EXECUTIVE SUMMARY

GWRDC PROJECT GWR 08/04

"Assessment of Economic Cost of Endemic Pests & Diseases on the Australian Grape & Wine Industry"

Prepared for : **GWRDC**

By : **Scholefield Robinson Horticultural Services Pty Ltd and EconSearch Pty Ltd**

Date : **March 2010**



PROJECT NO.

GWRDC Project GWR 08/04

PROJECT TITLE

"Assessment of Economic Cost of Endemic Pests & Diseases on the Australian Grape & Wine Industry" Final Report

PROJECT LEADERS

Dr Peter Scholefield
Principal Consultant/Director
Scholefield Robinson Horticultural Services Pty Ltd
PO Box 650
Fullarton SA 5063

Ph: (08) 8373 2488
Fax: (08) 8373 2442
srhs@srhs.com.au
www.srhs.com.au

Dr Julian Morison
Managing Director
EconSearch Pty Ltd
214 Kensington Road
Marryatville SA 5068

Ph: (08) 8431 5533
Fax: (08) 8431 7710
jbmorison@econsearch.com.au
www.econsearch.com.au

ACKNOWLEDGMENTS

We gratefully acknowledge the inputs to the project by:

- GWRDC Steering Committee, Dr Troy Fischer and Dr Mark Krstic.
- Project Team members from Scholefield Robinson and EconSearch.
- Industry Reference Group members Hugh Armstrong, Richard Hamilton, Vic Patrick and David Paxton.
- The many industry and research personnel who attended and contributed to the Workshop held on 3rd August 2009.
- The many respondents to the survey distributed within the winery, grape grower and RD&E communities.
- The specific winery growers liaison officers and regional grape growers who provided details of spray programs used in their regions.
- Anne-Marie Strudwick of Scholefield Robinson who was responsible for the layout and production of this report.

DISCLAIMER

This report has been prepared exclusively for the use and benefit of our client, Grape and Wine Research and Development Corporation (GWRDC). Neither Scholefield Robinson Horticultural Services Pty Ltd, EconSearch Pty Ltd, nor any employees of these firms undertakes responsibility in any way whatsoever to any person (other than to the above mentioned client) in respect of the report including any errors or omissions therein however caused.

MARCH 2010

EXECUTIVE SUMMARY

The Grape and Wine Research and Development Corporation (GWRDC) engaged Scholefield Robinson Horticultural Services Pty Ltd (Scholefield Robinson) and EconSearch Pty Ltd (EconSearch) to estimate the economic impact of the endemic pests and diseases of viticulture in Australia in order to provide current data on their absolute and relative cost to the grape and wine industry. Exotic pests and diseases are not included in this project.

The project objectives formulated by GWRDC were to:

- Collate a list of endemic pests and diseases considered to impact significantly on the productivity of winegrape producers in Australia;
- Collate all available contemporary estimates of the per annum economic impact of these pests and diseases on the profitability of Australian winegrape producers and identify pests including new and emerging pests and diseases for which no estimates of impact are available;
- Develop impact estimates using economic modelling for all significant pests and diseases (selected in consultation with relevant stakeholders) using consistent methodology; and
- Assess qualitatively how research investment on a specified list of pests and diseases might result in the largest return, for example through new prediction models, new control options, improved extension of current control recommendations, or a combination of these.

The project team was made up of Scholefield Robinson consultants with both grape and wine industry experience and pest and disease skills, EconSearch economists with grape and wine industry experience and a panel of industry personnel with “hands on” experience as grape growers, winery viticulturists and chemical company specialists.

This was a project assessing the economic impact over the national industry. The project team divided the industry into climatic zones based on Mean January Temperature (MJT) and Growing Season Rainfall (GSR) as described in Dry and Coombe (2008).

Five climatic zones were selected:

- Hot-wet (MJT >21°C, GSR >300mm);
- Hot-dry (MJT >21°C, GSR <300mm);
- Warm-wet (MJT 19-20.9°C, GSR >300mm);
- Warm-dry (MJT 19-20.9°C, GSR <300mm);
- Cool (MJT <19°C, GSR >300mm).

The Australian wine zones as defined by AWBC as part of their Australian Geographic Indicators (GI) register were allocated to the selected climatic zones (Table ES1). The climatic zones contained wine zones from different states with similar climatic characteristics and pest and disease issues.

