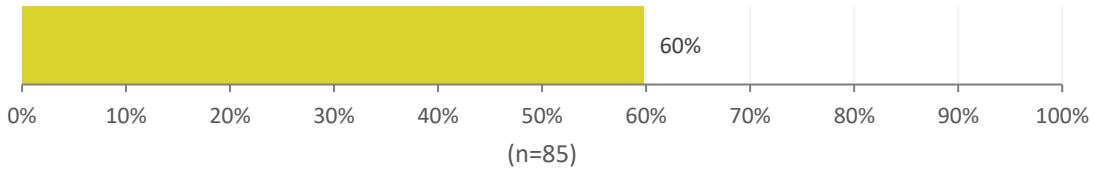
Table 8: Percentage by year

	2019 (n=87)	2018 (n=71)	Change
Smoke taint	71%	63%	+8%
Adapting to difficult vintages	67%	39%	**+28%**
Sooty mould	52%	28%	**+24%**
Addressing regional challenges	39%	28%	**+11%**
Other	6%	13%	-7%
No – can't recall	6%	18%	**-12%**

Note: Rootstocks; irrigation in dry winters; phylloxera; biosecurity; and sustainability were not available as options in the 2018 survey.

2.2.5 Actions resulting from promoted information

The majority (60%) of respondents indicated they had acted on information promoted by Wine Australia.



- A higher percentage of Grape Growers (69%) had acted on information compared to Wine Producers (50%).
- South Australian (67%) respondents had the highest percentage acting on information compared to the other main states.
- The most common changes mentioned related to biosecurity and pest/disease management (18 mentions), irrigation in dry winters (10 mentions), rootstocks (7 mentions), and smoke taint (7 mentions).
- Those who hadn't acted generally indicated there was no requirement for action, though many still valued the information provided (7 mentions).
- Compared to 2018 there was a similar overall percentage acting on information (+4% change) – though looking at business type, the percentage of Grape Growers acting had increased (+28%) and Wine Producers decreased (-19%).

Table 9: Percentage acting on information by demographic

	2019	2018	Change
Overall	60%	56%	+4%
Business Type			
Grape Grower	69%	41%	**+28%**
Wine Producer	50%	69%	**-19%**
Ownership			
Family farm/owned	60%	55%	+5%
Australian corporate	73%	62%	**+11%**
International corporate	53%	57%	-4%
Lifecycle			
Expanding	64%	55%	+9%
Stable	62%	63%	-1%
Location			
SA	67%	48%	**+19%**
Vic	53%	64%	**-11%**
NSW	60%	50%	**+10%**
WA/Other	53%	75%	**-22%**

COMMENTS

Specific actions/changes as a result of information:

- [18] **Biosecurity and pest/disease management** (e.g. phylloxera; trunk disease; spray programs; recommended protocols; signage; mock outbreak preparation; revamped procedures; exclusion zone; watch and wait)
- [10] **Irrigation in dry winters** (e.g. applied winter irrigation; watering mid-winter; changing the way I approach wetting up our soil profile)
- [7] **Rootstocks** (e.g. rootstock for when we replant; having a look at rootstock selection)
- [7] **Smoke taint** (e.g. specially after the bushfires checking for smoke taint; ran the recommended fermentation trials of smoke tainted fruit)
- [3] **Sooty mould** (e.g. researching it and looking at organic controls)
- [3] **Sustainability** (e.g. with the sustainability things we see that as very important)
- [2] **Climate change/adaption** (e.g. general adaptation to climate change)
- [1] **Adapting to difficult vintages**

Other Benefits:

- [13] **Improved decision making - improved knowledge/awareness/access to information can be utilised when needed** *(e.g. as a management tool; assessed it and so better understand our position; information has helped in clarifying my decisions; trying to keep aware of these different issues; utilise some things that needs further investigation of other things; informed us better; sometime you act on it and sometimes it just goes into your knowledge bank)*
- [3] **Improved advice to others** *(e.g. helps with my research for me to do presentation; used with my work as part of developing some training tools for our staff and growers; gives me something to link to clients)*

Information not acted on:

- [7] **No need to act at the moment - still take onboard information/increase awareness/knowledge** *(e.g. can't recall making any immediate actions on anything - any fresh information is always valuable; we now know the issues and what to do if needed; some things were useful but haven't acted of them at present)*
- [6] **General comments on not acting on information** *(e.g. didn't act on anything; not immediately; nothing I needed to act on urgently)*
- [3] **Making changes anyway/would have acted regardless of information** *(e.g. we are doing it anyway; it is applicable but we maybe already are implementing that; read those things and we are doing them as well)*
- **Single comments included:** Decided not to act after reviewing information; Information was not relevant; Unsure if information was from Wine Australia

2.2.6 Activity participation

Workshops (79%) and Roadshows (63%) were the two most common extension activities respondents had participated in over the last 2-3 years.

- Grape Growers as a percentage had participated in more activities compared to Wine Producers – particularly Involved in research (+28%), Other (+17%), and Mentoring (+13%).
- Other extension activities *included seminars/conferences, incubator projects, workshops,* and *field days.*
- Participation in Workshops (+21%) and Roadshows (+14%) had increased since 2018 – though webinar participation had decreased (-16%).

Figure 4:

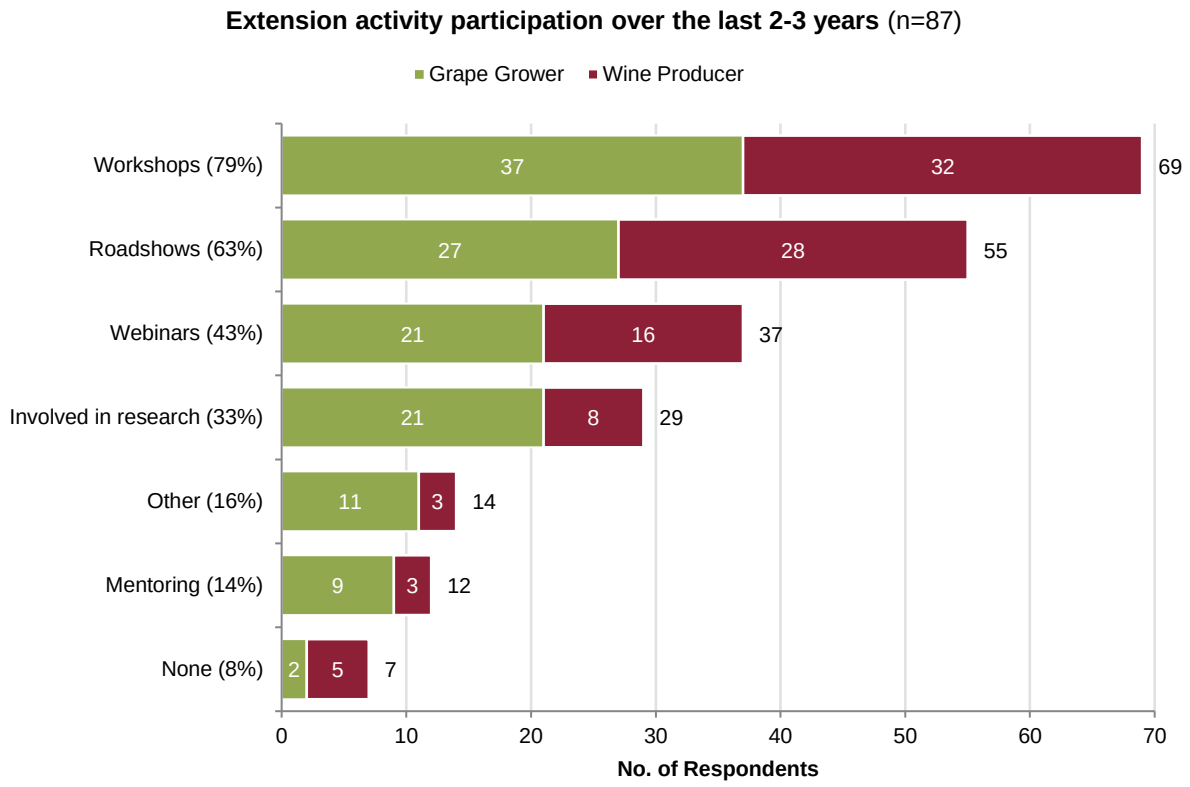


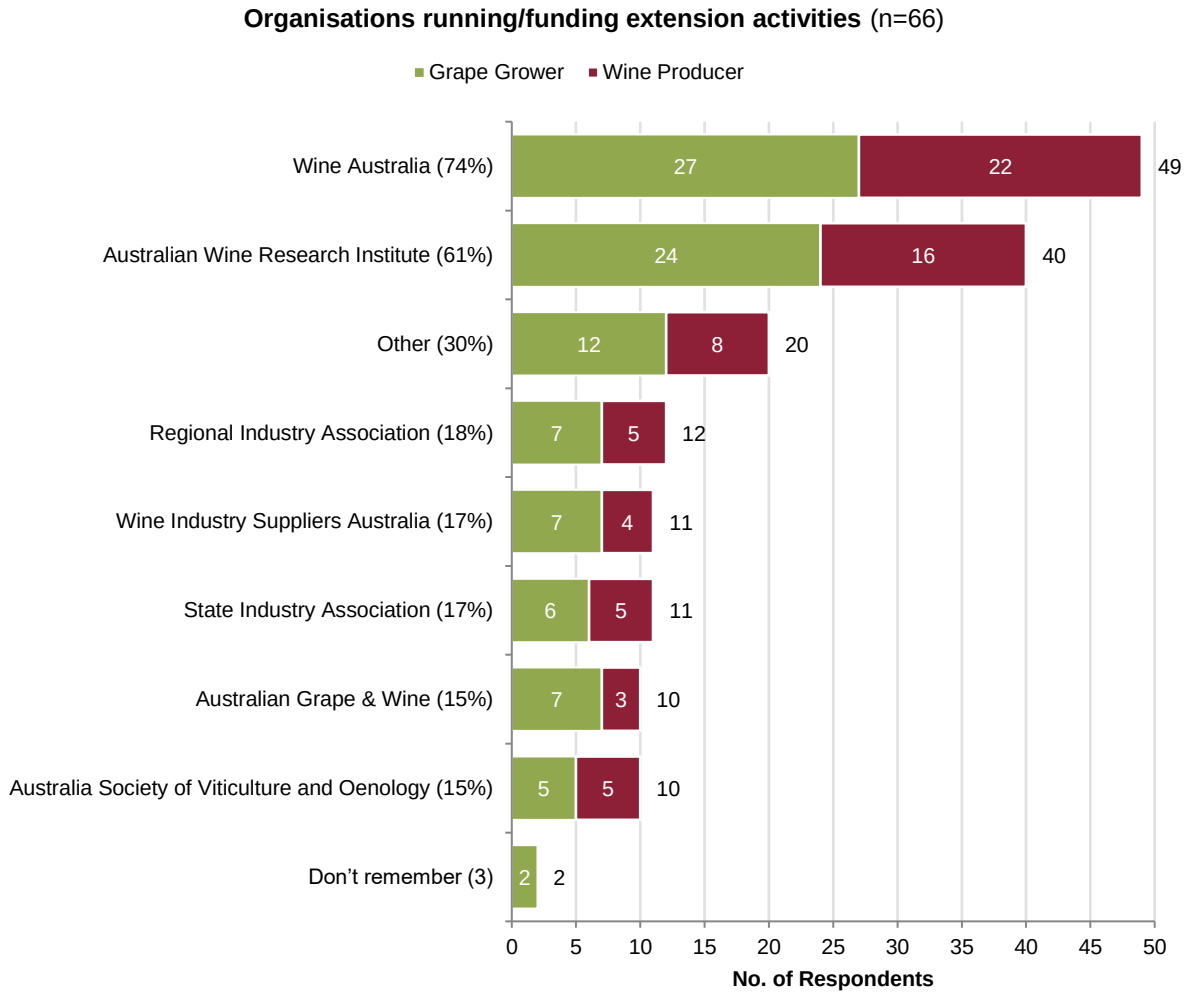
Table 10: Percentage by year

	2019 (n=87)	2018 (n=71)	Change
Workshops	79%	58%	**+21%**
Roadshows	63%	49%	**+14%**
Webinars	43%	59%	**-16%**
Involved in research	33%	25%	+8%
Other	16%	24%	-8%
Mentoring	14%	20%	-6%
None	8%	14%	-6%

Most respondents (83%) were aware of who was funding/organising activities they had participated in – mostly Wine Australia (74%) and the Australian Wine Research Institute (61%).

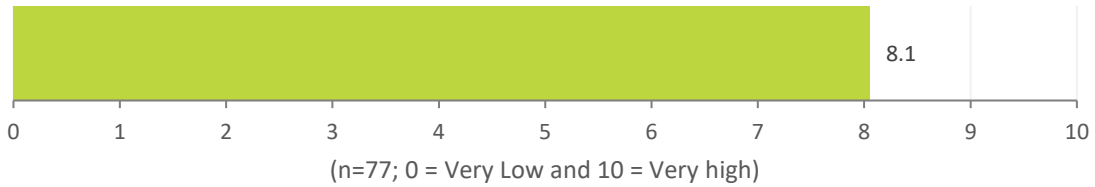
- Other organisations included: [4] Local organisations (*e.g. local associations; local grape growers; local industry groups*); [4] Government (e.g. *NSW DPI; Ag Victoria*); [3] Levy funded organisations (e.g. *all of the above which are funded through our levies*); and [3] Other research organisations (e.g. *University of Adelaide; Wagga Wine Research Industry*).

Figure 5:



2.2.7 Usefulness of activities

Wine Australia extension activities were rated overall as highly useful (8.1 avg.).



- Wine Producers (8.4 avg.) rated the activities slightly more useful compared to Grape Growers (7.8 avg.).
- Respondents who found the activities highly useful described them as: *incredibly useful; interesting; well organised; hands on; quality; excellent; vital; very good; helpful; educational; relevant; evidence based; topical*
- Most issues relating to activities related to a lack of relevance of information/topics to specific regions or situations.
- There was minimal change in average ratings compared to 2018, with activities continuing to be rated as highly useful by respondents.

