



# Sustainability assessment in wine grape growing

Submitted by

**Irina Santiago-Brown**

Master of Viticulture (University of Adelaide)

Master of International Relations (Universidade de Brasilia)

Bachelor of Business Administration (Universidade Federal da Bahia)

A thesis submitted for the fulfillment of the requirements of a  
Doctor of Philosophy

School of Agriculture, Food and Wine  
School of Mathematical Sciences  
Adelaide Business School

July 2014

# Contents

CONTENTS	II
ABSTRACT	V
STATEMENT OF ORIGINALITY	VII
ACKNOWLEDGEMENTS	VIII
THESIS CONVENTIONS	XI
PUBLICATIONS	XII
PRESENTATIONS	XIII
ACRONYMS AND ABBREVIATIONS	XIV
LIST OF FIGURES	XV
LIST OF TABLES	XVI
<b>CHAPTER 1. INTRODUCTION</b>	<b>1</b>
<b>PREAMBLE</b>	<b>2</b>
<b>RESEARCH HISTORY AND METHODS</b>	<b>4</b>
<b>AIMS/OBJECTIVES</b>	<b>5</b>
<b>THEORETICAL FRAMEWORK</b>	<b>6</b>
<b>THESIS CHAPTERS</b>	<b>7</b>
CHAPTER 2	7
CHAPTER 3	10
CHAPTER 4	12
CHAPTER 5	13
<b>THE DEVELOPMENT OF THE McLAREN VALE SUSTAINABLE WINEGROWING AUSTRALIA</b>	<b>13</b>
<b>CHAPTER 2. WHAT DOES SUSTAINABILITY MEAN? KNOWLEDGE GLEANED FROM APPLYING MIXED METHODS RESEARCH TO WINE GRAPE GROWING</b>	<b>15</b>
<b>CHAPTER 2 - ABSTRACT</b>	<b>16</b>
<b>INTRODUCTION</b>	<b>16</b>
BACKGROUND	17
WHY WINE GRAPE GROWING?	19
MIXED METHOD CHOICE: A NEED TO STEP BACK AND RE-DESIGN THE RESEARCH	19
<b>MIXED METHODS IN SCIENCES</b>	<b>22</b>
<b>METHOD</b>	<b>22</b>
OUTSOURCING PARTICIPANTS	23
THE FOCUS GROUPS	26
<b>DATA ANALYSIS</b>	<b>29</b>
<b>RESULTS</b>	<b>31</b>
DEMOGRAPHICS AND ORGANIZATION'S CHARACTERISTICS	31
SUSTAINABILITY COMPONENTS AND SPHERES OF INFLUENCE: PARTICIPANT'S PERSPECTIVE	32
CONTENT AND CONCEPTS FROM TRANSCRIPTS	35
<b>DISCUSSION</b>	<b>40</b>
<b>CONCLUSIONS</b>	<b>45</b>
<b>CHAPTER 3. ECONOMIC, ENVIRONMENTAL AND SOCIAL INDICATORS TO ASSESS SUSTAINABILITY OF INDIVIDUAL AGRICULTURAL SYSTEMS: A WINE GRAPE GROWING CASE STUDY</b>	<b>48</b>

<b>CHAPTER 3 - STRUCTURED ABSTRACT</b>	<b>49</b>
<b>INTRODUCTION</b>	<b>50</b>
<b>INDICATORS</b>	<b>52</b>
INDICATORS: VIEWPOINTS AND APPROACHES	52
SOME EXAMPLES OF CURRENT SUSTAINABILITY APPROACHES: AGROECOLOGY AND CARBON FOOTPRINT	54
GOOD INDICATORS	56
<b>MATERIALS AND METHOD</b>	<b>57</b>
WINE REGIONS	58
PARTICIPANTS	59
THE HYBRID METHOD	59
DATA ANALYSIS	63
<b>RESULTS AND DISCUSSION</b>	<b>66</b>
INTERSECTED INDICATORS FOR A BETTER ASSESSMENT	67
THE PROPOSED INDICATORS	70
PROPOSED ECONOMIC INDICATORS	71
PROPOSED ENVIRONMENTAL INDICATORS	73
PROPOSED SOCIAL INDICATORS	76
A GOOD START FOR SYSTEMIC ASSESSMENT USING A TRIPLE BOTTOM LINE APPROACH	78
RECURRENT INDICATORS	80
<b>CONCLUSIONS</b>	<b>81</b>
<b>CHAPTER 4. COMPARISON OF SUSTAINABILITY ASSESSMENT PROGRAMS FOR VITICULTURE AND A CASE-STUDY ON PROGRAMS' ENGAGEMENT PROCESSES</b>	<b>85</b>
<b>ABSTRACT:</b>	<b>86</b>
<b>INTRODUCTION</b>	<b>86</b>
<b>METHODS OF MEASUREMENT AND ASSESSMENT IN SUSTAINABILITY PROGRAMS</b>	<b>88</b>
<b>RESEARCH METHOD</b>	<b>92</b>
DESCRIBING/DOCUMENTING SUSTAINABILITY PROGRAMS	92
EXPECTED BENEFITS, ENGAGEMENT STRATEGIES, INHIBITING FACTORS AND REPORTING SYSTEMS OF SUSTAINABILITY PROGRAMS	93
<b>DATA ANALYSIS</b>	<b>94</b>
<b>RESULTS AND DISCUSSIONS</b>	<b>96</b>
SUSTAINABILITY ASSESSMENT PROGRAMS FOR INDIVIDUAL ORGANISATIONS IN VITICULTURE	96
Lodi Winegrowing Commission Sustainable Workbook / Lodi Rules	96
Sustainable Winegrowing New Zealand - SWNZ	99
Vineyard Team (Sustainability in Practice – SIP)	102
Low Input Viticulture and Enology (LIVE)	103
Integrated Production of Wine (IPW)	105
California Sustainable Winegrowing Alliance – CSWA/California Sustainable Winegrowing Program (SWP)	109
VineBalance, New York State's Sustainable Viticulture Program and Long Island Sustainable Winegrowing	112
Wines of Chile – Sustainability program	116
McLaren Vale Sustainable Winegrowing Australia	117
COMPARISON OF PROGRAMS	121
CREATION OF SUSTAINABILITY ASSESSMENT PROGRAMS IN VITICULTURE: ENGAGEMENT PROCESSES; ENABLING AND INHIBITING FACTORS	131

