Sustainability assessment in wine grape growing

Submitted by

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July 2014

Contents

Abstract

This thesis presents outcomes from a mixed methods research project in agricultural sciences. An atypical methodology for sciences was developed to avoid embedded assumptions commonly seen in sustainability investigations. Eighty-three upper echelon participants from the wine grape industry participated in 14 group discussions in five countries: Australia, Chile, New Zealand, South Africa and the United States. Quantitative measures were compared to results from qualitatively coded participant utterances using content analysis software tools. Results are presented from these group discussions, divided in three stages. Each stage had its own objective and method: (1) aimed to define sustainability through an Assisted Focus Group Method of Enquiry (AFGME), (2) produce a list of indicators for sustainability assessment through an Adapted Nominal Group Technique (ANGT) and (3) aimed to discuss the engagement process of viticultural sustainability programs through a traditional focus group approach, document and compare the most prominent sustainability assessment programs for individual organisations in viticulture worldwide.

It was found that a consensual sustainability definition prior to the establishment of assessment systems is essential. The model developed in this investigation seems to be viable for similar sustainability investigations of individual organisations. An overall sustainability definition is proposed as the continuous pursuit of equilibrium between economic, social and environmental variables and their trade-offs over time. Indicators have been used in many sustainability assessment methods, often to validate the scope of the evaluation. Disagreements over a common definition and scope for the sustainability concept have led to many distinct methods, which are not often directly comparable. Indicators should be seen as the starting point of sustainability assessments. This investigation develops indicators, within three categories: economic, environmental and social; ranked by the attributed importance given by participants. In the context of this investigation, indicators are presented as qualitative variables that in context will be quantified to fit the purpose and viewpoint of the proponents of the given assessment. To have assessments in place it is necessary to define, at the minimum: (1) the meaning of sustainability, (2) viewpoint of the assessor, (3) purpose of the assessment, (4) context, and (5) time frame.

The methodology developed is directly applicable to other agricultural assessments, contributing to decision-making processes in systems assessing sustainability of agricultural organisations, especially vineyards. The findings of this research contributed to the development of the McLaren Vale Sustainable Winegrowing Australia program. Although most research on sustainability seems to have a stronger focus on environment, environmental issues were neither the main

drivers to the conception of programs nor perceived as the most important concern of vineyards self- assessing their sustainability priorities. The environmental appeal is incontestably important and all programs have embraced it as part of their assessments. Nevertheless, successful programs have been created to increase growers' sustainability, mainly through the direct and indirect education they promote and the overall economic benefit to their business caused by overall operations improvement. The proper study of viticulture is ultimately the study of sustainability in viticulture, as research should be driven to keep the wine industry alive, over time.

Statement of originality

I certify that this work contains no material which has been accepted for the award of any other degree or diploma in my name, in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. In addition, I certify that no part of this work will, in the future, be used in a submission in my name, for any other degree or diploma in any university or other tertiary institution without the prior approval of the University of Adelaide and where applicable, any partner institution responsible for the joint-award of this degree.

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Irina Santiago-Brown Date

Acknowledgements

A thesis is always a result of many contributions and personal support of many people. I could not have done it without these people.

I would like to start thanking my beloved husband Dudley Brown who lived my PhD with me for the last three years of our lives. We lived the joy of discovering new people, places and knowledge. Dudley accepted the challenge of moderating my focus groups, which made the design of my research feasible within my research budget. He was also there for the hard moments, especially when you challenge the notional existence of any sort of social life. I love you.

Cassandra Collins, my supervisor, turned into one of my dearest friends in Australia. Cas believed in my potential and literally insisted that I should not only apply for the PhD but for the scholarships. Cas accepted the journey of guiding me, who was proposing a totally interdisciplinary research project that would need atypical solutions and partnerships. I've questioned many times if I would be able to reach such challenging objectives. She was always there saying I would, with no doubt. I would never start or continue this journey if I did not have her in my life. Cas has the amazing ability to give me limits as well as the generosity to share to make the project feasible.

This research had many turns and I was lucky enough to meet my two other supervisors, Andrew Metcalfe and Cate Jerram, who made it possible to develop the research as presented in this thesis. Andrew has a brilliant, curious and organised mind and expresses himself in an extremely gentle and simple way. I feel honoured he accepted to be part of my research team. Cate taught me how to collect and organise data in an appropriate way that saved me time and made data analysis possible. Cate is a natural connector of ideas and people who sees solutions when it seems that there is none available.

To my group of supervisors, many thanks. I could never imagine I would be able to have such interdisciplinary and complementary group working together in such a smooth way as you did. What a great and happy team!

I would like to express my gratitude to all focus group participants of the sustainability project for their generous acceptance to my invitation and time to be part of my research. We would also like to thank the organisations that hosted the focus group sessions and people involved in the grape growing industry that helped with introductions or interviews in Australia, Chile, New Zealand, South Africa and United States.

I also gratefully acknowledge support and discussions with Gerardo Leal, who played the role moderator in Chile, Joanna Kenny for making all the transcriptions of the focus groups, Ilona Box for great discussions and help with the Nvivo coding, Jane Swicegood for editing early versions of my manuscripts and Brent Kaiser for being the best referee ever.

Also, I would like to thank all McLaren Vale growers who accept the challenge of developing and participating in the McLaren Vale Sustainable Winegrowing Australia program.

The completion of this research would not be possible without the valuable support of Richard Warner, Michel Picard, Lea McBride and Robyn Groves from the Research Education and Development (RED) team, Sally Sibson helping me finding all bureaucratic answers and people when I needed and Lucy Zuzolo for introducing me to the EndNote world.

My special thanks to the librarians at the University of Adelaide, especially the team from the Waite Campus.

I would like to thank my family and friends for understanding my absence in the last years and valuable emotional support.

Last but not the least I would like to thank Kate Harvey and the Grape and Wine Research and Development Corporation (GWRDC) for choosing to fund my research. The funding made it possible to develop this research in five countries. Also, my gratitude to the University of Adelaide, for the scholarship that made all of this possible.

Thesis conventions

The following conventions has been adopted in this Thesis:

Notation. The acronyms and abbreviations used in this thesis are defined in the List of Acronyms and Abbreviations on page xiv.

Spelling. Australia English spelling conventions have been used, as defined in the Microsoft Office Dictionary. The word *programme* is written *program* due to its widespread usage in the sustainability literature, even though is not an Australian spelling. Also, the Chapter 2 presenting the article “What Does Sustainability Mean? Knowledge Gleaned from Applying Mixed Methods Research to Wine Grape Growing” was written using American English spelling, as it was the requirement of the journal in where it was accepted for publication.

Typesetting. This document was compiled using Microsoft Word 2011 for Mac. Microsoft PowerPoint for Mac 2011 and Excel for Mac 2011 were used to produce schematic diagrams, tables and other drawings.

Referencing. The APA 5th-full name style has been adopted for referencing using EndNote X7.

Publications

1. Santiago-Brown, Irina, Metcalfe, Andrew, Jerram, Cate, & Collins, Cassandra. (2014). Transnational comparison of sustainability assessment programs for viticulture and a case-study on programs' engagement processes. Sustainabiliy, 6(4), 2013-2066.

2. Santiago-Brown, Irina, Metcalfe, Andrew, Jerram, Cate, & Collins, Cassandra. (2014). Economic, environmental and social indicators to assess sustainability of individual agricultural systems: a wine grape growing case study. Manuscript submitted for publication.

3. Santiago-Brown, Irina, Jerram, Cate, Metcalfe, Andrew, & Collins, Cassandra. (2014). What Does Sustainability Mean? Knowledge Gleaned from Applying Mixed Methods Research to Wine Grape Growing. *Journal of Mixed Methods Research*

4. Santiago, Irina, Bruwer, Johan, & Collins, Cassandra. (2012). Sustainability in Viticulture: assessment and adoption. *Wine & Viticulture Journal, January/February*, 48-50. (in appendix)

5. Santiago, Irina (Ed). (2012). *McLaren Vale Sustainable Winegrowing Australia Workbook*. McLaren Vale: McLaren Vale Grape Wine and Tourism Association. (in appendix)

6. Dimasi, Giulio, & Santiago, Irina. (2012). Waste Management Chapter. In Irina Santiago (Ed.), *McLaren Vale Sustainable Winegrowing Australia Workbook. McLaren Vale* (pp. 80-94). McLaren Vale: McLaren Vale Grape Wine and Tourism Association. (in appendix)

7. Santiago, Irina. (2012). Social Chapter (community &wineries relations sections). In Irina Santiago (Ed.), *McLaren Vale Sustainable Winegrowing Australia Workbook* (pp. 106-113). McLaren Vale: McLaren Vale Grape Wine and Tourism Association. (in appendix)

8. Santiago, Irina, Bruwer, Johan. & Collins, Cassandra., 2013. Context and content in grapegrowing sustainability systems: a process. *Wine & Viticulture Journal*, 54-55. (in appendix)

9. Santiago, Irina. (2012) *McLaren Vale Sustainable Winegrowing Australia. 2012 Results*. Retrieved 7/2/2014, from http://www.mclarenvale.info/sites/default/files/projects/mvswga_2012_-_worbook_report_results.pdf (in appendix)

10. Santiago, Irina. (2012) *McLaren Vale Sustainable Winegrowing Australia. 2012 Results*. Retrieved 7/2/2014, from http://www.mclarenvale.info/sites/default/files/projects/sustainability_report_2013_0.pdf (in appendix)

Presentations

Santiago, Irina (2013). McLaren Vale Sustainable Winegrowing Australia. Sustainable Development Applied to Viticulture: Strategy, Implementation and Evaluation of Approaches, organised by the French Vine and Wine Institute (IFV) In partnership with the Champagne Wine Inter-professional Committee and ADEPTA in Epernay, France. (in appendix)

Santiago, Irina. (2012). Sustainability assessments in agriculture through programs. *FACETS 2012: conversations worth having.* Retrieved 7/2/14, from http://www.youtube.com/watch?v=YM1u3wZWy2U

Santiago, Irina; Dreelan Cary (2013) The McLaren Vale Sustainable Winegrowing on-line system. Presented in McLaren Vale for members of the program.

Note: During the PhD, presentations on the McLaren Vale Sustainable Winegrowing were made in a series of occasions, slightly varying in content, according to the audience (e.g. journalists, Masters of Wine, local events and many growers events). These presentations are not in the appendices as they are very similar in content to the ones already attached.

Acronyms and Abbreviations

AEM	Agricultural Environmental Management
AFGME	Assisted Focus Group Method of Enquiry
AII	Adjusted Importance Index
ANGT	Adapted nominal group technique
ARC	Agricultural Research Council
AWRI	Australian Wine Research Institute
BWI	Biodiversity and Wine Initiative
CCVT	Central Coast Vineyard Team
CEO	Chief Executive Officer
CFK	Cape Floral Kingdom
CSWA	California Sustainable Winegrowing Alliance
FIVS	International Federation of Wine and Spirits
GPS	Global Positioning System
II	Importance Index
IOBC	International Organization for Biological and Integrated Control
IPM	integrated pest management
IPW	Integrated Production of Wine
KPI	Key performance indicator
LISA	Low input sustainable agriculture)
LISW	Long Island Sustainable Winegrowing
LIVE	Low Input Viticulture and Enology
LWC	Lodi Winegrape Commission
MVSWGA	McLaren Vale Sustainable Winegrowing Australia
NA	Non-applicable
NGT	Nominal Group Technique
NO	No opinion (lack of)
OIV	International Organisation of Vine and Wine
PDCA	Plan-Do-Control-Act
PEAS	Pesticide Environmental Assessment System
PPS	Positive Points System
SAWIS	South African Wine Industry Information & Systems
SIP	Sustainability in Practice
SWC	Sustainable Wine of Chile
SWNZ	Sustainable Winegrowing New Zealand
SWP	Sustainable Winegrowing Program
USDA	United States Department of Agriculture
WCED	World Commission on Environment and Development
WIETA	Wine and Agricultural Industry Ethical Trade Association
WO	Wine of Origin (from South Africa)
WOSA	Wines of South Africa
WPRS	West Palaearctic Regional Section (form IOBC)
WSB	Wine and Spirit Board of South Africa

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Chapter 1. Introduction

Preamble

The lack of a common understanding of the sustainability concept has contributed to the confusing message embedded in the term. To minimize the confusion attributed to the sustainability concept, sustainability must be understood over a period of time and assessed over a period of time. It is unlikely that the performance evaluation from a single year can reveal the sustainability status of an agricultural organisation due to the unpredictable forces of nature, including climate and, as any other business, market. Additionally, sustainability assessments need to be viewed at a defined spatial level (Binder, Feola, & Steinberger, 2010; Giddings, Hopwood, & O'Brien, 2002). This research assumed four overall spatial levels: worldwide wine industry sustainability, a country's wine industry sustainability, a wine region's sustainability and an individual grape growing organisation's sustainability. This research was focused on the sustainability of individual grape growing organisations' sustainability (vineyards). Sustainability might mean different and even contradictory things, if the time period and spatial extent are not clearly stated.

The concept of sustainability does not seem to be as simple as it might at first appear. Broadly understood, it is the ability of someone or something to continue and be sustained over time. However, the term comes loaded with a high degree of complexity (Bebbington, Brown, & Frame, 2007; Dantsis, Loumou, & Giourga, 2009; Espinosa, Harnden, & Walker, 2008; Wojtkowski, 2006) and ideology (Bebbington et al., 2007). To date, there is not a widely accepted definition of sustainability (Casini, Cavicchi, Corsi, & Santini, 2010). Different individuals or organizations use different sets of premises and tools to define and interpret sustainability (Söderbaum, 2011).

In this thesis, I argue that an objective definition of sustainability, prior to the establishment of sustainability assessment methods, is essential. Furthermore, I argue that assessment methods should be determined and developed from a set of variables, which includes at a minimum: viewpoint of the assessor; purpose of the assessment; financial constraints; context of the assessment; spatial extent and time period. This research was developed in the context of agricultural systems using vineyards and wine grape growers as the main research resources. The major sustainability programs for viticulture and the process to engage growers in such programs are documented and compared as well as the expected benefits and inhibiting factors from the viewpoint of top-levels managers from the wine grape industry.

I present the results of a mixed method research approach to agricultural science. I discuss and propose a definition for the term sustainability as well as sets of indicators for sustainability in the context of agriculture from, and to, wine grape growers. The research program included five distinct but complementary research aims presented in three parts from three stages of uniquely conducted group discussions (Table 1-1). Each subsequent chapter to this introduction presents the main finding from each one of these stages. Although complementary, each of these chapters was written as a stand-alone article and has either been published in, or submitted to, a peer-reviewed journal. A consequence is that the figure and table numbers correspond to the specific chapter, followed by chapters' number that they appear in. This thesis is centred on these three chapters presented in manuscript typeset, plus the presentation of a practical outcome from this project, which was the development of the McLaren Vale Sustainable Winegrowing Australia (MVSWGA) program, further presented in Chapter 4 and complemented by the thesis appendices. The concluding chapter summarizes the conclusions from each one of the core thesis chapters and discusses the overall significance of the research and contribution to knowledge, as well as future directions for this research.

Table 1-1. Group discussion stages, technique, participants and purpose

Stage	Format	Technique	Participants	Purpose
1 (Chapter 2)	Group discussion Stage I	Adapted Focus Group Method of Enquiry - AFGME	83 top-levels managers from the wine industry (CEOs, Chief Viticulturists and Chief Winemakers)	Define sustainability. Determine the importance of three categories (economic, environment and social) by attributing weights for each out of 100%. Produce a sustainability concept map that mirrors the sustainability definition.
2 (Chapter 3)	Group discussion Stage II	Adapted Nominal Group Technique - ANGT	83 top-levels managers from the wine industry (CEOs, Chief Viticulturists and Chief Winemakers)	Produce list of indicators. Rank indicators within each category. Produce an overall indicators list from all categories.
3 (Chapter 4 and Appendix I)	Individual interviews Personal observations Group discussion Stage III	Semi structured in-person or email interviews and observations	12 managers either currently or formerly in charge of their region's sustainability programs for viticulture 83 top-levels managers from the wine industry (CEOs, Chief Viticulturists and Chief Winemakers)	Document and compare the most relevant sustainability programs for viticulture worldwide. Understand the expected benefits and inhibiting factors from growers' participation in sustainability programs (engagement).

Research history and methods

The research originally proposed to evaluate the sustainability status of vineyards in Australia. The straight-forward approach would have been developed through field trials, which would be defined during the development of the research. The evaluation was likely to be conducted using sets of pre-defined sustainability indicators. But in order to do so, appropriate indicators to measure vineyards would need to be chosen in advance. It became clear that appropriate indicators would depend on the definition of sustainability employed. Furthermore, indicators would require parameters that were likely to be distinct in different contexts. Thus, vineyard sustainability comparisons were likely to fall into an unsatisfactory pattern of circular reasoning. As a result, the research was re-directed to first define sustainability and then appropriate indicators. Given the redefined scope of enquiry, the field trial stage was discharged from the project.

The investigation was then focused on analysing adoption rates of sustainability programs (acreage program represented and membership numbers). However, this path turned out to be unfeasible as well because of the difficulty of defining the spatial area of influence for each one of the programs (which in many situations expanded their spatial area of influence along with their development) as well as annual specific statistics from each one of these areas. Additionally, programs had different levels of data recording, including uptake measurement as proportion of wine produced from the grapes from program participants. The data sets, as readily available, were not directly comparable. The research was then re-designed to achieve the following aims/objectives:

Aims/Objectives

1. Propose methods to define sustainability; construct indicators to assess sustainability; and understand the engagement of farmers in sustainability programs
2. Define sustainability in agriculture in the context and viewpoint of individual wine grape growing organisations.
3. Propose sets of indicators to assess sustainability of individual wine grape growing organisations
4. Document and compare the main sustainability programs in viticulture for individual organizations
5. Develop and implement the McLaren Vale Sustainable Winegrowing Australia program.

Theoretical framework

The Triple Bottom Method approach was used as theoretical framework to conduct this research. This project assumes sustainability as a favourable outcome for agriculture systems such as vineyards. Because of that, it is necessary to overcome the 'pro-innovation bias[1]' when investigating adoption (Rogers, 2003). The way to do that is to investigate not only the pattern of adoption of sustainable practices and/or sustainability program participation but also the lack of awareness of the grower about sustainability, the role of re-inventions (adapted or new sustainability practice) and the grower's motivations for adopting sustainability (Rogers, 2003). An alternative research pathway was developed for this investigation with the aim to minimize the pro-innovation bias by investigating wine growers' awareness. This was done by defining sustainability, proposing indicators, documenting sustainability programs, understanding the engagement processes for grower participation and comparing these. Details on the method used are presented in Chapter 2. Details on the calculations used are presented in the Chapter 4 Methods Section.

Each group discussion was organised in three stages following the basic recommendation for focus group organisation. A mixed method research approach, including modified methods, was developed and is described in each of the core chapters of this thesis. A pilot study was conducted to improve and validate the method and 14 subsequent groups were organised in five countries with the contribution of local wine growers associations, universities and enthusiastic individual wine growers who donated their time to support the organisation of the

[1]According to Rogers (2003), 'the pro-innovation bias is the implication in diffusion research that an innovation should be diffused and adopted by all members of a social system'

group discussions.

Thesis chapters

Chapter 2

Sustainability is defined as "the continuous pursuit of equilibrium between economic, social and environmental variables and their trade-offs over time” which in the specific context of grape growers means that a sustainable vineyard is "one that is able to economically provide for the farmer while maintaining its ability to consistently produce and improve quality over time. This definition arose from group discussions conducted as an Adapted Focus Group Method of Enquiry (AFGME) developed for this investigation in which 83 upper echelon participants from the wine grape industry participated in 14 discussion groups in five countries: Australia, Chile, New Zealand, South Africa, and the United States. This chapter also explains the sampling method and the overall research design and the benefits of this atypical methodology for sciences. This method was developed to avoid embedded assumptions commonly seen in sustainability investigations. Chapter 2 presents the main findings of stage (1) of the group discussion.

Forty per cent of the Earth’s surface is agricultural land (FAO, 2004). By its nature, agriculture depletes the environment. Natural resources are finite and need to be preserved to assure food security to the world’s population (Commission for Sustainable Development, 1995; Knowler & Bradshaw, 2007). Agricultural development has historically focused on the need to increase food production (Kendall & Pimentel, 1994). Food demand driven by rapid population growth helped to promote the ‘Green Revolution’ between the late 1940’s and early 1970’s (Kendall

& Pimentel, 1994). The Green Revolution was based on what became known as *conventional agriculture* which relies to a very large degree on the use of hybridized plants, genetically enhanced varieties, high ex-farm inputs such as synthetic chemicals (e.g. fertilizers, pesticides and herbicides) and mechanization to achieve high levels of food production at the lowest possible cost to the public (Altieri, 1992; Ohmart, Storm, & Matthiasson, 2008; Savage, 2010; Wojtkowski, 2006).

The Green Revolution has dramatically increased food production but at the same time has had some harmful consequences to the world's natural resources. A number of major concerns about past and current practices in high-input conventional agriculture, such as loss of top soil, soil erosion, ground and surface water depletion, effects of nitrate and pesticides on the environment and global climate change have become part of what was previously viewed as a solution (Dordas, 2009; Kendall & Pimentel, 1994). This type of agriculture has been shown to be unsustainable in the medium and/or long term (Kendall & Pimentel, 1994).

One major challenge is to improve options available to growers and to make a profitable transition from high-input conventional agriculture to more sustainable systems for current and future generations (Edwards, 1987; Madden, 1989; Ohmart et al., 2008; Zucca, Smith, & Mitry, 2009). However, we are still unable to determine which practices improve sustainability in farming systems and also maintain adequate productivity (Van Bruggen, 1995). In agriculture, comprehension of the full scope of the concept of sustainability is essential to increase our understanding to reconcile agriculture productivity with natural resource preservation and to prevent the degradation of farms (Abbona, Sarandón, Marasas, & Astier, 2007).

Elkington (1996) coined the term 'Triple Bottom Line' to emphasize that sustainable development occurs when organizations show responsibility toward economic, social and environmental aspects. Elkington also pointed out the importance of partnerships based on trust amongst all stakeholders and their communities to achieve sustainable outcomes. The development of trusting partnerships seems critical for the success of sustainability initiatives (Broome & Warner, 2008).

The fragmentation of the sustainability concept can be partially explained by its complexity. Many disciplines are necessary to fully assess sustainability outcomes. When assessments are done using a single discipline approach, it often becomes insufficient to generate useful recommendations to farmers to improve their practices (Altieri & Nicholls, 2005). Partial assessment and partial definitions have led to a confusing and ambiguous message about what the concept truly means. It seems that it can be understood by any set of criteria, consequently lacking scientific rigour (Giddings et al., 2002). It is still a challenge to find a comprehensive and widely accepted way to assess sustainability that takes economic feasibility, environment conservation and social equity into account.

It is a difficult task to measure outcomes of sustainability systems because of the complexity, the subjectivity of understanding and/or the idiosyncrasies embedded in the concept. Disagreements over a commonly understood concept for sustainability and its multidimensional characteristics have produced many different proposals on how to assess sustainability (Abbona et al., 2007; Pacini, Lazzerini, & Vazzana, 2011).

Chapter 3

This chapter discusses the use of indicators to assess sustainability of systems and points out that disagreement over a common definition and scope for the sustainability concept have led to many distinct methods which are often not directly comparable. This chapter's findings originated from an Adapted Nominal Group Technique (ANGT) developed for this investigation of indicators within three categories: economic, environmental and social. These are then ranked by the attributed importance given by participants. Indicators are presented as qualitative variables with the understanding that they will be quantified to fit the purpose and viewpoint of the proponents of any given assessment derived from these indicators.

Innovations are most likely to be developed within profitable and high value crops where the costs of improvements in the process of production can be compensated by the gains resulting from these innovations (e.g. money saved from process improvement or increased quality or value of production) (Rogers, 2003). Wine-grape production is the most economically valuable fruit crop in the world (R. S. Jackson, 2008) and part of a complex value chain due to the close and overlapping interests and interactions between source (grapes) and production (wine). Moreover, wine producing regions are important for rural development, landscape preservation and tourism worldwide (Soosay, Stringer, Umberger, & Dent, 2009; Tesco, 2011).

Sustainability has been a significant driver to promote change (Hansen, 1996) and adaptation in operations of agricultural systems worldwide. Sustainable practices can be seen as innovations that are being adopted by farms. Diffusion of innovation, defined as 'the process which an innovation is communicated through certain channels over time among members of social systems' (Rogers, 2003), is typically an s-shaped curve. Innovation (in the context of this investigation, sustainability) is seen as a dynamic concept constantly challenged by new innovations. Changes to the curve are promoted by new innovations. Rogers (2003) defines new innovation as re-inventions. This is a typical situation that might be observed in sustainability investigations when certain practices in the field are improved by a scientific finding (e.g. a new herbicide).

The pattern of adoption for each of these s-shaped curves was developed by Rogers (2003). The model shows that innovations are adopted in a normal distribution. He created five categories and calculated the percentage of adopters within this distribution based on the mean and standard deviation. Rogers points out that the degree of an individual's innovativeness determines their categorization. Innovators comprise the group of individuals who are the first ones to adopt a new idea. It represents 2.5% of the individuals in a normal distribution, followed by the Early Adopters (13.5%), Early Majority (34%), Late Majority (34%) and Laggards (16%) (Rogers, 2003, p. 280). In the context of this investigation, small groups of innovative growers started the main sustainability programs for wine grape growing worldwide.

To date, companies still have not found a commonly accepted way to identify, distinguish and communicate about products grown from sustainable practices. Consumer scepticism toward companies' sustainability claims seem to be reduced when consumers are more aware and educated about the topic (Alonso, 2010). Despite these results, it seems that there is marketing potential for sustainably grown products (Alonso, 2010; Forbes, Cohen, Cullen, Wratten, & Fountain, 2009). On the other hand, a clear knowledge gap is our poor understanding of the implications of studies relating willingness to buy and the actual purchase behaviour of the consumers (Forbes et al., 2009). Studies on willingness to buy sustainable products and have sympathy towards food produced sustainably are likely to have similar positive conclusions anywhere in the world. It is universally “correct” to be favourable to sustainability, even if the concept is not fully understood. The uncertainty of the useful marketing message of sustainability in influencing purchases did not stop sustainability programs from developing certification schemes as an assurance tool to facilitate communication on sustainability claims in wine production.

Additionally, supermarket chains have played a key role in sustainability of farms. These supermarkets have increasingly demanded traceability procedures to assure producers are adhering to their values and requests, including environmentally-friendly production (McEwan & Bek, 2009). In this way, supermarkets have had an important role in the changes of mode of production at the farm level.

Chapter 4

The main sustainability programs for viticulture worldwide are documented and compared as well as their certification processes. This chapter also presents an overall characterisation of assessments methods and relates them to the documented programs. Finally, this chapter presents an analysis of the engagement process of viticultural sustainability programs based on results derived from stage 3 of the group discussion. We discuss growers’ expected benefits and motives to become part of sustainability assessment programs as well as the main inhibiting factors and desirable reporting system features that can potentially contribute to program funding and membership uptake.

Chapter 5

In the conclusion, all the above are brought together and summarised.

The development of the McLaren Vale Sustainable Winegrowing Australia

When I started this PhD program I also started working part-time at the McLaren Vale Grape Wine and Tourism Association managing the implementation the McLaren Vale Sustainable Winegrowing Australia program, which is further described in Chapter 4. When my employment began, the program was in its initial stages with a workbook distributed to growers but the answers not yet collected. In the first year, 41 growers returned their responses and reports were produced from their answers. In the second year, the workbook was completely re-written with a new methodology derived from observations obtained during this PhD investigation.

Local growers were recruited to voluntarily develop new content following the chapters, sections and topics titles I proposed. I authored the Community and Winery Relations sections in the Social chapter and co-authored the Waste Management section (see appendices). To validate the content, volunteer external peer-reviewers (experts in each field) were also recruited. I also developed a new weighting system to indicate the overall sustainability status for each individual grower and region within the proposed assessment. The reports developed for the program became the most important engagement tool for new growers. An on-line system to collect and report data was also developed and became functional in 2013.

Currently, the program has 119 members, representing 191 vineyards that represent about 53% of the grape crushed and 40% of the area under vine in McLaren Vale (see appendices for details on method, reporting system and chapter contents).

Statement of Authorship

Title of Paper	Knowledge Gleaned from Applying Mixed Methods Research to Wine Grape Growing
Publication Status	O Published, ⦿ Accepted for Publication, O Submitted for Publication, O Publication style
Publication Details	Santiago-Brown, Irina, Jerram, Cate, Metcalfe, Andrew, & Collins, Cassandra. (in-press). What Does Sustainability Mean? Knowledge Gleaned from Applying Mixed Methods Research to Wine Grape Growing. Journal of Mixed Methods Research,

Author Contributions

By signing the Statement of Authorship, each author certifies that their stated contribution to the publication is accurate and that permission is granted for the publication to be included in the candidate's thesis.

Name of Principal Author (Candidate)	Irina Santiago-Brown		
Contribution to the Paper	Irina Santiago-Brown organized the focus groups, performed interviews, organised and interpreted data and wrote the manuscript.		
Signature		Date	

Name of Co-Author	Cassandra Collins		
Contribution to the Paper	Supervised the development of work, helped in data interpretation and contributed to the editing/proofing/revision process of writing. Acted as corresponding author.		
Signature		Date	27/2/14

Name of Co-Author	Andrew Metcalfe		
Contribution to the Paper	Supervised the development of work, helped with data analysis and methodological aspects of writing; and contributed to the editing/proofing/revision process of writing.		
Signature		Date	27/2/14

Name of Co-Author	Cate Jerram		
Contribution to the Paper	Supervised the development of work, helped with qualitative data analysis and methodological aspects of writing; and contributed to the editing/proofing/revision process of writing.		
Signature		Date	27/02/2014

Chapter 2. What Does Sustainability Mean? Knowledge Gleaned from Applying Mixed Methods Research to Wine Grape Growing

Chapter 2 - Abstract

We present outcomes from a mixed methods research project in agricultural sciences. An atypical methodology for sciences was developed as the only way to avoid embedded assumptions commonly seen in sustainability investigations. Eighty-three upper echelon participants from the wine grape industry participated in 14 focus groups in five countries: Australia, Chile, New Zealand, South Africa, United States. Quantitative measures were compared to results from qualitatively coded participant utterances using two content analysis software tools: Leximancer and NVivo. This paper presents the strategies and method applied in this investigation to define sustainability. We found out that a consensual sustainability definition prior to the establishment of assessment systems is essential. The model developed seems to be viable for similar sustainability investigations of individual organisations. Therefore, from the farmer's viewpoint, economic variables appear to be more important than environmental or social ones. An overall sustainability definition is proposed as the continuous pursuit of equilibrium between economic, social and environmental variables and their trade-offs over time. The findings from this investigation could not be achieved if a qualitative or quantitative method was used alone as a deeper understanding of sustainability is context or perspective specific. Understood this way and in a context specific, a sustainable farm or vineyard is the one that is able to economically provide for the farmer while maintaining its ability to consistently produce and improve quality over time.

Key Words: Mixed Methods, Sustainability, Content Map, Assisted Focus Group Method of Enquiry, Viticulture

Introduction

Sustainability is a complex concept (Bebbington et al., 2007; Dantsis et al., 2009; Espinosa et al., 2008; Wojtkowski, 2006) that is often taken for granted. Consequently, different agents seem to use different embedded assumptions in sustainability investigations and assessments (Abbona et al., 2007; Koohafkan, Altieri, & Gimenez, 2012; Pacini et al., 2011; Söderbaum, 2011). In agricultural systems the challenge to define sustainability seems even more complex because of the relationship between science-based and value-based indicators as well as a lack of agreement about where the farm boundaries end (Ohmart, 2011). To date, there is not a widely accepted definition of sustainability (Casini et al., 2010; Ohmart, 2011; Wei, Davidson, Chen, & White, 2009), so different sustainability assessments cannot be compared with precision. The focus of the study was *Sustainability in Viticulture* and the investigation was conducted with wine growers to define sustainability at the farm-gate level. Mixed methods were used for data gathering and analysis. These are discussed in the Methods section of this paper.

Background

Since the 1960's, agriculture systems have been relying to a large degree on the use of high ex-farm inputs such as synthetic chemicals (e.g. fertilizers, pesticides, and herbicides) and mechanization to achieve high levels of food production at the lowest possible cost (Altieri, 1992; Ohmart et al., 2008; Wojtkowski, 2006). This period of the history of agriculture became known as the Green Revolution (Hazell, 2002; Woodhouse, 2010). These practices have dramatically increased food production but have had well-known harmful consequences to the world's natural resources (e.g. loss of top soil, soil erosion, the effects of nitrate and pesticides on the environment among others). A number of major concerns about past and current practices in high-input conventional agriculture have become part of what was previously only considered a solution (Dordas, 2009; Kendall & Pimentel, 1994). One major challenge is to improve options available to growers and to make a profitable transition from high-input conventional agriculture to more sustainable systems for current and future generations (Abbona et al., 2007; Edwards, 1987; Madden, 1989; Ohmart et al., 2008; Zucca et al., 2009).

In 1983, the General Assembly of the United Nations created the World Commission on Environment and Development (WCED), also known as Brundtland Commission, named after its chairman (Keeble, 1987). The special commission was created to develop a long-term strategy for achieving sustainable development by the year 2000 and beyond. The Commission's task was, among other things, to recommend ways for organizations and countries to develop, taking into account the interrelationships between people, resources, and environment (United Nations, 1983). WCED (1987) defined sustainable development as development that "meets the needs of the present without compromising the ability of future generations to meet their own needs". Espinosa et al. (2008) pointed out that the assumption of equity between generations is critical and difficult to manage as a premise of the sustainability concept. Sustainability is embedded in fundamental and complex questions such as: to, or for, whom is one sustainable? At whose expense? With consequences (beneficial or disadvantageous) to whom?

In 1998, Elkington extrapolated the United Nation's sustainability recommendations to the business unit level. The term "Triple Bottom Line" was coined emphasizing that sustainable development occurs when organizations show responsibility toward economic, social and environmental aspects (Elkington, 1998, p. 1). The triple bottom line approach was used as the backbone of this research with the aim to help build a useful definition of the term sustainability in wine growing. The premise that sustainability is the interrelationship of economic, environment and social components at the business organizational level is the basis for developing a definition of sustainability for wine grape growers.

In agriculture, comprehension of the full scope of the concept of sustainability is essential to reconcile agriculture productivity, natural resource preservation and conservation and to prevent the degradation of farms (Abbona et al., 2007). In the United States, public policies for rural development have considered both the environmental impact of farming techniques and the socio-economic performance of rural communities. Because these components are intrinsically related, it is impossible to assess the outcomes of sustainability policies in an isolated way (Brodt, Feenstra, Kozloff, Klonsky, & Tourte, 2006). As a result, it seems essential to define sustainability prior to sustainability assessment proposals.

Why Wine Grape Growing?

Amongst agricultural crops, wine grape production is the most economically valuable fruit crop in the world (D. I. Jackson, 2010; R. S. Jackson, 2008). Wine grapes are part of a complex value chain due to the close and overlapping interests and interactions between source (grapes) and production (wine). Moreover, wine producing regions are important for rural development, landscape preservation and tourism worldwide (Soosay et al., 2009; Tesco, 2011). In 2010, vineyards covered about 7,355 million hectares worldwide (Wine Institute, 2013). Therefore, wine grape growing offers a unique complexity, depth, specificity and crucial insights into economic, agricultural, social, political and scientific aspects of sustainability.

Mixed Method Choice: A Need to Step Back and Re-design the Research

The original primary objective of this investigation was to assess vineyard sustainability and understand adoption of sustainable practices by members of sustainability programs in viticulture worldwide. The assessment would primarily be a quantitative measure driven by a set of variables, followed by field trials according to the precepts of the statistical design of experiments. The research as it was originally conceived proved to be unfeasible. Field comparison trials are often used in scientific agricultural research, including viticulture. However, the lack of consensus on which variables should be used to evaluate if vineyard X was more or less sustainable than vineyard Y, encouraged us to search for alternative ways to conduct this investigation.

A step back from the original objective became essential to proceed with the investigation. The search for a meaningful definition of sustainability for growers became our first objective. Growers were then chosen to be our primary research source because of the obvious impacts of potentially unsustainable practices on them. In agriculture, it seems that the farmer's voice has been under represented in agricultural studies overall (Chambers, 1994), including sustainability assessments, due to the widely-held belief of growers' inferior knowledge. Top-down assessments through programs are often biased by the sponsors' need to justify expenditures to the broader population. Systemic reports on farms' sustainability, considering economic, environmental and social as intrinsic components, are extremely complex and expensive to produce. Often, reporting a set of chosen indicators might be enough to the sponsor, but does not necessarily mean direct improvement of the farmer's sustainability.

A useful and meaningful sustainability definition became critical as it would drive future assessment choices. Additionally, a consensual definition could make different assessments comparable by analyzing farms' or vineyards' outcomes through the same lens. These outcomes should express a common understanding of what sustainability means. The ability to measure countless variables is currently possible because of the advances in science and technology. However, selecting variables that actually help growers make decisions toward more sustainable practices, in their own context, is still a challenge. Moreover, measurements imply costs. Choices need to be practical and driven by a sustainability definition.

Survey methods using a predefined questionnaire were not considered appropriate for the purpose of defining sustainability because of the risk of embedded assumptions from the investigation team. The development of a definition will be impacted by viewpoint and objectives of the investigator. In particular, variables will be preselected because the investigator perceives them to be crucial for a definition. More qualitative approaches exploring human perceptions, meanings, lexicons and understanding were needed to acquire a better understanding of sustainability definitions in use, a grounded theory approach. As quantification of the data for ranking possibilities was also required, a mixed methods approach was chosen for this investigation. Mixed methods became the ideal approach for both data gathering – in which an adapted focus group method was designed and used, as well as for data analysis.

A focus group is generally described as a group discussion facilitated by a moderator. Focus groups have been commonly used in market, social science (Morgan & Spanish, 1984) and health research (Barbour, 2005) but not in agriculture sciences or sustainability investigations. When well conducted and organized, focus groups promote beneficial interactions between participants that helps build in-depth and synergic results (De Ruyter, 1996). An adapted focus group method was developed for this investigation: the Assisted Focus Group Method of Enquiry.

Qualitative data collected from the focus groups were quantified. The data sets were then compared using a variety of mixed methods to analyze the data.

Mixed Methods in Sciences

Although qualitative and quantitative data integration has been largely used by experienced researchers for many years, mixed methods research was formally established only in the late 1980's (Guest, 2013). In the mid-1990's, Chambers (Chambers, 1994) published a series of papers on Participatory Rural Appraisals (PRA) that could easily be described today as mixed methods in agricultural development. Creswell (2009) predicted that different fields beyond social and health sciences will soon benefit from the usage of mixed methods. In spite of this, to date, it seems that there is no mixed methods research in agricultural sciences. This article proposes that use of mixed methods research in agricultural research is the best way to capture the complexity of investigations on sustainability assessments and to minimize research bias.

Method

This paper describes the research strategy and reports findings from the first stage of a large three-stage study, in which assessment of sustainability in viticulture is investigated. Stage 1 concentrates on the development of a definition of sustainability, and uses data from the first section of focus group sessions. To place this in the context of the overall study Stage 2 produces a list of indicators to assess sustainability using data from the second section of focus group sessions (Santiago-

Brown, Metcalfe, Jerram, & Collins, 2014), and stage 3 will describe the engagement process, the enabling and inhibiting factors for growers and other participants to become part of relevant viticulture sustainability assessment programs world-wide.

The stage 1 study is based on data gathered from fourteen focus groups conducted from December 2011 to November 2012 with upper echelons of grape growing organizations from five countries: Australia, Chile, New Zealand, South Africa and United States. Upper echelons are executives or top managers of their organizations (Hambrick & Mason, 1984) and in the context of this investigation they are CEO's, Chief Winemakers and Chief Viticulturists. The selection criterion for these countries was their being a wine producer with a well-documented sustainability program for viticulture. The countries represented in this investigation belong to a group known as "New World" wine producers. To the best of our knowledge, there were no relevant sustainability programs in "Old World" wine countries (Europe) at the time of this investigation.

Outsourcing Participants

This study applied a purposive (or non-probability) sampling approach. Each participant's role in their organization was defined as critical to achieving meaningful results. The research aimed to hear from a diverse group of people who were at the top-level of decision-making in their organizations. It was understood that this group could provide unique and representative information that could not be gathered through other means (Teddlie & Yu, 2007). A wider sample within these organizations, including non-managerial employees, could lead to misleading results, as this group does not drive strategies and, by consequence, sustainability outcomes of their organization.

Only upper echelons from wine grape organizations were recruited to be part of this research. Upper echelons characteristics often reflect organizational strategies (Hambrick & Mason, 1984). One of the expected benefits of using the upper echelons approach is the ability to predict organizational behavior and outcomes. Although most literature suggests focus groups participants should be paid, our participants were not. Nevertheless Morgan (1996) recognizes that among top-level executives, meaningful sponsors and/or topics might motivate unpaid participation. This project was introduced as academic research on sustainability in viticulture from the University of Adelaide, a recognized organization in the worldwide grape growing and winemaking community.

Participants were recruited mainly through an adapted snowball method. In a typical snowball sampling, the first individual recruited as part of the study suggests other participants. This sampling approach is often used when a standard sampling approach is not financially feasible because the population is very specific and characterized as impossible to be easily reached (Biernacki & Waldorf, 1981). Adapted snowball sampling was used in this case because the influential individuals who were identified to recruit others to become part of the study, are not necessarily themselves focus group participants.

Two complementary pathways were used to recruit participants to the focus groups using our adapted snowball sampling: pathway one – identification and involvement of a highly influential individual from the chosen sub-population (wine region where the focus group was to be organized), and pathway two – academics, researchers or wine industry representatives from regional associations with a sustainability program for viticulture in place. These two pathways were used simultaneously. As soon as influential individuals were identified and involved in the project, their help was requested to either use their names as a confirmed participant to invite others or to send a direct initial communication introducing the main researcher and the importance of having them in the research. There were also situations where former focus group participants suggested others from their personal network from wine regions in other countries.

A formal invitation was sent to all potential participants that were identified in the above process. Because focus group results rely on the spontaneity of the responses, the invitation was purposely vague, emphasizing only the overall research topic. Former participants or associations were requested to not provide more information than what was available in the standard invitation. To avoid refusals because of the lack of information on the specific objectives of the research, the location of the session became critical to help to convince participation. A board meeting room or location from a respected influential participant or from a local wine growing association would help to increase the credibility of the research. The session times varied according to local suggestions, following their cultural practices. In regions where more than one focus group was organized, participants were grouped by their roles in the organization. Similarity among participants helps to minimize potential inhibitions among participants, leading to better discussions.

Focus group techniques emphasize the importance of reminders prior to the sessions (written or phone calls). We did not want to send excessive communication since the potential participants were unpaid and were from upper echelons in their organizations, as excessive communication could annoy participants leading to drop outs. A brief survey was developed through a web-based tool as part of the solution. The substantive purpose of the survey was to characterize attributes of participants and their organizations relevant to the research. The survey could be held immediately before the session started and serve as a gentle reminder of the session they had already committed to attend. Invitations were individual, but the reminder email with the survey link was sent to the group, listing all names. The same email emphasized that the session could not be held if the minimum number of participants were not met or if all participants were not there on time. The knowledge of who would be in the session helped to increase commitment and confidence in the credibility of the research.

The Focus Groups

The first part of each focus group discussion was exploratory and self-contained - exploratory because of the approach of generating scientific hypotheses from everyday thought (Calder, 1977) and self-contained because the result of this part of the investigation stands by itself (Morgan, 1996). In our study, a focus group is a video and/or audio-recorded discussion with a small group of four to ten participants to explore a specific topic. An experienced moderator working from a pre-defined script (Table 2-1) conducted the focus groups. The moderator was assisted by the principal investigator over a two-hour period (Morgan & Spanish, 1984). The first section lasted, on average, one hour. All sessions were double digital recorded (both audio-video and audio).

Table 2-1 - Focus group questions – Stage1

1.[a]	For the purpose of the recording, please give your name, the name of your company and your connection with the company.
2.	What does the word sustainability mean to you?
3.[a]	Please think back when you became aware that you wanted to have work related to vineyards and grape growing. What did you want to achieve?
4.	In discussion, can you please complete the following sentence: "To me, a sustainable vineyard is…"
	ASSUMPTION: sustainability is the interrelationship between economic, environmental and social components and indicator is something that you can measure to assess sustainability.
5.	What measures or indicators would you use in your vineyard to assess its sustainability? To facilitate the discussion, please list about 5 indicators in form of sustainability in your vineyards.
6.	What would you measure (indicators) in a region (considering Geographic Indicators for instance) to assess its sustainability? (e.g. Is region A sustainable? Or this region is sustainable because….)
7.	What would you take into consideration to choose between one region and another to buy a vineyard? What did you take into consideration when you selected your vineyard (if you had)?
8.	Considering that different levels of sustainability of the grape growing industry may impact on the sustainability of your vineyard, please allocate the importance of each of these levels from 0-100% on the form. It must add up to 100% (as a pie chart). The options are: (1) Your sustainability (your vineyard), (2) Regional industry sustainability, (3) Country and (4) World grape growing sustainability.
9.	Rate the relative importance in your mind of the component variables of sustainability to your vineyard: economic, social and environmental so that they add up to 100%.

Notes: [a] Questions not included in the coding

In the beginning of the session, an overall explanation on how the section was going to be conducted was given. It was emphasized that there were no incorrect answers or a need to reach consensus. Focus groups aim to capture opinions and comments of different individuals that together benefit from each other's thoughts. Different opinions should be perceived as contributions to a potential synergic session result. Participants were instructed that the research aimed to discuss sustainability at the farm-gate level. For this purpose, "vineyard" should be considered the farm unit. Questions were oral whereas rating question options were written on the flip chart while the questions were being asked. The flip chart sheets and video were part of the data.

The traditional Focus Group Method was considered insufficient for this investigation. An adapted version was created using a modified procedural method for Focus Groups as described below. We called it the "Assisted Focus Group Method of Enquiry" (AFGME). The AFGME creation had two main motivations: (1) promote equal participants' contributions, avoiding potential inhibitions because of dominant participants, and (2) optimize session time by providing tools to facilitate participant's expression within the limited time of a focus group session.

The AFGME was developed and conducted with 14 distinct groups. The sessions included a technique where participants were requested to write down some of their answers on a pre-printed form, presented as a set of blank tables, prior to sharing their answers with the group. These answers also included some responses to numerical and rating questions. The purpose of the form was to capture individual spontaneous answers from all participants for further group discussion. There is vast literature on dominant expert or influential participants and how they can influence focus group results (De Ruyter, 1996; Krueger, 1997). The written answers from individuals before the discussion seemed to improve the chances that all participants would be equally heard. The written answers were collected at the end of the session, which included participants' identification.

The choice of not printing the questions on the form was made to avoid eliciting answers out of the context of the discussion. Printed questions or indications of the direction of the discussion would necessarily influence the session flow, compromising spontaneity. Furthermore, we wanted to avoid interruptions and interaction caused by forms distribution as it could lead to distraction among participants. Form distribution would also reduce useful discussion time. The principal purpose of the forms was to support participant answers. Nevertheless, the main researcher also used them to verify transcripts. None of the sessions exceeded the two-hour period agreed upon with participants.

To summarize, the objective of the study is to develop a definition of sustainability for wine grape growers using expertise from fourteen focus groups in five countries. We assume fourteen focus groups are sufficient for theoretical saturation, and we can test this assumption to some extent. The accessible data are:

- survey for characteristics of participants and organizations (sent out before focus group session)
- audio and video-visual recording
- flip chart sheets
- questionnaire with responses from participants throughout focus group session, collected at the end.

Data Analysis

Session recordings were transcribed verbatim using Express Scribe (NCH Software, 2012) a player software designed to assist the transcription of audio and video recordings. The principal researcher checked transcripts against the original audio and/or video for accuracy. Two transcripts from Chile were translated to English from Spanish. The content analysis was done through a combination of exploratory techniques from two distinct computer-aided processes: NVivo 10 (QSR International, 2012) and Leximancer 4 (Leximancer Pty Ltd, 2013). The content analysis enabled conceptual grouping of ideas and perceptions of winegrowers and empowered analysis of strength of weighting (e.g. between importance of economic, environmental and social components of sustainability). Results from the content analysis could then form a basis for more in-depth interpretive coding and analysis.

Transcripts were uploaded and coded in NVivo, a qualitative data management software package, to extract relevant data from them. The coding process proposed by Saldaña (2012) was followed. Questions and moderators' interventions and comments were not coded as the aim of the investigation was to capture participants' viewpoint (Saldaña, 2012). An *a priori* code list was developed from concepts, topics and notes identified in the sessions by the principal researcher. This first cycle of coding was performed by an assistant researcher using the *a priori* code list. The principal researcher conducted the interpretive-inductive second and third cycles of coding using iterative axial coding and pattern identification to generate elaborative and theoretical coding. A report containing all coded references to economic, environmental and social sustainability was used to generate a concept map and a tag cloud from spoken comments from focus group participants.

Concept maps or word/tag clouds are pictorial heuristic representations of text. Heuristics provide a sufficient and simplified pathway to find solutions to a given problem (Shah & Oppenheimer, 2008). Different software produces different illustrations based on chosen algorithms. Font sizes or color palettes are commonly used to indicate frequency of word or concept co-occurrences (weight): the bigger or brighter the fonts of the word in relation to the others, the more frequently the word or concept in the source document is used to generate the illustration. The software also determines the positioning and/or clustering of the words/concepts in the illustration. Concept maps are hierarchical representations of ideas to facilitate knowledge (Novak, 1990).

The most frequently occurring exact words produced a tag cloud displayed in larger fonts NVivo. The same coded references became the input source for Leximancer, automated text content analysis software. Leximancer was used to generate a concept cloud, displaying clusters of concepts (themes) as well as toggled pathways between pairs of chosen concepts. An automated co-occurrence matrix of concepts displaying x, y coordinates and weights and a concept rank of frequency of occurrence were then exported from Leximancer to generate a bubble chart of the main concepts in Excel (Microsoft, 2011). The weight, which is the sum of concept co-occurrences compared to how frequently they occur elsewhere, was used to determine the bubble sizes. Excel was also used to generate all graphs.

Results

Demographics and Organization's Characteristics

The sample was comprised of 83 participants from Australia, Chile, New Zealand, South Africa and United States (Table 2-2). The number of participants from each country is given in the top row. A cross tabulation between participants from each county, their demographic data (role and education) and participants' organizational characteristics (business ownership, wine producer, exporter, size and certifications) is presented as a percentage of the total of each country. The percentage display was chosen to facilitate comparison between countries. In our adapted snowball sample, 59 of the 83 participants' organizations belonged to a sustainability program, although all 24 of the other organizations are located in a wine grape region that had one available to join.

Table 2-2 - Focus group participants and their organizations' characteristics

		All	Australia	Chile	New Zealand	South Africa	United States
		83	**25**	**8**	**11**	**15**	**24**
		(%)	**30%**	**10%**	**13%**	**18%**	**29%**
Organization characteristics							
Own a wine label?	**72**	**87%**	80%	100%	100%	93%	79%
Wine exporter?	**68**	**82%**	76%	100%	100%	93%	67%
Family business	**53**	**64%**	76%	63%	45%	33%	79%
Participant's role [a]							
CEO/General Manager	**39**	**47%**	56%	50%	9%	53%	50%
Viticulturist	**57**	**69%**	76%	25%	82%	67%	71%
Winemaker	**11**	**13%**	12%	25%	0%	13%	17%
Owner of the business	**29**	**35%**	56%	13%	0%	27%	42%
Participant's education [b]							
High school degree or equivalent	**2**	**2%**	0%	0%	18%	0%	0%
Some college but no degree	**10**	**12%**	20%	0%	9%	13%	8%
Bachelor degree	**50**	**61%**	68%	63%	55%	60%	54%
Masters degree	**16**	**20%**	8%	38%	9%	27%	25%
PhD	**4**	**5%**	4%	0%	9%	0%	8%
Property sizes [b]							
<10 ha	**8**	**10%**	16%	0%	9%	0%	13%
11-24 ha	**7**	**9%**	12%	0%	0%	0%	17%
25-49 ha	**7**	**9%**	24%	0%	0%	7%	0%
50-99 ha	**8**	**10%**	8%	0%	0%	7%	21%
100+ ha	**52**	**63%**	40%	100%	91%	80%	50%
Certification							
Organic or biodynamic	**16**	**19%**	12%	25%	36%	13%	21%
Sustainability program	**59**	**71%**	72%	75%	91%	60%	67%

Notes: [a] Might be more than one role [b] Participants for this section (n=82)

Sustainability Components and Spheres of Influence: Participant's Perspective

Participants were asked to attribute an importance score, summing to one hundred percent, to the economic, environmental and social components of sustainability of their vineyards, at the end of the session. Their responses indicate that economic (41%) is followed by environment (35%) and the social is the least important component amongst the three representing 24% (pie chart - Figure 2-1a and parallel coordinate plot – Figure 2-1b). These results need to be interpreted cautiously as individual answers are spread over a wide range (Figure 2-1b). Attributed importance to economic sustainability varied from 15% to 80%; environment responses varied from 20% to 70% and social from 0% to 50%.

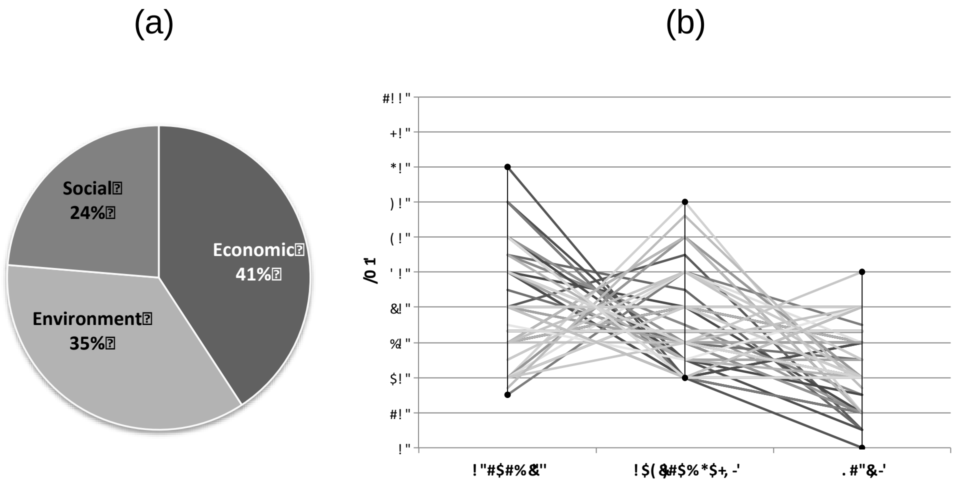

Figure 2-1 - Average attributed importance to components of sustainability by 83 participants: (a) pie chart, (b) parallel coordinate

The semantically significant words in participants' utterances were coded into three main categories: economic, social and environmental. From 14 focus group transcripts, 3416 references were coded. The number of references for each one of the three code groups was used to generate Figure 2-2. Qualitative data were transformed into quantitative to compare number of references from utterances with the questionnaire results. The results are 45% to economic, environment (31%) and social (24%), which are similar to those results from the participants' attributed values from the questionnaire during the focus group session.

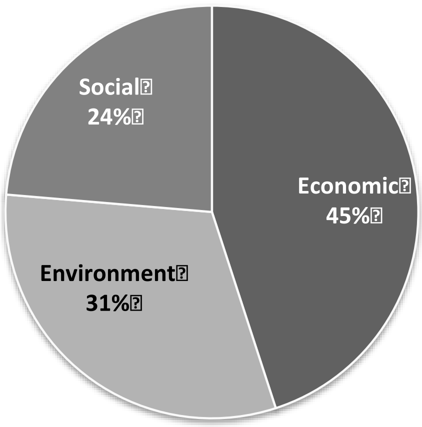

Figure 2-2 - Percentage of 3416 references coded in Nvivo, attributed to the three components of sustainability

A hypothetical set of spheres of influence or levels of sustainability within the wine industry was given to the participants to allocate, summing to one hundred percent, the perceived impact of these spheres on their organizations: own vineyard sustainability, regional sustainability, country's sustainability and world's sustainability. Participants' attributed scores are shown in Figure 2-3. Their own sustainable practices were valued as most important (44%) followed by regional (27%), country where they are located (16%), and worldwide sustainability (13%).

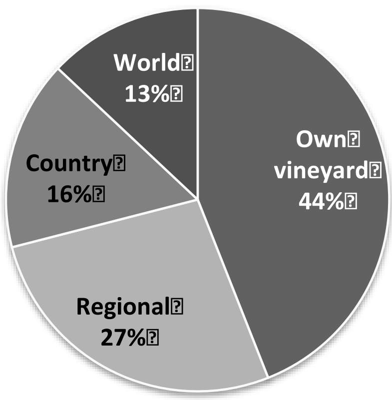

Figure 2-3 - Relative importance of sustainability spheres of influence on sustainability of 82 vineyards (1 abstention)

Content and Concepts from Transcripts

An initial concept map was generated using the suggested Leximancer settings for focus group transcriptions. After viewing the first unedited result, a minimal intervention approach, to avoid bias, was chosen by the principal researcher to refine the results. The following default settings were modified in order to create a more stable and representative concept map: one sentence per block of analysis (the default is two) as there were many one-sentence utterances from participants. A topical (or linear) clustering algorithm was chosen over the social (or Gaussian) to display the map. A few semantically weak words, commonly used in informal spoken language were excluded from the concept list generated automatically by the software (e.g. sure, probably, things). Those words were valued as "evidence" instead of being merely removed, as it was understood that they had an important role in the connectedness of the concepts. Some words with semantic similarity, in the context of this investigation, were merged manually by the principal researcher: (1) property and farm, (2) fruit and grape, and (3) area and region. Several concept maps were then generated and a visualization showing 100% of the top concepts and top 33% themes was chosen. These chosen settings produced the best representative concept map for this investigation. The data produced by Leximancer to generate the concept map were exported as spreadsheets to generate our own concept map (a black and white bubble chart).

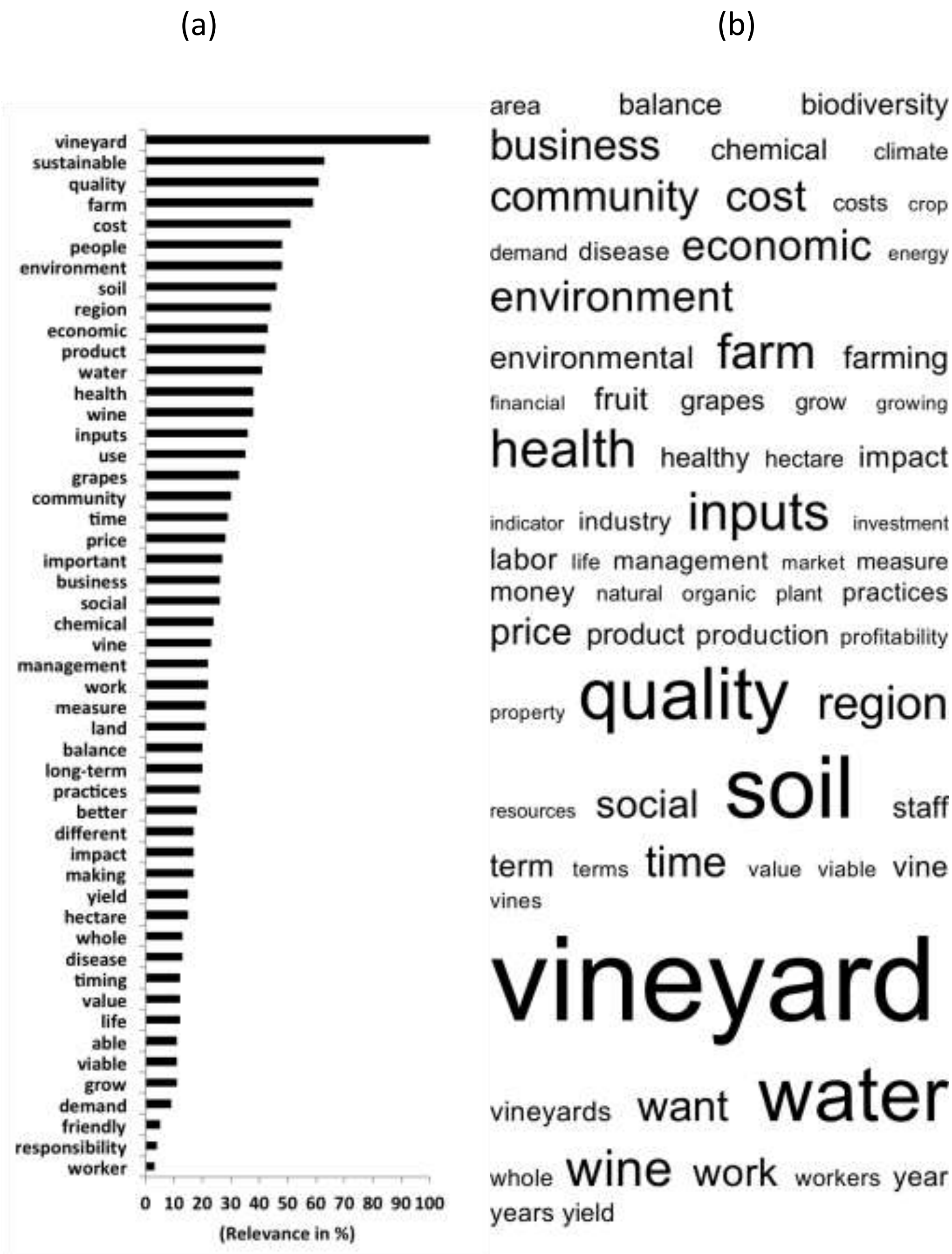

Figure 2-4 - (a) Ranked concepts (Leximancer) and (b) tag cloud of word frequency (Nvivo) from reference coding (total of 3416 references)

A ranked bar chart was produced by Leximancer displaying the most relevant concepts (Figure 2-4a). Leximancer performs its own semantic analysis based on an auto-learning process in the context of the content source. Therefore, concept rank is not the same as a simple word frequency count. The rank displays concept relevance that is a "percentage representation of the count value of each concept divided by the single highest count value" (Leximancer Pty Ltd, 2013), representing the proportionality of concepts in relation to each other. In our investigation, "vineyard" was the most relevant concept found, followed by sustainable (63%), quality (61%), farm (59%) and so on down to water (3%).

A tag cloud was generated from a word frequency query from NVivo (Figure 2-4b). The combined analysis of outcomes from two distinct programs was used to minimize any potential bias in the analysis of the results. Furthermore, similarities between the results would increase confidence in our analysis. The 70 most frequent words are shown in the tag cloud in larger fonts and alphabetical order. The tag cloud was generated from participants' exact words, from the references coded. In the NVivo query options, the "exact" word setting was chosen because some key words such as "product" that, in the context of this research mostly mean "grape" or "wine", was wrongly merged automatically with the words "production" and "productivity" when either the "synonyms" or the "stemmed words" settings were used as query settings. NVivo does not allow editing of its automatically generated synonyms list. From the NVivo query, "Vineyard" was the most frequent word (642 counts), followed by soil (459), environment/environmental (217+147=464) and so on down to resources (73). A close similarity was found between the ranked concept list (Leximancer) and the tag cloud (NVivo).

A heuristic representation of the meaning of sustainability was created as a concept map from Leximancer outputs (Figure 2-5). The coordinates (x and y) provided by this content analysis software were used to position the concepts in this representation, as well as to indicate their relative importance (weight). The size of the circles around each concept represents each concept weight. The illustration also displays the three most relevant themes identified by the software in our sustainability investigation. In Leximancer, ”themes” are auto-generated groups of strongly related concepts. The most relevant theme was labeled as “vineyard” and it clusters the group of concepts within the oval black continuous line (vineyard, sustainable, farm, economic and so on). The second theme is “soil” identified by an oval-shaped dashed-line and third is “quality” (double-lined oval shape).

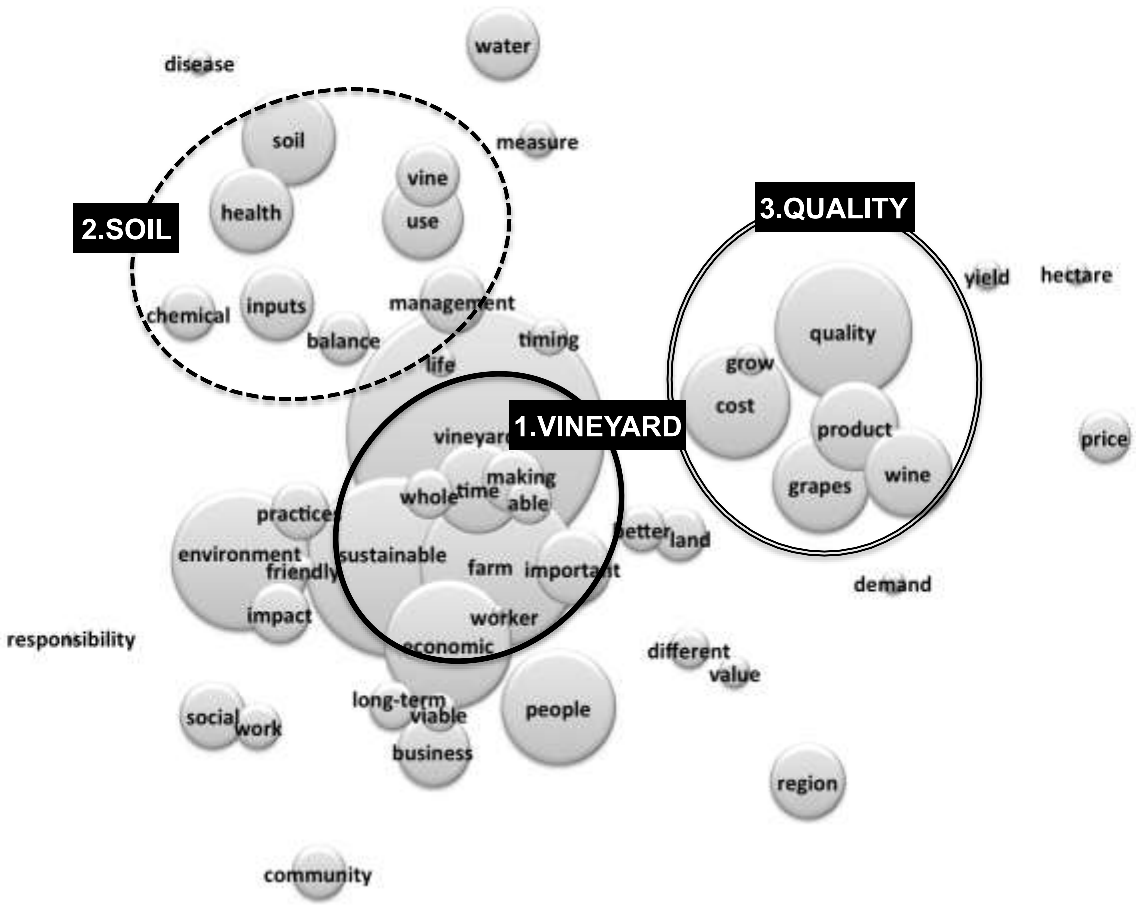

Figure 2-5 - Sustainability automated concept map, showing the three main emergent themes: (1) vineyard, (2) soil and (3) quality

The soil theme (Figure 6) contains the soil concept that is closely related to the health concept. This second theme encompasses input management, including chemical usage. Management, inputs and chemicals are closely related to balance that is directly related to soil and vines. Health emerged as a systemic concept related to soil firstly but also to vines. Some other important concepts float around the soil theme such as measure and water. Water has its main connection with this theme through the “use” concept therefore impacting on the vines. The soil and vineyard themes are directly connected through the concepts of timing and life, which form themes themselves that for visualization purposes are not shown in the concept map.

The connection between the cost and the vineyard concepts links the first and the third displayed themes. Within the quality theme are the two main possible end products from a vineyard: grapes and wines. The concept map suggests a strong relationship between costs and the intended grape and/or wine quality. Grape yield per hectare seems to be closely related to quality (grapes or wine produced), but is not placed into the quality theme. It suggests that yield per hectare itself is not related to quality but it impacts on it. Price is placed outside the theme but it connects with quality through wine. Cost, on the other hand, is directly connected to grapes. The themes “quality” and “vineyard” are directly connected by the cost and vineyard concepts. Apart from this, the land is placed as a key concept in between these two themes.

Leximancer also features a tool where the strongest pathways between concepts can be revealed by selecting any of the two concepts in the map. Figure 2-6 displays a series of automated toggle pathways from the concept map. Each line represents a distinct pathway between pairs of chosen concepts from the concept map. The order in which these concepts are displayed indicates the order they connect with each other in that specific query. These connections can be used to expand the knowledge about the connectedness between concepts. As an example, the strongest pathways between the concepts “long-term” and “price” are the following: business, viable, economic, farm, cost, product and wine, in this order. Concepts that were oppositely placed in the concept map were chosen to contribute to broader knowledge on the concepts’ connectedness.

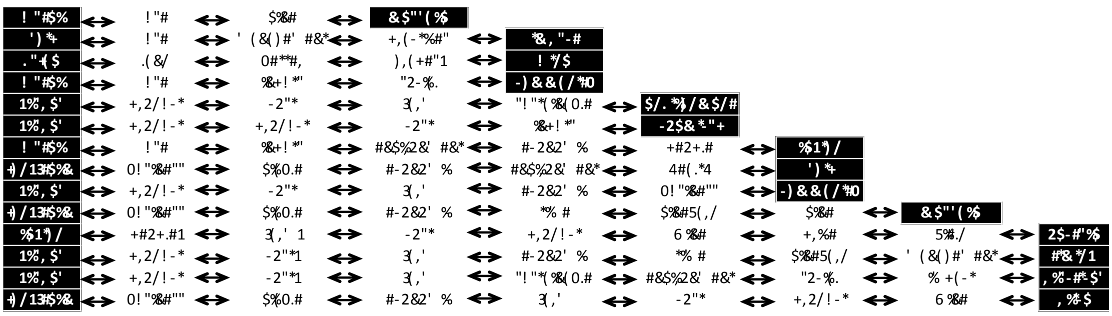

Figure 2-6 - Automated toggle pathway from Leximancer between pairs of chosen sustainability concepts from concept map (Figure 5)

Discussion

The complexity of the sustainability concept seems to be the main cause of the lack of a consensual definition for the term. Assessments using the triple bottom line approach have become the most usual way to illustrate sustainability (Figure 2-7a). This illustration has great merit in driving us away from the narrow perception that sustainability is only about the environment. A sustainable system is environmentally friendly, economically feasible, and socially equitable (CSWA, 2006; United Nations, 1983). However, this illustration also promotes the perception that sustainability is only reached if these three components are of equal importance and interact evenly. Eighty-three focus group participants from the wine industry from five countries seem to agree that the three components are important, but not equally so. From the farmer's perspective, the economic variables appear to have a stronger importance than the social and/or environmental components. This result was not surprising as our preliminary investigation suggested that environmental preservation and conservation, as well as social investments, are dependent on the economic performance of the vineyard. Nevertheless, the environmental and social components are also essential to the economic performance. Economic, social and environmental components are intrinsically inter-dependent. Furthermore, Figure 2-7a seems to neglect both the time factor and trade-offs commonly seen in everyday farm management choices.