Table 11: Average by demographic

	2019	2018	Change
Overall	8.1	8.0	+0.1
Business Type			
Grape Grower	7.8	7.6	+0.2
Wine Producer	8.4	8.3	+0.1
Ownership			
Family farm/owned	8.0	8.0	0.0
Australian corporate	7.8	7.8	0.0
International corporate	8.2	8.5	-0.3
Lifecycle			
Expanding	8.0	8.0	0.0
Stable	8.1	7.9	+0.2
Location			
SA	8.0	8.0	0.0
Vic	8.1	8.1	0.0
NSW	8.3	7.5	+0.8
WA/Other	7.9	8.6	-0.7

COMMENTS

High to very high usefulness (7-10 rating):

Positive Comments

- [39] **General positive comments** *(e.g. incredibly useful; interesting; well organised; hands on; quality; excellent; vital; very good; helpful; educational; relevant; evidence based; topical)*
- [3] **Have resulted in practice change** *(e.g. extremely valuable in getting the message out there and creating practice change; have changed the way we make wine; helped reduce my electricity cost.)*
- [3] **Good networking opportunity** *(e.g. the network after the seminars and workshops are important for the information you pick up at the time as well)*
- [3] **Value/importance of local face-to-face interaction/engagement** *(e.g. best way to get information out there is face to face and one on one; usefulness is the fact that you can directly engage the people at AWRI and Wine Australia; very good at touching base and maybe interacting with some of the problems that are associated with our region)*
- [3] **Good but always room for improvement** *(e.g. can always be improved and it's hard in a crowded marketplace to stand out)*
- [2] **Praise for specific activities** *(e.g. NSW DPI Roadshow was really good; couple of examples of recent extension activities that were simply excellent that were funded by Wine Australia - one in Mount Barker and one in Margaret River acclaimed by everybody.)*
- [2] **Praise for specific topics** *(e.g. will be using Wine Australia for more information on sustainability)*
- [1] **Importance of activities in filling industry extension gap** *(e.g. really important - the big companies have actually pulled out a lot of their extension work and viticulture staff)*

Concerns/Suggestions

- [4] **Some activities/information not regionally relevant** *(e.g. some of them are not always relevant to our region; often the specific wine and viticulture information is very much about warmer climates; very Eastern States-centric and are very focussed on East Coast issues as opposed to Western Australian issues)*
- [3] **Information not ground-breaking/already well known/can be repetitive** *(e.g. tot necessarily ground-breaking information given; they're good but they can be a bit repetitive - some of this information has got to be hounded into growers time and time and time again)*
- [2] **Need improved communication/system to notify of activities** ***(****e.g. somehow be notified in a better way so that I don't miss out on future workshops and roadshows)*
- **Single comments included:** Difficulty extending information to parts of the industry; Need to consult producers/growers on topics; Need for activities at different times/after hours; Difficulty attending due to remote location/no activities nearby

Moderate usefulness (4-6 rating):

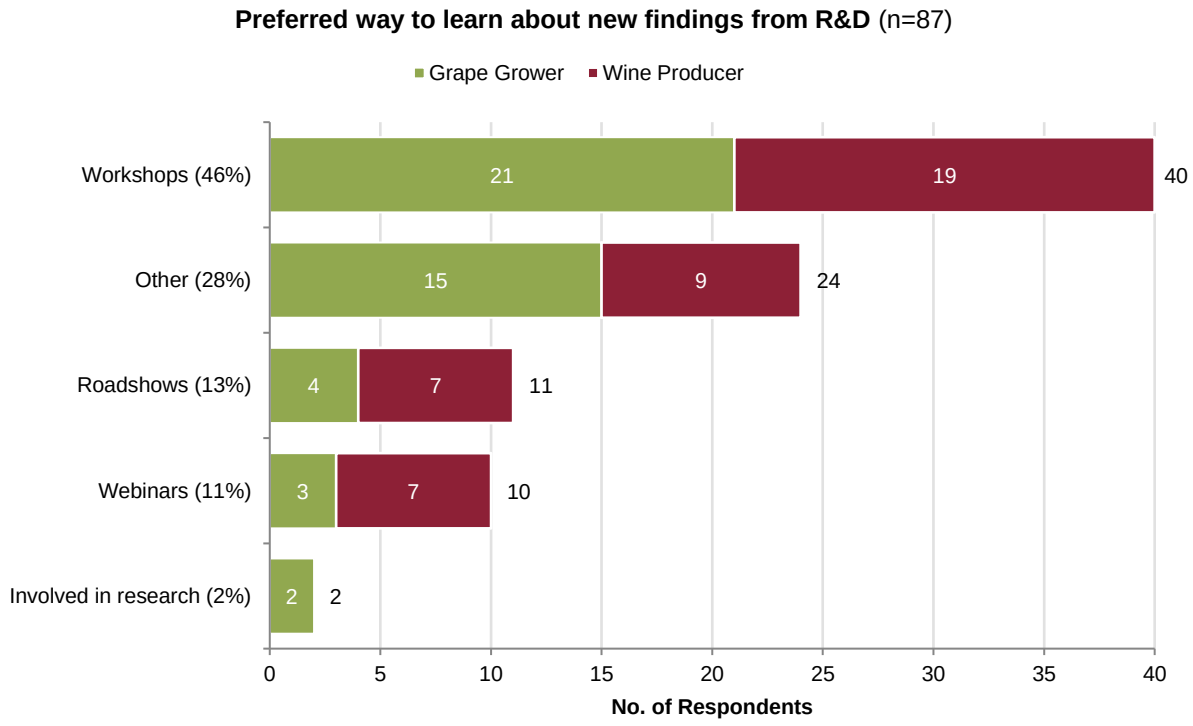
- [4] **Dependent on topic/if relevant** *(e.g. depends on the topic; everything is different and who is providing it and what the topic is)*
- [3] **Limited new information/already known** *(e.g. doesn't seem to be a quantity of new research; wasn't a lot of new information provided)*

2.2.8 Preferred way to learn about new R&D

Workshops were the most preferred way to learn about new findings from R&D (46%).

- Other preferred methods mentioned included any face-to-face engagement/group interaction (12 mentions – e.g. workshops, roadshows, involvement in research) as well as any remote communication methods (11 mentions – e.g. emails, newsletters, publications, webinars).
- Commenting on particularly useful or preferred activities, many respondents highlighted the general value and benefits of workshops and roadshows (11 mentions) – face-to-face interaction with presenters (12 mentions) and networking with and learning from other participants (9 mentions) were noted as particularly valuable aspects.
- The flexibility of webinars was also mentioned with respondents appreciating being able to view topics of interest at a convenient time and place (6 mentions).

Figure 6:



COMMENTS

Workshops/Roadshows:

- [11] **General comments on the value/benefit of workshops/roadshows** *(e.g. get the most out of it; particularly useful; really like workshops; prefer workshops)*
- [12] **Benefit/value of face-to-face/interactive contact with presenters** *(e.g. I like the face to face contact and they are most effective especially for my staff; if I go to a workshop, my complete attention is captured and I can really focus; great for interaction and getting your questions answered; can actually speak to a researcher or presenter; fairly in depth learning from them; tangible things in front of you)*

- [9] **Networking and talking with/learning from other grower/producers** *(e.g. good to talk to other guys about issues and things; networking through our local associations; can talk to my colleagues as well; talking to others and asking for help in relation to certain situations; good way to learn as you are talking to people)*
- [8] **Workshops in combination with webinars/email** *(e.g. does depend on the time of year - workshops when we are not overly busy and webinars when we are at our busiest time; sometimes a webinar is all I need and then other times to actually have the spray application days in the paddock; love the workshops but if time does not allow I don't mind webinars and emails; prefer workshops but if I am short of time it would be webinars and emails)*
- [4] **Importance of local/regional events - distance can make it difficult to** attend *(e.g. would rather go to a regional workshop or roadshow rather than going to the city; as we are a bit remote hard to get to some depending on when they are being run; workshops and roadshows if we don't have to travel too far to attend)*
- [2] **Ability to attend only those relevant** *(e.g. workshops and roadshows because we can pick what is relevant to us)*
- [1] **Issues/concerns - Large costs associated with attending roadshows**

Webinars:

- [6] **Flexibility - can be viewed anywhere/anytime** *(e.g. because of our location we mostly use webinars; particularly good because they're very flexible; nice and easy when you have a busy schedule; good because you don't have to leave home and you can pick which topic interests you; most cost effective as you can access them in your own time)*
- [3] **General comments on webinars** *(e.g. webinars are good; quite interested efficiency in webinars; webinar because there's that aspect of interacting with other likeminded people)*
- [1] **Issues/concerns - Limited by poor internet**

Other activities/resources:

- [6] **Emails**
- [3] **Other online resources** *(e.g. podcasts; videos)*
- [3] **Publications/fact sheets/other literature** *(e.g. fact sheets are easy because you can do that in your own time)*
- [2] **Field walks/demonstrations** *(e.g. need to be hands-on; going out into the field and actually seeing what exactly has been talked about)*
- [2] **Any face-to-face interaction** *(e.g. face to face interaction is really good)*

General Suggestions:

- [1] **Need to show examples/demonstrate benefits** *(e.g. show examples of changes that have occurred so that people can relate and see how they can either make money or save money)*
- [1] **Need for locally/regionally relevant information/activities** *(e.g. make sure that the information is relevant to our particular area - have lost most of our research from areas the like of Mildura - a lot of it has been consolidated back to Adelaide over the years [e.g. CSIRO moved from Mildura back to South Australia and low input from Victoria Government leaving much of the industry to run their own trials])*

2.2.9 Useful topics

Respondents were asked if there any topics that would specifically like more information on – topics mentioned included:

Grape Growing:

- [9] Pest/disease/weed management
- [6] Soil health
- [6] Sustainability
- [5] Organic viticulture
- [4] Biosecurity
- [4] Climate change/adaption/extreme weather
- [4] Water management/irrigation
- [3] Precision agriculture/new technologies
- [2] Variety selection/clonal science
- Single mentions: Bunch and stemming; vine balance; canopy management; post disposal

Winemaking:

- [2] Tannins/colour measurement
- [2] Fermentation
- Single mentions: copper use; preservative free winemaking

Economics:

- [3] Consumer/market behaviour/trends
- [2] Productivity/efficiency
- Single mentions: benchmarking data; wine stock data; taxation; export service costs; getting funding/grants; fundamentals/basics

2.3 Grape Grower Practices

2.3.1 Pest and disease

The majority of Grape Grower respondents were *aware of best practice treatment of pruning wounds to prevent trunk disease infection* (98%); *referred to the Eutypa dieback best management practice guide* (78%); *employed remediation strategies for trunk diseases* (78%); and were *aware of changes made in 2017 to the footwear and small hand tools disinfestation protocol for phylloxera* (67%).

- Just under half had a *copy of the Biosecurity Manual* (47%).
- Only 20% had *used PMapp for the assessment of powdery mildew (or anything else).*
- Awareness and use of these pest and disease practices had increased since 2018 (see table 12) – e.g. +15% Referred to the Eutypa dieback best management practice guide

Figure 7:

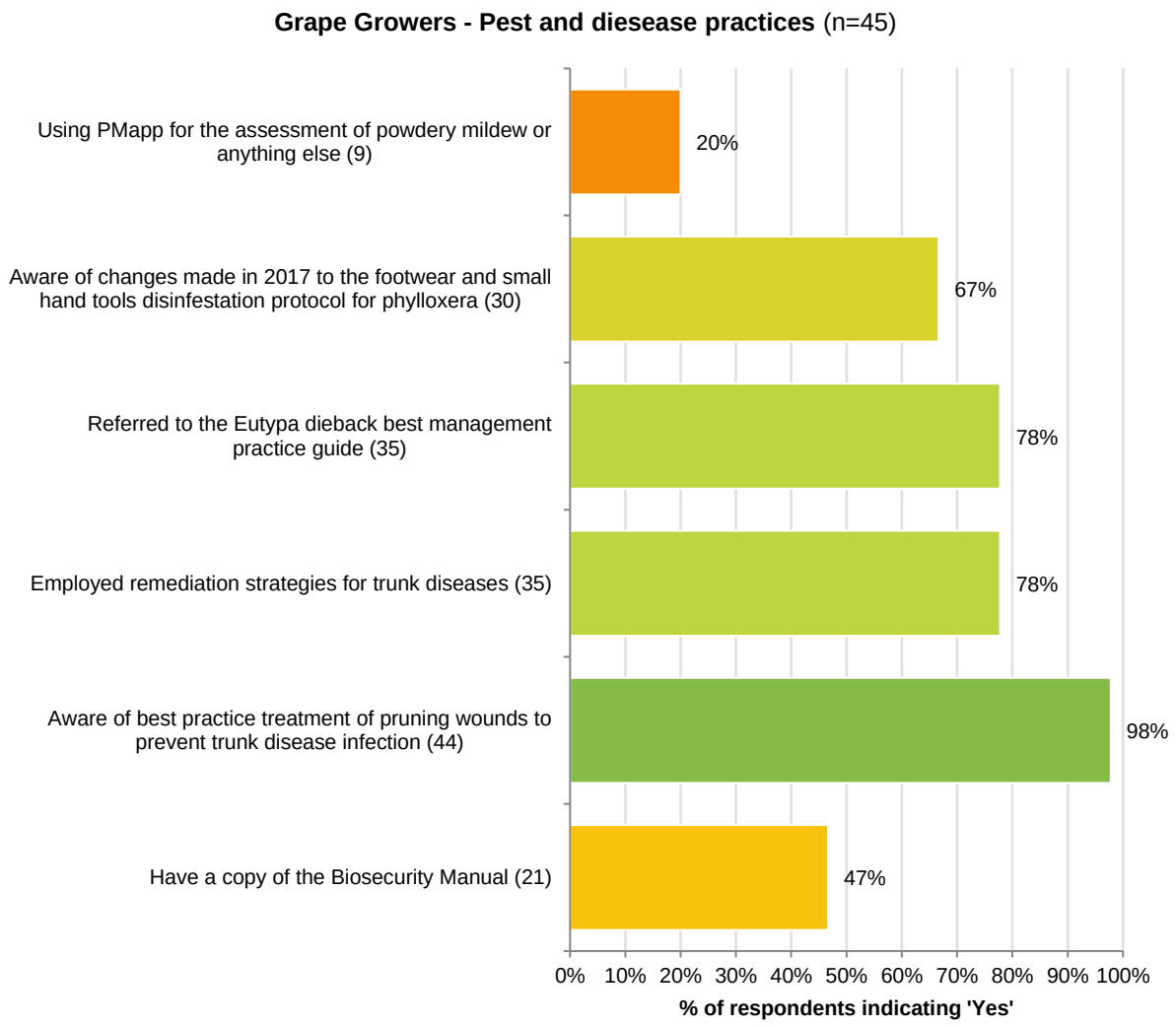


Table 12: Percentage 'Yes' by year

	2019 (n=45)	2018 (n=32)	Change
Using PMapp for the assessment of powdery mildew or anything else	20%	16%	+4%
Aware of changes made in 2017 to the footwear and small hand tools disinfestation protocol for phylloxera	67%	59%	+8%
Referred to the Eutypa dieback best management practice guide	78%	63%	**+15%**
Employed remediation strategies for trunk diseases	78%	63%	**+15%**
Aware of best practice treatment of pruning wounds to prevent trunk disease infection	98%	88%	**+10%**
Have a copy of the Biosecurity Manual	47%	47%	0%

