Winegrowing Futures

Final report

Theme 6

Knowledge management and capacity building











The National Wine and Grape Industry Centre is a research centre within Charles Sturt University in alliance with the Department of Primary Industries NSW and the NSW Wine Industry Association

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THEME 6: Knowledge management and capacity building

Abstract

Drawing on research outputs of the Winegrowing Futures program and other sources Theme 6 developed and delivered an extensive and diverse range of communication products for use in extension, training and education, including the development and delivery of Spring Vine Health field days and the Grapevine Management Guide

Theme 6 demonstrated the effectiveness and further potential of a user-defined and focussed approach to the state and national extension of the outputs of scientific research. Using the key elements of that approach provided by the prescribed Theme outputs, the NWGIC has created a coherent process from which to generate national innovation in the Australian wine sector. This includes the development of Extension of Australian Grape and Wine Research Findings: a plan for coordinated national delivery.

In summary investment in national extension contributed to the following:

- A coherent, user-focused approach to ensuring prompt and effective delivery of research benefits to national industry stakeholder groups
- A coherent national communication strategy with a range of tools and media
- Integration with regional adjustment processes
- Seamless delivery of extension approaches through state agencies and industry groups
- Establishment and utilisation of a coherent evaluation of the economic, social and environmental impacts of the WF program
- Knowledge and skill gap analysis for extension planning and evaluation of practice change
- Grape production guidelines that link farm practices to end quality specifications

Finally, Theme 6 offered new opportunities for creating a state-based but nationally coordinated team to satisfy whole-of-industry needs by promoting:

- Linkages with research themes both in terms of informing research of industry requirements and priorities and developing a range of products to promote research outcomes to industry.
- Desk audits of national, state and regional issues
- Independent extension activities with industry
- Development of training/short course opportunities e.g. competency based training
- Courses registered.

Summary

For the Australian wine sector to continue to grow all stakeholders must remain internationally competitive. This requires developing and maintaining an innovative culture underpinned by scientific research, education and vocational training. The aim of this Theme was to accelerate rate of innovation i.e. practice change within the wine sector, by responsive management of knowledge generated by R&D conducted within the Winegrowing Futures program and elsewhere. The program was focused initially on NSW regions while contributing to wine sector capacity building more widely.

A key principle throughout was to ensure that the focus remained on industry needs and finding appropriate solutions to those needs. The wine industry stakeholders include wine grape producers, wine producers, information brokers and private consultants each of these stakeholders may need information delivered in different ways to achieve the desired outcomes.

Theme 6 was to create a state-wide team that could meet whole-of-industry needs by promoting:

- Linkages with researchers
- Desk audits of National, State and regional issues
- Independent extension activities with industry
- Development of training/short course opportunities.

This theme has developed and delivered 58 workshops in most NSW regions and interstate. Four training courses were developed and mapped against National competencies; The theme has developed and delivered the Spring Vine Health Field Day (SVHFD) program which seeks to assist growers in managing pest and disease issues. A total of 13 SVHFD programs were delivered across four States in 2009-10 and these were evaluated using Bennett's hierarchy. The theme has produced eight technical reports including five editions of the Grapevine Management Guide.

A key outcome of the theme was a national plan to coordinate and deliver extension to the Australian wine industry leading ultimately to the establishment of the National Wine Extension and Innovation Network (NWEIN).

The Theme was conducted by NSW DPI's extension team along with the GWRDC-supported position of National Extension Coordinator, representing a total of 6.6 full time equivalents. Each extension officer was linked to a NSW wine region and, in addition, extension staff were assigned as extension officers for each of the four Winegrowing Futures R&D Themes.

In 2007 a baseline survey of grower practices was conducted to determine the current levels of adoption of a wide range of cultural and business practices. This information was analysed and fed back to the regions to validate the findings. Major findings of the survey were:

- Most growers had some type of business plan that included whole farm development, property/ business redevelopment, environmental management systems and fertilizer programs and amendments and annual pest and disease programs.
- Pruning processes were strongly correlated with farm size with machine pruning plus hand cleanup dominating larger farms while many smaller vineyards are hand pruned only.
- Irrigation management varied across the regions and timing of irrigations varied markedly. Timing of the first irrigation of the season was highly variable and lacked a strategic or measurement based approach
- Management of heat stress was problematic and lacked a coherent approach
- Under conditions of limited water supply soil water holding capacity was recognized as a limiting factor to production in many regions
- There was wide variation between the use of soil and tissue analyses to determine the nutritional requirements of vines
- Yield regulation and yield estimation were important issues for growers and their wineries.
- Sustaining grapevine health and more effective and efficient management of pests and diseases was an ongoing fundamental of grape production dependent businesses.

The findings from the survey closely affirmed, from a grapegrower perspective, the R&D priorities of the WF Themes and were readily incorporated into subsequent research and extension. For example the responses relating to establishment of vineyards and then seeing onset of young vine decline indicated most concern in the Riverina and parts of the Murray Darling wine regions. Consequently much of the Theme 2 Winegrowing Futures Young Vine Decline research was targeted at these regions. Similarly, managing heat stress was confirmed as a priority issue for which there was little fundamental knowledge of the physiological basis and opportunities for preventative measures. This directed research toward more fundamental understanding from both controlled environment studies at Wagga Wagga and field studies in the Riverina where the problem was most severe.

The survey identified the following aspects for targeted extension and training based on current best practices informed by emerging knowledge from research;

- Managing heat stress
- Timing of first irrigation of the season
- Opportunities for growers to improve soil water holding capacity

Training Course Development and Delivery

Under the Winegrowing Futures program the following training course materials were developed and registered under the National Training framework:

- *Certified Irrigation Manager* course (6 units).
- *Vine Health* conducted across NSW in 2009 including an ancillary course (50 participants) at the Hunter pathology forum.
- *Management of Trunk Diseases and Young Vine Decline* workshop developed and mapped against national horticulture competencies. This program is now registered under Farmready (FRTCO338). Approved trainers Allison Blake

and Tony Somers. This course was conducted in Rutherglen, Griffith and Young.

These modules have been developed and delivered in NSW and are available for other Registered Training Organisations (RTOs) to access and deliver using a range of funding sources.

Training Workshops

Irrigation and Nutrition Science for Riverina Wine Production: a workshop held in the Riverina presenting outputs from WF Themes 3, 4 and 5.

The evaluation of this workshop showed an increase in knowledge and large percentage of participants (76%) were considering changing their practices as a result of the workshop. The correlated comments expressed a very favourable response to this workshop. Participants enjoyed the format and the content of the presentation. The attendee's ability to fill out the evaluation forms showed that they had an overall appreciation of the day and expressed a strong interest in having similar workshops on annual basis.

Certified Irrigation Managers Training Workshop Series: conducted in 2007 by Theme 6 staff in Griffith on 18 October, 6 November and 29 November 2007.

The course was conducted again in Young on 7 November and 5 December and in Orange 4, 7 and 14 December. The course was supported by NSW Department of Education's (DET) Training's Strategic Skills program. The course was developed from the Environment Management Systems (EMS) and the Soils and Water Modules by updating the previously developed material with the most recent findings from the WF program and elsewhere.

This course provides a good example of how research funding can be levered by having the information incorporated into existing training material registered under the National Agriskills competencies and working closely with the industry to demonstrate important skills shortages that can be supported through DET strategic skills funding.