Table ES1 : Wine Zones allocated to Climatic Zones

Hot-Wet	Hot-Dry	Warm- Wet	Warm- Dry	Cool
Central Ranges, NSW	Big Rivers, NSW	Northern Slopes, NSW	South West WA	South Coast, NSW
Hunter Valley, NSW	Greater Perth, WA	Central VIC	Fleurieu, SA	Gippsland, VIC
Southern NSW	Central WA	Mt Lofty Ranges, SA	Barossa Valley, SA	Port Phillip, VIC
Northern Rivers, NSW	North West VIC			Western VIC
North East VIC	Lower Murray, SA			Limestone Coast, SA
Queensland	Far North, SA			Tasmania

The wine zones were aggregated into climatic zones to allow more pest and disease data to be collected from a larger vineyard area and to reduce the number of economic analyses required while still allowing for meaningful comparison between regions, pests and diseases.

A long list of pests and diseases was presented to industry for prioritising using an industry survey and workshop. The list was reduced to 13 individual or groups of pests and diseases that formed the basis of the economic impact assessment. These priority pests and diseases are:

Table ES2 : Pests & diseases in industry priority order used in the project

Priority Ranking[(a)]	Pest or Disease Name
1	Powdery Mildew
2	Botrytis and Other Bunch Rots
3	Light Brown Apple Moth
4	Downy Mildew
5	Birds
6	Trunk Diseases
7	Garden Weevil
8	Root-Knot and Other Nematodes
9	Trunk Boring Insects
10	Phylloxera
11	Root Rots
12	Viruses and Transmissible Organisms
13	Mealy bugs and Scale

(a) Based on industry survey and workshop discussions.

Information on pest and disease management programs, incidence and frequency of infestation and yield loss was sourced from attendees at the workshop, survey respondents, contacts with grape growers, winery personnel, chemical supply companies and the Project Industry Reference Group. These data formed the basis to the assumptions used in the economic model for assessing economic impact of pests and diseases.

The methodology used by EconSearch for the economic modelling and analysis is described in detail in Section 5 of this report.

Examples of the data and assumptions applied in the economic model are presented for Powdery Mildew, Light Brown Apple Moth, and Trunk Diseases in Tables ES3, ES4 and ES5 respectively.

Table ES3 : Examples of the data & assumptions applied in the economic model for Powdery Mildew

Climatic Zone	Costs - Preventative Spray Program			Impact on Production	
	Chemical	Application		Annual Frequency	Mean Yield Loss
	$/ha/year	$/ha/applic	Number/year	Probability (%)	Percent
Hot Dry	$78	$50	3.0	25.0%	5.0%
Hot Wet	$86	$60	3.0	33.3%	7.5%
Warm Dry	$73	$60	3.5	50.0%	10.0%
Warm Wet	$86	$80	3.5	50.0%	10.0%
Cool	$104	$60	4.0	50.0%	10.0%

Table ES4 : Examples of the data & assumptions applied in the economic model for Light Brown Apple Moth

	Costs - Preventative Spray Program			Impact on Production	
Climatic Zone	Chemical	Application		Annual Frequency	Mean Yield Loss
	$/ha/year	$/ha/applic	Number/year	Probability	Percent
Hot Dry	$23	$50	0.2	20.0%	3.0%
Hot Wet	$40	$60	0.4	33.3%	3.0%
Warm Dry	$56	$60	0.2	33.3%	3.0%
Warm Wet	$40	$80	0.4	33.3%	3.0%
Cool	$80	$60	0.5	33.3%	3.0%

Table ES5 : Examples of the data & assumptions applied in the economic model for Trunk Diseases