Table 13: Comments relating to pest and disease practices

Practice	Summary	Example Comment(s)
Other uses for PMapp	Other uses noted: Botrytis, frost assessment; other diseases; bird peck	*We use it for a lot of other diseases too and we use it to access bird peck damage.*
Activities undertaken to reduce chance of getting phylloxera	[20] **Decontamination/hygiene practices** (e.g. footbaths; cleaning) were the most common – other practices included: • [9] Sign-in/entry procedures • [7] Restricting farm access • [5] Education/training/awareness activities [4] Rootstock protocols [3] Signage/public notices	*Any one from interstate have to have foot baths and any equipment gets washed thoroughly before allowed in.* *We have a sign in logbook that everyone has to sign when they come into the property*
Awareness of exotic plant pests and diseases that could affect Australia's grapevines if they were to come here	[20] **Pierce's disease** was the most commonly mentioned exotic disease – others included: • [13] Stink bug • [9] Glassy-winged sharpshooter • [9] Phylloxera • [8] Xyella • [4] Red blotch • [4] Rusts • [10] Other pests/diseases (e.g. black vine weevil; Botryosphaeria; California wasp; Esca; leaf spot; fruit fly; black mould; pinot gris virus; BMSB; spotted lantern fly; exotic mealy bug)	*There is Pierce's disease, that's the main one.* *There are those marmorated stink bugs.* *Phylloxera is a big one too but because we haven't got it in our region we don't think about it too much.*
Other comments on Pest and Disease Practices	Other comments on pest and disease practices mainly described respondents' limited need to implement practices as they **are not affected and/or are in low risk areas** (9 mentions). Some respondents also **acknowledged the importance of biosecurity practices and protocols** (8 mentions).	*This area isn't subjected to these types of diseases because of the dry climate; those sort of issues are more to do with the cool climate regions. Yes we have to understand the risks and focus on quarantine. Education quarantine education is crucial.*

2.3.2 Rootstocks

The majority of Grape Grower respondents (71%) selected rootstocks specifically for their vineyard relevant properties, with most selecting those *appropriate to the planting site* (81%) and for their *pest resistant properties* (78%).

- Most respondents (71%) also indicated there were factors limiting their choice of rootstocks – including availability of rootlings through nurseries (56%), perceived quality impacts on wine (47%), and cost of grafted rootling (39%).
- Compared to 2018 a higher percentage of respondents were selecting rootstocks for their vineyard relevant properties (+15%) and also experiencing factors limiting their choice of rootstocks (+18%).

Figure 8:

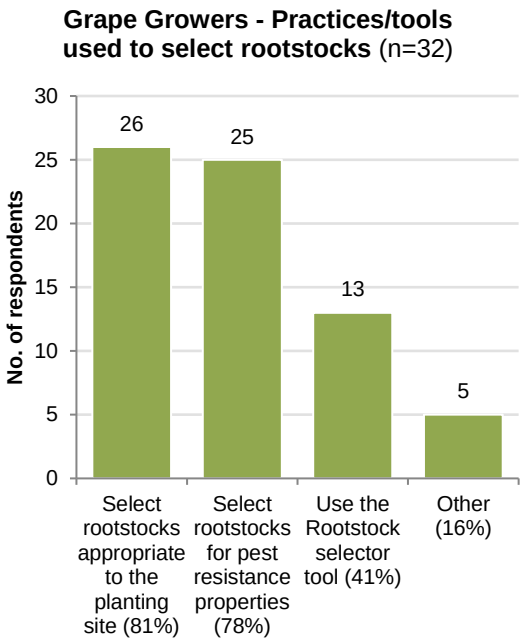


Figure 9:

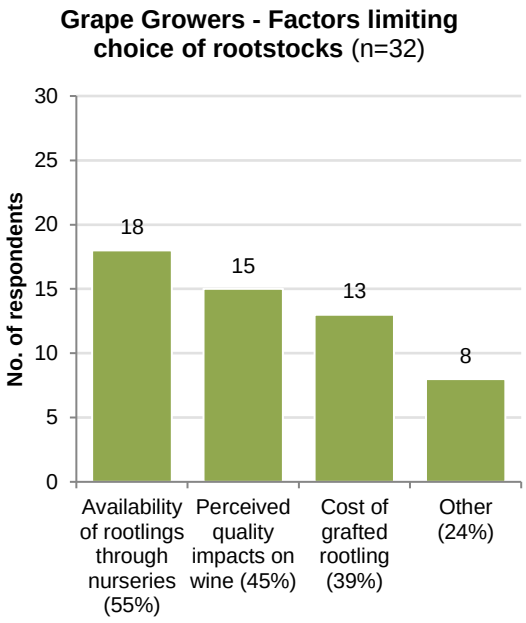


Table 14: Grape Growers – Specifically selecting rootstocks (percentage by year)

	2019 (n=45)	2018 (n=32)	Change
Rootstocks specifically selected for their vineyard relevant properties	71%	56%	**+15%**

Table 15: Grape Growers - Practices/tools used to select rootstocks (percentage by year)

	2019 (n=32)	2018 (n=18)	Change
Select rootstocks appropriate to the planting site	81%	72%	+9%
Select rootstocks for pest resistance properties	78%	83%	-5%
Use the Rootstock selector tool	41%	39%	+2%

Other	16%	22%	-6%

Table 16: Grape Growers - Experiencing factors limiting their choice of rootstocks (percentage by year)

	2019 (n=45)	2018 (n=32)	Change
Indicated there were factors limiting choice of rootstocks	71%	53%	**+18%**

Table 17: Grape Growers - Factors limiting choice of rootstocks (percentage by year)

	2019 (n=32)	2018 (n=17)	Change
Availability of rootlings through nurseries	56%	47%	+9%
Perceived quality impacts on wine	47%	41%	+6%
Cost of grafted rootling	41%	35%	+5%
Other	25%	18%	+7%

COMMENTS

- [10] **Variety availability issues** *(e.g. hard when you can't access the desired rootstock because it makes it difficult to move forward; availability is getting challenging lately; sometimes the rootlings can be in huge demand and you can't get your hands on them)*
- [7] **Rootstock choice based on quality/yield/tolerance/disease resistance** *(e.g. consideration of the quality impacts on wine; select rootstocks that are phylloxera resistance and also select for root quality as well as climate; think about quality, yield and Phylloxera resistant)*
- [3] **Cost impacts decision** *(e.g. costs do impact my decision; price always comes into it)*
- [3] **Importance of more rootstock studies/trials** *(e.g. I think it's good to do further study into quality effects of rootstock; needs to be investment in regional root stock trials)*
- [2] **Need for more education/information relating to rootstock management** *(e.g. more education and encouragement needs to be in this type of industry to adopt rootstocks; it'd be good/helpful to have a lot more information and knowledge on what to use)*
- [2] **Negative experience with rootstock variety** *(e.g. at the last drought the rootstock was useless; we seem to struggle to get them growing really well)*
- **Single comments included:** Positive experience with rootstock variety; Selection based on previous experience/knowledge of the area; Decision based on advice/recommendations; Winemakers bias towards particular rootstocks; Rootstock only one factor impacting vine health/quality
- [9] **Not applicable/not required** *(e.g. haven't done any planting since I have been here; haven't planted a new vineyard for 20 years)*

2.3.3 Spray application

All Grape Grower respondents were aware of spray drift technologies (100%) and almost all actively take steps to minimise spray drift (98%).

- Nozzle selection (77%) was the most common practice used to minimise spray drift, followed by no-spray buffer zones (41%) and using contemporary sprayer technologies (29%).
- Comments highlighted the importance of being aware of and factoring in weather and wind conditions (15 mentions). Many respondents also provided examples of their nozzle selection and sprayer setups – particularly the use of recycling sprayers.
- Compared to 2018 there was an increase in the percentage of Growers both aware of spray drift technologies (+19%) and those actively taking steps to minimise drift (+10%) – no spray buffer zones (+16%) and use of contemporary sprayer technologies (+10%) had the largest usage gains.

Figure 10:

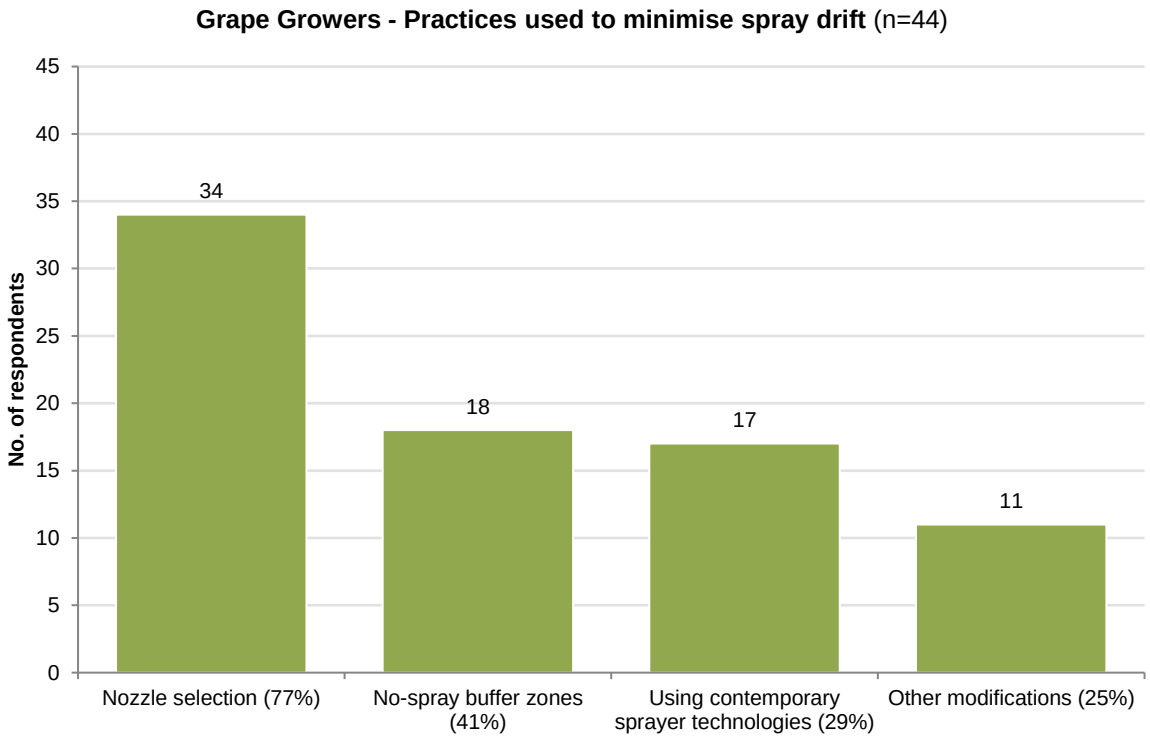


Table 18: Percentage by year

	2019 (n=45)	2018 (n=32)	Change
Actively take steps to minimise spray drift	98%	88%	**+10%**
Aware of spray drift technologies	100%	81%	**+19%**

Table 19: Percentage by year

	2019 (n=45)	2018 (n=32)	Change
Nozzle selection	77%	71%	+6%
No-spray buffer zones	41%	25%	**+16%**
Using contemporary sprayer technologies	39%	29%	**+10%**
Other modifications	25%	21%	+4%

COMMENTS

- [15] **Awareness of/factoring in weather conditions** *(e.g. monitor how much wind speed we're using with our fans and we also monitor wind direction; biggest factors on spray drift is weather conditions and you just have to be a bit sensible; won't spray if the wind is going towards those areas)*
- [12] **Nozzle selection** *(e.g. different nozzles for different times and different applications; always working on things like nozzle choices and pressures)*
- [9] **Sprayer type/setup/configuration** *(e.g. sprayer set up and configuration; making sure the equipment is set up really well and calibrated properly; importance of air flow; low impact spray)*
- [8] **Recycling/recirculating sprayers** *(e.g. using the latest technology like recirculating the spray units; use recycling sprayers that reduce the amount of drip)*
- [2] **Multi-factor approach** *(e.g. it is a multi-approach - there are different things like nozzle selection, weather conditions, buffer zones, everything)*
- [2] **Buffer zones** *(e.g. have to have buffer zones for organic viticulture)*

2.3.4 Vine balance/grape quality measures

Around two-thirds of Grape Growers used *bunch and shoot thinning* to manage their canopy.

- Leaf plucking was also used by around a third of Grape Growers. 'Other' practices used by some respondents included pruning and trimming.
- Most comments described specific canopy management practices used (26 mentions – e.g. pruning, trimming, plucking, bunch and shoot thinning, vertical positioning). Some Growers noted that methods used were dependent on variable factors such as season and variety (6 mentions), while others relied on their own knowledge and experience to best make decisions (5 mentions).
- Compared to 2018 there was a small increase in the percentage of respondents who were not using any canopy management practices (+9%) – this was reflected in the decreasing percentage using bunch and shoot thinning (-14%) and leaf plucking (-14%). One comment suggested the warm climate and need for shade were factors in them not needing to manage their canopy.