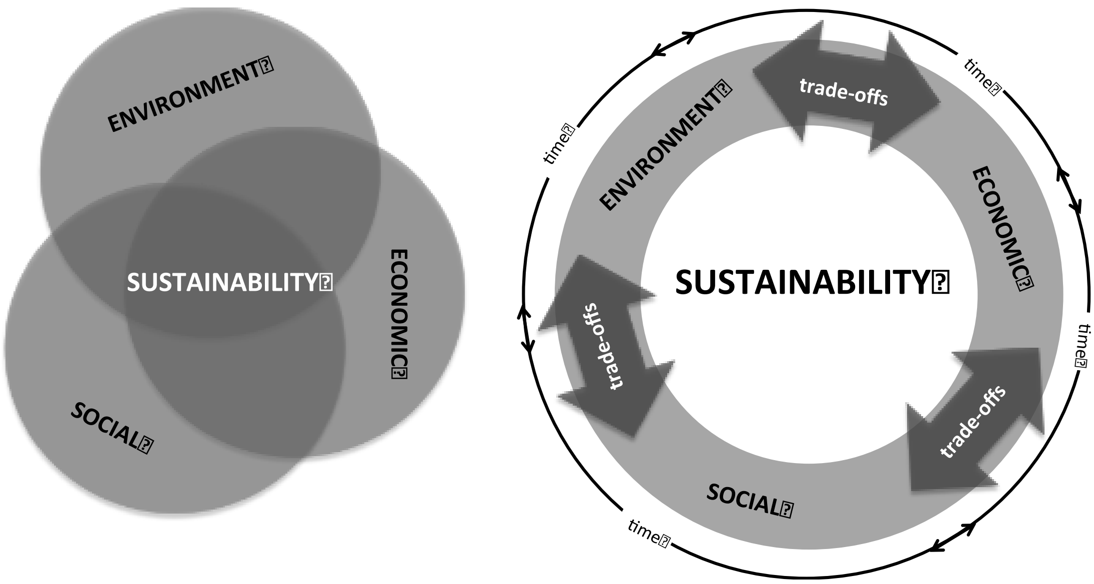

Figure 2-7 - A Sustainability definition: (a) classic triple bottom-line approach (b) proposed representation emphasizing time and trade-offs

As a result, traditional sustainability assessment using the triple bottom line approach, as presented in Figure 2-7a, does not encompass all of the important characteristics of the sustainability concept. The results achieved through the mixed methods research demonstrate that there are important and complex variables in sustainability, such as multiple time horizons of decision making, trade-offs, context, and the view point of the assessor. Furthermore, many of these variables might belong to more than one of the triple bottom line categories. These overlapping variables might overlap differently depending on the context of the sustainability assessment and analysis. The mixed methods research was essential to capture these subtle aspects of the sustainability concept that would be difficult to capture otherwise.

Just as different people are driven by different motivations, farm investment decisions are made for different reasons: new process implementation, purchase of new equipment, employee training investments, landscape improvement, and biodiversity increase among many others. For instance, in a vineyard, the need for a new tractor is likely to impact on something else of equal but different importance in that specific period of time. The farmer might even be giving up profit for that year. Trade-offs in farm management operations are difficult to capture through single point-in-time assessments. Improvements in specific areas might not compensate for a bad result in areas that did not receive the same amount of attention, investment, or improvement in that same period. Trade-offs over time promote continuous tension between the economic, social, and environmental components (Figure 2-7b). Moreover, these three components often overlap and an objective categorization of specific variables in each one of these three components seems to be context dependent. Thirty-six percent of the transcript references produced by using NVivo were coded in more than one component as the context of the discussion clearly indicated. In this way, sustainability should be re-defined as: “the continuous pursuit of equilibrium between economic, social and environmental variables, and their trade-offs over time” (Figure 2-7b).

Such definition still seems inadequate to ensure a common understanding of sustainability. The root of the problem is the direct, but non-obvious, link between the sustainability definition and the need for a commonly agreed assessment method. The above-proposed definition encompasses the social, economic and environmental components over time and their potential trade-offs. However, it is still too broad and subjective to achieve a consensual understanding. What is meant by “environmentally friendly farm”? What is meant by “economically feasible” or “socially equitable”? The answer is at least partially dependent on the viewpoint of who is asking the question and the context and time-frame of the analysis. This investigation brings attention to a need for a definition from farmers for farmers.

This investigation found out that the vineyards or farms themselves are seen as the center of the sustainability definition from the farmers’ viewpoint. The results from the content analysis software are consistent with the participant’s attributed rate for the levels or spheres of sustainability influence (Figure 2-3). Participants attributed 44% out of 100% to their own vineyard when asked about the weight of each one of the four hypothetical spheres of influence on their own sustainability. Winegrowers strongly relate their actions and overall consequences of these actions to direct impacts on their own sustainability. The theme “vineyard” encompasses the farm itself and its ability to produce over time. The concepts “making”, “whole”, “important”, “able”, “sustainable”, “economic”, and “worker” were placed within this theme by the content analysis software. Interestingly, the concept “worker” has a relative smaller weight than others within the set, but it is placed centrally in the concept map.

On average, regional sustainability was the second strongest sphere of influence on their vineyard sustainability. Regional sustainability can be related to the vineyard location, accounting for 27% of the weight attributed by participants. The community and/or region are listed among the most relevant concepts or recurrent words discovered by Leximancer and NVivo. In the concept map both terms are connected to the main theme “vineyard” through the concepts “people”, “business”, “viable”, and “economic”. Country and worldwide wine grape sustainability seems to be correlated to market forces, policies and regulation, and having a greater impact in higher volume wine export producers.

The automated toggle pathway from Leximancer linking pairs of chosen concepts in the map contributes to the emergence of a definition from the farmer’s viewpoint. The pathways suggest vine measures or vine health monitoring to determine water use. It also identifies that impacts on soil are directly related to the chosen practices and management. As indicated by the concepts placement in Figure 5, there is strong relationship between cost of grapes and products, which might also mean wine, and environment, through a sustainable farm. Vines and vineyard monitoring over time is necessary to achieve economically viable long-term businesses. Wine prices are connected to the wine itself or grape produced and it passes through the economics of the farm, again to drive long-term businesses or vineyards. In short, “a sustainable farm or vineyard is the one that is able to economically provide for the farmer while maintaining its ability to consistently produce and improve quality over time.”

Greene (2008) suggests that a mixed methods study should generate insights that would not have been accomplished with one method alone. Starting from fourteen focus groups, mixed methods in the form of the quantitative lexigraphic software led to the above definition of sustainability and highlighted subtle relations between concepts that were not apparent from perusal of the transcripts.

We were able to demonstrate a good approximation to theoretical saturation, inasmuch as the last few focus groups did not generate any substantial new concepts. We do have some tests of consistency, or methodological triangulation (Guion, Diehl, & McDonald, 2011), such as the comparison between the relative importance attributed to economic, environmental and social aspects of sustainability from the questionnaire and the automated count of utterances. The focus groups could be grouped by country, and hence by different culture, to provide some level of data triangulation (Guion et al., 2011), but the principal researcher considered that this would impede, rather than assist, the goal of establishing a generally accepted definition of sustainability for wine grape farmers. For the same reason, we have not considered viticulturists, wine makers and managers as separate groups.

Conclusions

The use of mixed methods research is not usual in sustainability or scientific agricultural investigations. The results from this study demonstrate that mixed methods research has the potential to be used as the main pathway in sustainability investigations of individual organizations. The method captures nuances of the concept that would be difficult to capture using just a qualitative or quantitative method alone. These nuances are revealed as complexities of the sustainability concept that are difficult to be perceived in similar investigations not using mixed methods: time factor, trade-offs or overlaps between variables used to assess sustainability, as well as the context and viewpoint of the assessment. These complexities, however, are essential to understand the concept and determine meaningful variables for sustainability assessments that can positively increase individuals' understanding of their organizations and therefore influence their choices.

Individual organizations, in the context of this study - vineyards, need to be sustainable to endure over time. The pursuit of sustainability is the goal of any individual organization aiming to survive over time. To be able to keep producing over time, vineyards need to maintain and improve the quality of their products as the world is in constant change. These changes challenge the current productive processes. Over time, practices and processes need to be changed and adapted to meet the requirements of a changing environment. In farms, the land and the environment are directly connected to production. Environment preservation impacts directly on production. The social component is also critical to the sustainability of organizations: not only the direct workforce but the surrounding communities because often they are the main service and product providers for the farms and people that work or live on them.

Mixed methods research also minimizes the researcher's bias by combining and analyzing multiple data sets, captured through different means. Moreover, it might shorten time in scientific research when common knowledge can contribute to select representative data sets or pathways. A bottom-up model, from the farm to industry bodies or government, as opposed to a top-down (from the industry bodies or government to farms), is proposed as the most viable pathway. The model seems to have a higher potential to increase the usefulness of sustainability investigations of companies, including farms. Similar models could be developed for sustainability investigation in any field. Such models can contribute to the development of sustainability assessments from the company's viewpoint. The findings from this research create a working definition of sustainability that can be used as a model for other fields.

Statement of Authorship

Title of Paper	Economic, environmental and social indicators to assess sustainability of individual agricultural systems: a wine grape growing case study.
Publication Status	O Published, O Accepted for Publication, ⦿ Submitted for Publication, O Publication style
Publication Details	Santiago-Brown, Irina, Metcalfe, Andrew, Jerram, Cate, & Collins, Cassandra. (2014). Economic, environmental and social indicators to assess sustainability of individual agricultural systems: a wine grape growing case study. Manuscript submitted for publication (submitted to Accounting, Auditing & Accountability Journal)

Author Contributions

By signing the Statement of Authorship, each author certifies that their stated contribution to the publication is accurate and that permission is granted for the publication to be included in the candidate's thesis.

Name of Principal Author (Candidate)	Irina Santiago-Brown		
Contribution to the Paper	Irina Santiago-Brown organized the focus groups, performed interviews, organised and interpreted data and wrote the manuscript.		
Signature		Date	

Name of Co-Author	Cassandra Collins		
Contribution to the Paper	Supervised the development of work, helped in data interpretation and contributed to the editing/proofing/revision process of writing. Acted as corresponding author.		
Signature		Date	27/2/14

Name of Co-Author	Andrew Metcalfe		
Contribution to the Paper	Supervised the development of work, helped with data analysis and methodological aspects of writing; and contributed to the editing/proofing/revision process of writing.		
Signature		Date	24/2/14

Name of Co-Author	Cate Jerram		
Contribution to the Paper	Supervised the development of work, helped with qualitative data analysis and methodological aspects of writing; and contributed to the editing/proofing/revision process of writing.		
Signature		Date	27 Feb 2014

Chapter 3. Economic, environmental and social indicators to assess sustainability of individual agricultural systems: a wine grape growing case study

Chapter 3 - Structured Abstract

Purpose – Auditing and certifying sustainability in agriculture has been challenging due to the plethora of indicators that have been proposed. The purpose of this paper is to present a set of indicators that have been developed by representatives from the community of wine grape growers, as a basis for triple-bottom line auditing of sustainability measures in viticulture. A measure of the relative importance of these indicators is developed.

Design & Methodology – A case approach spanning five countries, using an adapted nominal group technique (ANGT). Fourteen group discussions were conducted with top-level executives, sourced from wine grape growing organisations. A method was designed to create an importance index by which indicators were ranked.

Findings – To ensure accountability of sustainability assessments, appropriate representative indicators must be used. Many sustainability programs need certification which requires auditing. This paper defines the minimum necessary measures and pathway required to ensure accountability in assessment.

Research limitations/implications – This paper only offers a method and a rank of qualitative indicators. Further research is required to quantify the proposed indicators for accounting and auditing purposes in specific cases.

Practical and Social implications – The method offered is directly applicable for other agricultural assessments, contributing to decision-making and auditing in systems assessing sustainability of individual agricultural organisations.

Originality/value – A rush to produce 'proofs of sustainability' often results in ill-considered indicators that fail to adequately measure outcomes. It also prevents realistic accountability due to irreconcilable assessments with conflicting meanings. This paper offers guidelines for creating industry-specific assessment indicators to increase accountability in sustainability assessments.

Keywords: indicator, sustainability, agriculture, wine grape, assessment, adapted nominal group technique, rank, evaluation, viticulture, triple bottom line

Introduction

Sustainability awareness has been increasing since the World Commission on Environment and Development (WCED) was created by the United Nations in the 1980s (Keeble, 1987). However, improvement is unlikely to occur if progress cannot be measured and audited (Fraser, 2012; van Liempd & Busch, 2013). A variety of sustainability assessment methods have been proposed since then (Milne & Grubnic, 2011). To evaluate sustainability, indicators are used in many of these assessment methods. Indicators are selected variables used to support decision-making processes through "measurable facts" (Yli-Viikari, 2009). Individuals, organisations and societies need models, metrics and tools to evaluate unsustainable production activities in order to help decision-makers move away from unsustainable practices (Bebbington et al., 2007).

Indicators used to assess sustainability are often selected to validate the scope of the proponents of the assessment (Rinne, Lyytimäki, & Kautto, 2012; Van der Werf & Petit, 2002). The measurement task is difficult because the term sustainability is complex and embedded in ideology (Bebbington et al., 2007), subjectivity, personal beliefs, cultural backgrounds and political views (Rinne et al., 2012). Disagreements over a commonly understood and accepted definition for sustainability and its multidimensional characteristics (Burritt & Schaltegger, 2010) have led to many different proposals on how to assess it (Abbona et al., 2007; Pacini et al., 2011). Consequently, because the scope of the sustainability concept defines sustainability assessments, assessment methods are often not directly comparable.

The authors define a sustainable farm as "one that is able to economically provide for the farmer while maintaining its ability to consistently produce and improve quality over time” (Santiago-Brown, Jerram, Metcalfe, & Collins, in-press). This article proposes a method to establish meaningful indicators at the farm-gate to ensure accountability in sustainability assessment measures. We present results from a case study with wine growers, using the above definition as a framework to develop sustainability indicators proposed by farmers for farmers. The triple bottom line approach (Mitchell, Curtis, & Davidson, 2012) is used to group these indicators into three sets: economic, environmental and social. This approach contributes to the establishment of processes to evaluate farmers systemically and to maximize sustainability outcomes.

The purpose of this paper is to present financially viable indicators for evaluating triple-bottom-line sustainability measures in viticulture. Auditing and certifying sustainability in agriculture has been challenging due to the multiple possibilities of indicator choice. Financial constraints prevent realistic evaluation of all of these separate potential indicators. Mäkelä and Näsi (2010) point out that “[t]he ultimate objectives of the corporations are to be more efficient and to generate more profit and value for shareholders”. Therefore, the plethora of possible indicators needs to be reduced to a significant, appropriate and representative short list of workable indicators that can, in a financially feasible manner, be assessed for realistic evaluation of sustainability, contributing to decision-making and accountability.

This paper reports on a method developed in an extensive, multi-phase three-year project to help agricultural organisations improve their sustainability outcomes, contribute to improved communication between farmers and consumers, and facilitate effective governmental funding allocation in agricultural regions. The component of this research explained in this paper focuses on the method used to construct appropriate indicators for sustainability assessment of individual agricultural (wine grape growing) organizations.

The process of developing indicators using an empirical mixed method research approach can contribute to the development of meaningful key performance indicators (KPI's). Performance measures should support decision making processes by aligning daily activities to strategic objectives (Burritt & Schaltegger, 2010; Parmenter, 2010). However, over-reliance on a single KPI can be counter-productive. For example, in isolation "yield" as an indicator is unlikely to reflect the sustainability status of a vineyard. At a minimum, yield performance must be evaluated by taking into account water availability, potential for productivity, grape quality and, ultimately, wine quality (Oliver, Bramley, Riches, Porter, & Edwards, 2013).

Indicators

Indicators: viewpoints and approaches

In the past, the complexity and lack of consensus around the sustainability concept has led researchers to be more focused on adoption of conservation practices (Saltiel, Bauder, & Palakovich, 1994). Environmental sustainability became the most important component of many proposed assessments. Two representative examples of this are the popularity of the LISA (low-input sustainable agriculture) (Saltiel et al., 1994) in the early 1980s and carbon footprint assessments related to climate change from the late 1980s onwards (Brouwer & Crabtree, 1999; Commission for Sustainable Development, 1995). The LISA approach is focused on reducing the use of off-farm inputs. Carbon footprint assessments are closely associated to the idea of reducing greenhouse emissions in a context of natural resource scarcity, economic instability and climate change (Koohafkan et al., 2012; Saltiel et al., 1994).

Beginning in the 1990s, indicator based sustainability assessments were mainly driven by intergovernmental processes (Rametsteiner, Pülzl, Alkan-Olsson, & Frederiksen, 2011). Sunding and Zilberman (2001) argue that innovations embodied in capital goods or products (e.g. new fertilizers) are often easier to measure than the disembodied ones. The difficulty in measuring the benefits from disembodied innovations, such as adoption of sustainable practices (e.g. a new irrigation strategy that is precisely driven by three day ahead weather forecasts), explains the low level of investment in research and development for disembodied innovations. Similarly, governments tend to prefer quantitative measures to qualitative ones in an effort to improve their own accountability and transparency. However, these choices are not automatically linked to improved sustainability outcomes at the level of individual organisations.

Consequently, assessments that are too-heavily weighted to an accounting perspective that relies mostly on past input-usage rather than outcomes of the assessed sustainability praxis are limited. The method proposed in this article demands a shift of paradigm that requires a move from reducing input-usage to optimizing input-usage to improve farm output. Contextual issues that should be accounted for in any relevant assessment include aspects as varying as rainfall affecting water usage; soil type affecting soil quality inputs; farm management system choices such as organic or conventional affecting fuel and chemical usage; crop quality objectives such as premium wine versus cask wine affecting cost of inputs and management. Accounting is necessary and contributes to sustainability assessment (Milne & Grubnic, 2011), however the paradigm shift advocated here is that accounting should not determine the assessment, but should be applied after the qualitative indicators are defined. As explained by (Burritt & Schaltegger, 2010), accounting for sustainability should contribute to improved decision-making.

There is an environmental focus in sustainability assessments (Darnhofer, Fairweather, & Moller, 2010). It arose from the tension between development and limited natural resources. However, assessments only considering one, or two, categories of the triple bottom line are insufficient to evaluate sustainability. Cost-benefit analysis, commonly used to evaluate initiatives in economic and social terms has, so far, been insufficient to measure or promote sustainable development. Cost-benefit analysis has relied on the economic category of the sustainability concept. Economic models have generally measured growth and competition (Espinosa et al., 2008). More recently, there is an increasing interest in developing assessment systems based on human well-being since the creation of the Stiglitz Commission by the French Government in 2008 (Rinne et al., 2012). However, well-being assessment alone does not necessarily promote sustainable outcomes either.

Some examples of current sustainability approaches: agroecology and carbon footprint

Systemic approaches seem to be the only reasonable way to fully assess sustainability (Espinosa et al., 2008; Gibson, 2006; Koohafkan et al., 2012). Agroecology is a systemic and interdisciplinary approach for agriculture assessment and development. It uses indicators and also assumes ecology is the basis for the development of any agricultural system (Altieri & Nicholls, 2005; Gliessman, 2007; Wojtkowski, 2006). Agroecology shows promise for assessing agricultural sustainability. Nevertheless, it should not be seen as the only way. Agroecology has a social and political orientation emphasizing traditional knowledge, alternative agriculture and local food system experiences as core components of agriculture systems (Gliessman, 2011). It has been promoted as a feasible way for poorly resourced farmers to make agricultural progress as many new technologies are not appropriate for them and in many situations they simply have no access to credit and/or information. The political and social orientations of agroecology seem to restrict its universal uptake and acceptance in the discipline worldwide.

Agriculture accounts for one-third of the total carbon emissions in the world (Pretty et al., 2010). This figure includes emissions not only from croplands, but also from pastures. Lewis, Green, Warner, and Tzilivakis (2012) emphasise that farm assessments based on carbon emissions vary significantly depending on the method of assessment applied. Farm assessment solely based on greenhouse gas emissions should not be accepted as sufficient to assess sustainability either (Milne & Grubnic, 2011). The relationship between agricultural production and productivity, financial returns, rural and social development, and environmental conservation must also be taken into account systemically. In the wine grape chain (from grape production to wine in a bottle on the retail shelf), the vineyard phase represents only about 22% of the overall carbon emissions in wine production (Bosco et al., 2013). Production logistics seem to be responsible for around 50% of the emissions associated with wine production (Christ & Burritt, 2013). For reasons such as this, employing single factor indicators such as carbon accounting are inadequate to assess sustainability of the agricultural phase of the wine production chain.

Good Indicators

Regardless of how sophisticated any indicator may be, there must be follow up actions if indicators are to help to improve systems (Pacini et al., 2011). Indicators are not automatically linked to sustainability unless a clear reference level is attached to each of them (Lancker & Nijkamp, 2000). Indicators can only measure a given situation or the progress made towards a goal when a reference is defined and is compared over multi-year periods.

Indicators have been widely used by governments, sustainability programs, and individual organisations. Governments often use indicators to help design policies and guidelines for specific programs. Sustainability programs often use indicators to create benchmarks for their participants, to set certification rules (Rigby, Woodhouse, Young, & Burton, 2001) or to set regional sustainability targets (Reed, Fraser, & Dougill, 2006) or benchmarks. Individual organisations use indicators to compare and improve their operations throughout their life span.

A good indicator should reduce the complexity of the assessment of the studied system (Doody, Kearney, Barry, Moles, & O'Regan, 2009). To date, the biggest problem with assessments has been their inability to measure the totality of effects of practices undertaken toward sustainability. Environmental, economic and social components are "inherently intertwined and subject to trade-offs. Accomplishing one objective frequently means backpedalling on another" (Böhringer & Löschel, 2006). Therefore, the time frame and the motivations used to create a sustainability assessment have a direct impact on the results of the assessment itself.

In agricultural assessments, the uncertainty of weather and climatic conditions plays an essential role in business performance, adding extra complexity to sustainability assessments when compared with many other types of individual business organisations. In a specific year, does a poor yield due to lack of rain in an unirrigated farm determine the sustainability of this farm? A longer period of time needs to be considered to make such an evaluation. What are reasonable trade-offs between the assessed indicators? Predominantly regional studies on agricultural trade-offs have been published. Böhringer and Löschel (2006) and Wei et al. (2009) propose numerical models to assess the impact (therefore the accepted trade-offs) of (mainly) economic and environmental components. Bond, Morrison-Saunders, and Pope (2012) and Gibson (2006) emphasise the importance of having public trade-off rule criteria as an essential part of the accountability of assessment systems. Darnhofer et al. (2010) apply resilience theory to farming to propose pathways towards more sustainable, therefore resilient farms. Trade-offs are considered, especially between attributes ensuring success during the periods of stability and those that are required for transformation. In this paper we present a method for developing a range of indicators that could improve trade-off decisions and rules.

Materials and method

A hybrid interview and discussion group method was created for this investigation, combining and modifying the focus group and nominal group techniques. The purpose and objectives of a group discussion should drive the choice of method for interviewing. For this article, the data set was gathered from the second stage of 14 group interview and discussion sessions as described below (Table 3-1).

(insert Table 1 about here)

Table 3-1- Group interviewing and discussion stages

Stage	Technique	Purpose
1	Adapted Focus Group Method of Enquire - AFGME	Define sustainabilty. Determine the importance of three categories (economic, environment and social) by attributing weights for each out of 100%. Produce a sustainability concept map that mirrors the sustainability definition.
2	Adapted Nominal Group Technique - ANGT	Produce list of indicators. Rank indicators within each category. Produce an overall indicators list from all categories.

There is vast literature comparing group interviewing techniques (e.g. Nominal Group Technique, Focus Groups, Brainstorming, among others). Each of these has advantages and disadvantages when compared to each other (De Ruyter, 1996; Dobbie, Rhodes, Tysinger, & Freeman, 2004; Fox, 1989). For the purpose of this investigation, the above-mentioned techniques were combined and adapted with the aim of obtaining representative results. The objective of the second stage of the group discussions was to determine an overall ranked list of indicators for vineyard sustainability assessments and a ranked list within each one of the three sustainability categories: economic, environmental and social.

Wine regions

The data presented in this article were collected from December 2011 to November 2012 as part of a larger study on sustainability in vineyards (Santiago-Brown et al., in-press). The data came from nine wine regions in five New World wine countries:

McLaren Vale, Barossa Valley and Adelaide Hills in Australia; Stellenbosch in South Africa; Lodi, Napa Valley and Willamette Valley in the United States; Santiago in Chile; and Marlborough in New Zealand. At the time of the data collection, these regions seemed to have the most developed programs for sustainable grape growing, assessing it at an individual organisation level.

Participants

The 83 participants were sourced from wine grape growing organisations that also owned vineyards (Santiago-Brown et al., in-press). Only the executives and high level managers (CEO's, general managers, chief viticulturists or chief winemakers) employed in private grape growing organisations participated in the sessions. They were invited to attend a two-hour meeting, which was split into two stages. It was assumed that they were representative of the actions and strategies of their organisations (Hambrick & Mason, 1984).

The hybrid method

The first stage was conducted following an adapted version of the focus group method, which we called Assisted Focus Group Method of Enquiry (AFGME) (Santiago-Brown et al., in-press). The main purpose of this first stage was to define sustainability using the grape growing context, followed by the introduction of the sustainability triple bottom line approach. This approach encompasses the economic, environmental and social categories of the sustainability concept. The individual viewpoint of each participant regarding the weight of each one of these three categories in relation to each other was taken into consideration.

When the first stage of the discussion was concluded, our Adapted Nominal Group Technique – ANGT - was used to conduct the second stage of the group discussion, the subject of this paper. Nominal Group Technique (NGT) was originally developed in the early 1970's (Delbecq & Van de Ven, 1971) as a group discussion technique oriented to solve and identify problems, and in decision-making processes (De Ruyter, 1996; Gallagher, Hares, Spencer, Bradshaw, & Webb, 1993; Pastrana et al., 2010). The technique involves a structured process that aims to ensure equal opportunity for participants to share their thoughts.

A typical NGT (including modified methods) is organised into at least seven steps: (1) clear statement of the problem; (2) individual generation of ideas (prior to or during the session) on a blank page with the printed question on it; (3) the listing of individual ideas on a flip-chart in a round-robin format, where the list is built by collecting "one idea per person per turn" (Fox, 1989), in written or oral format; (4) limited discussion among participants, guided by the moderator, only to ensure clarification of items and merging of similar ideas; (5) individual rank of three to five best ideas; (6) voting, public or secret, through cards or stickers on the list; and (7) final rank from group voting and/or ranking, usually shared with participants at the end of the session (Delbecq & Van de Ven, 1971; Dobbie et al., 2004; Duggan & Thachenkary, 2004; Fox, 1989; Jones, 2004).

The initial difference between our ANGT and the NGT is related to participants' preparation. For our group, no prior preparation was required from participants. They were only advised that they would be part of an investigation of sustainability in vineyards. Secondly, the introduction to the topic happened during the first stage of the meeting. Participants were introduced to the sustainability concept and a vague explanation of the meaning of the term indicator ("something you can use to measure sustainability") through the group discussion. Explanations of terms used by the moderators were kept to a minimum to minimize bias. The only assumption provided was that economic, environmental and social categories should be taken into account in their proposed list of indicators. This assumption about categories was given to participants after a free discussion of the general meaning of sustainability. The discussion was moderated following focus group standards to ensure all participants in the group were heard. The aim was to capture indicators from the actual operational experience of participants' vineyards and their perception of the importance of each one of these indicators. The contribution from actual operations based on variables that vineyard operators use to manage their business would contribute to build a useful and meaningful list of sustainability indicators.

The ANGT discussion was conducted in three phases and started with the distribution of a set of blank forms to participants. They were asked to individually write down three to five sustainability indicators for the sustainability of their vineyards. Participants had no restrictions on the indicators that they could propose. Any qualitative or quantitative indicators would be accepted. All participants were encouraged to share their indicators with the group in any order. A list was drawn up on a flip chart with all suggested indicators. Unlike the NGT, a round-robin format was not used. In our pilot session we found that many participants elaborated their thoughts while they were presenting. Interactions among participants, when well moderated, contributed to a synergistic effect among participants. In the majority of the groups, a participant would share all of his, or her, indicators followed and complemented by another participant, in spontaneous rather than prescribed order, until everyone in the group had contributed to the list. The list was kept available for all participants for the second phase of the ANGT.

The second phase of the ANGT was similar to the first, except that participants were required to list the indicators into three discrete categories: economic, environmental and social. Participants were advised that they could use the initial group list, available on the flip chart, to help them to build the three new lists. New proposals for indicators were encouraged. Participants were also informed that an identical indicator could be repeated, if applicable, in different categories. The three lists from each participant were made available by posting them on the walls of the discussion room.

Scoring was conducted in the third phase of the ANGT. Participants were required to score from zero to four (or non-applicable/non-opinion) for each of the items in a round-robin format. *Non-applicable/no-opinion* could be used in two distinct situations: (1) structurally non-applicable (NA) (for example, organisation with no employees did not score indicators related to employee welfare for their companies), or (2) the lack of an opinion (NO) at the moment of the discussion for a particular indicator. We did not want to force participants to score if the proposed indicator was new to the participants and they were not comfortable about scoring something for which they did not yet have an opinion. There were only a few NA/NO responses and they were excluded from the average calculations.

The round-robin format was important for this phase because as each indicator was being scored there was an opportunity for the proponent to clarify the indicator, if necessary. The round-robin format ensured that all participants had a similar understanding of the items they were scoring as the scoring occurred immediately after the indicator was read out loud (and elaborated and discussed, when necessary, for the purposes of clarification) for the group. Unlike the NGT process, participants were not asked to choose three to five items from the list or to create an individual rank among the items on the list. All participants scored all indicators listed, unless they were non-applicable to their context or the participant had no-opinion on the indicator listed. Each indicator was scored individually, and participants were not asked to rank them. When the group, including the moderators, found similar items in the list, those items were merged only after discussion and with group consensus.

Data Analysis

The sessions were audio and audio-video recorded and transcribed. The forms used by participants, with their written proposed indicators, were collected at the end of each session. The flip-chart sheets were also collected. This data set was used to create three Excel spreadsheets (economic, environment and social indicators) where columns were indicators and rows were participants. Each column was numbered sequentially within each category, assigning a number to each indicator. Each set of indicators proposed by a specific group was colour coded with a distinct colour. The spread sheet was printed in a large format and all indicators were physically cut apart with scissors creating three big puzzles on a surface. The colour and number code would ensure traceability of the origin of each original indicator. The puzzles with indicators from each category were used to facilitate the merging of similar indicators among groups. Examples of merged items to produce the indicator presented in this investigation are shown in Table 3-2. Also, when similar indicators within the same group were found, they were merged and their scores averaged (becoming one). This may have occurred due to the minimal interference of moderators and long lists produced by some of the groups. Most merging processes happened during the sessions. However, many similar or identical indicators were mentioned in different sessions.

Table 3-2- Examples of how indicators were merged (as original lists)

Indicators	Examples of Merged Items
	ECONOMIC
Vine health	Longevity of the vineyard (e.g. disease free, virus free, etc.); longevity of the vines; increasing lifespan of the vineyard; useful life of the vineyard; health and longevity of the vineyard
Yield	Yield, tons per hectare; tonnes per hectare, tons per acre, productivity, production per hectare, production - so yield and production performance
Labour costs	Employees' wages, labour costs and input cost - labour
	ENVIRONMENT
Soil health	Soil health, maintaining nutrient status in the soil, improvement of soil health, monitor and optimise soil health, soil health - microbial activitiy, healthy soil, soil health capable to support the vineyard, soil health/vitality, presence of heavy metal in soil (not desirable), natural fertility of soil,soil microbiology, etc.
Aesthetics	Aesthetics and amenity, maintaining the integrity of the property, landscape and topography, aesthetics of your vineyard
Biological controls	Importance of biological controls and presence of beneficial insects
Erosion	No erosion, decrease erosion, reducing erosion, erosion and no till.
	SOCIAL
Happy workers	Happiness of people, happy workers, happy employees, labour climate, satisfaction of the employees (through surveys an worker satisfaction).
Happy neighbours	Good neighbouring, happy neighbours, number of incidents/complaints per year (concil), good communication with neighbours, good neighbours relations and reducing spray drifts to neighbours.
Business viability	Financial return and viability of your business and financial sustainable employment on farm.

The process of producing a final list of merged indicators used the following steps: (1) main researcher defined the best wording to describe each set of merged indicators, (2) moderator reviewed the proposed grouping, and (3) proposed wording and indicator groups, were signed-off by the chief investigator. Merged indicators from the puzzle were transferred to a spread sheet. For each merged indicator, the following were counted: the number of participants in the group that scored that indicator; and the number of ANGT sessions that mentioned the specific indicator. For each indicator the average of the scores from the participants, who gave a score to that indicator, was calculated. A rank of importance was created by calculating what we call the Importance Index by multiplying the number of groups that mentioned a specific indicator by the average score of that indicator. So, for example, biodiversity (within the environment category) was scored by 67 participants in 11 ANGT sessions. The average score given by the 67 participants is 3.16. The Importance Index is then 3.16 x 11, which equals 34.75. In this way, each ANGT session would have the same weight in our importance index calculations, independent of the number of people in each group. From the results of these calculations a spider graph for each category was created with indicators listed alphabetically. In the spider graphs display the more important indicators within each category, are closer to the outer circle.

To make the indicators comparable between different categories, the importance index was adjusted. The Adjusted Importance Index (AII) was calculated by multiplying the Importance Index by the participants' importance score (weight for each category, summing to one hundred percent) from stage 1 of this investigation. Economic components represented 41%, followed by environment, 35% and social 24% (Santiago-Brown et al., in-press). The attributed importance (weight) for each one of the sustainability categories was calculated from these results.

The decision to discontinue interviewing was made by the main researcher and group discussion moderator. Both agreed that additional groups would not add significant insights and results to the discussion. Sustainability themes, concepts and indicators were occurring repeatedly among groups. By the end of the fourteenth group session, theoretical saturation was achieved. There was a clear understanding that new and unique indicators could potentially be proposed by additional groups, but they are unlikely to affect the research results as they were not mention by the preceding groups (Draucker, Martsolf, Ross, & Rusk, 2007; Onwuegbuzie, Dickinson, Leech, & Zoran, 2009; Westhues et al., 2008).

Results and discussion

The ANGT sessions generated 507 indicators (Table 3). The participants proposed 161 economic, 171 environmental, and 175 social indicators to assess sustainability of individual organisations at the farm-gate. Table 3 also shows the number of indicators after similar ones were merged as well as after excluding the indicators only mentioned in a single session. The latter were excluded from the results, as they were not considered sufficiently representative for this investigation. The merged list was about one quarter of the size of the original one: 53 economic indicators, 34 environmental and 36 social totalling 123 indicators. The final merged list encompasses 76 indicators (27 economic, 26 environmental and 23 social). The following sections of this article present and discuss the indicator ranks from each sustainability component based on the Importance Index (II), followed by the combined list ranked from the Adjusted Importance Index (AII).

Table 3-3- Summary of number of indicators in each step of data processing

	Original indicators mentioned in all sessions	Merged indicators, mentioned in multiple sessions	Merged indicators, excluding the ones only mentioned in a single session
Economic	161	53	27
Environment	171	34	26
Social	175	36	23
Total	507	123	76

Intersected indicators for a better assessment

The results contribute to the understanding that sustainability assessments through indicators must be systemic. To fully assess sustainability, all three categories and their interrelationships should be taken into account. The final list comprises indicators from all three categories. For instance, as important as they might be, indicators such as *soil health* (environment) or *grape fit for purpose* (economic), first and second in the rank of importance (Table 3-4), in isolation only assess the sustainability status of a vineyard partially and at a specific time. Soil health assessments are based on whatever type of soil tests (chemical and/or physical and/or biological) are taken during a specific year. Grape fit for purpose can only be assessed in the framework of the original production plan and/or sales contract for a specific vintage. Sustainability assessments through measurements, such as indicators, must be seen as a process capturing changes in a farm over time (Oliver et al., 2013).

Table 3-4- Sustainability indicators

Rank	Sustainability Indicators	Number of participants	ANGT sessions	Participants' Average	Importance Index	Adjusted Importance Index
1	Soil health (ENVIRO)	64	12	3.61	43.31	15.16
2	Grape fit for purpose (ECON)	51	10	3.57	35.69	14.63
3	Water use optimization (ENVIRO)	61	11	3.37	37.06	12.97
4	Economic yield (ECON)	51	9	3.42	30.76	12.61
5	Biodiversity (ENVIRO)	67	11	3.16	34.75	12.16
6	Off farm impacts from farming (including healthy waterways)	51	9	3.48	31.32	10.96
7	Chemical inputs optimization (ENVIRO)	49	9	3.32	29.85	10.45
8	Management costs (ECON)	38	7	3.42	23.95	9.82
9	Staff retention (SOCIAL)	44	8	3.38	27.00	9.45
10	Profitability (ECON)	34	6	3.65	21.88	8.97
11	Yield (ECON)	36	7	3.10	21.68	8.89
12	Pest and disease management (ENVIRO)	42	8	3.14	25.14	8.80
13	Operational efficiency (ECON)	37	6	3.38	20.27	8.31
14	Soft/Appropriate chemical use (ENVIRO)	45	7	3.36	23.49	8.22
15	Grape demand (ECON)	23	5	3.85	19.24	7.89
16	Carbon footprint (ENVIRO)	26	6	3.10	18.58	6.50
17	Vine health (ECON)	27	5	3.15	15.74	6.45
18	Return of investment (ECON)	24	4	3.81	15.25	6.25
19	Training (SOCIAL)	37	8	3.19	25.51	6.12
20	Erosion (ENVIRO)	23	5	3.48	17.39	6.09
21	Healthy work environment (SOCIAL)	42	7	3.40	23.81	5.71
22	Workers engagement (SOCIAL)	44	7	3.39	23.70	5.69
23	Community benefits (SOCIAL)	44	9	2.63	23.63	5.67
24	Soil organic carbon (ENVIRO)	30	5	3.23	16.17	5.66
25	Improving operational efficiency (ECON)	25	5	2.68	13.40	5.49
26	Beyond legal standards for workers (SOCIAL)	42	7	3.20	22.42	5.38
27	End price of wine (ECON)	26	4	3.19	12.77	5.24
28	Brand value (ECON)	28	4	3.18	12.71	5.21
29	Vine health (ENVIRO)	15	4	3.49	13.96	4.88
30	Happy neighbors (SOCIAL)	35	6	3.35	20.11	4.83
31	Operational/management continuous improvement (ENVIRO	19	4	3.42	13.68	4.79
32	High fruit quality production (ECON)	19	3	3.79	11.37	4.66
33	Winery profitability (ECON)	20	3	3.60	10.80	4.43
34	Compliance with labor laws (SOCIAL)	32	6	3.06	18.34	4.40
35	Aesthetics (SOCIAL)	30	6	3.00	18.00	4.32
36	Happy workers (SOCIAL)	32	5	3.59	17.97	4.31
37	Labor costs (ECON)	16	3	3.44	10.31	4.23
38	Grape price (ECON)	16	3	3.31	9.94	4.07
39	Healthy work environment (ENVIRO)	18	4	2.86	11.44	4.01
40	Carbon footprint (ECON)	28	5	1.93	9.64	3.95
41	Inputs reduction (ECON)	23	4	2.39	9.57	3.92
42	Air quality (ENVIRO)	16	3	3.69	11.06	3.87
43	Recycling (ENVIRO)	22	4	2.73	10.91	3.82
44	Community health (ENVIRO)	13	3	3.46	10.38	3.63
45	Soil compaction (ENVIRO)	19	3	3.42	10.26	3.59
46	Land value (ECON)	27	3	2.89	8.67	3.55
47	Workers time off (injury/sick days) (SOCIAL)	23	4	3.67	14.67	3.52
48	Succession planning (ECON)	20	3	2.85	8.55	3.51
49	Wine (SOCIAL)	24	4	3.54	14.17	3.40
50	Fuel use (ENVIRO)	17	3	3.18	9.53	3.34
51	Workers housing (SOCIAL)	24	4	3.46	13.83	3.32
52	Production consistency (ECON)	11	2	4.00	8.00	3.28
53	Education (SOCIAL)	28	4	3.39	13.57	3.26
54	Record keeping (ENVIRO)	18	3	2.89	8.67	3.03
55	Community health (SOCIAL)	31	5	2.42	12.10	2.90
56	Protective equipment (SOCIAL)	11	3	4.00	12.00	2.88
57	Ability to benchmark performance (ECON)	21	3	2.33	7.00	2.87
58	Labor productivity (ECON)	12	2	3.50	7.00	2.87
59	Contracts (ECON)	15	2	3.27	6.53	2.68
60	Management continuous assessment (ECON)	9	2	3.22	6.44	2.64
61	Vineyard design (ENVIRO)	16	2	3.63	7.25	2.54
62	Ratio input:output in farm (as close as possible system) (EN\	16	3	2.38	7.13	2.49
63	Biological controls (ENVIRO)	12	2	3.50	7.00	2.45
64	Aesthetics (ENVIRO)	10	3	2.30	6.90	2.42
65	Certifications (SOCIAL)	18	3	3.19	9.58	2.30
66	Staff retention (ECON)	14	2	2.79	5.57	2.28
67	Certifications (ENVIRO)	13	2	3.21	6.41	2.24
68	Pesticide reduction (ENVIRO)	7	2	3.14	6.29	2.20
69	Capital replacement cost (ECON)	8	2	2.63	5.25	2.15
70	Use of (appropriate) cover crops (ENVIRO)	8	2	3.00	6.00	2.10
71	Workers productivity (SOCIAL)	14	3	2.64	7.93	1.90
72	Social events for workers (SOCIAL)	16	3	2.63	7.88	1.89
73	Business viability (SOCIAL)	13	2	3.85	7.69	1.85
74	Workers ownership (SOCIAL)	15	2	3.13	6.27	1.50
75	Labor costs (SOCIAL)	11	2	2.73	5.45	1.31
76	Tourism (SOCIAL)	14	2	2.71	5.43	1.30

Notes: For details on how the attributed weights were calculated, please refer to Santiago et al, 2013

The results also show indicators recurrent in more than one list, emphasizing the difficulty of single sustainability viewpoint analysis. Also, many of these indicators are complexly entwined into all three sustainability components in spite of being distinct in one of the three specific lists. For instance, use of appropriate cover crops is related to soil, but it can also be directly related to water availability, crop and yield. Furthermore, the use of cover crops can have a direct impact on aesthetics, biodiversity and erosion. Isolated indicators can tell only partial stories.

The indicator choice is an essential part of the decision making process (Noss, 1999; Parmenter, 2010) to improve sustainability outcomes. For instance, if financial results, such as profitability, were to be considered as the only driver in decision-making in agricultural business, in many (or most) situations the farmer's decisions with respect to environmental categories would be to do nothing (Bridgman, 2009). Wojtkowski (2006) points out that many intangible (but likely beneficial) variables are not being taken into account in purely financial measurements of sustainability. For example, Flores and Sarandón (2002) argue that the selection of different agricultural technologies is still done using simplified cost-benefit analysis, which tends to overestimate the performance of some systems. Because of that, simplified cost-benefit analysis may encourage the production and degradation of natural capital, as it does not include the environmental costs generated by the productive activity. Intangible variables, such as aesthetics, comfort, satisfaction, healthy surroundings, among others, are also essential parts of human/farm interaction that are not currently expressed quantitatively (Wojtkowski, 2006).

The proposed indicators

This investigation differs from the majority of sustainability studies because of the uniqueness of the participants' characteristics in a participatory bottom-up approach. Only top-level executives took part in this investigation. Participants were not poor-resourced farmers in remote rural communities which would have different agenda well described by agroecologists (Altieri & Nicholls, 2005; Gliessman, 2011; Wojtkowski, 2006). They were owners, or executives employed by their organisation, whose goal is to run the vineyard as a sustainable business in a developed economy. The majority of them had higher education access: 61% with Bachelor's degree, 20% Masters, and 5% a PhD (Santiago-Brown et al., in-press). The list of indicators proposed by them and presented in this article reflects the measurements they use in their own business to endure over time.

Indicators were ranked exclusively by the attributed importance from participants. Not surprisingly, the overall proposed rank seems to list (many) similar indicators proposed by other studies in sustainability gathered from different methodologies. Some examples include soil health/quality (Abbona et al., 2007; Oliver et al., 2013); biodiversity (Abbona et al., 2007; Altieri, 1992); chemical inputs (Bastianoni, Marchettini, Panzieri, & Tiezzi, 2001); water use optimisation and off-farm impacts, including waterways (Benini, Bandini, Marazza, & Contin, 2010), productivity (Altieri, 1992), yield (Astier, Speelman, López-Ridaura, Masera, & Gonzalez-Esquivel, 2011; Koohafkan et al., 2012); and aesthetics (Paoletti, 1999). Nevertheless, this investigation is unique as it objectively proposes lists of indicators ranked by their importance.

The ranks could contribute to decision-making processes in systems assessing sustainability of individual farms, including vineyards. The ranks should also contribute where there is an understanding that measurements have cost implications. The collection of any indicators increase management costs at the individual organisation, regional, private or governmental levels. Indicators should be chosen by the impact they can promote in the increase of sustainability outcomes in any system. The sustainability indicator ranks in this study should contribute to the understanding of the importance of each proposed indicator for sustainability assessments.

Proposed economic indicators

Figure 3-1 displays a spider graph of the economic sustainability indicators ranked by the Importance Index (II). *Grapes fit for purpose* is the highest rated economic indicator (Importance Index of 35.69) followed by *economic yield* (II=30.76), *management costs* (II=23.95), *profitability* (II=21.88), *yield* (II=21.68), *operational efficiency* (II=20.27), *grape demand* (II=19.24), *vine health* (15.74) and *return of investment* (II=15.25), down to *capital replacement costs* (II=5.25).

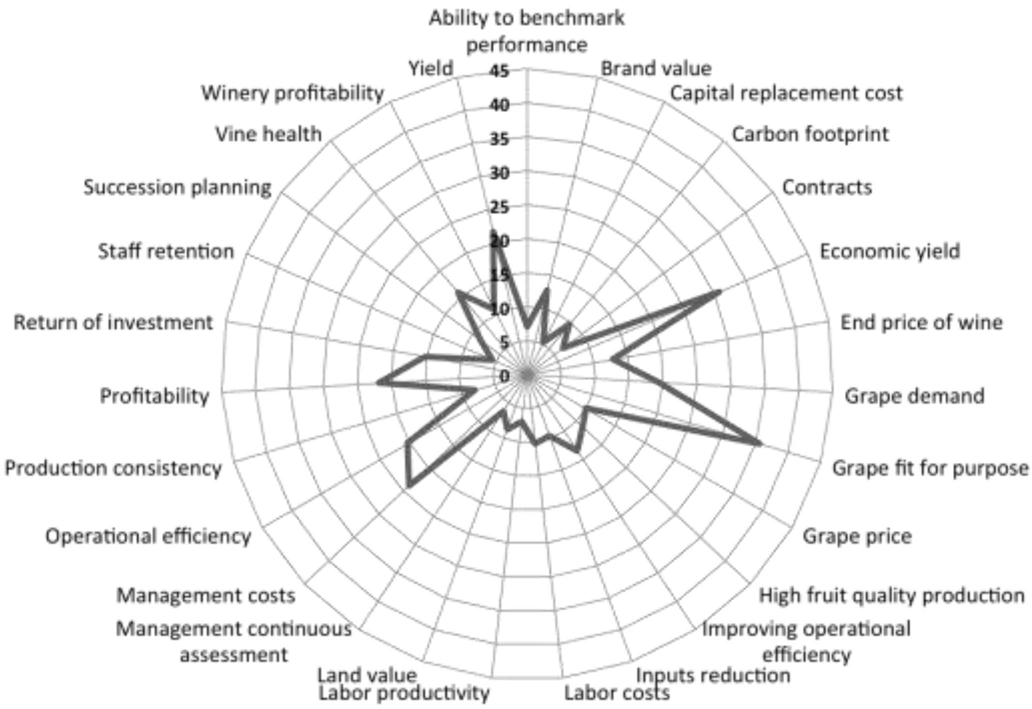

Figure 3-1- Spider graph of ranked economic indicators, alphabetically ordered

Grapes fit for purpose is a measurement of achieving the intended production quality. It is the most important economic indicator in the list. Fifty-one participants (out of 83 in total) mentioned it in 10 group sessions. The average score was 3.57 out of 4. *Economic* yield is the second highest economic indicator. It represents the total economic return of a crop by area taking into account both production (yield) and quality - fit for purpose (G. J. Hoffman, Howell, & Solomon, 1990).

Further comparisons between top indicators in each list are also described in this investigation with the objective of giving the reader an indication of importance between listed indicators. The percentage change between the highest, *grapes fit for purpose*, and the second ranked economic indicator, *economic yield*, is about 14%.

The percentage change between the *management costs* indicator (third most important indicator) and *economic yield* is 22%. The comparison between the *grapes fit for purpose* indicator with the indicator *improving operations efficiency* (10^{th} place in the economic rank) shows a decrease in importance of 62%. The weight of each indicator from the list is useful to select the most relevant ones in accordance to individual budgets and strategic objectives. The importance index is a powerful reference based on 83 real-vineyard operations from five distinct countries.

Proposed environmental indicators

Van der Werf and Petit (2002) review 12 indicator-based assessment methods to evaluate environmental sustainability and conclude that: (1) methods should consider both local and global effects, (2) quantitative indicators, mainly effect-based ones, are necessary to identify if results were attained or not, (3) indicators should measure impacts both per unit surface and per unit product, (4) indicators measuring outputs are preferable on a physical scale to scores to be able to benchmark results with the real world, (5) indicator thresholds should be defined, (6) indicator methods should fit the purpose of the objectives of the assessment, and (7) trade-offs should be carefully evaluated to ensure correct evaluations. The indicators proposed by these methods are driven by their objectives: input related, emission related and system state related. Many of the main indicators used by the 12 methods, such as soil erosion and quality, land use, water use and quality, fertiliser use, pesticide use, greenhouse-gas emissions, biodiversity among others, are similar to the indicators proposed by this investigation.

Unlike the proposed guidelines from Van der Werf and Petit (2002), the authors of this investigation prefer the definition of reference levels to thresholds for sustainability indicators. Reference levels do not assume a 'pass/fail' situation, if a certain number is not achieved. We understand indicators as reference points over time. The system can be adapted as new data are collected and provide more sophisticated and useful assessments for improving farms' sustainability.

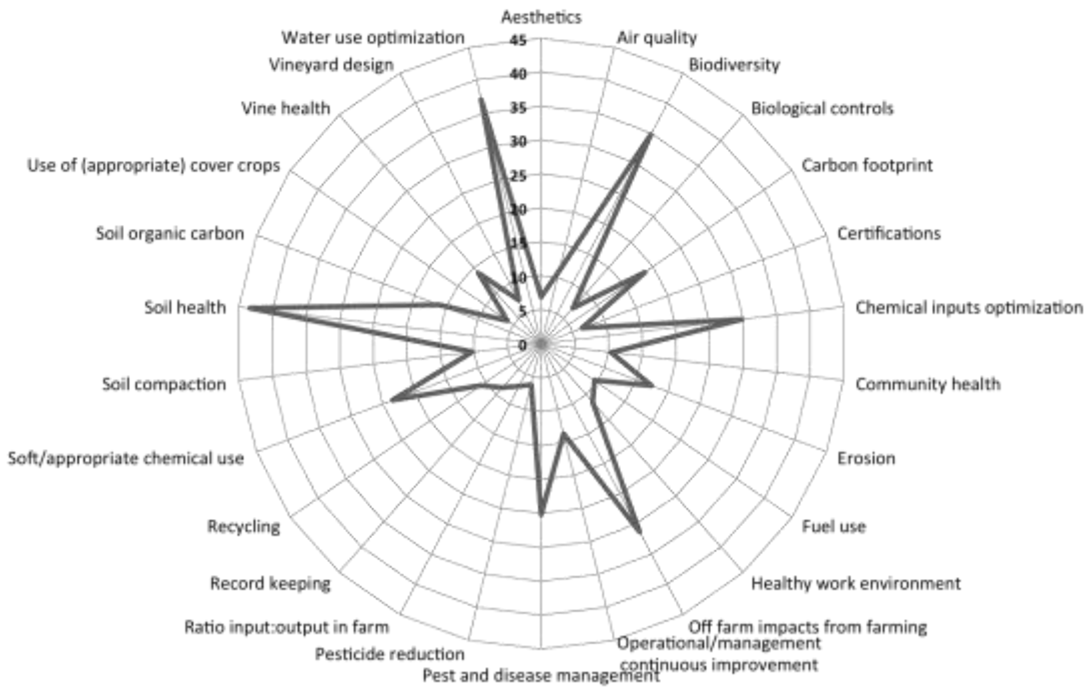

Figure 3-2 - Spider graph of ranked environmental indicators, alphabetically ordered

The environmental indicators are displayed as a spider graph (Figure 3-2) showing their importance index within this category. The most important environmental indicator, according to the group results is *soil health*. It has the Importance Index of 43.31, followed by *water use optimisation* (II=37.06), *biodiversity* (II= 34.75), *off farm impacts from farming (including waterways)*

(II=31.32), *chemical inputs optimisation* (II=29.85), *pest and disease management* (II=25.14), *soft/appropriate chemical use* (II=23.49), *carbon footprint* (II=18.58), *erosion* (II=17.39) down to *use of appropriate cover crops* (II= 6.0). The percentage change between the indicators *soil health* and *water use optimisation* is approximately 14%. However, the same calculation between the second and the third environmental indicators, water use and *biodiversity* respectively, is only 6%. The differences in indicators importance (from the top 10 in this group) become significantly higher from *pest and disease management* (ranked 6th) onwards. When *soil health* is compared with pest and disease management the percentage change is 44%. Compared with erosion (ranked 9th), it is 60%.

Within environmental indicators, 64 participants in 12 distinct ANGT sessions scored *soil health* as most important. Twelve was the maximum number of times a specific indicator was cited in the sessions (total of 14 sessions). Nevertheless, several indicators in the top list, such as erosion, *soil organic carbon*, *vine health, soil compaction* and *use of appropriate cover crops* are closely related to *soil health*. Therefore, soil related indicators were recurrent in all ANGT sessions. As an individual indicator, *biodiversity* ranked third place in the list, but 67 participants scored it. This most frequently proposed indicator among all categories averaged 3.16 (out of 4 scale) in 11 groups. Carbon footprint ranked eighth in the list in spite of the on-going debate on carbon footprint and climate change worldwide. It is important to point out that in the context of this investigation, greenhouse-gas emissions from the viticultural phase represents about 20% (Bosco et al., 2013) of the total emissions in the wine chain. Likewise, greenhouse-gas emission from arable farming represents only 10-12% of the total carbon emissions in the world (Friel et al., 2009).

Nevertheless, it is also important to point out that several top indicators could be easily merged into the *carbon footprint* indicator (e.g. *chemical use optimisation*, *fuel use* and *pesticide reduction*), but it would generate extremely generic indicators that would unlikely be useful for real life vineyard assessment.

Proposed social indicators

Indicators to assess social sustainability at farm-gate are not easily found in scientific literature. Figure 3 shows the social indicators proposed by this investigation, ranked by their importance index. *Staff retention* is the most important indicator within the social category with an Importance Index of 27. The second highest ranked social indicator is training (II=25.51), followed by *healthy work environment* (II=23.81), *workers' engagement* (II=23.70), *community benefits* (II=23.63), *beyond legal standard for workers* (II=22.42), *happy neighbours* (II=20.11), *compliance with labour laws* (II=18.34), *aesthetics* (II=18), *happy workers* (II=17.97) down to *tourism* (II=5.43).

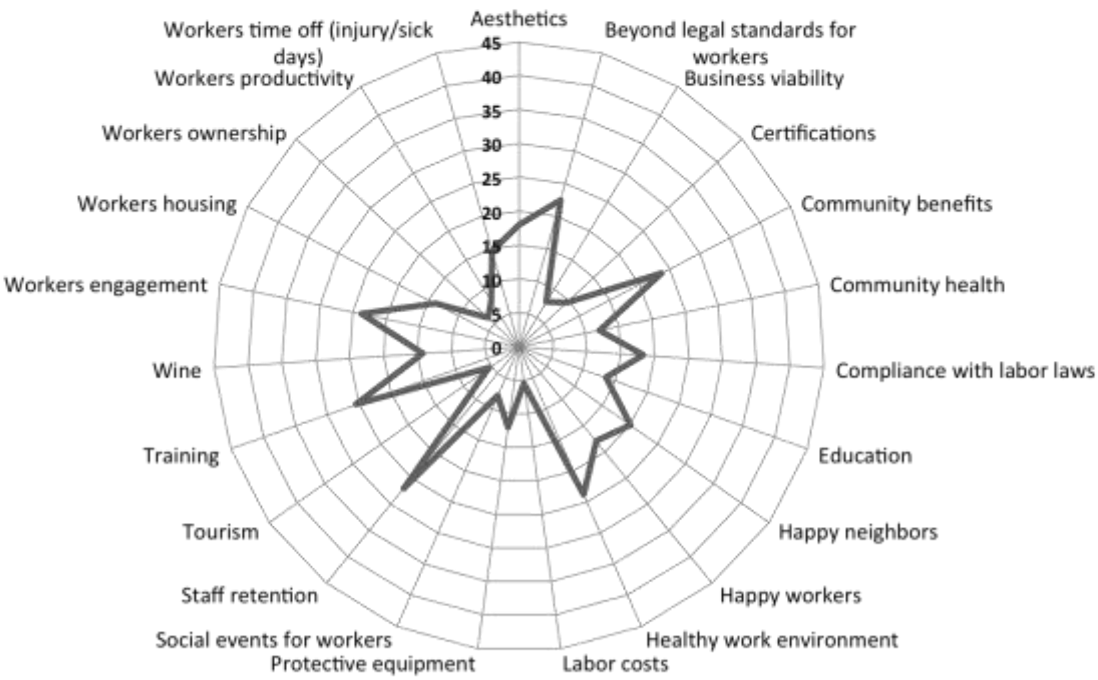

Figure 3-3- Spider graph of ranked social indicators, alphabetically ordered

Participants ranked the first six social sustainability indicators similarly. The decrease in the importance index between the six indicators is not high, varying from 27 to 22.42 (decrease of 17%). Among these, the community benefits indicator was cited by 9 groups. It was the highest recurrence among groups when listing social indicators. *Community benefit* also had the second lowest participants' average (2.63 out of 4) along with the indicator *social events for workers*. The high recurrence of *community benefits* in the ANGT session was fifth-ranked among the social indicators.

A good start for systemic assessment using a triple bottom line approach

Seventy-six indicators ranked by their Adjusted Importance Index (AII) are shown on Table 4. The new list with indicators adjusted by the average attributed weight shows *soil health,* from the environmental list, as the most important indicator amongst all. Its Adjusted Importance Index is 15.16 (II x attributed weight =43.31 x 35% =15.16). The second most important indicator, g*rapes fit for purpose*, belongs to the economic group and has an Adjusted Importance Index of 14.63 (35.69 x 41%). The first social indicator, *staff retention,* became ninth in this overall list (27 x 24% =9.45). Considering the top ten sustainability indicators from this combined and weighted list, five are environmental, four are economic and one is social. However, g*rapes fit for purpose* (economic) is only 3.5% less important than *soil health* (environment), first in the overall rank.

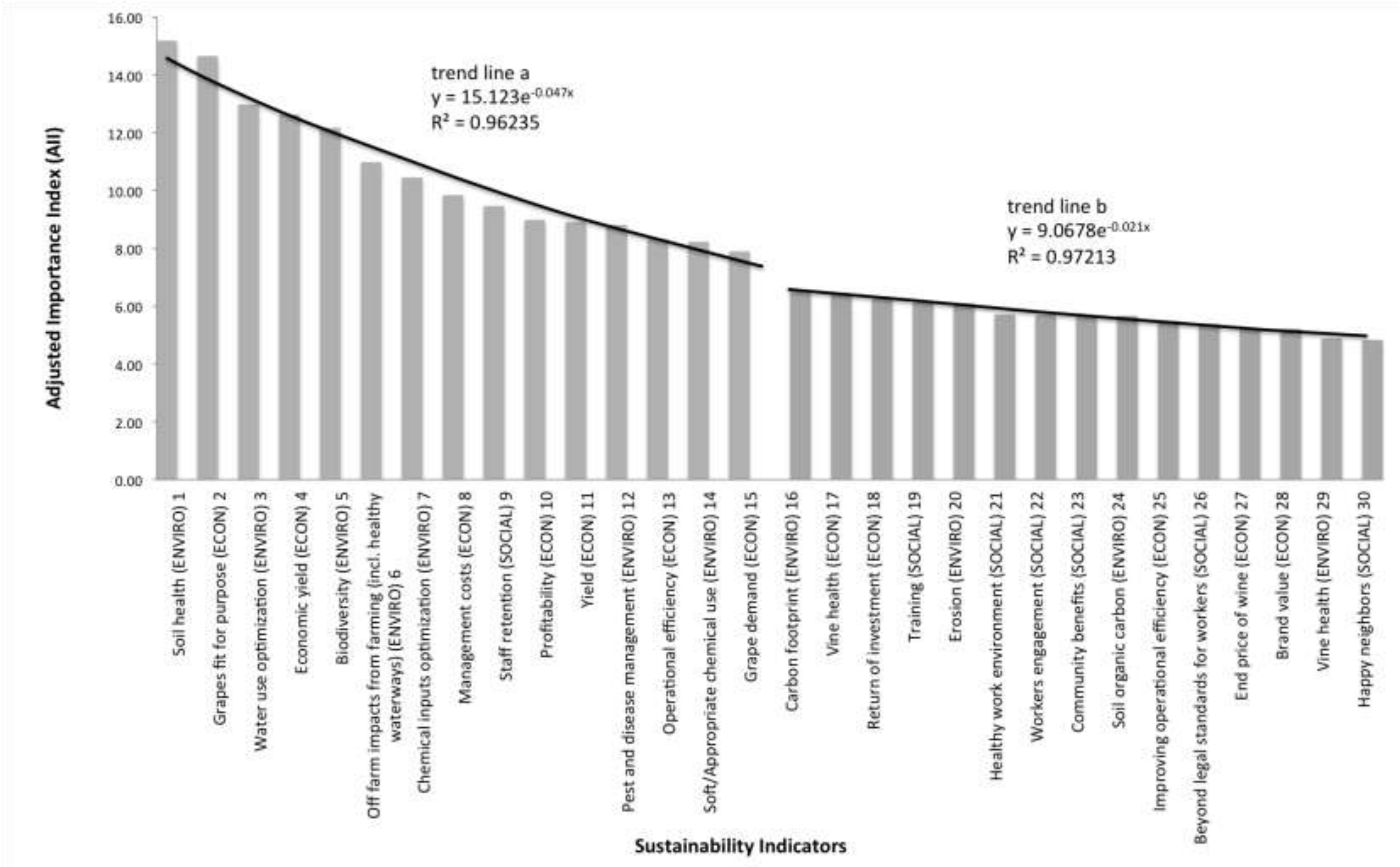

Figure 3-4- Top 30 sustainability indicators, ranked by the Adjusted Importance Index (AII)

Figure 3-4 is a Pareto chart of the top 30 indicators ranked by the Adjusted Importance Index. There is a particularly noticeable drop between *grape demand* (ranked 15th) and *carbon footprint* (environment – ranked 16th). Because of that, the top 30 indicators were grouped in two sets (fifteen each) to produce two distinct logarithmic trend lines, identified as *a* and *b*. From the 1st to the 15th indicator (*grape demand*), the importance of the indicators steadily decreases. From the 16th onwards the decrease in importance is more stable. Figure 3-4 shows that the first fifteen indicators are well fitted by an exponential function, which gives an importance of 14.43 for the first indicator, reducing by 0.954 in a geometric progression. The indicators from 16th onwards are well fitted by a second exponential function, which give an importance of 6.48 for the sixteenth indicator, reducing by 0.979 in a geometric progression. The last indicator shown in this chart, *happy neighbours*, (social), has an Adjusted Importance index of 4.8 while the *index soil health* (environment) is three times larger.

Recurrent Indicators

Table 3-5- Recurrent indicators

Recurrent indicator	Economic	Environment	Social
	Adjusted Importance Index (AII)		
Aesthetics		2.42	4.32
Carbon footprint	3.95	6.50	
Certifications		2.24	2.30
Community healt		3.63	2.90
Healthy work environment		4.01	5.71
Labor costs	4.23		1.31
Staff retention	2.28		9.45

Recurrent indicators in different sustainability categories are shown in Table 5. *Aesthetics*, *carbon footprint*, *certifications*, *community health*, *healthy work environment, labour costs* and *staff retention* are recurrent in at least two sustainability categories (Table 3-5). Most recurrences are between environmental and social list. *Aesthetics* in the social category is 78% more important than in environment. *Carbon footprint* (economic) is 39% less important than in the environment group. *Certifications* have about the same participants' average in both environment and social categories. However, the Adjusted Importance Index shows that *certifications* are slightly more important to the social (AII=2.30) than to the environment (2.24) list. The *community health* indicator is 25% more important in the environment than social category. *Healthy work environment* is 42% more important in the social category than in the environmental category. There are only two indicators that are recurrent in the social and economic lists: *labour costs* and *staff retention*. *Labour costs* is 223% more important in the economic than in the social category. On the other hand, *staff retention* is 315% more important in social than in the economic category. Only one indicator is recurring in both economic and environmental categories: *carbon footprint* is 65% more important in the environmental category than in the economical.

Conclusions

The ranked overall list of sustainability indicators has been constructed to be representative of wine grape growers in New World wines. To the best of our knowledge, there was no significant sustainability program in Europe assessing individual farms at the time the ANGT were organised. The methodology used to build the indicators list could be used to investigate Old World wine countries considering their context and particularities such as European Union regulations regarding plantings.

The data set was gathered from a sample of the wine industry population located in regions that have the most developed sustainability programs to assess sustainability of vineyards at the individual level. Participants were not only top-level managers/ operators, but were also involved (in many situations) with the development of sustainability assessments for their wine regions and organisations. As a result, their knowledge and experience contributed directly to production of a meaningful and useful list of indicators to assess sustainability in vineyards. Furthermore, the list also seems to reflect indicators proposed in different methods and programs worldwide. The point of difference in this research is that the indicators list proposed by this investigation reflects the perceptions and operations of everyday real vineyard management. This bottom-up approach produced a list of indicators that can be used by managers to evaluate and improve their businesses.

The literature review of indicator-based assessments shows that the environmental component seems to dominate the discussions of sustainability assessments of productive systems. The environmental appeal is incontestably important in sustainability assessments. Environment preservation and conservation is directly related to our existence as human beings. To continue to exist, it is necessary to preserve the air we breathe, the water we drink, and the land that produces the food we need. At the same time, the sole focus on environmental sustainability seems to compromise the full understanding of the importance of the equilibrium between the environmental, social, and economic components.

Assessments considering the triple-bottom line approach are necessary to assess the development, wealth, and long-term welfare of any system. Environmental components are as essential as economic or social factors in sustainability assessments.

Indicator choices are subject to the viewpoint and needs of the assessor (Cooper & Pearce, 2011). This viewpoint needs to be explicitly expressed to ensure accountability of sustainability assessments (Rametsteiner et al., 2011). Additionally, indicator thresholds are context dependent (Astier et al., 2011; Koohafkan et al., 2012). Type of crop, socio-economic environment, climate and soil are the minimum factors that need to be taken into account when establishing indicator thresholds to assess sustainability in agricultural systems. Sustainability outcomes are not easily measurable because of the complex interrelationship among indicators and lack of consensual definition for sustainability. To have assessments in place it is necessary to define, at the minimum, the following: (1) meaning of sustainability, (2) viewpoint of the assessor, (3) purpose of the assessment, (4) context, and, (5) time frame.

If something cannot be measured, it is unlikely it will be improved. During the Earth Summit in Rio de Janeiro in 1992 the United Nations recognized the importance of indicators for helping decision-making (Commission for Sustainable Development, 1995). If countries or organisations do not know their position in the market, it is likely that they will end in a place different from the one they originally intended to be (Böhringer & Löschel, 2006). The same analogy can be applied to an individual organisation. Indicators should be seen as the starting point of sustainability assessments. In the context of this investigation, indicators are presented as qualitative variables that in context will be quantified to fit the purpose and viewpoint of the proponents of given assessment.

Accountability is an embedded goal in any sustainability assessment. Therefore, the natural next step to ensure accountable sustainability assessment is the development of a communication strategy (Ferreira, Moulang, & Hendro, 2010) that would necessarily be dependent upon a credible auditing process (certification). In a world where you cannot see all the productive processes and therefore cannot assess yourself, certification is the known pathway to objectively assess measure and communicate sustainability.

Statement of Authorship

Title of Paper	Comparison of sustainability assessment programs for viticulture and a case-study on programs' engagement processes.
Publication Status	O Published, O Accepted for Publication, ⦿ Submitted for Publication, O Publication style
Publication Details	Santiago-Brown, Irina, Metcalfe, Andrew, Jerram, Cate, & Collins, Cassandra. (2014). Comparison of sustainability assessment programs for viticulture and a case-study on programs' engagement processes. Manuscript submitted for publication. (submitted to Sustainability)

Author Contributions

By signing the Statement of Authorship, each author certifies that their stated contribution to the publication is accurate and that permission is granted for the publication to be included in the candidate's thesis.

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Contribution to the Paper	Irina Santiago-Brown organized the focus groups, performed interviews, organised and interpreted data and wrote the manuscript.		
Signature		Date	

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Contribution to the Paper	Supervised the development of work, helped in data interpretation and contributed to the editing/proofing/revision process of writing. Acted as corresponding author.		
Signature		Date	27/2/14

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Signature		Date	27/2/14

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Contribution to the Paper	Supervised the development of work, helped with qualitative data analysis and methodological aspects of writing; and contributed to the editing/proofing/revision process of writing.		
Signature		Date	27/02/2014

Chapter 4. Comparison of sustainability assessment programs for viticulture and a case-study on programs' engagement processes

Abstract:

Sustainability assessments encompass four main stages: (1) definition of assessment method; (2) definition of indicators; (3) attributed scores and weights or compliance and (4) certification (conformance). This article categorizes assessment methods four distinct general types, based on their overall focus: (1) process-based, (2) best practice-based, (3) indicator-based and (4) criterion-based. This article presents the results of 14 focus group discussions with 83 top-level executives (CEOs, Chief Viticulturists or Chief Winemakers) from five countries (Australia, Chile, New Zealand, South Africa and the United States). The focus group results describe the expected benefits and inhibiting factors for growers' participation in sustainability programs from the viewpoint of the top-level managers from the wine grape industry. The most prominent sustainability programs for individual organisations in viticulture worldwide are documented and compared guided by a combination of 12 semi-structured interviews with managers either currently or formerly in charge of the sustainability programs and observations from the main researcher. Programs have been created to increase growers' sustainability, mainly through the direct and indirect education they promote and the overall economic benefit to their business caused by overall improvement of their operations.

Keywords: sustainability program; assessment; certification; wine grape; viticulture; agriculture; engagement; self-assessment; focus group; comparison

Introduction

This article aims to document and compare the most prominent sustainability assessment programs for individual organisations in viticulture worldwide and their certification processes. Sustainability concerns have become increasingly important since the publication of the "Our Common Future" report by the United Nations Commission on Environment and Development (WCED) in 1987 (Shen, Kyllo, & Guo, 2013). Sustainable development was defined as "economic growth that meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Comission on Environment and Development, 1987). Since then many countries have developed sustainability initiatives to promote sustainable development. Many of these initiatives have in turn generated regulations, especially on the environmental and social aspects of sustainability. Harmful consequences of chemical inputs from agriculture have been a common driver of many agricultural sustainability initiatives. Because of the high value of wine grapes (R. S. Jackson, 2008), wine grape growing regions have developed some of the most complex sustainability assessments and certifications for individual agricultural organisations. Most of these assessment programs incorporate a triple-bottom line approach, which evaluates entire production systems considering the interrelationship of economic, environmental and social factors (Elkington, 1998).

To the best of our knowledge, similar comparisons to this study have not been previously published in other peer-reviewed journals. This article seeks to fill this research gap by describing the following programs: Lodi Winegrowing Commission (LWC) Sustainable Workbook/Lodi Rules; Vineyard Team/ Sustainability in Practice (SIP); Low Input Viticulture and Enology (LIVE); California Sustainable Winegrowing Alliance (CSWA)/ California Sustainable Winegrowing Program (SWP); VineBalance, New York State's Sustainable Viticulture Program/Long Island Sustainable Winegrowing (LISW); Sustainable Winegrowing (SWNZ) from New Zealand; Integrated Production of Wine (IPW) from South Africa; Sustainable Wine from Chile (SWC); and McLaren Vale Sustainable Winegrowing (MVSWGA) from Australia. Where data are available, these descriptions include names of key individuals whose personal enthusiasm and motivation are perceived as essential for the program's implementation.