This workshop series reflects NSW DPI's Profarm strategy where extension and accredited training are combined, where feasible, to enable support from a number of funding providers e.g. (Farmready, DET, CMAs, GWRDC or DPI).

Strategic Support and Responding to Seasonal Contingencies

Theme 6 staff provided strategic support and responded to the following seasonal issues as they occurred including:

Strategic Support

- Ongoing phylloxera awareness programs across the State
- Abandoned and neglected vineyards and orchards within several regions
- Drought issues that included connecting industry participants with rural financial counsellors
- Evaluation of vineyard mothballing strategies and industry restructure

Responding to Seasonal Contingencies

- Recognising and managing the risk of smoke taint. Smoke taint information from WA and Victoria was used to develop closer ties between the Rural Fire Services of NSW and the local wine industry regions regarding issues of smoke taint in grapes that can arise though burning off on adjacent parklands before harvesting is completed.
- Monitoring an outbreak of Queensland Fruit Fly in the Hunter Valley in 2009 following flooding of Lower Hunter Valley.
- Assisting the industry in managing the grapevine disease outbreaks on the east coast due to the extremely wet season of 2010.

Spring Vine Health Field Days

The *Spring Vine Health Field Day* concept was developed and trialled in 2009 within NSW and then presented nationally in 2010 with the support of National Extension Steering Committee.

This initiative, based in adult learning, advances Australian extension practice in that it includes processes to actively ensure decision making and record decisions made by participants. Data management capability at the NWGIC allowed for post-season follow-up to record practice change and barriers in each specific area of presentation. In practice this involved each participant completing a post-workshop evaluation that sought to elicit changes in their knowledge and attitudes before and after the workshop along with their overall perceptions of the relevance and quality of the presentations. While providing information regarding changes in knowledge and attitudes, this data was also valuable for the presenters to identify and better address any issues requiring clarification or knowledge gaps that need better explanation.

The program delivered under a separate GWRDC supported program – "Spring Vine Health Field Days- CSU 1001". This initiative saw 11 field days presented in four States across Australia.

Summary

Theme 6 demonstrated the advantages of having a proactive extension team incorporated into any RD&E and shown that research outcomes can be readily incorporated into farming or winemaking practice when the information is coming from a credible source and that the industry has been involved in setting the research objectives and following the development of the research since its inception.

Background

Theme 6 entitled "Knowledge Management and Capacity Building" was conceived as the combining component or integrating focus, of the Winegrowing Futures program. This Theme was created to deliver outcomes for industry based on the communication of research outputs.

Coordination of extension in the Australian Wine Industry was recognised as an ongoing opportunity for increasing innovation and profitable use of research results in wine businesses. The benefits of coordination include economies of scale, focus, and avoiding duplication. The GWRDC was very supportive of the extension staffing and capacity of NSW DPI and, in recognition of this extension capacity, the GWRDC underwrote the cost of the National Extension Coordinator for the Australian wine industry through the NWGIC. The cost of this position was included in the Theme budget.

Funding was also provided to assist the activities of the NSW DPI extension team in taking the outputs of the research program and communicating these outputs to industry as outcomes for improved production practice

For continued growth of the wine sector, it was recognised that all stages of the supply chain from wine grape growing to wine marketing must remain internationally competitive. This would require an innovative industry culture that depends on research, education and vocational training.

It was, and remains, essential that communication of new knowledge focuses on industry needs and how the end-user perceives the innovation. The NSW wine industry has a wide range of stakeholders including wine grape producers, wine producers, information brokers and private consultants. This wide range of stakeholders presents a broad spectrum of characteristics and capabilities that demand different and targeted communication strategies for successful outcomes.

Theme 6 offered new opportunities for creating a state-based but nationally coordinated team to satisfy whole-of-industry needs by promoting:

- Linkages with research themes
- Desk audits of national, state and regional issues
- Independent extension activities with industry
- Development of training/short course opportunities

Theme aims and performance targets

The aim of Theme 6 was to accelerate the rate of innovation i.e. practice change, within the wine sector, by responsive management of knowledge generated by R&D conducted within the Winegrowing Futures program and elsewhere. The Theme was focused initially on NSW regions before contributing more widely to wine sector capacity building.

Specific outputs were as follows:

1. Baseline surveys and skill audits of financial management, marketing, leadership and production skills
2. Annual review of R&D priorities with regional and state industry champions
3. Profitability studies by production sector
4. On-farm best practice demonstrations
5. Communication plan (mass media technology transfer)
6. Case study evaluations of long term technology change
7. Training courses covering both field and management practices
8. A range of print materials including production guidelines, economic analyses booklets, posters etc.

Method

Theme 6 provided the underpinning extension function for the research Themes in the Winegrowing Futures program, and provided a coherent approach to promote the adoption of research outputs by within Australia. This approach comprised:

Project 6.1
Baseline survey and skills audit

Based on a the NWGIC's integrated management framework that includes a survey of performance indicators (financial and production based) and an education process to implement learning behaviour into practice change as related to improving profitability, in November 2007, a baseline survey of grower practices was conducted to determine the current levels of adoption of a wide range of cultural and business practices. This information was analysed and fed back to the regions to validate the findings.

120 questions were initially compiled to cover every aspect of grape production in New South Wales. Following a planning and development meeting where the total scale of the survey was realised, it was decided to focus analysis of the survey responses on aspects of grape production directly relevant to the Winegrowing Futures (WF) Themes 2 to 5. Due to a variable regional response rate, sample population sizes were used to indicate trends for a region. Once sufficient sample populations were achieved, the data was analysed and summarised each individual region. Subsequently, and to encourage inter-regional benchmarking, the completed analyses were presented to the survey participants in the regions through field days, reports and demonstrations.

Project 6.2
Annual review of R&D priorities with regional and state industry champions

An industry advisory group, the R&D Sub-committee of the NSW Wine Industry Association annually reviewed research outputs and determined evolving priorities. This group provided a reality check for future planning, extension directions and the need for any additional evaluation. Research and Extension priorities of that group that were not addressed by the Winegrowing Futures program became the focus of the "Vinicultural Priorities" proposal for future R,D&E.

Project 6.3
Profitability studies by production sector

The WF program was conducted through four years of drought conditions and one year of industry oversupply of wine grapes. Initial approaches to the industry regarding surveying growers for their financial status during such stressful times indicated that such a survey was not appropriate.

Project 6.4
On-farm best practice demonstrations

With the establishment of the GWRDC's Grassroots program designed to give regional grower associations direct responsibility for regional extension activities, the 'on-farm trials' element of Theme 6 activities was not pursued as a specific objective. However on-farm demonstrations were used where appropriate to demonstrate best practice and specific research outputs.

Project 6.5
Communication plan (including mass media technology transfer)

To provide a national focus of a national extension communication plan, a National Extension Coordinator was appointed in 2007 to target national and regional industry readjustment processes, promote seamless delivery of extension approaches to other state agency and industry groups; build relationships with key partners (grower associations, other research and education providers, wine companies and makers); and develop production guidelines that linked on farm practices to end quality specification and vice versa.

In NSW each of the NSW wine regions were assigned a district viticulturist who contributed to industry meetings, to provide on- ground advice and provide a link between the research at NWGIC and the industry.

In accord with the national communication plan Theme 6 devised a communication strategy to

encompassing a range of adult education learning principles and comprising a range of accredited training courses (see 7. Training Courses); mass media communications (see 8.); success story case studies to encourage and motivate; and a variety of learning environments such as field demonstrations to shed theatres.