Figure 11:

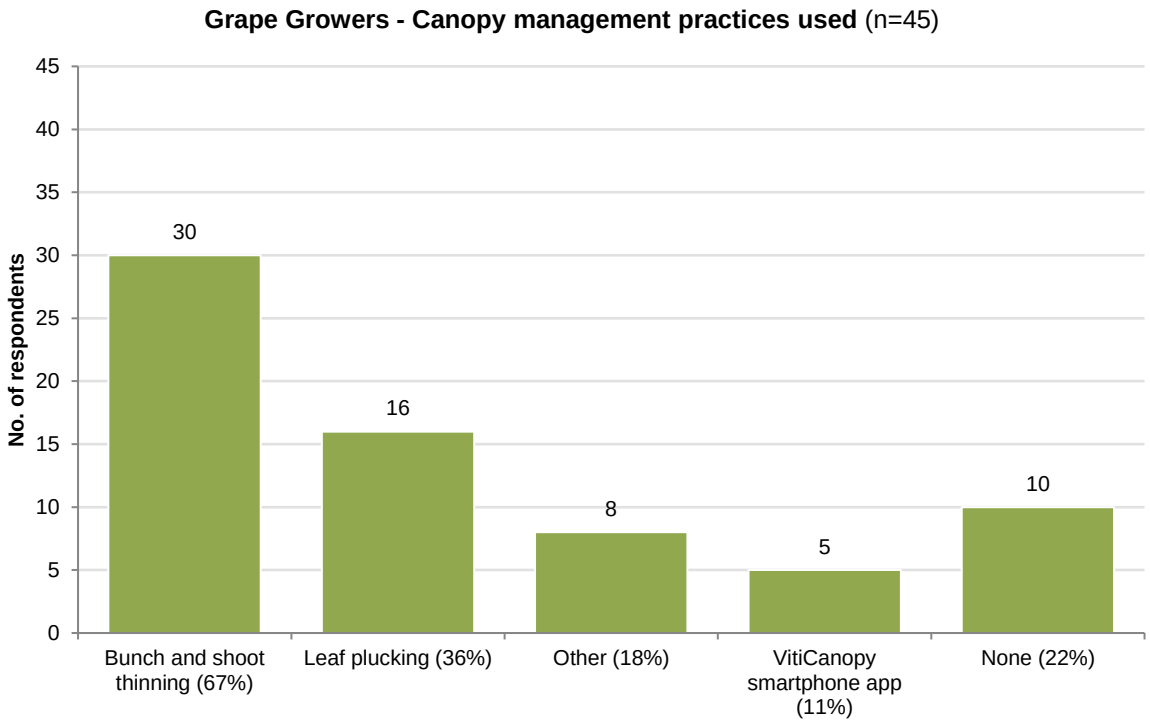


Table 20: Percentage by year

	2019 (n=45)	2018 (n=32)	Change
Bunch and shoot thinning	67%	81%	**-14%**
Leaf plucking	36%	50%	**-14%**
Other	18%	13%	+5%
VitiCanopy smartphone app	11%	16%	-5%
None	22%	13%	+9%

COMMENTS

- [13] **Pruning/trimming/plucking** *(e.g. all starts with pruning; has got to do with your pruning method; leaf plucking depending on site and variety)*
- [10] **Bunch/shoot thinning** *(e.g. do a certain amount of shoot thinning and then bunch thinning in high quality blocks)*
- [6] **Methods dependent on variable factors - season/variety/fruit use/cost** *(e.g. Bunch and shoot thinning would be variety dependant and dependant on where the quality level that we want; depends on the end use of the fruit; depending on what wine quality the wine maker wants; manage it per season - not the same every year)*
- [5] **Value/benefits/importance of canopy management** *(e.g. If you want to grow A grade fruit in Orange you need to do those activities; such a critical part of growing great grapes; use both of them in the hope that will increase our quality)*
- [5] **Based on personal knowledge/experience** *(e.g. basically just through experience and knowledge of our vineyard; ware of those things but I think I use my own interpretations; very aware of our canopy and how they are growing and I don't need an app)*
- [5] **Soil health** *(e.g. healthy soils result in balanced vines and increased grape quality; you've got to have balanced nutrition)*
- [3] **Irrigation management** *(e.g. got to have enough water so they can be wet all the time)*
- [3] **Vertical positioning**
- [1] **Canopy splitting** (e.g. splitting canopies to open up my canopies rather than a lot of labour intensive ways of doing it)
- [3] **General comments on practices used** *(e.g. that is what we do; have done all 3 for many years; doing more of that than probably anybody)*
- [4] **Unaware of/don't use VitiCanopy app** *(e.g. not heard of the VitiCanopy smartphone app - where can I get one; don't use the smart phone app because they are difficult to use)*
- [2] **Use the VitiCanopy app** *(e.g. use the canopy app to measure light penetration though our canopy)*
- [4] **Not applicable/not required** *(e.g. our canopy is that, we are in a warm climate and we need shade)*

2.3.5 Adaption to climate change

Most Grape Growers (80%) had implemented practices to deal with changes in climate and variability.

- The most common practices included delayed pruning (49%), variety selection (47%), and vineyard cooling (38%).
- Comments mainly related to specific practices Growers had implemented including irrigation management and vineyard cooling (16 mentions), soil and ground management (11 mentions), pruning timing (9 mentions), and variety selection (6 mentions).
- Compared to 2018 there was an increase in Grape Growers implementing climate practices (+11%) with all types of practices seeing increases in usage – e.g. vineyard cooling (+19%), variety selection (+16%), clonal trials + 13%), and delayed pruning (+11%).

Figure 12:

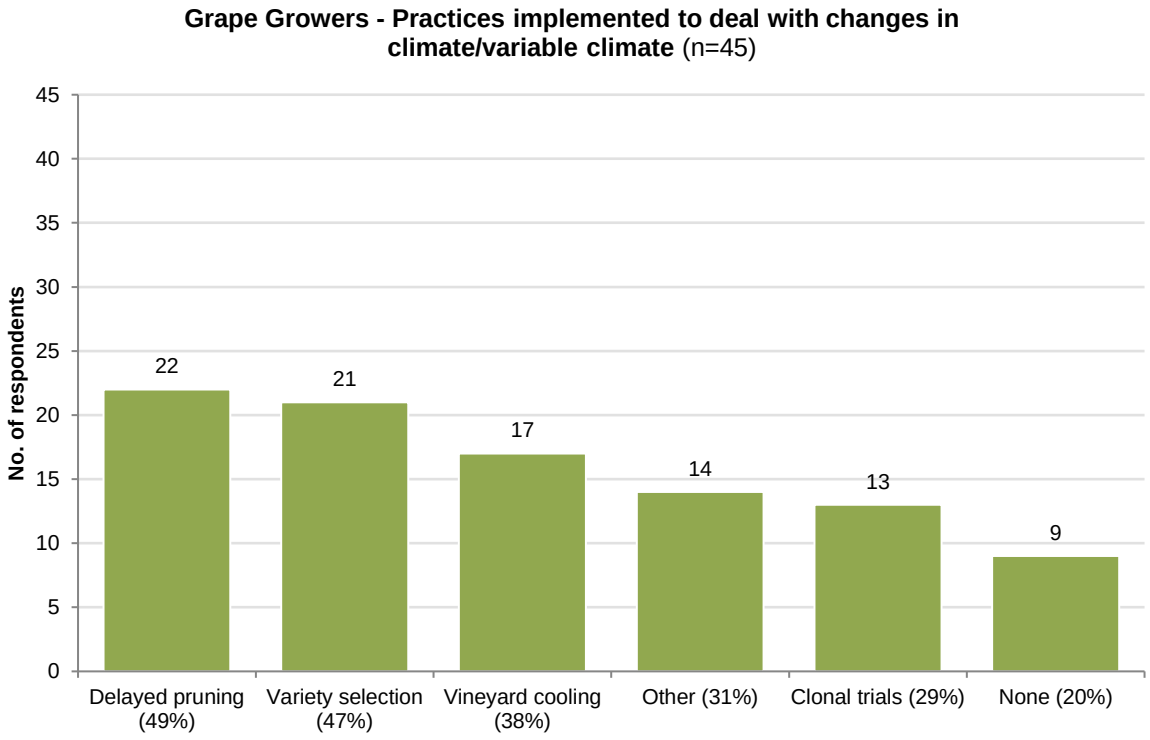


Table 21: Percentage by year

	2019 (n=45)	2018 (n=32)	Change
Delayed pruning	49%	38%	**+11%**
Variety selection	47%	31%	**+16%**
Vineyard cooling	38%	19%	**+19%**
Other	31%	25%	+6%
Clonal trials	29%	16%	**+13%**
None	20%	31%	**-11%**

COMMENTS

Practices Implemented:

- [16] **Irrigation management/vineyard cooling** *(e.g. vineyard cooling; modified irrigation systems; soil moisture monitoring)*
- [11] **Soil/ground management** *(e.g. reducing ground temperature; cover cropping; mulching; compost; soil carbon)*
- [9] **Pruning timing** *(e.g. delayed pruning; pruning to forecast condition)*
- [6] **Variety selection** *(e.g. drought tolerant; remove those that aren't suited to warmer climates)*
- [4] **General canopy management practices** *(e.g. provide shade from the heat; canopy structure)*
- [2] **Clone trials** *(e.g. tried different clones to lessen the risks faced for when we have a heat wave situation)*
- [2] **Sunscreen** *(e.g. spraying clays onto the tree like kaolin - a sunblock especially for heatwaves)*
- **Single comments included:** Fire risk management; Water security; Row orientation; Growing at different altitudes; Reduced input usage

Other Comments:

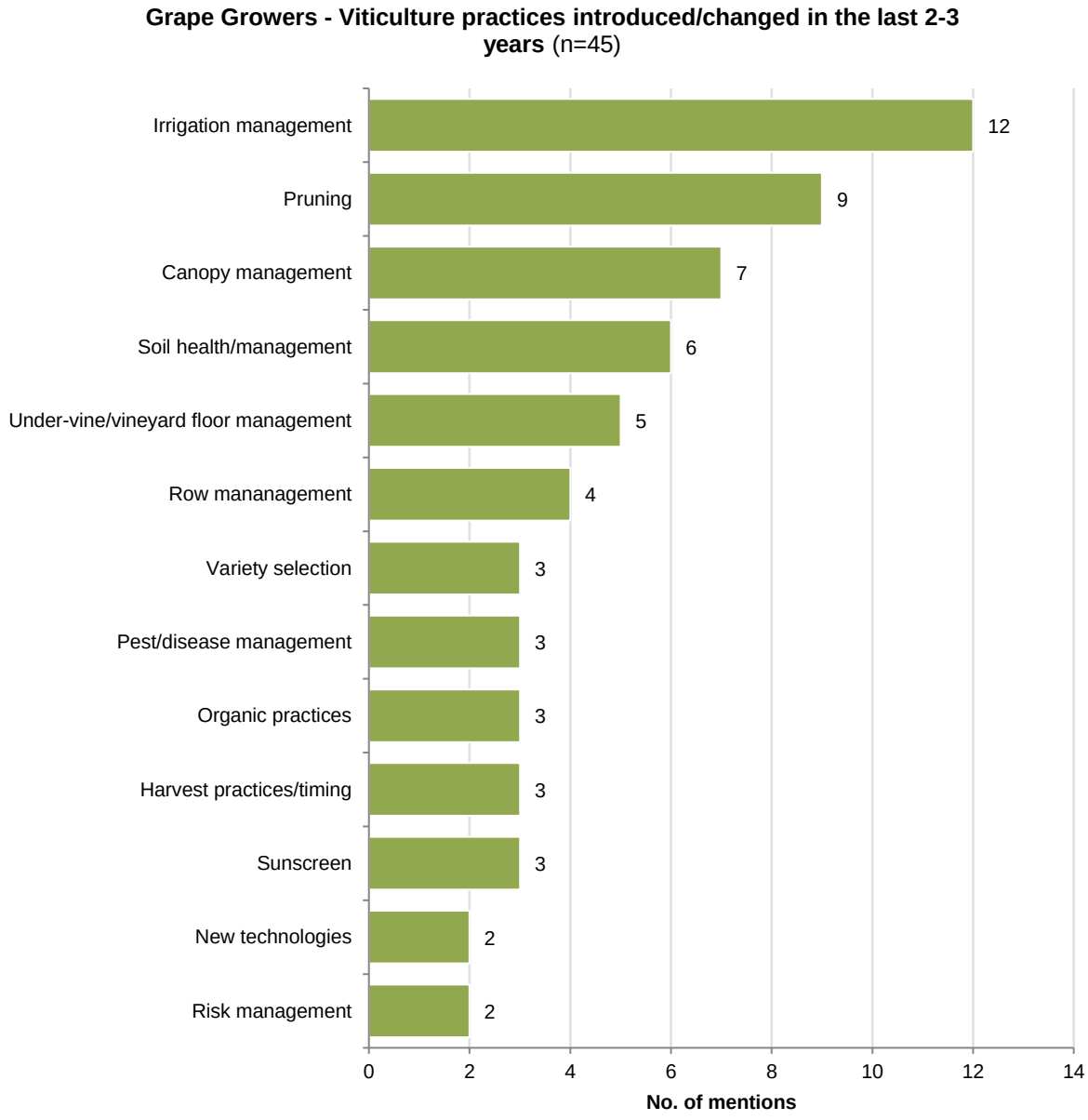
- [4] **Climate change scepticism** *(e.g. the climate has always been variable - there's nothing happening now that hasn't already happened before)*
- [2] **Implemented many practices** *(e.g. we are careful with vineyard design, variety selection, vineyard selection and irrigation management, we have to do the whole lot)*
- [2] **No practices used/needed** *(e.g. none because we are in the hills and we have a cooler climate)*
- [2] **No plan to change variety** *(e.g. very easy to suggest changing varieties but that is very difficult to implement in practice)*
- [1] **Issues with forecast accuracy** *(e.g. biggest problem is forecasting what the weather is going to do in 6 months' time)*

2.3.6 Practices introduced/changed in the last 2-3 years

The most common viticulture practices Grape Growers had introduced or changed in the last 2-3 years included irrigation management, pruning, canopy management, soil/health management, and under-vine/vineyard flood management.

- Other practices mentioned included row management, variety selection, disease management, organic practices, harvest practices/timing, sunscreen, new technologies, and risk management.
- Practices were similar to those being implemented in 2018, though there was a noticeable increase in the percentage of respondents specifically mentioning irrigation management (+14%) and decrease in those mentioning pruning (-14%).