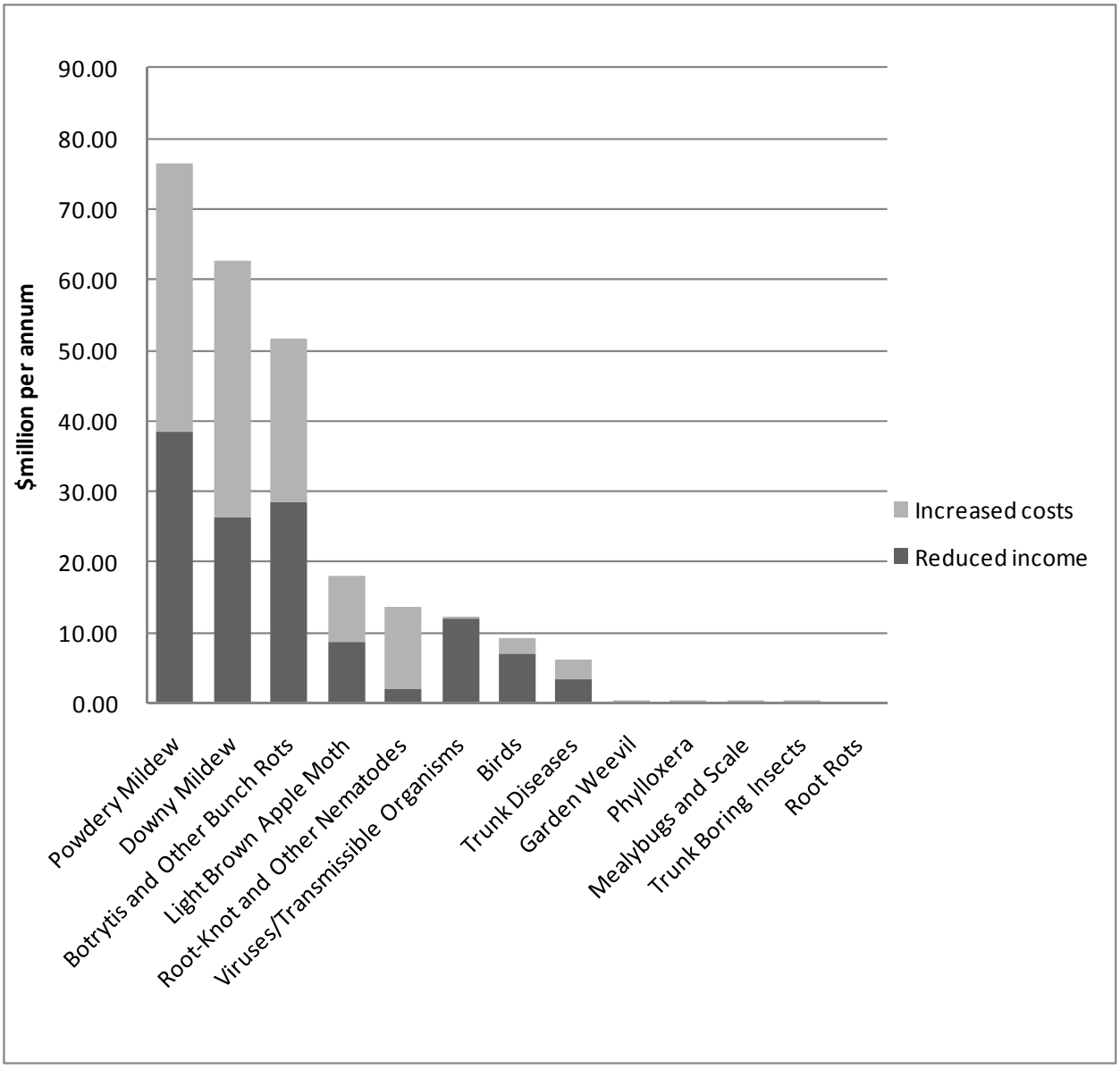
	Costs - Prevention and Control				Impact on Production		
Climatic Zone	Ad-hoc Surgery		Remedial Surgery		Annual Frequency	Incidence	Mean Yield Loss
	$/ha	% area/year	$/ha	% area/year	Probability (%)	% area/year	Percent
Hot Dry	$50	0.0%	$2,800	0.0%	100%	1.0%	0.5%
Hot Wet	$50	1.0%	$2,800	1.0%	100%	5.0%	10.0%
Warm Dry	$50	5.0%	$2,800	1.0%	100%	10.0%	10.0%
Warm Wet	$50	5.0%	$2,800	1.0%	100%	10.0%	10.0%
Cool	$50	5.0%	$2,088	1.0%	100%	10.0%	20.0%

For Powdery Mildew and Light Brown Apple Moth the cost of chemical ($/ha/year), application costs ($/ha/application) and number of applications (apportioned to the pest or disease based on tank mixes used) allow costs to be calculated. The impact on production was calculated using the annual probability of the pest or disease occurring, the regional loss as % of total winegrape area in the region and yield loss.