To support the implementation of the communication strategy staff in Theme 6 attended extension methodology training programs to increase professionalism and skills extension methodology.

As a resource to the regions NSW extension staff were called upon to respond to seasonal contingencies not anticipated in the communication strategy. Examples of activities undertaken included responding to an outbreak of Queensland Fruit Fly in the Hunter Valley in 2009, ongoing phylloxera awareness programs, abandoned and neglected vineyards within several regions, drought issues that included connecting industry participants with rural financial counsellors and industry restructure.

Project 6.6
Case Study Evaluations of Long Term Technology Change

An evaluation process using Bennett's Hierarchy of research-to-industry outcomes tracked the course of the innovation process and comparing before and after effects of extension intervention, as well as identifying knowledge and skill gaps to aid further development of targeted extension, training and education programs. Ongoing long term evaluation case studies of knowledge and practice change will continue to identify benefits of R&D investment as well as drivers and impediments to practice change.

Project 6.7
Training courses covering both field and management practices

Outputs from the WF research were mapped against national competencies and training supports were developed to assist students to reach the national competencies. Courses were conducted by the NSW DPI Agricultural colleges, which are Registered Training Organisations (RTOs) under the National Training Framework and as such are eligible for National Farmready funding and / or State Department of Education and Training funding.

Growers and extension and training staff participated in both formal and informal training programs to increase knowledge and capacity for change. Extension officers worked towards gaining greater industry participation to improve knowledge acquisition by a range of extension methods e.g. group facilitation, programmed learning, information access, grower mentoring and technology development.

Project 6.8
A range of print materials including production guidelines, economic analyses booklets, posters.

Using resources available to it through DPI NSW Theme 6 produced a comprehensive range of extension materials including the Annual Grapevine Management Guide, pest and disease recognition posters and technical articles in collaboration with researchers of the NWGIC and elsewhere.

Results/discussion

Results and discussion are presented under the output headings used in the WF proposal.

Project 6.1
Baseline survey and skills audit

The NSW Grape Grower Production and Cultural Practice Survey 2007 was designed to gauge the current cultural practices, identify knowledge gaps, and the learning preferences of the viticultural sector of the NSW wine industry.

The complete survey provided data on a very broad range of topics including property size, hectares planted, varieties, irrigation, fertiliser use, inter row management (see Appendix 5 .2).The focus of this report covers 40 questions of the original 120 questions put to growers.

Property details

In some regions limited survey responses resulted in a less than accurate account of some statistics, including information on planted area, varieties and grower numbers. In those cases it is necessary to rely on the Australian Bureau of Statistics reports and property records held by the regional vigneron associations.

A key element of all extension activities is to know how growers gain access to information and how they use this information to make decisions concerning production targets and cultural practices. The survey guided the extension team in deciding on the best channels to disseminate the results of WF research projects to growers.

Question 4 in the survey asked '*Where do you access information to help you make decisions about your enterprise*'. The results clearly showed that there is no one designated source used by growers to access information.

A key point revealed by responses to this question is the effectiveness of the Grapevine Management Guide, an NWGIC publication prepared by the Theme 6 group. The Guide is provided, free of charge, to winegrape growers who are members of the NSW Wine Industry Association, each growing season. The results showed that the guide is used by growers in each region, however; growers with limited experience in the industry access the guide more often than those with greater experience. Growers also rely on their own experience as well as neighbours who are involved in the wine industry.

Records

Gaining an understanding of the development of business plans and their implementation within the wine industry is important. This provides greater understanding of the business issues growers have in their businesses and how to address them throughout the season.

The results indicated that growers within the wine industry all use some type of business plan. These plans generally include whole farm development, property business, vineyard redevelopment, environmental management systems, fertiliser and soil amendments and annual pest and disease management strategies.

All the regions reported the use of some form of pest and disease management strategy each season. However, growers in the Hasting and Hunter Valley regions have tended to concentrate on fertiliser and soil amendment strategies. Vineyard redevelopment plans were the major focus of Cowra growers. This is an important indicator for this region as a majority of the region is dominated by Chardonnay plantings and to diversify from this variety will only benefit the region.

From this question we derived insights about what the district was concentrating on from experience of previous seasons. The Hunter Valley region's responses suggest that this region, in the past, had many problems with pest and diseases. Thus, growers there are interested in developing a pest and disease plan. We then referred to the pest and disease section to identify the specific needs of this region.

Pruning and training systems

Given that pruning is the most expensive labour cost to grape producers, the survey attempted to address types of pruning methods that are used in each grower's enterprise. The response from participants was then compared back to the size of their property and the region in which they were located. Results showed a direct correlation to the property size and preferred pruning method. The larger the property the more machine pruning is used which is then followed by hand clean up.

This result showed that growers are trying to reduce labour cost by using more mechanised pruning systems when their enterprise increases in scale. However where the vineyard is a small scale operation, in most cases they still hand prune. Results also show that there is no link between the type of enterprise be it family or corporation to the pruning method used.

Irrigation

The questions in the irrigation management section of the survey had a direct relationship with WF Themes 3 and 4. The survey asked growers what methods/monitoring device they used to measure soil moisture and did they use these tools to schedule irrigation. Growers were also asked whether they had experienced heat stress in their vineyard as result of lack of soil moisture or extreme heat conditions.

Growers were also asked if they needed further information to reduce irrigation inputs.

Respondents reported using a wide array of soil moisture monitoring tools including EnviroScans, gypsum blocks, dig sticks and visual health of the vine.

A large portion of respondents (72.3%) stated they use simpler methods to schedule irrigation being mainly by visually observation of vines or the use of a dig stick in the soil profile. However in all regions, with the exception of Gundagai, the majority of respondents said that they applied their first irrigation based on soil moisture readings. Overall, (64%) of respondents said that they did apply their first irrigation based on soil moisture readings, while (36%) said that they did not.

Severe heat stress of vines leading up to harvest has been the experienced in all regions with the most prominent being (90%) of respondents from the Hunter Valley and (83.3%) from Hilltops. The only two regions where the majority of respondents did not report severe heat stress were the Murray River, where (56.52%) stated that this had not occurred and (43.48%) said that they had experienced severe heat stress leading up to harvest and Tumbarumba region where (66.67%) did not experience heat stress near harvest.

The vast majority of respondents (75%) feel they do not need further information to reduce their irrigations applications but do require information on how to build water holding capacity, the efficiency of sub-surface irrigation and more information on vine physiology of how the vine responds under water and heat stress.

Looking at the responses it would seem clear that a roll out of the Waterwise course (which covers vine physiology, water holding capacity and gives growers a thorough understanding of irrigation practises and theory) would be appropriate to deliver and likely to have a high uptake by industry.

Vine nutrition

Vine nutrition relates to all Themes in the WF program. Questions related to this topic were tailored to gain insight of how growers make decisions on whether their make nutrient amendments or not. Industry current best practices are to take petiole samples at flowering so participants were asked how often they use petiole samples to help them make nutrition additions to their vineyard. Related questions concerning soil testing where also asked to gain an understanding of the nutritional values and general soil health of participant's vineyard.

Across all regions, 30% of people use petiole analysis on yearly basis, 27% every two years, 21% every three years. This leaves 22% of respondents who do not get their petiole tested for nutrient status at all.

There were less participants having soil tested. From the survey population 19% have a soil test done each season, 22% every second season and 35% every three years, the remaining 24% never have their soil tested. Fifty six percent of the respondents made nutrient inputs according to the results of either petiole or soil tests.