Figure 13:



COMMENTS

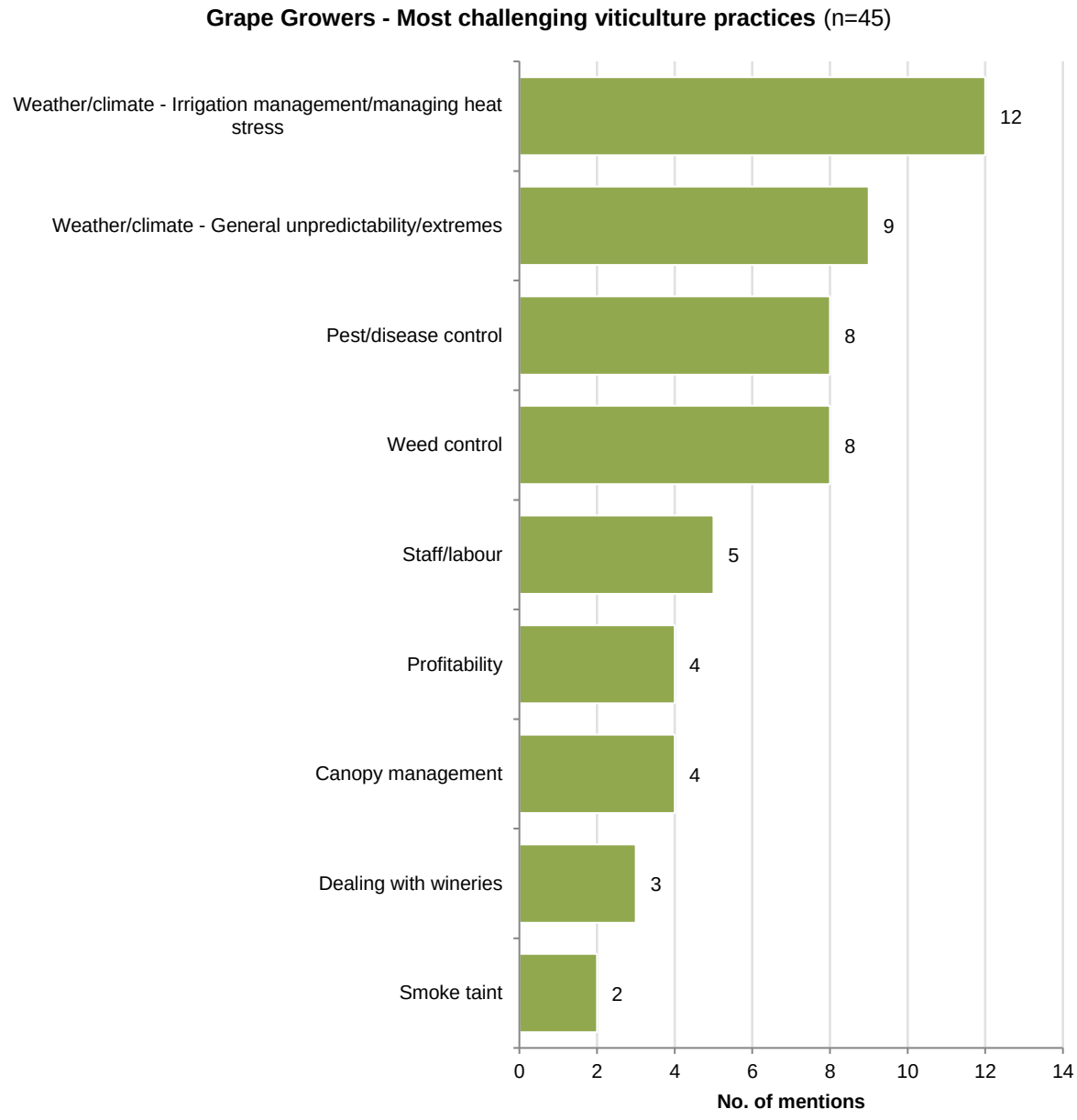
- [12] **Irrigation management** *(e.g. monitoring; drip; irrigating for the heat; increased efficiency)*
- [9] **Pruning** *(e.g. delayed pruning; pruning strategies; techniques)*
- [7] **Canopy management** *(e.g. leaf plucking; bunch and shoot thinning; even canopy; reduced variance; balanced structure)*
- [6] **Soil health/management** *(e.g. compost; improve health and resilience; cover-cropping; increase the carbon)*
- [5] **Under-vine/vineyard floor management** *(e.g. mulching)*
- [4] **Row management** *(e.g. trenching our row orientation to minimise any sunburn)*
- [3] **Variety selection** *(e.g. more drought tolerant rootstocks; selecting varieties with climate change in mind)*
- [3] **Pest/disease management** *(e.g. monitoring of mealybug; converting a lot of our vineyard to VSP for disease control and quality)*
- [3] **Organic practices** *(e.g. taking a further 100 vineyard hectares and having that certified organic)*
- [3] **Harvest practices/timing** *(e.g. changed the harvest date - pulling it forward a bit; changed the way we harvest fruit so MOG removal at the point of harvest)*
- [3] **Sunscreen** *(e.g. proactive on forecasting and putting on protective sun block sprays)*
- [2] **New technologies** *(e.g. using a lot of technology to actually improve our practices; installed more solar panels on my shed for the irrigation)*
- [2] **Risk management** *(e.g. learning to deal with the extreme weather event; is a variable climate so risk management - we can justify the investment in those practices because we know we will get a return)*
- [9] **No/minimal practice changes** *(e.g. I haven't made any changes at all)*

2.3.7 Most challenging viticulture practices

Practices around adapting to climate change – particularly managing irrigation and heat stress – were the most challenging viticulture practices identified by Grape Growers.

- Managing pests, disease, and weeds was also challenging for many – other challenges included staffing/labour, profitability, canopy management, winery relations, and smoke taint.
- These challenges remained consistent from 2018 with weather/climate and pest/disease issues continuing to impact Grape Growers.

Figure 14:



COMMENTS

- [12] **Weather/climate - Irrigation management/managing heat stress** *(e.g. irrigation applications in heat stress periods; keep vines happy in the heat; scheduling; availability of water)*
- [9] **Weather/climate - General unpredictability/extremes** *(e.g. so unpredictable at the moment; high rainfall all of sudden gets very hot and dry; more and more extreme weather; myriad of weather scenarios)*
- [8] **Pest/disease control** *(e.g. bunch rot; garden weevils; snails; powdery mildew; late season humidity)*
- [8] **Weed control** *(e.g. organic control; chemical selection)*
- [5] **Staff/labour** *(e.g. getting reliable labour when we need it; trying to find highly skilled labour)*
- [4] **Profitability** *(e.g. cost of production would be the most challenging; trying to actually make money is my biggest challenge)*
- [4] **Canopy management** *(e.g. leaf plucking; pruning)*
- [3] **Dealing with wineries** *(e.g. want grapes way too late; contracts stacked in favour of the wineries)*
- [2] **Smoke taint**
- [1] **Site selection for new properties**
- [2] **All challenging**

2.3.8 Management help required

Reflecting those practices that were seen as most challenging, Grape Growers felt they needed more help managing issues such as *pest/disease/weed control, climate variability/extremes* and *irrigation/water management.*

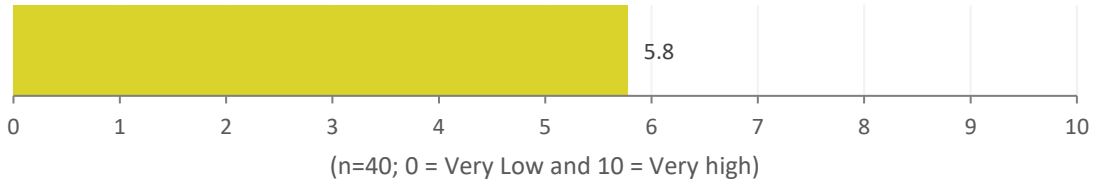
- Other areas requiring help included labour and staff availability, new technologies, dealing with wineries, biosecurity, soil health, long range forecasting, government regulations/policies, sustainability, and power costs.
- These practices were similar to 2018 with Growers still needing help for issues particularly relating to pest/disease/weed control, staffing, and climate variability.

COMMENTS

- [10] **Weed/disease/pest control** *(e.g. bunch rot; organic weed control; biological disease control; fungicide selection; garden weevils; viruses)*
- [4] **Climate variability/extremes** *(e.g. heat waves; water availability; prevent crop loss)*
- [4] **Irrigation/water management** *(e.g. water quality management; how much water grape vines require)*
- [3] **Labour/staff availability** *(e.g. make people available to work outdoors)*
- [3] **New technologies** *(e.g. uptake of digital technology; remote monitoring; drones; futureproofing)*
- [3] **Dealing with wineries** *(e.g. as a grower we are on the receiving end of some very unfair treatment from wine makers)*
- [2] **Biosecurity** *(e.g. skills set to manage incursion)*
- [2] **Soil health** *(e.g. more on soil microbes)*
- **Single comments included:** Long range forecasting; Government regulations/policies; Sustainability; Power costs
- [14] **No specific help needed** *(e.g. nothing really, we have everything under control)*

2.3.9 Influence of Wine Australia on changes

Wine Australia information, tools and extension activities were overall rated as moderately influential in helping Grape Growers successfully make changes (5.8 avg.).



- Expanding businesses (6.4 avg.) found Wine Australia assistance more influential than stable businesses (5.3 avg.).
- Wine Australia appeared to have had the most impact on Grape Growers from Victoria (6.9 avg.).
- Respondents who were highly influenced by Wine Australia made positive comments including: *excellent; helped; useful information; fact sheets are really good; doing a great job; contributed heavily; clearer picture.*
- Those who were less influenced suggested that information had come from other sources, information wasn't relevant to their needs, and/or they relied more on their own knowledge and experience.
- There was little change in average ratings compared to 2018, with Wine Australia continuing to be moderately influential on Growers ability to successfully make changes.

Table 22: Average by demographic

	2019	2018	Change
Overall	5.8	5.9	-0.1
Lifecycle			
Expanding	6.4	6.2	+0.2
Stable	5.3	5.2	+0.1
Location			
SA	5.0	4.9	+0.1
Vic	6.9	5.9	**+1.0**
NSW	5.7	6.6	-0.9
WA/Other	6.3	6.7	-0.4

COMMENTS

High to very high influence (7-10 rating):

- [10] **General praise for Wine Australia** *(e.g. excellent; helped; useful information; fact sheets are really good; doing a great job; contributed heavily; clearer picture)*
- [3] **Used in combination with own knowledge/common sense** *(e.g. whilst it is very good information, we still have to make judgement calls ourselves)*
- [2] **Information not regionally specific** *(e.g. even though we get the information we still have to apply it ourselves with our own knowledge for our own specific region)*
- [2] **Comments on accessing information** *(e.g. there are the others that might be overseas; information available on all the big stuff - just need to know where to find it)*

Moderate influence (4-6 rating):

- [3] **Information not regionally specific** *(e.g. sometimes the information is very general and you really take onboard what suits your area)*
- [2] **Used in combination with own experience/knowledge** *(e.g. after lots of experience we draw on lots of other experiences as well)*
- [2] **One of many information sources** *(e.g. getting little bits and pieces of information from a lot of different sites)*
- [1] **General usefulness** *(e.g. always looking for advice given by the Wine industry)*

No to low influence (0-3 rating):

- [4] **General comments on limited influence** *(e.g. a little bit; pretty low; minor)*
- [3] **More reliant on own experience/knowledge** *(e.g. through my 20 odd years of grape growing and through that experience; we did our own research)*
- [2] **Limited help on specific topics** *(e.g. not much help from out of Wine Australia on Drones)*

2.4 Wine Producer Practices

2.4.1 Clarification and filtration

a. Juice clarification techniques

Cold settling (86%) and _flotation_ (43%) were the two most common white juice clarification techniques used by Wine Producer respondents.

- Increased efficiency and cost savings were the main benefits of the clarification techniques used by wine producers.
- Cold settling and flotation remained the two most popular techniques from 2018.

Figure 15:

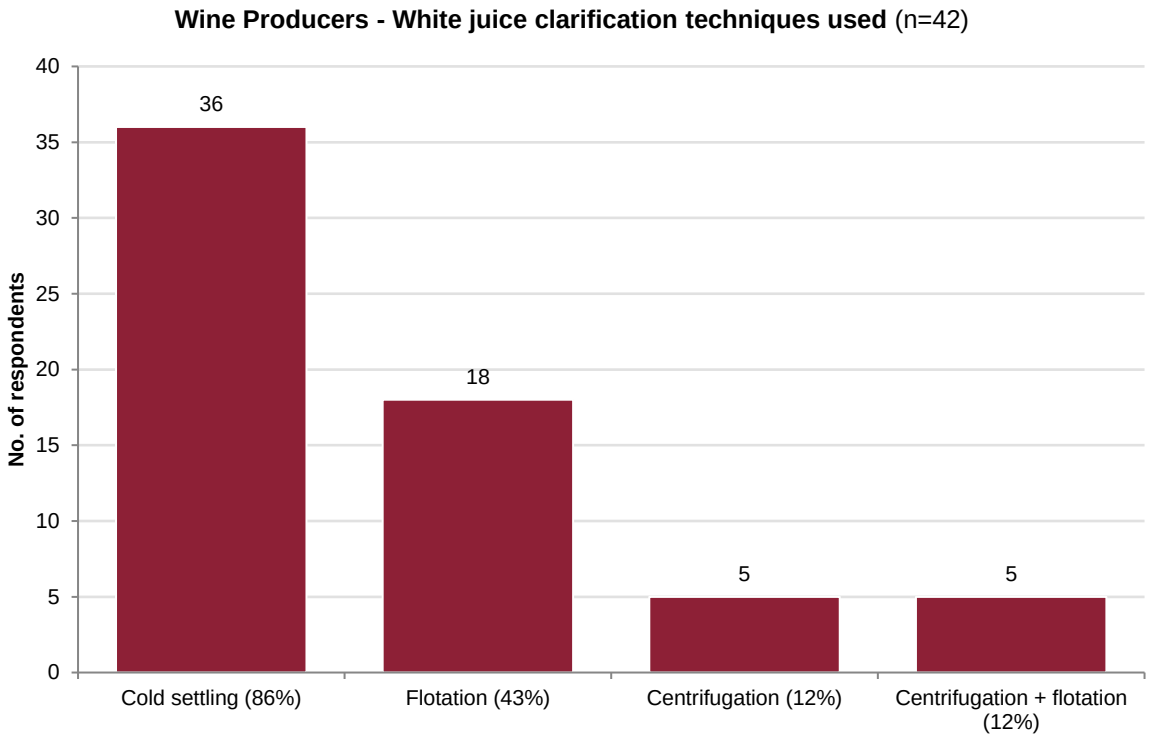


Table 23: Percentage by year

	2019 (n=42)	2018 (n=39)	Change
Cold settling	86%	87%	-1%
Flotation	43%	49%	-6%
Centrifugation	12%	18%	-6%
Centrifugation + flotation	12%	10%	+2%
Other	0%	5%	-5%
Not relevant	10%	0%	**+10%**

COMMENTS

- [19] **Benefits - Increased efficiency/cost savings** *(e.g. cost and speed; reduce energy requirements; faster turnaround and less loss; low capital; decreasing the amount of lees generated; minor quality gain)*
- [7] **Issues/challenges** *(e.g. possible compromising by having to batch juices up quickly; over-ripe fruit and the juices not separating as efficiently; struggled with it with rose; dealing with solids material from process)*

b. Reprocessing method

For Wine Producer respondents where reprocessing was relevant, *Cross-flow filtration* was the most common method used.

- The most common benefits of cross-flow filtration seen by producers were increased efficiency and speed, reduced waste and loses, and improved wine quality.
- Rotary drum vacuum filter (RDV) was most likely used in white juice reprocessing (23%).
- Many wine producers used other reprocessing methods including:
    - **White juice:** Cross flow and RDV (2), Pad filtration (2), and Other (5 – e.g. dispose; flotation; treated and composted; whole bunch pressed)
    - **Red ferment:** Discarded (4), Pad filtration (2), Racked (2), Recycled/composted (2), and Other (2)
    - **White bentonite lees:** Discarded (7) and Other (5 – e.g. cold settled; recovered as a spirit; rack off bentonite and discard; composted; pad filter)
- Compared to 2018 there was noticeable decrease in the percentage of producers using RDV reprocessing (white juice -25%, red ferment -38% and white lees -48%) – there was a subsequent increase in the percentage using Other methods (white juice +22%, red ferment +36% and white lees +33%).