Finally, this article presents an analysis of the engagement process of viticultural sustainability programs based on results derived from 14 focus groups with 83 top-level managers from wine grape production organizations. We discuss growers' expected benefits and motives to become part of sustainability assessment programs as well as the main inhibiting factors and desirable reporting system features that can potentially contribute to program funding and membership uptake.

Methods of Measurement and Assessment in Sustainability programs

Methods of measurement are likely to change over time because of the development of new technologies; however the fundamental principles of measurements and especially of validity are likely to remain the same. "Validity is an overall evaluative judgment, founded on empirical evidence and theoretical rationales" (Messick, 1988 p.33). The main validity concerns, within measurements, are "interpretability, relevance, and utility of scores, the import or value implication of scores as basis for action, and the functional worth of scores in terms of social consequences of their use" (Messick, 1988 p.33).

Sustainability programs have developed their own assessment methods, adopting and/or adapting other evaluation methods from other sustainability programs in viticulture, agriculture or from other fields such as education, accounting, and management. Minimum fundamental issues must be defined prior to the establishment of the assessment method, such as: a sustainability definition (Hansen, 1996); scope; context; objectives; and viewpoint of the assessment (Santiago-Brown et al., in-press; Santiago-Brown et al., 2014). Having these issues defined, assessments must be constantly evaluated regarding their appropriateness, meaningfulness and usefulness (Messick, 1988). Therefore, in the scope of this investigation, beneficial outcomes from inferences made from assessment results improve wine grapes growers' sustainability.

Hansen (1996) concluded that sustainability is crucial to guide change in agriculture. In order to be able to positively impact on agricultural systems, rapidly respond to the need for change, ensure viability of agriculture over time and be a useful criterion to guide changes, sustainability not only needs to be defined but its characterization should be literal, system-oriented, quantitative, predictive, stochastic and diagnostic. This paper assumes that a *sustainable farm or vineyard* is "one that is able to economically provide for the farmer while maintaining its ability to consistently produce and improve quality over time" (Santiago-Brown et al., in-press) and that *assessment for sustainability* must incorporate a triple bottom line including economic, environmental and social components (Santiago-Brown et al., 2014).

Sustainability assessments roughly encompass four stages: (1) definition of assessment method; (2) definition of indicators; (3) attributed scores and weights or compliance and (4) certification (conformance). The term *indicator* is used broadly to indicate any direct, indirect, qualitative or quantitative defined measure of something to assess sustainability within a given system (Bragança, Mateus, & Koukkari, 2010). The assessment method determines which, and how, indicators are used. Scores and weights are subjective values attributed by the proponent of the assessment (Rametsteiner et al., 2011; Reig-Martínez, Gómez-Limón, & Picazo-Tadeo, 2011), usually based on scientific/expert knowledge and/or assessment goals and context. *Compliance* is related to fitness of the method and content and conformance is directly related to certification of compliance by an external authority (Font, 2002).

We categorize assessment methods generally in four distinct types based on their overall focus (see Table 4-1): (1) process-based, (2) best practice-based, (3) indicator-based and (4) criterion-based. Each of these can be used individually or combined and each has weaknesses and strengths. Independently of chosen method, the establishment of benchmarks and performance measures is necessary (Sainsbury & Sumaila, 2003; Santiago-Brown et al., 2014) to assist wine growers to improve their sustainability by comparing to their peers and analysing their results and/or performance against program goals. Certification can be developed for any of these methods with a higher or lower degree of complexity, however it is important to point out that the purpose of certification is marketing. It is to provide a seal of assurance (Haynes, Cubbage, Mercer, & Sills, 2012) for society that the organisation conforms to a stated requirement (Font, 2002).

Table 4-1 Methods of assessment of sustainability (examples from viticulture)

Assessment methods	**Focus**	**Example**
Process-based	process rather than the outputs of the activity	Is there is a plan to manage soil erosion?
Best practice-based	implementation of the task, therefore the output of the activity	Were cover crops planted to prevent erosion?
Indicator-based*	past input usage	Record of electricity usage
Criterion-based	compliance to a set of rules	Determines x% of the farm land dedicated to biodiversity

Note: * ‘indicator’ as used in this table, is not understood as a broad concept as described in the text, but purely as a quantitative value

Process-based assessments are usually based on the International Organisation for Standardization Standards (ISO) standards. In agricultural assessments, a typical example is the implementation of environmental management systems (EMS) through the ISO 14001 standard or through ISO-based locally developed guidelines. The greatest shortcoming of a process-based assessment is that it does not ensure performance outcomes (Cary & Roberts, 2011; Gunningham, 2007). The practical outcome of process-based methods is the production of written documentation (e.g. management plans). Furthermore, the ISO family of standards were developed mainly to provide a model for large enterprises to set and operate a management system. The ISO 14001 is a challenging (International Organization for Standardization, 2014) and costly task for small and medium size organisations (Font, 2002).

The *best practice-based* assessment method's strongest point is the practical and immediate pathway to objectively deliver net sustainability gains (Bond et al., 2012). Education is a core component of this method (Landers, 2008). Among the described methods, it seems to be the easiest to engage farmers because of its focus on the sustainability output. Gibson (2006) argues that best practice systems should be implemented gradually but the process is not without risk(s). The greatest challenge of this method is to ensure that factors that are not priorities in conventional decision-making process are not left behind. In an example of environmental sustainability assessment, Gibson points out that the effects on the community might not be prioritised. To overcome the problem, definition, scope and trade-off rules must be clearly established prior to the development of the assessment.

Indicator-based assessments rely on reporting of numerical values related to past input use. The weakness of the system is related to the meaningless value of indicator collection when not linked to reference levels. When not related to reference levels, indicators become just a set of collected data (Santiago-Brown et al., 2014). Carbon/greenhouse gas accounting and water footprint methods are typical examples of indicator-based assessments. These examples of the usage of indicator-based assessments oversimplify life cycle assessment methods and are insufficient to understand the dynamics of the interrelationships of system outcomes and resource (inputs) use (Halog & Manik, 2011; Van der Werf & Petit, 2002). On the other hand, the strength of this method relates to the small time required for data recording and ability to readily compare data (Van der Werf & Petit, 2002).

Criterion-based assessments are assessment methods focused on compliance with legislation or sets of rules from the sustainability assessment program employed (Kajikawa, Inoue, & Goh, 2011). The strength of the method seems to also be its weakness: the method clearly excludes non-compliant (with rules) participants and establishes a clear message of group exclusivity. However, the exclusion can undermine possible participation by growers who are in most need of help to improve their sustainability.

Research Method

Describing/documenting sustainability programs

The most relevant sustainability programs for viticulture worldwide are documented in this article. The description of the programs is based on interviews, observations, and secondary sources. Between December 2011 to January 2014, 10 in-person semi-structured interviews and two semi-structured email interviews were conducted with people either currently or formerly in charge of the sustainability program described in this article. Interviewees were asked to describe the creation of the sustainability program they were involved with as well as its assessment methodology, original motivations, certification, engagement processes to maintain the program and strategies to engage new members. Interviewees also provided observations and opinions of the current situation of the programs. All interviewees were re-contacted in January 2014 to update program statistics and validate texts from their specific programs.

Expected benefits, engagement strategies, inhibiting factors and reporting systems of Sustainability programs

The results from this study are part of a larger 3-stage study in which stage (1) aimed to define sustainability through an Assisted Focus Group Method of Enquiry (AFGME) (Santiago-Brown et al., in-press), stage (2) produce a list of indicators for sustainability assessment through an Adapted Nominal Group Technique (ANGT) (Santiago-Brown et al., 2014), and stage (3) – reported in this paper – aimed to discuss the engagement process of viticultural sustainability programs through a traditional focus group approach and document and compare the most prominent sustainability assessment programs for individual organisations in viticulture worldwide. Table 4-2 outlines the questions used in the stage 3 focus group discussions.

Table 4-2 - Focus group question: stage 3 used for this article

1. What potential benefits would induce you to participate in sustainability program? What benefits would you expect to receive for your business from participating in a sustainability program for your vineyard?
2. What reasons would cause you to not participate in a sustainability program?
3. If you were responsible for implementing a sustainability program, what would you do to engage growers to participate?
4. Assuming that results oriented foundation is considering sponsoring your program. How would you convince them to fund the project?
5. Assuming you are the external sponsor. What would you want to be measured?

The stage 3 group discussions were conducted from December 2011 to November 2012 with top-level managers (e.g. CEO's, Chief Winemakers and Chief Viticulturists) of grape growing organisations from five countries: Australia, Chile, New Zealand, South Africa and United States (Santiago-Brown et al., in-press). The countries were selected because of the existence of sustainability assessment programs for viticulture 'at the farm-gate' (for individual organizations). This group of countries is known as "New World" wine countries. To the best of our knowledge, at the time of this investigation, there were no similar programs in "Old World" wine countries.

Data Analysis

The program descriptions below were informed by the interview transcriptions and personal observations. Program websites and official program documents were also used as secondary sources to develop the information from the data gathered through the interviews. All data was then analysed in a three-phase process in which first-order analysis combined descriptive- and pattern-coding, second-order analysis for data-reduction using thematic-coding, then third-order analysis using *tag cloud* analysis, which is described in detail below. The coding process was aided by use of NVivo 10 (QSR International, 2012), a qualitative data management software package.

Tag cloud analysis is usually used for indexing and searching websites (Sinclair & Cardew-Hall, 2008). This was adapted for this study, using tag clouds analytically to aid researcher evaluations of data emphasis and participants' prioritization of benefits, hidden factors and critical values relating to the stage 3 questions.

Question content and moderators' utterances were discharged from the coding which exclusively analysed participant responses. Four tag-clouds were created from the seventy most frequently occurring exact words. The tag clouds display the most frequently used words in larger fonts in a circular layout, randomly organized to optimize display space. Tag clouds are "pictorial heuristic representations of text" (Santiago-Brown et al., in-press) with the aim to present a problem in a simplified but sufficient way. Its interpretation is straightforward and requires little explanation (Bateman, Gutwin, & Nacenta, 2008). It helps to find solutions to problems through the display of patterns of a given problem (Shah & Oppenheimer, 2008). The tag clouds generated and used for analysis in this study are displayed in the Results and Discussion section of this paper.

Results and Discussions

Sustainability assessment programs for individual organisations in viticulture

The first results presented here are the descriptions of the sustainability programs investigated for the study. They are presented in the order in which the initiatives for the programs commenced. There is a deliberate emphasis, where possible, on recognising the names of persons who were initiators and drivers of the programs. A finding arising from this research was that the individual persons who initiate and drive programs are critical to the process and its success. In other words, without the initiating and driving people, and the early adopters, it is unlikely these programs would exist as they are.

Lodi Winegrowing Commission Sustainable Workbook / Lodi Rules

Lodi Winegrape Commission (LWC) was created in 1991 with the core objective of promoting the Lodi wine region in California, United States and its wines (M. Hoffman, 2009). At that time, Integrated Pest Management (IPM) was identified as one of the most important issues for wine grape growers. The Grassroots IPM program was launched in 1992 and a consultant with a PhD in IPM conducted the group until 1995 when the Commission's budget was reorganized. An IPM organisation was contracted replacing the consultant and Dr Cliff Ohmart became part of the project with the objective to expand it. Ohmart, with a group of innovative growers, was the driving force behind the sustainability initiatives in Lodi.

In 1995 the program had its objectives expanded by implementing and tracking the results of a series of sustainable winegrowing projects (Ohmart, 2008a). The first assessment methodology was based on the *Farm*A*Syst model*, developed by the United States Department of Agriculture (USDA) agencies, regional organisations, universities and local governments. The content of the model was tailored to fit Lodi's purposes (Ohmart, 2008a).

By the end of its first year, 40 growers were directly involved with the project and monitored weekly. The group represented about 1000 hectares and 70 distinct vineyard sites. Many new topics beyond pest and disease management such as ecosystem management and human resources, among others, were included as well as incorporating the knowledge and data gathered from the demonstration vineyards' data (Ohmart, C, pers. comm. 2012). The proposed content was reviewed by a committee of growers, vineyard consultants, University of California Farm Advisors and Scientists, vintners and a wildlife biologist (Lodi Winegrape Comission, 2013). The first edition of the assessment workbook was launched in 2000. The workbook was about growing quality wine grapes efficiently: the strategy was quality and sustainability was the means (Ohmart, C, pers. comm. 2012).

After the launch of the assessment methodology, 40 workshops were organised and scores from 265 growers were compiled in a system that became the basis for the database of the sustainability program. A second printed version of the workbook was published in 2008 and a third in 2013. The self-assessment workbook has the educational purpose of optimising wine grape quality and costs. The *Lodi Rules*, a third-party certification scheme, was launched in 2005 to respond to the growers' demand for a marketing application for the self-assessment workbook. The certification process encompasses two components: the *Lodi Rules* (practice standards), and a *Pesticide Environmental Assessment System (PEAS)*, a risk assessment tool that measure the total impact of all organic and synthetic pesticides used during the year by each individual participant grower (Ohmart, 2008b).

In the workbook, each self-assessment topic has four options (plus non-applicable). Self-assessment topics range from questions about soil and water management to ecosystem and human resources. The self-assessment options which range from 1 (least sustainable) to 4 (most sustainable) should be interpreted exclusively within each assessment topic. The *Lodi Rules* (certification) are designed to lead to measurable improvements in the health of the surrounding ecosystem, society-at-large, and wine quality. To achieve certification, growers must achieve 70% of the total possible (maximum) score plus at least 50% of the total score of each chapter. Protected Harvest, a third party non-profit organization, independently audits *Lodi Rules*. Vineyards must be audited annually through a rigorous process of in-site inspection prior to harvest and pesticide and nutrient usage post-harvest (Lodi Winegrape Comission, 2013).

Lodi growers were surveyed by the LWC in 1998 and 2003. The surveys and data gathered from the growers' assessments helped the identification of winegrowers' regional strengths and weaknesses and, therefore, educational needs. Ohmart is a believer of self-assessments for growers: "if you self-assess, you invariably learn something by doing it" (Ohmart, C, pers. comm. 2012).

Sustainable Winegrowing New Zealand - SWNZ

Sustainable Winegrowing New Zealand (SWNZ) has its origins in a pilot project started by a group of seven growers from the Hawke's Bay Winegrowers Association in 1995 (Jordan, 1997). The original motivation was to assess vineyard chemical usage, inspired by international demands and constraints learned from fresh food exporters (van der Zijpp, S, pers. comm. 2012). At that time, these growers had access to, and adopted, a system called the *Wäidenswil Integrated Production Scorecard* developed in Switzerland (Hughey, Tait, & O'Connell, 2004). The idea spread rapidly among other wine grape regions and a working group was formed with the objective to develop a sustainability program. In 1997 the group had approximately 120 vineyards self-assessing their operations. Certifications by third party started in 2000. A wineries standard was introduced in 2002 (New Zealand Wines, 2014). In 2004, Ms. Sally van der Zijpp was employed as the National Coordinator for the program, a position that she still holds. The scorecard model was fully reviewed and changed in 2007 to embrace the reality of New Zealanders' growers: new assessment areas were added and the scoring methodology was completely changed. The online system was launched in 2007.

The program defines sustainability as "delivering excellent wine to consumers in a way that enables the natural environment, the businesses and the communities involved, to thrive" (New Zealand Wines, 2014). The New Zealand Winegrowers' Sustainability policy states that wine must be made from 100% certified grapes in fully certified winemaking facilities and certification must be through an independently audited third program (*SWNZ* or one of the recognized organic or biodynamic certifications). The program aims to provide a 'best practice' model, and it is also a quality assurance scheme that addresses consumer concerns and aims to protect the market for wines from New Zealand (Renton, Manktelow, & Kingston, 2002).

To become part of the program members must self-assess their operations online annually and provide supporting documentation for their responses. There is also a data collection of indicators such as water and input use (electricity, fuel records and spray diary). As a premise, the program avoids collection of data that can be gathered through other sources such as government. It also avoids collecting data that will not be analysed or help growers to improve their sustainability in a practical manner. The *SWNZ* flexibly incorporates practices across a range of business sizes and regions and meets the International Organisation of Vine and Wine (OIV) and International Federation of Wine and Spirits (FIVS) guidelines, in spite of not being accredited by them. The decision not to be accredited is an on-going debate amongst growers because they are unsure about the direct benefits of such accreditations that would increase the program's costs.

The program is based on three pillars: monitor, measure, and manage. Currently, the measures that *SWNZ* focuses on are water, energy and agrochemical use. Members are required to supply their spray diaries. Reports produced from growers' data are analysed and reported back to growers and also used by New Zealand Wines to represent the industry needs, for research purposes and discussions with government.

The self-assessment consists of three sets of questions: major, minor and best practices: Majors are mandatory, minors are generally relevant practices and best practices are the next step up. Questions can be answered in the following ways: yes or compliant; no or non-compliant and non-applicable (NA). Questions are followed by a list (to be ticked) of applied strategies, which growers select.

Compliance with all major questions and 80% of minor questions are required to achieve certification. If 100% of major questions are not achieved, corrective actions are required to pass. A second on-site inspection may or may not be requested, depending on each situation. Questions are supported by a guidance text and pertinent excerpts from the Standard. The program also sets maximum chemical sprays per target and demands comprehensive justification in case of extra spray needs (van der Zijpp, S, pers. comm. 2012). Questions, results and benchmarks are not readily available to the external public but widely used in the NZSW's website texts including growers' individual profiles. The program is focused in engaging all members of the wine growing community.

Program auditors, from independent third-party organisations, work closely with the program managers. Vineyards need to meet the program requirements at an initial inspection in order to be certified, then are inspected again every three years. Auditors are encouraged to provide advice to growers to help them to meet the Standard's requirements. This is similar to the educational approach taken in the *Integrated Production of Wine (IPW)* program in South Africa (described below), but to a smaller extent. Certificates are issued by *SWNZ* based on inspection results. Certification is still voluntary, however since 2010, the New Zealand Winegrowers, the body responsible for promoting the brand New Zealand Wines, made vineyard and wine accreditation to the *SWNZ* (or one of the recognized organic or biodynamic certifications) a pre-requisite to participation in promotional events. As a result, 90% of the wines produced in New Zealand became part of the *SWNZ*.

Vineyard Team (Sustainability in Practice – SIP)

In 1994, a group of growers, wineries and service providers in California, in the United States volunteered to create the *Central Coast Vineyard Team (CCVT)*. Two years later, the *Positive Points System (PPS)*, a self-assessment on sustainable vineyard practices was launched and 20 vineyard assessments were performed. In 1999, their database had 200 growers. In 2000, the membership program began. The group grew steadily with a strategy of engaging the community and vineyard neighbours in informal meetings and viticultural educational initiatives (CCVT, 2014).

In 2004, the CCVT began the development of a third party certification program called *Sustainability in Practice (SIP)* Certification. *SIP* Certification was designed to be a distinguishing program with requirements for certification, which authenticate vineyard practices and distinguish their wines in the market. According to the *SIP* Certification Manager, "it is not a certification that every vineyard can achieve. All of the questions are practice-, as opposed to process-, based and are auditable (Vukmanic-Lopez, B, pers. Comm. 2014). The *PPS* was used as foundation to the development of the certification. The pilot project for the certification program was launched in 2008 and 14 vineyards, representing 1200 hectares, became certified in the region. Certification is now extended to the whole state of California.

The program's standards are annually updated and peer-reviewed by a vast group of Universities, Government departments and industry associations. Currently, the program only assesses vineyards but wineries are able to certify their wines, which allows them to use a *SIP* Certified seal on a wine bottle provided that a chain of custody audit shows that the final product is made with at least 85% *SIP* Certified fruit. A certification for sustainable winery production is being developed. Certification must be renewed annually in a three-year cycle: on-site inspection in the first year and evaluation of demanded records, a combination of paper audits, interviews, and on-site inspections in years 2 and 3 (CCVT, 2014; SIP, 2014).

Low Input Viticulture and Enology (LIVE)

The creation of the *Low Input Viticulture and Enology (LIVE)* in Oregon, USA, has its roots in a mid -1990's presentation arranged by Dr Carmo Vasconcelos, a Portuguese researcher at the Oregon State University, and conducted by Dr Ernst F. Boller, a founding member of the International Organization for Biological and Integrated Control (IOBC). After Boller's presentation, a few individuals from the audience realised that they were already practising and sharing similar principles to those presented by Boller (Macdonald, A, pers. comm. 2012). The creation of an official assessment program based on IOBC guidelines was initially proposed by a winegrower, Mr Al MacDonald, who was also involved with the University. *Low Input Viticulture and Enology program [LIVE]*, a voluntary organization, was then established in 1997 by a group of Oregon winegrowers led by Mr Ted Casteel (LIVE, 2013).

The pilot project started with about 20 vineyards and the group was voluntarily inspected through a partnership developed with the Oregon State University. The objective was to understand their level of compliance with the guidelines. In 1999 *LIVE* was incorporated and certified by *IOBC* to certify individual farmers. In the same year the inspections were conducted by independent third party contractors with IPM – integrated pest management expertise. In 2006, the program was expanded to include growers from Washington State. In 2007, *LIVE* hired Mr Chris Serra as a paid Program Manager who was promoted to Executive Director in 2011 (LIVE, 2013). All Board members and technical committee members were and still are volunteers.

The assessment system is freely available on-line on the *LIVE* website (LIVE, 2013). Transparency is the key part of their strategy to engage growers and consumers: the first to join the program and the latter to trust what the *LIVE* brand stands for (Serra, C, pers. comm. 2012). Growers need to join the program to have access to a username and password to access all functionalities of the on-line system and to have their data saved and considered for inspection by the program management. All educational resources and administrative documents are available as well. The program has the objective of promoting viticulture in conjunction with environment preservation and conservation of the vineyard and surrounding areas, a farm's economic viability and support to its social, cultural and recreational aspects. Also, to sustain healthy and high quality grapes with great emphasis on minimizing pesticide residues, by encouraging biological diversity and use of natural regulating mechanics and unwanted side effects from agro-chemical handling.

The program assessment is comprised of mandatory record keeping (pesticide, fertilizer, and irrigation), 5% of farm area set aside as a biodiversity and ecological compensation zone and a checklist of 13 chapters, each one with a series of topics, called ‘control points’ (Serra, C, pers. comm. 2012). The approved pesticides lists are specific to two vineyard locations based on climate: Region I refers to cool-weather maritime climate and region II refers to warm-weather continental viticultural climate. The check list follows a colour scheme rationale where Red control points are 100% required, which means that full compliance is mandatory to become part of the program. *LIVE* requires 90% of the Yellow control point and 50% of the Green control points. The system was developed to avoid members concentrating too heavily on any one given area of assessment (LIVE, 2013).

Certification is only achieved after completion of two years of farming under *LIVE* standards. Farmers have to be inspected in the first two years of the program. After passing the second year inspection, they can be certified by an independent third party, if program requirements are met. Certification must be renewed every three years but any member is subjected to random inspections at any time. Additionally, members certified or not, must submit their records every year.

Integrated Production of Wine (IPW)

The *Integrated Production of Wine (IPW)* scheme was promulgated by a South African governmental Act in November 1998. *IPW* is one of the three schemes managed by the Wine and Spirit Board of South Africa (WSB). WSB is also responsible for the Wine of Origin (WO) claims (origin, cultivar and vintage assurance) and the Estate Brandy Scheme (Rossouw, J, pers. comm. 2012). The first *IPW* certifications started two years after the program's promulgation in 2000. The work developed by of the Agricultural Research Council (ARC) was used as the background of the program content. As the main agricultural research organisation in the country, the ARC has been conducting and funding research as well as disseminating information and education since its establishment in 1990 (Schietekat, D, pers. comm. 2012).

The Wine of Origin (WO) scheme was mandatory, highly regulated and regimented at the time *IPW* started. According to Ms Sue Birch, former head of Wines of South Africa (WOSA), WO was not itself a marketing message for the wines produced in South Africa. Likewise, *IPW* did not have a strong marketing direction or intent. The WOSA, in collaboration with *IPW*, was behind the introduction and design of a new seal "integrity & sustainability guaranteed" in 2010, incorporating the WO seal's attributes. The new seal ensures not only origin but also 100% certification under the *IPW* program. This seal is voluntary. The WO seal still exists, for wine being currently bottled from vintages previous to 2010 or for wines that failed to meet the *IPW* requirements or blended with uncertified grapes (Van Schoor, L, pers. comm. 2012). Although the original driver for the program was not retailers' demands (Rossouw, J and Schietekat, D pers. comm. 2012) the seal added integrity and a clear message about the wines produced for the retailers (Birch, S, pers. comm. 2012).

The *IPW* program is based on two main documents: the guidelines and the manual. The guidelines present recommendations of what should be done, as well as minimum standards and the manual is a practical document showing the pathways for the implementation of the guidelines and completion of the self-assessment for further third party auditing and WSB certification. The wine labels drive the certification process. Wineries must be compliant with the guidelines, as well as 100% of the grapes used to produce the wine. Each bottle has a seal, which is uniquely numbered (SAWIS, 2014) which ensures integrity and traceability of the process at the consumers' level through the South African Wine Industry Information & Systems (SAWIS) website (www.sawis.co.za).

The farm/vineyard component of the *IPW* program consists of a set of guidelines focused on critical aspects for good agricultural practices related to grape production (IPW, 2014) and minimum compliance with the South African legislation (environmental related issues, food safety, labelling and social aspects). Farms with vineyards are verified annually through the completion of the self-assessment and require farm and production records. The guidelines and manuals are reviewed and updated bi-annually. The program assessment is compliant with FIVS and OIV.

Growers must reach 60% of the total points of the program to comply and become *IPW* certified. The self-assessment is undertaken on an annual basis and independently audited on a spot check basis (IPW, 2014). Growers are allowed to score zero, two, three and five, in a scale of zero to five, for each criteria. Only auditors are allowed to score one or four. The self-assessment is then sent back through the online system with the pertinent documentation. One third of the wine producers are inspected annually, therefore all members are inspected in a three-year cycle (Van Schoor, 2012). The number of vineyard inspections will be driven by the origin of the grapes.

In South Africa, there are about 70 Producer Cellars, which are wineries that receive and process grapes on behalf of a group of wine grape growers (SAWIS, 2013). Each Producer Cellar has an *IPW* coordinator, responsible for liaising with *IPW* and meeting the program requirements. The chief viticulturist usually fills this role. The Producer Cellars produce about 90% of the total wine in South Africa (Schietekat, D, pers. comm. 2012).

Environscientific, the auditing body for the WSB, conducts the audits and advises the WSB on who can/may be certified if/when found compliant. They are an independent group formed by scientists (with at least a Master's degree) with demonstrated field experience (at least 5 years). The auditors are not allowed to be involved in any agricultural products sales. Auditors are paid by *IPW*, unless the grower fails and needs to be re-inspected. In this case, the grower has to pay for the re-inspection. Additional supporting documentation is accepted by the auditing body after the initial audit, within a specific time frame, if this was the reason for failure. If inspected growers do not reach the pass mark by about 5%, a shorter re-audit can also be arranged. Unlike ISO14001 audits where auditors are not allowed to provide any advice, the *IPW* auditors point out pathways to reach the pass mark, provide information about minimum requirements of South African legislation used by the program assessment, share scientific knowledge and suggest training when the need is perceived. The core objective is to help growers to meet the requirements while ensuring credibility of the program (Van Schoor, L, pers. comm. 2012). The consultative audits, conducted as part of the South African *IPW* program, are one of the most complex and strict auditing processes of its kind.

In South Africa, two other schemes, created about 10 years ago, are also directly related to wine grape sustainability: *Biodiversity and Wine Initiative (BWI)* and the *Wine and Agricultural Industry Ethical Trade Association (WIETA) Code*. The first one is related to the conservation of the Cape Floral Kingdom (CFK), the richest and also the smallest plant kingdom on the planet (WWF South Africa, 2014) and WIETA is related to fair labour practices (WIETA, 2014). *BWI* requires *IPW* accreditation, as a condition to become part of the group. In the South African wine industry, "the ultimate goal is to have one seal, issued by the Wine and Spirit Board, that certifies the *Wine of Origin* information (vintage, date, variety), the environmental sustainability *(IPW)* and the ethical treatment of workers (*WIETA*)"(WOSA, 2014).

California Sustainable Winegrowing Alliance – CSWA/California Sustainable Winegrowing Program (SWP)

In the late 1990's a group of the wine industry executives determined that sustainability was one of the important issues that needed to be addressed by the wine industry in California (Jordan, A.; Francioni, L, pers. comm. 2012). Several sustainability initiatives were already in place in wine regions such as Lodi and the Central Coast in California. The California *Sustainable Winegrowing Program (SWP)* was originated in 2001 through a partnership of the Wine Institute and the California Association of Winegrape Growers. The *California Sustainable Winegrowing Alliance (CSWA)* was formed in 2003, a year after the first edition of the *SWP* workbook was published, with the objective to implement the *SWP* (CSWA, 2004). Part of the Lodi and Central Coast sustainability programs and other related regional and statewide efforts, were adapted and adopted by *CSWA* for use in its Code of Sustainable Winegrowing Program Self-Assessment Workbook. The Certified *California Sustainable Winegrowing* program was launched in 2010 as a third-party certification to verify adoption of sustainable practices and continuous improvement. The *SWP* was developed as a statewide sustainability assessment program. It was felt that a state-wide program would create a common base for sustainability goals in the state and also promote sustainability of California vineyards and wineries as a group (Jordan, A.; Francioni, L, pers. comm. 2012). The statewide initiative also aimed to become an important educational channel for the wine industry providing an objective pathway to continuously improve organisations' sustainability through better operational and management practices.

The vision of the *SWP* is "the long-term sustainability of the California wine community". To place the concept of sustainability into the context of winegrowing, the program defines sustainable winegrowing as "growing and winemaking practices that are sensitive to the environment (Environmentally Sound), responsive to the needs and interests of society-at-large (Socially Equitable), and are economically feasible to implement and maintain (Economically Feasible)" (CSWA, 2013). The program's development is guided by values such as to: increase and optimise grape quality; protect and conserve the environment; maintain the long-term viability of agricultural lands and community; ensure economic and social wellbeing of farmers and employees; and support research and education among others.

Currently the program encompasses two sets of assessments: indicator collection and the self-assessment workbook. The workbook assessment data is publically reported in statewide sustainability reports presenting counts of responses as percent distribution of responses. These reports are available on line and are an indication of the Californian self-assessment results for the workbook topics. The indicators, called “Performance Metrics,” are water use, energy use, greenhouse gas emissions and nitrogen use. At the time of publication reports on the performance metrics were still not available. However, benchmarks will be generated per acre and per ton of fruit production for vineyards, and per case for wineries, and will be available when they have sufficient data to produce statewide benchmarks. Most information regarding the assessment and administrative documentation is freely available on-line.

The current workbook version (3rd Edition) was released in January 2013. The online assessment is only available to California participants through a user name and password. The assessment topics are presented in increasing scenarios (options/categories) from 1 (least sustainable but within regulatory compliance, if regulations exist) to 4 (most sustainable). From the results of the self-assessment, growers are encouraged to produce an action plan to set their own sustainability goals for improvement. The workbook is available for sale through the website for non-participants. The key component of the engagement process for participants is education. More than four hundred seminars and workshops have been organized about vineyard and wineries issues throughout California to provide education on sustainability (Jordan, A.; Francioni, L, pers. comm. 2012).

The program is described as having participants rather than members. Participants self-assess their operations and most of them report the results back to the CSWA to produce the program’s sustainability reports emphasising strengths and weaknesses of the state. Most growers joined the SWP because of its educational benefits (Jordan, A.; Francioni, L, pers. comm. 2012).

Many participants became certified to meet customer demand for sustainable certification including retailers, distributors, restaurants, and consumers. Independent third party auditors are accredited by the *CSWA* to conduct audits. *CSWA* has a mix of practice-based and process-based certification centred on the continuous Plan-Do-Control-Act (PDCA) developed from Deming's Plan-Do-Study-Act (PDSA or Shewhart) improvement cycle (Deming, 2000). To retain certification status, growers must pass the initial certification audit, update the online self-assessment and action plan annually (with targets and times), and complete an annual audit. In most cases the on-site audits are on a three-year cycle so, in intermediate years, auditors review annual *SWP* assessment and action plan during an off-site audit. The certification program also includes a minimum of 50 vineyard and 32 winery prerequisites that must be achieved. There are minimum scores and rules for each one of these prerequisites (CSWA, 2013).

VineBalance, New York State's Sustainable Viticulture Program and Long Island Sustainable Winegrowing

The VineBalance program, launched in 2004 was a result of a series of initiatives, initially driven by water quality concerns in both the Finger Lakes and Long Island (Cattell, 2012). In 1997, Dr Tim Martinson, from Cornell University became the local extension educator with the Finger Lakes Grape Program. He was tasked with writing an 'Agricultural Environmental Management (AEM)' worksheet for grape growing.

The AEM for grapes was inspired by the work developed by dairy farms in reservoir watersheds in state of New York, particularly around Keuka Lake.

Meanwhile, in 1992, Long Island grape growers where developing management guidelines to emphasize good stewardship practices for the region (Moreno-Lacalle, 2013). The assessment developed by Martinson as well as the *LIVE* and *Lodi* programs inspired the development of the guidelines. In 2004, the initiatives developed by Martinson and Long Island growers merged.

At that time, Martinson was approached by the National Grape Cooperative to develop a sustainable practices workbook for grapes. The National Grape Cooperative is a subsidiary of the Welch Food Inc., that represents about 1300 members; producers of grape juice and table grapes (Amanor-Boadu, Boland, Barton, Anderson, & Henehan, 2003). The National Grape Cooperative has adopted *VineBalance* as their production standard (T. Martinson pers. Comm., 2014). The project was funded by a larger grant from the New York Farm Viability Institute and resulted in the *VineBalance* program, a joint initiative of the Finger Lakes Grape Program, Lake Erie Regional Grape Program and Long Island's Grape Extension Program.

VineBalance was developed to answer industry groups' demand to develop "an outreach and educational program to promote the adoption of sustainable viticultural practices in New York State's vineyards". The grower self-assessment workbook sections were developed using materials from two previous programs in New York: NYS Agricultural Environmental Management (AEM) worksheets and the Long Island Sustainable Practices Workbook. During the winter of 2005-2006, a steering committee composed of extension, research, industry and growers' representatives from National Grape Cooperative, Centerra Wine Co., as well as Finger Lakes and Long Island vineyards reviewed the original topics and added new content to the program to address the diversity of the distinct wine grape growing regions (Long Island, Lake Erie and Finger Lakes) in New York State. In 2006, 15 growers volunteered to become part of the pilot assessment using the new workbook. Feedback from growers was used to improve the content. In 2007, the *VineBalance's* New York Guide to Sustainable Viticulture Practices Grower Self-assessment Workbook was publically launched (VineBalance, 2014).

The workbook is the program's foundation. It has eight chapters containing 134 topics. Each topic has four options from 1 (most desired, most sustainable) to 4 (least desired, least sustainable) plus NA (non-applicable). Most questions have an explanatory section about the rationale used to develop the promoted practice plus additional resources for further education. It assesses a combination of specific production practices used to manage soil, vines, water, pest and disease and promotes education about sustainable options for improving growers' sustainability. The self-assessment is followed up by the production of individual action plans (with templates provided by the program) for the growers (VineBalance, 2014). Martinson emphasises that the action plan, developed from self-assessment, is the key component to promote positive sustainability outcomes: "What should change? What can you afford to change?" (Pirro, 2013).

Martinson defines himself as a 'university extension person' and from their standpoint at the Cornell University; they felt that it was up to the industry groups to decide how they wanted to use the workbook developed by them to communicate with their consumers. For him, the success of *VineBalance* can be measured by the adoption of their assessment methodology by the industry. *VineBalance* does not have a certification scheme, as its main objectives are to educate and promote the adoption of sustainable practices. However two different groups, Welch's with the juice grape growers and Long Island Sustainable Winegrowing with high-end wine vineyards have adopted *VineBalance* using two different approaches. Since 2012, the *Long Island Sustainable Winegrowing (LISW)*, a non-profit organisation started a certification process based on the *VineBalance* workbook (Goldberg, 2012). The process was started by a group of four wineries, which worked with Alice Wise's team from the Cornell Cooperative Extension to write a specific code for certification (Cattell, 2012). Eleven growers were certified in the first year through independent third party audits (Nigro, 2012).

The certification started in 2011. Initially, it only covered the Green chapter. By the end of 2012, the Red and Orange chapters were added to the certification process. Independent third party certifiers that are accredited by the program conduct the audits. A minimum three-month implementation period, prior to the first certification cycle is required. Certification must be renewed every two years. The process certifies the company's sustainable management from the winery's viewpoint, giving them the right to use the "Certified Sustainable Wine of Chile" seal. The certification has different rules depending on ownership, based upon the minimum percentage of total surface area included in the certification process, as the program distinguishes vineyards owned or long-termed leased (type A) by wineries and external vineyards (type B). The program stipulates a progressive increase in the proportion of total vineyard area under the certification process, required to reach certification (I+D Vinos de Chile Consortium, 2014) .

Wines of Chile – Sustainability program

In 2009, the Wines of Chile, a non-profit organisation representing 95% of the bottled wine exported from Chile, released the Wines of Chile Strategic Plan 2020. The Plan points out sustainability as one of its key principles and empowered the Consorcio Tecnológico (Technological Consortium) – the technical arm of the industry – to develop a sustainability program. Retailers' demands for sustainability initiatives and certification were the main drivers for the creation of the program (Carbonell, 2013).

A joint project between industry representatives and the University of Talca started the development of the *Sustainability Code*. The *Code* became the foundation of the *Wines of Chile Sustainability Program*, which encompasses a series of initiatives, with the objective of establishing a sustainable wine industry in the country. The *Code* covers three areas: Vineyard (Green Area), Winery and Bottling plant (Red Area), and Social (Orange Area), and provides a checklist of control points and a compliance standard which establishes the requirements in the three areas. The green area focuses on natural resources, pest and disease, agrochemicals and job safety and has 18 critical points of assessment (I+D Vinos de Chile Consortium, 2014; WOC, 2014). The red area contains chapters about energy, water management, contamination prevention and waste. Finally, the orange chapter considers all social issues and includes relationships with the workers, community, environment and clients.

The program accepts two levels of participation: Level 1 (training and education) and Level 2 (certification). The certification started in 2011. Initially, it only covered the Green chapter. By the end of 2012, the Red and Orange chapters were added to the certification process. Independent third party certifiers that are accredited by the program conduct the audits. A minimum three-month implementation period, prior to the first certification cycle is required. Certification must be renewed every two years. The process certifies the company's sustainable management from the winery's viewpoint, giving them the right to use the "Certified Sustainable Wine of Chile" seal. The certification has different rules depending on ownership, based upon the minimum percentage of total surface area included in the certification process, as the program distinguishes vineyards owned or long-termed leased (type A) by wineries and external vineyards (type B). The program stipulates a progressive increase in the proportion of total vineyard area under the certification process, required to reach certification (I+D Vinos de Chile Consortium, 2014) .

McLaren Vale Sustainable Winegrowing Australia

The *McLaren Vale Sustainable Winegrowing Australia (MVSWGA)* program has its origins in the early 2000's. Since that time, the McLaren Vale Grape Wine and Tourism Association (MVGWTA) developed a series of viticultural initiatives with the objective to improve viticultural practices, fruit quality and financial viability in the region. These initiatives included seminars and workshops; a growers' bulletin (CropWatch) providing information from nine weather monitoring stations and pest and disease alerts for the region, research trials and information days. The Association also released a Financial Benchmark for McLaren Vale growers in 2005, and a Pest and Disease Code of Conduct in 2006, which was voluntarily endorsed by the growers in 2007. In this same year the Soil Management, Water Management and Preservation of Biodiversity Codes were also released.

The program creation was influenced by a visit from Ohmart (who developed *Lodi Rules*) to McLaren Vale in the mid-2000's. Ohmart's visit was hosted by Mr James Hook, who was then employed by the MVGWTA. In 2008, the then-Chair of the Association, Mr Dudley Brown, formalized the project with the argument that: "while this (all viticultural activities promoted by the MVGWTA) yielded great on farm results, we were unable to measure and discuss the outputs of our investment with ourselves or the outside world because we were not measuring the results". From this realisation, the *Generational Farming program* was born with the purpose of monitoring and measuring results and promoting best viticultural practices based on sound science. Mr Jock Harvey, local grower and a former Chair of the MVGWTA was the project leader with the goal of developing Hook's outline into a regional sustainability program, including a certification scheme.

Ms Jodie Pain took on the Viticultural Officer role at the Association in 2008 and continued to develop the project. Pain developed the assessment book with the voluntary assistance of a group of growers put together by Harvey. In 2009, *Generational Farming* was officially launched and an assessment book (workbook) was made available for the growers in the region. Hook continued to contribute to the program, authoring two of its six chapters. At the time, about 50 growers decided to self-assess their operations. By the end of 2010, the MVGWTA decided they needed an employee dedicated to the Generational Farming program. Viticulturist Ms Irina Santiago was hired as a part-time employee for this role. The data from 41 growers (representing 56 vineyard sites) were collected in 2011 and Santiago reviewed and revised the assessment methodology and developed a reporting system. The workbook was re-written by local growers and the program was re-named to *McLaren Vale Sustainable Winegrowing Australia (MVSWGA)* to be more easily found by others searching for their program. Volunteer workbook authors were growers with either extensive experience and/or formal education in viticulture.

The new method of assessment is similar to that of the *Lodi* and *CSWA* workbooks, in that, it replaces yes/no questions with scenario questions ranging from zero (explicitly unsustainable) to four (most sustainable) as well as non-applicable (NA). This methodology differs from the *Lodi* and *CSWA* workbook methods with the addition of having a 'zero' scoring option. Growers from McLaren Vale followed the methodology to develop program content based on assessment topics that most impacted their sustainability. The content of the assessment is updated annually and peer-reviewed by independent experts, mostly from universities and governmental departments recognised globally for excellence in the relevant fields.

The *MVSWGA* method of assessment has three main principles: (1) assessment over time; (2) grower sustainability levels identified on a continuum and not on a pass/fail basis; (3) the assessment and reporting system must be useful for the grower to understand their sustainability status and be able to improve it. In contrast to the other certifications which have a single category of compliance, the *MVSWGA* places growers into four certification categories: category 1 - red, needs attention; category 2 - yellow, good; category 3 - green, very good; and category 4 –

blue, excellent. The sustainability level is determined by attributing a weight to each topic, section and chapter from the assessment method. It is expected that very few growers can reach the blue level in the program. The program's content also changes annually to incorporate any relevant and commercially feasible scientific findings to the assessment. To continue in a certain category growers must update and improve their operations to align with the current content of the assessment of a certain category. This way, the workbook does not only show the pathway to improve sustainability in every assessment topic but also promotes continuing improvement through content update. The program assessment is compliant with FIVS and OIV (Hayes, 2012).

Ten percent of program members are randomly selected annually and audited by a third-party. These audits are paid for by the *MVGWTA*, including the on-site inspections. Audits are in place to ensure credibility of the growers' sustainability levels based on their responses. There are specific rules and penalties that, in extreme cases, can lead to a member's exclusion in case of discrepancies between inspections and the self-assessment answers and data reporting. Audits are also available to members who wish to become certified. Certification audits are carried out every three years, whereas self-assessment, random inspection process and data reporting through the on-line system are annual. The online system uses GPS coordinates to identify each vineyard block and relate it to the spray diaries. The reporting system cross-tabulates regional disease pressure on vineyards (ie spray targets) and chemical usage, as data is entered.

The *MVSWGA program* uses a systemic assessment that combines relevant indicators and best-practices and processes to indicate a clear pathway for growers to improve their sustainability at their own pace, using a triple bottom line approach (economic, environment and social).

Comparison of programs

The main characteristics of the most relevant sustainability programs for viticulture are displayed in Table 4-3. The programs from Chile, South Africa and New Zealand have a national scope while the others are regional. *McLaren Vale Sustainable Winegrowing Australia* is the only program that has its scope limited to a single wine region. All the other regional programs have at least a statewide scope. *Lodi* is the pioneer of sustainability initiatives among all programs and *LIVE* conducts the oldest certification scheme. *VineBalance* is the only program that does not hold a certification scheme but other initiatives that do lead to certification (such as newly started *Long Island Sustainable Program*) were derived from it.

Program website addresses, number of members, certified vineyards and area they represent is also shown in Table 4-3. All programs are voluntary. However, *New Zealand Wine* has a quasi-compulsory situation, as to be included in international marketing, promotional and awards events, wines from vintage 2010 onwards must be certified. This creates and helps explain the strong adoption rate (90%) in New Zealand.

Table 4-3 - Wine growing sustainability programs comparison

	Lodi Winegrowers' Workbook / Lodi Rules	Sustainable Winegrowing New Zealand (SWNZ)	Vineyard Team / Sustainability in Practice (SIP)	Low Input Viticulture and Enology (LIVE)	Integrated Production of Wine (IPW)	Sustainable Winegrowing Program (SWP)*	VineBalance	McLaren Vale Sustainable Winegrowing Australia (MVSWGA)	Sustainable Wine Chile
Website	www.lodiwine.com/certified-green	www.nzwine.com/sustainability/	http://www.sipcertified.org and www.vineyardteam.org	www.liveinc.org	www.ipw.co.za	www.sustainablewinegrowing.org	www.vinebalance.com	www.mclarenvale.info/sustainablewinegrowing	www.sustentavid.org/en
Country	United States	New Zealand	United States	United States	South Africa	United States	United States	Australia	Chile
Scope	Regional, mainly Lodi but also California	National	Regional (California)	Regional (Oregon and Washington States)	National	Regional (California)	Regional (New York state)	Regional (McLaren Vale)	National
Year of establishment	1992 (as the Grassroots IPM program)	1995 pilot (commercially in 1997)	1996 (Positive Points System) 2008 (SIP)	1997 (pilot) 1999	1998	2003 (CSWA) / 2002 (SWP)	2005	2009	2009
Year of establishment of certification	2005	2000	2008	1999	2010	2010	NA	2012	2011
Wineries certification	Yes**	Yes	No	Yes	Yes	Yes	No	No	Yes
Number of members/vineyards	Not available	94% of the total vineyards in New Zealand	300 (VT)	289	3000 farms - 95% of the wines produced in South Africa	954 (SWP) – 55% of statewide acres	75 (2008)	119 members 191 vineyards	79 (level 1 &2) vineyards or wineries
Vineyard area acres/hectares	Not available	33600 hectares	80,000 acres in Vineyard Team membership	10,639 acres	93,155.96 hectares (92.6% of total in South Africa in 2011)	293,404 acres – 69% of statewide acres	6,560 acres	2,929 hectares – 39% of total area under vine in McLaren Vale	Not available

Table 4-3. cont.

	Lodi Winegrowers' Workbook / Lodi Rules	Sustainable Winegrowing New Zealand (SWNZ)	Vineyard Team / Sustainability in Practice (SIP)	Low Input Viticulture and Enology (LIVE)	Integrated Production of Wine (IPW)	Sustainable Winegrowing Program (SWP)*	VineBalance	McLaren Vale Sustainable Winegrowing Australia (MVSWGA)	Sustainable Wine Chile
Certified Vineyard area	25,709 (Lodi Rules)	33,600 hectares	31,600 acres	9,342 acres	93,155.96 hectares (92.6% of total in South Africa in 2011)	62,455 (11.6% of statewide acres)	NA	Not available	Not available
Number of certified members/vine yards	72 members	1,784	174	251	3000	187	NA	22	46 vineyards or wineries
Educational objectives	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Program content peer-reviewed	Yes	No	Yes	Yes	Yes	Yes	No	Yes	No
Different sustainability levels for certification	No	Yes	No.	No	No	No	N/A	4 levels. Higher level demands 75% of available points	Yes
Prohibited chemicals list	PEAS requirements (Lodi Rules)***	Yes, from New Zealand legislation	Yes (high risk pesticides are not allowed)	Yes. Two distinct lists based climate of vineyard location	Yes	No	NA	Yes, adopted from AWRI***	Yes, for herbicides

Table 4-3. cont.

	Lodi Winegrowers' Workbook / Lodi Rules	*Sustainable Winegrowing New Zealand (SWNZ)*	*Vineyard Team / Sustainability in Practice (SIP)*	*Low Input Viticulture and Enology (LIVE)*	*Integrated Production of Wine (IPW)*	*Sustainable Winegrowing Program (SWP)**	*VineBalance*	*McLaren Vale Sustainable Winegrowing Australia (MVSWGA)*	*Sustainable Wine Chile*
Certification	Pass or fail (must exceed 70% of the overall points available plus at least 50% in every chapter	Pass or fail (must reach 100% of major questions and 80% of minor questions)	Pass or fail (Participants must meet 75% of total points including all requirements)	Pass or fail. 100% (Red control points) + 90% (Yellow control points) + 50% (Green control points) +5% farm area set aside for biodiversity	Pass or fail (must reach at least 60%)	Pass or fail. Certification requires scoring a 2 or higher for specific criteria, or have an action plan in place to improve performance*	NA	Sustainability level validation: Red (from 0 to 25%), Yellow from (25.1% to 50%), Green (from 50.1% to 75%) and Blue (more than 75.1%)	Pass or fail (must reach 100% of critical points and at least 60% of the score)
Assessment type	Best practice-based + indicator based	Best practice based + indicator based	Best-practice based + indicator based	Best practice-based + indicator based + criteria based	Best-practice based + criteria based + indicator-based	Process-based Best-practice based (SWP)	Best practice-based	Best practice-based + process based + indicator based	Best-practice based
Promotion of viticultural training	Yes,	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Third party certification	Yes (Lodi Rules)	Yes	Yes (SIP)	Yes	Yes	Yes (Certified SWP)	No	Yes	Yes

Notes: * California Sustainable Winegrowing Alliance **Lodi wineries' certification only on the change of custody (proof of segregating certified from non-certified grapes); ***PEAS requirement, visit http://www.lodiwine.com/certified-green/lodi-rules-for-sustainable-winegrowing/peasenvironmental-impact ; ****list from AWRI (AWRI, 2014)

Of the programs reported in this paper, South Africa's program is the only one that is regulated. South Africa's *WO* scheme was already in place and mandatory when the *IPW* started. When the *IPW* and *WO* scheme merged, *IPW* embraced the traceability and integrity features of *WO* and added legislation compliance and sustainability topics to the scheme/assessment. Wine grape growers in South Africa seem to be extremely conscious about the importance of preserving and conserving the natural resources of the country as well being able to ensure to (predominantly) international consumers that they are 'doing the right thing". Because of the level of organisation of the wine industry, *IPW* also became one of the tools to enforce South African legislation for farms and wineries. In spite of not being mandatory, the big cooperatives, largely, only buy grapes that are certified. Also, it is currently difficult to sell wines from South Africa without the *IPW* seal. All of these factors helped the broad adoption (92%) of *IPW* by winegrowers.

The assessment types used by the sustainability programs for viticulture are not wholly comparable amongst each other (Santiago-Brown et al., in-press). However, all programs embrace, to a certain extent, the triple bottom line approach (economic, environmental and social) as a goal. Table 4 summarizes program content and the number of assessment topics of programs and/or certification. The economic component is directly evaluated by *Lodi*, *SIP* and *SWP* in their business management chapters. All the best practice-based programs assess economic sustainability through the analysis of the adoption rate of best practices and the potential to reduce costs by optimizing resource use and fruit quality. Economic sustainability is understood through a diverse correlation of data from best-practices benchmarks.

Many programs analyse economic sustainability using value indicators to understand measurable outcomes (e.g. yield/area and inputs/area). *MVSWGA* reports this type of data and *SWP* is currently developing such correlations. Economic sustainability is also evaluated through regional socio-economic indicators such as average grape price per ton per variety, land price, wine bottle prices from the region, new planting areas, planted area, longevity of current vineyards, and similar measures. The governments of Australia, New Zealand, United States and South Africa collect and publish this sort of data which is used by the programs.

Programs located in countries with no specific chemical usage legislation (allowed, restricted and prohibited inputs as well as withholding periods) for wine grape growing, usually developed their own chemical list. These lists, in turn, became a requirement to meet their sustainability standards. Australia seems to have one of the strictest chemical usage legislation specific to vineyards and based on a sum of all export markets requirements. "Agrochemicals Registered for Use in Australian Viticulture" (AWRI, 2014) is published annually by the Australian Wine Research Institute (AWRI) and distributed for free for all members of the wine industry and also as an insert in a trade magazine. This resource is also publically available online (AWRI, 2014).

All programs use best-practice assessments, however, they use it in different combinations, as demonstrated in Table 4-3. While all programs have sustainability focus, motivations and outcomes vary. Some are driven primarily by education, others by certification. Most have a combination of these two goals in some form. For instance, *VineBalance* is a program with no certification, but *Long Island* adopted the *VineBalance* program and standards and used them to develop a certification scheme. *IPW, LIVE* and *SWNZ* are certification schemes in nature but enable participation, education and support without certification for wine growers who are unable to meet (or are in process of meeting) certification standards. Some programs may or may not lead to certification by the individual wine grower's choice – *CSWG*, *Lodi*, *SWC* and *Vineyard Team*. These programs have a certification scheme in place but certification is independent of sustainability program participation. Similarly, *MVSWGA* also has optional certification. However, all members (certified or not) are subject to random third-party audit to validate responses from self-assessment. *MVSWGA* is the only program that embraces four different levels of sustainability certification.

Overall, the idea of creating each one of these programs came from a group of progressive/innovative growers who were aware of the need for operational improvement of their activities. Certifications were developed to ensure external credibility (marketing) of what was happening in their vineyards. For those programs that developed sustainability assessment for wineries, the main driver was to communicate (or, market) the sustainability message in a more systemic way. Increasing environmental concerns, as expressed through large retailers' demands, were also taken into consideration. It is important to raise the issue that certification only attests to compliance with the standard of a nominated program, and makes no claims to individual standards of vineyards that have chosen not to participate or certify.

The sustainability programs that are currently in place, with great membership uptake, have a strongly motivated and technical manager with a powerful interpersonal network. The importance of the interpersonal networks in innovation adoption (sustainable practices in the context of this investigation) is exhaustively discussed by Rogers (2003). This is the case in *New Zealand*, *Lodi*, *McLaren Vale* and *Oregon* for instance. These program managers seem to be strongly supported by the wine grower community. It was observed that this situation seemed to be driven by growers' perception of their program managers' strong technical skills in viticulture and ability to manage all aspects of the program. The important role of these program managers can also be perceived as their greatest weakness, as it is uncertain the direction such programs will take when these manager are not in their roles anymore. Succession planning was never discussed during this study, so retirement or withdrawal of entrepreneurial and driving leaders is likely to have a severe negative effect on program performance, similar to the negative effects of a lack of succession planning in private businesses (Gilding, Gregory, & Cosson, 2013; Trow, 1961).

Table 4-4 - Sustainability programs for viticulture: number of assessment topics and content

	Lodi Winegrowers' Workbook / Lodi Rules	Sustainable Winegrowing New Zealand (SWNZ)	Vineyard Team / Sustainability in Practice (SIP)	Low Input Viticulture and Enology (LIVE)	Integrated Production of Wine (IPW)	Sustainable Winegrowing Program (SWP))*	VineBalance	McLaren Vale Sustainable Winegrowing Australia (MVSWGA)	Sustainable Wine Chile
Number of Assessment topics	125 (Lodi Rules) 160 (Lodi Workbook)	80	225	190	Approx. 120**	191	134	165	228 topics (Green and Orange Area), 35 critical points***
Assessment topics	Business Management	Organisation Management	Conservation and Enhancement of Biological Diversity	Farm Records, Self-Inspection, Training and Traceability	IPW Training	Sustainable Business Strategy	Soil Management	Soil Health, Nutrition & Fertilizer Management	Soil evaluation and management
	Human Resources Management	Resources Management	Vineyard Acquisition/Establishment and Management	Biodiversity, Ecological Infrastructures	Conservation and Improvement of Farm and Vineyard Environment	Viticulture	Nutrition Management	Pest and Disease Management	Design, planting and care of the ecosystem.
	Ecosystem Management	Soils and Nutrient Management	Soil Conservation and Water Quality	Site Selection	Soil and Terrain	Vineyard Water Management	Vineyard management	Biodiversity Management	Vegetable material for planting.
	Soil Management	Frost Protection	Water Conservation	Site Management	Cultivars	Soil Management	Irrigation Management	Water Management	Weed management
	Water Management	Ground Cover Management	Energy Conservation and Efficiency	Varieties, Rootstock, Sowing/Planting Aspects	Rootstocks	Pest Management	Weed Management	Waste Management	Nutrition and vigour management
	Pest Management	Water Management	Air Quality	Plant Nutrition and Fertilizer Use	Vineyard Layout	Wine Quality	Pest Management	Social (Work, Community and Wineries relations)	Pest management

Note: * California Sustainable Winegrowing Alliance ** IPW bases its audits on its guidelines.120 represents an estimation of minimum number of assessment topics based on the guidelines. The number might greater as some questions are complex. *** Some of these topics might refer to the winery's assessment, therefore, number of assessment topics for vineyard matters might be smaller.

Table 4-4. (cont.)

	Lodi Winegrowers' Workbook / Lodi Rules	Sustainable Winegrowing New Zealand (SWNZ)	Vineyard Team / Sustainability in Practice (SIP)	Low Input Viticulture and Enology (LIVE)	Integrated Production of Wine (IPW)	Sustainable Winegrowing Program (SWP))*	VineBalance	McLaren Vale Sustainable Winegrowing Australia (MVSWGA)	Sustainable Wine Chile
Assessment topics	Vineyard Establishment and Replanting (LWW) Viticulture (LWW) Shop and Yard Management (LWW) Wine Quality and Customer Satisfaction (LWW)	Plant Protection Spills and Emergency Procedures By Product Management Energy Contractors Conservation Logo	Social Equity Pest Management Continuing Education Product Assurance and Business Sustainability	Irrigation Integrated Plant (Crop) Protection Harvesting and Food Safety Animal Density and Welfare On Mixed Farms With Livestock Worker Health and Safety Salmon-Safe Whole-Farm Protocols	Cultivation Practices Nutrition Irrigation Pruning, Training and Trellising Crop and Canopy Management Growth Regulators Integrated Pest Management Handling Chemicals Record Keeping	Ecosystem Management Energy Efficiency Winery Water Conservation And Quality Material Handling Waste Reduction And Management Environmentally Preferred Purchasing Human Resources Neighbours & Community Air quality	Pesticide Management Continuing Education		Disease management Training Handling, storage and application of agrochemicals Vigour management Handling loads Working life quality Community Care of water sources and watering management Records Marketing and commitment with consumers Energy and fuel use Waste management Biodiversity Ethics Environment

Creation of sustainability assessment programs in viticulture: engagement processes; enabling and inhibiting factors

Third order analysis of the focus group discussions used a qualitatively analysed and content-analysis driven visualisation that resulted in four tag clouds that were subsequently analysed in three segments that are described in the following sections: benefits; inhibiting factors; and engagement process.

Benefits (question 1 from focus group)

Eighty-three top-level managers from the wine industry from five countries were asked in 14 focus group sessions about the potential benefits to induce their participation in a sustainability program. They were also asked to list specific benefits they would expect to receive from a chosen program. The qualitative analysis of the transcripts shows that the educational aspect is the most important benefit gained by participants in sustainability programs and one of the core reasons for participation. Education was expressed as an objective opportunity to self-improve. According to participants, education is the main consequence of the sustainability self-assessment and benchmarks derived from the collection of their peers' results as well as interaction with peers and training promoted by the program's management. This result endorses the viewpoint of Ohmart who emphasises the improvement opportunity growers receive by just being part of sustainability programs (Ohmart, C, pers.comm., 2012). All programs listed in this article had origins directly related to the need to promote operational improvement in their vineyards.

(a) (b)

Figure 4-1 (a) **– Benefits (a) and inhibiting factors (b) for growers' participation in wine growing sustainability programs**

There was a limitation in the analysis software that originally made it difficult to align quantitative results with the qualitative results. This was significant in the results on the topic “education” as seen in Figure 4-1a, which displays the tag cloud created in Nvivo10, from Stage 3, question 1 of the focus group discussions. The term “education” only appears as the 32nd most recurrent word in the analysis of all transcripts and is displayed in very small font on the bottom left of the tag-cloud – a result inconsistent with the clearly established importance of education in all other findings, which is why the qualitative results are critical in understanding the focus group results. Content analysis methods and the role of the investigator in making analytical choices to produce meaningful results have been widely studied in the academic literature (Krippendorff, 2004; Luyt, 2012; Onwuegbuzie et al., 2009). If a qualitative analysis of the transcript was not conducted, and the results relied solely on the tag-cloud interpretation, it could lead to a misinterpretation of the results.

The qualitative analysis of the transcripts showed that many displayed words were directly expressing educational aspects, such as ‘better’, ‘practices’, ‘standards’, ‘vineyard’, ‘improve’, ‘improvement’, ‘information’, ‘knowledge’, ‘technical’, ‘benchmarks’, among others – giving us a deeper and richer insight into the importance of education to the participants of this study. Each content analysis must be seen as a unique situation, and tag-clouds are still powerful displays of contents (Bateman et al., 2008; Kaser & Lemire, 2007; Sinclair & Cardew-Hall, 2008), so are used here to display these results.

The term ‘people’ is the most recurrent term followed by ‘marketing’. In the context of the interviews, ‘people’ represents program managers, program peers and community members where vineyards are located as well as consumers. This result seems quite understandable as programs are created for people (in the context of this investigation, wine growers) by people to promote sustainability in vineyards. Sustainability encompasses the economic (business, quality, practices, product, fruit, buy, wineries, amongst others), environmental and social (community, region, people) components. Marketing helps to create the bridge between the winegrowing/making processes with the external world, to assure consumers. The qualitative analysis also pointed out marketing as the second most expected benefit. The terms ‘marketing’, ‘market’, ‘wine’, ‘certified’, ‘certification’, ‘endorsement’, ‘buy’, ‘credibility’ and ‘story’ are intrinsically related to public external validation, and therefore the accountability of sustainability assessments. All the terms displayed in the tag-cloud are intrinsically related, intersecting many of the benefits listed by participants. All these tag-cloud results align consistently with, and highlight the key factors brought out in the qualitative analysis – that educational focus, people, and marketing are core drivers and benefits for participation in sustainability programs.

Inhibiting factors (question 2 from focus group)

The inhibiting factors for participation are presented in Figure 4-1b. 'People' is displayed as the most import factor to drive wine growers away from a sustainability program. In this context, ‘people’ represented two very specific situations directly related to the credibility of the program: (1) the program managers, if they are seen as someone that lacks appropriate background or experience to run the program, or be able to interact or provide any technical benefit for the wine growing community; and (2) program peers, when they are not really sustainable but try to use the (good) perceived image of other members to increase their own value, compromising the credibility of the group as a whole. Participant 56 says: “I could be practicing a very high level of sustainability and because I’m practicing in a very high level and someone is just saying they’re sustainable…they’re benefiting from the kind of practices that I’m utilising but they are not really doing anything…”. Participant 40, from another group says: “Accreditation (to a program) is often a risk…you have people who abuse the system and if there is a scandal involved with accreditation then you’re all painted with the same brush…in our business, we try as much as possible to put maximum effort in between all accreditations so that our customers will entrust (sic) us rather than our accreditations.”

In summary, the other inhibiting factors are cost; time consuming paperwork; lack of appropriateness (and a low bar) of the assessment; lack of useful information provided back to growers; absence of business improvement or marketing benefit, programs that are too prescriptive; and confusion between sustainability and farming system choices (e.g. organic). There are many pathways to achieve sustainability in winegrowing, which is a context-dependent situation. Not all innovations (in this context, sustainable practices) are desirable for all situations. In agriculture, for instance, the needs and reality of small-sized organisations differ greatly to the ones from large commercial farms (Rogers, 2003). We suggest that the role of sustainability programs should not be telling growers how to grow grapes but contribute to their education to help them to optimize quality and costs, comply with legislations, minimize impacts on environment and ensure a healthy working environment for employees.

The prescriptive factor that might inhibit growers to become part of the sustainability program was discussed by Andrew Jefford in the Decanter Magazine, when writing about a visit to a traditional French vineyard where the owner, Jean Orliac, expresses deep dissatisfaction about certifications in general: “For us, agriculture is an *art modeste*, needing lots of experience and reflection… The role of the winegrower is to be in some sense a free man.” Jefford states: “a small-scale, independent winegrower in almost any country on earth is an unusually free individual -- meaning that, once debt is repaid, they are economically beholden only to themselves, and that their work involves making decisions (key to existential notions of freedom) rather than conforming to a pattern of behaviour acquired from or imposed by others”(Jefford, 2013).

Engagement process (question 3 focus group)

Just as the major strengths in programs and leaders tend to be the greatest weaknesses, in the same way, the factors that promote sustainability programs and participation are also the same factors that inhibit wine growers participation. The balance between cost and time versus benefits and credibility will drive wine growers’ participation in sustainability assessments. Figure 4-2 shows the tag-cloud created from the third question of this section of the discussion. For example, when growers were asked about the strategies they would use if in charge of engaging other growers to become part of a sustainability program, the majority of the growers referred to the benefits they had listed before. Additionally, they would emphasise success stories from members involved with sustainability programs.

Figure 4-2 - Engagement process for growers' participation in wine growing sustainability programs

Many participants mentioned that current members should be the main focus of the program management. Participants pointed out that their stories and the changes promoted by adoption of sustainable practices would drive the engagement of new members. Furthermore, it was emphasised that it was important to demonstrate that the group is stronger than individual growers. For instance, among the economic benefits, accreditation of the program with wineries and retailers and a consequent payment of a bonus price for the grapes would contribute to membership uptake.

Reporting and sponsorships (questions 4 and 5)

When asked about how the program should report results to obtain funding from external sponsors, including government(s), 'benefits to people' was the most important outcome that should be demonstrated through measurements (Figure 4-3). Not only benefits to the growers themselves, thorough the perpetuity of their businesses, but especially social benefits promoted by the program to their employees and community. The direct and indirect social-economic impact of the grape-growing activity as well as the benefits to the environment should be used as the main reasons to attract sponsorship. According to participants, the benefits to the environment could be demonstrated through preservation and conservation actions, including water as well as chemical reduction from vineyard management practices improvement. Program popularity among growers, measured through membership in relation to the total number of growers, should also be taken into consideration when approaching sponsors for the program. When programs are voluntary, membership and acreage numbers seem to be the most direct measurement of program relevance for growers.

Figure 4-3 -Suggested results reported by wine grape growers to obtain funding for wine growing sustainability programs

Conclusions

Most research on sustainability emphasises the environmental impacts of productive processes. However, environmental issues were not the main drivers for the conception of sustainability assessment programs for viticulture. The environmental appeal is incontestably important and all programs have embraced environmental sustainability as part of their assessments. Nevertheless, successful programs like those described in this study have been created to increase growers' overall sustainability, mainly through the direct and indirect education they promote and the overall economic benefit to their business caused by overall improvement of their operations. The universities involved played an essential role in the development of these programs aiming to improve grape growers' sustainability. Ultimately, the proper study of viticulture is the study of sustainability as viticultural research should be driven by the need to keep the wine industry alive, over time.

Agriculture is the cultivation and harvesting of crops (International Labour Organization, 1999) and the primary purpose of agriculture is to meet the demand for agricultural products, mainly food, but also raw materials for fibre production (European Environamental Agency, 2013) to maintain and enrich life. In the context of this study, the purpose of wine grape growers is to produce grapes to produce wines and to do so sustainably; *i.e.* "be able to economically provide for the farmer while maintaining its ability to consistently produce and improve quality over time" (Santiago-Brown et al., in-press). Sustainability assessment programs in viticulture only make sense if they are useful to help growers to improve their sustainability in the context of the community and environment they are located.

Chapter 5. Conclusions

Summary, significance and contribution to the discipline

This study has two major areas of contribution. Principally, it offers a number of contributions to the field of sustainability, particularly as it pertains to agriculture, and most of this chapter will address those contributions. However, this study also makes a significant contribution to methodology and method.

The use of mixed methods research (MMR) is novel in sustainability or scientific agricultural investigations. The results from this study demonstrate that mixed methods research has the potential to be used as the main pathway in sustainability investigations of individual organizations in agriculture or any other industry. A strength of MMR is that it minimizes the researcher's bias by combining and analyzing multiple data sets, captured through different means. Furthermore, MMR captures nuances of the concept that would be difficult to capture using a qualitative or quantitative method alone. These nuances are revealed as complexities of the sustainability concept that are difficult to detect in similar investigations where mixed methods were not employed.

These complexities are essential to a shared understanding of the concept of sustainability. The complexities also determine meaningful and appropriate variables for sustainability assessments that can positively increase individuals' understanding of their organization's status and, therefore, influence their choices and contribute to promote positive changes. This thesis highlights the importance of defining at least seven essential points prior to the establishment of sustainability assessment programs: (1) definition of sustainability; (2) viewpoint; (3) scope; (4) spatial scale of the assessment; (5) purpose; (6) timeframe; (6) assessment method (s) and (7) trade-offs and trade-off rules. These seven essential points are necessary to minimize the confusing message(s) embedded in sustainability as they clarify the meaning of sustainability related to productive processes and products.

Sustainability is the goal of any individual organization aiming to survive over time. To be able to keep producing over time, vineyards need to maintain and improve the quality of their products in a world of constant change. These changes challenge current productive processes. Over time, practices and processes need to be changed and adapted to meet the requirements of a changing environment. In farms, the land and the environment are directly connected to production. Environmental preservation impacts directly on production. The social component is also critical to the sustainability of organizations: not only the direct workforce but the surrounding communities as well, because often they are the main service and product providers for the farms and people that work or live on them. The results suggest that sustainability assessments focused on the outcomes of growers' actions rather than the input usage are more likely to engage growers in sustainability programs because of the practical and useful application in the decision-making process on farms. Empirical observation suggests that the high adoption rate of McLaren Vale Sustainable Winegrowing Australia is driven by the perceived usefulness of the program to growers' sustainability.

Chapter 3 of this thesis presents four sets of ranked sustainability indicators: overall, economic, environmental and social. These indicators seem to be representative for use by wine grape growers in New World wines as results are derived from participants from these countries (Australia, Chile, New Zealand, South Africa and the United States). In viticulture, these qualitative indicators should be seen as the starting point of the assessment as they will need to be quantified in the context and particularities of each wine region that wishes to embrace them. Similarly, the same rationale could be applied to the Old World wine countries or any other agricultural crop or industry. The method develops a rank that defines the most meaningful indicators to assess sustainability. The rank shows indicators by their importance index, which is an easy and practical way to focus assessments on variables that most impact on growers' sustainability. Therefore, it also has the potential to save money and time by reducing the number of indicators required to assess sustainability. The list of indicators also seems to reflect indicators proposed in different methods and programs worldwide. The point of difference in this research is that the indicators list proposed by this investigation reflects the perceptions and operations of everyday real vineyard management. This bottom-up approach produced a list of indicators that are effectively used by managers to evaluate and improve their businesses.

A bottom-up model, from the farm to industry bodies or government, (as opposed to a top-down from the industry bodies or government to farms), was proposed by this thesis as the most viable pathway to develop sustainability assessments. The model seems to have a higher potential to increase the usefulness of sustainability investigations of companies, including farms. Such models can contribute to the development of sustainability assessments from the company's viewpoint. The findings from this research create a working definition of sustainability that can be used as a model for other fields.

Chapter 4 concludes that the most successful and relevant sustainability programs for wine growing have been created to increase growers' overall sustainability, mainly through the direct and indirect education they promote and the overall economic benefit to their business caused by overall improvement of their operations. The universities involved played an essential role in the development of these programs aiming to improve grape growers' sustainability. Sustainability assessment programs in viticulture only make sense if they are useful to help growers to improve their sustainability in the context of their business, their community and the environment in which they are located.