Examining individual regions, we found that each region differs in the use of these nutritional tests and how different they were in their decision-making. The Riverina and Hunter Valley had growers having petiole and soil testing done but also had the greatest number of respondents who did not use these results to change their nutrient inputs. The questions this raises are: Why has the testing been done? Do they apply nutrient in the way they always have or do they visually observe the vines and make their decisions accordingly or do they have problems interpreting the results from both tests? From these results, the need for extension activities in these regions based around vine nutrition became apparent.

Crop regulation

Variability in yield forecasting from season to season creates large costs due to inefficiencies in wineries and strain relationships between wineries and growers, particularly in high yielding seasons. The greatest challenge for growers is to achieve consistent cropping levels from season to season or at least provide more accurate yield estimates.

The survey asked respondents to consider whether they had problems achieving consistent cropping levels. The results showed that a majority of growers (55%) had difficulties achieving uniform levels. Closer examination of the regions showed that both the MIA and Orange regions tended to have the least amount of difficulty in achieve consistent cropping levels, followed by the Hunter Valley and Murray River regions. The regions that reported the greatest difficulty in achieving uniform cropping levels from season to season were the Perricoota, Hilltops, Gundagai and Tumbarumba regions.

Gaining an understanding of how growers forecast their yield is an important question to ask in relation to Theme 4 of the WF program. Classical approaches to estimating grapevine yield are inherently inaccurate (±30%) so the survey asked if growers conduct crop estimates, and if they do, what method do they use?

- The response was that all regions, predominantly used bud dissections, bunch counts and experience to make crop estimates.
- This then led into the question if the estimate is high what methods are used to regulate crop load to meet targeted yield. The majority of respondents regulated crop loads at pruning (35%), through bunch removal (23%), irrigation use (22%) and shoot removal (19%).

From these results we saw a pattern in relation to experience of the growers in the regions, with temperature, rainfall and available irrigation all playing a part in not achieving consistent cropping

levels. Better understanding of grapevine physiology in these regions was needed to help growers gain better consistency in this practice.

Vine health (including 'pest and disease management', 'young vines' and 'bunch diseases')

Questions that were asked in this section of the survey related directly to Theme 2 in the WF program. Participants were asked if their vines had suffered from any forms of die-back in trunks or cordons and if they had, to their knowledge what had caused the die back. Respondents replied that there were many pests and diseases that had an impact on their vines including: Australian Grapevine Yellows, Esca, Botryospheria, Phomopsis, Eutypa Dieback and Fig Longicorn beetle.

The respondents level of knowledge was relatively low when it comes to trunk diseases and it was recommended that a series of workshops and identification pamphlets be made available to all regions to improve understanding.

The questions relating to establishment of vineyards and subsequent onset of Young Vine Decline showed up significantly in the Riverina and parts of the Murray River region. Most of the Theme 2 Young Vine Decline project was conducted in these regions.

Bunch rots are dependent on seasonal conditions and growers in regions that experience wet humid conditions throughout the growing season tend to have more confidence in dealing with bunch diseases. Respondents had considerably more knowledge of Botrytis, than Sour rot, Bitter rot or Ripe rot. However, it appears that growers had a tendency to call all rots "Botrytis" highlighting the need to produce an identification chart with the relevant control measures.

It was clear in regard to bunch rots, that growers required information regarding infection conditions, reliable control measures and prevention and this information needed to be supplied in several forms such as CD or pamphlets with photos and diagrams with clear descriptions of the disease.

Semillon vineyards

Semillon is a variety that when grown in the Hunter Valley has the ability to produce table wines of the highest standard and likewise when grown in the Riverina it produces world-renowned dessert wines. Question relating to crop load, clones and management and style all relate to the WF Theme 5



1 Canberra
2 Cowra
3 Gundagai
4 Hastings River
5 Hilltops
6 Hunter Valley
7 Mudgee
8 New England
9 Orange
10 Pericoota
11 Riverina
12 Shoalhaven
13 Southern Highlands
14 Tumbarumba

Figure 6.1 NSW wine regions

Semillon project. Respondents identified the clones they had planted; mostly DA16162 (Riverina) and H781 (Hunter Valley). However it is significant that most growers were unsure of what clone they had.

A majority of respondents who grew Semillon stated they did not use any different type of management practices compared to any other variety. However in the Riverina they did have a different pest and disease program as some growers in this region promote Botrytis (Noble rot) infection for their dessert style wines.

Project 6.2
Annual review of R&D priorities with regional and state industry champions

There are 14 winegrape growing areas in NSW as shown in *Figure 6.1*.

The NSW wine regions are all represented on the NSW Wine Industry Association.

The NSW Wine Industry Association's RD&E subcommittee conducts an annual RD&E meeting where research priorities are reviewed and researchers and extension staff can present their results and new initiatives. More recently this meeting has also become the venue for determining priorities for the GWRDC Grass Roots funding program. Through this mechanism the NSWWIA Grassroots Extension

program is coordinated with the WF extension initiatives to avoid duplication of effort and resources.

Project 6.3
Profitability studies by production sector

As noted already this aspect of the original methodology was not conducted due to financially difficult (and potentially unrepresentative) seasonal conditions. Limited data on grower financial performance is collected by both the Murray Valley Wine Industry Development Committee and the Riverina Wine Grape Marketing Board on a confidential basis. The team is still proposing to develop a benchmarking tool for growers to determine the cost of and level of inputs needed to produce wine at different points. This will enable both growers and their wineries to better target costs and activities related to producing perhaps less quantity of higher value grapes.

Project 6.4
On-farm best practice demonstrations

The extension team used a number of on-farm best practice demonstrations in conjunction with the four WF research Themes or as 'stand alone' extension activities. Examples of these activities included, biosecurity best practice for phylloxera awareness days, development and comparison of *mothballing* strategies for vineyards, top working of Chardonnay vines at Dareton, irrigation and fertilisation best practice farm days.

Project 6.5
Communication plan (including mass media technology transfer)

Development of an industry-wide communication plan commenced following the appointment of a National Extension Coordinator in 2007. This first involved the engagement of all the major stakeholders in extension for the wine sector, including the state governments, AWRI, universities, and wine industry peak bodies and the GWRDC's Innovators Network. This led to the establishment of the National Extension Steering Committee and through this body identified five priority elements of the National Extension Plan.

Climate Change –The National Extension Steering Committee were reviewed issues and activity in the wine sector related to climate change. This identified many activities that were operating in each state and nationally. This communication allowed alignment of thinking and activities in this area but no additional nationally funded extension campaigns were considered necessary. A legislated Emissions Trading Scheme was recognised as an industry change management issue on the near horizon.

Irrigation and Water Use A significant coordinated program of extension called Water and Vine was funded under the Irrigation Industries Workshop Program and managed by Dr Mark Krstic of the GWRDC. A final report of this activity is available at http://www.gwrdc.com.au/webdata/resources/files/WaterAndVineFinalreport.pdf. From this activity GWRDC also developed the Innovators Network; a network of regional wine industry service providers who are an important conduit in the extension of knowledge in the Australian wine sector. That network is informed with fact sheets, presentations, technical notes and an E-newsletter from the GWRDC website. The coordination achieved through the National Extension Steering Committee avoided potential duplication of extension initiatives and many of the research findings of the Winegrowing Futures program and other research organisations in Australia was channelled through this "route to market".