The assumptions for Trunk Diseases included costs for ad-hoc and remedial surgery, the frequency (annual probability) of the disease occurring, the proportion of area in the zone affected and the yield loss per hectare.

The national economic impact of individual pests and diseases across all climatic zones was calculated and is presented graphically in Figure ES1. The impact is separated into increased costs and reduced income. For further analysis and comparison of these impacts, the pests and diseases were allocated to three groups, Group A High Impact, (Powdery Mildew to Botrytis), Group B Low/Medium Impact, (Light Brown Apple Moth to Trunk Diseases) and Group C Very Low Impact, (Garden Weevil to Root Rots) as shown in Figure ES1.

Figure ES1 : Average industry-wide economic impact of selected winegrape pests & diseases in Australia[a]



[a] In constant 2009 dollars.
Source: EconSearch analysis.

Table ES6 presents a summary of the National Economic Impact of pests and diseases and GWRDC funding for the priority pests and diseases.

Table ES6 : Comparison of pests and diseases in order of Mean Economic Impact ($) and GWRDC funding on these pests and diseases

Pest or Disease	Grouping Based on Economic Impact	Mean National Economic Impact[a]		GWRDC Funding[b],[c]	
		$m/annum	%	$m	%
Powdery Mildew	Group A *High Impact*	76		3.35	
Downy Mildew		63		1.68	
Botrytis & Other Bunch Rots		52		2.86	
	Sub Total	191	(76%)	7.89	(47.9%)
Light Brown Apple Moth	Group B *Low/ Medium Impact*	18		0.04	
Root-Knot & Other Nematodes		14		0.21	
Viruses/Transmissible Organisms		12		1.67	
Birds		9		0	
Trunk Diseases		6		3.03	
	Sub Total	59	(23.8%)	4.95	(30.1%)
Garden Weevil	Group C *Very Low Impact*	0.3		0.37	
Phylloxera		0.2		2.90	
Mealy bugs and Scale		0.1		0.34	
Trunk Boring Insects		0.02		0.02	
Root Rots		0.01		0	
	Sub Total	0.5	(0.2%)	3.63	(22.0%)
	TOTAL	$251m	(100%)	16.47	(100.0%)

(a) From Table 55, this report (2009 dollars).
(b) Total 1993/94 - present adjusted to 2009 dollars.
(c) Note that GWRDC has also funded R&D for mites and for Phomopsis and Black Spot totalling $0.71 (in 2009 dollars) not included in this table.

The estimated annual economic impact of pests and diseases across the Australian winegrape industry varied between $76m to $52m for Group A, $18m to $6.2m for Group B, and very low <$0.5m for Group C. Across all pests and diseases the total National Economic Impact was $251m per annum. It should be noted that National Economic Impact refers to the estimated annual impact. However, several pests and diseases have a relatively low estimated annual national economic impact but can have relatively high potential national economic impact (eg Phylloxera).

The National Economic Impact was related to the investment by GWRDC in RD&E from 1993/94 to the present. During this period a total of $17.2m was expended on all pest and disease projects with the major allocation to Powdery Mildew ($3.4m), Trunk diseases ($3.0m), Phylloxera ($2.9m), Botrytis and other bunch rots ($2.9m), Downy Mildew ($1.7m) and Viruses/Transmissible diseases ($1.7m).

Table ES7 compares the rankings of the pests and diseases for Mean Economic Impact, Survey and Workshop priorities and GWRDC funding.

Table ES7 : Comparison of ranking of pests and diseases for Mean Economic Impact, Survey and Workshop Priorities and GWRDC funding from 1993 to 2009

		Ranking Base[a]		
Pest or Disease	Grouping Based on Economic Impact	Mean National Economic Impact	Survey & Workshop Priorities	GWRDC Funding
Powdery Mildew	Group A *High Impact*	1	1	1
Downy Mildew		2	4	5
Botrytis & Other Bunch Rots		3	2	4
Light Brown Apple Moth	Group B *Low/ Medium Impact*	4	3	10
Root-Knot & Other Nematodes		5	8	9
Viruses/Transmissible Organisms		6	12	6
Birds		7	5	12 equal
Trunk Diseases		8	6	2
Garden Weevil	Group C *Very Low Impact*	9	7	7
Phylloxera		10	10	3
Mealy bugs and Scale		11	13	8
Trunk Boring Insects		12	9	11
Root Rots		13	11	12 equal

(a) Refer to Table ES6 above for economic impact dollars and GWRDC funding dollars that are the basis for these rankings.

