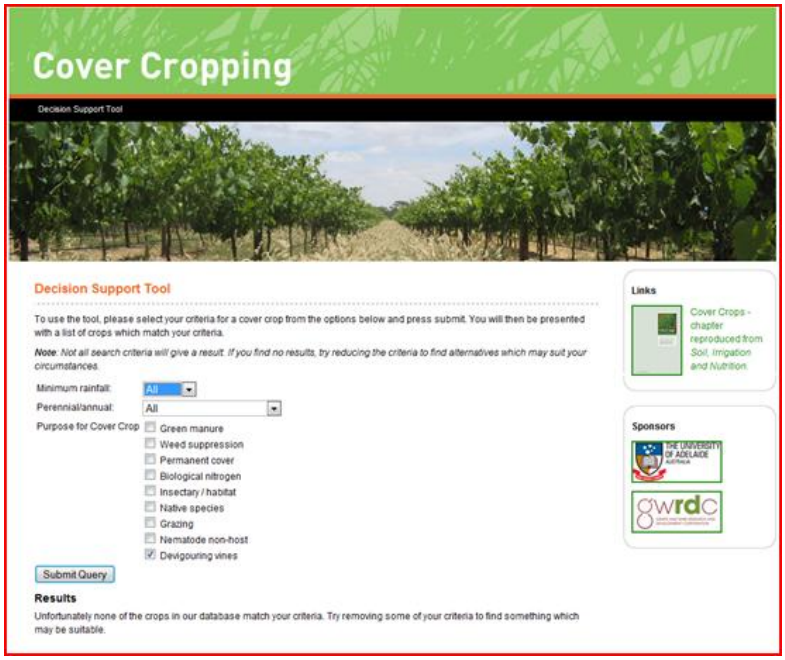
Building vineyard resilience through improved floor management practices



FINAL REPORT to

GRAPE AND WINE RESEARCH & DEVELOPMENT CORPORATION

Project Number: **UA 1001**

Principal Investigator: **Mr Christopher Penfold**

Research Organisation: **University of Adelaide**

Date: **July 2011**

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GWRDC Final Report

Project No. UA 1001

Principal Investigator: Mr Christopher Penfold
Project Supervisor: Dr. Cassandra Collins

University of Adelaide

July 2011

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Abstract

Cover crops and their management are important to the function of a vineyard. They serve many roles including soil protection, habitat for beneficial insects, biological nitrogen fixation, enabling machinery access and regulation of soil moisture availability. Much of the information required by growers, service providers and students of viticulture on cover cropping was previously difficult to access. Now, through a series of fact sheets and a web-based decision support tool, cover crop selection and management will be considerably easier. The information is now accessible on the GWRDC website.

Executive summary

The vineyard mid-row accounts for approximately 60% of the floor area. While this zone of the vineyard is generally not income generating, it performs critical ecosystem services that impact on the overall performance of the vines and resultant fruit quality. Best management practice of the mid-row is determined by factors such as rainfall, desired yield and quality, soil type, organic/biodynamic or conventional systems and endemic vegetation.

This project aimed to provide growers, students and service providers with information on the contributions that cover crops make to overall vineyard management via web based media. Coupled with this web based information is a decision support tool designed to assist in determining the most appropriate cover crop for particular environments. Both delivery mechanisms are user friendly, with links to further information should it be required.

The information utilized was distilled from books, web sources and the scientific literature. Much of the information was irrelevant to the Australian viticultural industry. For example, cover crops are regularly used for reducing vine vigour in California, but in most cases in Australia their water use has to be minimal to prevent competition with the vines. From this information, a series of fact sheets were produced on the impacts of cover crops on frost, biodiversity, weed suppression, nematode populations, vine nutrition, native ground covers and seeding guidelines. As background information to these, an Innovators Network power point presentation and supporting information was produced. In addition, a web based decision support tool was developed in conjunction with Arris Pty. Ltd. This enables users to select from three options (rainfall, crop type (perennial / annual) and intended use) and the tool will deliver the species best suited to those criteria along with supporting information.