Vine Health *Spring Vine Health Field Days* was a concept of the National Extension Steering Committee aimed at annually preparing grapegrowers to apply best grapevine health management practices for the coming season. The Spring Vine Health Program concept was developed and trialled in 2009 within NSW and then taken nationally in 2010, when with GWRDC support, the program – "CSU 1001 Spring Vine Health Field Days" – successfully presented 11 field days in four States. The Final Report for this project was accepted by GWRDC on 15 August is available at the GWRDC website.

This initiative advanced Australian extension practice in that it included process- based, adult learning to actively confirm post-field day decision making and record decisions made by participants. Data management capability at the NWGIC allowed for post-season follow-up to record practice change and barriers to practice change in specific topics as inputs to analysis within the Bennett's Hierarchy framework.

In practice each participant completed a post-workshop evaluation that sought to reveal changes in their knowledge and attitudes before and after the workshop along with their overall perceptions of the relevance and quality of the presentations. While providing information regarding changes in knowledge and attitudes, this data was also valuable for the presenters to identify and better address any issues requiring clarification or knowledge gaps that need better explanation.

Participants were also asked to identify and practice changes or actions that they would take as a result of the information presented. Some months later an email was sent to each participant reminding them of their thoughts and asking if they had followed through or to identify any barriers that had arisen. The results from each region were collated and published on the NWGIC website.

Participants were sent an email greeting card advising them of the weblink.

Thus informed each participant could see how their region was proposing to tackle the issues identified and compare their responses with other regions facing similar issues.

It also demonstrated quite quickly where change was being initiated and where barriers were present.

It must be noted that grapevine health issues became "top of mind" in 2010 with an exceptionally wet season following 10 years of drought. These circumstances obviously assisted in getting rapid adoption of improved grapevine health practices.

Another advance in extension capacity developed through this initiative was the active coordination of a very broad group of stakeholders in grapevine health. Presentations by regulators and researchers, and the industry responses to these are collated online at www.NWGIC.org New presenters can draw on a broad range of sources and approaches presented in other regions. The NWGIC website allows for a continuously improving innovation cycle through "vine health system" communication. This advance draws on thinking from the Australian Innovation Research Centre on Sectoral Systems of Innovation.

GWRDC has supported the delivery of another eight Spring Vine Health Field Days in 2011.

Quality and Regionality The National Extension Plan aimed to support regional groups with a focus on wine production excellence with a particular grape variety. This approach recognised the need to promote a market-led approach to industry development. In NSW it is reflected in the shift in the role of state extension officers toward industry development in contrast to direct horticultural production support.

This approach was applied at the National Wine and Grape Industry Centre with a focus on Semillon in the Hunter Valley and Riverina districts. The Tasmanian and Mornington Pinot Noir Forums are other lead examples. There is considerable potential for developing industry value by wider application of similar approaches. However this approach has not yet been extended as a nationally-coordinated approach across Australia as envisioned.

The National Wine Extension and Innovation Network

Following the introduction of the National Research, Development and Extension Framework of the Primary Industries Ministerial Council in 2010 the role of National Extension Steering Committee became the National Wine Extension and Innovation Network (NWEIN). NWEIN continues as the lead extension coordination body in Australian wine sector.

The NWGIC extension team continued to use the priorities of the National Extension Plan as a focus for continuous mass media communication products along with workshops, webinars, posters for on-farm use, presentations at conferences and one-on-one advice. The team used the national plan to foster coordinated delivery of appropriate messages.

Theme 6 extension viticulturists collated information for producers from a wide range of sources including AWRI, NWGIC outputs from the Winegrowing Futures Program and international literature. They were also instrumental in liaising with growers to obtain access to properties for research trials and demonstrations.

Pathways to Outcomes

A *Pathways to Outcomes* document based on Bennett's Hierarchy was developed to serve as a guide in directing project resources as well as providing the framework for the WF program's communication plans. This living document continues to provide the team with a measure of the advance of technological innovation toward "aspirational" outcomes and attempts to place a value on the size and impact of the issues being addressed by the research and the value to the industry and the broader community of the outcomes.

The *Pathways to Outcomes* approach has the following elements:

- A clear, agreed statement of outcomes in terms of benefit to defined industry target stakeholders.
- An estimate of the financial value of this outcome in dollars of benefit to the different stakeholders.
- Use of the Bennett's Hierarchy to conceptualise progress toward achieving the outcomes with a special focus on the Knowledge, Attitudes, Skills and Aspirations (KASA) of the stakeholders.
- Design of communications focussed on best impact toward achievement of outcomes.
- Use of stakeholder feedback techniques for guiding decision making and recording audience response to information delivered.

An estimated $60M worth of potential outcomes were delivered during the term of the Winegrowing Futures Program encompassing savings from the management of Young Vine Decline, improved water and nitrogen use efficiency and improved quality (market preferred) of Semillon wine styles. A further $60M or more of value is estimated as potential future benefits from other WF research. These further benefits will require ongoing champions to lead achievement in the future.

The *Pathways to Outcomes* framework is a living document that tracks progress toward outcomes generated from the Winegrowing Futures Program. The framework for this account is adapted from a seven step protocol of USDA agricultural extension specialist Claude Bennett. *Figure 6.2* provides an example of that framework. The framework has allowed us to track the progress made toward value adding to the wine sector within the five years of the WF, and to signal future benefits and/or opportunities from further investment in development of WF outputs at various steps in the hierarchical framework. The framework sits on a common computer drive and tracks progress toward outcomes from the Themes and identifies the communication strategies to best support delivery those outcomes.

It is acknowledged (and intended) that the valuations developed can be readily challenged, but providing the rationale remains sound each iteration improves the quality of the framework. This process also helps clarify the gaps in our knowledge. Having researchers /extension staff and industry considering the true impact of adopting the research outcomes