The rankings of the 13 pests and diseases in Table ES7 for their National Economic Impact correlated closely with the ranking from the industry survey and workshop priorities. The main variation was the lower ranking (12th) in the survey and workshop priority for Viruses/Transmissible Organisms compared with a ranking of 6th in the National Economic Impact.

However, the ranking of the National Economic Impact of the 13 priority pests and diseases compared less closely with the ranking of GWRDC expenditure since 1993/94. For example, Light Brown Apple Moth, Root-Knot and other Nematodes and Birds ranked lower for GWRDC funding than their ranking based on National Economic Impact, while Trunk Diseases and Phylloxera received a much higher ranking for level of GWRDC funding than the National Economic Impact indicated.

The difference in these rankings may be related to changing priorities for GWRDC funding extending over the 13 year period to 2009/10 while the National Economic Impact was estimated for the 2009 year. It may also be related to the number of submissions made by RD&E agencies to GWRDC for funding of research on these pests and diseases.

Implications

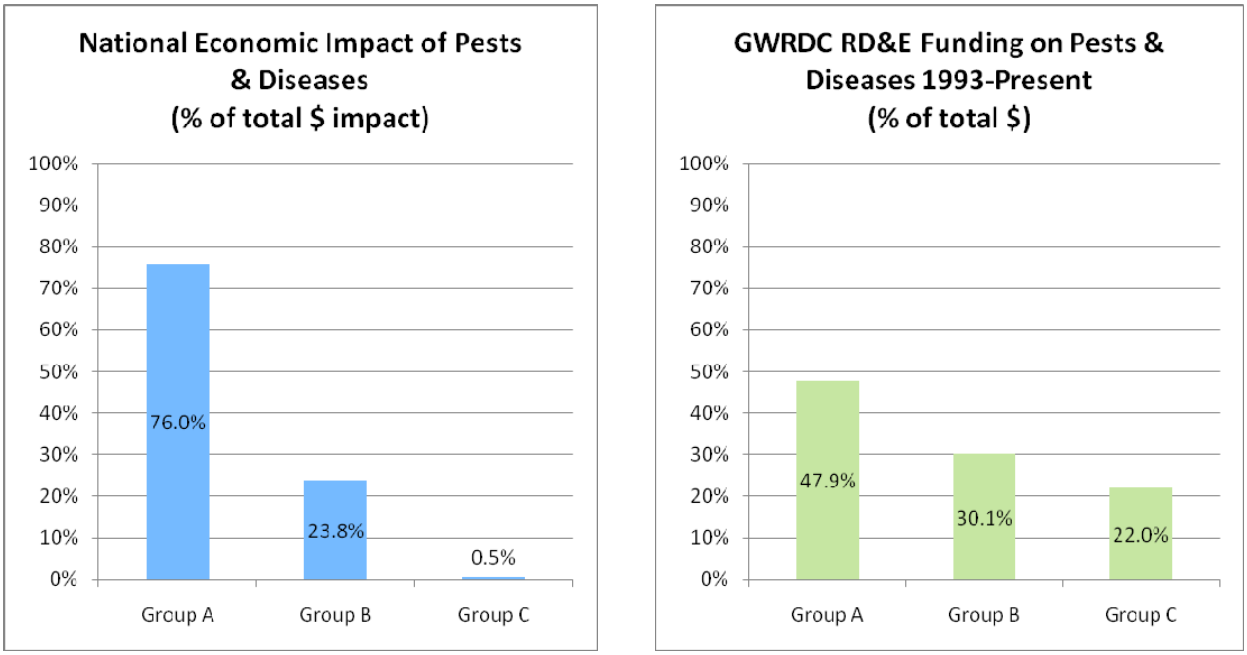
Pest and disease RD&E funding must have a balance between basic research, applied research and the extension of research findings in a practical way to grape growers. Not all of these RD&E activities have immediate economic impacts for the grape industry but some are still very important for the industry, particularly those which address pests and diseases with high potential economic impact. Examples include:

- Phylloxera is a real and perceived threat to Australian viticulture because only a small proportion of vineyards are grafted on rootstocks that have resistance to phylloxera. Most vineyards are therefore susceptible to phylloxera. Monitoring, vineyard surveillance, grower awareness, and quarantine are all critical to the containment of phylloxera. In addition, technical research capability must be maintained in RD&E agencies to ensure that in the (almost certain) event of future outbreaks of phylloxera, specialists are available to advise on the best course of action.