Figure 16:

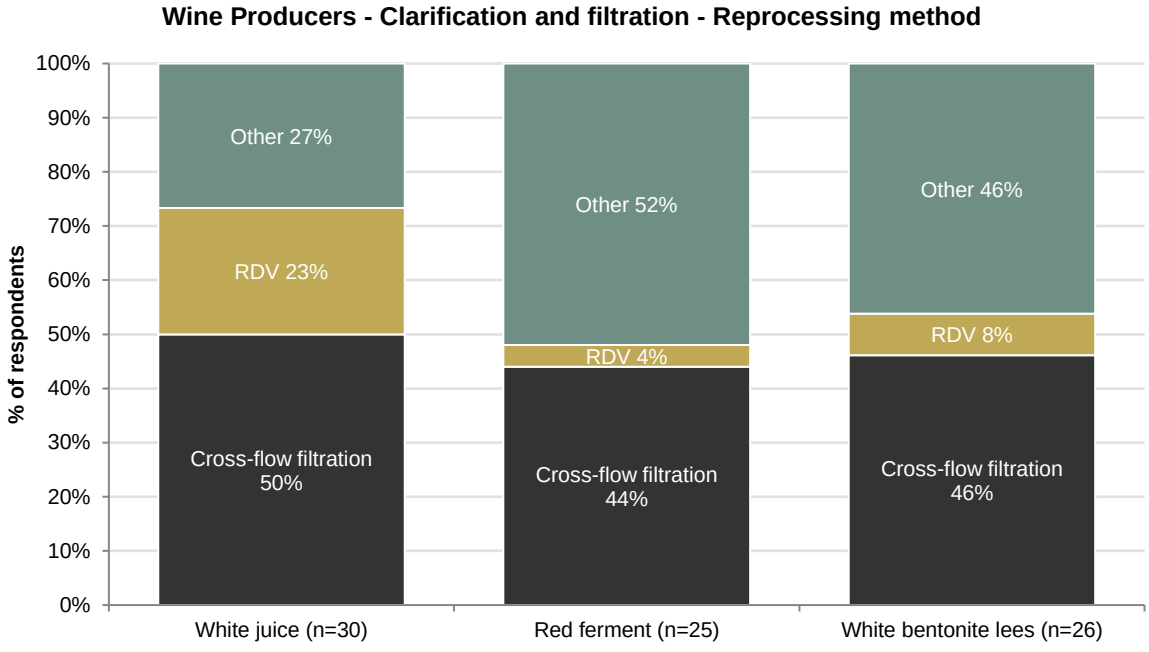


Table 24: Percentage by demographics

2019	White juice (n=30)	Red ferment (n=25)	White bentonite lees (n=26)
Cross-flow filtration	50%	44%	46%
RDV	23%	4%	8%
Other	27%	52%	46%
2018	**White juice (n=21)**	**Red ferment (n=19)**	**White bentonite lees (n=16)**
Cross-flow filtration	48%	42%	31%
RDV	48%	42%	56%
Other	5%	16%	13%
Change	**White juice**	**Red ferment**	**White bentonite lees**
Cross-flow filtration	+2%	+2%	**+15%**
RDV	**-25%**	**-38%**	**-48%**
Other	**+22%**	**+36%**	**+33%**

COMMENTS

Cross-flow filtration benefits:

- [16] **Increased efficiency/speed** *(e.g. quicker; efficient; one-pass filtration; automation; run unmanned)*
- [11] **Reduced waste/loses** *(e.g. minimal waste; low losses; very clean; improve wine recovery)*
- [8] **Improved wine quality** *(e.g. avoids oxidation/dilution; sterile filtration; stable wine; soft on the wines; clarity of the wine; better results)*
- [5] **Simplicity/ease of use** *(e.g. very easy to use; ease of operation)*
- [6] **Cost effective/economical** *(e.g. maximum return; extreme cost benefit; less consumables; improved yield; price)*
- [2] **Reduced labour** *(e.g. reduction in staff in the winery)*
- [2] **Reliability/consistency** *(e.g. filtration is much more reliable)*
- [2] **Safety** *(e.g. dangerous for people breathing it in - gets rid of all that)*

Cross-flow filtration issues:

- [6] **Issues** *(e.g. can also be losses if the batch is too small; low micron filtration in one pass which is a negative for red wines; poorer descent solids recovery; reduction speed of filtration; membranes are very sensitive to TVPP)*

c. Proteins

Almost half of Wine Producer respondents had used *plant-derived fining proteins* (45%), almost all had used *bentonite to remove proteins* (95%), and most were *aware of pasteurisation plus enzyme as a method for heat/protein stabilising* (86%).

- Of the 19 Wine Producers that had used plant-derived fining proteins, 84% had used them with white juice, 79% with white wine, and 58% with red wine.
- Comments describing the benefits of using bentonite included: *more gentle; wine isn't cloudy; cheap; very cost effective; and helps with flavour.*
- Compared to 2018 a higher percentage of producers were both using plant-derived fining proteins (+7%) and using bentonite to remove proteins (+16%).

Figure 17:

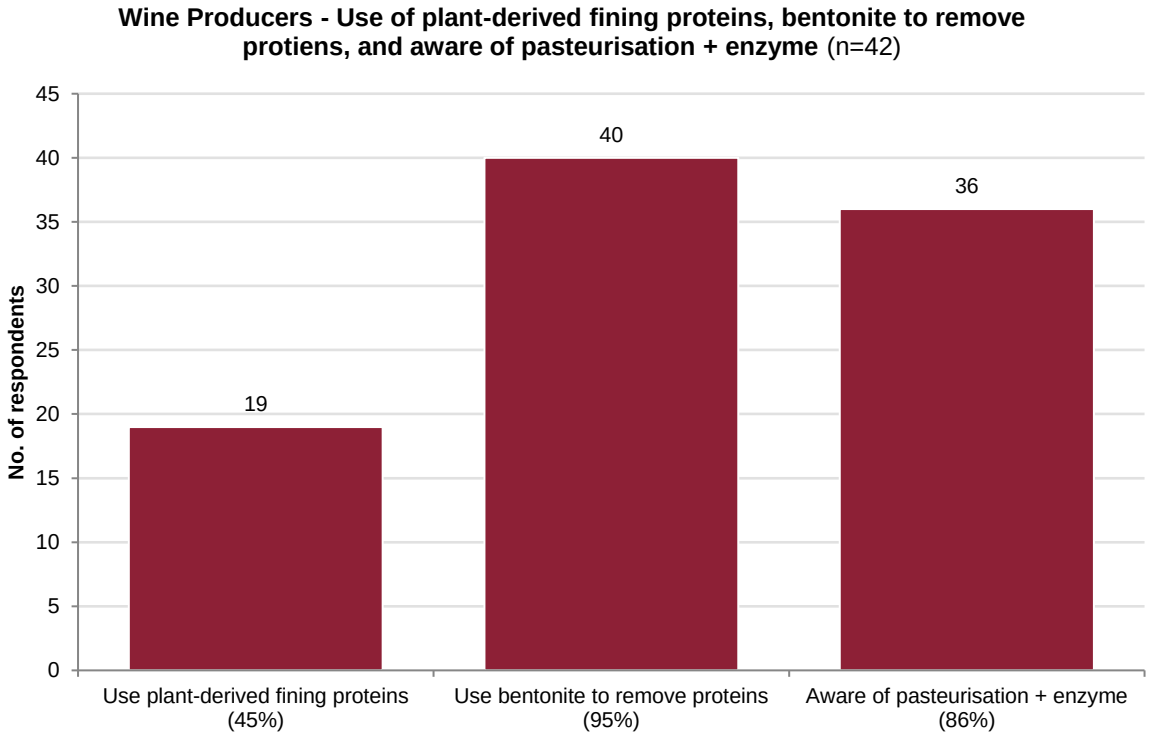


Table 25: Percentage by year

	2019 (n=42)	2018 (n=39)	Change
Use plant-derived fining proteins	45%	38%	+7%
Use bentonite to remove proteins	95%	79%	**+16%**
Awareness of pasteurisation + enzyme as a method for heat/protein stabilising	86%	87%	-1%

Table 26: Use of plant-derived fining proteins - Percentage by year

	2019 (n=19)	2018 (n=15)	Change
White wine	84%	67%	**+17%**
White juice	79%	73%	+6%
Red wine	58%	47%	**+11%**

COMMENTS

Bentonite benefits:

- [15] **General benefits** *(e.g. it works; more gentle; wine isn't cloudy; aid settling; protein stabilisation; compactness of less; cheap; very cost effective; helps with flavour)*
- [6] **Combination of Calcium/Sodium bentonites** *(e.g. reliability; maximise settling; reduce the rate of addition)*
- [5] **Sodium based bentonite** *(e.g. doesn't strip the flavour as aggressively as other bentonites)*
- [3] **Calcium based bentonite** *(e.g. good for settling and effective; easy to prepare)*
- [1] **Potassium sodium based bentonite** *(e.g. benefit is protein stability)*

Bentonite issues:

- [9] **Issues - all types** *(e.g. disposal of the bentonite residue; settling time and variability; can't put it through cross-flow; volume loss; reduction in flavour; recovering the lees)*

d. Comments about clarification and/or filtration practices

COMMENTS

General comments:

- [9] **General comments on processes used** *(e.g. cold settle; rack and cross flow filter; one pass through and earth filter; cross-filters; enzymes used to make bentonite more efficient)*
- [4] **Interested in future use** *(e.g. would consider it; willing to try)*

Reasons for not using:

- [8] **Not relevant/required** *(e.g. we are organic; too small; size of our winery doesn't warrant heat processing; don't have the equipment; aware of that but it's not really that relevant to us)*
- [7] **Reduced wine quality** *(e.g. don't want to ruin our wines; quality downside; wine looks bad; ruins the aromatics)*
- [3] **Unconvinced of research/benefits** *(e.g. looked at the research that has been done on it and I am not convinced by that)*
- [2] **Cost** *(e.g. everything is about cost; not part of our capital footprint)*

2.4.2 Cold stabilisation

Chilling with tartrate seeding (43%) was the most common cold stabilisation method used by wine producers.

- *Chilling* was the next most common method (29%), followed by *Combination/Other* (14%), and *CMC* (12%).
- All Wine Producers were aware of the energy costs associated (100%).
- Around half used additives to prevent tartrate precipitation (45%) and had taken steps to manage risk around calcium tartrate instability (48%).
- Monitoring and testing were most common steps taken to manage risk around calcium tartrate instability (10 mentions).
- General comments on cold stabilisation practices highlighted the benefit of reliability and quality (5 mentions), although many noted its inefficiency and high power consumption (7 mentions).

Figure 18:

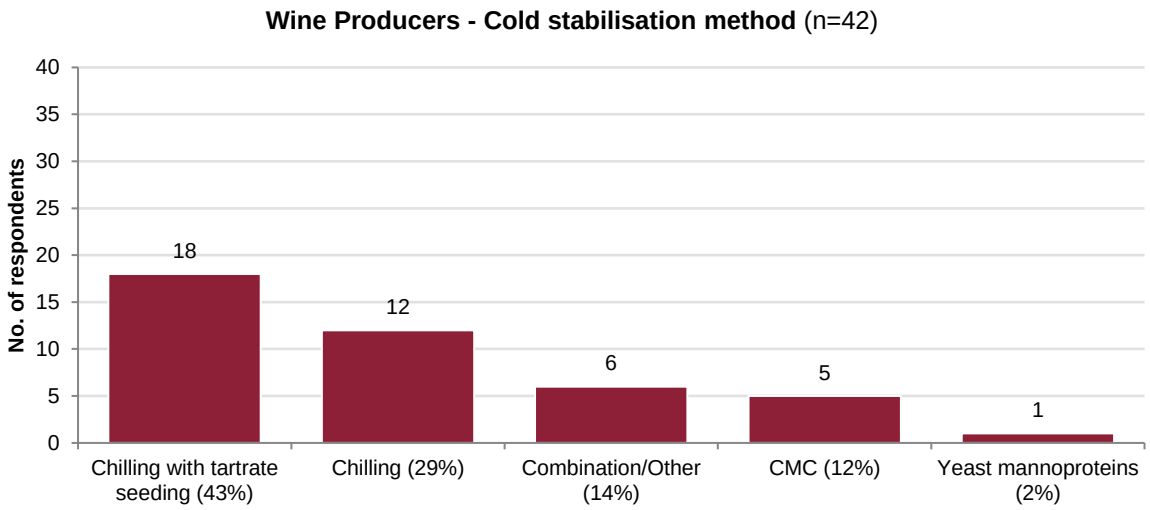


Figure 19:

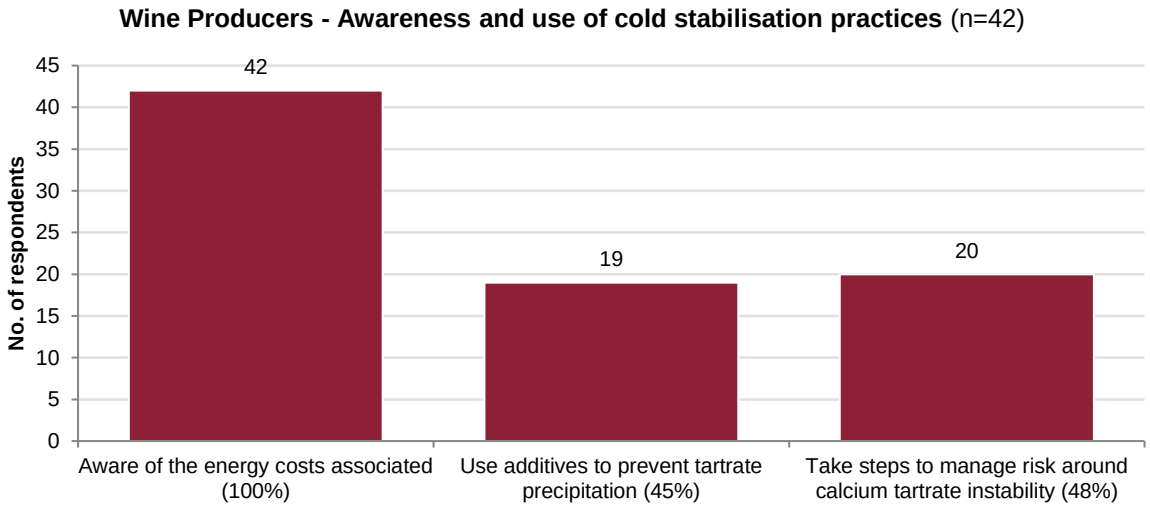


Table 27: Percentage by year

	2019 (n=42)	2018 (n=39)	Change
Chilling with tartrate seeding	43%	51%	-8%
Chilling	29%	33%	-4%
Combination/Other	14%	8%	+6%
CMC	12%	5%	+7%
Yeast mannoproteins	2%	-	-