It is expected that a wide range of clientele will appreciate the simplicity of this tool and the value of the supporting fact sheets provided on the GWRDC website. It is

also expected the site will be continuously updated as further information becomes available.

The support from growers and winemakers through the GWRDC, which has enabled the preparation and development of these information sources, is gratefully acknowledged.

Background

The wine industry, with support from the Australian Government, has endorsed the need to pursue an environmentally sustainable Australia. Vineyards account for approximately 160,000 ha of Australian land use, and the industry is now worth some three billion dollars. To maintain the reputation of environmentally responsible production in an increasingly competitive and discerning retail landscape, it is imperative that a strong research and information dissemination focus is maintained on resource management, including:

- Reducing pesticide requirements
- Reducing fossil fuel input
- Reducing input costs
- Simultaneously addressing soil health and carbon sequestration
- Increasing vineyard biodiversity by strategic introduction of native species (Danne et al, 2009)

The chief investigator for this proposal has now completed a preliminary investigation of replacing conventional exotic cover crop species in vineyards with native grass and saltbush species (Project SAR 04/02 – Soil Management for Yield and Quality). A major outcome of this project was the increase in beneficial invertebrate populations where habitat was improved through the introduction of native perennial species.

There has been a substantial amount of research conducted into cover cropping, but this is not readily accessible. Coupled with this is a recognized need for ready access to information on cover crops which will also be addressed within this project.

Project Aims and Performance Targets

Project Aims

1. To generate a web based tool that will assist growers in making decisions on which cover crop to grow as well as information on management, benefits and costs.

2. To produce a set of materials on cover cropping for use in the GWRDC Innovators Network. This could be easily made available on the GWRDC website for industry stakeholders.

3. To support industry in their quest to develop and introduce sustainable viticultural practices.

Outputs and Activities 2010-2011

Year 1	Output	Target Date dd/mm/yy	Activities
a	Cover cropping information	15/6/10	Cover cropping web site development initiated
b	Cover cropping information	28/2/11	Power point and information fact sheets produced
c	Cover cropping information	31/3/11	Web site development - 'draft' completed and sent to growers / students for assessment
d	Cover cropping information	30/4/11	Web site development completed
e	Cover cropping information	30/6/11	Final report completed and delivered

Method

This desktop project required accessing and scrutinizing the relevant literature on cover cropping from books, web-based publications and scientific papers, then synthesizing this with the chief investigators experiences from over 10 years of working with cover crops. This information was then packaged in the form of factsheets and a presentation for the GWRDC Innovator Network Program. The information was then used to create a web based decision support tool in conjunction with Arris Pty. Ltd. To do this the primary plant types used as cover crops in Australia were determined, providing a total of 27. For each of these, their preferred minimum growing rainfall, whether annual of perennial and their functions as cover crops were listed. This formed the backbone of the web page which users would respond to prior to obtaining a listing of the possible plant types for the established criteria. Each plant type is accompanied by a fact sheet which provides information regarding its potential use in the vineyard as a cover crop, benefits to be derived, nematode host status, legume status, weed competitiveness, and agronomic information including seeding rates and approximate seed costs.

Results / Discussion

The results of this work are fact sheets that have been presented to GWRDC for placement on the web. They cover the topics of;

- Cover crops and frost
- Cover crops and vine nutrition
- Cover crop seeding guidelines
- Cover cropping using native species
- Cover crops and weed suppression
- Cover crops and nematodes
- Cover crops and biodiversity

The decision support tool (available at http://www.covercropfinder.com.au until placed on website) very simply enables the options for cover crops suitable for particular environments and purposes to be instantly provided to growers, their advisers, students and other interested parties. In addition, each cover crop genus used in the decision support tool, of which there are 27, has a fact sheet attached to it providing information on the value of the cover crop for particular purposes, seed cost, sowing and management guidelines. Limited evaluation of the decision support tool has provided very positive feedback. Potential users must now be made aware of the sites existence, and as this occurs it is expected that it will prove a popular tool in decision making.