- Grapevine viruses and transmissible diseases have had demonstrated negative impacts on the productivity of vineyards. They are mainly spread in infected planting material. Control is not possible once a vine is infected. Clean planting material is the only way to reduce the economic impact of virus diseases. The technology of testing vines for viruses and the rapid expansion of knowledge of viruses using new scientific methods requires that specialist scientific staff be available and supported. A national capacity in grapevine virus research and testing capacity is necessary.
- Some pests and diseases can be severe but localised in their impact (Garden Weevil in WA, Trunk Borers in the Hunter Valley and Langhorne Creek, Birds, etc). Their national impact is low. RD&E funding is warranted at the local level, and the risk of spread to other regions warrants investment in RD&E to be ahead of future problems, rather than having to catch up if the problem expands.
- "Blue sky" RD&E can generate useful information for understanding pests and diseases, their changing threat profiles and a proportion of investment is warranted in this research.

Figure ES2 presents graphically a comparison of economic impact over Groups A, B & C pests and diseases with GWRDC funding for the same Groups.

Figure ES2 : Comparison of Economic Impact and GWRDC funding



The difficulty for priority setting and investment in RD&E funded by industry levies and matching federal funds is that the immediate issues facing growers demand attention and the scientific capacity of the agencies is only appreciated when a new problem emerges. The need for preparedness is important but inadequately recognised. GWRDC has an industry leadership role in striking a balance between these competing interests for RD&E funding and a legal obligation (as signatories to the EPPRD) to address biosecurity generally by developing Risk Management Strategies.

Note: For more details on the information presented in this Executive Summary, readers are referred to the full report available from GWRDC.

The "Table of Contents" page from the full report is attached to this Executive Summary to provide readers with more detail on the report.

TABLE OF CONTENTS

Glossary ..... **vii**

Executive Summary ..... **viii**

1 Introduction **1**
1.1 Scope 1
1.2 Project Objectives 1
1.3 Project Team & Management 1

2 Methodology **2**
2.1 Inception Meeting 2
2.2 Industry Reference Group 2
2.3 Issues Paper and Survey 2
2.4 Workshop 2
2.5 Initial Estimates 3
2.6 Prioritisation 3
2.7 Design of Economic Model 3
2.8 Operation of Economic Model 3
2.9 Draft Report 3
2.10 Final Report and Distribution 3
2.11 Summary of Methodology 3

3 Project Development & Planning **4**
3.1 Introduction 4
3.2 Selection of Climatic Zones 4
3.3 Selection of Pests & Diseases 6
3.4 Types of Data Required 6
3.5 Data Acquisition 6
3.6 Analysis and Synthesis into Model 7

4 Survey, Workshop & Consultation **7**
4.1 Data Acquisition 7
4.2 Issues Paper 7
4.3 Survey 7
4.4 Workshop 8
4.5 Description of Priority Pests & Diseases 12
4.6 "Organic" Production Systems 14

5 Economic Modelling **15**
5.1 Introduction 15
5.2 Modelling the Economic Impact of Pests & Diseases 15
5.3 Physical & Economic Characteristics of the Australian Winegrape Industry 39
5.4 Estimates of the National Economic Impact of Selected Winegrape Pests & Diseases 41
5.5 Summary & Conclusions 76

6 Findings Related to Investment in RD&E **78**
6.1 Introduction 78
6.2 Past GWRDC Funding 78
6.3 Comparison of Economic Impact of Pests & Diseases & GWRDC RD&E Funding 80
6.4 Comments on GWRDC Funding & Industry Needs 83

7 Implications for GWRDC **85**
7.1 RD&E for Pests & Diseases: An Overseas Example 85
7.2 Findings from the Present Project 86