Additionally, the findings and methods proposed by this thesis can contribute to the promotion of sustainable development of wine regions in Australia and worldwide as well as rural areas in general. This thesis proposes an objective pathway to evaluate sustainable practices that can potentially help improve growers' sustainability and therefore contribute to: (1) land preservation and conservation, (2) farmers' improved profitability, (3) maintenance of rural areas by maintaining farmers on farms and (4) guide governments, universities and research organisations to invest in relevant topics to foster sustainable practices and promote social development; as well as to contribute to keeping the wine industry viable, over time.

Recommendation for future research

Opportunities to further develop this research exist in two dimensions: linearly within the wine industry chain or laterally within other agricultural pursuits or other fields.

The linear dimension could be developed to further look mainly at: (1) the elaboration of quantitative measures from the qualitative proposed indicators. The quantitative measures must be developed in the context of the wine region adopting the sustainability definition proposed by this thesis; (2) the study of the impact and usefulness of sustainability programs on improving growers' sustainability; and (3) the impact at the farm level of the increasing demand for sustainable schemes by retailers as a requirement for wine purchase and exports.

The lateral dimension could be similarly developed as the linear dimension, but from the development of a sustainability definition and elaboration of appropriate and meaningful indicators in other agricultural crops or other fields where sustainability programs are being implemented or reviewed. These two dimensions would contribute to the sustainability of the world.

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Appendix

Santiago, I., Bruwer, J. & Collins, C. (2013) Context and content in grapegrowing sustainability systems: a process.
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NOTE:
This publication is included on pages 159-160 in the print copy of the thesis held in the University of Adelaide Library.

Santiago, I., Bruwer, J. & Collins, C. (2012) Sustainability in viticulture: assessment and adoption. *Wine & Viticulture Journal, January/February(1), pp. 48-50*

NOTE:
This publication is included on pages 161-163 in the print copy of the thesis held in the University of Adelaide Library.

MCLAREN VALE SUSTAINABLE WINEGROWING AUSTRALIA

IFV
INSTITUT FRANÇAIS DE LA VIGNE ET DU VIN

WORKSHOP: Sustainable Development Applied to Viticulture: Strategy, Implementation and Evaluation Approaches

Oct. 16th 2013

Irina Santiago
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VITeff.com
The sparkling wine technology exhibition

McLAREN VALE SUSTAINABLE WINEGROWING AUSTRALIA

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One thing leads to another

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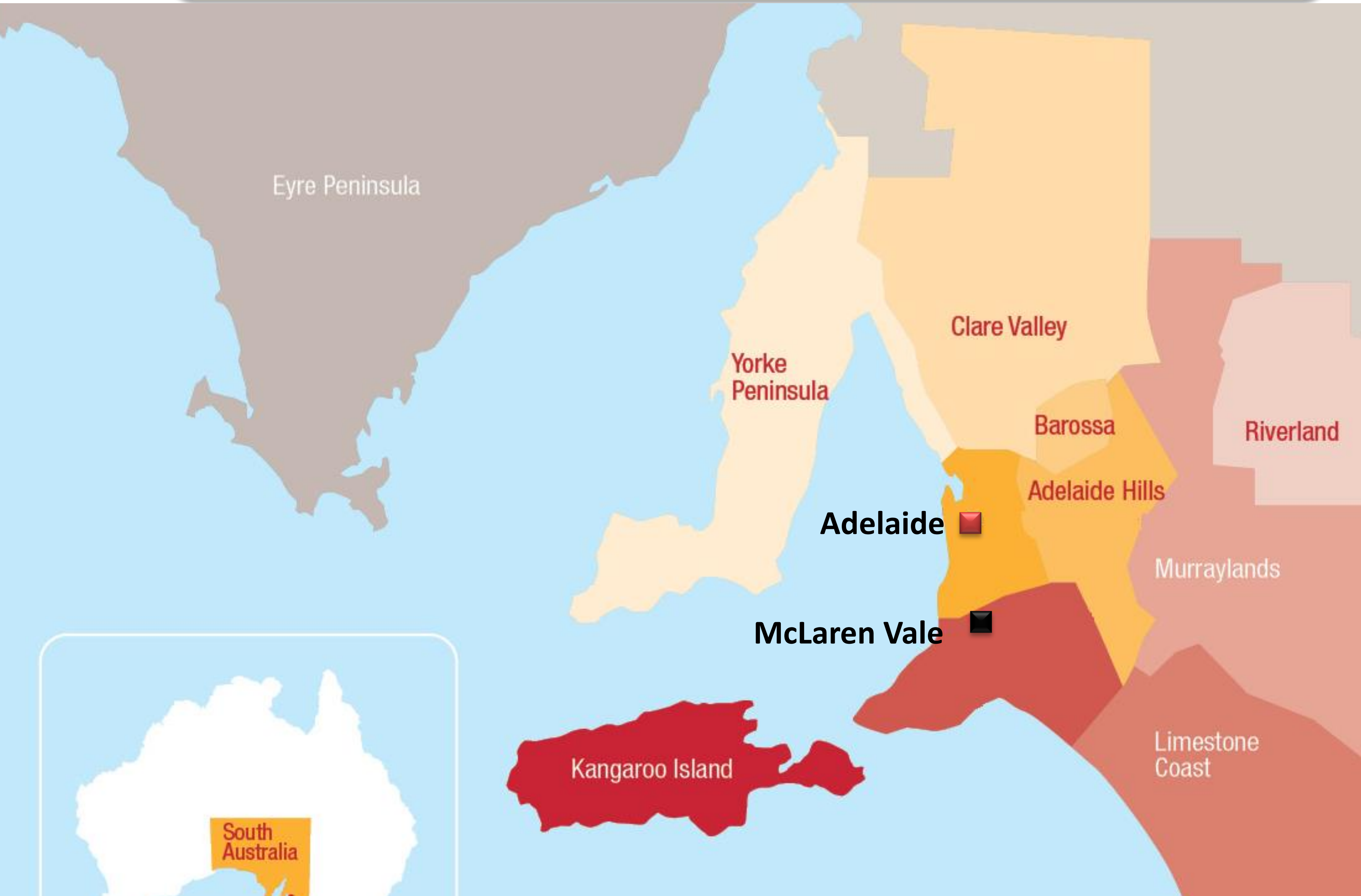
McLaren Vale



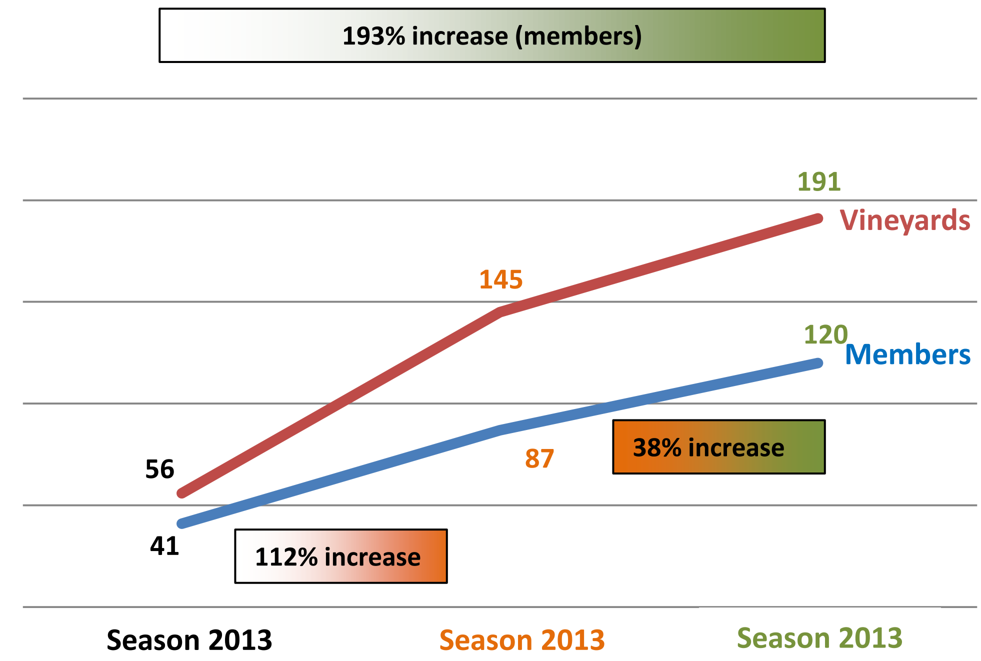
The program

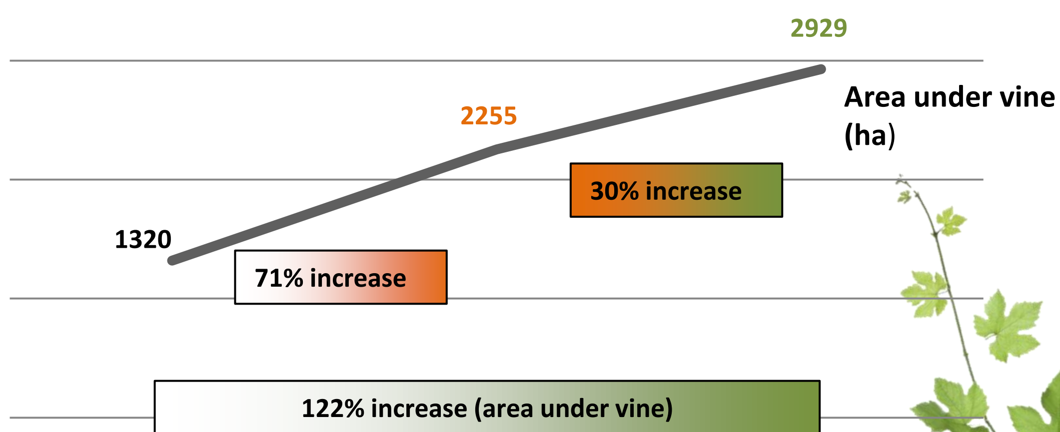
- The only sustainability program for viticulture in Australia
- Written by local growers (from the bottom to the top system)
- Content peer-reviewed by recognised experts
- Partnerships with government, universities, industry bodies, research organisations, third party certified, etc.
- Voluntary scheme
- Credible: All members subjected to be audited by a third-party organisation.
- Inspections: sampling approach. Up to 10% members at MVGWTA's expenses (yearly)
- Feasible: $50.00 per grower.
- Comprehensive, useful and interactive result report for growers

Program snapshot

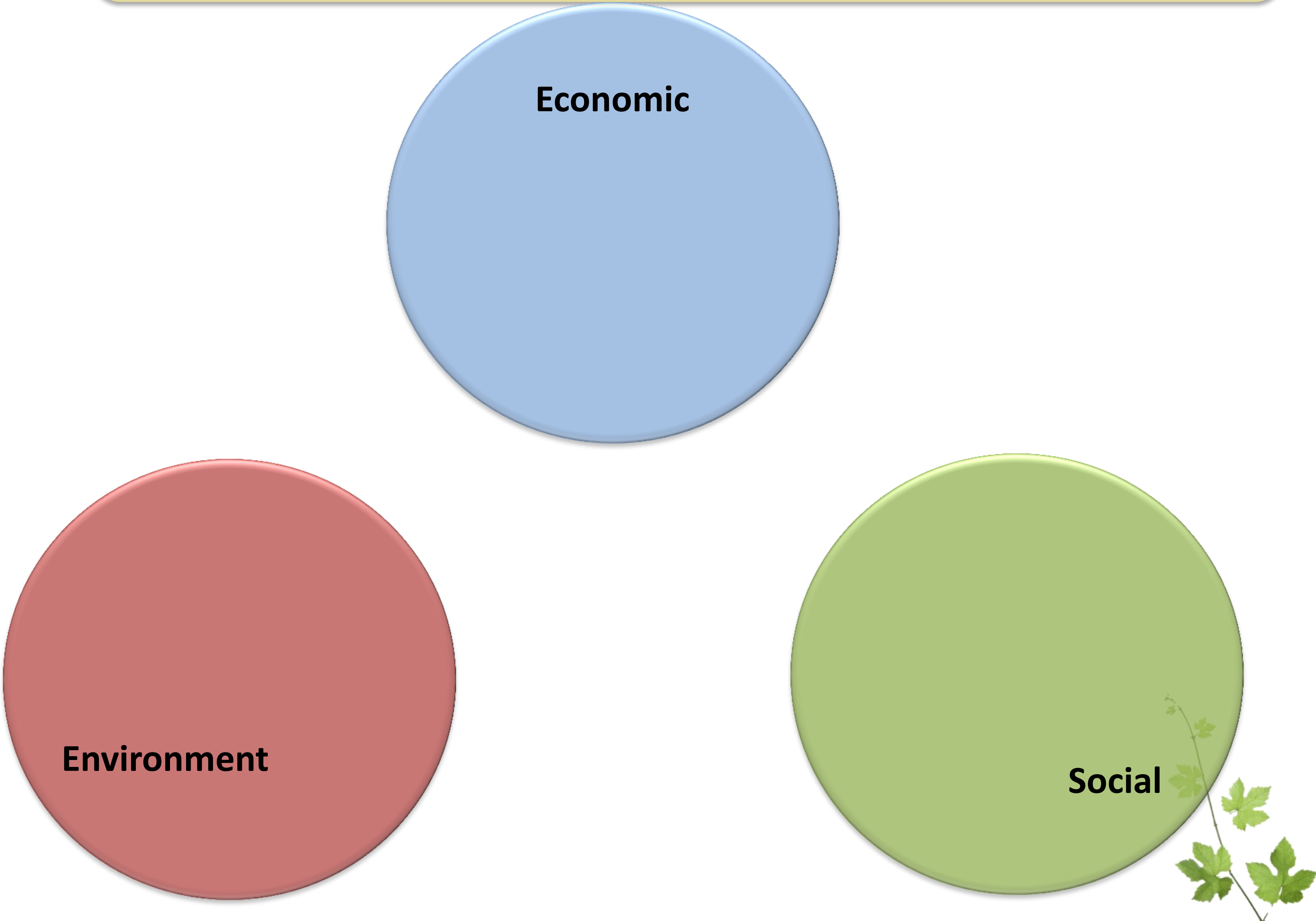
	Season 2013	Season 2012	Season 2010
Members	120	87	41
Distinct Vineyard Sites	191	145	56
TOTAL FARM area (ha)	4386	3028	1446
TOTAL area UNDER VINE (ha)	2929	2255	1320
Area under RED grapes (ha)	2572	2021	1146
Area under WHITE grapes (ha)	274	234	174
RED grape Production (ton)	16215	10444	
WHITE grape production (ton)	2491	1461	

Program members vs. McLaren Vale
53% total grape production
39.2% total area under vine
35% distinct vineyards

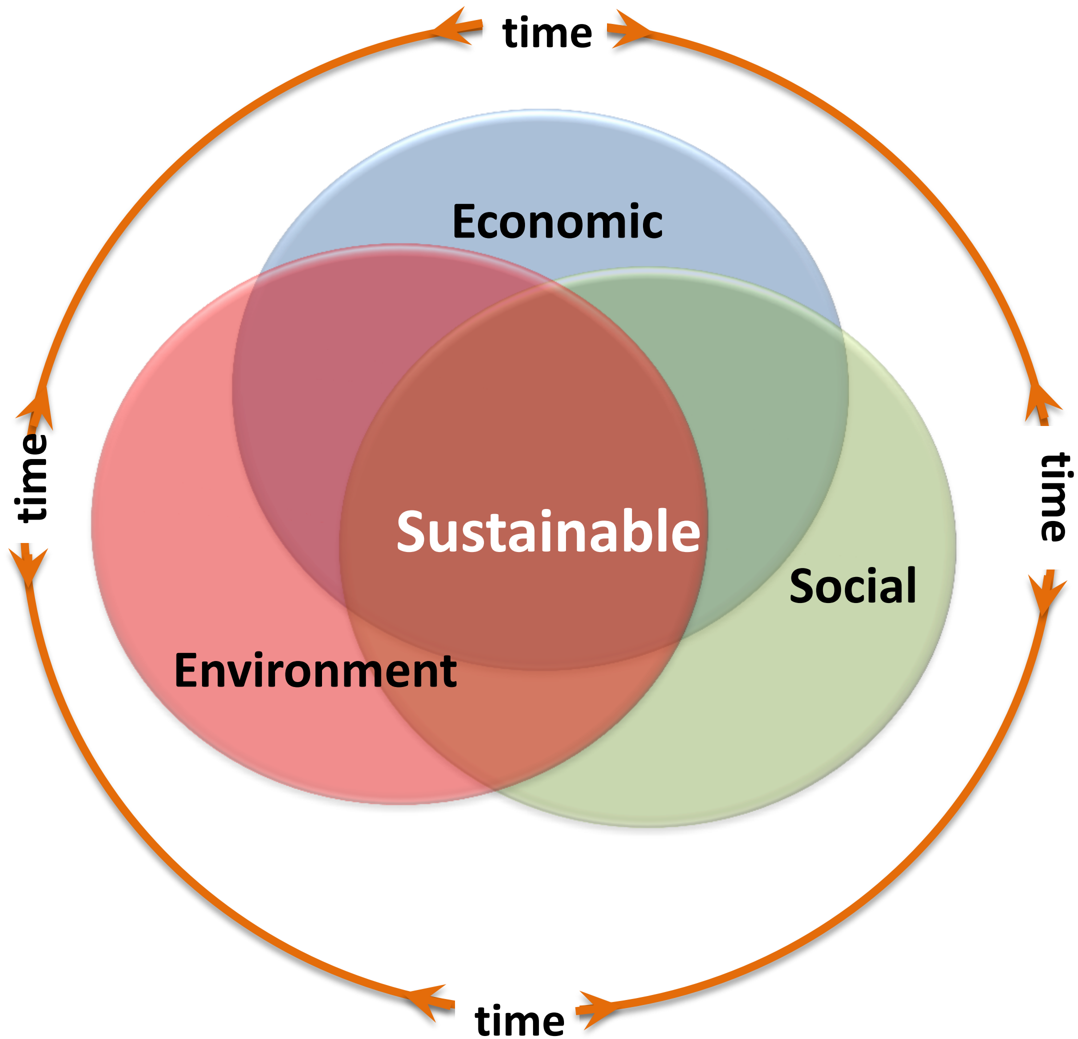




Sustainability

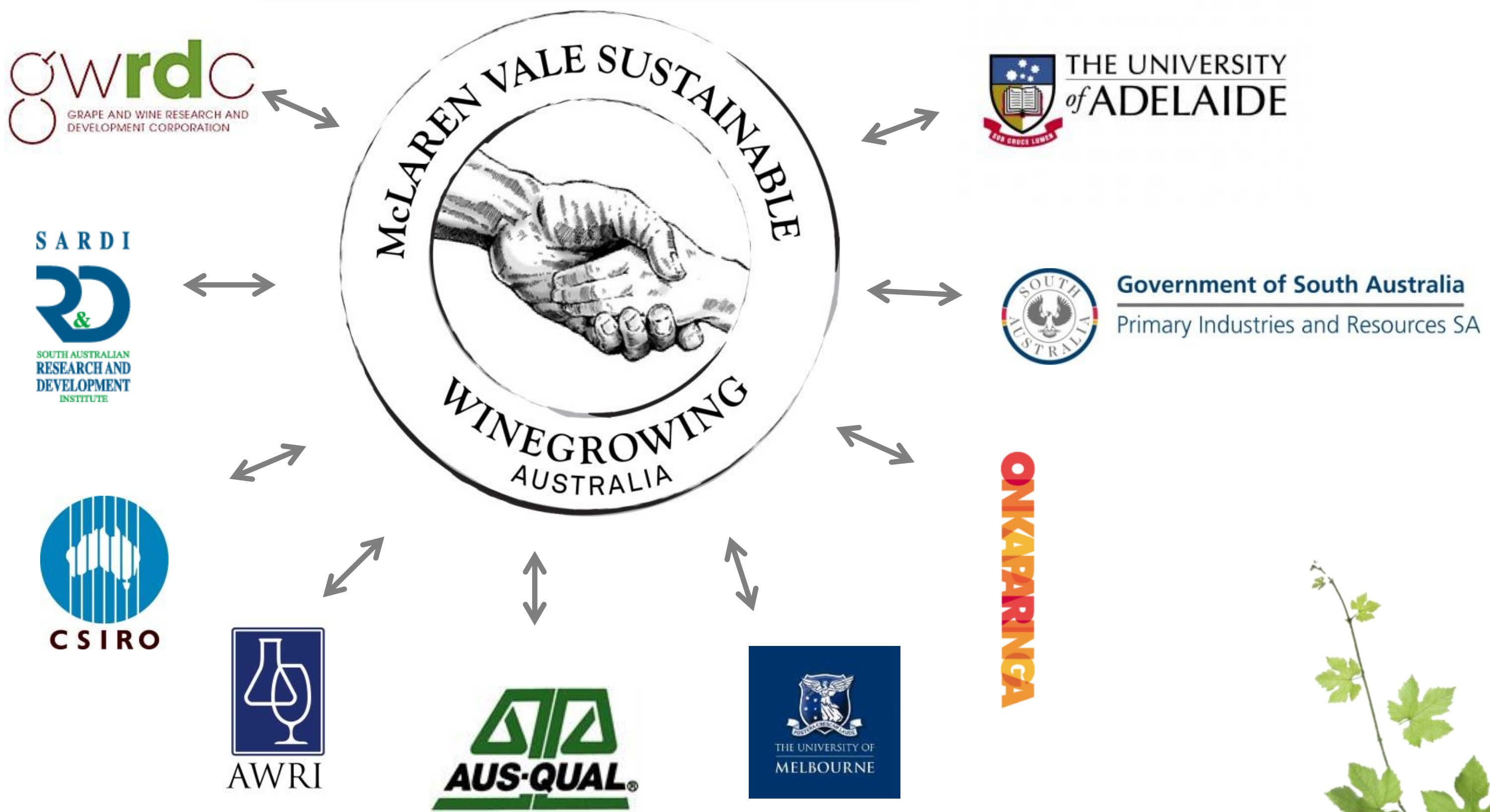


Sustainability over time



Partnerships

McLaren Vale Growers and Wineries



The assessment

- The Assessment
  - Indicators collection
  - Business characterisation
  - Wine
  - 6 chapters (22 sections, 122 topics)

- Results used by the Association to support investments in viticulture related training, workshops, publications, etc.

20%	Soil Health, Nutrition and Fertiliser Management
20%	Pest & Disease Management
15%	Biodiversity
15%	Water Management
15%	Waste Management
15%	Social Relations (workers, community and wineries)

The Program and categories

Workbook:

- Answers from 0 to 4 + N/A
- Options are not linear

E.g. 2 is not necessarily 2x more sustainable than 1

Grower's action plan = workbook

Continuous Improvement:

- Workbook content update
- Growers' improvement in the system

Sustainability

4	3	2	1	0
Excellent	Very good	Good	Needs attention	Needs urgent development

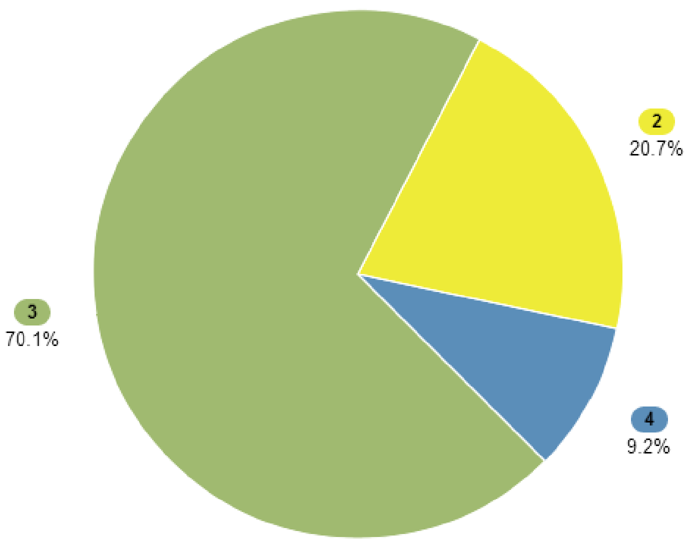
N/A

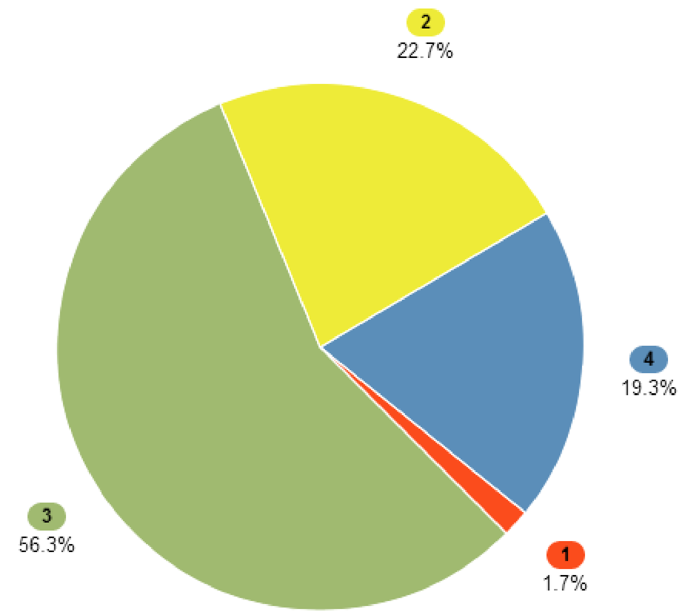
Growers answers in the workbook

Most sustainable			Least sustainable	Not sustainable

Members’ sustainability level

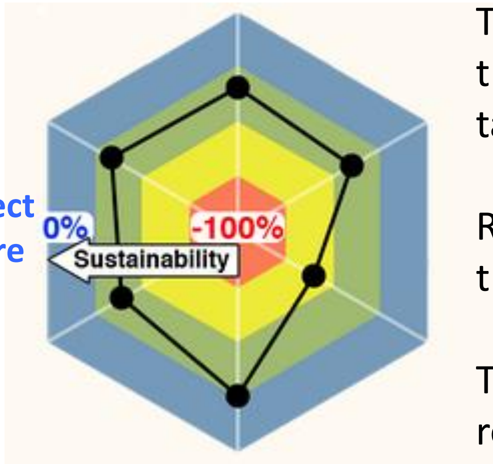
2012	2013





The reports

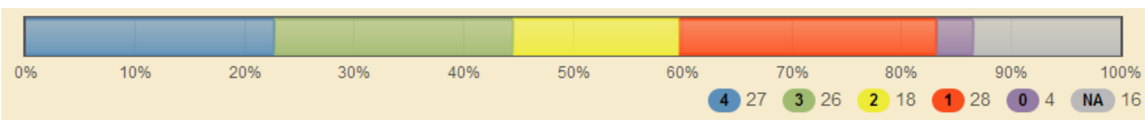
Perfect score



The spider graphs show values relative to the maximum "**perfect score**" that can be achieved. The attributed weight (importance) for each item is taken into consideration

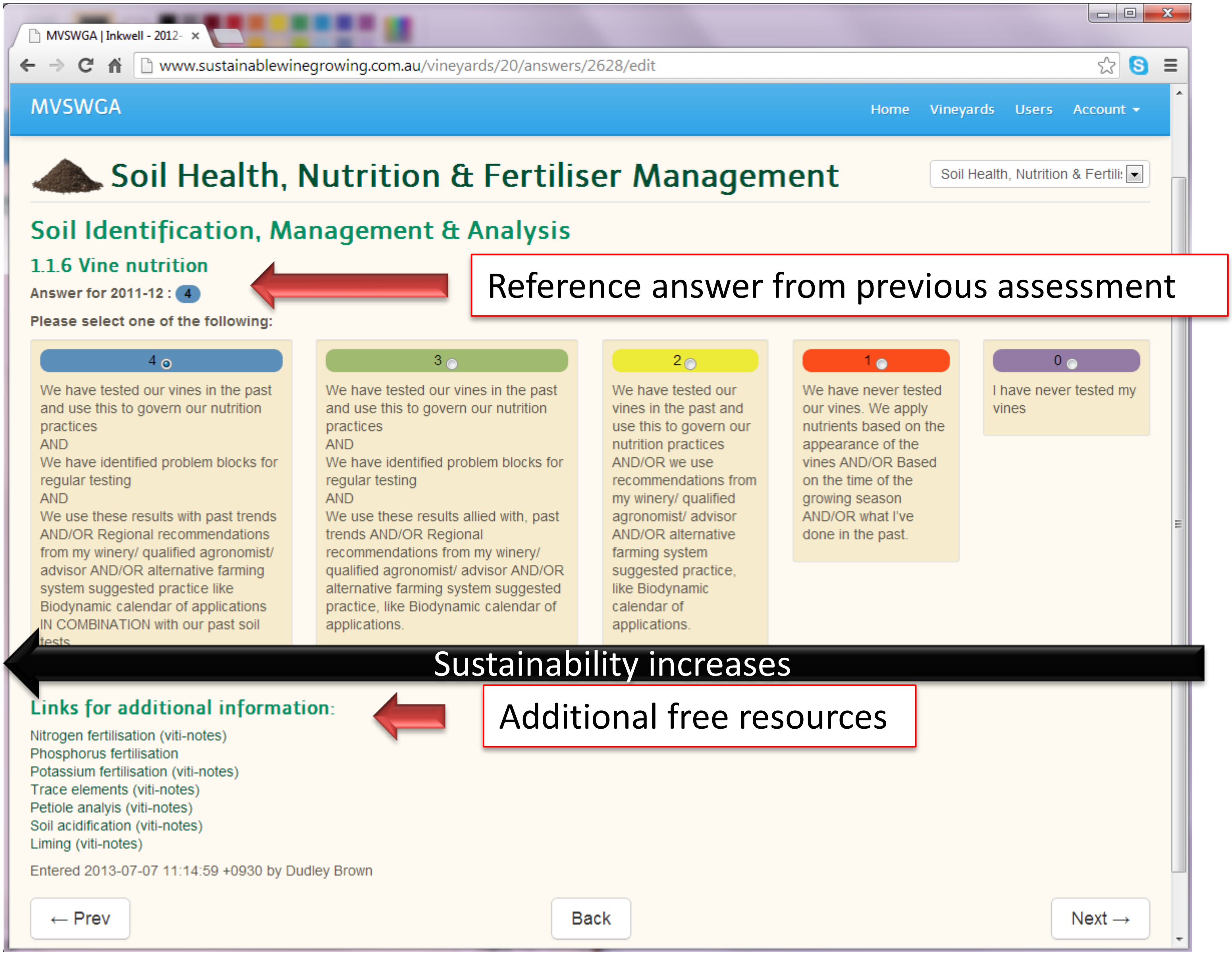
Results are shown as % change between maximum possible points and the score for the specific member or region.

The centre of the graph represents -100%. The outer edge of the graph represent 0% (best possible result

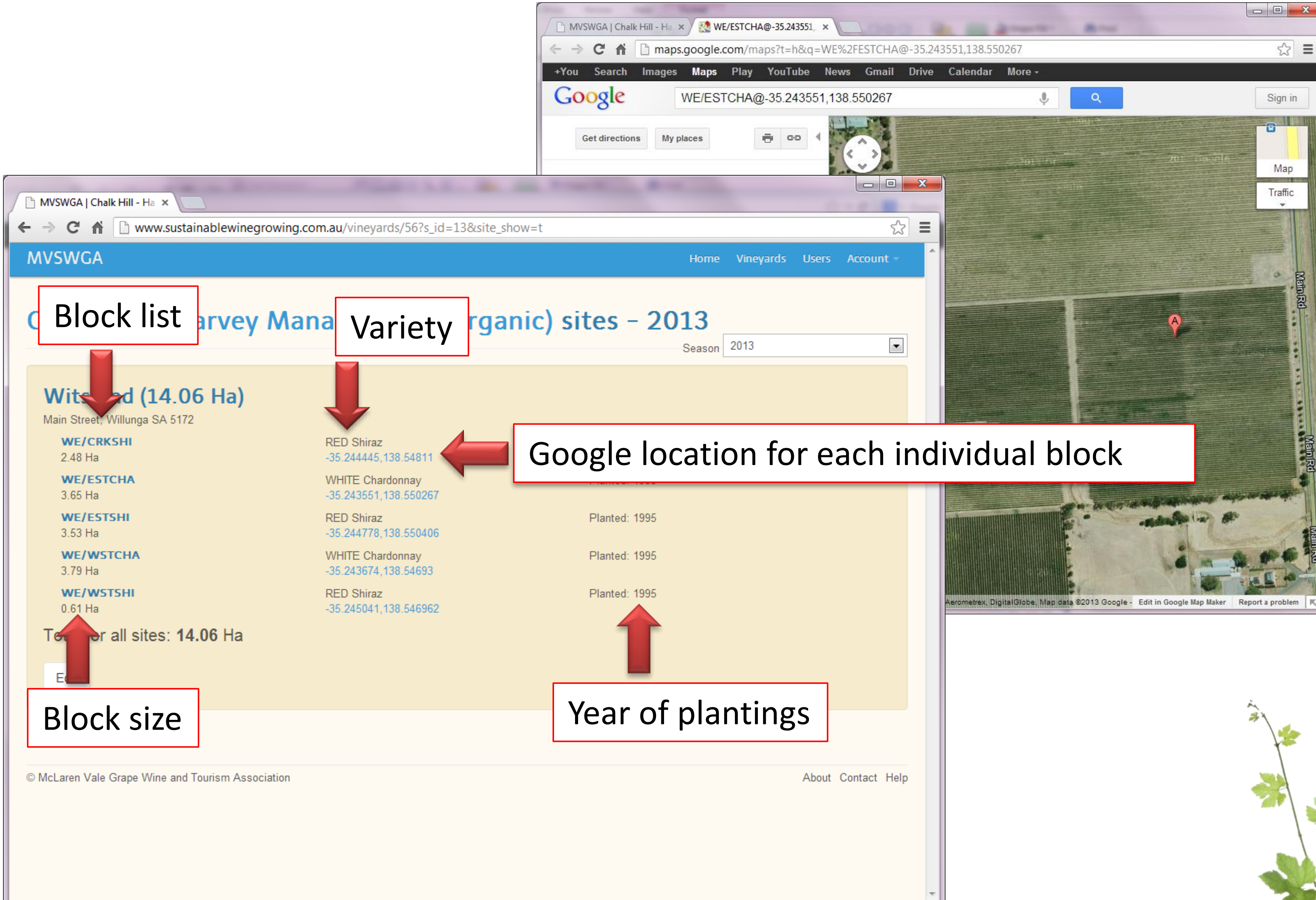


- Comprehensive report system:
  - Comparing different variables
  - Comparing own results over years
  - Comparing results against peers' average
  - Tracking of own improvement
  - Tracking of regional improvements
  - Web-links for self-education on specific topics

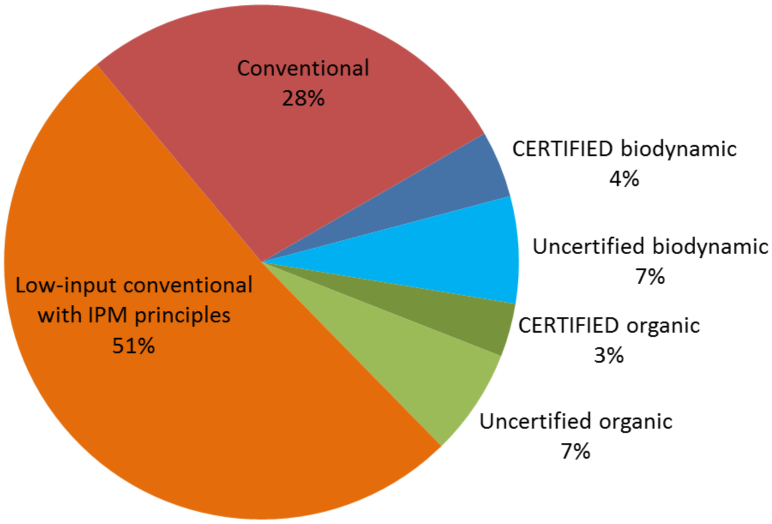
On-line system



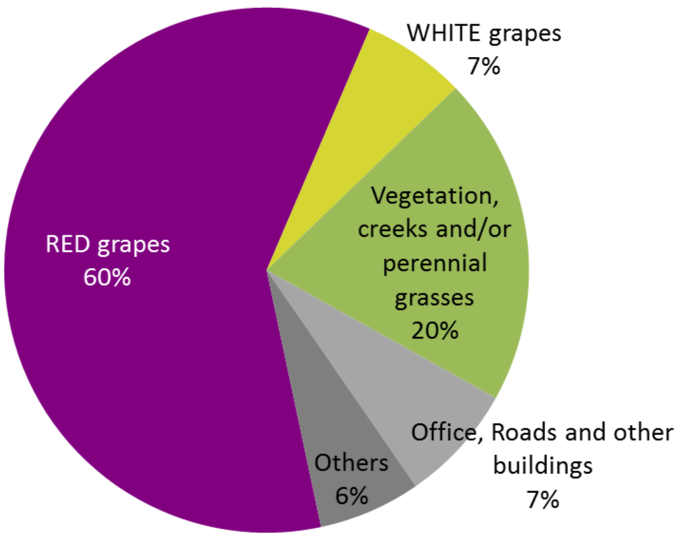
On-line system



Our members



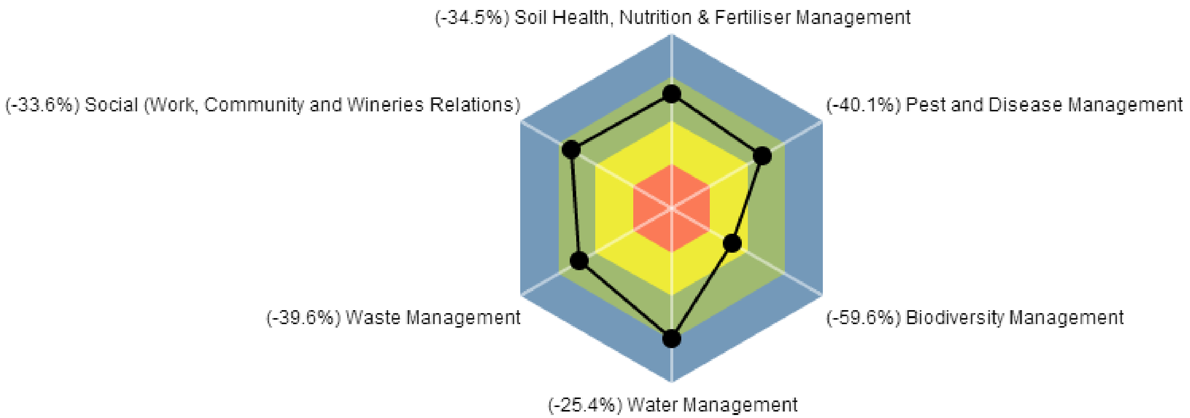
Conventional
28%
CERTIFIED biodynamic
4%
Uncertified biodynamic
7%
CERTIFIED organic
3%
Uncertified organic
7%
Low-input conventional
with IPM principles
51%



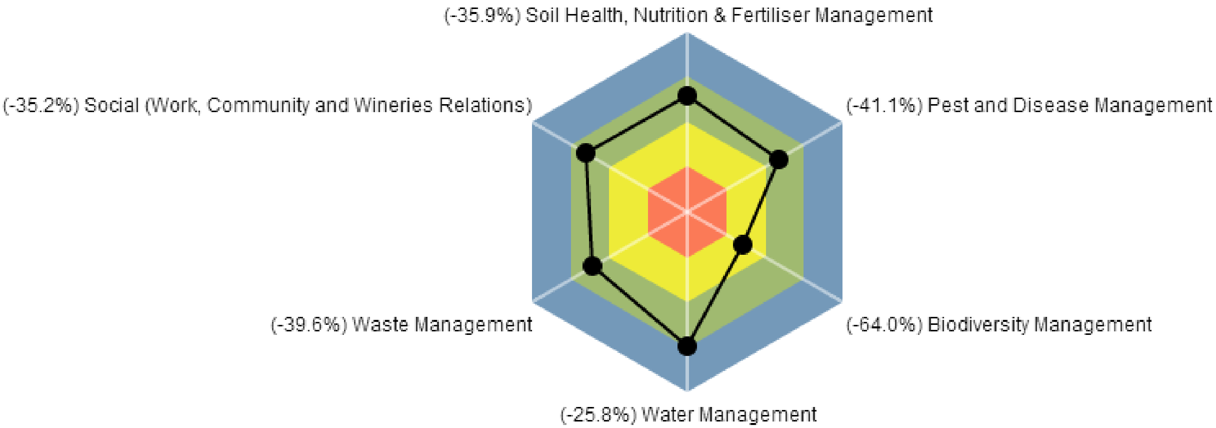
WHITE grapes
7%
Vegetation,
creeks and/or
perennial
grasses
20%
Office, Roads and other
buildings
7%
Others
6%
RED grapes
60%

Overall results

2013



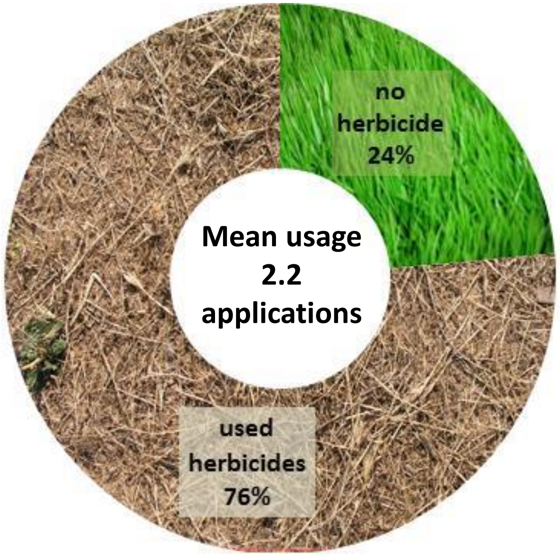
2012



Chapter	% Change Previous vs. Current Season
Soil Health, Nutrition & Fertiliser Management	3.9% improvement ✓
Pest and Disease Management	2.4% improvement ✓
Biodiversity Management	6.9% improvement ✓
Water Management	1.2% improvement ✓
Waste Management	no change
Social (Work, Community and Wineries Relations)	4.5% improvement ✓
Overall annual IMPROVEMENT	3.5% improvement ✓

Chemical usage and targets

Herbicides



Pest and Disease

Target	% of area of Members	Average times
Botrytis bunch rot	13.5%	1.8
Bud mite	7.0%	1.1
Bunch mite	0.9%	1
Downy mildew	58.9%	2.7
Garden weevil	0.4%	1
Grapeleaf rust mite	6.3%	1.4
Grapevine moth	0.8%	1
Grapevine scale	2.0%	1
Light brown apple moth	23.2%	1.1
Powdery mildew	94.7%	5.7
Rust Mite	0.8%	2
Snail	1.8%	1
Wingless grasshopper	0.6%	1

Thank You!

MCLAREN VALE SUSTAINABLE WINEGROWING AUSTRALIA

Acknowledgements

- Dr. Cassandra Collins
- Dr. Andrew Metcalfe
- Dr. Cate Jerram
- Mr. Cary Dreelan
- McLaren Vale Grape Wine and Tourism Association Members

IFV
INSTITUT FRANÇAIS DE LA VIGNE ET DU VIN

WORKSHOP: Sustainable Development Applied to Viticulture: Strategy, Implementation and Evaluation Approaches

Oct. 16th 2013

Irina Santiago
irina.santiago@adelaide.edu.au

VITeff .com
The sparkling wine technology exhibition

McLAREN VALE SUSTAINABLE WINEGROWING AUSTRALIA

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gwrdc
GRAPE AND WINE RESEARCH AND DEVELOPMENT CORPORATION

THE UNIVERSITY OF ADELAIDE AUSTRALIA
SUB CRUCE LUMEN

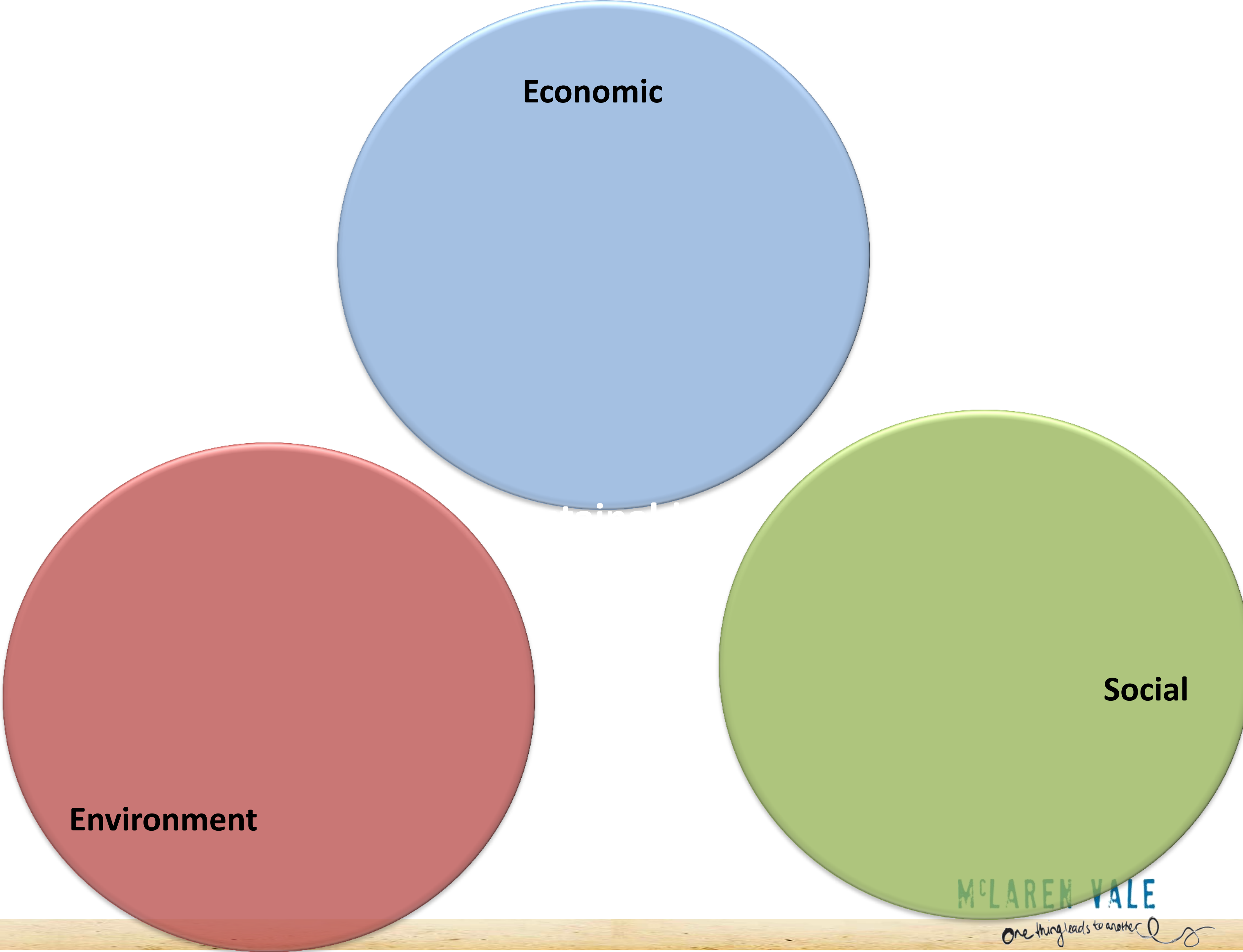
McLAREN VALE SUSTAINABLE
WINEGROWING AUSTRALIA

May, 7th 2013

Irina Santiago & Cary Dreelan

Presentation outline

- Acknowledgments for the season
- The program and our philosophy
- Partnerships already in place
- How to become a 2013 member
- Outcomes for growers
- System overview
  - How to start
  - System features
  - Future


Economic
Social
Environment
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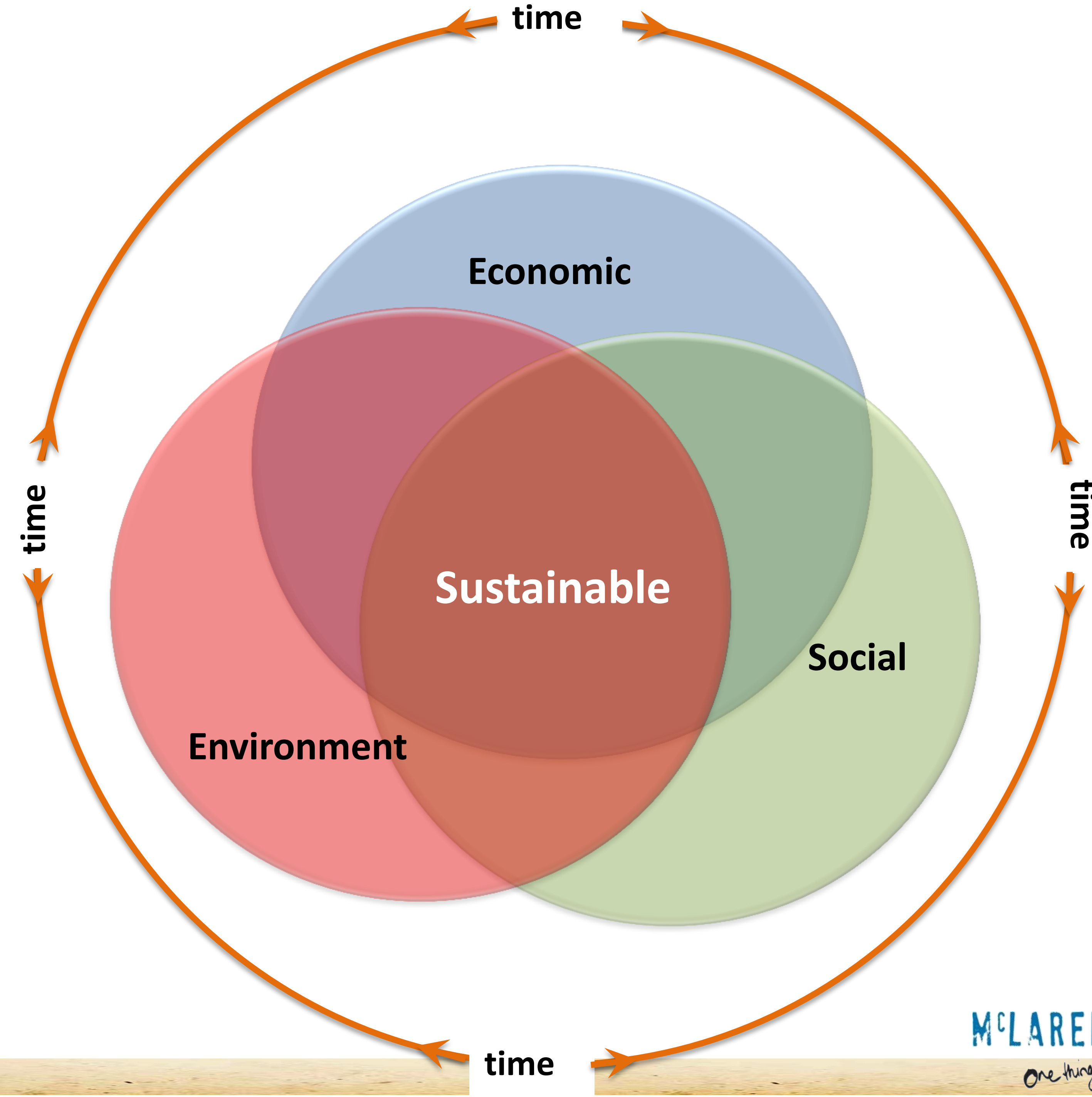
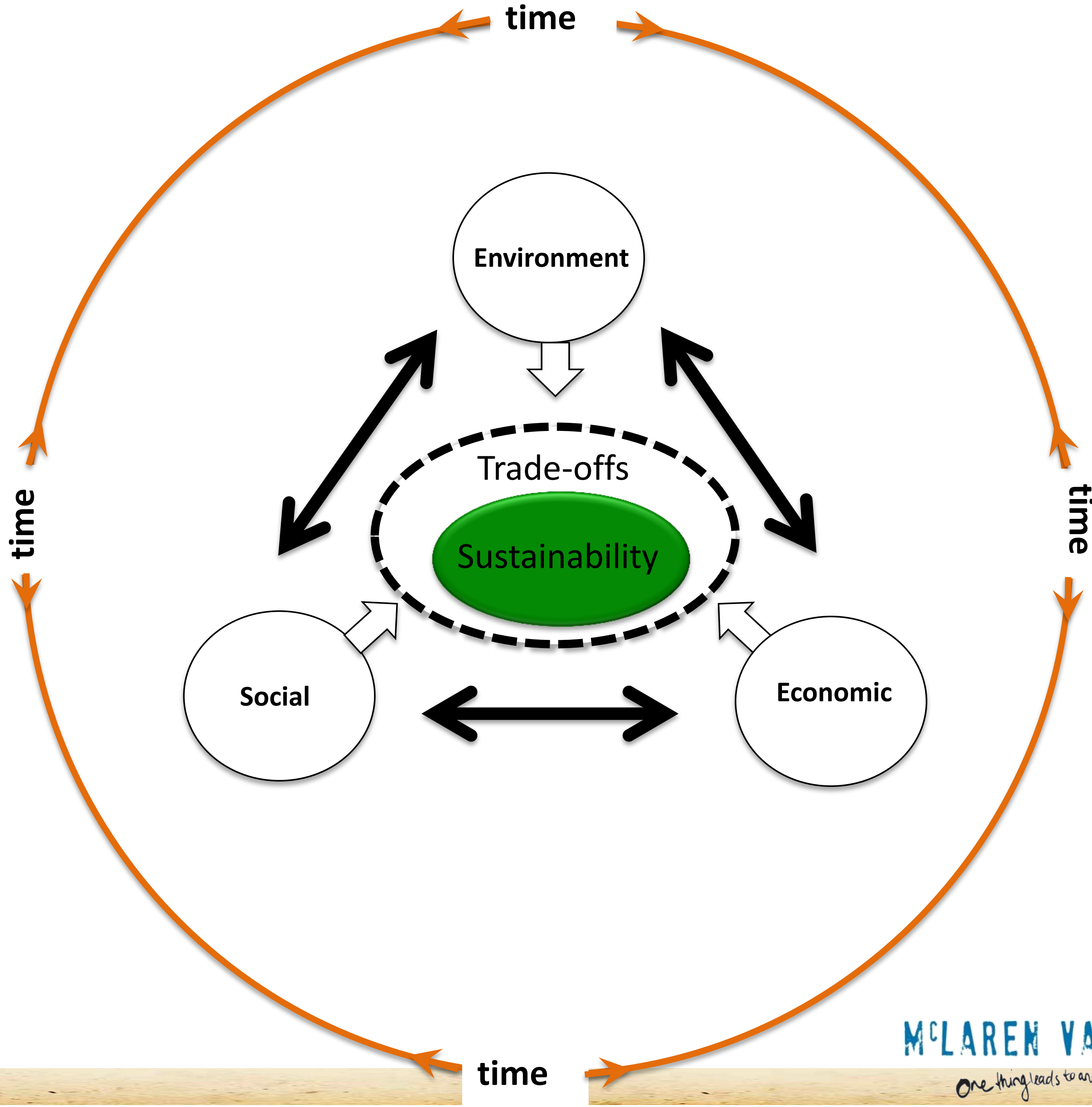

time
Economic
Sustainable
Social
Environment
time
time
time



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The origin of our program

2009

(2011)

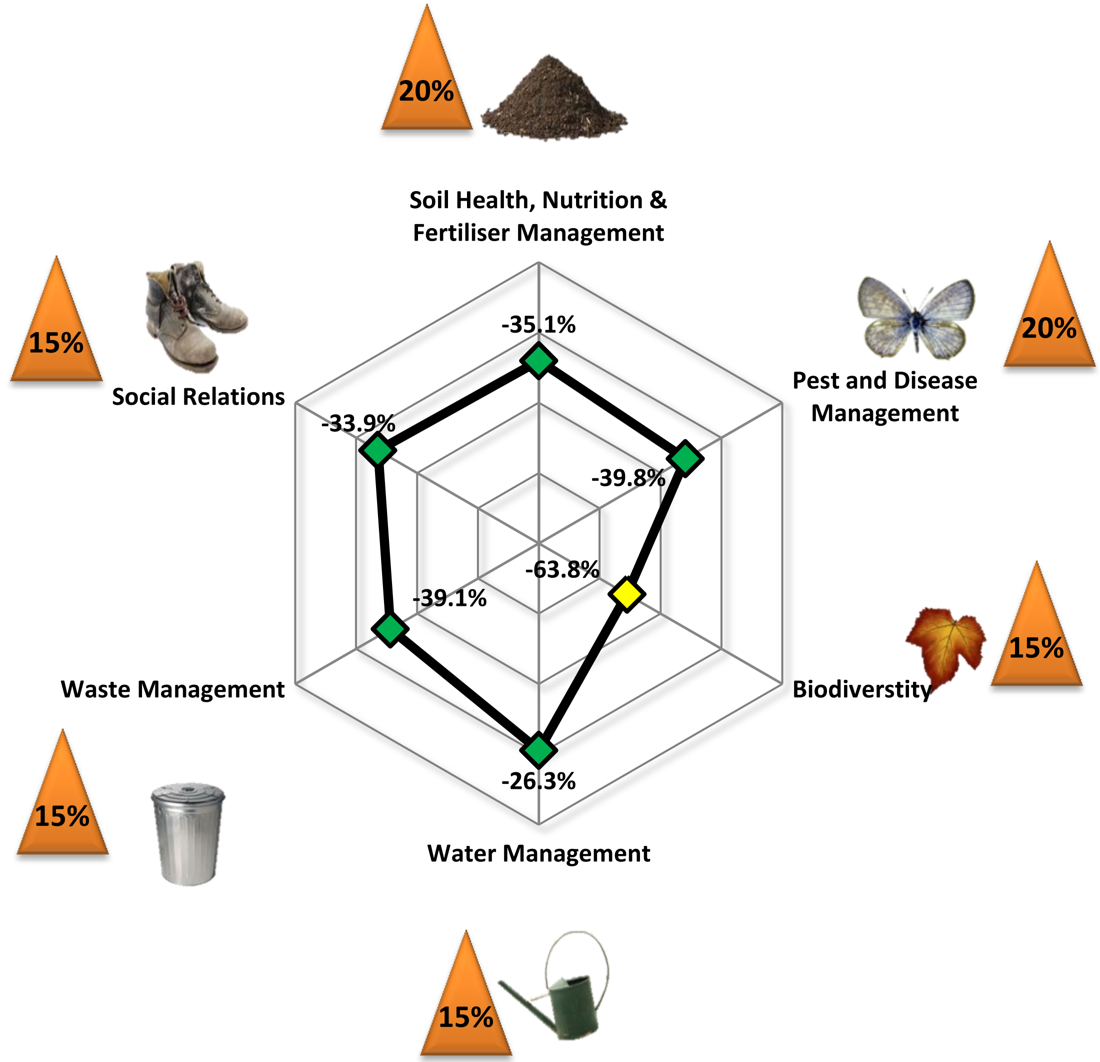
2012

The program

- Written by local growers (from the bottom to the top system)
- Peer-reviewed by recognised experts
- Partnerships with government, universities, industry bodies, research organisations, third party certified, etc.
- Voluntary scheme
- Credible: All members subjected to be audited by a third-party organisation.
- Feasible: $50.00 per grower.
- Inspections: sampling approach. Up to 10% members at MVGWTA's expenses (yearly)
- Comprehensive result report for growers

The McLaren Vale overall result 2012

- Six main assessment Chapters
  - Soil Health
  - P&D
  - Biodiversity
  - Water Management
  - Waste Management
  - Social Relations
- The most complete and comprehensive report system to growers, providing ability to:
  - Compare different variables
  - Compare own results over years
  - Compare results against peers' average
  - Track own improvement
  - Track regional improvements
  - Web-links for self-education on specific topics
- Results used by the Association to support investments in viticulture related training, workshops, publications, etc.



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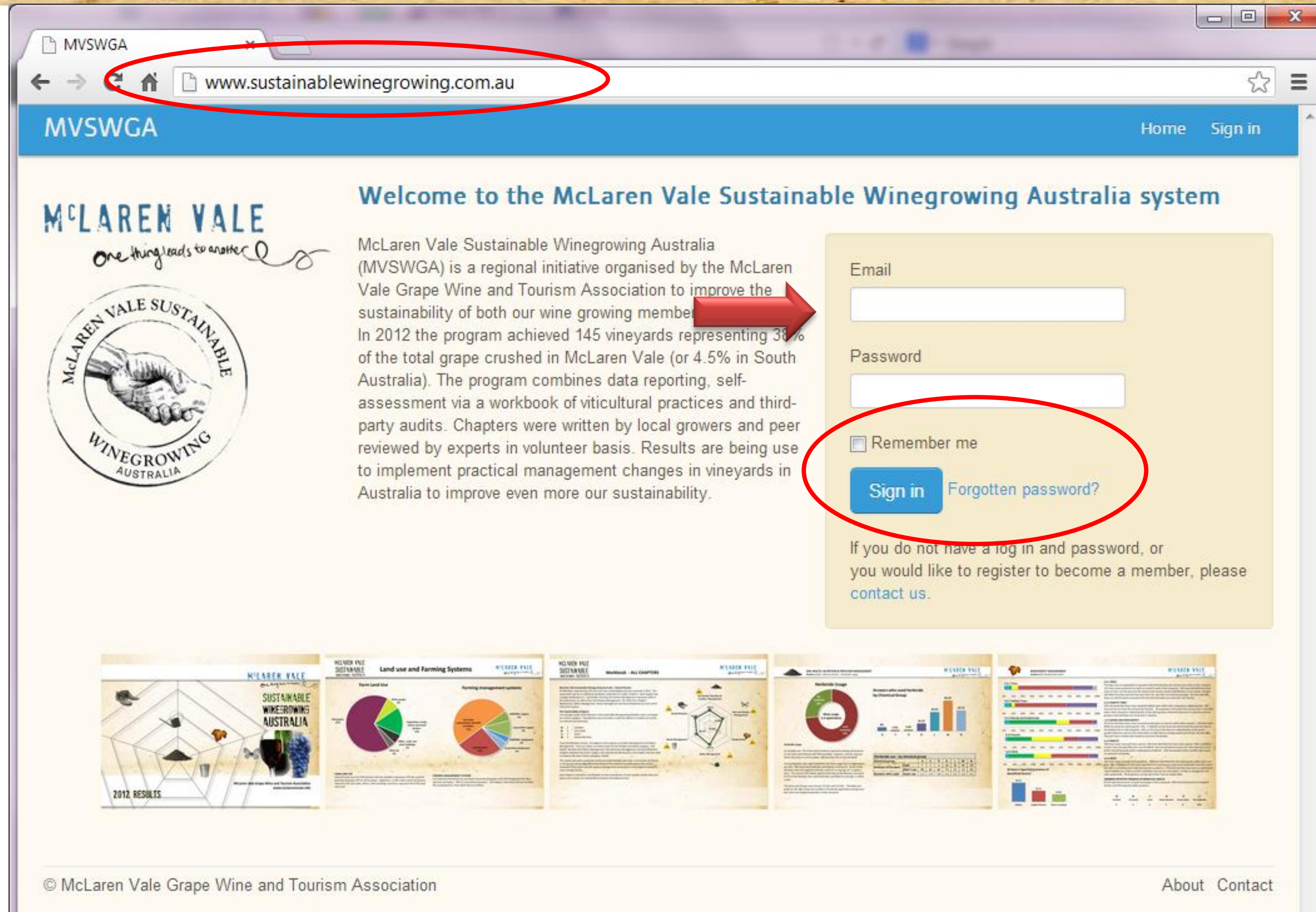
Partnerships

McLaren Vale Growers and Wineries

The new on-line system



www.sustainablewinegrowing.com.au

2013 membership - Steps

STEP 1

– Register your interest

Email will be sent to you with further instructions

STEP 2

– On-line payment

Link to payment in the email sent to you

STEP 3

– Complete all sections of the on-line system

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Deadline

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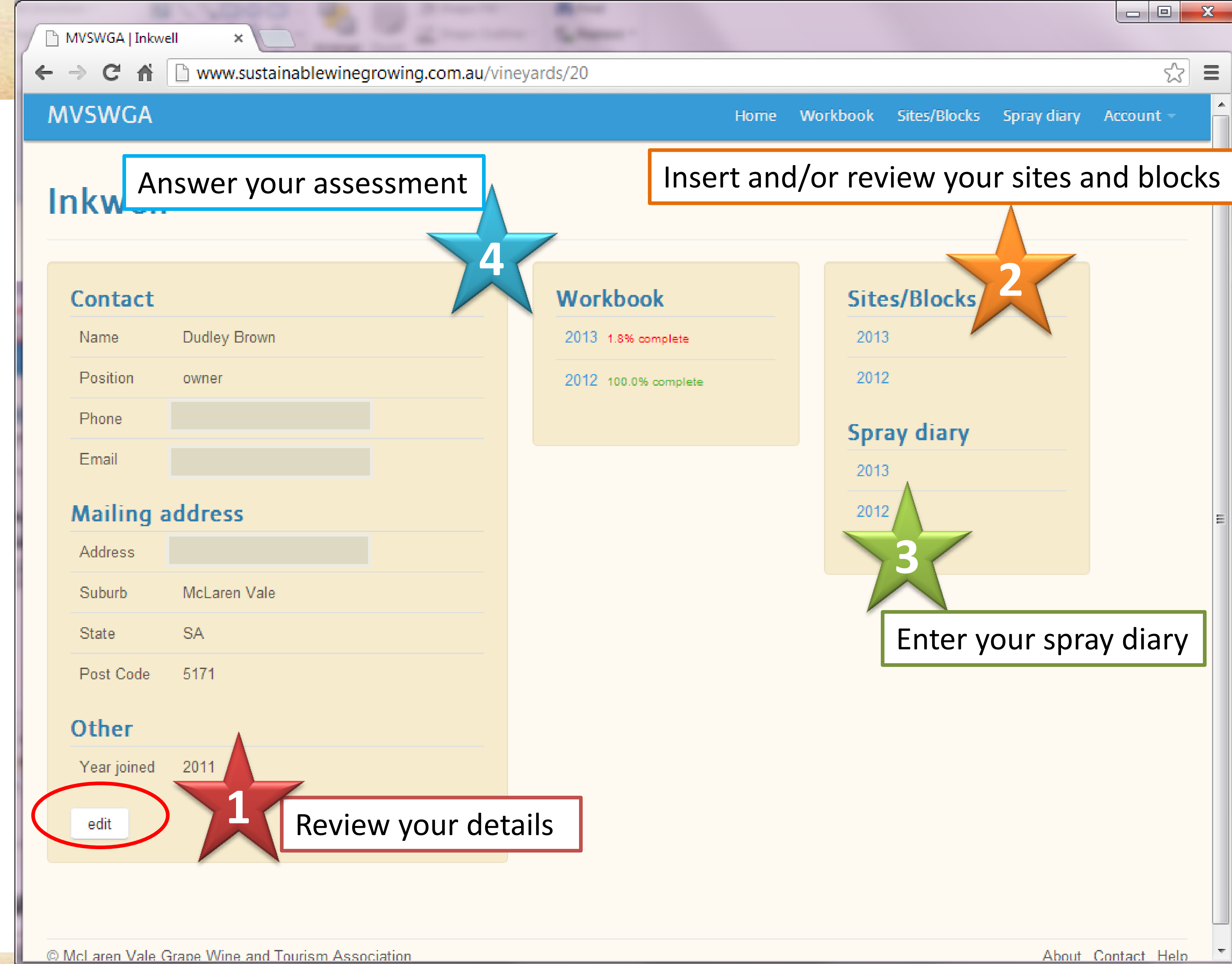

MVSWGA | Inkwell
www.sustainablewinegrowing.com.au/vineyards/20
MVSWGA
Home
Workbook
Sites/Blocks
Spray diary
Account
Answer your assessment
Insert and/or review your sites and blocks
Inkw
4
2
Contact
Name
Dudley Brown
Position
owner
Phone
Email
Mailing address
Address
Suburb
McLaren Vale
State
SA
Post Code
5171
Other
Year joined
2011
edit
1
Review your details
Workbook
2013 1.8% complete
2012 100.0% complete
Sites/Blocks
2013
2012
Spray diary
2013
2012
3
Enter your spray diary
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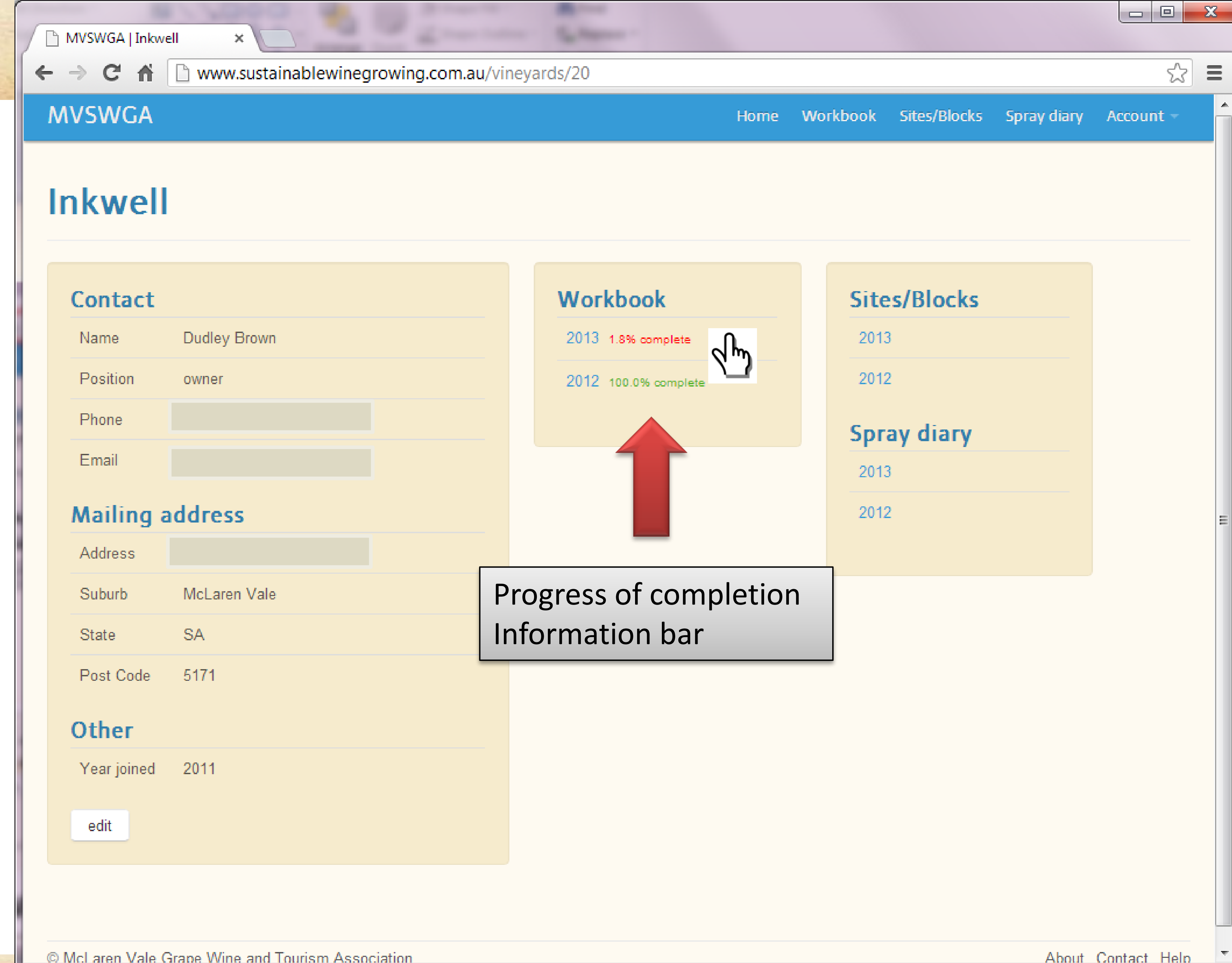
MVSWGA | Inkwell
www.sustainablewinegrowing.com.au/vineyards/20
MVSWGA
Home
Workbook
Sites/Blocks
Spray diary
Account
Inkwell
Contact
Name
Dudley Brown
Position
owner
Phone
Email
Mailing address
Address
Suburb
McLaren Vale
State
SA
Post Code
5171
Other
Year joined
2011
edit
Workbook
2013
1.8% complete
2012
100.0% complete
Sites/Blocks
2013
2012
Spray diary
2013
2012
Progress of completion
Information bar
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MVSWGA | Inkwell - 2013

www.sustainablewinegrowing.com.au/vineyards/20/answers?s_id=13

MVSWGA

Home Workbook Sites/Blocks Spray diary Account

Inkwell – 2013 Workbook

Main Survey
0% complete

Soil Health, Nutrition & Fer[illegible]er Management
4% complete

Pest and Disease Management
0% complete

Biodiversity Management
0% complete

Water Management
0% complete

Waste Management
13% complete

Social (Work, Community and Wineries Relations)
0% complete

About Contact Help

MVSWGA | Inkwell - 2013

www.sustainablewinegrowing.com.au/vineyards/20/answers?c_id=23&s_id=13

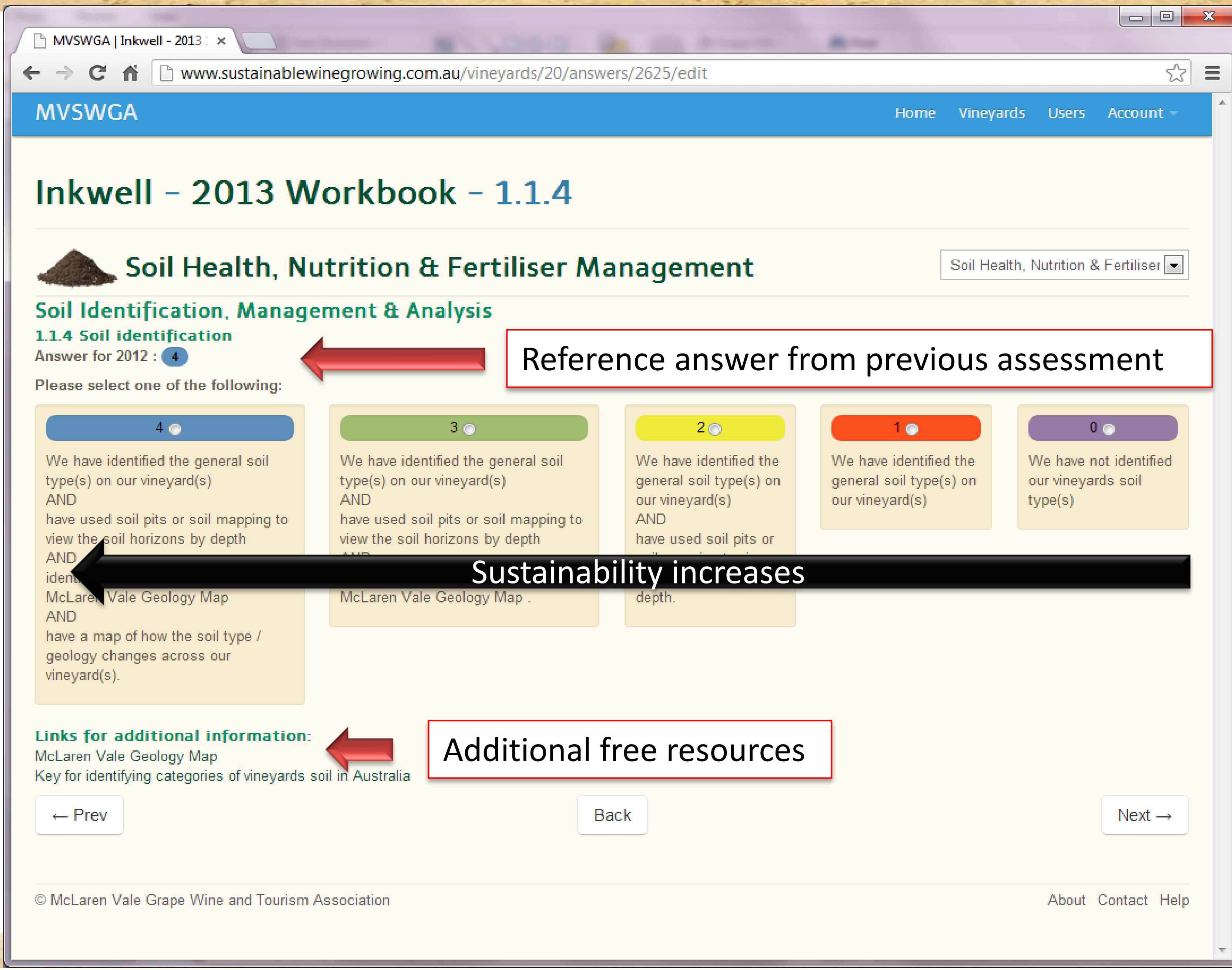
MVSWGA — Home | Workbook | Sites/Blocks | Spray diary | Account

1.1.3	Soil management plan and vineyard nutrition	NOT YET ANSWERED
1.1.3a	Soil test results: pH (Please do not average soil test results. Complete the following three questions with the most recent results you have from a representative sample of your vineyard)	NOT YET ANSWERED
1.1.3b	Soil test results: Exchangeable Sodium Percentage (%ESP)	NOT YET ANSWERED
1.1.3c	Soil test results: Sodium adsorption ration (SAR)	NOT YET ANSWERED
1.1.4	Soil identification	NOT YET ANSWERED
1.1.5	Soil organic carbon monitoring	NOT YET ANSWERED
1.1.5a	Organic carbon	NOT YET ANSWERED
1.1.6	Vine nutrition	NOT YET ANSWERED

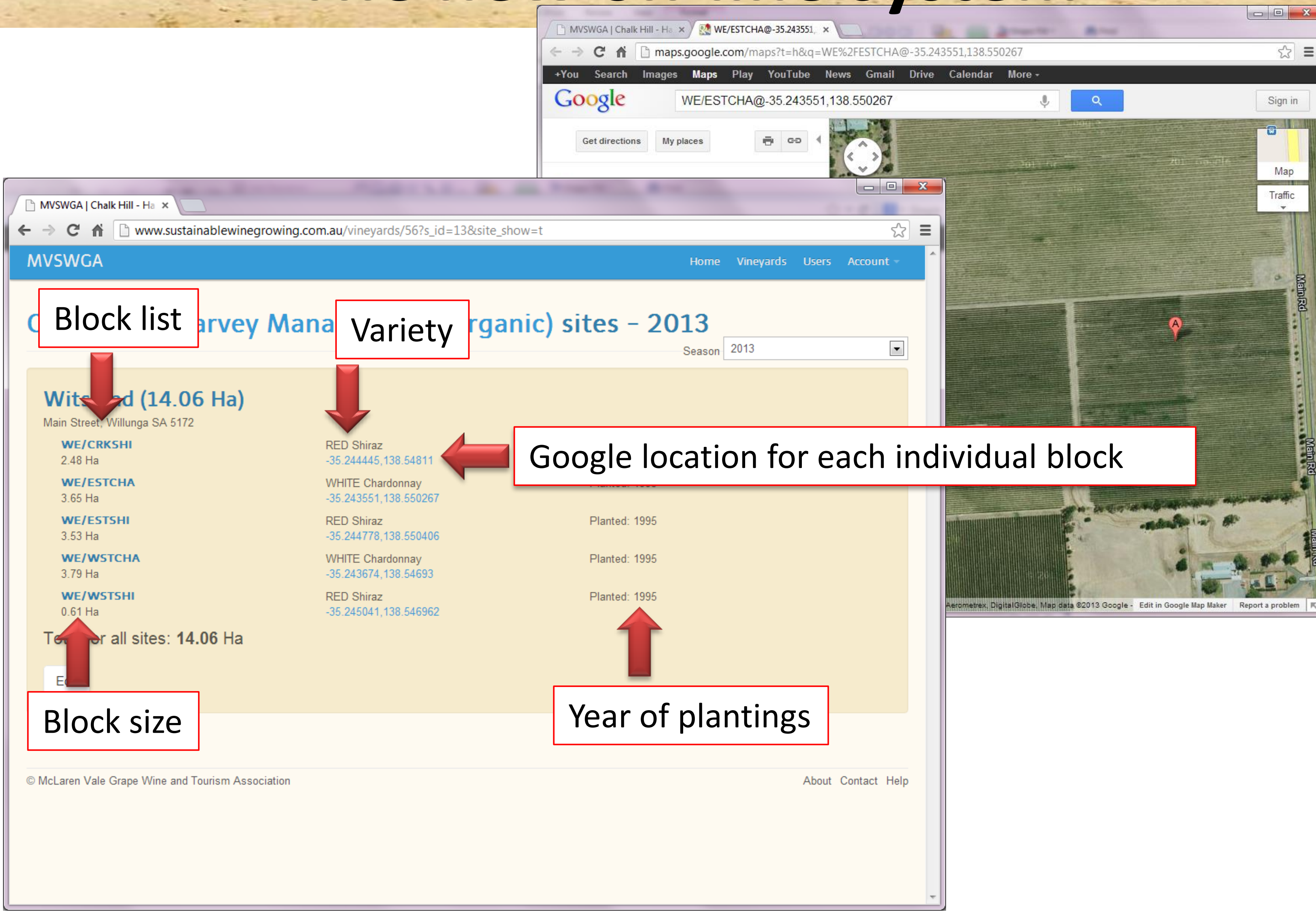
Soil Degradation

1.2.1	Degraded or eroded land	NOT YET ANSWERED
1.2.2	Saline land	NOT YET ANSWERED

The new on-line system



The new on-line system



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Future

- Reports
- Cross tabulations

McLaren Vale Sustainable Winegrowing Australia — Workbook

Publisher:
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Editor — Project Manager
Irina Santiago
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Cover imagery
Showpony Advertising

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Contents

Introduction

McLaren Vale Sustainable Winegrowing Australia is our program to improve vineyard sustainability using a combination of data reporting, self-assessment through our workbook of viticultural practices and third party audits. The content was written by local growers and validated by Australian wide recognised experts in each topic:

Our workbook comprises of 6 chapters with the following attributed weights:

1. Soil Health, Nutrition & Fertilizer Management ♦ 200 points
2. Pest and Disease Management ♦ 200 points
3. Biodiversity Management ♦ 150 points
4. Water Management ♦ 150 points
5. Waste Management ♦ 150 points
6. Social (Work, Community and Wineries relations) ♦ 150 points

The workbook covers most of the everyday practices related to vineyard management to help growers increase their operational efficiency, minimize any negative impacts to the environment and ultimately increase their overall sustainability and grape quality. The completion of the workbook and the data reporting is used to classify each vineyard in a sustainability category (from 0 to 4).