Table 28: Percentage by year

	2019 (n=19)	2018 (n=15)	Change
Aware of the energy costs associated	100%	97%	+3%
Use additives to prevent tartrate precipitation	45%	28%	**+17%**
Take steps to manage risk around calcium tartrate instability	48%	44%	+4%

COMMENTS

Steps to manage risk around calcium tartrate instability:

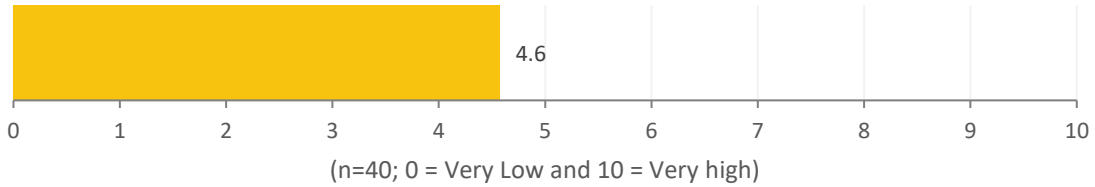
- [12] **General comments on specific practices to reduce instability (***e.g. chilling; follow guidelines; rack the wine; seed with cream of tartar)*
- [10] **Monitoring/measuring/analysis** *(e.g. 3rd party testing; in-house testing; lots of checks; AWRI cold stability test; monitoring levels; juice analysis for calcium content)*
- [6] **Don't take steps/not applicable** *(e.g. no because I haven't had an issue)*

Comments about cold stabilisation practices:

- [6] **General comments on practices used** *(e.g. chilling and seeding)*
- **Reasons for using:**
    - [5] **Reliability/quality** *(e.g. reliable; longer shelf life; quality reasons; don't take risks)*
    - [2] **Standard practice**
    - [2] **Market requirement** *(e.g. compliant with a lot of the big UK supermarkets who require specific testing; only do it for an aesthetic for a customer)*
- **Issues:**
    - [7] **Inefficient/high energy consumption** *(e.g. major area of energy consumption within the wine industry)*
    - [1] **Taste impact**
- [3] **Benefits of CMC** *(e.g. CMC is something that we're investigating because of the cost and time benefits)*
- [2] **Alternatives in development** *(e.g. looking at alternative methods - KPA which is a new technology; constantly being approached with new exciting processes and additives)*

2.4.3 Awareness of wine efficiency research

Wine Producers were moderately aware of research being undertaken on wine efficiency (4.6 avg.).



- Commenting on wine efficiency practices, many Producers were aware of the research, with some having already or planning to implement efficiency practices (7 mentions) and others noting the importance of efficiency to the industry (5 mentions).
- Those Wine Producers with low to now awareness commented they were *not aware at all* of efficiency practices – one respondent felt it should be *publicised more.*
- Compared to 2018, respondents remained only moderately aware of wine efficiency research with overall average awareness slightly decreasing (-0.4 avg.).

Table 29: Average by year

	2019	2018	Change
Overall	4.6	5.0	-0.4

COMMENTS

Moderate to high awareness (4-10 rating):

- [7] **Efficiency practices implemented/planned** *(e.g. load scheduling; heat recovery; solar energy; carbon neutral; we try to adapt our practices to less energy; trying to adapt where possible)*
- [5] **Importance of efficiency** *(e.g. logistics and efficiencies are critical; every business is trying to improve efficiency; only going to become more of an issue; all trying to be efficient all the time)*
- [3] **General comments on awareness** *(e.g. heard of it; Could always be aware of more; get most of it from Grape Grower & Winemaker)*
- [2] **More applicable to larger wineries** *(e.g. a lot of the wine efficiency practices might pertain more towards the bigger wineries)*
- [2] **Issues** *(e.g. no evidence that [CMC] lasts longer than 18 months; focus has decreased in recent years)*

No to low awareness (0-3 rating):

- [13] **General comments on low awareness** *(e.g. not very aware; not aware at all; need to be publicised more)*

2.4.4 Fermentation monitoring

a. Tools and practices used

The three most common tools and practices used to monitor fermentation were *malolactic fermentation monitoring* (67%), *plotting of ferment sugar/density measurements* (62%), and *measuring pre-harvest YAN* (45%).

- Comments on monitoring formation described specific practices used (10 mentions), daily monitoring (6 mentions), and satisfaction with current practices used (5 mentions).
- Compared to 2018 there was a large increase in the percentage of respondents using *malolactic fermentation monitoring* (+54%) – noticeable increases were also seen in the use of *measuring pre-harvest YAN* (+22%) and *monitoring fermentation progress by sensors* (+14%).

Figure 20:

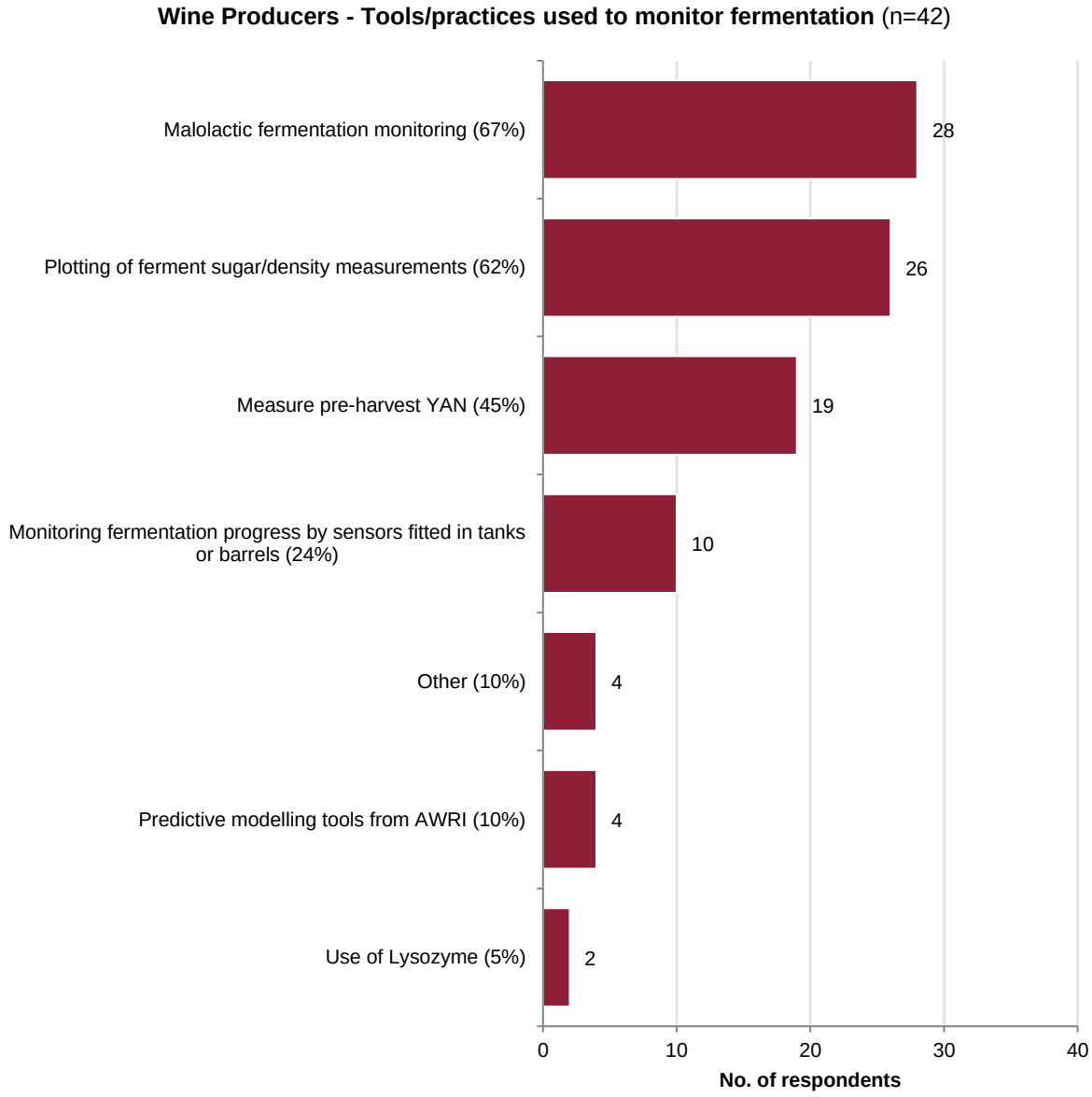


Table 30: Percentage by year

	2019 (n=42)	2018 (n=39)	Change
Malolactic fermentation monitoring	67%	13%	**+54%**
Plotting of ferment sugar/density measurements	62%	69%	-7%
Measure pre-harvest YAN	45%	23%	**+22%**
Monitoring fermentation progress by sensors fitted in tanks or barrels	24%	10%	**+14%**
Other	10%	10%	0%
Predictive modelling tools from AWRI	10%	5%	+5%
Use of Lysozyme	5%	0%	+5%

COMMENTS

[10] **Details of specific practices used** *(e.g. field fruit analysis; independent lab testing pre-bottling; taste; hydrometry; enzymatic analysis; measure YAN; enzyme malolactic test; predictive measurements)*

[6] **Daily monitoring** *(e.g. density meter once daily; tank fermentation twice a day; monitor daily; measuring sugar each day)*

[5] **Happy with practices used** *(e.g. pretty simply - happy where I am at; simple and effective; use the most efficient; keep it simple)*

b. Average percentages

Percentage of Wine Producers providing data and the average percent of occurrence:

- 81% of Wine Producers indicated on average 35% of their ferments were wild;
- 100% of Wine Producers indicated on average 65% of their wine went through malolactic fermentation (MLF);
- 60% of Wine Producers indicated on average 54% of MLFs were wild;
- 52% of Wine Producers indicated on average 68% of MLF inoculations were co-inoculated; and
- 64% of Wine Producers indicated on average 14% of MLFs had been sluggish or stuck over the last five years.
- Compared to 2018, there was noticeable increase in the percentage of Wine Producers indicating *ferments were wild* (+16%) and *wine goes through MLF* (+18%) – there was a 13% decrease in those indicating *MLFs were sluggish or stuck*.

Table 31: Percentage of respondents by year

	2019 (n=42)	2018 (n=39)	Change
% of ferments that were wild (vs. inoculated)	88%	72%	**+16%**
% of wine that goes through MLF	100%	82%	**+18%**
% of MLFs that were wild (vs. inoculated)	60%	51%	+9%
% of MLF inoculations that were co-inoculated (vs. 'sequential' which is inoculated after alcoholic fermentation)	52%	54%	-2%
% of MLFs were sluggish or stuck (over the last 5 years)	64%	77%	**-13%**

Table 32: Average percentage of occurrence by year

	2019	2018	Change
% of ferments that were wild (vs. inoculated) *[n: 2019=37, 2018=28]*	35%	41%	-6%
% of wine that goes through MLF *[n: 2019=42, 2018=32]*	65%	73%	-8%
% of MLFs that were wild (vs. inoculated) *[n: 2019=25, 2018=20]*	54%	77%	**-23%**
% of MLF inoculations that were co-inoculated (vs. 'sequential' which is inoculated after alcoholic fermentation) *[n: 2019=22, 2018=21]*	68%	72%	-4%
% of MLFs were sluggish or stuck (over the last 5 years) *[n: 2019=27, 2018=30]*	14%	13%	+1%

Note: The average percentage figure excluded responses indicating 0% (i.e. of those respondents indicating this occurred, this is the average percentage of ferments or times it occurred) Figure is overall and includes both red and white wines.

2.4.5 Faults and taints

The majority of Wine Producer respondents indicated *copper additions were used on site* (74%) and *oxygen was used during fermentation to manage stinky sulfur compounds, flavour and colour* (69%).

- Of the 31 Wine Producers using copper additions, the majority based the dose on fining trial (81%) and made copper additions during or soon after ferment (68%).
- Only a small percentage did tannin or colour measurement (12%)
- Compared to 2018, Wine Producers were managing faults and taints using similar methods with only slight changes in the percentage of respondents undertaking specific practices.

Figure 21:

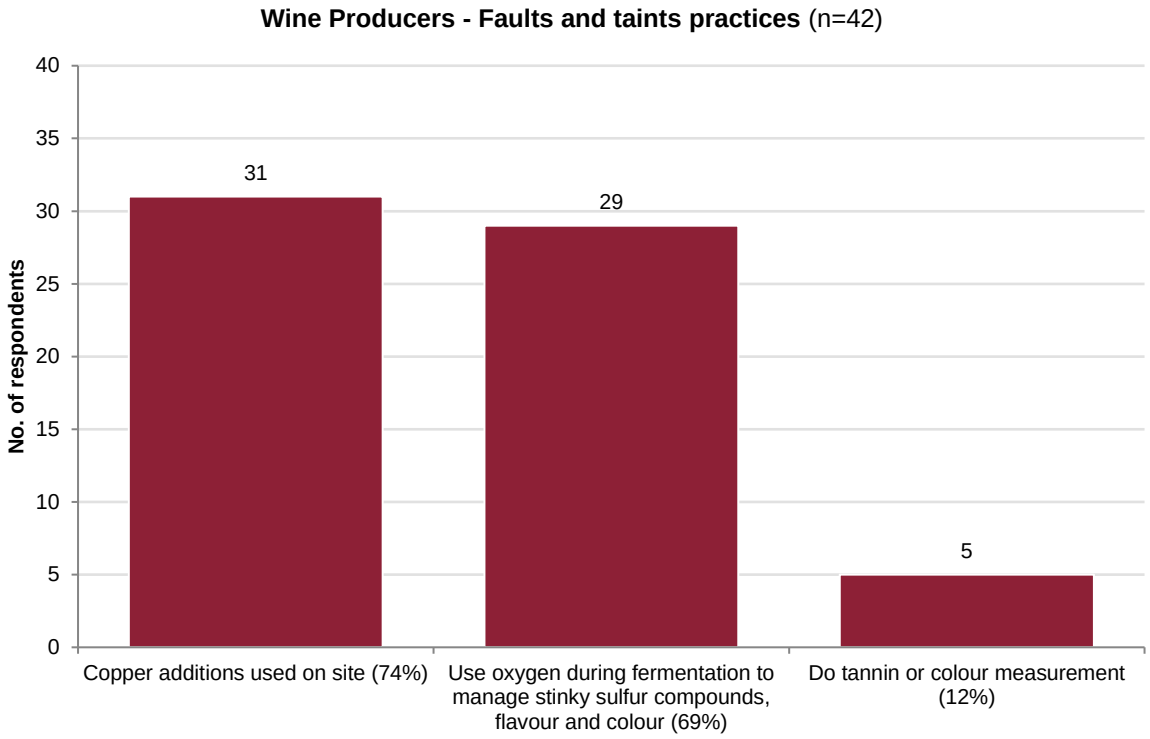


Table 33: Percentage by year

	2019 (n=42)	2018 (n=39)	Change
Copper additions used on site	74%	79%	-5%
Use oxygen during fermentation to manage stinky sulfur compounds, flavour and colour	69%	64%	+5%
Do tannin or colour measurement	12%	15%	-3%