Benefits (question 1 from focus group)	131
Inhibiting factors (question 2 from focus group)	134
Engagement process (question 3 focus group)	136
Reporting and sponsorships (questions 4 and 5)	138
<b>CONCLUSIONS</b>	<b>139</b>
<b>CHAPTER 5. CONCLUSIONS</b>	<b>141</b>
<b>SUMMARY, SIGNIFICANCE AND CONTRIBUTION TO THE DISCIPLINE</b>	<b>142</b>
<b>RECOMMENDATION FOR FUTURE RESEARCH</b>	<b>145</b>
<b>REFERENCES</b>	<b>147</b>
<b>APPENDIX</b>	<b>158</b>

## 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.

I give consent to this copy of my thesis when deposited in the University Library, being made available for loan and photocopying, subject to the provisions of the Copyright Act 1968.

The author acknowledges that copyright of published works contained within this thesis resides with the copyright holder(s) of those works.

I also give permission for the digital version of my thesis to be made available on the web, via the University's digital research repository, the Library Search and also through web search engines, unless permission has been granted by the University to restrict access for a period of time.

---

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 5<sup>th</sup>-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. *Sustainability*, 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.mclarenavale.info/sites/default/files/projects/mvswga\\_2012\\_-\\_workbook\\_report\\_results.pdf](http://www.mclarenavale.info/sites/default/files/projects/mvswga_2012_-_workbook_report_results.pdf) (in appendix)
10. Santiago, Irina. (2012) *McLaren Vale Sustainable Winegrowing Australia. 2012 Results*. Retrieved 7/2/2014, from [http://www.mclarenavale.info/sites/default/files/projects/sustainability\\_report\\_2013\\_0.pdf](http://www.mclarenavale.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
All	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 Palaeartic Regional Section (form IOBC)
WSB	Wine and Spirit Board of South Africa

## List of Figures

Figure 2-1 - Average attributed importance to components of sustainability by 83 participants: (a) pie chart, (b) parallel coordinate.....	33
Figure 2-2 - Percentage of 3416 references coded in Nvivo, attributed to the three components of sustainability .....	34
Figure 2-3 - Relative importance of sustainability spheres of influence on sustainability of 82 vineyards (1 abstention) .....	34
Figure 2-4 - (a) Ranked concepts (Leximancer) and (b) tag cloud of word frequency (Nvivo) from reference coding (total of 3416 references) .....	36
Figure 2-5 - Sustainability automated concept map, showing the three main emergent themes: (1) vineyard, (2) soil and (3) quality.....	38
Figure 2-6 - Automated toggle pathway from Leximancer between pairs of chosen sustainability concepts from concept map (Figure 5) .....	40
Figure 2-7 - A Sustainability definition: (a) classic triple bottom-line approach (b) proposed representation emphasizing time and trade-offs.....	41
Figure 3-1- Spider graph of ranked economic indicators, alphabetically ordered .....	72
Figure 3-2 - Spider graph of ranked environmental indicators, alphabetically ordered.....	74
Figure 3-3- Spider graph of ranked social indicators, alphabetically ordered .....	77
Figure 3-4- Top 30 sustainability indicators, ranked by the Adjusted Importance Index (AII). 79	
Figure 4-1 (a) – Benefits (a) and inhibiting factors (b) for growers’ participation in wine growing sustainability programs .....	132
Figure 4-2 - Engagement process for growers’ participation in wine growing sustainability programs.....	137
Figure 4-3 -Suggested results reported by wine grape growers to obtain funding for wine growing sustainability programs .....	139

## List of Tables

Table 1-1. Group discussion stages, technique, participants and purpose .....	4
Table 2-1 - Focus group questions – Stage1 .....	27
Table 2-2 - Focus group participants and their organizations' characteristics .....	32
Table 3-1- Group interviewing and discussion stages.....	58
Table 3-2- Examples of how indicators were merged (as original lists).....	64
Table 3-3- Summary of number of indicators in each step of data processing .....	67
Table 3-4- Sustainability indicators.....	68
Table 3-5- Recurrent indicators .....	80
Table 4-1 Methods of assessment of sustainability (examples from viticulture) .....	90
Table 4-2 - Focus group question: stage 3 used for this article .....	94
Table 4-3 - Wine growing sustainability programs comparison .....	122
Table 4-4 - Sustainability programs for viticulture: number of assessment topics and content .....	129