Sustainability for us is about developing our vineyards, preserving and/or improving the land, increasing the quality of our grapes, meeting the requirements of the wineries, optimizing the use of inputs relative to on farm returns and minimizing potential negative impacts on the environment. The program also aims to promote regional social development and well-being of the people who live in our community.

Irina Santiago
Sustainability Coordinator
McLaren Vale Grape Wine and Tourism Association

McLAREN VALE
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Authors and Reviewers

1. Soil Health, Nutrition & Fertilizer Management

Author: **James Hook** ♦ DJ's Growers (www.djsgrowers.com.au) and Lazy Ballerina Wines (www.lazyballerina.com)
Reviewer: **Dr Michael McCarthy** ♦ South Australian Research and Development Institute—SARDI / Department of Primary Industries and Resources of South Australia—PIRSA (www.sardi.sa.gov.au/viticulture)

2. Pest and Disease Management

Author: **James Hook** ♦ DJ's Growers (www.djsgrowers.com.au) and Lazy Ballerina Wines (www.lazyballerina.com)
Reviewer: **Dr Trevor Wicks** ♦ South Australian Research and Development Institute—SARDI / Department of Primary Industries and Resources of South Australia—PIRSA (www.sardi.sa.gov.au/viticulture)

3. Biodiversity Management

Author: **Richard Leask** ♦ Leask Vineyards
Reviewer: **Dr Linda Thomson** ♦ University of Melbourne—Faculty of Sciences—Department of Zoology (www.zoology.unimelb.edu.au)

4. Water Management

Author: **Rachel Steer** ♦ Chapel Hill Wines (www.chapelhillwine.com.au)
Reviewer: **Dr Michael McCarthy** South Australian Research and Development Institute—SARDI / Department of Primary Industries and Resources of South Australia—PIRSA (www.sardi.sa.gov.au/viticulture)

5. Waste Management

Authors: **Giulio Dimasi** ♦ d'Arenberg Wines (www.darenberg.com.au)
and **Irina Santiago** ♦ McLaren Vale Grape Wine and Tourism Association
Reviewer: **Lynda Wedding** ♦ City of Onkaparinga – Waste & Recycling Education (http://www.onkaparingacity.com/onka/living_here/waste_recycling.jsp)

6. Social (Work, Community and Wineries relations)

Authors: **Dee Hoad** ♦ d'Arenberg Wines(www.darenberg.com.au)
and **Irina Santiago** ♦ McLaren Vale Grape Wine and Tourism Association
Reviewers: **Paul Georgiadis** ♦ Paulmara Estate Wine (www.paulmara.com.au)
and **Dee Hoad** ♦ d'Arenberg Wines(www.darenberg.com.au)

Program History

McLaren Vale Sustainable Winegrowing Australia ("MVSWA") is our sustainability program for wine grape growing. It is special because it is the result of the work of so many different people who care deeply about McLaren Vale wine growing.

Over the last ten years, the growers of McLaren Vale have invested over two million dollars of their own money into levies through the MVGWTA to dramatically improve their viticultural practices, fruit quality and financial viability. This funding has been used for seminars, CropWatch, weather stations, research trials, an Environmental Management Plan, viticultural officers, and newsletters.

In 2005 James Hook, then the Viticultural Officer for MVGWTA, developed the outline of a self-scoring system for grape growers for pest and disease management. The Lodi System in California as well as the outreach work Jodie Pain had done at the City of Onkaparinga had inspired James and his predecessor Richard McGeachey, to explore sustainability systems. The idea at the time was to offer growers multiple paths to minimize their farm inputs while achieving better outcomes.

While the investments in grower education made by MVGWTA yielded dramatic on-farm results for many growers, as a region we were unable to measure and discuss the outputs of our investments because we were not measuring on-farm results systematically. McLaren Vale Sustainable Winegrowing is the vehicle for us to do that.

When I became the Chairman of MVGWTA in 2008, we assembled a working party of local growers and volunteer viticulturalists under Jock Harvey's direction with the goal of developing James' outline into a regional certification system that would become the highest standard of environmental sustainability in Australian viticulture. This project was named Generational Farming.

Because sustainability in viticulture is a global concern, we were fortunate to be able to learn from many systems that went before us, particularly in the United States. In recognition of these efforts, the first rule for Generational Farming was that we would share our system with anyone, anywhere provided attribution and acknowledgement were provided.

Within nine months, our volunteer army exceeded all expectations and delivered a nearly complete viticultural scoring system. Jodie Pain, then the Viticulture Officer at MVGWTA, assembled this program into a workbook for wine growers. In 2010, we began record keeping for Generational Farming with 41 initial participants representing about 20% of the acreage under vine in our region.

Recognizing that we were very close to having a true "triple bottom line" (economic, environmental, social) sustainability system with Generational Farming, we chose to further invest in our system by employing an expert in viticultural management systems to complete our sustainability program.

(continue)

Program History

In 2011, MVGWTA was fortunate to hire Irina Santiago as our Sustainability Coordinator. A PhD research student from Brazil at the University of Adelaide in Sustainable Viticulture, Irina brought the system the level of coordination, analysis and rigor required to make Generational Farming into a recognized, world-class system.

Irina has in turn has had the good fortune to work with still more growers and viticulturalists from McLaren Vale as well as a number of expert reviewers across Australia to refine the system further. Now re-named McLaren Vale Sustainable Winegrowing Australia, the workbook results are a reflection of her efforts to present the data collected in the most useful way possible.

An incredibly important dimension to Sustainable McLaren Vale is that it provides growers with the ability to ascertain how well they are doing on farm both in terms of absolute best practice as well as against their peer group. This approach enables growers to assess their practices and fine-tune their businesses in ways small and large, easy and difficult.

The goal of this long-term project is to provide growers with the information and the flexibility to choose how to individually improve practices. Our new system is fully compliant with the national Entwine environmental documentation system for viticulture that eliminates the need for duplicate record keeping between systems.

The information collected provides each of us with enormous insight into how much we have or have not improved year to year as well as what we need to address to ensure that we continue to be recognized as one of the world's most sustainable viticultural regions.

To mention everyone who has involved at one point or another in the development of McLaren Vale Sustainable Winegrowing would be a daunting task. So many people have freely given their time to make this system a reality that to mention any would mean slighting someone else through omission. The efforts of all of these people are the reason that we have achieved our goal of setting the benchmark for sustainability in viticulture in Australia on a remarkably small budget.

McLaren Vale Sustainable Winegrowing is an example of McLaren Vale at its finest – collaborative, open, forward looking, creative and generous. These are the core attributes of any "living" sustainability system.

Thank you for your participation and support.

Dudley Brown
Former Chair McLaren Vale Grape Wine and Tourism Association (2010-2008)

Foreword

As one of the globally current “buzz - words”, the term “Sustainable” incurs an array of uses, abuse and appropriation by many interests across politics, media, supply – chain and public or consumer interest groups.

To many, it seems that “Sustainable Winegrowing” should be readily amenable to measurement and reporting of a few simple metrics, e.g. water or fuel use and thus be comparable across all production systems; if only it were so simple!

Much of the attraction of wine across the globe is founded in its diversity, with production from highly diverse regional and social geographies interacting with similarly varied economies and markets.

Genuinely sustainable winegrowing must embrace the base “triple bottom line” principles relating to economic, social and environmental considerations and applied within a specific regional context. If continuous improvements in sustainability are desired, then actions cannot simply be reduced to using a universal template for accounting and reporting purposes.

The approach undertaken within the **McLaren Vale Sustainable Winegrowing Australia (MVSWGA)** scheme has been founded squarely on “triple bottom line” principles around which high priority-high impact regional drivers have been identified and incorporated for deliberately targeted action.

Such an approach will deliver significant direct dividends for regional sustainability of the winegrowing industry, the natural resource base on which it depends and the social context within which it operates.

In commending this approach to both its industry participants, external interests, observers and commentators, I note that the program is completely consistent with internationally supported environmental approaches such as:

- FIVS’ (The worldwide trade federation for all sectors of the global alcohol beverage industry, including wine, spirits and beer) Global Wine Sector Environmental Sustainability Principles, see http://fivs.org/wm/strategicInitiatives/fivsForesee.htm , and
- The International Organisation of Vine and Wine (OIV) an intergovernmental organisation for the grape and wine sector, see http://www.oiv.int/oiv/info/enguidesoiv

Future legitimacy and social licence for the wine sector will be dependent on actively addressing identified and agreed high priority sustainability issues and demonstrating continuous improvement of relevance to regions, their producers and the global consumer.

On behalf of the MVGWTA Board, I congratulate the original proponents and champions for this approach and particularly Irina Santiago, our Sustainability Coordinator for her drive and dedication in bring it to this stage.

Peter Hayes
Chair—McLaren Vale Grape Wine and Tourism Association

CHAPTER 5
WASTE MANAGEMENT

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one thing leads to another

In this Chapter

A responsible waste management program will ensure efficient resource use and minimal environmental impact. Monitoring of the amounts of waste generated, reused, recycled, stored or disposed of will allow for improvement in waste management programs.

The Environmental Protection Authority (EPA), Zero Waste SA and the City of Onkaparinga regulate recycling or disposal of many waste types. Growers should familiarise themselves with the requirements of those bodies.

5.1.1 Council and EPA regulations				
4	**3**	**2**	**1**	**0**
I am aware of Council and EPA regulations regarding solid waste management AND I follow their guidelines to dispose wastes from my vineyard.			I am aware there are council and EPA regulations regarding Solid Waste Management but I don't really follow their guidelines to dispose wastes from my vineyard.	I am not aware of the Council and EPA regulations.

5.1.2 Waste management program for the vineyard				
4	**3**	**2**	**1**	**0**
I have a detailed and up to date waste management program **AND** I have targets to reduce the amount of waste currently produced **AND** I've attend at least one training event on waste and recycling in the last 12 months (e.g. workshops offered by the City of Onkaparinga Waste and Recycling team, waste management seminars, etc.).	I have a detailed and up to date waste management program **AND** I have targets to reduce the amount of waste currently produced.	I understand waste management and recycling but I do not have an up to date waste management program. I collect solid wastes and take actions on as needed basis.		I don't do anything to manage wastes in my vineyard.

5.1.3 Waste management program for households within vineyards				
4	**3**	**2**	**1**	**0**
I separate and recycle domestic waste materials using the kerbside bin systems **AND** I have targets to reduce the amount of waste currently produced **AND** I've attend at least one training event on waste and recycling in the last 12 months.	I separate and recycle domestic waste materials using the kerbside bin systems **AND** I have targets to reduce the amount of waste currently produced.			I don't do anything to manage waste from the house(s).
N/A – No household within the vineyard.				

5.2.1 Training on waste management

4	3	2	1	0
My vineyard has no employees. All work is done by me and/or my family and seasonal contractors **AND** We are aware of the need to collect solid wastes (e.g. glasses, plastics, metals, packing materials, etc.) **AND** Waste collection is incorporated in our daily routine to keep our landscape clean **AND** We have attended at least one formal training event on waste management in the last 12 months **OR** We have employees and all are trained in waste management. Casual/seasonal workers are exposed to our waste management program during their induction & permanent employees are required to attend a formal training session within their first 12 months **AND** There is a nominated person in charge of waste management who is up to date with current practices and implements new industry practices.	My vineyard has no employees. All work is done by me and/or my family and seasonal contractors **AND** We are aware of the need to collect solid wastes (e.g. glasses, plastics, metals, packing materials, etc.) **AND** Waste collection is incorporated in our daily routine to keep our landscape clean **AND** We have attended at least one formal training event on waste management **OR** We have employees **AND** Our management program is available in the office for employees upon request **AND** Our management program is given to every new employee when they start working for us **AND** Permanent employees (only) are trained on waste management & are required to attend, within the first 12 months of work, a formal training session.	My vineyard has no employees. All work is done by me and/or my family and seasonal contractors **AND** We are aware of the need to collect solid wastes (e.g. glasses, plastics, metals, packing materials, etc.) **AND** Waste collection is incorporated in our daily routine to keep our landscape clean **AND** We have never attended formal training but we read and save all informative materials **OR** We have employees **AND** Our management program is available in the office for the employees upon request **AND** Our management program is given to every new employee when they start working for us **AND** The employees are not trained on waste management.	My vineyard has no employees. All work is done by me and/or my family and seasonal contractors **AND** We are aware of the need to collect solid wastes (e.g. glasses, plastics, metals, packing materials, etc.) **AND** We have never attended formal training but we have been reading about waste management **OR** We have employees **AND** Our management program is available in the office for the employees upon request **AND** The employees are not trained on waste management.	My vineyard has no employees. All work is done by myself and/or my family and seasonal contractors **AND** We have never discussed waste management among us nor with the contractors **AND** No one was ever trained on waste management **OR** My vineyard has employees **AND** There is no training or procedures in place for waste management **AND** We have never discussed waste management among us nor with the contractors.

Zero Waste SA:
http://www.zerowaste.sa.gov.au

5.2.2 Waste management monitoring				
4	**3**	**2**	**1**	**0**
I have a detailed and up to date waste management program **AND** The waste management program is monitored (written) to allow improvements in my waste management program **AND** I have targets to reduce my waste.	I have a detailed and up to date monitoring system **AND** The waste management program is monitored to allow improvements in my waste management program.	I have a written monitoring spread sheet **AND** I record my waste.	I have a written monitoring spread sheet **BUT** My monitoring is not up to date.	I don't have monitoring procedures for waste.

Organic waste composting:
As a means of reducing the amount of organic matter that goes to landfill and reducing the production of greenhouse gas emissions, we support our communities and businesses to participate in composting. Composting is a very worthwhile pursuit as it produces useable compost, worm castings and worm tea which are very beneficial for our soil and plants. These products add nutrients, microbial diversity and increase the water holding capacity of your soil. You will start seeing food scraps and garden waste not as rubbish but as a resource to be recovered and used in your home compost systems. (Source: City of Onkaparinga Waste and Recycling website)

5.3.1 Hard waste collection from households in vineyards.

4	3	2	1	0
I do the best I can regarding disposal of hard waste from the house, putting everything together in a designated area **AND** I remove or recycle my hard waste at least once a year (when there is available waste to recycle) **AND** I am aware of the "Council's Pre-booked Hard Waste Collection Service" for domestic households and I use it when I need to dispose items that are not useful in the house anymore such as old furniture, fridges, wires, etc.			I do the best I can with regard to disposal of hard waste from the house, putting everything together in a designated area **BUT** I have no plans for removing or recycling my hard waste.	I neither collect nor separate hard wastes from my property.
N/A – No household within the vineyard.				

Organic waste composting:
As a means of reducing the amount of organic matter that goes to landfill and reducing the production of greenhouse gas emissions, we support our communities and businesses to participate in composting. Composting is a very worthwhile pursuit as it produces useable compost, worm castings and worm tea which are very beneficial for our soil and plants. These products add nutrients, microbial diversity and increase the water holding capacity of your soil. You will start seeing food scraps and garden waste not as rubbish but as a resource to be recovered and used in your home compost systems. (Source: City of Onkaparinga Waste and Recycling website)

5.3.2 Composting (other than grape mark)				
4	**3**	**2**	**1**	**0**
I compost garden and non-vine vegetation **AND** I compost all vineyard wastes (when they are classified as waste and need to be removed from the field, such as pruning’s, grass cuttings, weeds, etc.).		I compost garden and non-vineyard vegetation only.		I don't compost organic matter.
N/A – No Household within the vineyard.				

5.3.3 Grape marc composting				
4	**3**	**2**	**1**	**0**
Grape marc is composted on site **AND** Any excess is sent to a composting facility (e.g. Peat's Soils).	Grape marc is spread directly to the vineyard **OR** Sent to a composting facility (e.g. Peat's Soils).		Grape marc is stored on site for landfill or appropriate disposal.	Grape marc is spread randomly.
N/A – I don't crush any grapes on site.				

http://www.onkaparingacity.com/onka/living_here/waste_recycling.jsp

5.3.4 Waste collection and recycling containers and/or bins				
4	**3**	**2**	**1**	**0**
I collect all waste that is produced in the vineyard **AND** I separate all waste into appropriate recycling containers/bins.	I collect all waste that is produced in the vineyard **AND** I place it in a recycling container/bin.		I collect most waste that is produced in the vineyard **AND** I place it in a recycling container/bin.	I don't have separated recycling containers/bins.

Many vineyard waste products have the potential to cause air, soil and water pollution if they are not handled or disposed of correctly.

5.3.5 Creosote or CCA timber posts (timber treated with copper chrome arsenate)				
4	3	2	1	0
I stock pile my posts in a reserved area within the site **AND** The reserved area is away from wetlands and waterways **AND** I have identified and put in practice some re-use options (e.g. fence posts, landscape timber, parking lot bumpers, guardrail posts, composting bins, planter boxes, shipping crates, walkway edging, etc.) **AND** When it is not possible to recycle on site, the posts are sold to companies that recycle them or given away to employees for fencing or similar usage.	I stock pile my posts in a reserved area within the site **AND** The reserved area is away from wetlands and waterways **AND** I have identified and put in practice some re-use options (e.g. fence posts, landscape timber, parking lot bumpers, guardrail posts, composting bins, planter boxes, shipping crates, walkway edging, etc.).	I stock pile my posts in a reserved area within the site **AND** The reserved area is away from wetlands and waterways.	I stock pile all my posts in a reserved area within the site.	The broken and/or old posts are spread out anywhere.
N/A – I do not have timber posts.				

5.3.6 Machinery & vehicle metal spare parts (not tyres)

4	3	2	1	0
Machinery and vehicle spare parts are collected **AND** They are stored in a designated area for reuse or recycling (when possible) **AND** Waste is only disposed as a last resort through appropriate disposal.	Machinery and vehicle spare parts are collected **AND** They are stored in a designated area for reuse or recycling (when possible).		Machinery and vehicle spare parts are collected for disposal to landfill.	Machinery and vehicle spare parts are spread out anywhere.
N/A – I do not own any machinery, all machinery belongs to contractors.				

Waste oil is classified as a Hazardous Waste. For more information regarding disposal please contact the EPA or the City of Onkaparinga
http://www.epa.sa.gov.au/environmental_info/waste/how_can_i_dispose_of_waste/waste_oil
http://www.onkaparingacity.com/onka/living_here/waste_recycling/hazardous_waste.jsp

In landfill, used oil will slowly leach into surrounding land, underground water and infrastructure. In the sewerage, its effects will be even more immediate and catastrophic. It only takes one litre of oil to contaminate 1,000,000 litres of water (that's about half the water in an Olympic swimming pool). Oil-polluted stormwater and sewage is the biggest single source, causing extensive, immediate and long-term damage to coastal and marine habitats and ecosystems, seabirds, mammals, fisheries and people. (Source: Zero Waste SA website)

5.3.7 Oils				
4	**3**	**2**	**1**	**0**
Oils are collected in designated containers and recycled appropriately **AND** I have a written maintenance program for all machines in the vineyard to avoid unnecessary oil usage due to lack of servicing.	Oils are collected in designated containers and recycled appropriately.			Oils are not collected.

Waste tyres as whole units cannot be disposed to landfill in South Australia. This is because the tyres do not compact and can flex back to the surface after burial. Waste tyres stored in large quantities can present a fire hazard and harbour disease vectors such as mosquitoes and vermin (source: Zero Waste SA website).
For more information regarding storage or disposal options please contact the EPA or the City of Onkaparinga.

5.3.8 Tyres

4	3	2	1	0
Tyres are collected **AND** Tyres are stored in a designated area for reuse (where possible) or recycling /disposal through appropriate channels.			Tyres are collected **AND** Tyres are stored in a designated area.	Old tyres are not collected. They are spread out anywhere.

5.3.9 Paper and cardboards

4	3	2	1	0
Paper and cardboard are collected and stored in a designated area and are recycled appropriately (e.g. Kerbside bin system, SA Paper & Cardboard or Peat's Soils) **AND** Cardboard is recycled within the farm as mulch and/or compost.	Paper and cardboard are collected and stored in a designated area and are recycled appropriately (e.g. Kerbside bin system, SA Paper & Cardboard or Peat's Soils).			Paper and cardboard are not collected. They are spread out anywhere.

ChemClear is a national program that collects and disposes of unwanted agricultural and veterinary chemicals. Many of these rural chemicals have accumulated in communities and particularly on farming properties.

ChemClear collects two categories of chemicals, Group 1 and Group 2. Eligible Group 1 chemicals are collected free of charge. ChemClear provides a collection and disposal service for Group 2 chemicals, these chemicals incur a fee for disposal. Please refer to the Chemical Group Categories tab on this website for more information on eligibility.

A chemical becomes a waste when it has:

1. Served its purpose and is no longer of use;
2. Is left over or surplus;
3. Reached its expiration date;
4. Deregistered;

There are 3 ways you can register for the program

Phone 1800 008 182

Complete the Inventory Form available on this website and wither fax it to the number displayed, or, mail it to us.

5.4.1 Dispose of unusable chemical

4	3	2	1	0
Unusable chemicals are stored, dated and labelled 'not for use' **AND** I have an inventory of all unwanted chemicals **AND** My inventory includes manufacturer and product name, size of the container, estimation of the remaining quantity in the container **AND** They are disposed through Chemclear.	Unusable chemicals are stored, dated and labelled 'not for use' **AND** I have an inventory of all unwanted chemicals **AND** My inventory includes manufacturer and product name, size of the container, estimation of the remaining quantity in the container.	Unusable chemicals are stored not for use **AND** I have an inventory of all unwanted chemicals.	I store all unusable chemicals **BUT** I do not have procedures to dispose of them.	We don't collect unusable chemicals. There is no procedure to dispose of them.

Inventory Form for Registrations
http://www.chemclear.com.au/res/File/ChemClear/27284%20AGSAFE%20Chemclear%20Inventory%20Pad_4.pdf
Chemical User Fact Sheet
http://www.chemclear.com.au/res/File/Fact%20Sheet%20General%20Info%20Users%202009.pdf
Product Registration Guide
http://www.chemclear.com.au/res/File/ChemClear/Fact%20Sheet%20Product%20Registration%20Guide.pdf
Chem Clear web
http://www.chemclear.com.au/index.php

5.4.2 Disposal of empty chemical containers

4	3	2	1	0
I collect and store all unusable empty chemical containers **AND** I separate drums in two groups: 1.drums larger than 1 litre/Kg and up to 205 L/Kg (eligible to be collected through drumMUSTER, when logo is on the drum) 2.drums smaller than 1 litre/Kg **AND** I use appropriate rinsing methods to wash all my containers (e.g. following drumMUSTER guidelines for pressure rinsing or triple rinsing **AND** I dispose drums smaller than 1 litre/Kg to landfill **AND** I dispose drums larger than 1L/Kg through drumMUSTER. **AND** I only purchase chemicals that have drumMUSTER approved drums (with drumMUSTER logo).	I collect and store all unusable empty chemical containers **AND** I separate drums in two groups: 1.drums larger than 1 litre/Kg and up to 205 L/Kg (eligible to be collected through drumMUSTER, when logo is on the drum) 2.drums smaller than 1 litre/Kg **AND** I use appropriate rinsing methods to wash all my containers (e.g. following drumMUSTER guidelines for pressure rinsing or triple rinsing **AND** I dispose drums smaller than 1 litre/Kg to landfill **AND** I dispose drums larger than 1L/Kg through drumMUSTER.	I collect and store all unusable empty chemical containers **AND** I separate drums in two groups: a) drums larger than 1 litre/Kg (eligible to be collected through drumMUSTER, when logo is on the drum) b) drums smaller than 1 litre/Kg **AND** I use appropriate rinsing methods to wash all my containers (e.g. following drumMUSTER guidelines for pressure rinsing or triple rinsing **AND** I dispose drums smaller than 1 litre/Kg to landfill.	I collect and store all unusable empty chemical containers.	I don't collect empty chemical containers.
N/A – I do not use any chemical sold in containers.				

Source for methods to properly rinse containers:
http://www.drummuster.com.au/content.php?id=30

CHAPTER 6
SOCIAL RELATIONS

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In this chapter

Human Resource Management is the process of attracting, developing and maintaining a quality workforce. Recruitment strategies for employees and/or contractor selection are essential to assist you obtain suitably experienced and qualified staff to carry out their role.

6.1.1 Recruitment of employees

4	3	2	1	0
An existing employee or I fill the role of recruitment **OR** A recruitment agency is used **AND** There is a written recruitment plan with a standard job description for each position in the organization **AND** I have a benchmark for the time required for developing each role **AND** A variety of advertising methods is used to recruit employees **AND** The recruitment plan includes selection criteria.	I recruit as required **BUT** I have an informal recruitment strategy in place that is not written **AND** I have a list of potential casual employees that I can use **AND** I contact them in advance to plan the task I'll need to perform.	An existing employee or I fill the role of recruitment **OR** A recruitment agency is used **AND** I have a list of potential casual employees that I can use **AND** A recruitment strategy is developed as required when planning new tasks/contracting new employees.	I recruit as required **BUT** I have an informal recruitment strategy in place that is not written **AND** I have a list of potential casual employees that I can use **AND** I contact them in advance to plan the task I'll need to perform.	I don't have a recruitment plan. I recruit as required.
N/A – I do not have any employees. If I ever hire someone, it would be done through a contractor.				

Job interviews are part of the process of hiring employees. A job interview is a method to help to evaluate and select potential employees. It is useful to help the employer to evaluate if the potential candidate is or isn't suitable for the job. Interview techniques help the employer to ensure they place the right candidate in the role.

6.1.2 Interviewing for hiring

4	3	2	1	0
There is a structured interview based selection criteria **AND** A written letter (or email) of offer to the successful candidate is provided **AND** A letter (or email) to unsuccessful applicants is also sent out **AND** The candidate is reference checked.	There is a structured interview based on the job description **AND** A written letter (or email) of offer to the successful candidate is provided **AND** A letter (or email) to unsuccessful applicants is also sent out.	A generic interviewing process is in place **AND** A written letter (or email) of offer to the successful candidate is provided **AND** I do not advise all unsuccessful applicants of the outcome.	I have an informal interview process conducted by myself or the Supervisor **AND** Job offers are verbal.	I don't have an interview process in place.
N/A – I don't have any employees. If I ever hire someone, it would be done through a contractor.				

6.1.3 Contractor selection				
4	**3**	**2**	**1**	**0**
I choose my contractor based on a combination of the lowest quote to perform the job and their potential to develop a quality job **AND** I also choose my contractor based on references from other vineyards that have already used their services or my own past experiences **AND** It is also based on their ability to bring innovative solutions to the operations that can minimise negative impacts, improve quality and/or save money **AND** The licences and certificates necessary to perform the proposed task are taken into consideration when selecting contractors.	I choose my contractor based on a combination of the lowest quote to perform the job and their ability to complete the job satisfactory following my instructions and requirements **AND** I also choose my contractor based on references from other vineyards that have already used their services or my own past experience **AND** It is also based on their ability to bring innovative solutions to the operations that can minimise negative impacts, improve quality and/or save money.	I choose my contractor based on a combination of the lowest quote to perform the job and their ability to complete the job satisfactory following my instructions and requirements **AND** I also choose my contractor based on references from other vineyards that have already used their services or my own past experiences.	I choose my contractor specifically based on the lowest quote to perform the job.	I do not have any criteria to hire contractors. I hire as required.
N/A – I do not use independent contractors.				

6.1.4 Contractor hiring

4	3	2	1	0
There is a written contract for all the contractors specifying, the cost, location, operation to be performed, responsibilities of each party, starting date, finishing date and special requirements **AND** All necessary licenses to perform the tasks are checked by me or someone from my vineyard.	There is a written contract that is signed prior the beginning of the job **AND** the expectations of performance and timing to complete the job are established.	There is a written commitment on the task to be performed **AND** the expectations of performance and timing to complete the job are established.	There is a verbal commitment on the task to be performed **AND** the expectations of performance and timing are established.	There is only a verbal commitment on the task to be performed.
N/A – I do not use independent contractors.				

Difference between Employee and Contractors (Fair Work Ombudsman - Australian Government)
http://www.fairwork.gov.au/resources/fact-sheets/workplace-rights/pages/independent-contractors-and-emplyees-fact-sheet.aspx
Is the person performing the work for you an employee or a contractor (Employee/Contractor decision tool)
http://www.ato.gov.au/businesses/content.aspx?doc=/content/00095062.htm&pc=001/003/018/003/001&mnu=35879&mfp=001/003&st=&cy=1
About.com - Human Resources (variety of topics related to human resources)
http://humanresources.about.com
Australian Human Resources Institute
www.ahri.com.au

Employee Orientation and Training are necessary to ensure staff can carry out their role effectively and safely.

6.1.5 Induction and training

4	3	2	1	0
There is a formal induction in place for new employees, which is documented **AND** The induction is signed off **AND** There is on the job training and mentoring in place **AND** Structured internal and external training is provided **AND** Training records are maintained **AND** I have written SOPs (Standard Operational Procedures) **AND** My SOPs are available for my employees **AND** Further training needs identifying and scheduled as part of a structured program.	There is a formal induction in place for new employees, which is documented **AND** The induction is signed off **AND** There is on the job training and mentoring in place **AND** Both internal and external training are provided as required **AND** Training records are maintained **AND** I have written SOPs (Standard Operational Procedures) **AND** My SOPs are available for my employees.	There is a formal induction in place for new employees, which is documented **AND** There is on the job training and mentoring in place.	There is an informal induction conducted where the job, the tools, equipment and procedures are demonstrated as well as what is expected from the employee **AND** There is some on the job training provided **BUT** It is not documented.	There is no induction and/or training program in place.

N/A – I don't have any employees. If I ever hire someone, it would be done through a contractor.

Remuneration should reflect the responsibilities of the role and attract a suitably qualified employee. Incentives, such as 'pay for performance' might help the vineyard to save money in its operations. 'Incentive pay', also known as "pay for performance" is generally given for specific performance results rather than simply for time worked. While incentives are not the answer to all personnel challenges, they can do much to increase worker performance' (source: Gregorio Billikopf Encina from the University of California)

6.1.6 Remuneration

4	3	2	1	0
Remuneration reflects skills and qualifications **AND** Company Grading System provides guidelines **OR** I have a 'pay for performance' system to reward more efficient employees **AND** There are also some other benefits to motivate and retain employees.	Remuneration reflects skills and qualifications **AND** Company Grading System provides guidelines **OR** I have a 'pay for performance' system to reward more efficient employees.	I pay above industry award rates to attract suitably qualified staff when necessary **BUT** I don't have any plan or system in place.	I pay basic award rates to my employees when they commence, irrespective of experience.	I don't have a remuneration plan.
N/A – I don't have any employees. If I ever hire someone, it would be done through a contractor.				

SafeWork SA from the Government of South Australia
www.safework.sa.com.au
Labour Management in Agriculture
http://www.cnr.berkeley.edu/ucce50/ag-labor/7labor/001.htm
South Australian Legislation
http://www.legislation.sa.gov.au/index.aspx

Performance Appraisals allow for both employee and employer comments, and joint action plans. 'Performance appraisal in its simplest form is the process in which the employer decides how well the employee is doing in relation to the employer's expectations and the employee's expectations. This goes on whether there is a formal process or not and whether the employee is informed as to how he/she is doing. The employer should formalize the process and use it as a means of improving the performance of the employee. The process also helps the employer and employee address the employee's satisfaction with the job.' (Source: Performance Appraisal of Farm Employees from Ohio State University)

6.1.7 Performance appraisals

4	3	2	1	0
I conduct performance appraisals regularly following a structured process enabling both employer and employee inputs **AND** The outcomes are documented **AND** I use the results of the performance appraisal for career development planning and further training.	I conduct performance appraisals regularly following a structured process enabling both employer and employee inputs **AND** The outcomes are documented.	I conduct performance appraisals as required **AND** The outcomes are documented **BUT** There is no structured process in place.	I conduct performance appraisals when requested by an employee.	I don't conduct performance appraisals.

It's important to communicate company strategies, practices, policies, standard operating procedures and **legislative requirements** to employees. A good communication process helps the employee to perform better; the employees understand what is expected from them, their rights and obligations. Toolbox meeting is an interesting process to increase safety involvement and awareness at grass roots level. Toolbox meetings are usually run in small work groups. The meetings are short, about 5 to 10 minutes, and informal. The basic idea is to provide a direct method of communication and exchange of information between management, supervision and the shop floor with the purpose of improving safety and health by directly involving workers in issues that are important to them. Using tool box meetings is an ideal way to get employees involved in matters relating to their own safety, finding solutions to problems, as well as building a committed and productive team. (Source: Achieve Safety)

6.1.8 Employee relations and communication				
4	**3**	**2**	**1**	**0**
Scheduled monthly meetings are in place **AND** Minutes of Meetings are taken **AND** Toolbox meetings are held regularly **AND** Memos and/or Minutes are distributed, emailed or placed on notice boards.	I schedule regular meetings **AND** Minutes of Meetings are taken **AND** Toolbox meetings are held as required.	I hold meetings as required to advise of any company practices, policies, standard operating procedures and legislative requirements.	I rarely have meetings **BUT** I recognise the need to keep employees informed.	I don't have meetings with employees to discuss work matters.

Organisations have a duty of care to provide their employees with a safe working environment

6.1.9 Employees' safety

4	3	2	1	0
Formal and informal OH&S training is conducted regularly **AND** Scheduled Safety Audits are conducted* **AND** An Incident/Accident Reporting system is in place **AND** PPE (Personal Protective Equipment) is required or supplied to perform tasks **AND** There is an OH&S Committee who make recommendations.**	Formal and informal OH&S training is conducted regularly **AND** Scheduled Safety Audits are conducted* **AND** An Incident/Accident Reporting system is in place **AND** PPE (Personal Protective Equipment) is required or supplied to perform tasks.	Informal OH&S training is conducted regularly **AND** Safety Audits are conducted as required.*	I endeavour to follow safe practices, and follow legislative requirements.	I don't have concerns about safety training.
N/A – I do not have employees.				

*If you are a small vineyard, visual inspections are acceptable
**Applicable only for large vineyard

The community surrounding your vineyard is also important for the sustainability of your vineyard.

6.2.1 Knowledge and support on community initiatives

4	3	2	1	0
I am aware of some community initiatives **AND** I have helped to promote these initiatives (e.g. telling friends to support/attend, sending invitation emails, etc.) **AND** I have volunteered to help the development of community initiatives **AND** I encourage my employees or other family members to be part of community initiatives.	I am aware of some community initiatives **AND** I have helped to promote these initiatives (e.g. telling friends to support/attend, sending invitation emails, etc.) **AND** I have volunteered to help the development of community initiatives.	I am aware of some community initiatives **AND** I have helped to promote these initiates (e.g. telling friends to support/attend, sending invitation emails, etc.).	I am aware of some community initiatives.	I am not aware of any community initiatives.

6.2.2 Neighbours' relations

4	3	2	1	0
I know who my neighbours are **AND** I regularly exchange information with them regarding vineyard matters **AND** We support each other when necessary (e.g. vintage, help to find specialised service, equipment hire, loan, tip, etc.).	I know who my neighbours are **AND** I often exchange information and ideas with them regarding vineyard matters.	I know who my neighbours are **AND** We exchange information regarding vineyard matters on an as needs basis.	I know who my neighbours are **BUT** I do not have any contact with them.	I do not know who my neighbours are.

6.2.3 McLaren Vale Sustainable Winegrowing Australia support

4	3	2	1	0
I am a member of McLaren Vale Sustainable Winegrowing Australia **AND** I have sent at least one written feedback to the program coordinator **AND** I have helped to bring at least one new member into the program **AND** I have attended at least one of the events of the program (e.g. launching of the program, launching of the results) **AND** I have volunteered to help the program development (e.g. as author, reviewer, promoter in presentations, etc.).	I am a member of McLaren Vale Sustainable Winegrowing Australia **AND** I have sent at least one written feedback to the program coordinator **AND** I have helped to bring at least one new member into the program **AND** I have attended at least one of the events of the program (e.g. launching of the program, launching of the results).	I am a member of McLaren Vale Sustainable Winegrowing Australia **AND** I have sent at least one written feedback to the program coordinator **AND** I have helped to bring at least one new member into the program.	I am a member of McLaren Vale Sustainable Winegrowing Australia **AND** I have sent at least one written feedback to the program coordinator.	I don't know what McLaren Vale Sustainable Winegrowing Australia means.

6.2.4 Local seminars and workshops related to viticulture				
4	**3**	**2**	**1**	**0**
I, or someone in my vineyard, attended at least one seminar; organized by local associations or organisations in the last 12 months **AND** I have been providing feed-back on my training requirements.	I or someone in my vineyard attended at least one seminar, organised by local associations or organisations in the last 12 months.	I, or someone in my vineyard, have attended at least one seminar, organised by local associations or organisations in the last 24 months.	I, or someone in my vineyard have attended locally organised workshops and or seminars **BUT** Nobody has attended any seminars or workshops in the last 24 months.	I don't go to local seminars and/or workshops.

6.2.5 Participation in committees and volunteer work				
4	**3**	**2**	**1**	**0**
I think committee participation and volunteer work are important **AND** I or someone in my vineyard are ongoing members of a committee/s **AND** participate in voluntary work on a regular basis.	I think committee participation and volunteer work are important **AND** I, or someone in my vineyard, have been part of a committee in the last 12 months **AND** have volunteered at least once in the last 12 months.	I think committee participation and volunteer work are important **AND** I, or someone in my vineyard, have been part of a committee in the last 24 months **OR** have volunteered at least once in the last 24 months.	I think committee participation and volunteer work are important **BUT** Have not had the opportunity to be part of a committee or be a volunteer.	I don't think committee participation and volunteer work are important.

6.3.1 Contracts

4	3	2	1	0
I always sell my grapes with contracts **AND** The contracts specify, at least, Term of Agreement, vineyard location, variety, prices, tonnes, payment terms and delivery location **AND** The contracts also specify expected quality for the fruit (growing to specification) **AND** It also has a reward system for quality (bonus) **AND** My contract has quality control standards (penalty or rejection) clauses (higher or lower expected quality and/or tonnage reduction or over production) **AND** My contracts also specify other possible winery requirements, estimates and acceptance advice, need for certifications, etc. **AND** My contracts also specify other requirements for block details, tonnage, variety, area, clones and rootstocks, irrigation system.	I always sell my grapes with contracts **AND** The contracts specify, at least, variety, prices, amounts, payment conditions and delivery location **AND** The contracts also specify expected quality for the fruit (growing for specification) **AND** It also has a reward system for quality (bonus) **AND** My contract has quality control standards (penalty or rejection) clauses (higher or lower expected quality and/or tonnage reduction or over production).	I usually sell my grapes with contracts **AND** The contracts specify, at least, variety, prices, amounts, payment conditions and delivery location.	I do not sign written contracts **AND** When I sell my grapes, I have handshake agreements.	I do not have contracts to sell my grapes.

N/A – I am also the winemaker from the grapes produced by my own vineyard or our grapes are totally allocated to our own winery.

6.3.2 Communication with the winery

4	3	2	1	0
I think communication with the winery is important **AND** I always have an on-going dialogue with the winery on the overall situation in the vineyard that might impact on fruit quality or yield throughout the year. (This assists both the winery and the grower to manage expectations) **AND** My communication reinforces my contract to assure meeting specifications targets (emails, etc.).	I think communication with the winery is important **AND** During the growing season, I have an on-going dialog with the winery on the overall situation in the vineyard that might impact on fruit quality or yield throughout the year.	I think communication with the winery is important **AND** Prior to harvest I inform them at least once on the overall situation in the vineyard that might impact on fruit quality or yield.	I think communication with the winery is important	I avoid communicating with the winery as much as I can.

6.3.3 Grape grading

4	3	2	1	0
The grading of my grapes is based on a winery system **AND** The winery has explained the grape grading process **AND** I participate in vineyard assessment (benchmarking) workshops with my winery **AND** They hold comparative tastings to show me how my wines compare to other growers/grades **AND** If there is a different perception of quality between my winery and I, there is an option for dispute resolution (e.g. independent/external expert to assess my grape quality to benchmark against the winery grading and to help me to improve my operations).	The grading of my grapes is based on a winery system **AND** The winery has explained how they grade my grapes **AND** I participate in vineyard assessment (benchmarking) workshops with my winery.	The grading of my grapes is based on a winery system **AND** The winery has explained how they grade my grapes.	The grading of my grapes is based on a winery system **AND** I have an overall understanding of the system.	I don't know how my grapes are graded.

6.3.4 Grape production, quality and vineyard operations				
4	**3**	**2**	**1**	**0**
Operations of my vineyard that might impact on the grape quality are discussed with the winery at critical phenological stages to meet the winery requirements **AND** I participate in the decision on harvest date and grape maturity with my winery to meet the specifications (produce the best wine possible).	Operations of my vineyard that might impact on the grape quality are discussed with the winery on critical phenological stages to meet the winery requirements.	My vineyard operations are solely defined by me to achieve the grape production and quality I to meet the winery requirements.	My vineyard operations are solely defined by me to achieve the grape production and quality I understand I can produce in my site.	I do not have an understanding of which practices might impact on the grape quality.

6.3.5 Grape chemistry testing				
4	**3**	**2**	**1**	**0**
We or the winery perform grape chemistry tests to follow up the grape maturity **AND** The tests include at least TSS (Total soluble solids to measure sugars), TA (Titratable Acidity) and pH **AND** We use historical data of the grape chemistry test to help us on our operational decisions in the vineyard.	We or the winery perform grape chemistry tests to follow up the grape maturity **AND** The tests include at least TSS (Total soluble solids to measure sugars), TA (Titratable Acidity) and pH.	We or the winery perform grape chemistry tests at least once before harvest **AND** The tests include at least TSS (Total soluble solids to measure sugars), TA (Titratable Acidity) and pH.	We only perform grape chemistry tests if requested by the winery.	We do not perform chemical tests for the grapes.

6.3.6 Record keeping for the winery				
4	**3**	**2**	**1**	**0**
I have my records available for the winery **AND** I have them organised so I can check/answer questions from the wineries during their visits **AND** I regularly send out a short report, emphasizing the key operational issues in the vineyard (e.g. sprays, irrigation, rainfall, heat degree days, etc.) that might impact on the wineries' requirements.	I have my records available for the winery **AND** I have them organised so I can check/answer questions from the wineries during their visits **AND** I send out a short report prior to harvest, emphasizing the key operational issues in the vineyard (e.g. sprays, irrigation, etc.) that might impact on the wineries' requirements.	I have my records available for the winery **AND** I have them organised so I can check/answer questions from the wineries during their visits.	I have my records available for the winery upon request.	I do not keep or organise any of my records to have available for the wineries.

6.3.7 Wine produced from your grapes				
4	**3**	**2**	**1**	**0**
There is a transparency between my winery & myself that allows me to know what wine is produced from my grapes **AND** I have met all the specifications of my winery for my grapes **AND** I make wine from my blocks to benchmark the wines.	There is a transparency between my winery & myself that allows me to know what wine is produced from my grapes **AND** I have met all the specifications of my winery for my grapes.	There is a transparency between my winery & myself that allows me to know what wine is produced from my grapes.	I have an overall idea of what type of wine the wineries produce from my grapes.	I do not know what sort of wine is produced from my grapes.

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2013 RESULTS

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Credits

Publisher

McLaren Vale Grape, Wine & Tourism Association

(www.mclarenvale.info)

Editor, Production and Design

Irina Santiago

Result Graphs

Irina Santiago & Cary Dreelan

Text

Irina Santiago & Shay Bayly

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Introduction

McLaren Vale Sustainable Winegrowing Australia (MVSWGA) is a program developed for the McLaren Vale region to assess and improve winegrowers' sustainability. It is the only sustainability program in winegrapes in Australia.

It was formally launched in 2009, inspired by some of the main sustainability programs in viticulture at the time, such as Lodi Rules and California Sustainable Alliance. Growers from McLaren Vale developed content based on topics that most impacted their sustainability. The content of the assessment is updated annually and reviewed by world-recognised experts in the field.

All growers from the program are subjected to third-party audits in a random sampling approach. The methodology was developed by Irina Santiago's findings from her ongoing PhD research on sustainability in viticulture at the University of Adelaide. The methodology has three main principles: (1) assessment over time; (2) grower sustainability levels identified on a continuum and not on a pass/fail basis; (3) the assessment and reporting system must be useful for the grower to understand their sustainability status and be able to improve it.

MVSWGA encompasses sustainability indicators and spray diary reporting plus six assessment chapters: Soil Health, Nutrition & Fertiliser Management; Pest & Disease Management; Biodiversity Management; Water Management; Waste Management; and Social Relations (Work, Community & Wineries). Blocks within vineyards are identified by GPS coordinates which are related to spray diaries. The reporting system cross-tabulates disease pressure and chemical usage in 'real time'.

The program uses a triple bottom line approach (economic, environment and social) in a systemic assessment that combines relevant indicators and clear pathways for growers' improvement. It does not favour any farming system but it does favour outcomes from management choices. The reporting system, which includes regional benchmarks for all assessment topics, is available through an interactive online system available for all members of the program.

The aim of MVSWGA is to increase overall grower sustainability by providing useful and comprehensive reports to help growers increase their understanding of their own vineyards while comparing results with their peers. The program takes into account the impact of the natural environment, cultural and market forces on individual business. It also demonstrates growers' collective responsibility for maintaining and enhancing the surrounding landscape.

MVSWGA is starting its fourth year of data collection, with all data collection and the reporting system made available online.

I'd like to thank all growers who have given their time, contributing to the improvement of MVSWGA. I'd also like to thank Cary Dreelan, our system developer who exceeded all expectations with the design and functionality of the online system.

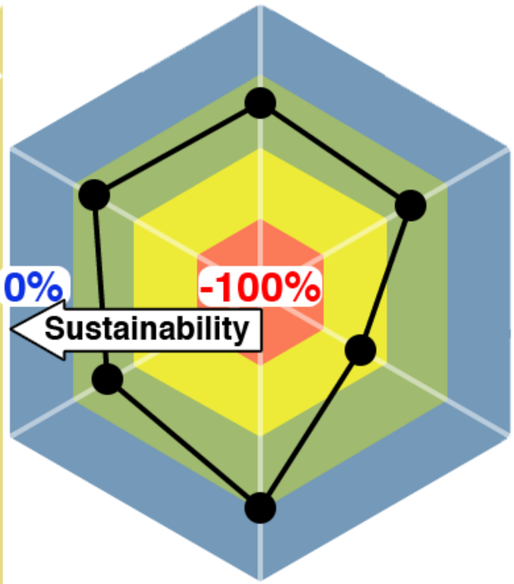
Last but not least, thank YOU for your support and help. MVSWGA would not be possible without your contribution. It has been an incredible journey!

Irina Santiago

Sustainability Officer
McLaren Vale Grape Wine and Tourism Association
November 2013

How to read the graphs

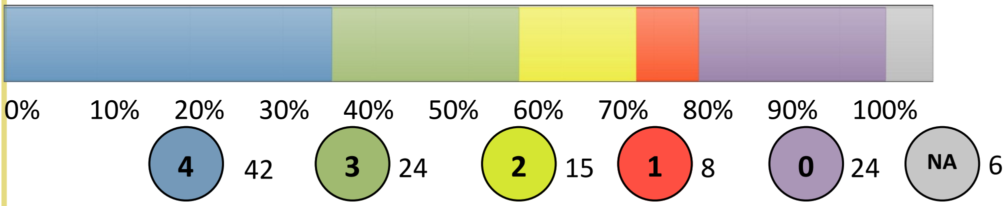
Spider Graphs



The spider graphs show values relative to the maximum 'perfect score' that can be achieved. The attributed weight (importance) for each item is taken into consideration and is displayed on the table below the graphs.

Results are shown as percentage change between maximum possible points and the score for the specific member or region. The centre of the graph represents -100% (minus one hundred percent), the worst possible result or least sustainable situation. The outer edge of the graph represents 0% (zero percent), the best possible result, i.e. 'perfect score' or most sustainable situation. The closer to zero (the outer edge), the better the result! The sustainability journey is about moving from the centre to the edge of the spider graph.

Stacked 100% Bar Graphs



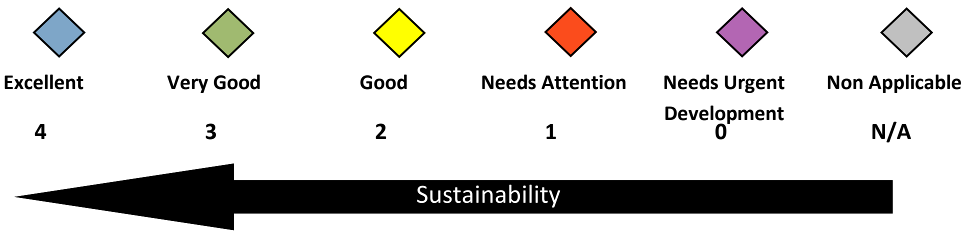
The Stacked 100% Bar Graphs show the count of absolute values for each topic. The attributed weight (importance) for each item is not taken into consideration.

The count above shows how many members responded in each category. The graph results are shown in percentages of the total, out of 100%.

The graph compares the percentage that each value contributes to a total, across each of the categories.

How to interpret the results and colours

Each colour represents a category of the workbook, varying from grey (non-applicable) through 0 to 4. The aim is to move from the right to the left as shown in the image below.



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Members: sites, production & areas under vine

This booklet shows the results of MVSWGA, one of the finest programs for viticultural sustainability in the world. McLaren Vale growers continue to embrace this world-class program, which moved to an online system in 2013, providing significant benefits in analysis and comparative measures, as well as data input, recording and reporting.

There was a 37% growth in membership this year, from 87 to 119 members, leading to a 32% rise in participating vineyard sites, from 145 to 191. As a result, the total area under vine in the MVSWGA program has grown by 30% in the past 12 months.

MVSWGA members represent 4,386ha of farm land, of which 2,929ha (67%) is area under vine. Amongst its members, there are 2,572ha of red varieties planted and 274ha of whites, producing 16,215t and 2,491t of grapes, respectively.

The average red grape production is 6.3t/ha, while for white grapes it is 9.1t/ha.

Snapshot

Members	119
Distinct Vineyard Sites	191
TOTAL FARM area (ha)	4,386
TOTAL area UNDER VINE (ha)	2,929
Area under RED grapes (ha)	2,572
Area under WHITE grapes (ha)	274
RED grape production (t)	16,215
WHITE grape production (t)	2,491
Average RED grape productivity (t/ha)	6.3
Average WHITE grape productivity (t/ha)	9.1

Comparisons

	South Australia	McLaren Vale	MVSWGA	Comparisons		
				MVSWGA vs South Australia	MVSWGA vs McLaren Vale	McLaren Vale vs South Australia
TOTAL grapes (t)	700,525	35,229	18,706	2.7%	53.1%	5.0%
Total RED (t)	412,856	29,258	16,215	3.9%	55.4%	0.7%
Total WHITE (t)	287,669	5,971	2,491	0.9%	41.7%	2.1%
TOTAL area (ha)	75,301	7,463	2,929	3.9%	39.2%	9.9%
RED area (ha)	53,519	6,275	2,572	4.8%	41.0%	11.7%
WHITE area (ha)	21,782	962	274	1.3%	28.5%	4.4%
Others (unknown, rootstocks, etc)	1,232	225	83	6.7%	36.9%	18.3%
Number of Growers	3,488	544	191	5.5%	35.1%	15.6%

Note: South Australian data from the SA Winegrape Crush Survey Regional 2013. The Phylloxera Board estimates that the non-response rate for McLaren Vale is 18.9%

The table above shows the position of MVSWGA members compared to South Australia and the McLaren Vale region.

MVSWGA members represent 35% of grapegrowers in the McLaren Vale region.

Members produced more than half of the total amount of grapes in the McLaren Vale region, and almost 3% of that in South Australia. About 55% of the region's – and 4% of the state's – red grapes came from MVSWGA growers. Members represented almost 40% of the area in McLaren Vale and about 4% of South Australia.

There are 544 vineyards in the McLaren Vale region, 191 of which are owned by MVSWGA members. They represent 35% of total vineyards in the region and 5% of South Australian vineyards.

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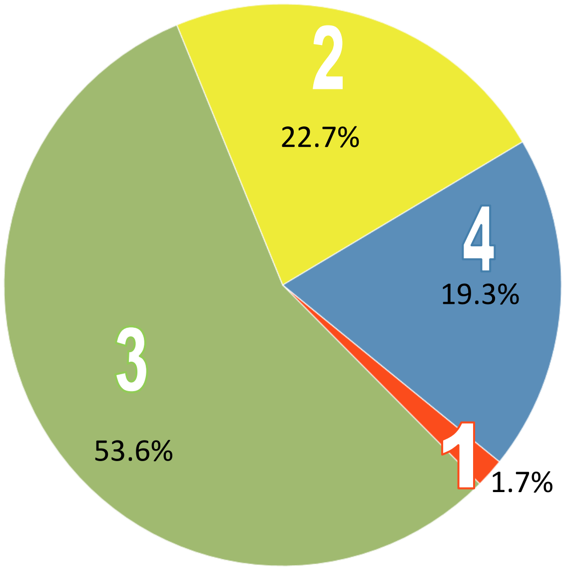
Factsheet: members, farming system & sizes



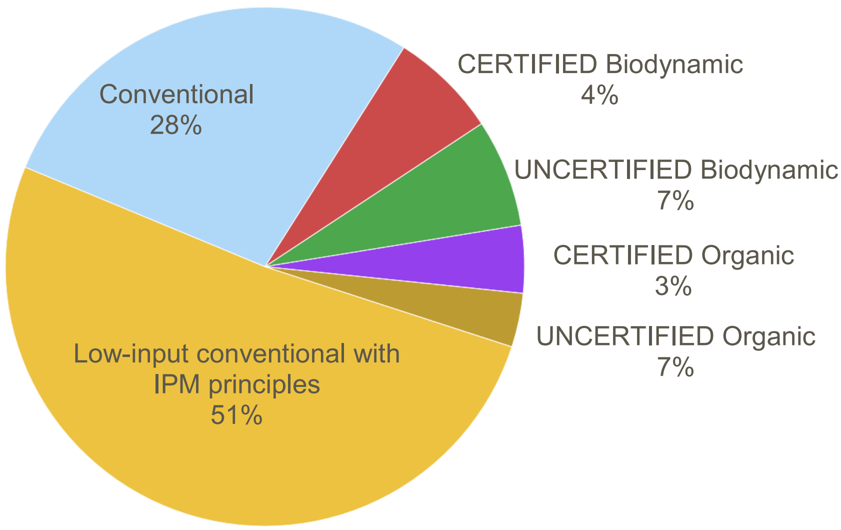
MVSWGA was created with the assumption that growers have different levels of sustainability. The assessment method places growers in four distinct categories which express their sustainability level according to a colour code, correlating results from the assessment with a level as follows:

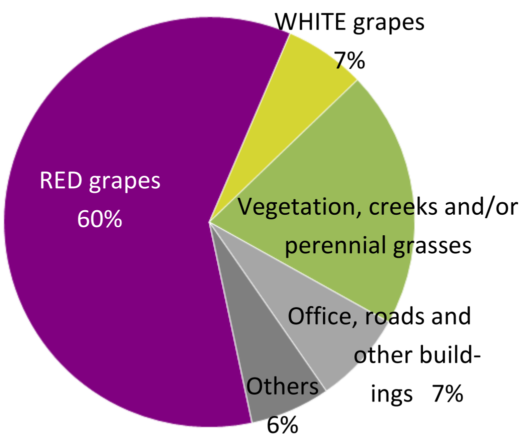
- 4 Excellent
- 3 Very Good
- 2 Good
- 1 Needs Attention

The pie chart on the left shows the number of members by sustainability category. The majority of members (56.3%) are in the Green category. Both Blue and Yellow categories each have about 20% of the members, while two members are in the Red category.

MVSWGA members are committed to sustainable and responsible grapegrowing. An impressive 72% of growers are either farming with low inputs and Integrated Pest Management (IPM) principles, biodynamically or organically.

More than half of MVSWGA members (51%) are farming with low inputs and IPM principles, while 6% are certified organic (a further 9% are uncertified) and 3% are certified biodynamic (a further 5% are uncertified). The remaining 28% of members farm conventionally.

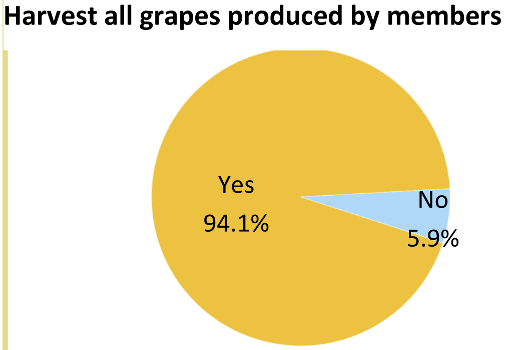


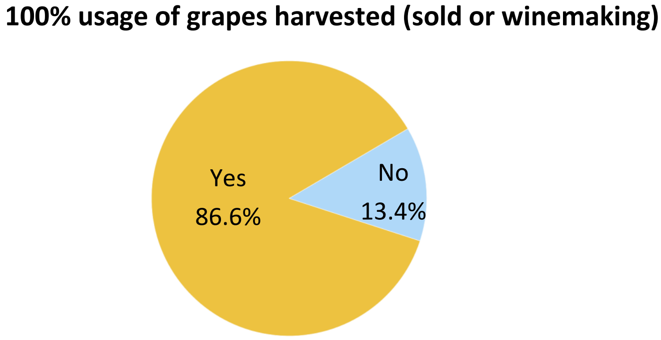


The McLaren Vale region is heavily dominated by red grape production. From the total 4,386ha of farm land that MVSWGA members hold, 60% is used for growing red grapes, while 7% is used for whites.

Generating biodiversity is certainly high on the agenda in the region, with members dedicating 20% of farm land to vegetation, creeks and/or perennial grasses. About 7% is allocated to offices, roads and buildings.

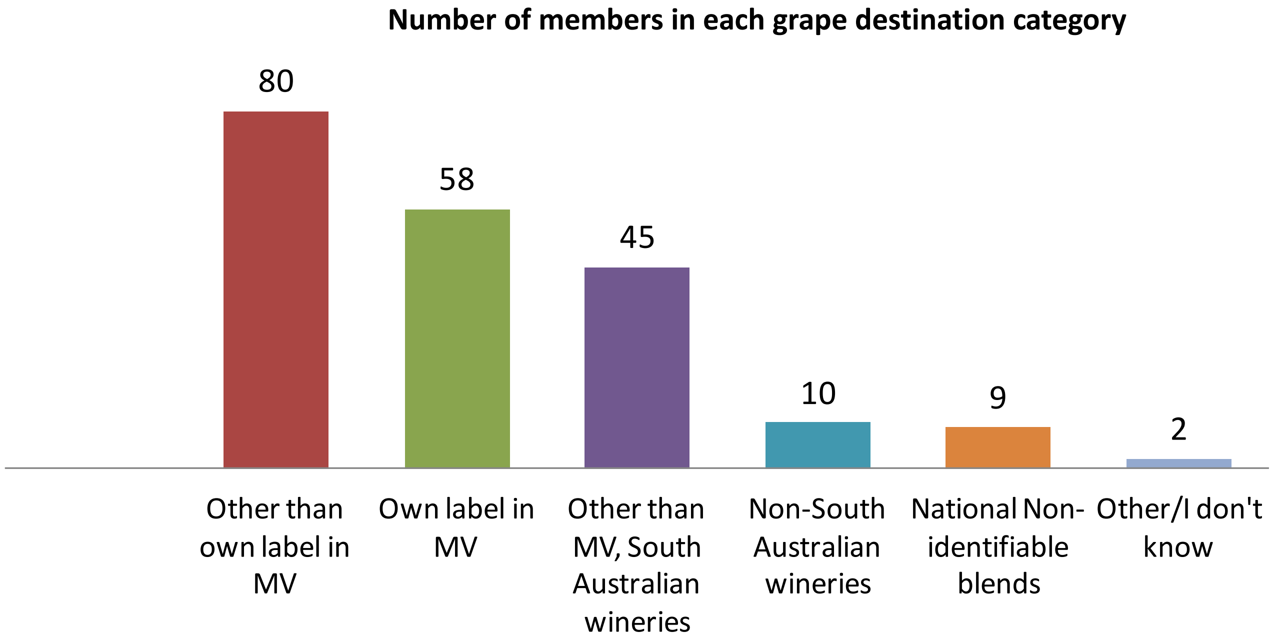
Grape production & wines





MVSWGA members have a high level of economic sustainability, with 94% harvesting all of their grapes. Only seven members did not harvest all the grapes they produced, with the total amount of grapes not harvested only amounting to 11t.

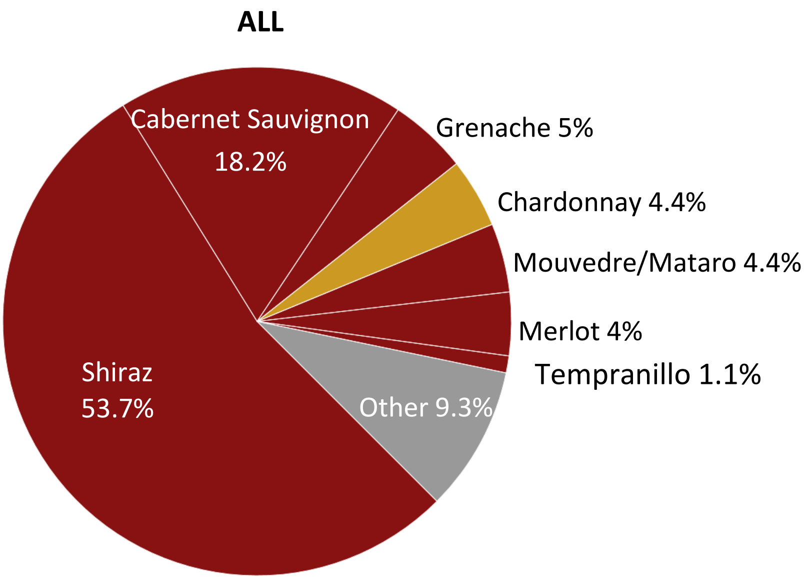
More than 86% of members used 100% of their harvested grapes, with only 17t not utilised.