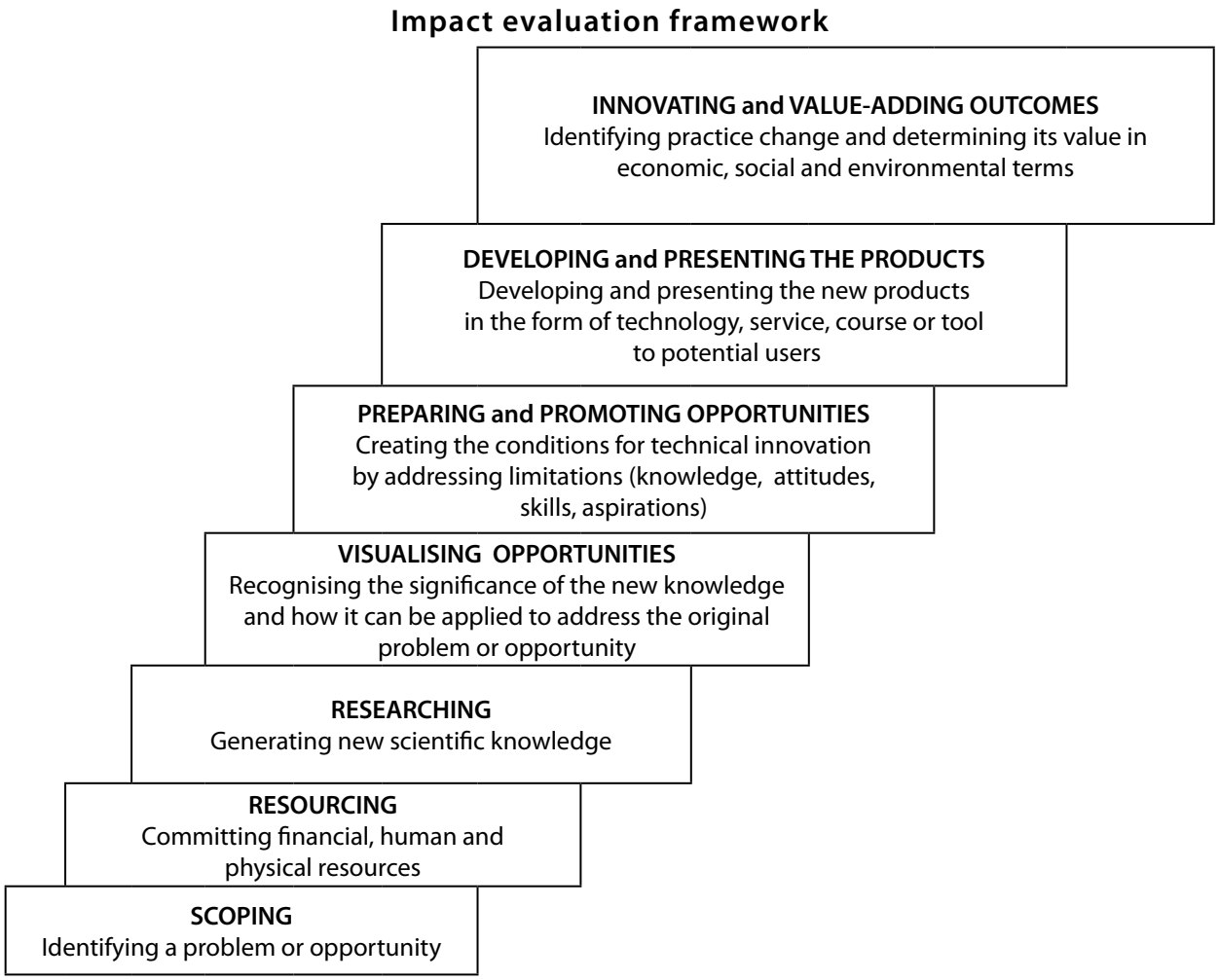


Figure 6.2 Bennett's impact evaluation framework (Bennett 1976)

helps provide a logical way to allocate resources needed to be directed towards promoting desirable practice change.

This document will be published as part of the NWGIC Impact Statement in January 2012.

6.5.1 NSW extension

Strategic support

Responding to seasonal contingencies

Recognising and managing the risk of smoke taint of winegrapes

Smoke taint information from WA and Victoria was used to inform the Rural Fire Services of NSW and the local wine industry regions regarding issues of smoke taint in grapes that can arise though burning off on adjacent parklands before harvesting is completed. Subsequent liaison between the NSWWIA and the Rural Fire Services of NSW established a regional strategy to minimise the risk of smoke taint.

Monitoring an outbreak of Queensland fruit fly in the Hunter Valley

In 2009 following flooding of Lower Hunter Valley there was an outbreak of Queensland fruit fly; a new pest to grapes in that region. Control and movement issues for grape movement in and out of the exclusion zone were addressed and publicised. A fruit fly baiting program seminar series for fruit fly control and a GWRDC RITA project was secured for the Hunter Valley.

Managing exceptional grapevine disease outbreaks

The extremely wet season of 2010-11 created exceptional grapevine disease conditions that demanded a focussed response to handling enquiries and providing timely advice. Theme 6 extension staff responded accordingly.

Grapevine inflorescence rot

A follow-up GWRDC RITA project was developed and secured on behalf of the Tumbarumba region entitled: "Understanding and Managing Early Bunch Stem Necrosis (EBSN) in the Tumbarumba Wine Grape Growing Region". That project led directly to NWGIC research which successfully identified a previously unknown cause (Pseudomonas syringae pv syringae) of a condition now known as 'Grapevine Inflorescence Rot'.

Property Identification Codes (PICs)

A project to use to locate and map vineyards in NSW to assist in pest and disease biosecurity and avoidance of smoke taint has been implemented with support from DPI NSW and the RLPBs. The project aims to capture the name, address and area of vineyards in NSW for disease control purposes and to alert growers when burning off activities are being undertaken.

Mothballing vineyards

A GWRDC RITA project proposal regarding vineyard mothballing was completed and submitted to the GWRDC.

6.5.2 National extension

National Extension Plan

A National Extension Plan (see Appendix 5.4) was developed in collaboration with other wine producing States and GWRDC. The National Extension Plan was developed with the major stakeholders in extension in the Australian wine sector. A progress report on this plan can be found at http://www.csu.edu.au/research/nwgic/extension/Project%20Progress%20Report.pdf

Workshops

Spring Vine Health Field Days: a flagship program of the NWGIC delivered in Orange, 9 September 2009 (powdery and downy mildew) and Hunter Valley. (bunch diseases).

GWRDC project "Coordinating National Spring Vine Health Workshops (CSU 1001)". This initiative saw 11 field days delivered in four states across the Australia. The final report for this project was accepted by GWRDC on 15 August 2011

Improving Spray Efficiency: a series of workshops delivered nationally, aimed at improving spraying efficiency.

Irrigation and Nutrition Science for Riverina Wine Production: a workshop held in the Riverina presenting outcomes from WF Themes 3, 4 and 5. The evaluation of this workshop showed an increase in knowledge and large percentage of participants (76%) were considering changing their practices as a result of the workshop. The accompanying comments confirmed a very favourable response to the workshop. Participants enjoyed the format and the content of the presentation. The attendee's ability to fill out the evaluation forms showed that they had an overall appreciation of the day and expressed a strong interest in having similar workshops on annual basis.

Nutrition: Module 15 in the *Water and Vine* series of the Innovators Network was presented in a number of seminars across the Australia.

Two-spotted mite, ***Fruit fly monitoring***, and ***Integrated pest management***': a series of workshops conducted in the Hunter Valley.

Project 6.6
Case Study evaluations of long term technology change

Properties for long term technology change have been identified and baseline data collected. Case studies will include:

- Fruit fly management in the Hunter Valley
- Adoption of heat treatment for reduction in incidence and impact of Young Vine Decline
- Water use - drip versus flood irrigation
- Nutrient management and fertigation strategies.

Project 6.7
Training courses covering both field and management practices

Under the Winegrowing Futures program Theme 6 the following materials were developed and Registered under the National Training framework:

Grapevine Health: a course conducted across NSW in 2009 including an ancillary course (50 participants) at the Hunter Valley "Grapevine Pathology" forum.

Management of trunk diseases and young vine decline: workshop developed and mapped against national horticulture competencies. This program is now registered under Farmready (FRTCO338). Approved trainers Allison Blake and Tony Somers. This course was conducted in Rutherglen, Griffith and Young

Certified Irrigation Managers: a workshop training series (6 units) presented in Griffith on 18 October, 6 November 2007 and 29 November 2007. The course was conducted again in Young on 7 November and 5 December and in Orange 4,7 and 14 December.

This project was funded by NSW Department of Education and Training's Strategic Skills Program

The series was developed from the Environment Management Systems (EMS) and the Soils and Water Modules by updating the previously developed material with the most recent findings from the WF program and elsewhere.

Grapevine Bunch Diseases: a workshop currently being mapped to be registered under the National Farmready program for an October 2011 presentation.

These workshops and courses have been developed in NSW and are available for other RTOs to access and deliver. They reflect NSW DPI's Profarm strategy where extension and accredited training are combined where feasible to enable support from a number of funding providers (e.g. Farmready, DET, CMAs, GWRDC or DPI).