Outcome / Conclusion

The nature of this project changed from its original intent, and that of the project title “Building vineyard resilience through improved floor management practices” through changes in funding availability. The project has produced what is expected to be very useful and readily accessible information about cover cropping for a wide range of client group associated or directly involved in the viticulture industry.
The benefit of this work to the Australian wine industry will depend on several factors viz;

- Growers, students, advisers awareness of the information and then accessing and using it
- Growers present practice – many are already excellent practitioners that will gain little from the site. Others will have access to sufficient information to convince them to change practices, and the mechanism to do so.
- The financial status of the industry. Some suggested practices require significant initial input to purchase seed, which will suppress willingness for change.

The economic benefits which may be generated from the adoption of this work could in the extreme case mean the difference between growers being able to sell their fruit and not. For example, the most recent season, where heavy and continuous rainfall required regular access to the vineyard for fungicide application, tilled soil restricted access. It also led to excessive vegetative growth with large canopies restricting air-flow, increasing disease pressure. Where active cover crops were present some of the available moisture was utilized which enabled spray unit access to the vineyards. Some wineries now require growers to pay attention to vineyard floor management, and within schemes such as EntWine, ecologically sound vineyard floor management practices are required for certification. It is therefore expected that the outcomes of this project will provide a recommended tool for growers to use when improving vineyard floor management becomes a priority.

Recommendations

In researching this project, the dearth of information on native species suitable for cover cropping became apparent. It is therefore recommended that as funds become available further research is conducted into species compatibility with a range of environments, and their agronomic requirements, to enable growers to establish perennial native swards when required.

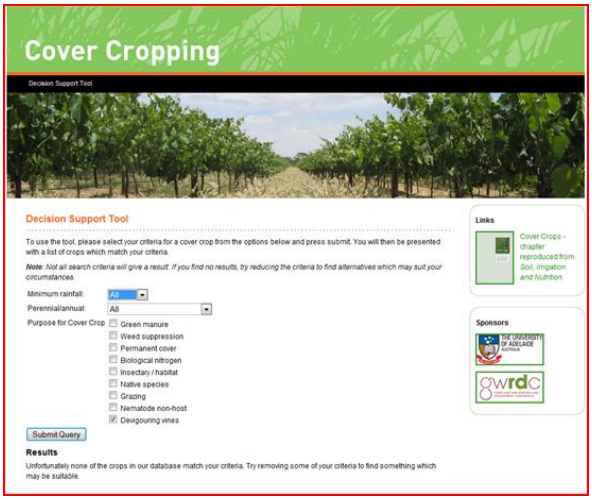
Unlike a book where once printed it cannot be altered until a new edition is published, the web allows updating and additions as new information becomes available from numerous sources. With regards to the information provided in this project, it is expected that new fact sheets will be added over the next three years, particularly in relation to organic and biodynamic systems and their floor management practices. Where new information is provided from sources other than the authors, it would be appreciated if the authors were able to maintain editing rights in conjunction with GWRDC personnel to ensure a consistency in the message being presented – that is the enhancement of environmental and economic sustainability.

Informing the client group of the existence of this information is a priority and will be pursued at the earliest opportunity but prior to autumn of 2012.

Appendix 1. Communication

The project is one of communication via the production of fact sheets and a decision support tool, both of which are located on the GWRDC web site. These have only just been completed, but already Tony Hoare (Hoare Consulting) has alluded to their arrival in the Wine and Viticulture Journal (May/June 2011). As agribusiness supply much of the advice and cover crop seed to growers, flyers will be sent to those businesses in the grape growing regions prior to the 2012 season.

The cover cropping web page is shown below.



The fact sheets produced for this project are included in the appendices of this report.

The chief investigator was involved in numerous group meetings before and during the course of this project, including Biodiversity in Vineyards Workshops at Nuriootpa and McLaren Vale, Soil Management Field Days at Langhorne Creek and McLaren Vale, the Australian Wine Industry Technical Conference and a seminar with the Mornington Peninsula Grapegrowers. On each of these occasions' the participants have been informed of the present project and the predicted time it will go on-line.

Appendix 2. Intellectual Property

The IP generated during this work has been translated to the fact sheets and decision support tool for general access. No further IP is claimed for this work.