About 39% of MVSWGA members grew grapes that were used to produce wines by other wineries in the McLaren Vale region, while 28% used their grapes to produce wines for their own McLaren Vale label.

For 22% of members, their grapes were used by South Australian wineries outside the McLaren Vale region, while 5% of members had their grapes used by non-South Australian wineries, and another 5% had their grapes used in national non-identifiable blends.

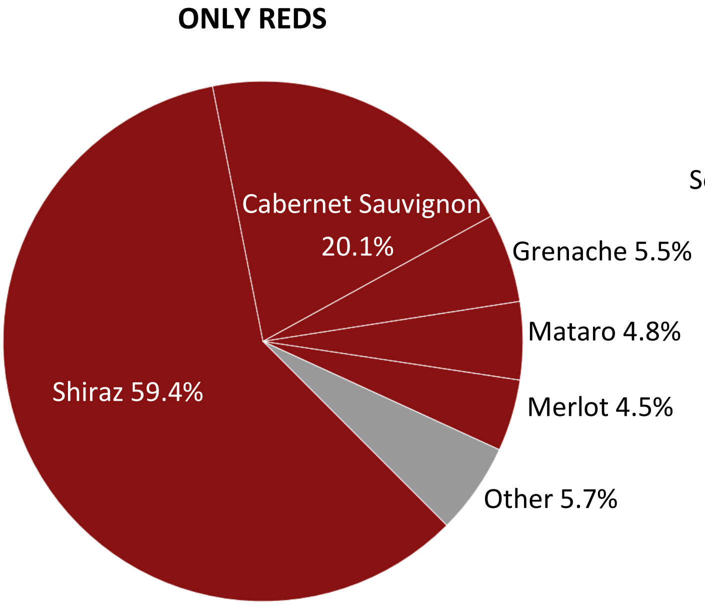
Grapes (area under vine)

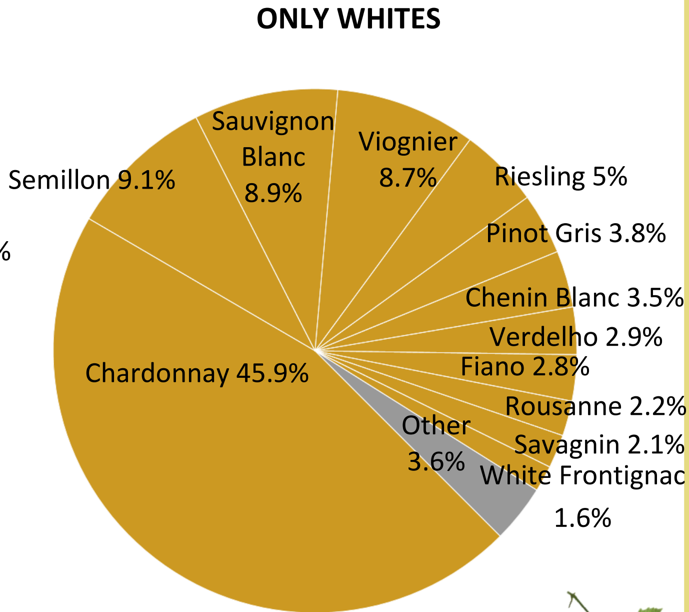


Shiraz remains by far the most important variety in the McLaren Vale region, accounting for more than half (54%) of all area under vine amongst MVSWGA members. Cabernet Sauvignon accounts for 18%, Grenache 5%, Merlot 4%, Mouvedre/Mataro 4% and Chardonnay 4%. All other varieties represent about 11%.

MVSWGA members produced 16,215t of red grapes in 2013 from 2,572ha under vine. Shiraz is the most planted red, representing 59% of the total reds, followed by Cabernet Sauvignon (20%), Grenache (6%), Mouvedre/Mataro (5%) and Merlot (4%). Other varieties, including Tempranillo and Sangiovese, represent 6% in total.

Members produced 2,491t of white grapes this year, which came from 274ha under vine. By far the main planted white variety is Chardonnay (46%), followed by Semillon (9%), Sauvignon Blanc (9%), Viognier (9%) and Riesling (5%). There are many new and alternative varieties with small production that represent 19% of the total white varieties planted. They include Pinot Gris/Grigio (4%), Chenin Blanc (3%), Verdelho (3%), Fiano (3%), Rousanne (2%), Savagnin (2%) and White Frontignac (2%).





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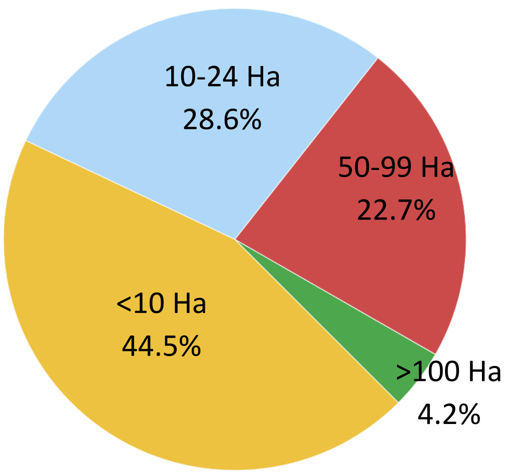
Farming systems and vineyard sizes & land use (by members)

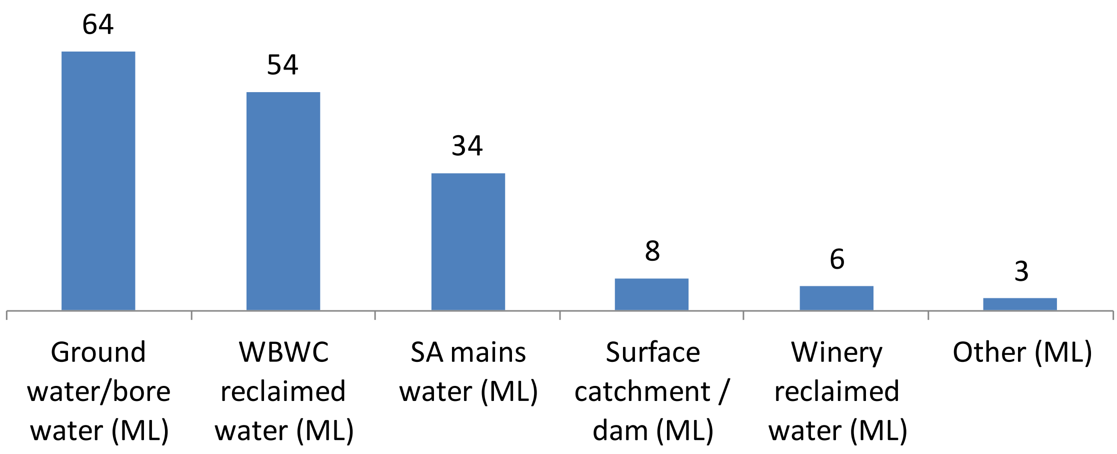
Members by size (total area under vine)



With a large percentage of wineries in the McLaren Vale region being small, family-run boutique operations, it is not surprising that close to half (44%) of MVSWGA members have vineyards smaller than 10ha. Almost a third (29%) have vineyards between 10-24ha and close to a quarter (23%) have 50-99ha, while only a handful of growers (4%) have more than 100ha. No MVSWGA members have vineyards between 25-49ha.

Water: irrigation sources & water usage

Number of members in each water source



Ground/bore water, Willunga Basin Water Company (WBWC) reclaimed water and SA mains water were the three major water sources used by MVSWGA members in 2013.

Ground/bore was the water source most heavily relied upon by members, with 64 utilising it. WBWC reclaimed water followed with 54 members, and 34 used SA mains water.

Eight members used surface catchment/dam water, while six made use of winery reclaimed water.

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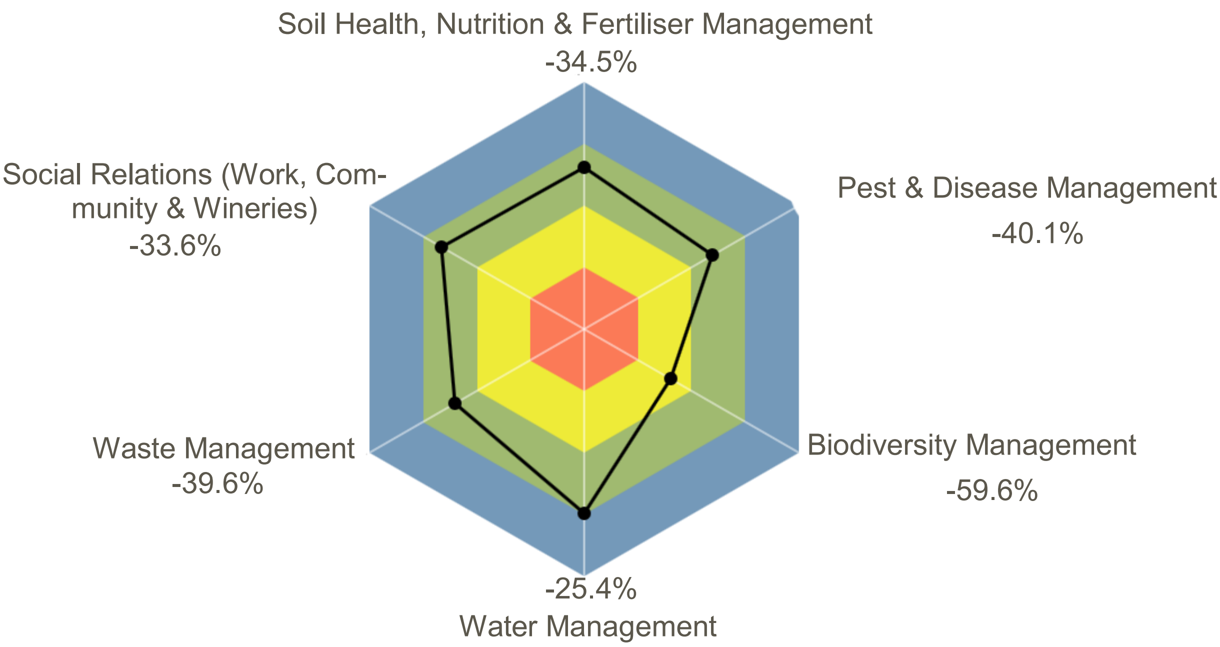
All Chapters



The spider graph above shows the overall results of our main assessment chapters: Soil Health, Nutrition & Fertiliser Management; Pest & Disease Management; Biodiversity Management; Water Management; Waste Management; and Social Relations (Work, Community & Wineries).

In the MVSWGA program the Soil Health and Pest & Disease chapters each account for 20% of the weight of the assessment, and all others each account for 15%.

The overall sustainability category for McLaren Vale is Green as well as all the individual chapters. The results are similar to last year, however this year there was a 3.5% overall improvement in the sustainability level of the region.

Water Management achieved the best result in 2012/13. The percentage change between the regional result and the maximum points that could be achieved was -25.4%.

Biodiversity Management had the weakest result with -59.6%.

Social Relations achieved -33.6%, Soil Health -34.5%, Waste Management -39.6% and Pest & Disease -40.1%.

All Chapters

Table 1. Comparison between 2011/12 to season 2012/13

Chapter	Gap to reach the 'Perfect Score' Previous season 2011/12	Gap to reach the 'Perfect Score' Current season 2012/13	% Change Previous vs Current Season
Soil Health, Nutrition & Fertiliser Management	-35.9%	-34.5%	3.9% improvement
Pest & Disease Management	-41.1%	-40.1%	2.4% improvement
Biodiversity Management	-64.0%	-59.6%	6.9% improvement
Water Management	-25.8%	-25.5%	1.2% improvement
Waste Management	-39.6%	-39.6%	no change
Social Relations (Work, Community & Wineries)	-35.2%	-33.6%	4.5% improvement
Overall annual IMPROVEMENT	**-40.1%**	**-38.7%**	**3.5% improvement**

The table above shows the comparison by chapter between season 2011/12 and 2012/13. All chapters except Waste Management showed an improvement in 2012/13.

Soil Health recorded a 3.9% improvement on season 2011/12 while Pest & Disease increased by 2.4%.

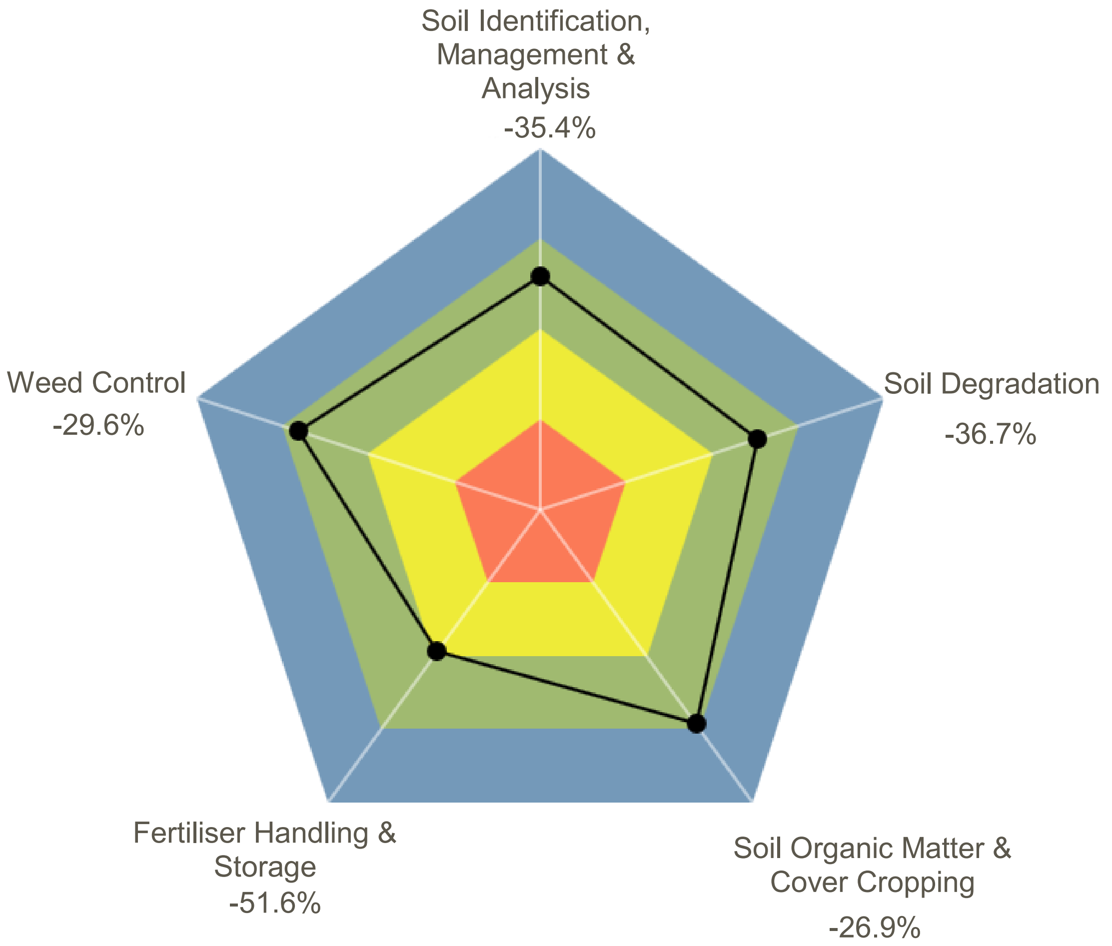
Biodiversity Management had the highest improvement (6.9%). This reflects activities by the McLaren Vale Grape Wine and Tourism Association (MVGWTA) to increase awareness and education in viticulture. There was particular emphasis placed on Biodiversity Management in the region as it was the lowest result among the chapters in 2011/12.

The release of the *McLaren Vale Biodiversity ID Booklets* (birds, trees and grasses) by the MVGWTA and a series of seminars on biodiversity played a significant role in the improvement of Biodiversity Management in 2012/13.

The highest rated chapter was Water Management at -25.5% in relation to the maximum achievable results. In addition to the excellent result, Water Management also had a 1.2% improvement on season 2011/12.

Waste Management had identical results in 2011/12 and 2012/13, while Social Relations recorded a 4.5% improvement.

Soil Health, Nutrition & Fertiliser Management



Sections and Weights

The Soil Health, Nutrition & Fertiliser Management chapter is divided into five sections: Soil Identification, Management & Analysis; Soil Degradation; Soil Organic Matter & Cover Cropping; Fertiliser Handling & Storage; and Weed Control.

The Soil Health chapter represents 20% of the assessment in the MVSWGA program.

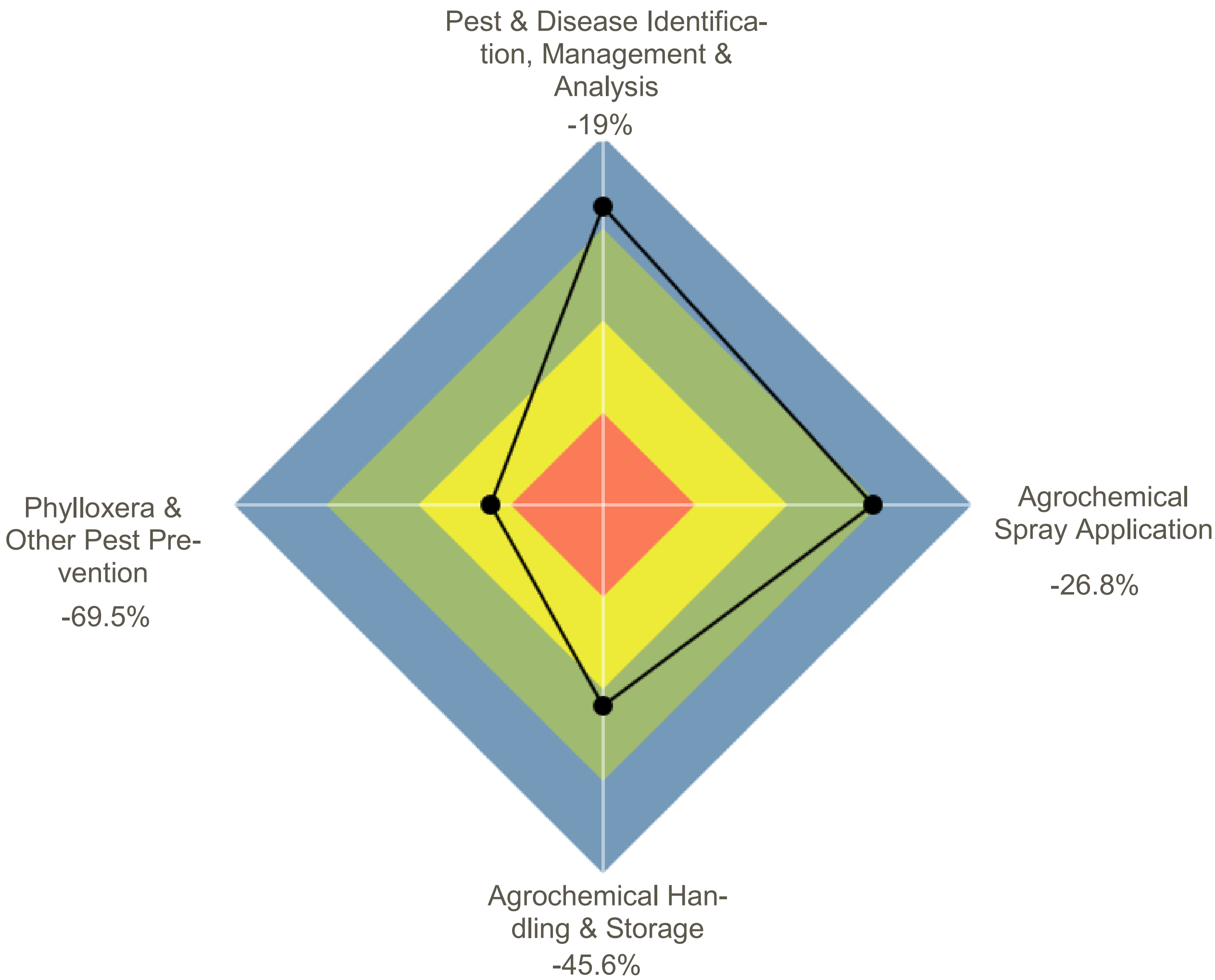
Within the Soil Health chapter, the Soil Identification section represents 30%, Soil Degradation 20%, Soil Organic Matter & Cover Cropping 15%, Fertiliser Handling & Storage 10%, and Weed Control 25%.

Overall Results

The Soil Organic Matter & Cover Cropping section had the best results for the Soil Health chapter. The percentage change between the regional result and the maximum points that could be achieved was -26.9%.

Fertiliser Handling had the weakest result with -51.6%.

Weed Control achieved -29.6%, Soil Identification -35.4% and Soil Degradation -36.7%.



Sections and Weights

The Pest & Disease Management chapter is divided into four sections: Pest & Disease Identification, Management & Analysis; Agrochemical Spray Application; Agrochemical Handling & Storage; and Phylloxera & Other Pests Prevention.

The Pest & Disease chapter represents 20% of the assessment in the MVSWGA program.

Within the Pest & Disease chapter, both Pest & Disease Identification, Management & Analysis and Phylloxera & Other Pests Prevention represent 30% each. Agrochemical Spray Application represents 25% and Agrochemical Handling & Storage represents 15%.

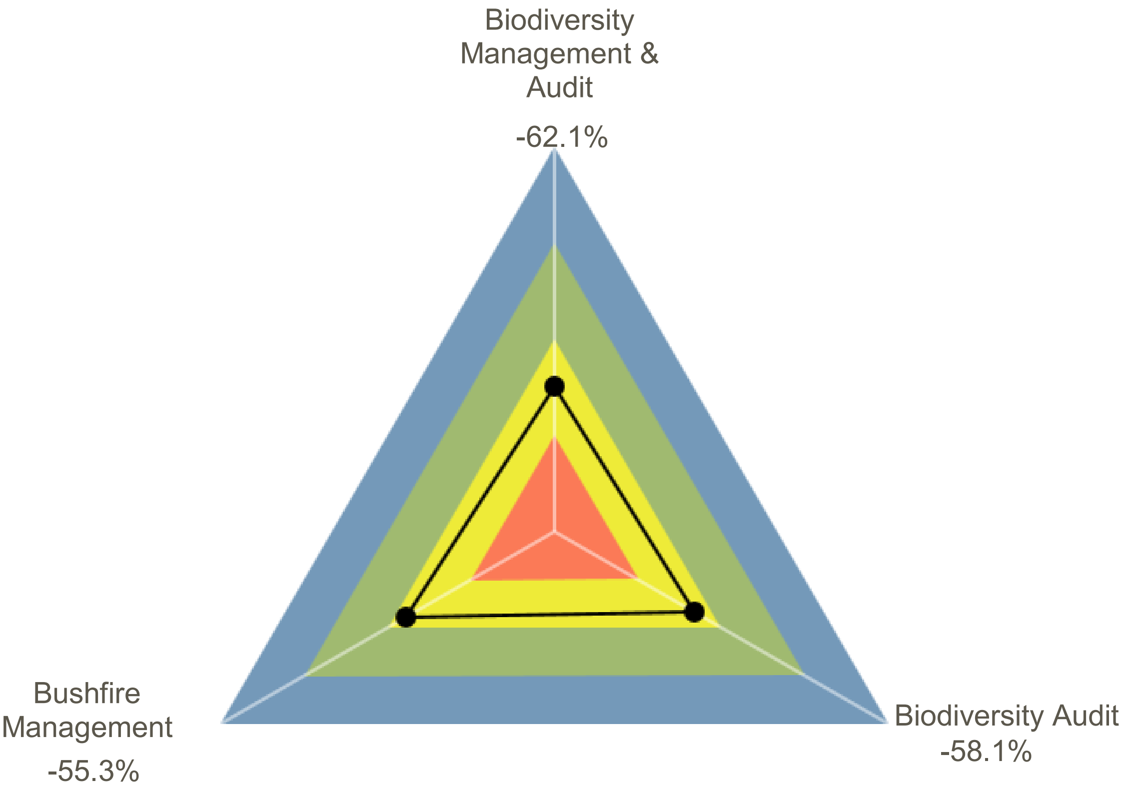
Overall Results

The Pest & Disease Identification, Management & Analysis section had the best results for the Pest & Disease Management chapter. The percentage change between the regional result and the maximum points that could be achieved was -19%.

Phylloxera & Other Pest Prevention had the weakest result with -69.5%.

Agrochemical Spray Application achieved -26.8% and Agrochemical Handling & Storage -45.6%.

Biodiversity



Sections and Weight

The Biodiversity Management chapter is divided into three sections: Biodiversity Management & Audit; Biodiversity Audit; and Bushfire Management.

The Biodiversity Management chapter represents 15% of the assessment in the MVSWGA program.

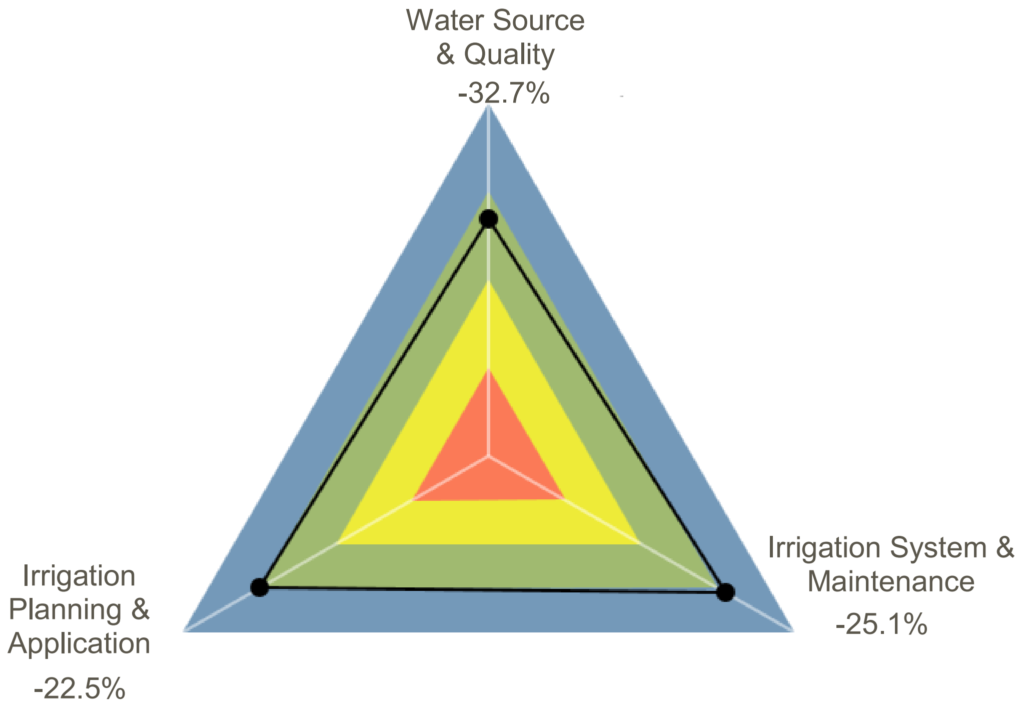
Within the Biodiversity chapter, Biodiversity Management & Audit represents 47%, Biodiversity Audit 40% and Bushfire Management 13%.

Overall Results

The Bushfire Management section had the best results for the Biodiversity chapter. The percentage change between the regional result and the maximum points that could be achieved was -55.3%.

Biodiversity Management & Audit had the weakest result with -62.1%.

Biodiversity Audit achieved -58.1%.



Sections and Weights

The Water Management chapter is divided into three sections: Water Source & Quality; Irrigation Planning & Application and Irrigation System & Maintenance.

The Water Management chapter represents 15% of the assessment in the MVSWGA program.

Within the Water Management chapter, Water Source represents 20%, Irrigation Planning & Application 47% and Irrigation System Maintenance 33%.

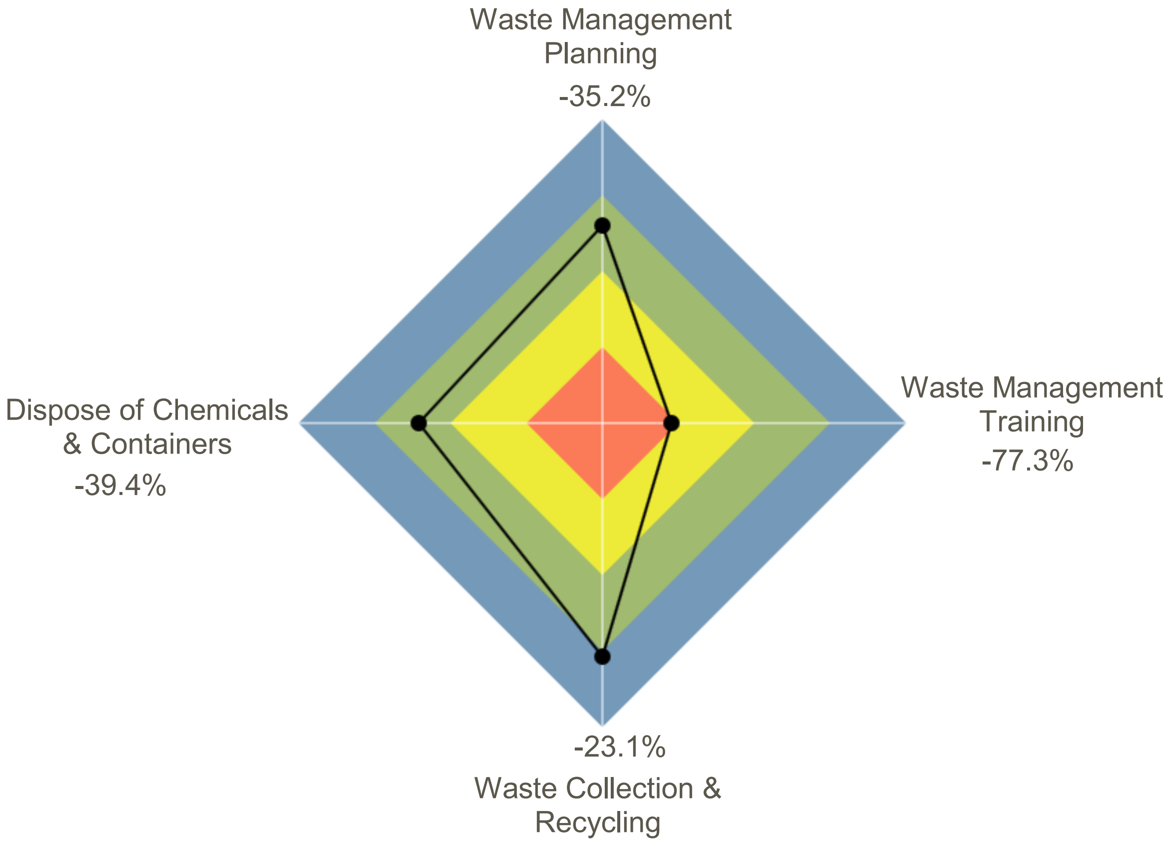
Overall Results

The Irrigation Planning & Application section had the best results for the Water Management chapter. The percentage change between the regional result and the maximum points that could be achieved was -22.5%.

Water Source had the weakest result with -32.7%.

Irrigation System & Maintenance achieved -25.1%.

Waste Management



Sections and Weights

The Waste Management chapter is divided into four sections: Waste Management Planning; Waste Management Training; Waste Collection & Recycling; and Dispose of Chemicals & Containers.

The Waste Management chapter represents 15% of the assessment in the MVSWGA program.

Within the Waste Management chapter, the Waste Management Planning section represents 20%, Waste Management Training 20%, Dispose of Chemicals & Containers 20%, and Waste Collection & Recycling 40%.

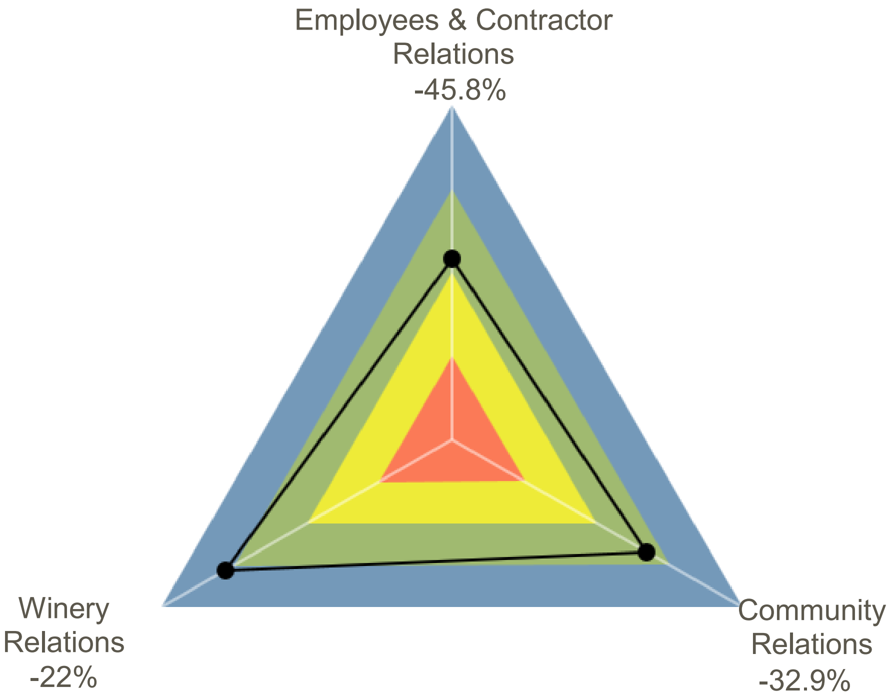
Overall Results

The Waste Collection & Recycling section had the best results for the Waste Management chapter. The percentage change between the regional result and the maximum points that could be achieved was -23.1%.

Waste Management Training had the weakest result with -77.3%.

Waste Management Planning achieved -35.2% and Dispose of Chemicals & Containers -39.4.

Social Relations (Workers, Community and Wineries)



Sections and Weights

The Social Relations chapter is divided into three sections: Employees & Contractors Relations; Community Relations; and Wineries Relations.

The Social Relations chapter represents 15% of the assessment in the MVSWGA program.

Within the Soil Health chapter, the three sections were evenly weighted at 33% each.

Overall Results

The Winery Relations section had the best results for the Social Relations chapter. The percentage change between the regional result and the maximum points that could be achieved was -22%.

Employees & Contractor Relations had the weakest result with -45.8%.

Community Relations achieved -32.9%.

Sprays

Spray Target	Area (ha)	% area of Members	Average times
Biodynamic	128.1	4.4	7
Botrytis bunch rot	396.4	13.5	1.8
Bud mite	205.2	7.0	1.1
Bunch mite	27.7	0.9	1
Downy mildew	1724.5	58.9	2.7
Garden weevil	10.3	0.4	1
Grapeleaf blister mite	1.4	0.0	1
Grapeleaf rust mite	185.9	6.3	1.4
Grapevine moth	22.6	0.8	1
Grapevine scale	58.2	2.0	1
Herbicide [a]	523.4	17.9	2.8
Herbicide spot spraying	4.2	0.1	1
Light brown apple moth	680.3	23.2	1.1
Mealybug	1.3	0.0	1
Nutrition [b]	1385.6	47.3	2.7
Plant growth regulators	5.5	0.2	1
Powdery mildew	2774.4	94.7	5.7
Rust Mite	24.8	0.8	2
Snail	52.5	1.8	1
Wetting/adjuvant agent	666.1	22.7	4.6
Wingless grasshopper	16.8	0.6	1
(Not matched) [c]	654	22.3	4
(Unspecified) [c]	206.1	7.0	2.6

Important notes

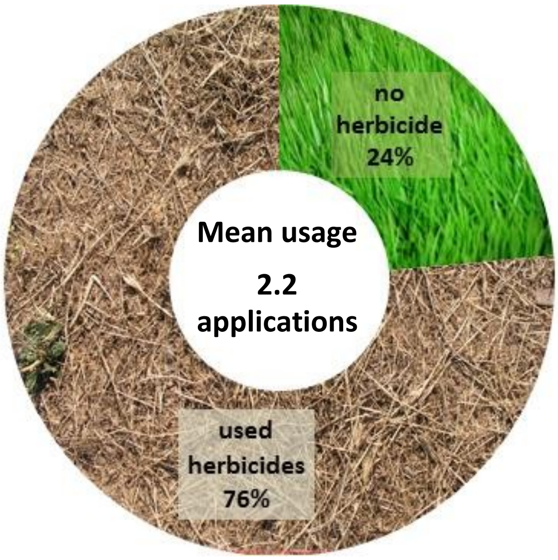
[a] The system only allows to capture nutrition through foliar sprays. Some growers might have used composts or liquid fertilisers through drip lines (fertigation).

[b] Because the spray data was collected historically, after Vintage 2013, many growers did not report herbicide spraying properly in our online system. This table shows that only 18% of the area was sprayed with herbicides, however the number seems too low as 91 members have informed us (in the workbook assessment) they've applied herbicides. See graph on the right.

[c] In most situations, targets were placed automatically into the unmatched or unspecified categories because of misspellings in the importing process from other spray diaries maintained by growers.

The table above shows spray targets, area (ha), the percentage area for each spray target, and the average spray times per target per year.

For example, it is clear from the data that the highest disease pressure in the McLaren Vale region is powdery mildew. On average, among those who spray for powdery mildew, growers spray 5.7 times per year.



The graph above is the herbicide usage during the 2012/13 growing season.

Among members who used herbicides, the mean usage was 2.2 applications per year. About 76% of members used herbicides at least once, while 24% didn't use any. There is a direct correlation between growers who did not use herbicides and their reported farming system. About 21% of members farm organically or biodynamically.

It is important to note that there is a discrepancy between the graph above and the table to the left, which is the result of capturing the same data in two models. Our preferred data for herbicide usage is the one above as this was captured through a direct question within the assessment. The data to the left, however, came from the Spray Diary which was collected historically at the end of the season. It was observed that several members reported only canopy sprays targeting Pest & Disease. This was accepted for the 2012/13 season as the requirement to report sprays was a new feature in the assessment system.

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SUSTAINABLE WINEGROWING AUSTRALIA

McLaren Vale Grape Wine and Tourism Association
www.mclarenvale.info

2012 RESULTS

Credits and Introduction

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McLaren Vale Grape Wine and Tourism Association

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INTRODUCTION
I'm delighted to introduce the results of the second year of assessment of the McLaren Vale Sustainable Winegrowing Australia.

This booklet presents the results from the new assessment method, developed for the program, using contributions from my on-going PhD at the University of Adelaide and co-funded by GWRDC.

Each Member assessed their vineyards following the topics from our Workbook and this short report shows the overall results of this group that represent 145 vineyards in McLaren Vale.

The McLaren Vale community embraced these changes and a group of engaged members contributed actively to adapt and improve the content of our program. I'd like to once more to say thank you to (in order of the chapters):

James Hook—Lazy Ballerina and DJ's Growers
Richard Leask—Leask Viticulture
Rachel Steer—Chapel Hill Wines
Giulio Dimasi—d'Arenberg Wines
Dee Hoad—d'Arenberg Wines

With our homework done, a group of recognized experts accepted the challenge to review the content of our assessment, generously donating their time and expertise in their area of knowledge:

Dr. Michael McCarthy—SARDI/PIRSA
Dr. Trevor Wicks—SARDI/PIRSA
Dr. Linda Thomson –University of Melbourne—Department of Zoology
Lynda Wedding—City of Onkaparinga—Waste and Recycling Education
Paul Georgiadis—Paulmara Estate Wines

I'd like also, to thank Jodie Pain, my predecessor managing the sustainability program. The McLaren Vale Sustainable Winegrowing would never be at the stage it is without her contribution.

Last, but not the least, I'd like to thank all Members who agreed to be part of the program and anytime they see me, ask about their spider graphs! I feel honoured and fortunate to be part of the McLaren Vale community and being part of this journey to increase the sustainability of our region.

Thank you all!

Irina Santiago
Sustainability Officer

MCLAREN VALE SUSTAINABLE WINEGROWING AUSTRALIA

Message from the CEO

McLAREN VALE
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The 2012 results of the MVSWA sustainability program represent a remarkably detailed snapshot of viticultural practice in McLaren Vale.

During 2011/12, the program underwent some major changes:

1. The assessment methodology and questions were re-written.
2. The name was changed from Generation Farming to **McLaren Vale Sustainable Winegrowing Australia** to better reflect the objectives of the program.
3. The trial phase ended and the program was made available to all members.

MVGWT members embraced the program and uptake has exceeded expectation. 87 members participated in 2012, representing 145 individual sites. This represented growth of 158.9% by area between 2011 and 2012.

The total area of vineyard reported by MVSWGA members was 2,255Ha, an impressive 30.2% of the total McLaren Vale vineyard area. Wine-grape tonnage reported was 11,905 tonnes from a total McLaren Vale harvest of 31,755 tonnes, or 37.5% of the McLaren Vale wine-grape crop for 2012.

To have achieved better than 30% participation in each of these key measures can only be considered an exceptional result in the first full year of the program. A conscious decision was made to ensure that the system offers the opportunity to improve business performance in addition to encouraging (and offering a pathway to) environmental best practice. In assessing member feedback it seems reasonable to conclude that this focus has helped to encourage adoption amongst a wide segment of the grower base.

Along with specific measures of vineyard practice and environmental performance, the system has generated some very useful and powerful data with which to generate an overview of viticulture in the region. This data, over time, will be extremely useful for the Association in terms of understanding the region and it's members, uncovering marketable trends, and as a tool when attempting to influence policy that affects the region. Notable examples include:

- Accurate measures of land use. Example: vegetation and creeks represent 16% of members land holdings.
- Farming systems: Example: 23% of respondents identify as using certified or uncertified organic/biodynamic farming systems. A further 51% identify their farming system as low-input conventional with IPM principles.
- Water resources: Example: Water used for irrigation by respondents averaged 1.08ML/Ha. The sources of water as a percentage of the total used- Willunga Basin Water Company (reclaimed): 50.4%, Bore: 39.3%, SA mains: 8.6%.
- Fruit destination: Example: 55% of members produced their own wine from their own grapes. 65.5% supplied fruit to other McLaren Vale wineries. 35.6% supplied other SA wineries outside of McLaren Vale.

These examples serve to highlight the powerful information that the system is capable of generating. Over time, comparisons from year to year will be possible which will only add to the value of the system.

MVSWGA has emerged as the most highly developed regional system of it's kind in the Australian wine industry. A number of new initiatives aim to improve the system and keep it at the forefront:

- Independent audits will add rigour to the system
- Compatibility with the WFA Entwine system is expected to be achieved and will eliminate the need for members to complete two assessments
- A more sophisticated electronic database will enable the data to be used more effectively and with more confidence
- Ongoing review of the booklet chapters is designed to continually push the boundaries of accepted best practice and encourage further improvement
- A winery assessment is a logical next step

Uptake and the results generated to date have exceeded expectation. It is a credit to those responsible for the system's initiation and development, MVGWT staff and the proactive attitude of McLaren Vale's grape growers and winemakers who have embraced the program and support it's development and operation through their levy contributions.

Peter Ali
Chief Executive Officer

MCLAREN VALE SUSTAINABLE WINEGROWING AUSTRALIA

Message from the Chairman

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McLAREN VALE SUSTAINABLE WINEGROWING

In my introduction to the growers' handbook for the McLaren Vale Sustainable Wine Growing Australia handbook I observed that;

"Genuinely sustainable winegrowing must embrace the base "triple bottom line" principles relating to economic, social and environmental considerations and applied within a specific regional context. If continuous improvements in sustainability are desired, then actions cannot simply be reduced to using a universal template for accounting and reporting purposes.

The approach undertaken within the **McLaren Vale Sustainable Winegrowing Australia (MVSWA)** scheme has been founded squarely on "triple bottom line" (TBL) principles around which high priority-high impact regional drivers have been identified and incorporated for deliberately targeted action."

Data, its analysis and commentary from this the first of the substantially developed MVSWGA program illustrates very comprehensively the diversity of relevant regional measures to underpin "triple bottom line" performance.

The material within this report highlights the considerable commitment and progress growers have made in seeking sustainability with a generally outstanding report achieved in areas of "Water Management", "Soil Health, Nutrition and Fertiliser Management" and "Pest and Disease Management". Nevertheless and allowing the positive outcomes for these sections, perhaps the most disappointing of results sits around awareness and observance of biosecurity protocols for prevention of phylloxera and other pest, disease and weed incursions; this warrants particular attention in the near future.

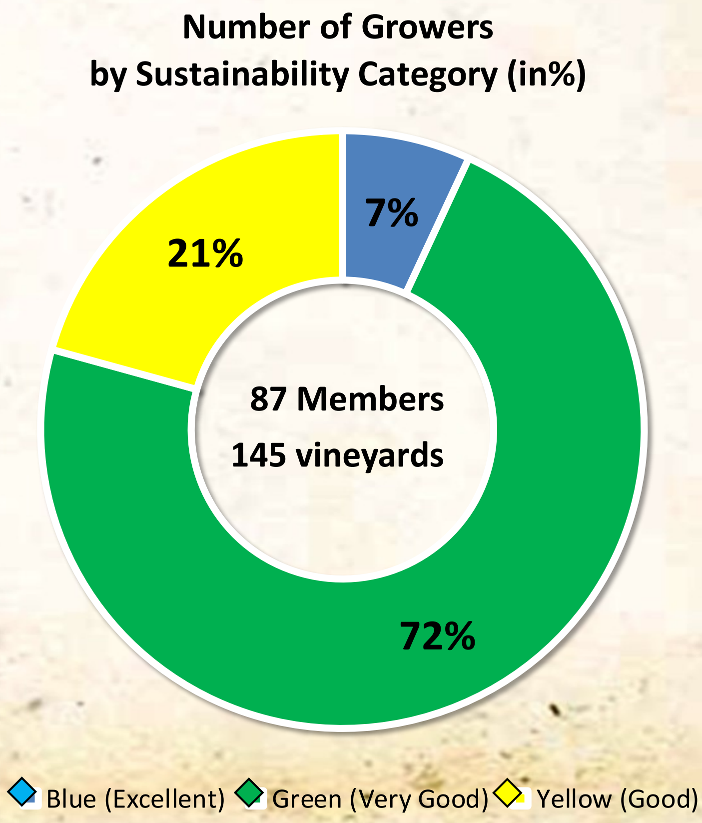
Greater variability and somewhat lesser attainment is demonstrated in other areas such as "Biodiversity Management", "Waste Management" and "Social Relations" although there remains clear evidence of a number of growers already with good-excellent performance in these areas. It seems clear that targetted awareness and training campaigns together with peer support from leading practitioners will go a long way to redress these weaknesses, especially where a number relate to poor record keeping and analysis rather than "poor practice" *per se*.

A substantial foundation has now been established for MVSWGA and I anticipate continued solid progress from current program members and new participants over the next 12 months; our region and its many wine consumers will continue to benefit greatly from this endeavour.

I invite your review of this document and continued engagement with our growers and supporters in this quest for continuous improvement and genuine TBL Sustainability

Peter Hayes
Chairman

Sustainability category among members



McLAREN VALE SUSTAINABLE WINEGROWING -MEMBERS

The pie chart on the left shows the percentage of members in each one of our sustainability categories. The majority of the members (72%) achieved the Green (Very Good) overall score in our system. 21% (Good) were placed in the yellow category and 7% are Blue (Excellent). The Members in the Blue category achieved high scores in most chapters and can be considered benchmarks for our region in terms of currently assessed sustainable practices.

MCLAREN VALE SUSTAINABLE WINEGROWING AUSTRALIA

Fact Sheet

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McLAREN VALE SUSTAINABLE WINEGROWING AUSTRALIA—FIGURES

Members	87
Distinct Vineyard Sites	145
Total farm area (ha)	3,028
Total area UNDER VINE (ha)	2,255
Area under RED grapes (ha)	2,021
Area under WHITE grapes (ha)	234
RED grapes production (ton)	10,444
WHITE grapes production (ton)	1,461
Average RED grape production (ton/ha)	5.2
Average WHITE grape production (ton/ha)	6.2

NUMBER OF MEMBERS IN EACH GROUP SIZE AREAS UNDER VINE

# Members	Total area under vine, including multiple sites per member
39	< 10 hectares
23	10 - 24 hectares
14	25-49 hectares
8	50-99 hectares
3	>100 hectares
87	**TOTAL**

Source: Phylloxera Board—data on South Australia and McLaren Vale (overall regional data)

McLAREN VALE SUSTAINABLE WINEGROWING AUTRALIA—FACT SHEET

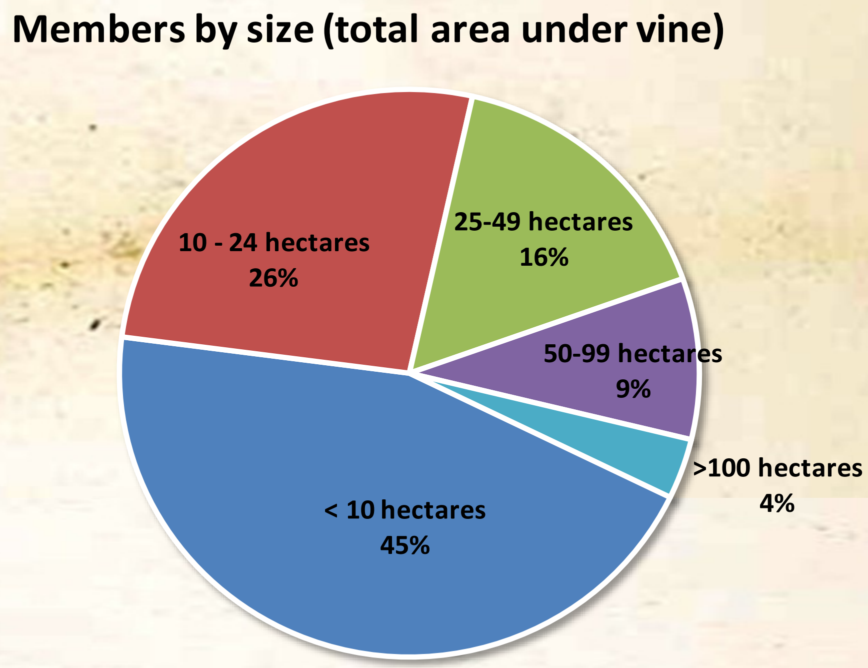
This booklet shows the results of the McLaren Vale Sustainable Winegrowing program. 87 growers became members of MVSWGA in 2012, representing 145 individual vineyards. In 2011, there were 41 growers comprising 56 sites. This represents a member growth of 112.2% and vineyard area growth of 158.9%.

In 2012, the whole assessment methodology was reviewed and changed from what its original form. Many results will not be comparable with last year results, when the program was called Generational Faming.

Our members represent 3,028 hectares of farm land from which 2,255 is area under vines. Among members, there are 2,021 ha of red grapes and 234 ha of white grapes, which produced 10,444 tonnes and 1,461 tonnes respectively .

For the assessment season, the average red grape production per hectare is 5.2ton/ha and 6.2 ton/ha for white grapes.

45% of our members had vineyards smaller than 10 hectares. 26% had vineyards between 10 and 24 hectares, 16% had vineyards between 25-49ha, 9% had vineyards between 50-99ha and only 4% had vineyards larger than 100 hectares.



MCLAREN VALE SUSTAINABLE WINEGROWING AUSTRALIA

Fact Sheet

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McLAREN VALE SUSTAINABLE WINEGROWING AUSTRALIA—FIGURES
POSITION OF THE MEMBERS RELATIVE TO SOUTH AUSTRALIA AND McLAREN VALE

	South Australia	McLaren Vale	MVSWGA	McLaren Vale / South Australia	MVSWGA / McLaren Vale	MVSWGA / South Australia
Total grape (ton)	698,005	31,755	11,905	4.5%	37.5%	1.7%
Total red (ton)	416,582	26,399	10,444	6.3%	39.6%	2.5%
Total white (ton)	281,423	5,356	1,461	1.9%	27.3%	0.5%
Total area (ha)	76,589	7,472	2,255	9.8%	30.2%	2.9%
Red area (ha)	53,298	6,223	2,021	11.7%	32.5%	3.8%
White area (ha)	22,204	1,028	234	4.6%	22.8%	1.1%
Others (unknown, rootstocks, etc.) (ha)		221				
Number of Growers (distinct sites)	3,626	540	145	14.9%	26.9%	4.0%

Note: South Australia and McLaren data from the 2012 South Australian Winegrape Crush Survey. The Phylloxera Board estimates that the non-response rate for McLaren Vale is 9.7%.

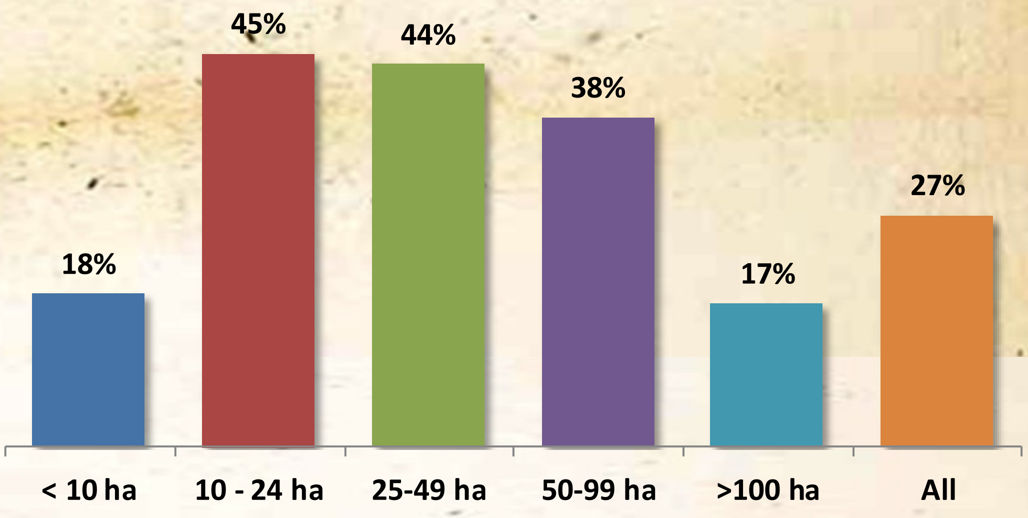
McLAREN VALE SUSTAINABLE WINEGROWING AUTRALIA—FACT SHEET

The table above shows the position of the Members, in relation to South Australia and the McLaren Vale Region.

MVSWGA members represents 37.5% of the total amount of grapes produced in McLaren Vale or 1.7% in South Australia. Red grapes from members represent almost 40% of the total amount of red grapes produced in the region and 2.5% in the state. Members represent about 30% of the area in McLaren Vale or almost 3% of South Australia.

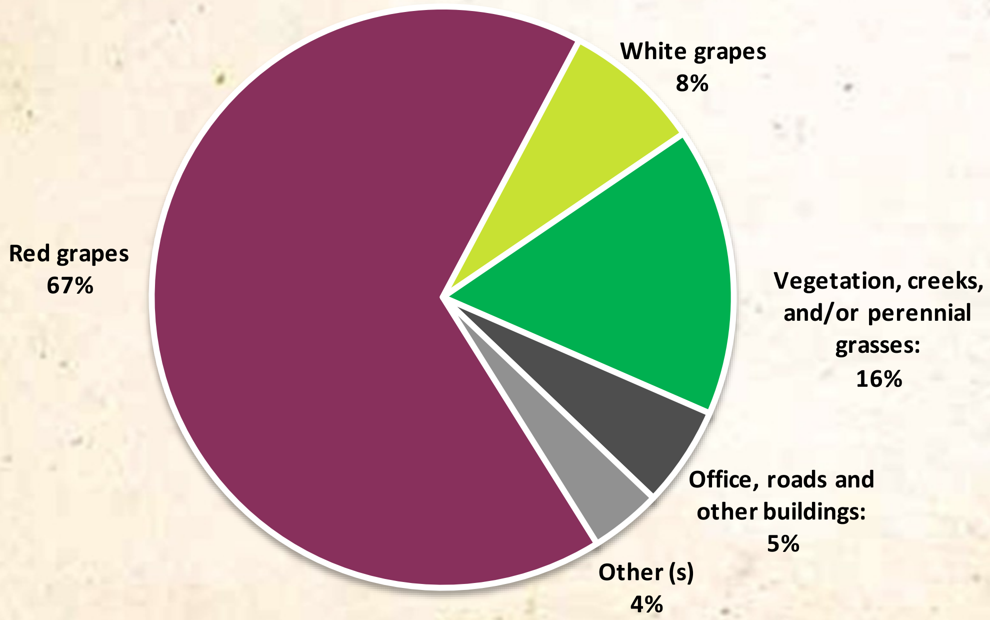
There are 540 vineyards in McLaren Vale from which 145 are part of the McLaren Vale Sustainable Winegrowing Australia. It represents about 27% of the total vineyards in McLaren Vale or 4% of the vineyards in South Australia. Considering vineyard group sizes, our members represent 18% of the vineyards smaller than 10 hectares, 45% of the vineyards between 10-24 hectares, 44% of the 25-49 hectares, 38% of the 50-90 hectares vineyards and 17% of the vineyards larger than 100 ha.

Members' share in McLaren Vale Region (by vineyard group size)

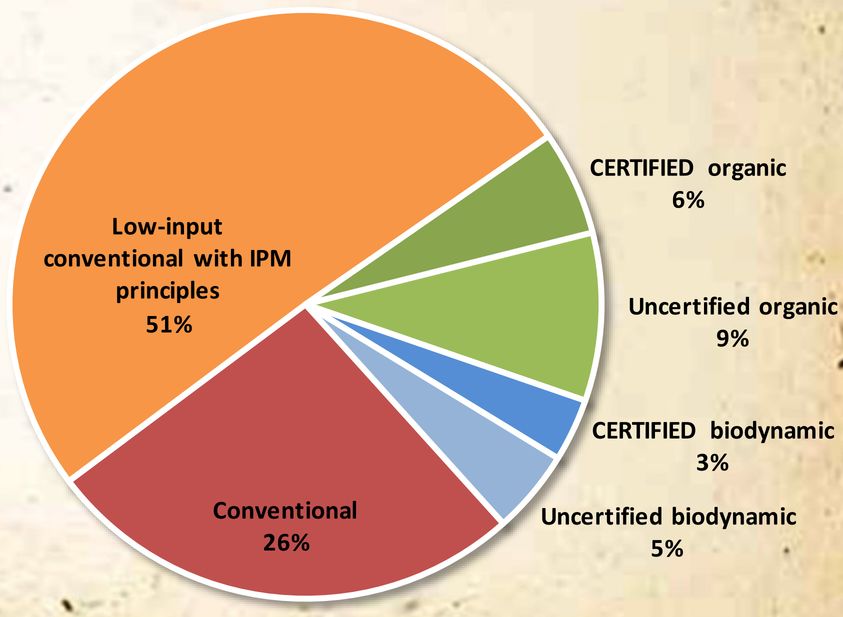


Land use and Farming Systems

Farm Land Use



Farming management systems



FARM LAND USE

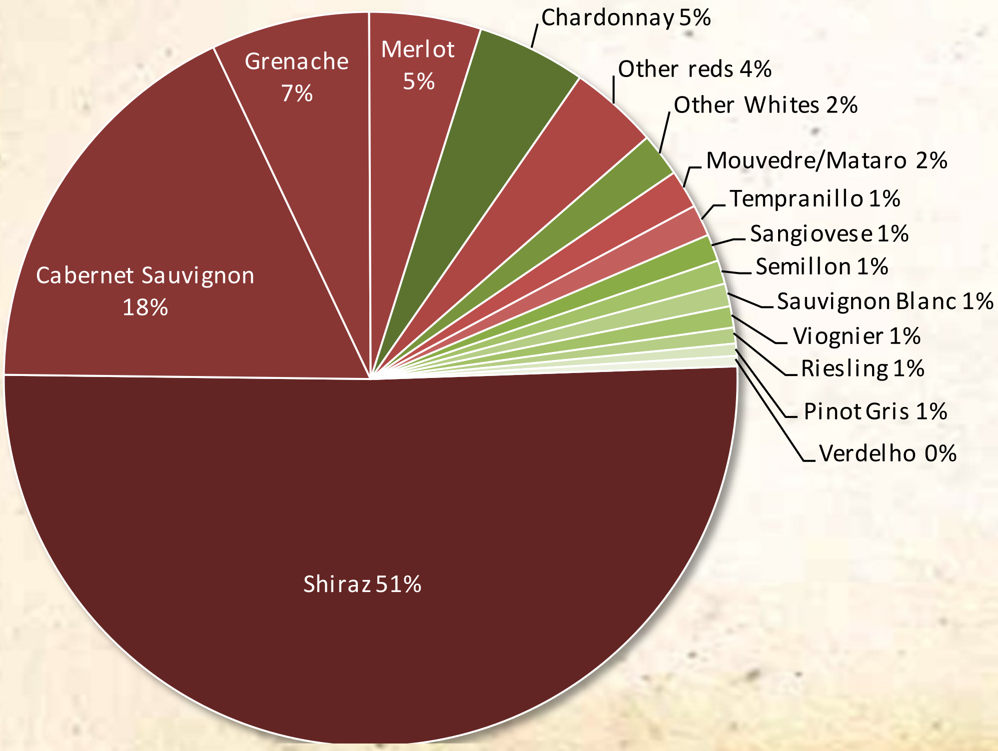
From the total area of 3,028 hectares that the members represent, 67% was used for growing red grapes, 8% for white grapes. Vegetation, creeks and/or perennial grasses represent 16% and roads, offices, other buildings and others represent 4% of the total farm land.

FARMING MANAGEMENT SYSTEMS

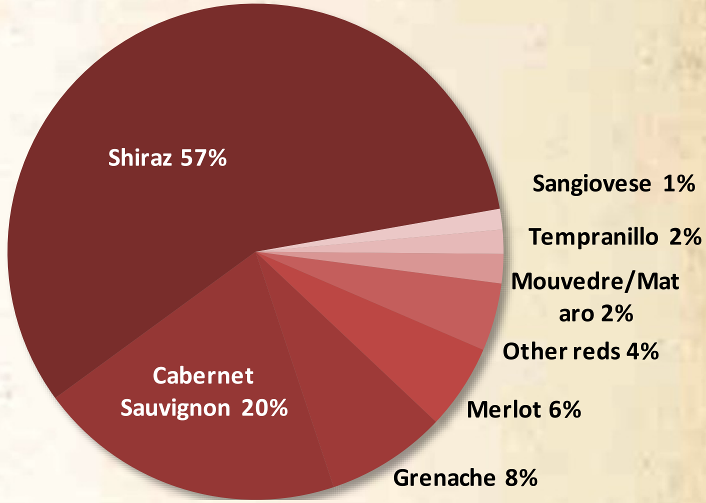
51% reported themselves as Low-input Conventional growers with IPM (Integrated Pest Management principles). 26% are conventional growers. 15% Organic, from which 6% are certified. 8% are Biodynamic, from which 3% are certified.

Area under vine—by grape variety

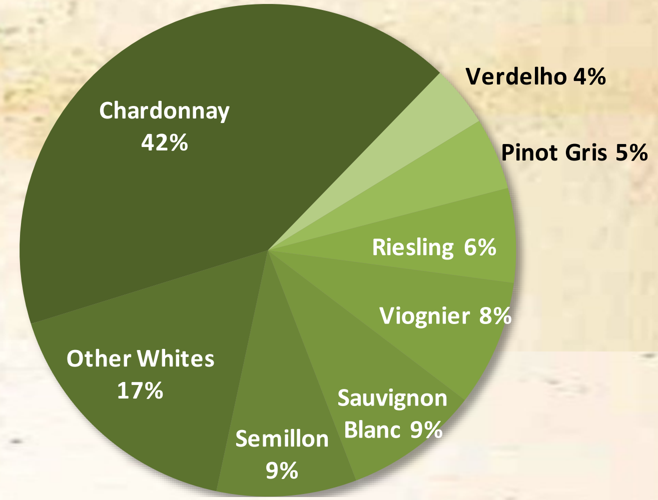
Area Under Vine - ALL Varieties



Area Under Vine - Only Red Grapes



Area Under Vine - Only White Grapes



GRAPES

Shiraz is the most planted variety among all grapes (51%) in McLaren Vale, followed by Cabernet Sauvignon (18%), Grenache (7%), Merlot (5%), Chardonnay 5%. All other varieties represent about 14%.

McLaren Vale Sustainable Winegrowing Australia members produced 10,444 tons of red grapes in 2012. Shiraz is the most planted variety, representing 57% of the total red grapes, followed by Cabernet Sauvignon (20%), Grenache (8%), Merlot (6%). Other red varieties represent 4% of the total reds, Mataro (2%), Tempranillo (2%) and Sangiovese (1%).

McLaren Vale Sustainable Winegrowing Australia members produced 1,461 tons of white grapes in 2012. The grapes came from 234 hectares under vine. The main white variety is Chardonnay (42%). There are many new varieties with small production that represent 17% of the total white grapes varieties. Semillon and Sauvignon Blanc are 9% each, Viognier 8%, Riesling (6%), Pinot Gris (5%) and Verdelho (4%).

MCLAREN VALE SUSTAINABLE WINEGROWING AUSTRALIA

Water—Irrigation Sources and Water Usage

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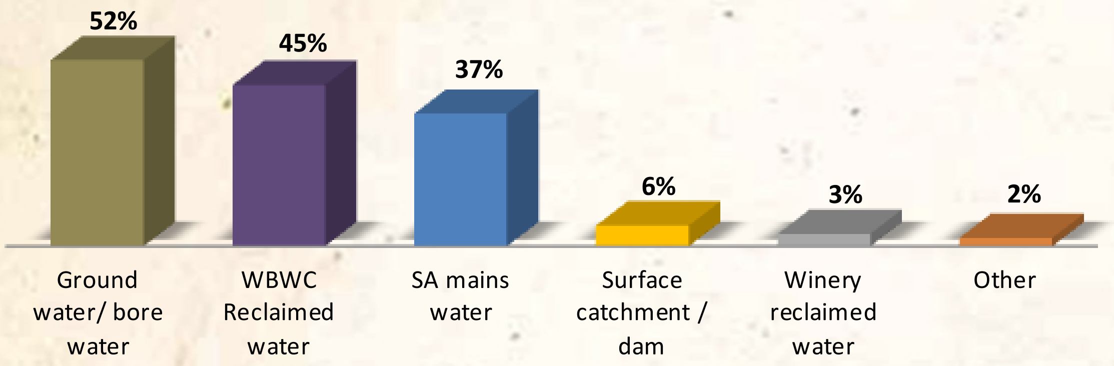
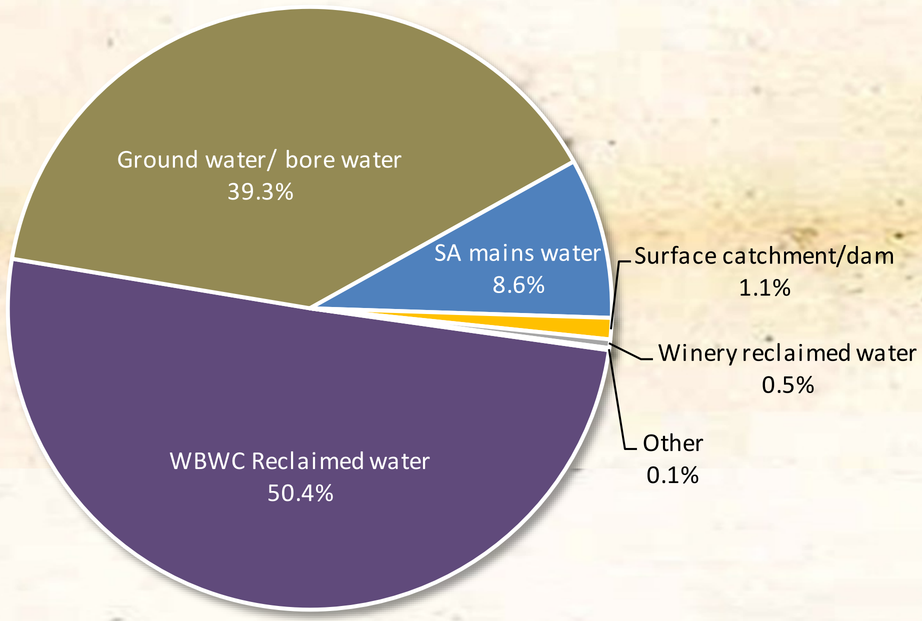
% of Growers in each Irrigation Source



Total Water Usage (by source)



IRRIGATION SOURCES

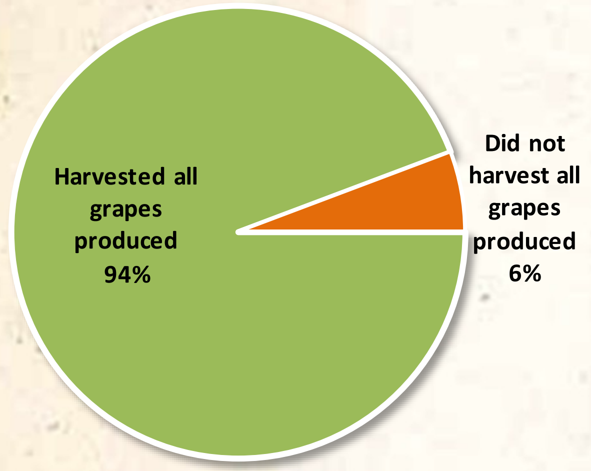
83 members irrigated their vineyards in 2012, representing 95% of the participants.

Only 5 members did not irrigate their vineyards in 2012.

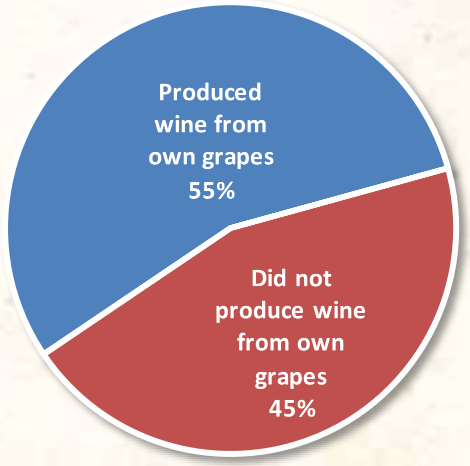
On average, McLaren Vale Sustainable Winegrowing Members used 1.08 ML/ha of water to irrigate their vineyards in 2012. The column graph on the left shows the source of irrigation water among members. A grower might use more than one water source. 52% used ground/bore water. 45% used reclaimed water from the Willunga Basin Water Company. 37% used mains water. 6% used water from surface catchment/dams, 3% used water recycled from the winery.

From the total amount of water used to irrigate vineyards and considering all irrigation sources, reclaimed water represents 50.4% of the total water used by members to irrigate their vineyards in the McLaren Vale region, followed by ground/ bore water (39.3%), SA Mains Water (8.6%), recycle water from the winery (0.5%)

Grapes Harvested



Wine Production from Own Grapes

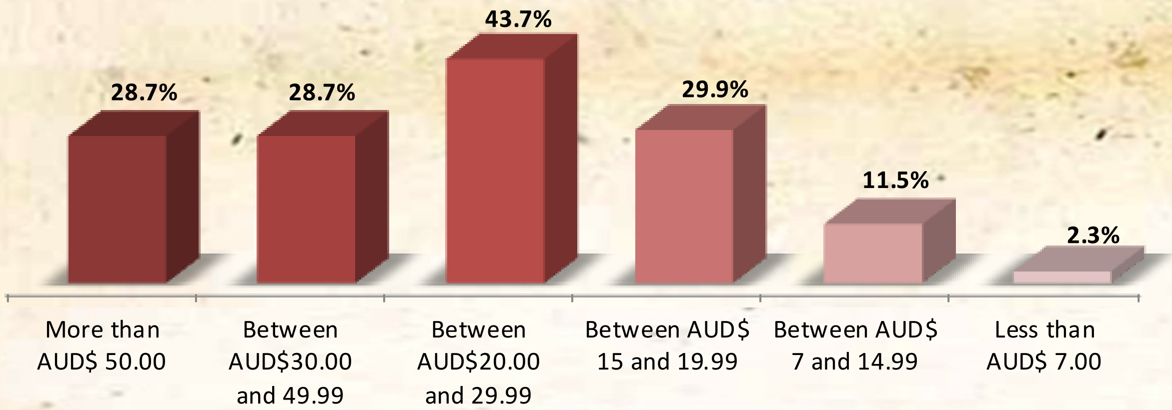


Grapes Harvested
Only 5 growers did not harvest all fruit they produced in 2012. The total amount of fruit that was not harvested among McLaren Vale Sustainable Winegrowing members in 2012 is 59 tonnes.