Education

Outputs from the WF research were incorporated into CSU viticulture and oenology courses where they will inform new entrants to the Australian and international wine sector, including new business owners (R&D levy payers) and potential employees.

Project 6.8
Range of print materials

The Theme 6 extension team produced a range of print materials including production guidelines, booklets and posters targeting a wide audience over the period of the project.

Grapevine Management Guide

Since 2008 the NWGIC Grapevine Management Guide has been published and distributed to growers in NSW, Tasmania and WA and Victoria.

A list of other publications is attached in Appendix 1. It is proposed to complete and present economic analyses of key aspects of the Winegrowing Futures early in 2012 as part of an appraisal of the impact of the Winegrowing Futures Impact program using a 'Pathways to Outcomes' document based on the Bennett's Hierarchy approach as originally foreshadowed.

Outcome and conclusions

Theme 6 demonstrated the effectiveness and further potential of a user-defined and focussed approach to the state and national extension of the outputs of scientific research.

Using the key elements of that approach provided by the prescribed Theme outputs, the NWGIC has created a coherent process from which to generate national innovation in the Australian wine sector. Drawing on research outputs of the Winegrowing Futures program and other sources Theme 6 developed and delivered a range of communication products for use in extension, training and education.

The baseline survey report provided both an indication of current extension needs and a baseline for future surveys.

Where the survey identified current knowledge and skills gaps or major variations to what is considered normal practice for a region, the extension team members sought solutions from the WF research program and other relevant sources. Those solutions were presented in a broad range of extension presentations and materials (see Appendices).

The survey established a comprehensive format that will remain applicable for future use in gauging the rate of innovation within the sector. Repeating this survey at a later date will reveal whether changes in knowledge and practise have occurred. This survey will be one of the many valuable tools that will be used to gauge uptake and adoption.

National Extension Coordination

Following 14 years of successful coordinated research and extension the Cooperative Research Centre for Viticulture ceased operating on the 29th June 2007. From that time national extension coordination was led by the National Wine and Grape Industry Centre. Through this Theme the NWGIC established the foundation for the national coordination of extension within the wine sector through the creation of the first National Extension Steering Committee with the task to develop a National Extension Plan.

The National Extension Steering Committee now continues as the National Extension and Innovation Network; recognised as leading forum for ongoing extension coordination within the Wine Sector Strategy. That Strategy, established under the National Primary Industries Research Development and Extension Framework of the Primary Industries Ministerial Council (PIMC), will form part of the remit of Primary Industries Standing Committee (PISC).

The potential of the NWGIC to contribute substantially to national extension was recognised by the successful, independent review of the Winegrowing Futures program in November 2009 and since that review the approach has successfully extended beyond NSW as exemplified by the NWGIC's current leadership of the National Wine Innovation and Extension Network and growing national popularity of the Spring Vine Health Field Days.

National coordination of extension through the National Extension Steering Committee, which evolved into the National Extension and Innovation Network, contributed to objectives 1, 2, 4, 5, 6, 7, 8 and 9 of the WF program.

NSW Grape Grower Production and Cultural Practice Survey

The NSW Grape Grower Production and Cultural Practice Survey 2007 has provided a comprehensive basis for future assessment of the impact of extension initiatives on innovation ie practice change, in NSW grapegrowing. The survey framework is provided in Appendix 5.2.

In summary investment in national extension contributed to the following:

- A coherent, user-focused approach to ensuring prompt and effective delivery of research benefits to national industry stakeholder groups
- A coherent national communication strategy with a range of tools and media
- Integration with regional adjustment processes
- Seamless delivery of extension approaches through state agencies and industry groups
- Establishment and utilisation of a coherent evaluation of the economic, social and environmental impacts of the WF program
- Knowledge and skill gap analysis for extension planning and evaluation of practice change
- Grape production guidelines that link farm practices to end quality specifications.

The "Viticare" concept of the former CRCV became a potential element of the GWRDC's regional "Grassroots" program designed to give regional stakeholders direct responsibility for extension activities.

Coordination of delivery of Winegrowing Futures Program outputs with the Pathways to Outcomes Knowledge Management tool contributed to objectives 1, 2, 3, 4, 6, 7 and 8.

Recommendations

For continued growth of the wine sector, it is recognised that all stages of the supply chain from wine grape growing to wine marketing must remain internationally competitive. This will require a continuing innovative industry culture that depends on research, education and vocational training to enhance adoption of strategies to improve long term sustainability.

It was, and remains, essential that communication of new knowledge focuses on industry needs and how the end-user perceives the innovation. The NSW and Australian wine industry has a wide range of stakeholders including wine grape producers, wine producers, information brokers and private consultants. This wide range of stakeholders presents a broad spectrum of characteristics and capabilities that demand different and targeted communication strategies for successful outcomes. These strategies will include greater use of social media and technology to ensure widest possible uptake.

Theme 6 offered new opportunities for creating a state-based but nationally coordinated team to satisfy whole-of-industry needs by promoting:

- Linkages with research themes both in terms of informing research of industry requirements and priorities and developing a range of products to promote research outcomes to industry.
- Desk audits of national, state and regional issues
- Independent extension activities with industry
- Development of training/short course opportunities e.g. competency based training courses registered.

It is recommended that:

1. The level of resourcing for extension be maintained so that the industry participants can continue to respond to seasonal contingencies within NSW as well as extension staff meeting targeted outcomes from future projects. Project outcomes and contingency responses will made available to the rest of Australia through the National Wine Extension and Innovation Network (NWEIN).
2. A national extension coordinator be appointed to work closely with the GWRDC Program Manager for "Smart Science, Practical Solutions" to determine national extension priorities and capacity, and to coordinate extension and innovation on a national basis
3. The NWGIC plays a major role in producing and packing information in a variety of formats including, short courses, Free Running Audio Powerpoint presentations (FRAPs), brochures and leaflets, DVD and "You tube" videos and the Grapevine Management Guide. These would be made available to the rest of the industry through the National Wine Extension and Innovation Network (NWEIN)
4. GWRDC continues to support the NWEIN network. NWEIN has representation from each of the states WFA, WGGA, AWRI, wineries, Bayer, University and TAFE sector levels and provides a useful vehicle for national coordination.