Table 34: Copper dosage type - Percentage by year

	2019 (n=31)	2018 (n=31)	Change
Dose based on fining trial	81%	74%	+7%
Standard preventative add - only if reductive characters are evident	13%	16%	-3%
Standard dose - only if reductive characters are evident	6%	6%	0%

Table 35: Stage copper additions made for red and white wines- Percentage by year

	2019 (n=31)	2018 (n=31)	Change
During/soon after ferment	68%	77%	-9%
>1 week before packaging	23%	23%	0%
< 1 week before packaging	10%	0%	**+10%**

COMMENTS

Tannin or colour measurement – Why/why not:

- [4] **Compare colour to previous vintages** *(e.g. blend consistency; check colour compared to the previous blend; compare those with previous mixtures)*
- [1] **Check potential dilution** *(e.g. colour measurement on rose to check potential dilution at bottling)*
- [10] **Unnecessary/don't do it** *(e.g. don't feel it is needed; only make white wine; look at it for colour - don't measure as such)*

General comments about faults and taints practices:

- [15] **Use of oxygen/air** *(e.g. use oxygen to aid fermentation; inject oxygen; aeration by splashing; pump overs; roll the ferment)*
- [3] **Use AWRI tools/information** *(e.g. equipment that comes into contact with vines is checked following the AWRI protocol; used the AWRI taint kits a couple of times to educate my staff and myself which worked really good)*
- [2] **Monitoring/testing** *(e.g. 3rd part testing; most things can be avoided by regular fermentation monitoring)*
- [2] **Problem of Brettanomyces** *(e.g. remains a big problem within the Australian wine industry)*
- [3] **Other methods used** *(e.g. nutrients during fermentation; reduced temperature; racking; splashing to control solidifies; regularly tasting)*
- [4] **Other comments** *(e.g. better tools to recognise smoke taint; salinity worries me; avoid them in the first place; thinking of doing that in our upcoming vintage)*

2.4.6 Wine making practice changes

a. Types of changes in the last 2-3 years

The most common practice changes made by Wine Producers over the last three years related to *fermentation practices* – including yeast changes (e.g. wild fermentation) and changes to managing faults and taints (e.g. oxygen during fermentation).

COMMENTS

- **Changes to fermentation practices:**
    - [9] Yeasts *(e.g. wild fermentation)*
    - [8] Faults and taints *(e.g. air during ferment; more oxygen; less copper; addition of copper; better hygiene practices)*
    - [6] Co-inoculation/MLF *(e.g. seeding bacteria)*
    - [2] Other *(e.g. fermentation monitoring; fuller ferments)*
- [11] **Clarification and filtration changes** *(e.g. flotation; cross flow filtration)*
- [4] **Cold stabilisation** *(e.g. CMC)*
- [4] **Other changes** *(e.g. vibrating hopper; mannostab; lighter toasting oak)*
- [2] **General comments on changes** *(e.g. always tweaking; constant evolution)*
- [8] **No practices introduced/changed in last 2-3 years** *(e.g. haven't done anything major; none actually; doing all that for the last 5 years)*

b. Most challenging wine making practices

The most challenging wine making practices identified by Wine Producers were varied with the most common relating to *fermentation* (7 mentions), *producing specific wine varieties* (5 mentions), *clarification and filtration* (4 mentions), and *seasonal variations* (4 mentions).

COMMENTS

- [7] **Fermentation** *(e.g. malolactic fermentation; wild ferments; maintaining a healthy ferment)*
- [5] **Making specific wine varieties** *(e.g. sweet styled; chardonnay in barrels; fermented chardonnay to dryness; pinot - fickle variety; blending)*
- [4] **Clarification and filtration** *(e.g. cleaning up/reducing the solids; achieving full MLS and white juice lees recovery)*
- [4] **Seasonal variations** *(e.g. vintage because every year is different; make good reds from difficulty years/seasonal variations)*
- [3] **Harvest timing** *(e.g. getting the exact time for picking to get the right flavour for our wine)*

- [3] **Faults and taints** *(e.g. hygiene; sulphate used in white wine; avoiding Brettanomyces)*
- [2] **Stabilisation** *(e.g. heat and cold stabilisation)*
- [2] **Maintaining traditional techniques** *(e.g. applying Technics we saw by trends whilst holding onto tradition; challenging one is sparkling in the traditional method)*
- [2] **Labour/staffing (***e.g. hard to get good workers and that can be so frustrating)*
- [8] **Other** *(e.g. following guidelines; analysing so many things; managing high alcohols; bottling; ullage; lifting barrels; equipment and logistics)*

c. Areas were more help is needed

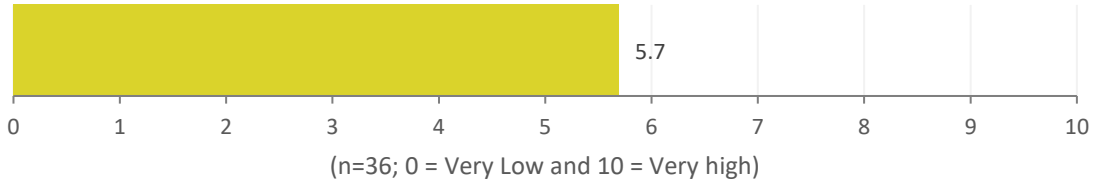
Business management and productivity **(8 mentions) and** ***fermentation*** **(6 mentions) were the two most common areas Wine Producers felt they need more help to manage.**

COMMENTS

- [8] **Business management/productivity/efficiency** *(e.g. costs; money; resources; time; paperwork)*
- [6] **Fermentation** *(e.g. management; nutrition; monitoring; Malolactic MLF)*
- [3] **Labour/staffing** *(e.g. more staff; someone to manage)*
- [3] **Fruit supply** *(e.g. seasonal dependence; consistency)*
- [2] **Sales/tourism**
- [2] **Vine health**
- [2] **New technologies/software** *(e.g. computer applications; scheduling app)*
- [6] **Other** *(e.g. sustainability; oak selection; lifting barrels; understanding new product categories; bentonite lees disposal; weathers effects on vintage)*
- [2] **General assistance** *(e.g. effects of different actions in the process of wine making; continued technical response to issues that arise)*

2.4.7 Influence of Wine Australia on changes

Wine Australia information, tools and extension activities were overall rated as moderately influential in helping Wine Producers successfully make changes (5.7 avg.).



- Respondents who had been influenced by Wine Australia provided positive comments with many praising the quality, usefulness and relevance of information available from Wine Australia.
- Some of those who were less influenced suggested that information had come from other sources.
- Compared to 2018, there was a slight increase in the average rating of Wine Australia's influence (+0.8).

Table 36: Average by year

	2019	2018	Change
Overall	5.7	4.9	+0.8

COMMENTS

High to very high influence (7-10 rating):

- [14] **Positive comments** *(e.g. new ideas; really good information; helpful in implementing changes; very targeted and focused; research highly relevant; great assistance; recommend them highly; without Wine Australia/AWRI would not have access to that information; gave me more knowledge; essential part of the toolkit;)*

Moderate influence (4-6 rating):

- [4] **Positive comments** *(e.g. fairly useful; helped some; somewhat helpful; helps with the intuitive decisions you might be making)*

No to low influence (0-3 rating):

- [5] **General comments on limited influence** *(e.g. not very; hadn't helped with any changes; it wasn't)*
- [4] **Influenced by other sources** *(e.g. driven by information from suppliers; through my own findings, mentors and groups; more information that was disseminated and then you speak to other fellow colleagues)*

2.5 Final Questions

2.5.1 Other sources of advice/information

***Input suppliers* (72% – e.g. rootstock, fertiliser, or chemical suppliers) were the most common other source of advice and information used by respondents to support their business needs. Also commonly used were *private advisers/consultants* (55%), *state government advisers* (34%) and *wine companies* (31%).**

- Grape Growers were more likely to use input suppliers (+16%), state government advisers (+16%), and wine companies (+23%).
- The main 'Other' source of advice/information was peers and colleagues within the industry (12 mentions – e.g. other wine makers and growers). Other sources mentioned included; AWRI, local industry association, ASVO, universities, accountants, retailers, agronomists, magazines and journals.
- Compared to 2018, the popularity of other sources of advice/information remained similar – there was though a 13% decrease in those using wine companies.

Figure 22:

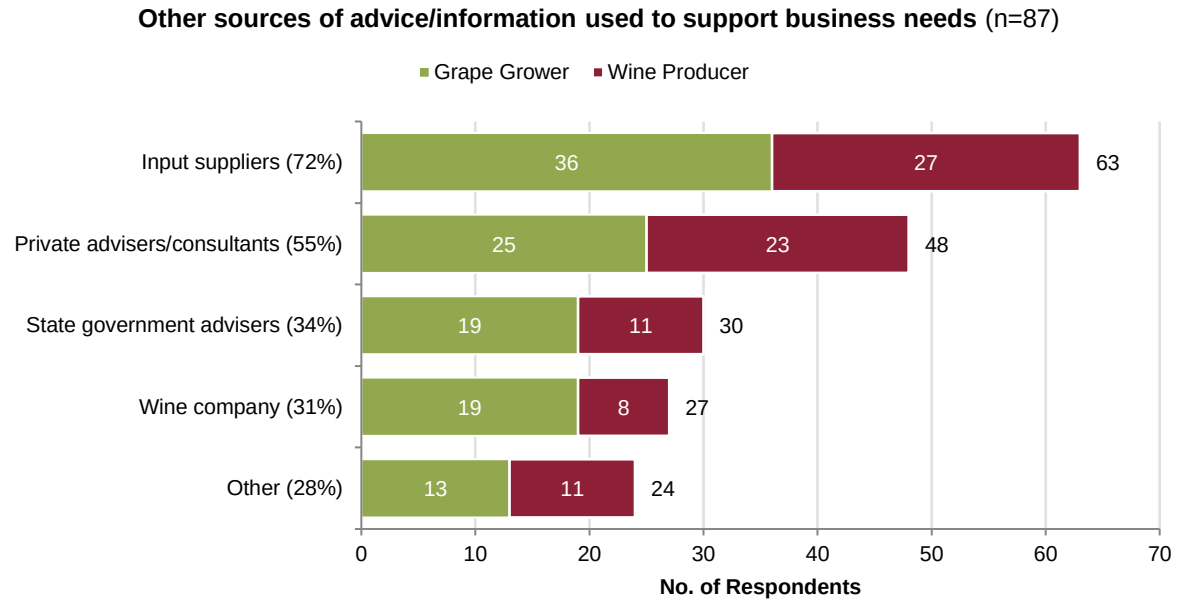


Table 37: Percentage by year

	2019 (n=87)	2018 (n=71)	Change
Input suppliers	72%	73%	-1%
Private advisers/consultants	55%	51%	+4%
State government advisers	34%	41%	-7%
Wine company	31%	44%	**-13%**
Other	28%	27%	+1%

2.4.6 Other/final comments

Given the opportunity to provide any other comments about practices and/or research or information needs, many respondents provided general positive praising the value of Wine Australia (8 mentions – e.g. *very good source of information for the industry*).

- Some respondents highlighted areas where more information/assistance would be helpful (e.g. organics and business management), while others provided suggestions on how Wine Australia could improve (e.g. more workshops in more regions).
- The value and importance of peer to peer learning and networking with others was noted (6 mentions), as was the importance of Wine Australia continuing to provide timely and easy access to the latest relevant information, research, and practices (6 mentions).

COMMENTS

Positive comments:

- [8] **Praise for Wine Australia** *(e.g. Really happy with the direction of Wine Australia; very happy with the current availability through Wine Australia; activities have been very beneficial and we're very lucky to have them; very good source of information for the industry; great that Wine Australia are proactive about sending out emails and information on what's happening; very supportive of what Wine Australia is doing; they are great support - always at hand if you need them)*

Type of information/assistance/research needed:

- [2] **Any information/research that improves wine making** *(e.g. essentially anything that helps me make better wine)*
- [2] **Organics** (e.g. more research into organic principles to make change)
- [2] **Regionally/winery specific research/information** *(e.g. need to look at each region in its own right because each region is focusing quite differently to the other)*
- [2] **Economics/business management** *(e.g. how to make more money)*
- [5] **Other** *(e.g. biosecurity; cool climate research; clone selection; rootstocks; sustainability)*

Suggestions:

- [2] **More workshops/roadshows in more regions** *(e.g. hope in the future there would be activities in our region, we seem to miss out when it comes to that)*
- [2] **Ensure a commercialisation pathway for R&D** *(e.g. understanding the R&D in short term as well as long term and making sure there is a commercialisation pathway for R&D)*
- [2] **Understand/communicate impact/benefits of practice change better** *(e.g. greater case study distribution on how people are putting research into practice or new techniques into practice with real numbers)*
- [7] **Other** *(e.g. information relevant to larger wineries; improve international marketing; better engagement on research priorities; Australian website for research papers; acknowledging cost effectiveness of warm region growing; better regulation around organics; increased focus on viticulture)*

Issues/Concerns:

- [6] **Issues/concerns** *(e.g. Wine Australia bias towards big companies; loss of research capacity in the industry; lack of local extension in some regions; difficulty maintaining profitability; issues dealing with wineries; Bentonite lees disposal)*

General comments:

- [6] **Value/importance of peer to peer learning/networking with others** *(e.g. much more inclined to listen to colleagues and neighbours; sharing experiences and knowledge with other people in the industry; interact with other vineyard managers and that seems to be where a massive exchange of information is actually practical information)*
- [6] **Importance of continuing to provide timely/easy access to the latest relevant information/research/practices** *(e.g. making sure that all the tools are updated and any new information is put on the website; ensure it remains relevant to the Industry; encourage the webinar and use of newer knowledge to get information across; remaining updated with what's going on)*
- [6] **General comments on information sources/awareness/decision making** *(e.g. we never stop questioning what we do; actually making myself aware of what's out there; got my mind open to new practices)*
- [2] **General comments on industry involvement** *(e.g. collaborate with all of these because I work in the industry as well as having a vineyard)*
- [3] **Other comments** *(e.g. importance of suppliers; importance on focusing on increasing sales; importance of extension in the industry)*