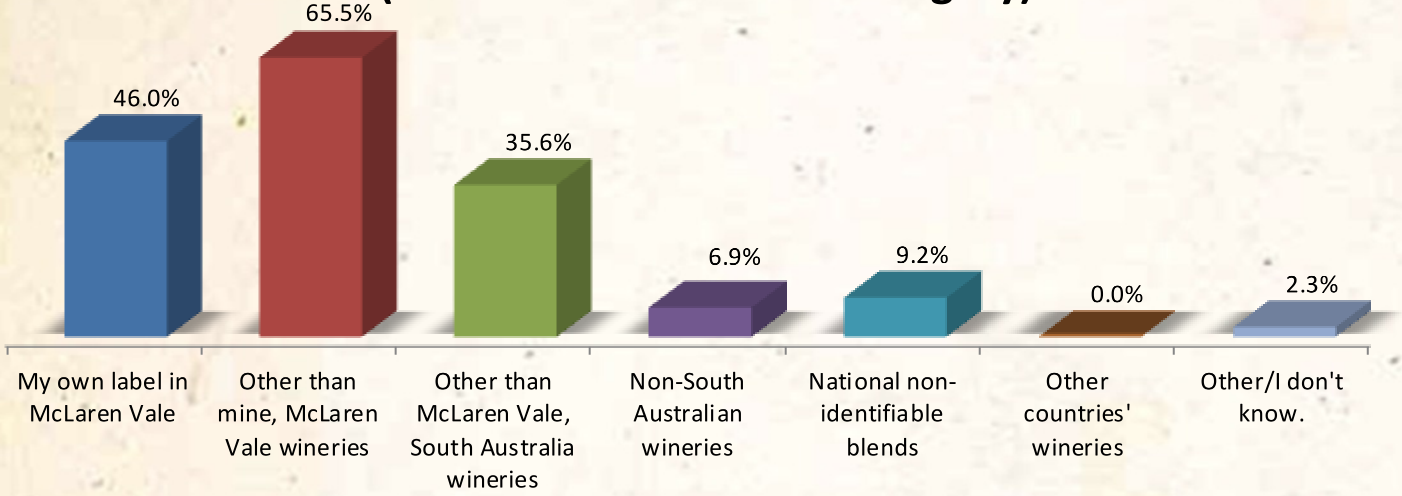
Wine Production among Members
55% of the members produced wines from their own grapes and 45% did not produce wine from their own grapes.

Price Range Categories of Wines Produced from Grapes from Members (% of Members in each price range category)
Among Members who had produced wines, 43.7% produced wines between $20-29.99 dollars. About 30% produced wines between $15-19.99; 28.7% produced wines between $30-49-99; 28.7% produced wines that have prices higher than $50.00; 11.5% produced wines ranging between $7-14.99 and only 2.3% produced wines that are less than $7.00 dollars at retailers.

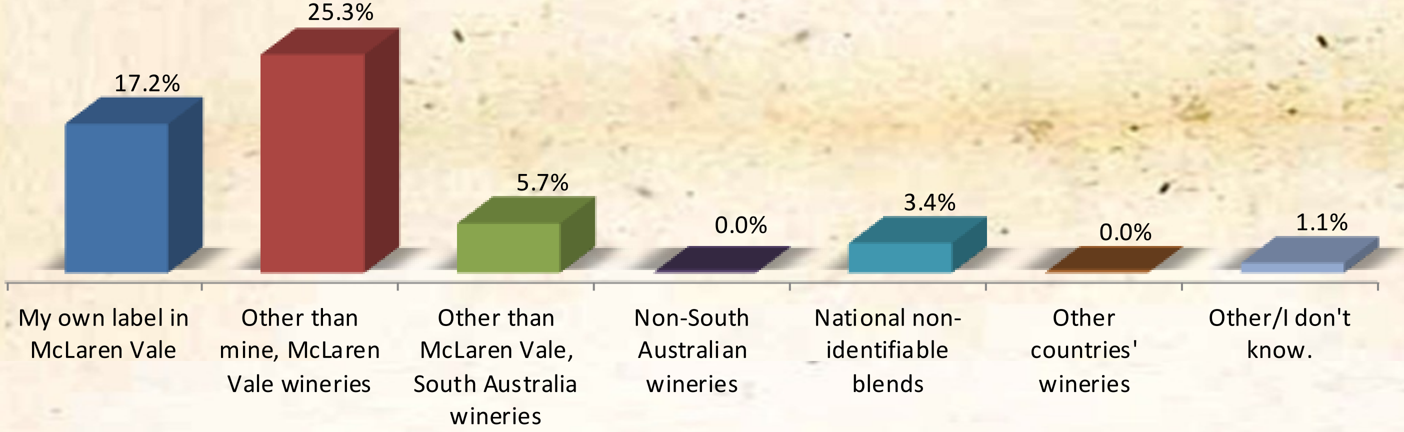
Price Range Categories of Wines Produced from Members' Grapes (% of growers in each category)



Grape Destination for Wine Production
(% of Members in each category)



Grape Destination for Wine Production from Member's Grapes
(% of Members in Single Destination category)



Grapes Destination for Wine Production

65.5% of the members informed us their grapes were used to produce wines by other than their own McLaren Vale winery/ wine label. 46% use the grapes to produce wines for their own McLaren Vale label. For 35.6% of the members, the grapes were used by other than McLaren Vale but in South Australia wineries. 9.2% sell their grapes to be used by national non-identifiable blends and 2.3% don't know.

Single Winery Category Destination

17.2% of the Members only used their grapes to produce wines to their own McLaren Vale label.

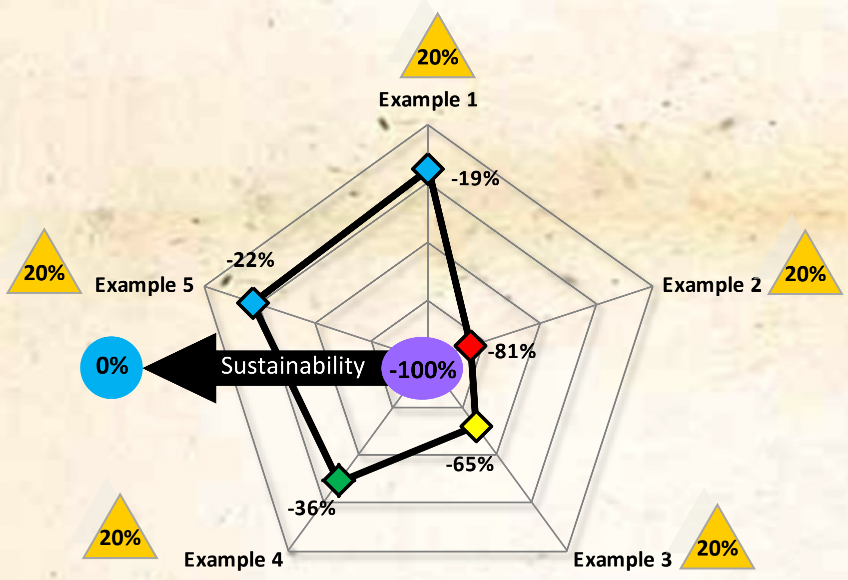
Grapes from 25.3% of the members were used only to produce wine other than their own, McLaren Vale label. 5.7% of the members informed that their grapes were used solely to produce wines from other than McLaren Vale but South Australian wineries. None of the Members produced exclusively to non-South Australian wineries or other countries' wineries

McLaren Vale Sustainable Winegrowing Australia— Understanding and reading our graphs

The results in this book are presented through two types of graphs:

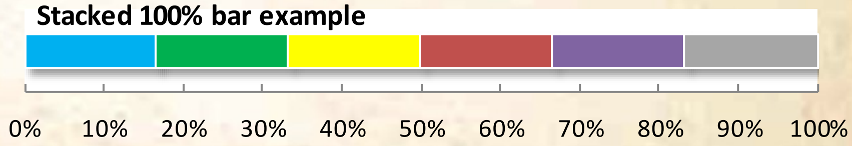
1. Spider graphs

- Shows values relative to the whole system. The attributed weight (importance) for each item was taken into consideration and it is displayed (by the graph) in a little orange triangle. 20%
- In the example below, each section is worth 20% of the whole.
- Results are shown as percentage difference between and maximum possible points and Members' mean.
- The centre of the graph represents –100% (minus one hundred per cent) between percentage difference of the maximum possible points and the Members' means.
- The outer line of the graph represent 0% (zero per cent) of percentage difference between the maximum points and the Members' means.
- The closer to zero (to the edges), the better the result! The sustainability journey is about moving from the centre to the edge of the spider graph.



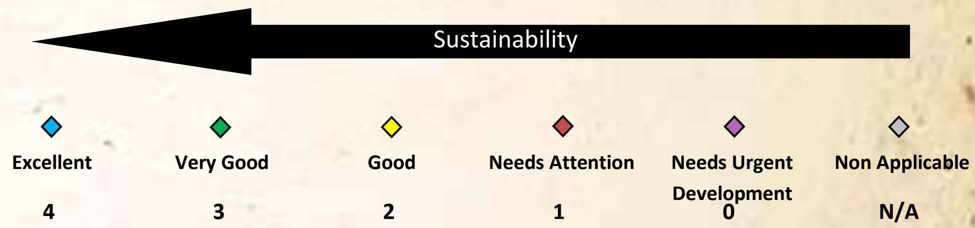
2. Stacked 100% bar graphs (showing count value)

- Shows absolute values for each topic. The attributed weight (importance) for each item was not taken into consideration.
- The bar graphs show how many of our 87 Members, responded in each category.
- The results are shown in percentages out of 100% (=87 participants).
- It compares the percentage that each value contributes to a total, across categories.



How to interpret the results and colours

Each colour represents a category of the workbook, varying from grey (non-applicable) to 1 to 4.
The aim is to move from the right to the left as shown in the image below.



McLaren Vale Sustainable Winegrowing Australia—Overall Results

87 Members, representing 145 sites had their sustainability practices assessed in 2012. The assessment was by an individual workbook comprised of 6 major chapters. Each chapter had a weight attributed to it. Soil Health, Nutrition & Fertiliser Management represents 20% of the assessment, as well as Pest and Disease Management. The other four chapters (Biodiversity, Water Management, Waste Management and Social Relations) are each worth 15% of the system.

The Sustainability Chapters

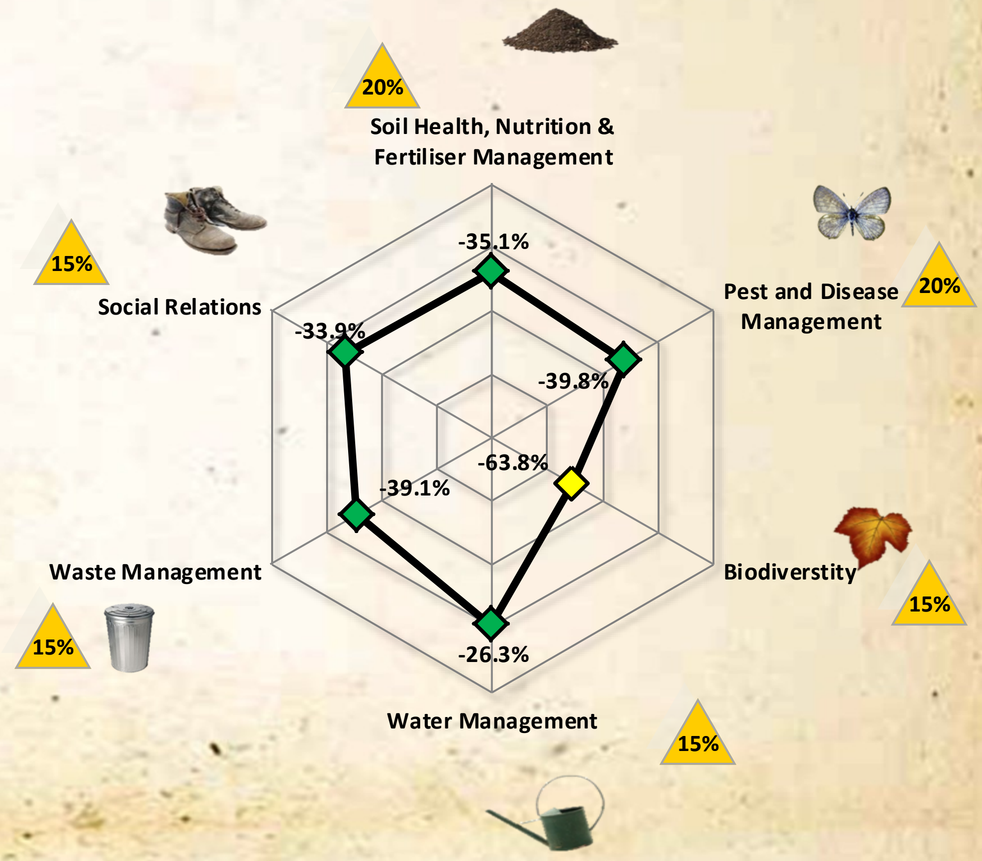
The average results of the McLaren Vale Sustainable Winegrowing Members were correlated to a colour category. The objective was to provide us with the ability to visualise our results in a easy but accurate way:

◆ (blue)	4	Excellent
◆ (green)	3	Very Good
◆ (yellow)	2	Good
◆ (red)	1	Needs Attention

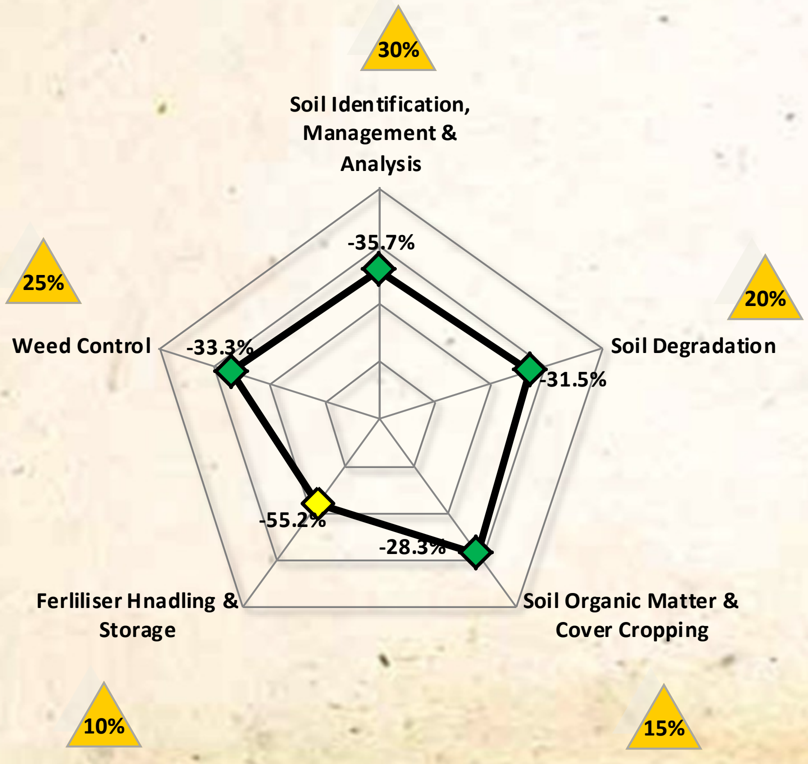
From the Members results , the highest rated chapters are Water Management and Waste Management. From our colour correlation both fit into the Blue (Excellent) category. Soil Health, Nutrition & Fertiliser Management, Pest & Disease Management and Social Relations chapters achieved the Green category (Very Good) and Biodiversity is the chapter that we need to improve the most (Yellow category—Good).

The system was built to promote continuous improvement over time, so all results are shown as the gap (as percentage difference) between the maximum possible points that can be achieved in the system and the regional average from participants in the program instead of static average results.

Each chapter is detailed in this booklet and the contribution of each specific section that comprises each chapter are individually presented and explained here.



SOIL HEALTH, NUTRITION & FERTILISER MANAGEMENT



Sections and Weights in the System:

The Soil Health, Nutrition & Fertiliser Management chapter is divided into 5 sections: Soil identification, Management and Analysis; Soil Degradation; Soil Organic Matter & Cover Cropping; Fertiliser Handling & Storage and Weed Control.

The Soil Health, Nutrition and Fertiliser Management chapter represents 20% of the total of the McLaren Vale Sustainable Winegrowing possible points.

From what is possible to score within the Soil Health, Nutrition & Fertiliser Management Chapter Soil Identification section represents (30%), Soil Degradation (20%), Soil Organic Matter and Cover Cropping (15%), Fertiliser Handling and Storage (10%) and Weed control (25%).

Overall Results: Categories within the System fro Each Section:

Soil Organic Matter & Cover Cropping section has the best results for the chapter. The percentage difference between the maximum possible points and the members result is -28.3%, placing this section into the Blue (Excellent) category. All the other sections are in the Green (Very Good) category.

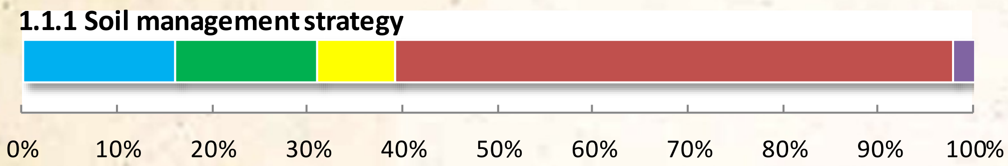
Comments:

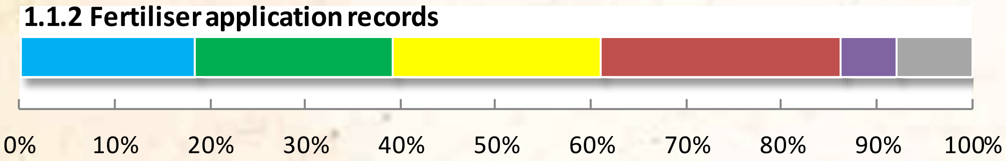
McLaren Vale has a long and rich farming history. With this history comes a vast experience in soil management and this is reflected in an overall Good to Excellent assessment of member practices. The results of our program reflect that members have been putting increasing resources into their soil. They have been planning their soil management and nutrition and tracking the results of their actions. They have been developing vineyard techniques to not only maintain soil, but *improve it* by adding organic matter.

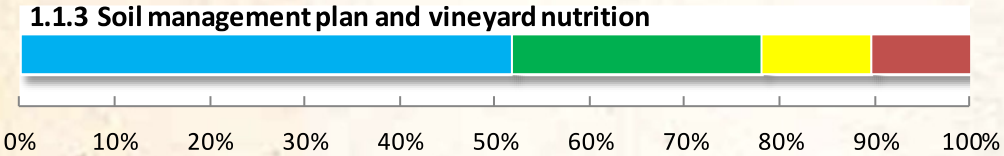
McLaren Vale farming practices have been evolving with an emphasis on using cover crops in harmony with grape growing. The very life is being put into the soil with ploughing the land replaced by cover cropping and leaving soil covered all year round. 25% of Members have gone to the step of using non-agrichemical methods of weed control. Grape growers with steep slopes, saline or degraded land have identified these as important issues and most are actively managing their valuable land to keep it in production.

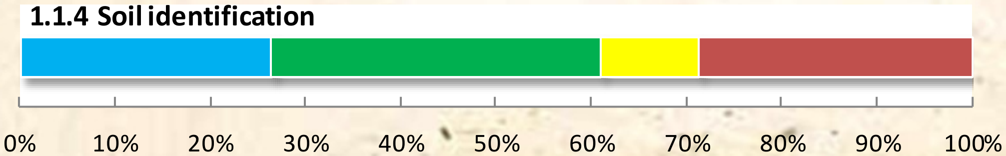
On farm storage and record keeping have been identified as continual improvement areas. McLaren Vale members will be a living demonstration that all farming is rooted in the soil and that great, healthy soils make great wines.

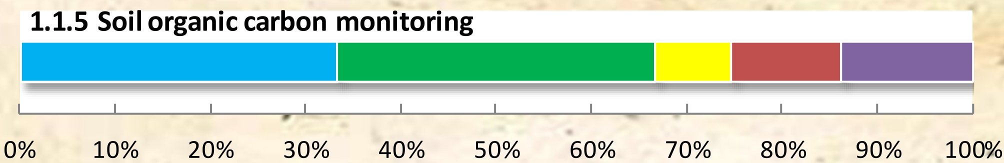
Excellent	Very Good	Good	Needs Attention	Needs Urgent Development	Non Applicable
4	3	2	1	0	N/A

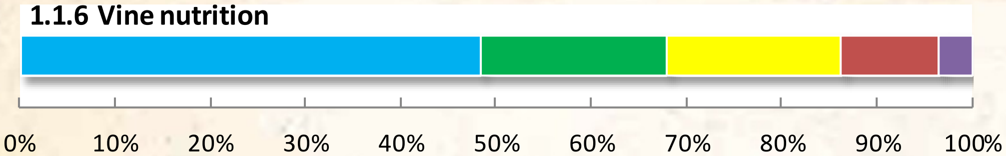












1.1.1 SOIL MANAGEMENT STRATEGY

58% of the Members have a soil management strategy but it is not written. 8% have a soil management strategy that is recorded and followed. 15% of the Members, in addition, also have different strategies for different blocks which is reviewed each season in consultation with the winery. 16% of them, in addition to that, also update their strategy every year based on soil tests and identification of degraded areas.

1.1.2. FERTILISER APPLICATION RECORDS

8% of the Members do not use fertilisers of any type. 6% of the Members informed they do not have a record of vineyard fertiliser applications. 25% have records (product name, rates of nutrient within the product applied, application rates, operator name, date and block) but they are not recorded in rigid time. 22% of them have similar records but their records are made within 24 hours of fertiliser application. 18% of the Members also keep receipts and contractor invoices attached to these records.

1.1.3 SOIL MANAGEMENT AND VINEYARD NUTRITION

All growers have some sort of soil management plan regarding plant nutrition. 10% of the Members manage vineyard nutrition status using similar strategies used in the past or follow neighbours plus vine appearance. 11% also use soil tests from representatives areas but not within the last 5 years. 26% do the same but within the last 5 years. 52% of the Members have their soil management strategy based on vine appearance and soil tests taken within the last 3 years.

1.1.4 SOIL IDENTIFICATION

All growers have identified their soil types. In addition to that, 10% have used soil pits or soil mapping to view the soil horizon by depth. 34% have also identified the base geology from the McLaren Vale Geology Map. 26% of the Members, on the top of that, have also a map of how the soil type/geology changes across the vineyard.

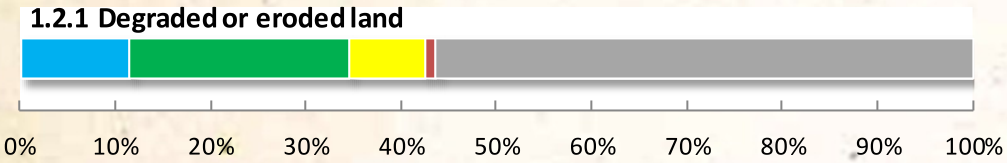
1.1.5 SOIL ORGANIC CARBON MONITORING

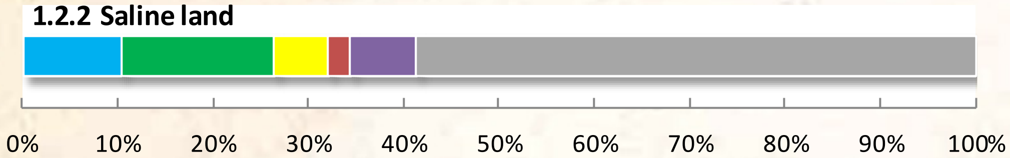
14% of the Members do not monitor organic carbon levels. 11% have a single record from the vineyard establishment period. 8% have multiple records but these are older than 3 years. 33% of the Members have a current record taken within the last 3 years and they track changes to our levels over time by comparing them to older multiple records. 33% of the Members, in addition to that, have take action when the records show reduction of the organic carbon.

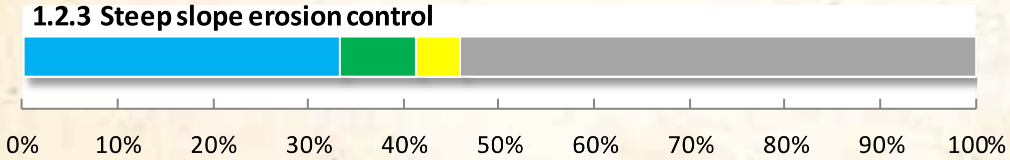
1.1.6 VINE NUTRITION

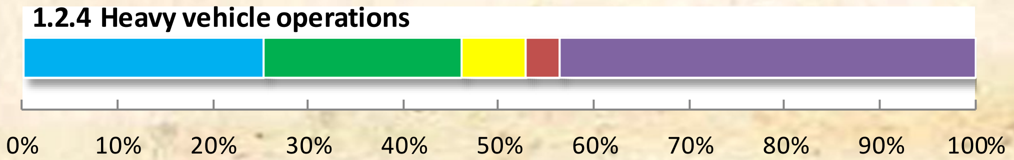
13% have never tested their vines. Nutrients are applied based on vine appearance, time of the growing season or what they've done in the past. 18% have tested their vines and use results to govern nutrition practices in consultation with wineries or qualified agronomist or they follow biodynamic calendar applications. 19% , in addition to that, also have identified problem blocks for regular testing and use these results allied with past trends. Half of the Members also use past soil tests to manage vine nutrition.

Excellent	Very Good	Good	Needs Attention	Needs Urgent Development	Non Applicable
4	3	2	1	0	N/A









1.2.1 DEGRADED OR ERODED LAND

This topic is not applicable to 56% of the members as there is no degraded land within their vineyards. 8% of the Members have identified areas that are highly degraded or eroded and they have left the areas as they are. 23% have identified highly degraded areas and maintain cover on these areas to prevent erosion and have been proactive to prevent erosion. 11%, in addition to that, have been tracking the improvements from their corrective actions.

1.2.2. SALINE LAND

This topic is not applicable to 58% of the Members as they informed they do not have saline land in their vineyards. 7% of the member don't know if they have problems with saline areas. 2% have identified saline areas but did not do anything about them. 6% have identified saline areas and they have used techniques like flushing irrigation and soil amendments. 16% of the members, in addition to that, have also been proactive to prevent increasing soil salinity. 10% of the Members informed that in addition of being proactive to prevent soil salinity they have been also tracking the improvements from their corrective actions.

1.2.3 STEEP SLOPE EROSION CONTROL

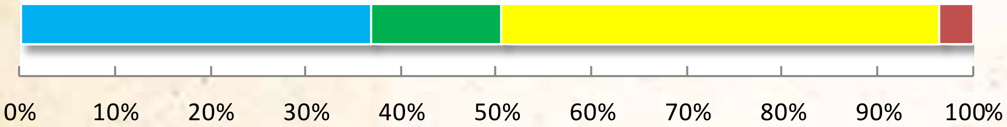
54% of the members informed they do not have steep slopes in their vineyards, so erosion control for these areas is not applicable for them. About 4% of the members have identified steep slopes in their property and they cultivate their steep slope areas each season and they have a annual cover crop system. 8% have identified steep slopes in their properties but they have not cultivated their soils or sprayed out the midrow in last 12 months. 33% of the members in the same situation have not cultivated or sprayed out the midrow in the last 24 months and they keep permanent cover crops throughout the year.

1.2.4 HEAVY VEHICLE OPERATIONS

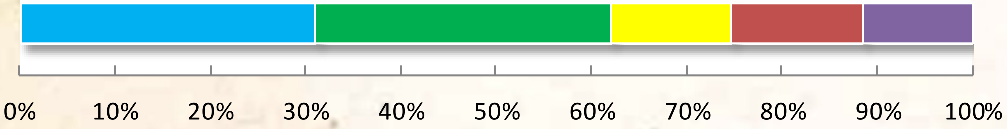
43% of the Members do not keep records of how many heavy vehicles operations occur each season. 3% keep a record of how many tractor passes occur each season. 7% of Members, in addition to the records also try to reduce the number of tractor passes by using multiple –row gantry machinery where possible. 25% of members , on the top of that also use equipment with large floatation tires where possible.

Excellent	Very Good	Good	Needs Attention	Needs Urgent Development	Non Applicable
4	3	2	1	0	N/A

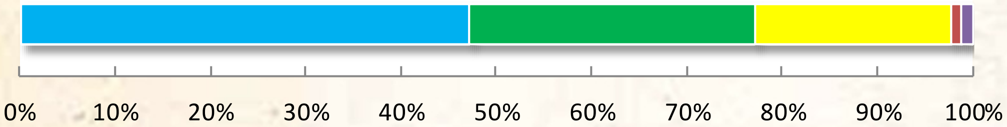
1.3.1 Machinery operations on wet soil



1.3.2 Organic matter soil amendment (compost, basalt or humates)



1.3.3 Cover crops, organic matter and soil structure



1.3.1 MACHINERY OPERATIONS ON WET SOIL

46% of the Members have identified soils in vineyard most at risk from compaction when wet and aim not to use machinery on wet soil. 14% of the Members, in addition to that, have a schedule of soil amendments and ripping to reduce the compaction effects of machinery on wet soil. 37% of the Members, on the top of that also monitor soil moisture levels and compaction risks before they perform tractor operations and select light weight machinery where possible and they reported that they only perform operations when absolutely critical and there is no other option or timing to do it as the forecast indicates continuing rain.

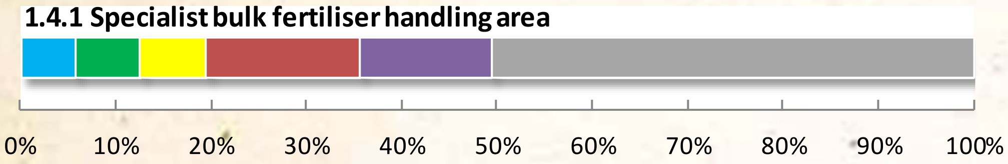
1.3.2. ORGANIC MATTER SOIL AMENDMENTS (COMPOST, BASALT OR HUMATES)

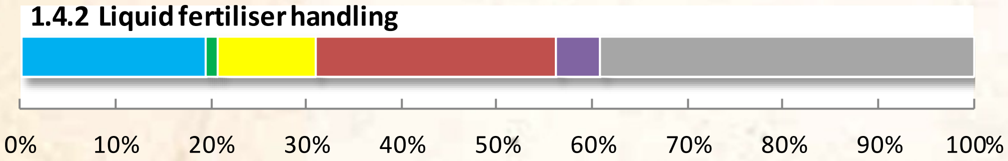
11% of the Members do not track organic matter content in their soils. 14% have applied organic matter intermittently in the past. 12% have applied intermittently and have also kept record of it. 31% have applied organic matter based on vine appearance, on as needed basis and they also kept records of their application. 31% of the Members have also used soil tests to measure and assist their decision to apply organic matter soil amendments and they have kept track of the effects of their applications.

1.3.3 COVER CROPS, ORGANIC MATTER ANS SOIL STRUCURE

20% of the Members have established an annual cover crop system. 30% informed they have a permanent cover crop established within the last 5 years or a volunteer sward that has not been cultivated in that time. 47% of the Members have a permanent cover crop established or a volunteer sward that has not been cultivated for at least 5 years.

◆ Excellent	◆ Very Good	◆ Good	◆ Needs Attention	◆ Needs Urgent Development	◇ Non Applicable
4	3	2	1	0	N/A





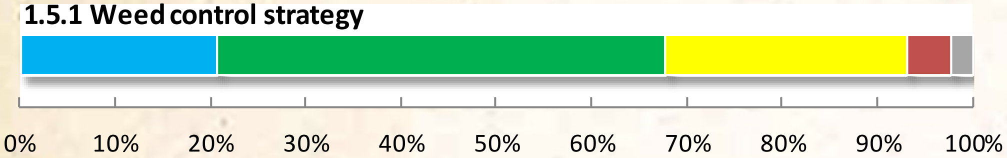
1.4.1 SPECIALIST BULK FERTILISER HANDLING AREA

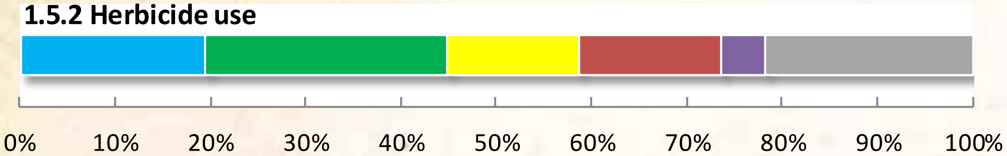
51% of the Members do not handle or use bulk fertiliser on their farms. 13% informed they do not have a specialized handing area on the farm. 16% have an area in the vineyard where they handle and store bulk fertiliser. 7% have an area and this area is identified with a sign. 7% of the Members also informed that this handling area is located, constructed and maintained to minimise harm to off target and sensitive areas from nutrient run off or leaching. 6% of the Members also keep this area secure .

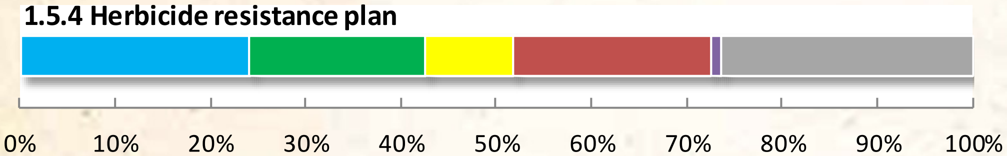
1.4.2. LIQUID FERLTILISER HANDLING

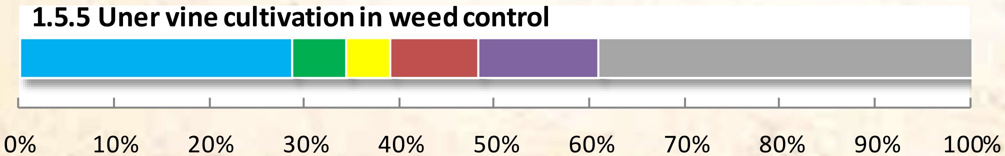
39% of the Members do not use or handle liquid fertiliser on their farms. 25% have an area where they store liquid fertiliser. 10% have this area identified with a sign and /or have it pointed out on the map. 19% of the Members, in addition to that have also the site located, constructed and maintained to minimise harm to off target and sensitive areas from nutrient leaching with bunding to control wash water where applicable and this area is secure to keep animals or people from disturbing it.

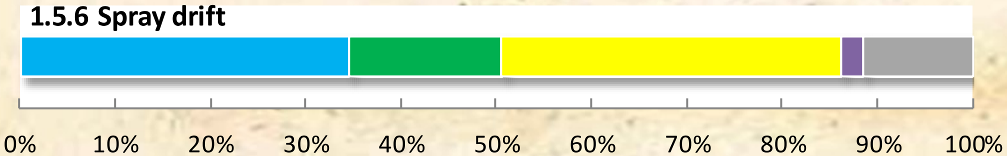
Excellent	Very Good	Good	Needs Attention	Needs Urgent Development	Non Applicable
4	3	2	1	0	N/A











1.5.1 WEED CONTROL STRATEGY

2% of the Members do not have weed problems, so having an strategy is not applicable for them. 4% of the Members have identified their main weed problems and target their control to critical times of the year. 47% informed they manage weeds through an integrated weed control approach using conventional herbicide or organic weed management tools that are available or a combination or both. 21% of the Members, in addition to that, keep a written record.

1.5.2. HERBICIDE USE

22% do not use herbicide to control weeds and because of that this topic is not applicable to them. 4% do not keep records of herbicide applications.15% record the herbicide application (amount used per hectare and date). 14% of the Members record herbicide application in a spray diary as a written record. 25% reported that, on the top of that, they also clean their equipment after spraying to prevent cross contamination and before entering other vineyards to prevent spreading weeds. 19% informed that in addition to that they are also developing methods to reduce their reliance on herbicide by integrating other alternative farming practices.

1.5.4 HERBICIDE RESISTANCE PLAN

26% reported they do no use undervine herbicides to control weeds. 21% of the Members generally rely on the same herbicide but they said they have altered herbicides groups in the past. There is an assessment of the weeds before spraying. On the other hand, 9% informed they avoid herbicide resistance by not using the same herbicide from year to year without rotation. 18% informed that in addition to that, they also check if they are not using herbicides from the same group and they are also concern about the correct rate while getting good spray coverage. 24% reported that on the top of that they also apply herbicides at key times to prevent weeds from setting seeds to limit the carry over from year to year.

1.5.5 UNDER VINE CULTIVATION IN WEED CONTROL

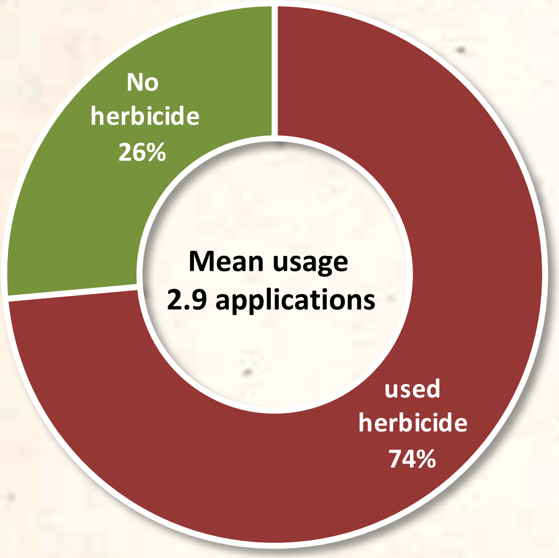
39% of the Members do not use undervine cultivation to control weeds, so topic is not applicable. 12% do not plan their cultivations to keep a bare strip undervine. 9% use cultivation at key times to prevent weeds from setting seeds. 4% cultivate at key times and also clean the equipment before moving to other vineyards to limit the spread of weeds between sites.. About 6% informed they also assess soil moisture levels before undertaking cultivation. 28% of the Members, in addition to that also assess the performance of their weed controls.

1.5.6 SPRAY DRIFT

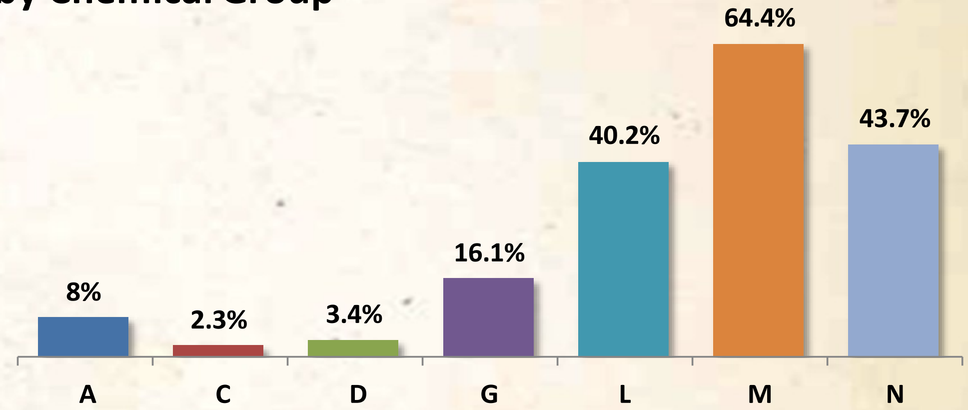
The topic is non-applicable to 11% of the Members who do not use herbicides. 35% of the Members check weather conditions during application and only spray when it is suitable for spraying. 16% also check Delta T, low humidity or strong winds before spraying.   34% of the Members check how the herbicide cart (nozzle size and system pressure) is set up to have suitable droplet size to limit drift, in addition to the weather check.

Excellent	Very Good	Good	Needs Attention	Needs Urgent Development	Non Applicable
4	3	2	1	0	N/A

Herbicide Usage



Growers who used herbicide by Chemical Group



Herbicide Usage

67 members (or 77% of the total members) reported as being conventional or low input conventional with IPM principles. However, only 64 used synthetic chemicals to control weeds, representing 74% of the members.

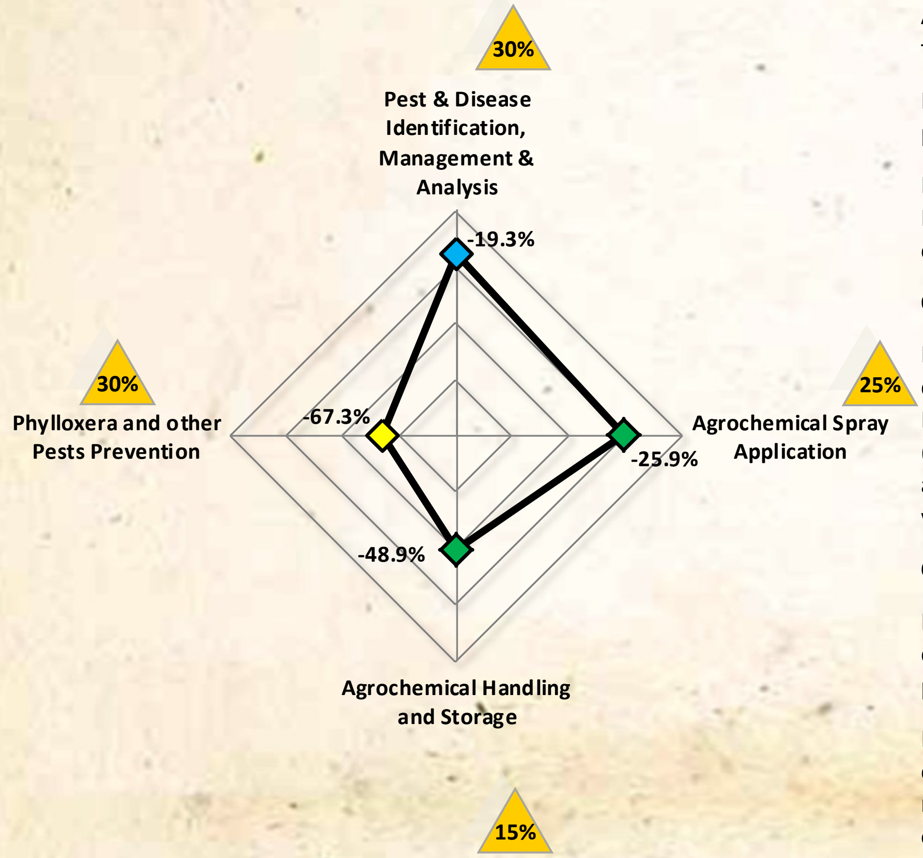
Among Members who used herbicides, the mean usage was 2.9 applications per year. The most used herbicide used belong to Group M. 64.4% of the Members who had applied herbicides used it in an average of 1.2 applications. The second most widely applied herbicide groups belong to Group N. 43.7% of the Member who used herbicides used them on average 1.1 times a year.

The least used Groups were Group C (2.3%) and D (3.4%) . The table and graph on the right shows the numbers of herbicide application among members who have applied herbicides in their vineyards.

Herbicide use - by chemical group

Chemical group		A	C	D	G	L	M	N
Amount of Growers	used	7	2	3	14	35	56	38
	didn't use	80	85	84	73	52	31	49
Growers who used	mean use	1.1	1.0	1.0	1.1	1.2	1.3	1.1

PEST AND DISEASE MANAGEMENT



Sections and Weights in the System:

The Pest and Disease Management chapter is divided in 4 sections: Pest & Disease Identification, Management & Analysis, Agrochemical Spray Application, Agrochemical Handling & Storage and Phylloxera and Other Pests Prevention.

Pest and Disease Management represents 20% of the total of the McLaren Vale Sustainable Winegrowing possible points.

From what is possible to score within the Pest and Disease Management chapter, both Pest & Disease Identification, Management & Analysis and Phylloxera and Other Pests Prevention represent 30% each. Agrochemical Spray Application represents 25% and Agrochemical Handling and Storage 15% of the chapter.

Overall Results: Categories within the System fro Each Section:

Pest & Disease Identification, Management & Analysis section has the best results for the chapter. The percentage difference between the maximum possible points and the members result is -19.3%, placing this section into the Blue (Excellent) category. Agrochemical Spray Application and Agrochemicals Handling and Storage are in the Green (Very Good) category. The percentage difference between the maximum points in the system and the McLaren Vale average is -25.9% and 48.9% respectively. The Phylloxera and Other Pests Prevention section had the worst result within the chapter, the gap between the maximum results and the section results is -67.3%.

Comments:

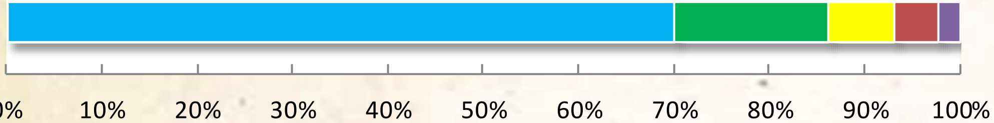
Producing clean and healthy grapes has helped make McLaren Vale a world acclaimed wine region. This is no accident judging by the responses in the Pest & Disease Chapter of the *McLaren Vale Sustainable Winegrowing Australia* program.

McLaren Vale grape growers members have excellent skills in identifying problems in their vineyard with pest and disease. Growers are practicing agrochemical resistance management strategies as per AVCARE advice and keeping records from season to season to assist their vineyard planning. The have good awareness of the cultural control options, using these in combination with conventional agrochemical control where possible. This reflects well on existing McLaren Vale regional pest and disease services like CropWatch which is now in its 10th season of monitoring climatic data from the regions weather stations.

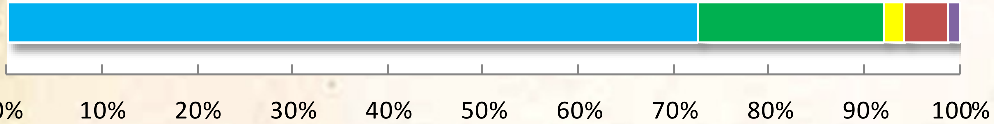
Phylloxera prevention & bio-security is one area where the region is not close to best practice. *McLaren Vale Sustainable Winegrowing Australia* results from the 'Phylloxera and other Pests' highlights some significant weaknesses in vineyard hygiene and farm gate security. The majority of growers rated themselves in the needs improvement or needs urgent development category in a couple of key areas. Over the next few seasons growers have the challenge of developing practices in vine hygiene that match those of their pest and disease control.

Excellent	Very Good	Good	Needs Attention	Needs Urgent Development	Non Applicable
4	3	2	1	0	N/A

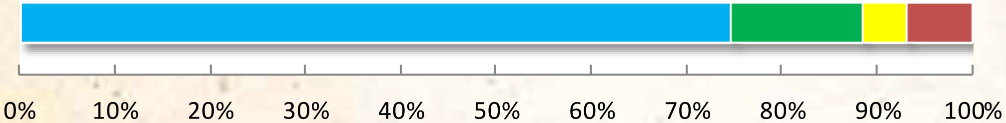
2.1.1 Pest and disease management strategy



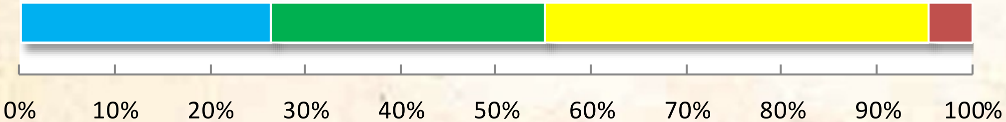
2.1.2 Integrated pest management (IPM)



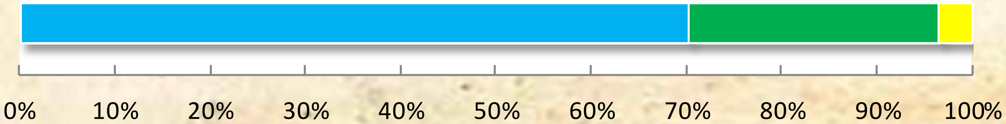
2.1.3 Resistance management guidelines



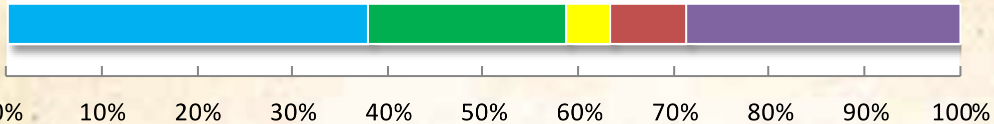
2.1.4 Grapevine fungicide application records



2.1.5 Vineyard monitoring



2.1.6 Vineyard monitoring records



2.1.1 PEST AND DISEASE (P&D) MANAGEMENT STRATEGY

Two growers don't have a pest and disease management strategy. 5% have a plan based on P&D problems that have affected their vineyards. 7% update their plan occasionally and have a resistance management guidelines. 16% have an annually updated plan using not only P&D problems that have affected their vineyards, but also information from other vineyards through services including CropWatch and winery advice and 70% do the same, but seasonally and also use professional advice on P&D from monitoring reports from their vineyard.

2.1.2. INTEGRATED PEST MANAGEMENT (IPM)

One grower does not use IPM. 5% informed their seasonal P&D control is governed by set spraying intervals and cost of the agrochemical control programs versus potential losses through P&D crop damage. 2% reported their seasonal P&D control is governed by knowledge of risk gained through weather and disease forecasting, monitoring and identification information. 19%, in addition to that also use susceptibility of the grape variety t the particular P&D. 72% also assess any potential impacts on beneficial organisms.

2.1.3 RESISTANCE MANAGEMENT GUIDELINES

7% have altered their fungicide groups occasionally in the past, but generally rely on the same ones. 5% are aware of AVCARE resistance management guidelines and they minimise fungicide resistance by not using chemicals from the same activity group from year to year without rotation. About 14% also ensure that they are using the correct rate while getting good spray coverage when applying agrochemicals. 74%, in addition to that, also apply fungicide at key times to limit disease carry from year to year.

2.1.4 GRAPEVINE FUNGICIDE APPLICATION RECORDS

All growers have fungicide application records but 4% only record whenever they have time to do it (not a rigid time frame). 40% , in addition to that, include weather condition during spraying, growth stage, product name, rates of use, spray type, water rates, operator name and block. 28% also keep receipts and/or contractor invoices attached to these records. 26% of the Members, on the top of that, relate fungicide application to nutritional tests.

2.1.5 VINEYARD MONITORING

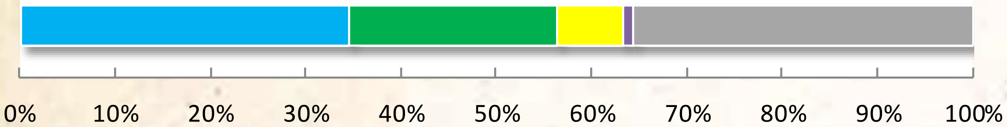
3% of the Members monitor representative areas of their vineyard frequently. 26% also informed their monitoring is backed up with CropWatch McLaren Vale and other industry information to keep up to date. 70% , in addition to that, also attend regularly to P&D workshops and /or work closely with other growers to identify problems

2.1.6 VINEYARD MONITORING RECORDS

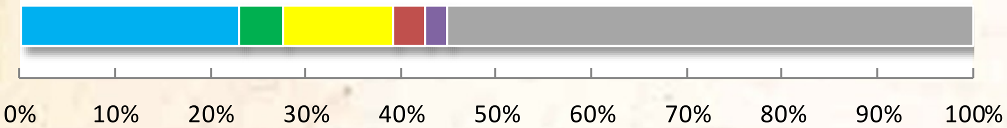
28% do not monitor their vineyards or keep records. 8% record each P&D monitoring (date, name of monitoring person, P&D target, weather conditions, management response and outcome). 5% also record growth stage. 20%, in addition to that, record any observable season or fungicide spray impacts. 38%. on the top of that, cross check records from previous years.

Excellent	Very Good	Good	Needs Attention	Needs Urgent Development	Non Applicable
4	3	2	1	0	N/A

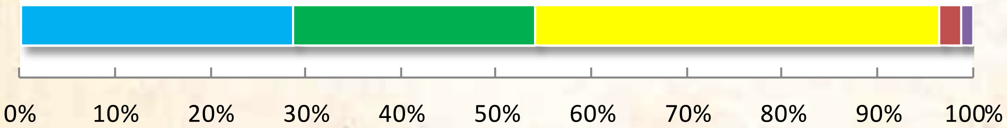
2.2.1 Spray application - self managed



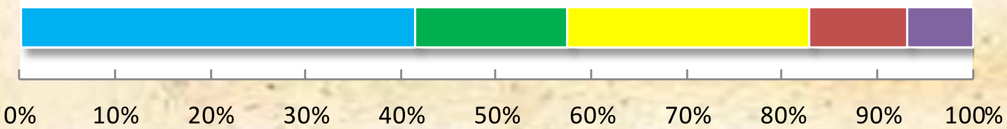
2.2.2 Spray application - contractor



2.2.3 Spray coverage



2.2.4 Calibration



2.2.1 SPRAY APPLICATION—SELF MANAGED

This topic is not applicable to 36% of the members who do not spray their vineyards or use contractors to do so. 7% check the application rate, method and application before applying agrochemicals. They also check the forecast weather and conditions to assess their suitability for spraying. 22% , in addition to that, also check the fungicide spray unit is set up to have suitable droplet size to limit drift by considering nozzle size and system pressure. 34% of the Members, on the top of that, also check current weather conditions (i.e. Delta T).

2.2.2. SPRAY APPLICATION—CONTRACTOR

This topic is not applicable to 55% of the growers who do not use contractors to spray their vineyards. 2% informed they check the application rate, method and application before the contractor applies agrochemicals in their vineyard. They also check if contractor holds all appropriate licences. 3% also ask for documentation that their contractors fungicide unit is set up to have suitable droplet size to limit drift considering nozzle size and system pressure. 23%, in addition to that, also request that contractor follows a "cut-off" of weather conditions i.e. Delta T or high winds, when they halt spraying because it is likely to cause drift.

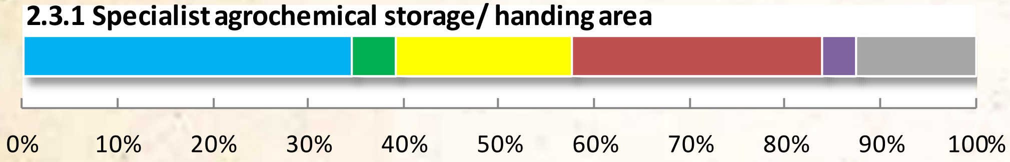
2.2.3 SPRAY COVERAGE

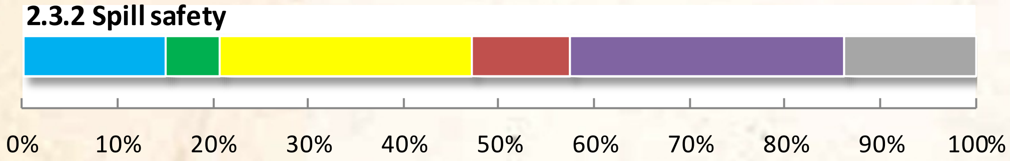
One grower is not aware of the spray coverage. 2% monitor the performance of their spray unit ensuring the system is operating at correct pressure and nozzles are operating during application or they ask their contractors to do so, providing if asked evidence of that. 42% , in addition to that also consider the canopy set up and design to adjust fungicide spray coverage accordingly. 25%, on the top of that , also assess spray coverage during critical times of the season with spray sensitive paper or by other means. 28% of the growers, in addition to that also test the quality of the water (cleanliness and pH).

2.2.4 CALIBRATION

7% do not calibrate spray units. 10% calibrate fungicide sprayer set up annually, before the season starts or ask the contractor to do so. 25% calibrate sprayer set up more than once a season. 16%, in addition to that also check the nozzles to be within 10% +/- of the manufacturer output. 41% of the growers, on the top of that also check if filters are clean and system pressure gauge is checked to be accurate and operational.

Excellent	Very Good	Good	Needs Attention	Needs Urgent Development	Non Applicable
4	3	2	1	0	N/A





2.3.1 SPECIALIST AGROCHEMICAL STORAGE/HANDING AREA

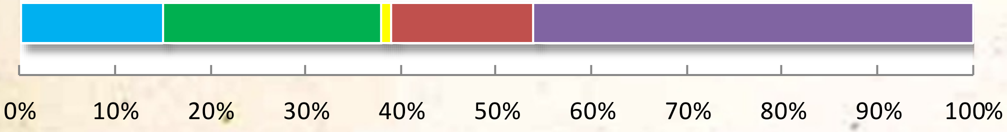
This topic is non-applicable to 13% of the Members who do not store/handle agrochemicals. 3% do not have a specialist handling area. 26% have an area on their vineyard where they handle and store agrochemicals. 18%, also informed the are is identified with relevant signage and map location. About 4% of the Members, informed that, in addition to that, the site is located, constructed and maintained to be secure and bunded to prevent run off or leaching. 34% also informed the are is secure to keep animals or people from disturbing it.

2.3.2 SPILL SAFETY

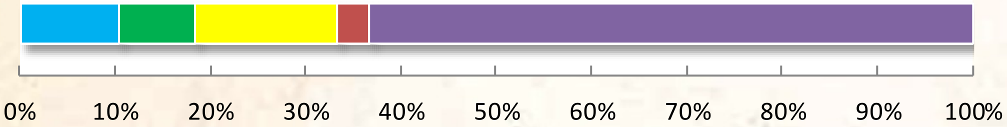
This topic is non-applicable to 13% of the Members. 29% informed they do not have spill safety kits. 10% have a spill kit and safety kit on hand. 26% also informed they keep accessible MSDS's on file in an easily accessible location. About 6%, in addition to that , also have a written containment plan to follow in the event of a chemical spillage or safety issue. 15% of the members informed that, on the top of that they also check and update their plans and MSDS's at least annually before they commence spray operations.

Excellent	Very Good	Good	Needs Attention	Needs Urgent Development	Non Applicable
4	3	2	1	0	N/A

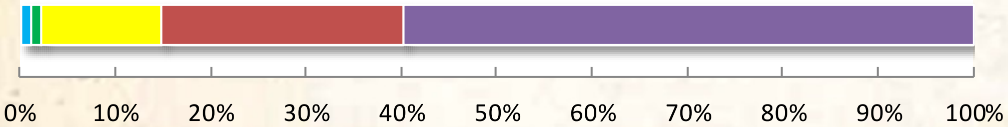
2.4.1 Entrance signs



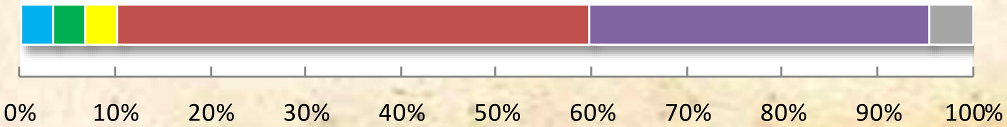
2.4.2 Physical barriers for external visitors



2.4.3 Wash-down areas for personnel



2.4.4 Vineyard access by industry personnel



2.4.1 ENTRANCE SIGNS

46% of the Members do not have entrance signs. 15% have entrance signs but these do not advise entrance conditions and restrictions. One grower has entrance signs that advise conditions. 23% of the Members on the top of that, informed their signs are related to the risk of phylloxera and 15% responded that the sign also have a contact number, if access is required.

2.4.2 PHYSICAL BARRIERS FOR EXTERNAL VISITORS

63% of the Members do not have vineyard gates. Three growers have gates but do not have other fences and other natural barriers to avoid entrance of external visitors, 15% have gates, fences and/or natural barrier to limit entrance of external visitors. 8%, in addition to that, keep their gates close to limit any external visitors' entre to the vine row as much as possible. 10% have additional measure in place during times of high visitor number in the McLaren Vale region such as Sea and Vines Festival or Tour Down Under.

2.4.3 WASH-DOWN AREAS FOR PERSONNEL

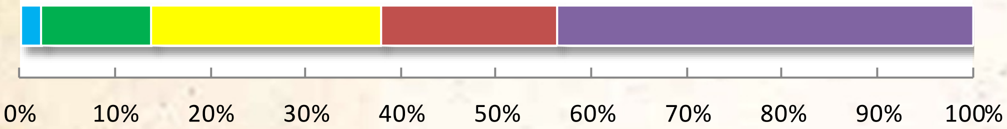
About 60% of the members do not have a wash down area or footwear kit for personnel. 25% informed that, despite not having a wash-down are they visually inspect or instruct that footwear is inspected for mud and plant materials before allowing entry onto the vineyard and if there is mud of plant material, the members ask the them to wash their boots on a hard surface (gravel, concrete or bitumen) and well way from grapevines. 12% have a wash-down area or kit for footwear.

2.4.4 VINEYARD ACCESS BY INDUSTRY PERSONNEL

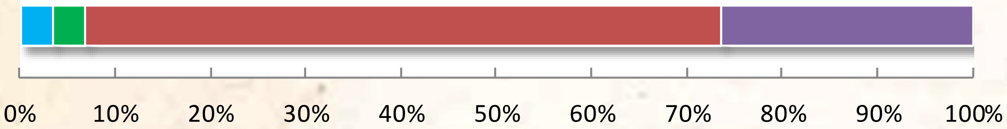
35% of the members informed that they do not have a visitors log or policy. 49% informed that they do not have a visitor's log but they ask where the visitor has been previously, before commencing work or entering rows. 3% have a visitor's log and policy. 3% of the members, in addition to that, record the date and time of the entry. 3% informed that the log is kept for future reference in case of an outbreak of phylloxera.

Excellent	Very Good	Good	Needs Attention	Needs Urgent Development	Non Applicable
4	3	2	1	0	N/A

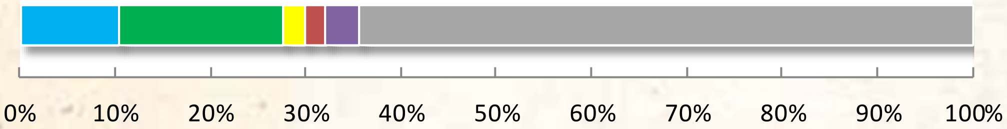
2.4.5 Vehicles hygiene (disinfection and/or cleaning)



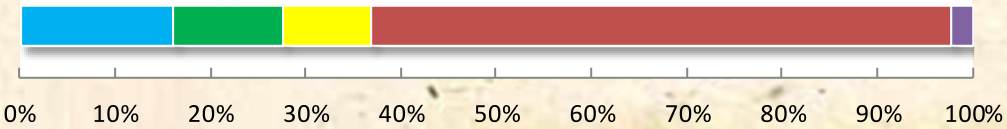
2.4.6 Vehicles movement



2.4.7 New vine planting



2.4.8 Biosecurity protection



2.4.5 VEHICLES HYGIENE (DESINFECTION AND/OR CLEANING)

44% of the members do not have facilities or procedures for vehicle disinfection. 18% do not have a formal written procedure for disinfection but they visually inspect vehicles and if there is mud or plant materials, the machinery is cleaned as needed. 24% of the members, in addition to that, informed that the cleaning happens on hard surfaces and away from grapevines. 11% do have a wash-down area and machinery is cleaned there, if necessary. 2% of the members, on the top of that, have a formal written procedure for vehicle disinfection.

2.4.6 VEHICLES MOVEMENT

26% do not have any type of control for external vehicles. 66% do not have an external vehicle policy that asks where vehicles have been prior to their vineyard before commencing work, but they require notifications when vehicles enter their vineyard and they also keep a written log of them. 3% informed they also keep the date and time of entry. 3% informed that, on the top of that, they keep the log for future reference in case of an outbreak of phylloxera.

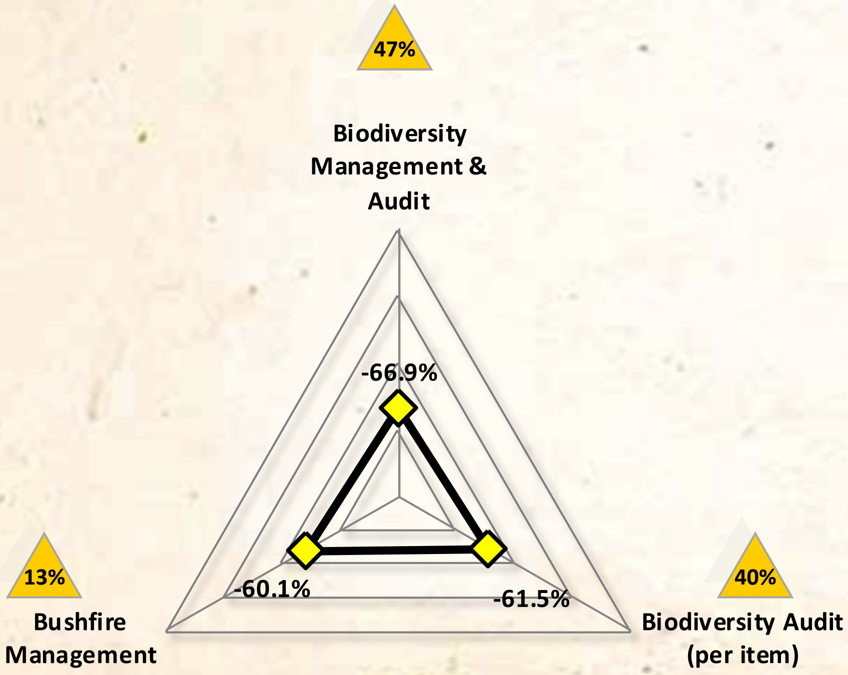
2.4.7 NEW VINE PLANTING

The topic is not applicable to 64% of the Members who did not plant new vines last season. 3 members informed they do not use certified materials when planting new vines. Two members use certified planting material purchased through a nursery or Vine Improvement Society. 2% of the members informed that the material was inspected to be clean of soil and other foreign plant materials. 17%, in addition to that responded they have a receipt for the planting materials. 10% informed that in addition to that, the material was hot water treated.

2.4.8 BIOSECURITY PROTECTION

Two members informed that they are not aware of anything related to biosecurity protection. 61% are aware that there is biosecurity legislation and regulations to protect South Australian from phylloxera. 9% informed that they also have a copy of the biosecurity legislation. 11% responded that , on the top of that, they are aware of the process or have sent grapes or vine material interstate by applying for permits from PIRSA. 16%, in addition to that, informed they have a copy of the Phylloxera Board protocol on had for additional guidance.

Excellent	Very Good	Good	Needs Attention	Needs Urgent Development	Non Applicable
4	3	2	1	0	N/A



Sections and Weight in the System:

The Biodiversity Management chapter is divided in 3 sections: Biodiversity Management & Audit, Biodiversity Audit and Bushfire Management.

Biodiversity Management represents 15% of the total of the McLaren Vale Sustainable Winegrowing possible points.

From what is possible to score within the Biodiversity Management chapter, Biodiversity Management & Audit represents 47% of the chapter, Biodiversity Audit (40%) and Bushfire Management, 13%.

Overall Results: Categories within the System fro Each Section:

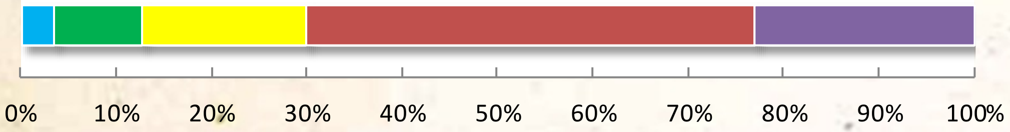
The results from all sections within the Biodiversity chapter were categorized as Yellow (Good). The percentage difference between the maximum score the region could achieve and the section Biodiversity Management & Audit is –66.9%, Biodiversity Audit (-61.5%) and Bushfire Management (-60.1%).

Comments:

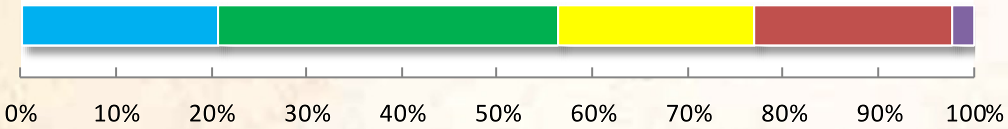
The keys to this biodiversity chapter, indeed biodiversity management in general are observation and measurement. They can and indeed, at times do work independently of one another. All of us as individual growers have our own unique environments that surround and interact with our vineyards. We already, to varying degrees, understand some of the linkages that occur between these various systems and the way in which they have positive and negative impacts on what we are trying to achieve. What we need to improve on and expand is our formal measurement of these key relationships so that we can better manage these linkages to have a more profoundly positive outcome for, not only what we are trying to achieve, but the surrounding environment as well. Improved measurement of these systems will allow us as a region, to identify the key positive influences of the region and how to expand on them, and to also allow us to identify and provide management solutions for the negative influences around us. Over time this will allow this region to properly plan and manage the important biodiversity linkages on our individual properties and, as a region, to ensure the most sustainable outcome for both.

Excellent	Very Good	Good	Needs Attention	Needs Urgent Development	Non Applicable
4	3	2	1	0	N/A

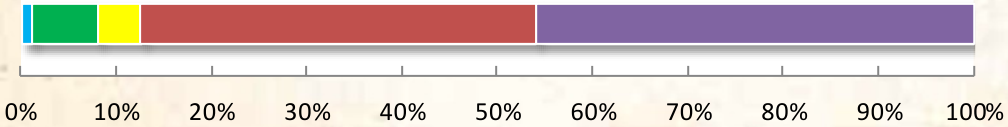
3.1.1 Biodiversity management plan



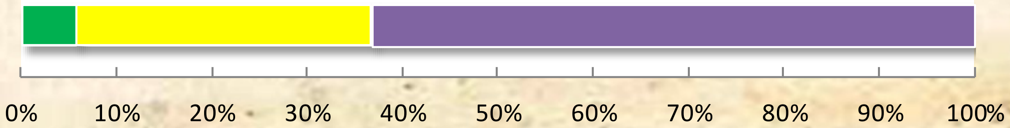
3.1.2 Potential for biodiversity enhancement



3.1.3 Biodiversity Audit (BA)



3.1.4 Biodiversity Action Plan (BAP)



3.1.1 BIODIVERSTIY MANAGEMENT PLAN

23% of the Members informed they do not have a biodiversity management plan. 47% responded they have information about the land area in their properties and they have been developing some initiatives to improve biodiversity. 17% of the Members informed, that on the top of that, there is a designated person in charge of biodiversity management and they have a defined budget and understanding of all necessary resources to begin their biodiversity management plan. 9%, in addition to that have a written plan but not annually updated. Only 3% of the Members have an up to date written plan with yearly targets and records of biodiversity enhancement.

3.1.2 POTENTIAL BIODIVERSITY ENHANCEMENT

Two growers don't know where biodiversity could be enhanced in their vineyards. 20% know the total size of the production area of their vineyard (vines, mid row and under vine) and surrounds (headlands, border, non-producing areas around infrastructure and land unsuitable for productive grape growing). 20% know the individual sizes of all the above areas. 36%, in addition to that, have a map indicating each of the above areas. 20% informed that, in addition to that, their map also indicates the major activities on adjacent land areas to their vineyards.

3.1.3 BIODIVERSTIY AUDIT (BA)

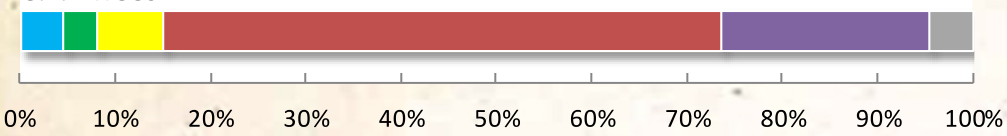
46% of the Members have not done a biodiversity audit (BA) of any of their property. 41% have not done a BA but they monitor and have monitoring records of pest and potential beneficial insects during the growing season. About 5%, in addition to that, informed they have recorded flora and fauna species in the vineyard and headlands, including a written description. Only one grower had a professional audit of every section of the property including a written description of them.