Appendix 3. References

Barnes AM, Wratten SD, Sandhu HS Harnessing biodiversity to improve vineyard sustainability. In 'Proceedings of the Organic Fruit Conference', September, 2010 2008, Vignola, Italy. (Eds RK Prange and SD Bishop), pp. 67-74.

Danne, A., Thomson, L.J., Sharley, D.J., Penfold, C.M. and Hoffmann, A.A. (2010) Effects of Native Grass Cover Crops On Beneficial and Pest Invertebrates in Australian Vineyards. Environmental Entomology, 39 (3) Pgs. 970 -978

Fourie JC, Louw PJE, Agenbag GA (2006) Cover crop management in a Chardonnay/99 Richter vineyard in the Coastal Wine Grape Region, South Africa. 1. Effect of two management practices on selected grass and broadleaf species. *South African Journal of Enology and Viticulture* **27**(2), 167-177.

Gurr GM, Scarratt SL, Wratten SD, Berndt L, Irvin N (2004) Ecological engineering, habitat manipulation and pest management. In 'Ecological engineering for pest management.' (Eds GM Gurr, SD Wratten and MA Altieri). (CSIRO: Collingwood, Victoria, Australia).

Hoare, T. (2011) Mid-row crop management options to improve vineyard performance and profitability Wine and Viticulture Journal (May/June)

Madge, David. (2005) Organic Viticulture: an Australian manual http://new.dpi.vic.gov.au/agriculture/farming-management/organic-farming/weed-management/vineyard-weed-management

Porter R (1999) The role of inter-row ground covers to improve the management and sustainability of soils in Australian vineyards. Final Report No. 93/1 GWRDC: Adelaide

Teasdale JR (2008) Principles and practices of using cover crops in weed management systems In Weed management for developing countries. FAO Agriculture and Consumer Protection Department http://www.fao.org/docrep/006/y5031e/y5031e0d.htm.

Appendix 4. Staff

Mr Christopher Penfold

Dr. Cassandra Collins

Appendix 5. Other relevant material

Appendix 6. Budget Reconciliation

END OF PROJECT
FINANCIAL STATEMENT
Statement of Receipts and Expenditure

At the conclusion of each Project, the GWRDC requires a Statement of Receipts and Expenditure of GWRDC funds received in relation to the Project.

Project Title:	Building vineyard resilience through improved floor management practices.

GWRDC Project Number	Project Start Date	Project End Date
UA 1001	01/07/2010	30/06/2011

Financial Year (e.g. 2006/07)	(a) *Funds brought forward from previous year	(b) #Approved GWRDC Budget (full year)	(c) Total budget available (a)+(b)	(d) Actual expenditure ($)	(e) Difference ($) (c)-(d)
Year 1: 2010/2011	n/a	89,853.00	89,853.00	67,841.77	22,011.23
Year 2: 20__/__	0.00		0.00		0.00
Year 3: 20__/__	0.00		0.00		0.00
Year 4: 20__/__	0.00		0.00		0.00
Year 5: 20__/__	0.00		0.00		0.00
TOTAL		89,853.00		67,841.77	**22,011.23**

NB: Final Balance includes instalment not yet received of $13,477.95, as the project has a surplus balance we will not be invoicing for the last payment. Therefore could you please forward the University an invoice in the sum of $8,533.28 to facilitate the return of unspent funds?

* "Funds brought forward" refers to any unspent GWRDC funds from the previous year and approved by the GWRDC to be spent the following year (i.e. column *(e)* from previous year).

"Approved GWRDC Budget" is the funding amount specified in the Project Agreement, including any approved Variations after Project commencement.

Was funding expended as approved in the Project Agreement? Yes ☐ No ☐

*If **NO**, please provide reasons:*

Has the cash and/or in-kind funding from Contributing Agencies been received and applied to the Project as approved in the Project Agreement? Yes ☐ No ☐

*If **NO**, please provide reasons:*

I hereby certify that this statement is true and accurate.

Signature of duly authorised representative) cmudge

Chelsea Mudge *Name:* | Senior Research Accountant *Title:* | 4/11/2011 *Date:*