3.1.4 BIODIVERSITY ACTION PLAN (BAP)

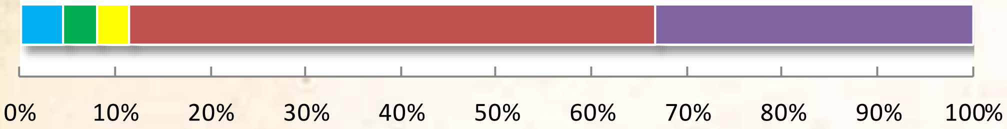
63% of the Members do not have a Biodiversity Action Plan. 31% responded that they have attended biodiversity workshops and/or training but have not yet written a plan. 6% have a written BAP, including a written description for their vineyard headland zones.

Excellent	Very Good	Good	Needs Attention	Needs Urgent Development	Non Applicable
4	3	2	1	0	N/A

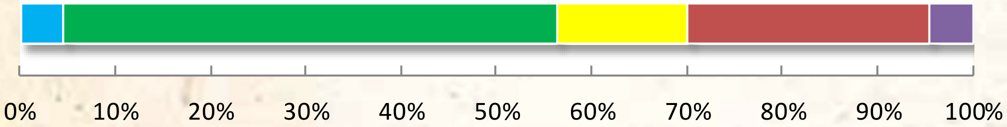
3.2.1 Trees



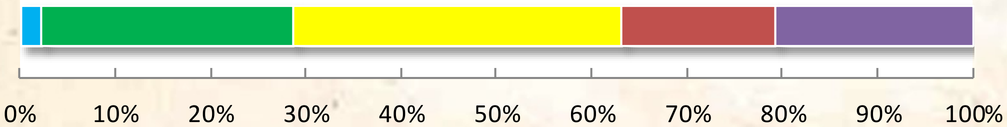
3.2.2 Habitat Trees



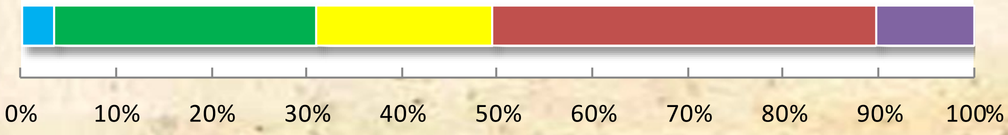
3.2.3 Weeds and biodiversity



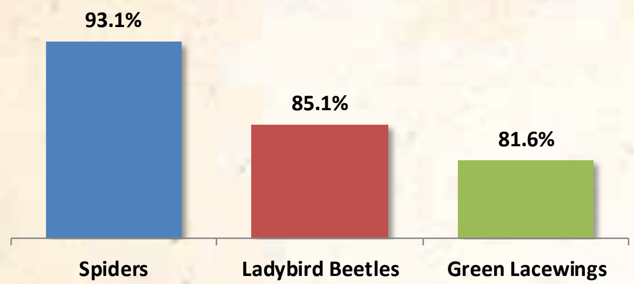
3.2.4 Insects



3.2.5 Birds



Growers reported presence of beneficial insects



3.2.1 TREES

The topic was not applicable to 4 growers that informed they do not have any trees in their vineyard. 22% have never assessed tree types or amounts within their vineyards. 58% have identified the main types of trees but do not know the amount per hectare and the identification is not written. 7% have identified the trees and informed that there are less than 10 trees/ha (average). 3% informed that there are 10-20 tree/ha and about 5% informed that there are more than 20 trees/ha.

3.2.2 HABITAT TREES

33% informed they have never assessed habitat trees within their vineyards or adjoining land. 55% have but do not know the amount per hectare. Three growers informed there are less than 2 trees/ha within their vineyard or adjoining land, three other growers informed there are 3-5 trees/ha and four growers informed there are more than 5 trees/ha.

3.2.3 WEEDS AND BIODIVERSITY

4% of the Members have never assessed weed types or amounts within their vineyard. 25% have identified the dominant weed species. 14% , in addition to that have also determined the potential risk to the biodiversity on their property. 52%, on the top of that have an understanding of the weed's growth behaviour and use this information to help them to manage weed systemically. 4% informed they also have a written plan based on economic thresholds.

3.2.4 INSECTS

20% have never assessed insect species. 16% have identified the main insect species. 34%, in addition to that, have also identified the main beneficial and non-beneficial insects and their potential role in either controlling pests and/or creating pest problems. Only two growers have a written plan based on economic thresholds.

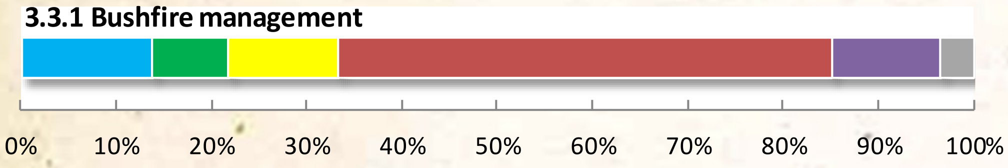
3.2.5 BIRDS

10% have never assessed bird population. 40% have identified the main bird species within their vineyard. 18%, in addition to that, have identified the insectivorous and/or territorial birds and their potential role in controlling insect pest and bird pest problems. 27% informed they also have an understanding of food sources, habits and bird behaviour and use the information to help to manage the vineyard systemically. Three growers, on the top of that, have an written plan.

MEMBERS REPORTED PRESENCE OF BENEFICIAL INSECTS

81.6% reported presence of green lacewings in their vineyards. 85% informed presence of ladybird beetles and 93% reported spider presence.

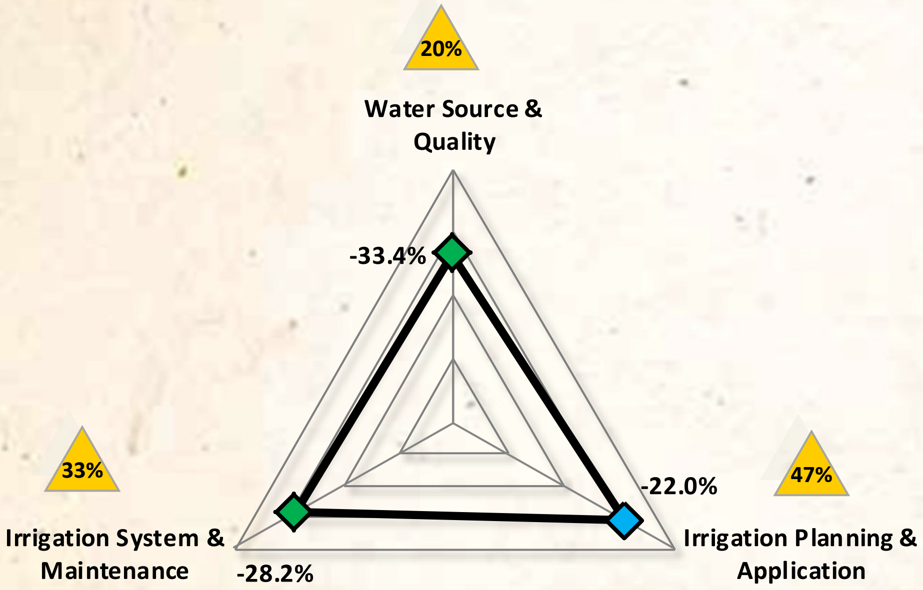
Excellent	Very Good	Good	Needs Attention	Needs Urgent Development	Non Applicable
4	3	2	1	0	N/A



3.3.1 BUSHFIRE MANAGEMENT

The topic is non-applicable to 3% of the Members who reported that they are not located in bushfire management zones. 11% of the Members are not aware of the risk level regarding bushfire. 51% are aware of the risk level regarding bushfire within their property and surrounding areas that might impact on their property (general, medium or high risk). 11% , in addition to that, have a bushfire management plan. 8% informed that everybody in the farm has been exposed to the plan to know what to do to in case of fire. 14%, on the top of that, have been implementing measures to reduce the risk of bushfire and its potential impacts on the biodiversity of the property.

Excellent	Very Good	Good	Needs Attention	Needs Urgent Development	Non Applicable
4	3	2	1	0	N/A



Sections and Weights in the System:

The Water Management chapter is divided in 3 sections: Water Source & Quality, Irrigation Planning & Application and Irrigation System & Maintenance.

Water Management represents 15% of the total of the McLaren Vale Sustainable Winegrowing possible points.

From what is possible to score within Water Management Chapter, Water Source represents 20%, Irrigation Planning & Application (47%) and Irrigation System Maintenance (33%).

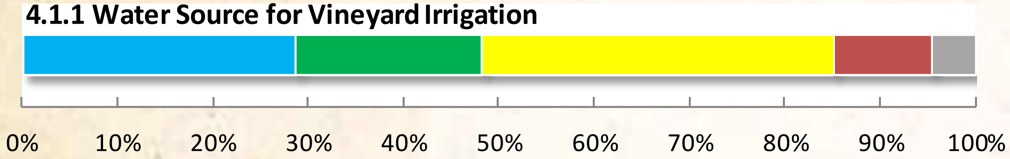
Overall Results: Categories within the System fro Each Section:

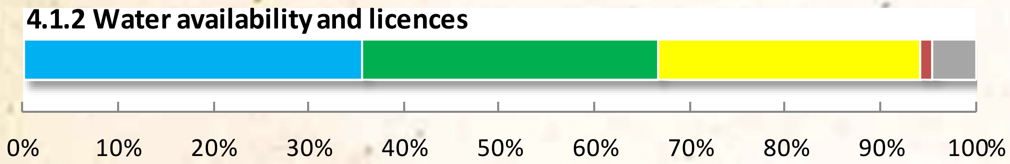
Irrigation Planning & Application is in the Blue (Excellent) category. The gap between the maximum possible points and overall results for this section is –22%. Both Water Source Quality and Irrigation System & Maintenance were placed in the Green (Very Good) category as the percentage difference between the maximum points and the average results are –33.4% and –28.2% respectively.

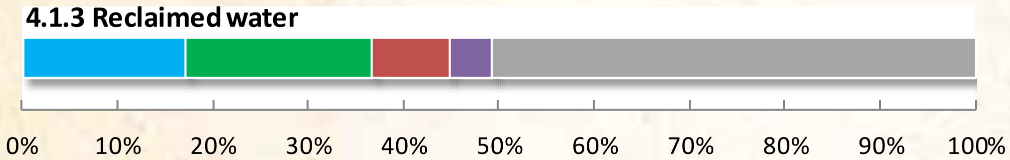
Comments:

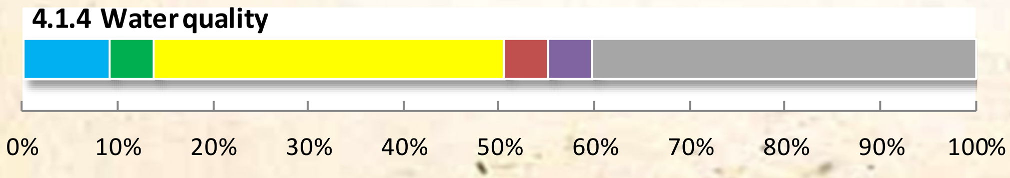
The McLaren Vale wine region has a long history of responsible water management. It was an early adopter of drip irrigation and soil moisture monitoring equipment. These practices are considered “standard” here but are still only just being utilized in some other wine regions around the world. McLaren Vale has been progressive in the management of its natural water assets with the adoption of a basin wide water management plan to preserve its underground water resource for generations to come. It has the largest privately owned recycled water network in Australia that helps previously thought to be waste water irrigate large portions of the regions vineyards. It is this network that has allowed MVGWTA, in partnership with both Commonwealth and State Governments, to administer the McLaren Vale Water Plan, a mains water substitution program. This program has been running for 4 years and with the help of 4 million dollars in funding from the Commonwealth and State Governments will achieve potable water savings of around 900 ML for some 80-odd growers. It has enabled these growers to convert from potable mains water to recycled water for vineyard irrigation. This will have social, financial and environmental benefits for the entire region.

Excellent	Very Good	Good	Needs Attention	Needs Urgent Development	Non Applicable
4	3	2	1	0	N/A









4.1.1 WATER SOURCE FOR VINEYARD IRRIGATION

This topic is non-applicable to 5% of the Members who do not irrigate their vineyards. 10% use mains water. 37% use bore or surface runoff water (e.g. dam or creek) as their main source for irrigation. 19% use a combination of reclaimed and mains, bore or surface runoff of water and 28% responded they use reclaimed water for irrigation.

4.1.2. WATER AVAILABILITY AND LICENCES

All growers know how much water they have available for vineyard irrigation from various water sources and have the appropriate licences for usage. 27%, in addition to that, also responded they do not exceed their allocation. 31% of the Members also plan their water usage to reduce their reliance on the more 'at-risk' resources such as mains, bore and surface run-off. 35% only used reclaimed water and know how much water is available for vineyard irrigation and they also responded that they always follow the rules of usage and understand the penalties that apply for misuse.

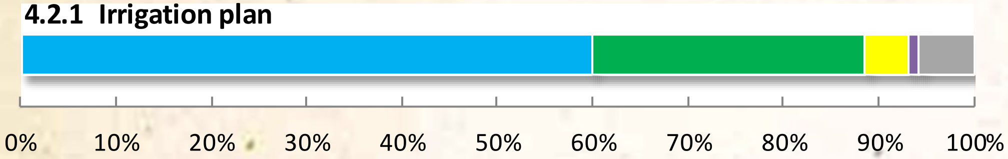
4.1.3 RECLAIMED WATER

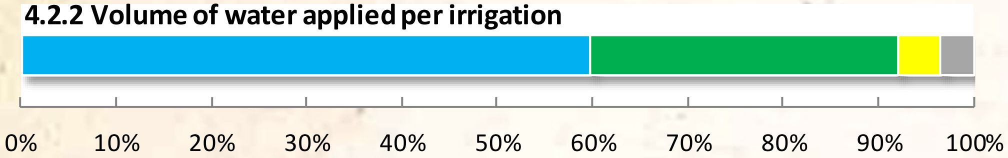
This topic is not applicable to 50% of the Members as they already have reclaimed water. 5% of the Members would not change to reclaim water even it becomes available to their vineyard. About 8% of the Members would consider changing to reclaimed water if it became available to their vineyard and if it is a cost effective option for their business model. 19% would change to reclaimed water if it becomes available through a cost effective option for their business. 17% would change to reclaimed water if it becomes available as they believe it is the most sustainable water source for vineyard irrigation.

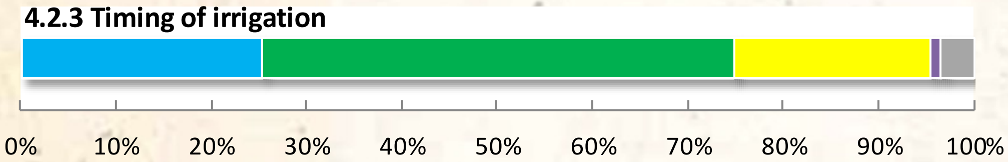
4.1.4 WATER QUALITY

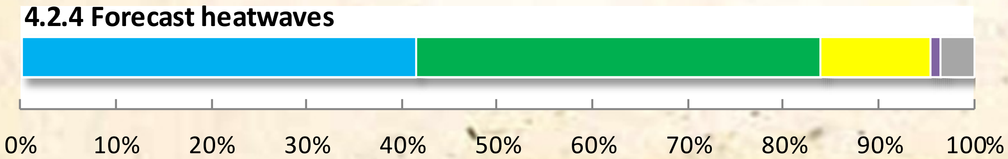
40% of the Members do not test the quality of their water because they only use either reclaimed or mains water which is tested regularly by the providers, so the topic is non-applicable for them. 5% of the Members never tested their water. 5% informed they have tested their water for salinity within the last 3 years for salinity (TDS or EC) but they are unsure of how to use the test results. 37% have tested the quality of their irrigation water within the last 3 years for salinity (TDS or EC) with an appropriately calibrated salinity meter and have use the information to determine whether they have a problem with salinity in their water. 5%, in addition to that, used accredited laboratory and also tested sodium absorption ratio, pH, bicarbonate, suspended soils and other nutrients appropriate for the site and they have an amendment plan if problems are identified. 9% informed they test the quality of their irrigation water annually.

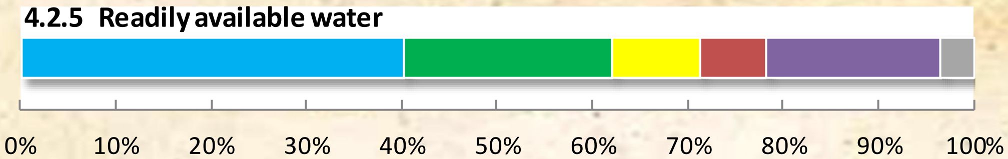
◆ Excellent	◆ Very Good	◆ Good	◆ Needs Attention	◆ Needs Urgent Development	◆ Non Applicable
4	3	2	1	0	N/A











4.2.1 IRRIGATION PLAN

Only one grower does not have an irrigation plan. About 5% informed they have a weekly/ fortnightly irrigation plan which best utilises the water available to them to reach a specific yield and/or quality targets. 28% responded they have a flexible, seasonal irrigation plan which best utilises the water available to reach specific yield and/or quality targets which are negotiated with the winery/buyer and the plan is reviewed weekly to account for seasonal variation. 60%, in addition to that, also review the irrigation plan annually and make improvements where necessary.

4.2.2. VOLUME OF WATER APPLIED PER IRRIGATION

About 5% of the Members responded that the volume of water applied is determined by water availability , the forecast weather conditions and by the appearance of the vine. 32% informed the volume of water they applied is determined by their irrigation plan which takes into account water availability, soil type, plant water usage, forecast weather conditions and appearance of the vine. 60%, in addition to that use monitoring data to ensure the correct amount of irrigation is applied.

4.2.3 TIMING OF IRRIGATION

21% of the Members answered that, where possible, they schedule irrigation to avoid the hottest part of the day to reduce evaporation. 49% informed that ,where possible, they schedule irrigation at night to reduce not only evaporation but also electricity costs for pumping. 25% informed that on the top of that, their irrigation system has the capacity to allow for schedule the irrigation for the night period.

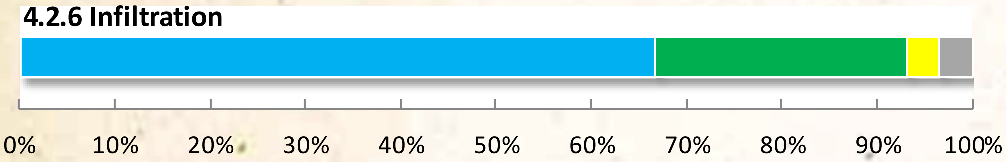
4.2.4 FORECAST HEATWAVES

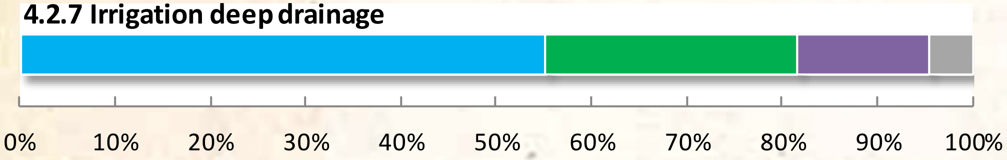
11% informed they follow the weather forecasts and aim to apply extra irrigation to any blocks that need it, prior to a forecast of heatwave. 42% also prioritise blocks based on their value and susceptibility to damage and their irrigation system has the capacity to allow them to do this. 41% , in addition to that, also informed their seasonal irrigation plan has water allocated for heat waves events and block value and/or susceptibility to damage.

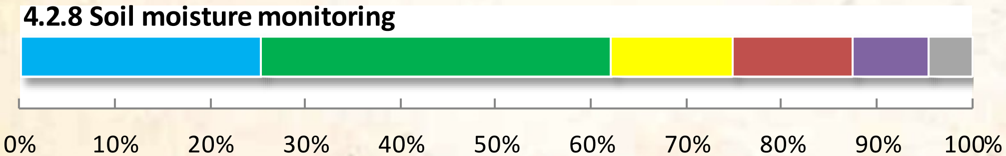
4.2.5 READILY AVAILABLE WATER

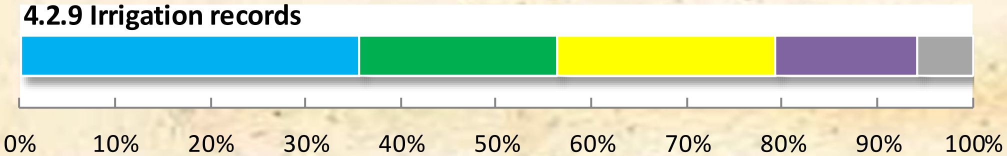
18% of the Members do not know the RAW (Readily Available Water) in their soil. 7% estimate RAW based on soil type. 9% estimate RAW based on soil texture charts and approximate root zone depth and use this information to help plan irrigation. 22% have estimated their RAW using soil pits or soil moisture monitoring data. 40% have also estimated their DAW (Deficit Available Water) and use soil moisture monitoring to optimise the vines use of DAW in an effort to improve grape quality.

Excellent	Very Good	Good	Needs Attention	Needs Urgent Development	Non Applicable
4	3	2	1	0	N/A









4.2.6 INFILTRATION

26% of the Members informed that water infiltration under vine is adequate and that they address soil permeability issues as they arise via increased organic matter or soil amendments. 67% informed that water infiltration under vine is good and they have been proactive in addressing any soil permeability issues.

4.2.7 IRRIGATION DEEP DRAINAGE

14% of the Members informed they do not know if they are over irrigating resulting in deep drainage. 26% know the water holding capacity of their soil and their irrigations are calculated so as to prevent the loss of water to deep drainage. 55% informed that in addition to that they use soil moisture monitoring to ensure they are not losing water to deep drainage.

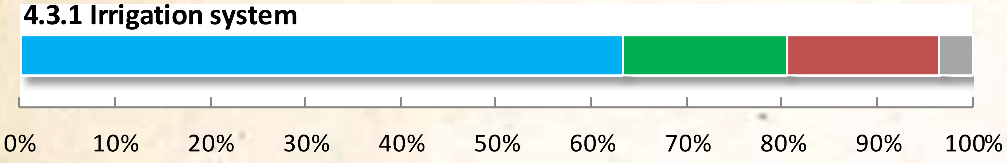
4.2.8 SOIL MOISTURE MONITORING

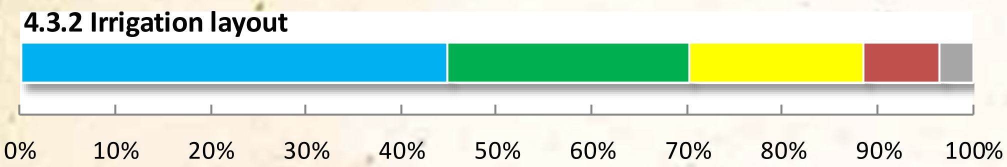
8% of the Members informed they do not monitor soil moisture. 12% responded they occasionally monitor soil moisture using basic techniques such as dig stick and the 'ribbon test'. 12% of the Members occasionally monitor soil moisture using gypsum block or capacitance probes or they regularly monitor soil moisture using the same techniques as the previous group. 37% regularly monitor their soil moisture using gypsum blocks or capacitance probes and they keep a record of their results to refine their irrigation plan as the season progresses. 25% informed they have a continuous soil moisture monitoring system and they review their data regularly and use it to refine their irrigation plan as the season progresses.

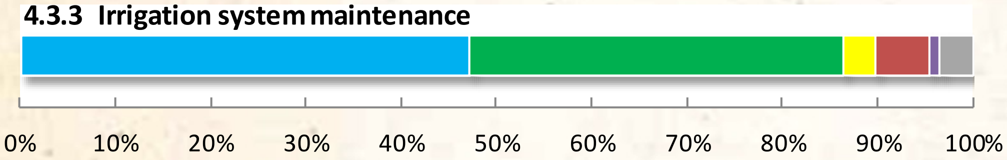
4.2.9 IRRIGATION RECORDS

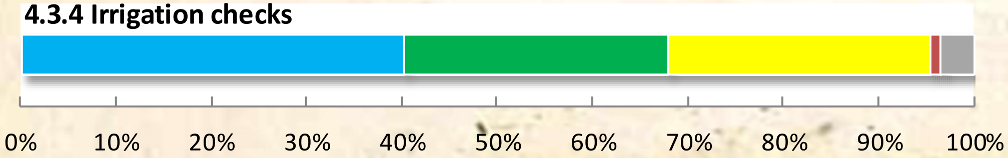
15% of the Members do not keep irrigation records. 23% keep irrigation records showing the block, date and hours of irrigation applied. 21%, in addition to that also record length of shift and the metered volume of water per shift and make note of any significant rainfall events. 35% of the Members on the top of that also records growth stage of the vine and make note of any significant rainfall events or any problems or anomalies.

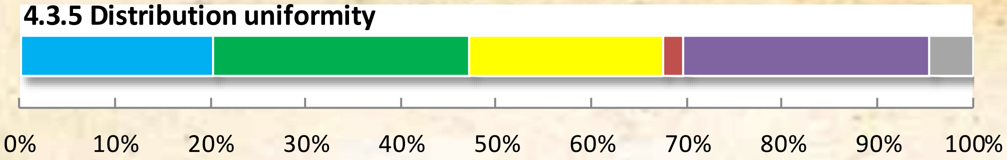
Excellent	Very Good	Good	Needs Attention	Needs Urgent Development	Non Applicable
4	3	2	1	0	N/A

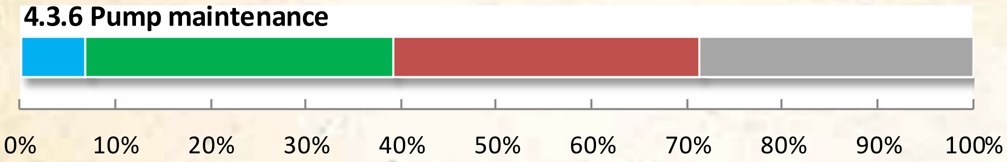












4.3.1 IRRIGATION SYSTEM

All growers in the McLaren Vale Sustainable Winegrowing Australia that irrigate, use drip irrigation. However16% of the Members have a non-engineered drip. 17% have an engineered surface or subsurface drip irrigation system which includes flow meters, filtration and pressure and pressure compensation. 63%, in addition to that, also have an automated system.

4.3.2 IRRIGATION LAYOUT

8% of the Members informed they are familiar with the layout of their irrigation system but do not have a plan. 18% have drawn a basic plan. 25% have the initial plan of their irrigation layout showing mainlines, sub-mains, solenoids, irrigation sections, etc. but it has never been updated. 49% of the Members have a detailed and up to date plan of their irrigation layout.

4.3.3 IRRIGATION SYSTEM MAINTENANCE

6% of the Members informed they clean their irrigation filters and flush their lines occasionally. 3% do at the beginning of each irrigation season. 39% informed they also clean their irrigation system when they notice problems. 47% responded that, in addition, they monitor the quality of the irrigation water and clean filter and lines during the season to prevent pressure and uniformity problems or they have a auto flushing and self-cleaning system which they check regularly.

4.3.4 IRRIGATION CHECKS

27% occasionally do a visual check inspection of blocks whilst the irrigation is running. 27% of the Members regularly perform visual inspection within the blocks whilst the irrigation is running and keep accurate records of water volume pre-shift to determine if there is are problems. 40% informed they have an automated system and regularly check water volumes, flow and block pressure to ensure there are no anomalies and they regularly perform visual inspection whilst the irrigation is running as well.

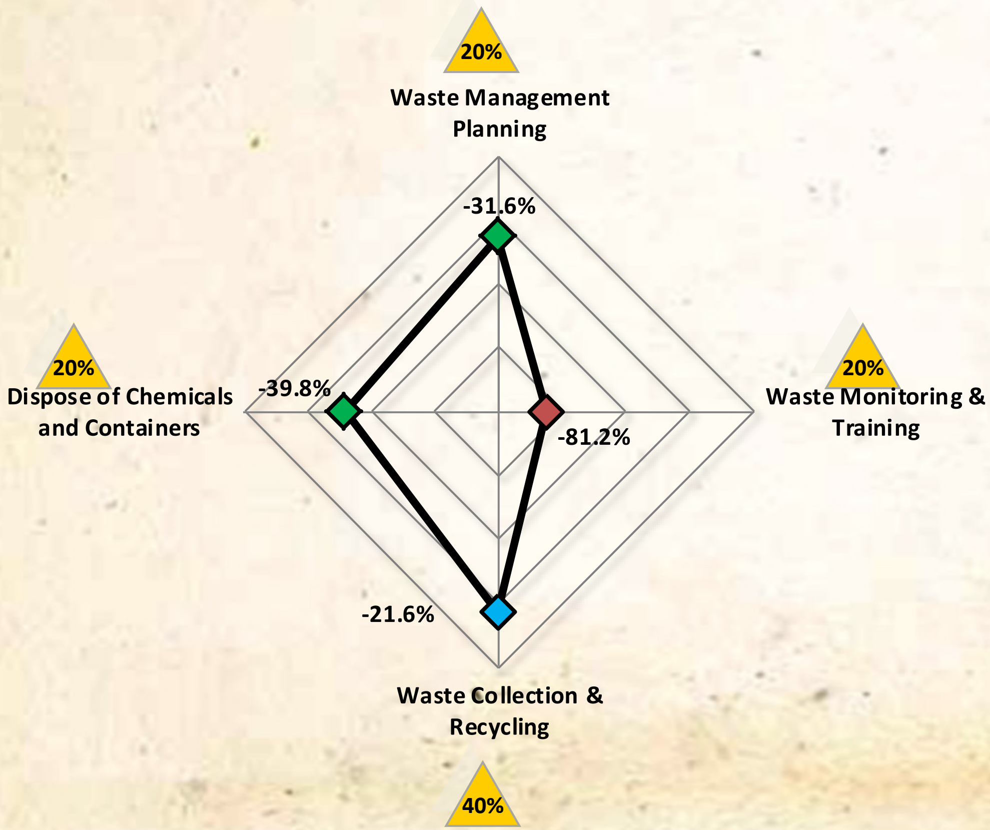
4.3.5 DISTRIBUTION UNIFORMITY

26% of the Members do not test the distribution of uniformity of their irrigation system. 20% occasionally check the distribution of uniformity by performing dripper output tests. 27% check uniformity at the beginning of the growing season and make adjustments if necessary. 20% , on the top of that, keep records of water flow rates and volumes and/or system pressure to determine problems when they arise.

4.3.6 PUMP MAINTENANCE

The topic is non-applicable to 29% of the Members who use reclaimed water which is delivered at pressure and does not to be re-pumped. 32% service their pumps only when there is a problem. 32% service their pumps routinely to prevent problems. 7% informed that, in addition to that, they have a preventive maintenance schedule.

Excellent	Very Good	Good	Needs Attention	Needs Urgent Development	Non Applicable
4	3	2	1	0	N/A



Sections and Weights in the System:

The Waste Management chapter is divided in 4 sections: Waste Management Planning, Waste Management & Training, Waste Collection & Recycling and Dispose of Chemicals and Containers.

Waste Management represents 15% of the total of the McLaren Vale Sustainable Winegrowing possible points.

From what is possible to score within the Waste Management Chapter, Waste Management Planning, Waste Management & Training, and Dispose of Chemicals and Containers represent 20% of the chapter each and Waste Collection & Recycling (40%).

Overall Results: Categories within the System fro Each Section:
The Waste Collection and Recycling section has the best result within the chapter. The gap between the maximum achievable points within the system and the McLaren Vale's result is only –21.6% , placing this section in the Blue (Excellent) category. Waste Management and Dispose of Chemical and Containers results are in the Green (Very Good) category. Waste Monitoring & Training is amongst the lowest average in the whole system. The gap between the maximum points and regional average is –81.2%.

Comments:

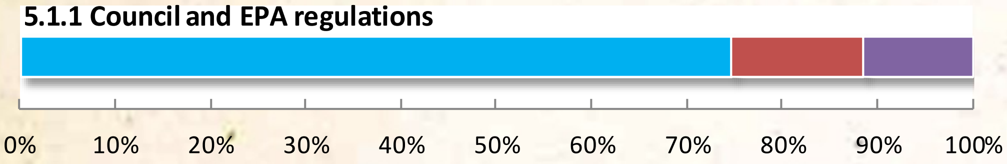
The results for Waste Management vary across the categories with excellent results for Waste Collection and Recycling, and good results for Waste Management Planning and Disposal of chemicals and Containers. However the Waste Monitoring and Training area needs attention.

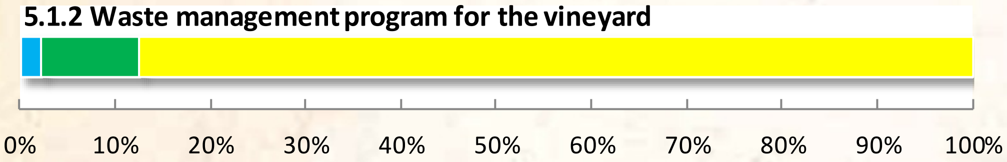
These results reflect the nature of the majority of participants in the McLaren Vale Sustainable Winemaking program, mostly being small, family owned vineyards that are less likely to have procedures and monitoring systems in place due to their small size. However, it is clear that the majority of participants make an effort to reduce and recycle waste, with waste collection incorporated in their daily routine to keep the landscape clean and tidy, and recycling implemented in the majority of member's vineyards.

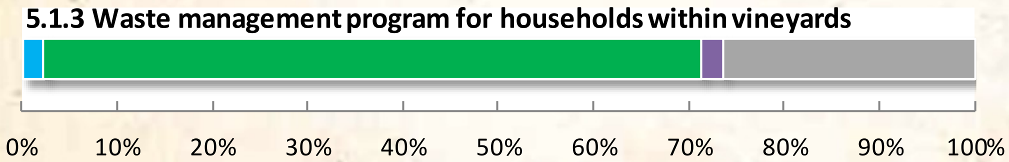
Improvements could easily be made by implementing simple procedures for waste management, such as training employees during induction, discussing waste reduction and recycling with family members and keeping recycling and disposal records by waste type. Council information sessions could also provide important information that could be incorporated into vineyard operations, such as following the waste hierarchy as shown below:

MOST PREFERABLE **Avoid** ← **Reduce** ← **Reuse** ← **Recycle** ← **Recover** ← **Treat** ← **Dispose** **LEAST PREFERABLE**

◆	◆	◆	◆	◆	◇
Excellent	**Very Good**	**Good**	**Needs Attention**	**Needs Urgent Development**	**Non Applicable**
4	**3**	**2**	**1**	**0**	**N/A**







5.1.1 COUNCIL AND EPA REGULATIONS

11% of the Members are not aware of the Council and Environmental Protection Authority (EPA) regulations. 14% informed they are aware of the Council and EPA regulations regarding solid waste management but they don't really follow all guidelines to dispose wastes from their vineyard. 75% informed they are aware of the regulations and they follow their guidelines to dispose wastes from their vineyards.

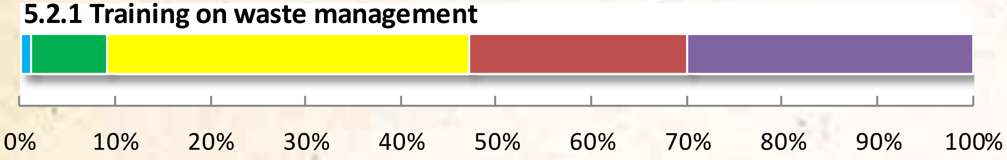
5.1.2. WASTE MANAGEMENT PROGRAM FOR THE VINEYARD

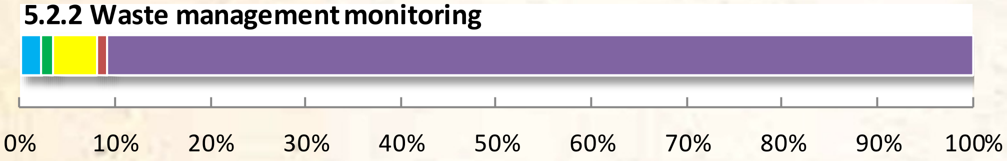
The majority of the Members, 87% informed they understand waste management and recycling but do not have an up to date waste management program. They collect wastes and take actions on as needed basis. 10% have a detailed and up to date waste management program and have targets to reduce the amount of waste currently produced. Two growers, in addition to that, have also attended at least one training event on waste and recycling in the last 12 months.

5.1.3 WASTE MANAGEMENT PROGRAM FOR HOUSEHOLDS WITHIN VINEYARDS

The topic is non-applicable to 26% of the Members that informed that there is no household within the vineyard. 2% of the Members do manage waste from the house. 69% separate and recycle domestic waste materials using the kerbside bin system and have targets to reduce the amount of waste currently produced. Two growers, in addition to that, have also attended at least one training event on waste and recycling in the last 12 months.

Excellent	Very Good	Good	Needs Attention	Needs Urgent Development	Non Applicable
4	3	2	1	0	N/A





5.2.1 TRAINING ON WASTE MANAGEMENT

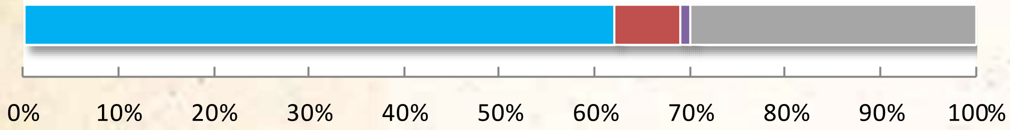
30% of the Members have never discussed waste management among family members involved in the vineyard management or have employees and have never discussed waste management with employees or contractors and do not have any sort of training or procedure in place for waste management. 23% informed they are aware of the need to collect solid wastes or there is an waste management program available in the office for the employees upon request. 38% informed that waste collection is incorporated in their daily routine to keep the landscape clean and they have never attended formal training but they read and save informative materials or when they have employees, informative materials are given for all new employee, but they are not trained. 8%, in addition to everything informed by the previous group, have attended at least one formal training event on waste management or have permanent employees who have been trained within the first 12 months of work. Only one grower (with employees) have a nominated person in charge of waste management who is up to date with current practices and implements new industry practices.

5.2.2. WASTE MANAGEMENT MONITORING

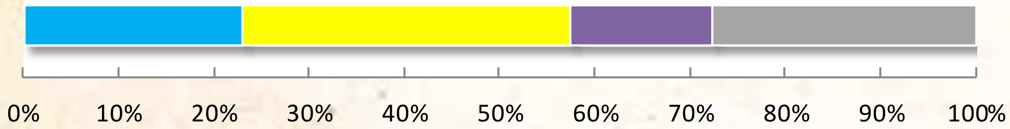
90% of the Members do not have monitoring procedures for waste management. One grower has a written monitoring spread sheet but is not up to date. About 5% have a written spread sheet and they record their waste. One grower has a detailed and up to date monitoring system and the waste management program is monitored to allow improvements in their waste management program. Two growers, in addition to that, have targets to reduce their waste.

Excellent	Very Good	Good	Needs Attention	Needs Urgent Development	Non Applicable
4	3	2	1	0	N/A

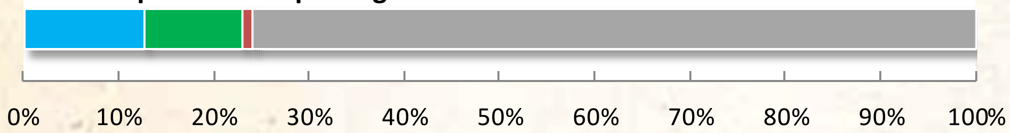
5.3.1 Hard waste collection from households in vineyards.



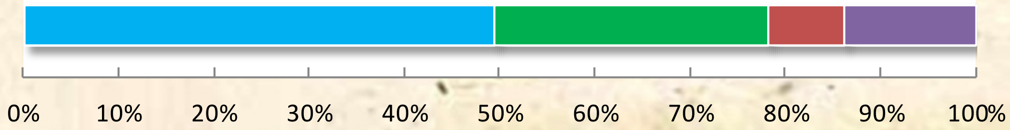
5.3.2 Composting (other than grape marc)



5.3.3 Grape marc composting



5.3.4 Waste collection and recycling containers and/or bins



5.3.1 HARD WASTE COLLECTION FROM HOUSEHOLDS

28% informed there are not households in the vineyard , so the topic is non-applicable for them. One grower neither collects nor separates hard wastes from their property. 7% of the Members collect and put everything together in a designated area but have no plans for removing or recycling their hard waste. 62% of the Members in addition to collecting hard waste and putting it in a designated area, they also remove or recycle their hard waste at least once a year and are aware of the Council's Pre-Booked Hard Waste Collection Service for domestic households and dispose of items using the system, when necessary.

5.3.2. COMPOSTING (OTHER THAN GRAPE MARC)

The topic is non-applicable to 27% of the Members as they do not have households in the vineyard. 15% do not compost organic matter. 34% compost garden and non-vineyard vegetation only and 23%, in addition to that also compost all vineyard wastes (when they are classified as waste and need to be removed from the field).

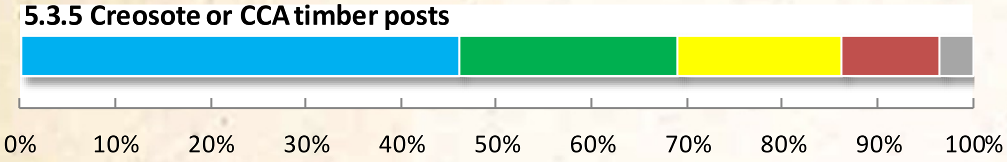
5.3.3 GRAPE MARC COMPOSTING

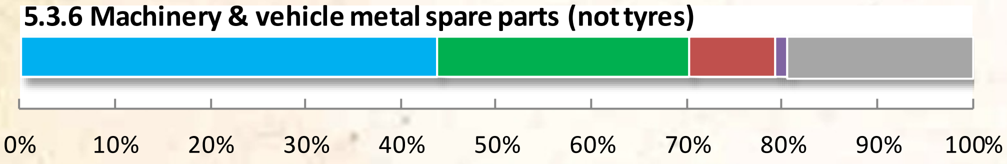
76% of the Member do not crush grapes on site and because of that the topic is non-applicable for them. One grower responded that the marc is stored on site for landfill or appropriate disposal. 10% responded that they spread the grape marc directly to the vineyard or they send it to a compost facility. 12% compost their marc on site and any excess is sent to a composting facility.

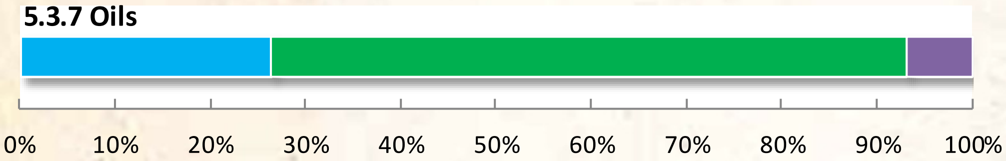
5.3.4 WASTE COLLECTION AND RECYCLING CONTAINERS AND/OR BINS

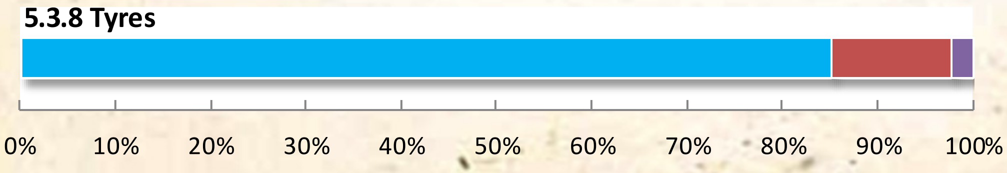
14% of the Members do no have separated recycling containers/bins. 8% collect most waste that is produced in the vineyard and place it in a recycling container/bin. 29% responded that they collect all waste that is produced in the vineyard and place it in a recycling container/bin. 49%, in addition to that, separate all waste into appropriate recycling containers/bins.

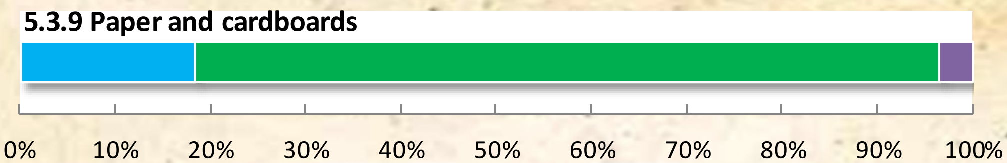
Excellent	Very Good	Good	Needs Attention	Needs Urgent Development	Non Applicable
4	3	2	1	0	N/A











5.3.5 CREOSOTE OR CCA TIMBER POSTS

Three growers do not use timber posts, so the topic is non-applicable for them. 10% stock pile all post in a reserved area within the site. 17% stock pile their posts in a reserved area within the site and this area is away from wetlands and waterways. 23%, in addition to that have identified and put in practice some re-use options (e.g. fence posts, landscape timber, parking lot bumpers, guardrail posts, etc.) . 46% on the top of that informed that when is not possible to recycle on site, the posts are sold to companies that recycle them or they give them away to employees for fencing or similar usage.

5.3.6 MACHINERY & VEHICLE METAL SPARE PARTS (NOT TYRES)

The topic is non-applicable to 19% of the Members as they do not own any machinery. One grower does not collect machinery and vehicle spare parts. 9% of the Members informed that their machinery and vehicle spare parts are collected for disposal to landfill. 26% collect spare parts of machinery and vehicles and they store them in a designated are for reuse or recycling (when possible). 43%, in addition to that, informed they only dispose as last resort through appropriate disposal.

5.3.7 OILS

7% do not collect oils. 68% informed that oils are collected in designated containers and recycled appropriately. 26% of the Members, in addition to that, have a written maintenance program for all machines in the vineyard to avoid unnecessary oil usage due to lack or servicing.

5.3.8 TYRES

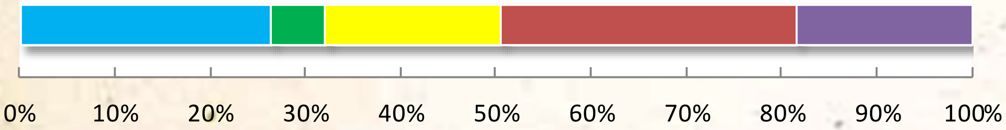
Two growers do not collect old tyres from their vineyard. 13% of the Members collect tyres and they are stored in a designated area. 85%, in addition to that, reuse (where possible) or recycle/dispose through appropriate channels.

5.3.9 PAPER AND CARDBOARDS

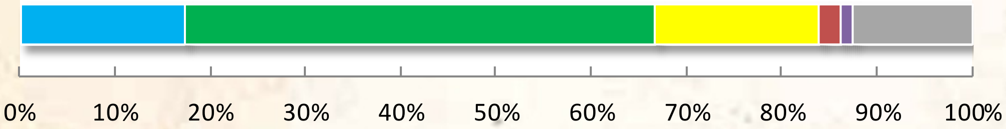
Three growers do not collect cardboards from their vineyards and they are spread out anywhere. 78% collect cardboards and store in a designated area where they are recycle appropriately (e.g. kerbside bin system, SA Paper & Cardboard, Peat's Soil, etc.)

Excellent	Very Good	Good	Needs Attention	Needs Urgent Development	Non Applicable
4	3	2	1	0	N/A

5.4.1 Dispose of unusable chemical



5.4.2 Disposal of empty chemical containers



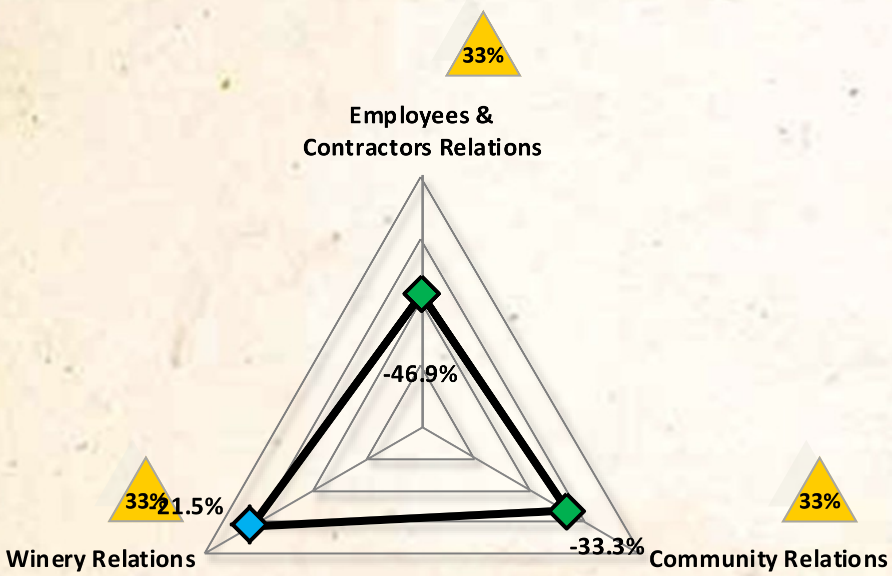
5.4.1 DISPOSE OF UNUSABLE CHEMICALS

18% do not collect unusable chemicals and there is no procedure to dispose them. 31% store all unusable chemicals but do not have procedures to dispose them. 18%, in addition to that, have an inventory of all unwanted chemicals. 6%, informed that their inventory for unwanted chemicals includes manufacturer and product name, size of the container and estimation of the remaining quantity. 26% informed that they dispose of unusable chemical through ChemClear.

5.4.2 DISPOSAL OF EMPTY CHEMICAL CONTAINERS

The topic is non-applicable to 12% of the Members that responded that they do not use any chemicals sold in containers. One grower does not collect empty containers. Two growers collect and store all unusable empty containers. 17% separate containers following DrumMUSTER groups and also rinse the containers using appropriate methods. 49% not only separate containers but dispose them through DrumMUSTER. 17%, on the top of that, only purchase chemicals that have DrumMUSTER approved drums (with DrumMUSTER logo).

Excellent	Very Good	Good	Needs Attention	Needs Urgent Development	Non Applicable
4	3	2	1	0	N/A



Sections and Weights in the System:

The Social Relations chapter is divided in 3 sections: Employees and Contractors Relations, Community Relations and Wineries Relations.

The Social Relations chapter represents 15% of the total McLaren Vale Sustainable Winegrowing Australia possible points.

From what is possible to score within the Social Chapter, the three sections were evenly weighted . Each one represents 33% of total points for the chapter.

Overall Results: Categories within the System for Each Section:

The average results of members for Employees & Contractors Relations falls into the Green Category (Very Good). Community Relations is also Green (Very Good) and the section that assesses the relations between growers and Wineries is classified as Blue (Excellent).

The spider graph on the left always shows the gap that we still want to pursue. The percentage difference between the possible maximum points the region can score and the members result for Employees & Contractors Relations is -46.9%, for Community Relations is -33.3%, and for Wineries Relations is -21.5%.

Comments:

Informal recruitment strategies are utilised more than a formal recruitment structure, indicating that members successfully recruit employees, irrespective of the method used. Most members have some type of interviewing process in place, assisting them to evaluate and select suitable employees. Contractor selection is based on a combination of cost competitiveness and quality, in conjunction with recommendations from other members.

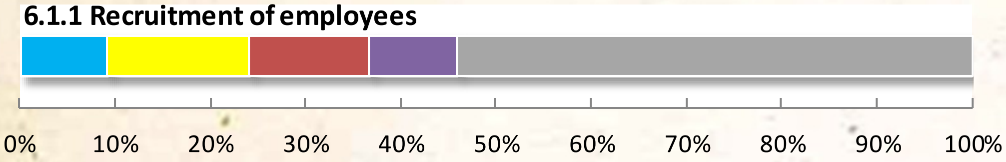
A large number of contracts, especially between smaller growers and contractors in the region are verbal, suggesting there is a high level of mutual respect and trust. Written contracts on the other hand do eliminate any room for misinterpretation. On the job training is the most common approach to training whilst inductions are more structured. With the introduction of the new National Work Health and Safety Bill (WHS) next year, training and inductions may need to be better documented.

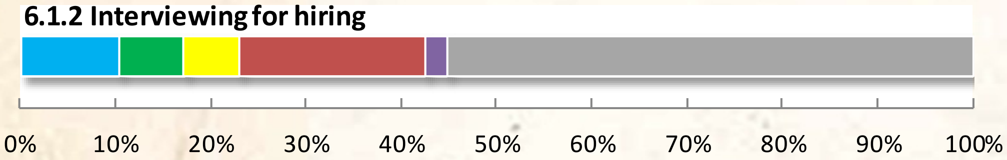
Community involvement is high and locals are generally committed to the development of community initiatives such as the McLaren Vale Sustainable Winegrowing program.

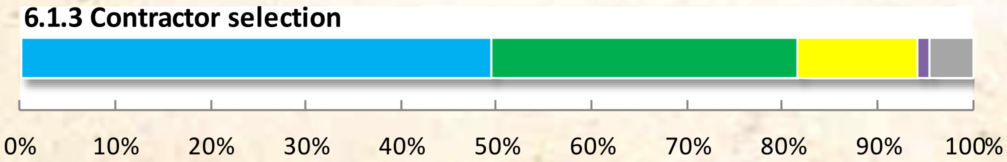
Interaction between neighbours is excellent with regular communication in relation to vineyard matters and sharing of ideas. The region supports one another.

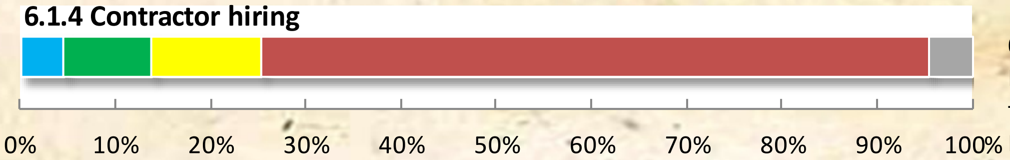
Growers value communication with the wineries in order to achieve the expected results from their grape production. For the majority of growers harvest decisions as well as the grape grading system are commonly agreed between growers in wineries in McLaren Vale.

Excellent	Very Good	Good	Needs Attention	Needs Urgent Development	Non Applicable
4	3	2	1	0	N/A









6.1.1 RECRUITMENT OF EMPLOYEES

Recruitment of employees is not applicable to 55% of the members as they don't have employees. If they hire someone to do seasonal work such as pruning or harvesting, they do so through contractors. This number is consistent with the vineyard sizes among members. 39 members are smaller than 10-hectares representing 45% of the members.

Among members who reported having employees, 9% do not have a recruitment plan, 12 recruit as required through an informal recruitment strategy which includes a list of potential casual employees. 15% have someone or an agency filling the role of recruitment with a recruitment strategy developed as required. 9% of the members , have a written recruitment plan with standard job descriptions for each position and they have selection criteria and a benchmark for the time required for developing each role.

6.1.2 INTERVIEWING FOR HIRING

Similar to recruitment, interviewing is not applicable to 55% of the members. Among those who have employees, 2% do not have an interview process in place. 19% have an informal interview process in place and 6% have a generic interview process in place. 7% have an structured interview process in place based on the job description. 10% have a structured interview process in place based on selection criteria.

6.1.3 CONTRACTOR SELECTION

50% of members choose contractors based on a combination of the lowest quote and their potential to develop a quality job. These Members also use references from other growers and expect contractors to bring innovative solutions to operations. 32% select contractors similarly but do not necessarily check contractors licences and certificates. 12% do not expect contractors to bring innovative solutions.

6.1.4 CONTRACTOR HIRING

Most contracts between growers and contractors in McLaren Vale are verbal, representing 70% of the total. 11% have an written commitment and 9% have an actual written contract. About 5% of the Members use written contracts specifying costs, location, task, responsibilities, starting and finishing dates and they also check all necessary licenses.

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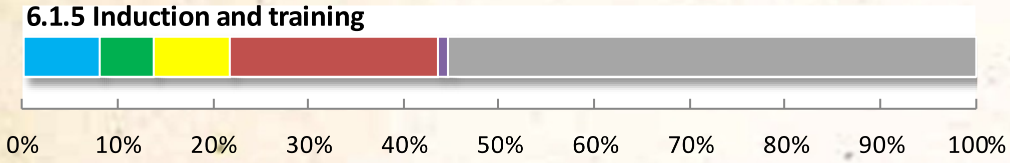
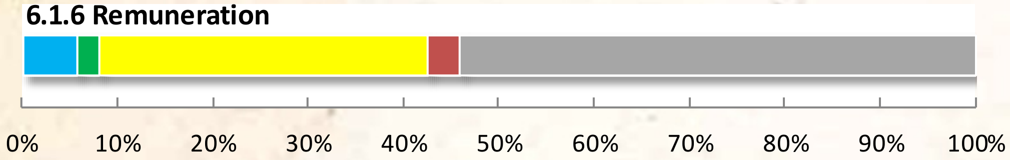
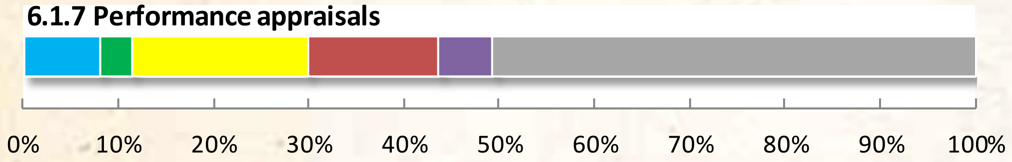
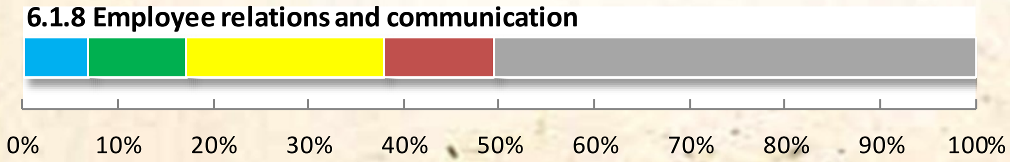
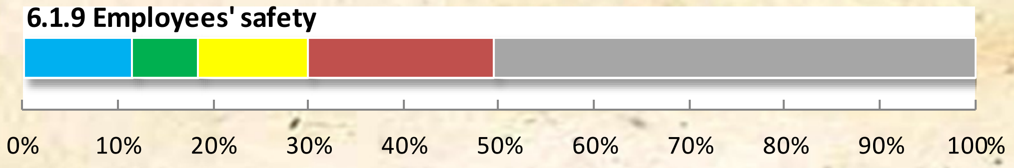
Excellent	Very Good	Good	Needs Attention	Needs Urgent Development	Non Applicable
4	3	2	1	0	N/A











6.1.5 INDUCTION AND TRAINING

Induction and training is not applicable to 55% of the Members. 22% conduct an informal induction with employees and some on the job training is provided. 6% have formal inductions which are documented and training is also provided. 8% have formal documented induction and provide structured training. SOP's are available for the employees and further training needs are also structured

6.1.6 REMUNERATION

3.% pay basic rates when employees commence working, irrespective of their experience. 35% pay above industry award rates to attract suitable qualified staff when necessary but they don't have a formal plan or system in place. For about 6% of the Members, remuneration reflects skills and qualifications and a grading system provide guidelines or they have a 'pay for performance' system to reward more efficient employees.

6.1.7 PERFORMANCE APPRAISALS

14% of the Members conduct performance appraisals when requested by an employee. 18% Conduct appraisals as required and the outcomes are documented. 3% conduct performance appraisals regularly following a structured process. 8% use the regular performance appraisals for career development, planning and further training.

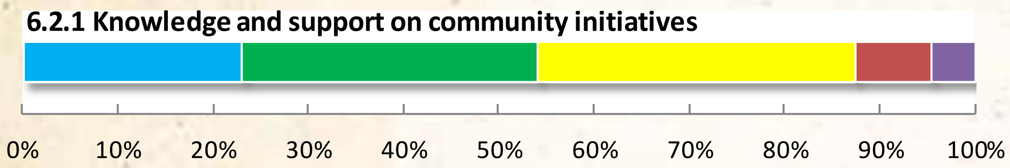
6.1.8 EMPLOYEE RELATIONS AND COMMUNICATION

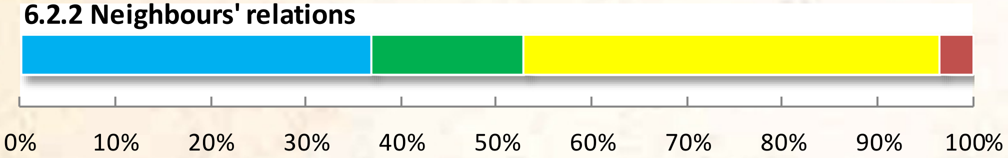
11% reported that they rarely have meeting with employees but recognise the need to keep them informed. 21% hold meetings as required. 10% schedule regular meetings and minutes are taken and toolbox meetings are held as required. 7% of the Members have monthly scheduled meetings with minutes taken and distributed to employees. In addition to that, toolbox meetings (very short and informal morning meetings between workers and supervisor) are held regularly.

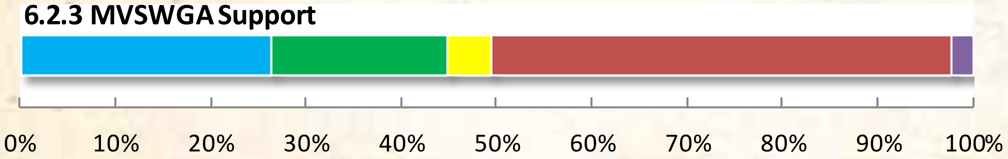
6.1.9 EMPLOYEE'S SAFETY

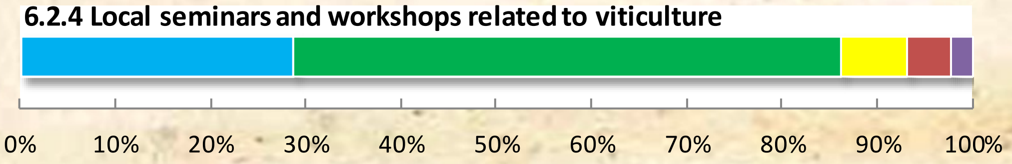
20% of the Members endeavour to follow safe practices, and follow legislative requirements. 11% also conduct informal OH&S training regularly. 18% have formal and informal OH&S training regularly and also have a incident/accident reporting system in place. Furthermore, they require or supply PPE (personal protective equipment). 11 % of the larger companies also have an OH&S committee who make recommendations.

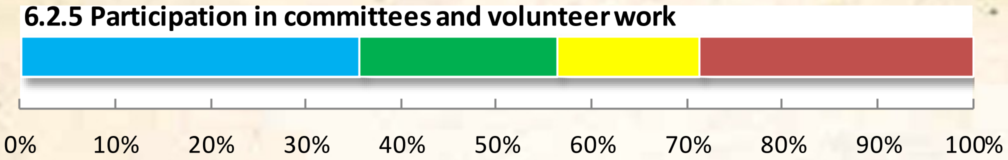
Excellent	Very Good	Good	Needs Attention	Needs Urgent Development	Non Applicable
4	3	2	1	0	N/A











6.2.1 KNOWLEDGE AND SUPPORT ON COMMUNITY INITIATIVES

5% of the Members are not aware of any community initiatives. 8% are aware of some community initiatives. 33% of the Members reported they are aware of some community initiatives and they have also helped to promote them. 31% of the Members, on the top of that, also have volunteered to help the development of community initiatives. 23% of the Members helped to promote these initiatives, also volunteering to help the development of the community initiatives but they have also encourage employees or other family members to be part of the initiatives.

6.2.2 NEIGHBOURS' RELATIONS

Only 3% of the members reported that don't have any contact with their neighbours. 44% reported they not only know their neighbours but they also exchange information with them regarding vine-yard matters on an as needs basis. 16% reported they often exchange information and ideas with them regarding vineyard matters. 37% of the Members, beside regular exchange of information with neighbours regarding vineyard matters also support them when necessary (e.g. during vintage, finding specialised service, equipment hire, loans, tips on how to do things, etc.)

6.2.3 MVSWGA SUPPORT

About 50% were not members of McLaren Vale Sustainable Winegrowing Australia in 2011. All the others have sent at least one written feedback to the program coordinator. 5% of the Members, who were previous members, informed they have helped to bring at list one new member to the program. 18% of the Members, who were also previous members reported that they not only helped to bring a new member but have also attended at least one of the events of the program. 26% of the members, in addition to that also have volunteered to help the program development.

6.2.4 LOCAL SEMINARS AND WORKSHOPS RELATED TO VITICULTURE

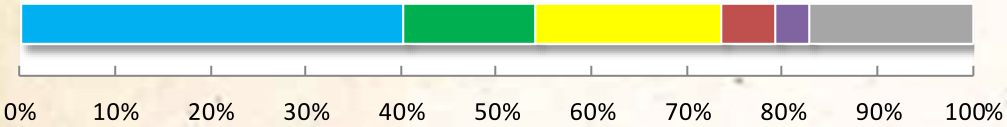
48% of the Members reported they have attended locally organised workshops and /or seminars but none in the last 24 months. 5% have attended locally organised workshops and/or seminars within the last 24 months. 18% have attended at least one locally organised seminar/workshop in the last 12 months. 26% have not only attended seminars within the last 12 months but also pro-vided feed-back on their training requirements.

6.2.5 PARTICIPATION IN COMMITTEES AND VOLUNTEER WORK

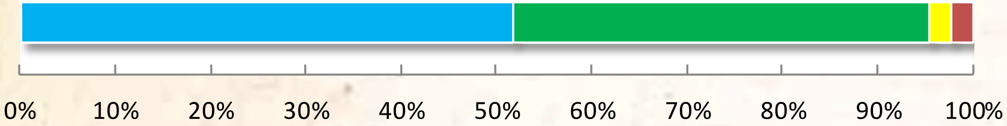
2% of the Members don't think committee participation and volunteer work is important. 5% be-lieve it is important but haven not had opportunities to participate. 7% had participated in com-mittees or volunteered in the last 24 months. 57% have participated in committees or volunteered in the last 12 months. 29% are on going members of committees and participate in voluntary work on a regular basis.

Excellent	Very Good	Good	Needs Attention	Needs Urgent Development	Non Applicable
4	3	2	1	0	N/A

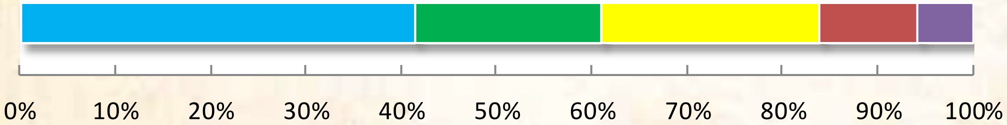
6.3.1 Contracts



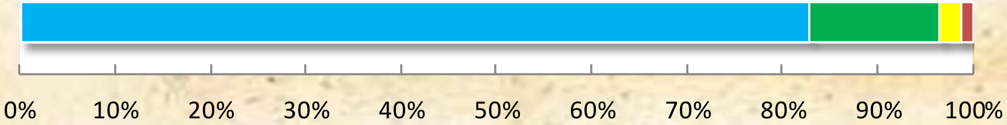
6.3.2 Communication with the winery



6.3.3 Grape grading



6.3.4 Grape production, quality and vineyard operations



6.3.1 CONTRACTS

7% of the Members do not have written contracts to sell their grapes. 7% reported that they usually sell their grapes using contracts and when they do, the contracts specify, at least, variety, price, amounts, payment conditions and delivery location. 14% always sell their grapes using contracts and the contract also specify the expected quality for the fruit and it also has a reward system for quality and quality and penalty control standard clauses. 40% of the Members, in addition to that, also specify other possible winery requirements, such as certifications, block details, tonnage, variety, areas clones, rootstock, irrigation system.

6.3.2 COMMUNICATION WITH THE WINERY

All growers think communication with the winery is important. 2% of the Members informed that prior to harvest they inform the overall situation in the vineyard that might impact on fruit quality or yield at least once prior to harvest. 43% reported they have an on-going dialogue with the winery during the growing season. 52% of the Members, in addition to that, reported that their communication with the wineries reinforces the contracts to assure meeting specification targets.

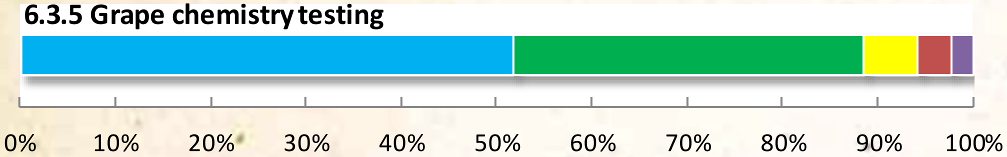
6.3.3 GRAPE GRADING

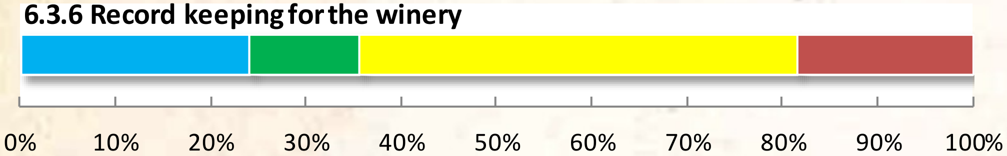
6% of the Members reported they do not know how their grapes are graded. 10% informed the grading system is based on a winery system and they said they have an overall understanding of the system. 23% use a winery system and the winery has explained how they grade their grapes. 20% of the Members use a winery system and also participate in vineyard assessment workshops with the wineries. 41% of the Members, in addition to all of that, also participate of comparative tastings at the wineries to learn how their wines compare to other growers/grades and when there is a different perception of quality between themselves and the winery, there is an option for dispute resolution.

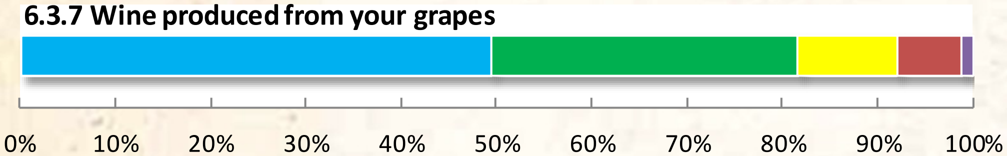
6.3.4 GRAPE PRODUCTION, QUALITY AND VINEYARD OPERATIONS

14% of the Members reported that operations that might impact on the grape quality are discussed with the winery on critical phenological stages to meet the winery requirements. 83%, in addition to that, informed they also participate in the decision on harvest date and grape maturity to meet the specifications (produce the best wine possible).

Excellent	Very Good	Good	Needs Attention	Needs Urgent Development	Non Applicable
4	3	2	1	0	N/A







6.3.5 GRAPE CHEMISTRY TESTING

2% do not perform chemical tests for the grapes. 3% only do when requested by the winery. 6% of the growers perform (or the winery) grape chemistry tests a least once before harvest, including TSS, TA and pH. 36% perform the same tests to follow up grape maturity. 52% do the same but also use historical data to help to improve operational decisions in the vineyard.

6.3.6 RECORD KEEPING FOR THE WINERY

18% of the Members reported they have their records available for the wineries upon request. 46% have their records available for the winery and the records are organised so they can be checked/be used to answer questions from the wineries during their visits. 24% of the Members, on the top of that, also send out regularly short reports, emphasizing the key operational issues in the vineyard (e.g. sprays, irrigation, rainfall, heat degree days, etc.) that might impact on the wineries' requirements.

6.3.7 WINE PRODUCED FROM OWN GAPES

Only one grower does not know what sort of wine is produced from their grapes. 7% informed they have an overall idea on what type of wine the wineries produce from their grapes. 10% informed they have a transparent relationship with the wineries which allows them to know what wine is produced from their grapes. They also have met all the specifications of the winery for their grapes. 50% of the Members, in addition to that, also make some wine from their blocks to benchmark their grapes/wines produced.

Excellent	Very Good	Good	Needs Attention	Needs Urgent Development	Non Applicable
4	3	2	1	0	N/A