Appendix 1
Communication

Training courses delivered

Workshops, presentations

Presenter	Event	Location	Date
2006			
Somers, A.	5th International Workshop on Grapevine Trunk Diseases "Esca and Grapevine Declines"	University of California, Davis.	11–13 September
Somers, A.	Pruning workshop	Cessnock	18 July
Somers, A.	Pruning workshop	Denman	1 July
Somers, A.	Pruning workshop	Tenterfield	19 July
Somers, A.	Pruning workshop	Armidale	20 July
Somers, A.	Pruning workshop Cessnock 24 July		
Somers, A.	IPM workshop	Orange	23–24 August
Somers, A.	IPM workshop	Port Macquarie	16–17 August
Somers, A. and **Bright J.**	IPM workshop	Armidale	30 August
Somers, A.	Drought survival workshop	Broke	16 October
Somers, A.	Drought survival workshop	Tenterfield	18–19 October
Quirk, L.	Heat/Water Stress workshop	Cowra	26 November
2007			
Blackman, J., **Somers, A.** and **Saliba, A.**	HVVA Wine Technical Sub-Committee Semillon Seminar	22 January	
Somers, A.	Bunch rots identification and control workshop	Clovelly Estate Kingaroy	6 February
Somers, A.	Bunch rots identification and control workshop	QDPI&F Research Station Applethorpe, Queensland.	7 February
Connellan, J.	Wine Grapes Marketing Board–presentation on gauging water quality, new agrichemicals, pest and disease issues for coming season	Yenda, Hillston, Hanwood, and Whitton	9–10 October.
Quirk, L. and **Deegenaars, A.L.**	Soils and Irrigation workshop held in	Young	7 November
Farquhar, D.	Opportunities for Nationally Coordinated Viticulture Extension	Hunter Region	29–30 October.
Farquhar, D.	Opportunities for Nationally Coordinated Viticulture Extension	NWGIC, Wagga Wagga	12 November
Farquhar, D.	Steering Extension in Australian Wine–a plan for coordinated extension		
Deegenaars, A.L.	Chemical User Training Course	Tumbarumba	November
Deegenaars, A.L.	Chemical user Training Course	Tumbarumba	December
2008			
Quirk, L.	Winegrape Benchmarking Survey–Cowra results	Cowra	12 June
Quirk, L.	Bunch Stem Necrosis–a regional issue	Orange	13 June
Bright, J.	ORVA vineyard walk and season wrap.		
Somers, A. and **Weckert, M.**	Using mulches in vineyards –benefits and costs	Hunter Valley	5 August
Marte, S. and **Weckert, M.**	Using mulches in vineyards–benefits and costs	Mudgee	6 August
Quirk, L. and **Loch, A.**	Queensland Fruit Fly	Hunter Valley	20 August
Landers, A.	Improving spray application in the vineyard	Griffith	13 October
Landers, A.	Improving spray application in the vineyard	Orange	15 October

Presenter	Event	Location	Date
Somers, A. and **Rogiers, S.**	Industry Seminar on the Hunter Valley Semillon Project		28 October
Somers, A.	Workshops on Managing Fruit Fly in home gardens	Cessnock and Singleton	1 November
2009			
Somers, A.	Vineyard Mini Workshop	16 September	
Somers, A.	Protecting Vine Health workshop	Hunter Valley	3 October
Somers, A.	Vineyard Mini Workshop	Hunter Valley	21 October
Somers, A.	Protecting Vine Health Workshop	Hunter Valley	31 October
Somers, A.	Soil Health Workshop	Stanthorpe	11 November
Blake, A. and **Somers, A.**	Map Soil Biology Course for training competencies in viticulture		17 December
Hackett, S.	Survey Horticulture farms for Bot. alternate hosts		23 November
Quirk, L. and **Hackett, S.**	Training workshop on trunk diseases for Riverina growers	Griffith	24 November
Somers, A.	Training workshop on trunk diseases for Riverina growers	Griffith	24 November
Quirk, L. and **Hackett, S.**	Training workshop on trunk diseases for Victorian growers	Rutherglen	25 November
Somers, A.	Training workshop on trunk diseases for Victorian growers	Rutherglen	25 November
Somers, A.	Soil Biology Meeting	Mudgee	19 January

Research conference–papers and/or addresses

Somers, A., Thompson, R., Qiu, Y., Savocchia, S. and Lamb, D. (2006). Spatial variability of soil salinity and grapevine dieback in Chardonnay and Shiraz. 5th International Workshop on Grapevine Trunk Diseases "Esca and Grapevine Decline". 11-15 September, Davis-California, USA. p 65.

Quirk, L., Bright, J., Somers, A. and **Andrew, J.** Winegrowing 2007 Futures–A baseline that has an Orange Flavour. Agriculture and Fisheries Extension Conference Orange 25–28 June, Excellence in Agricultural Extension–Balancing the Demands. 49–51.

Deegenaars, A.L. (2007) National Wine and Grape Industry Centre's holistic approach to merging training, education, extension and research in Catchment Communities across NSW". Australian National Committee on Irrigation and Drainage Conference, Bundaberg 19–22 August, Sharing the water; food fibre, people and environment–working together there is a way. Proceedings CD.

Deegenaars, A.L. (2008). NSW staff connecting wine industry organisations in learning about their spaces–environmental sustainability, water use efficiency and quality wine grapes. Australian Learning Communities Conference.

Somers, A., Quirk, L. and **Loch, A.** (2009). Using participatory processes to manage a new pest of wine grapes. APEN Conference, Bunbury WA. 10–11 November

Research conference–posters

Quirk, L., Bright, J., Somers, A., Moulds, G., Hackett, S., Beckingham, C., Dart, J. and **Connellan, J.** (2007) A survey that has an Orange flavour. 13th Australian Wine Industry Technical Conference, Adelaide, 28 July–2 August.

Deegenaars, A.L., Somers, T. and **Leavitt, G.M.** (2007) National Wine and Grape Industry Centre's holistic approach to merging training, education, extension and research. *In* Proceedings of 13th Australian Wine Industry Technical Conference. Adelaide, 28 July–2 August.

Farquhar, D. (2008). Whats happening in the National Wine Extension Effort ? A snapshot in 2008. Prepared for the priority development for the Wine Extension Steering Committee.

Rogiers, S., Hutton, R., Greer, D. and Somers, A. (2008). Stomatal control of transpiration in irrigated and nonirrigated Semillon (*Vitis vinifera* L.) In Proceedings of 8th International Symposium on Grapevine Physiology and Biotechnology. Adelaide, 23–28 November.

Somers, A., Quirk, L., Loch, A., Riley, L., Bright, J., Bray, K. and **Fries, N.** (2010). Using participatory processes to manage a new pest of wine grapes, APEN.

Somers, A., Thompson, R., Qiu, Y., **Savocchia, S.** and Lamb, D. (2007) Spatial variability of soil salinity and grapevine dieback in Chardonnay and Shiraz. Conference abstracts, 13th Australian Wine Industry Technical Conference. 28 July–2 August, 2007. Adelaide, Australia.

Technical reports and industry journals

Beckingham, C. and Porteus, M. (2006). Mulching repeats yield lift in second Mudgee harvest. *Australian Viticulture*, September/October, p 47.

Somers, A. (2006). 5th International Workshop on Grapevine Trunk Diseases and Investigation of summer fruit rots. Final report to GWRDC. Project number GWT 06/02. 30 November.

Quirk, L., Bright, J., Andrews, J. and **Somers, A.** (2007). Survey aims for strategic direction that has an Orange flavour. *The Australian and New Zealand Grapegrower and Winemaker.* pp 19–20.

Giddings, J. and **Deegenaars, A.** (2008). Managing the conversion to drip irrigation in vineyards- pitfalls and post conversion scheduling techniques. GWRDC drought module (trainer and trainee notes and presentation materials).

Holzapfel, B. and **Quirk, L.** (2008). Post Harvest Care of Vines. GWRDC drought module (trainer and trainee notes and presentation material)

Savocchia, S., Steel, C.C., Stodart, B.J. and **Somers, A.** (2007). Pathogenicity of *Botryosphaeria* species isolated from declining grapevines in sub-tropical regions of eastern Australia. *Vitis* **46:** 27–32.

GWRDC (2006). 5th International Workshop on Grapevine Trunk Diseases and Investigation of summer fruit rots. Final report to GWRDC. Project number GWT 06/02. 30 November.

GWRDC (2008). The final report to Grape and Wine Research and Development Corporation on Water Relations of Semillon Vines. Project Number: RD 04/03-1

Leaflets, brochures, technical guides

Hackett, S. (2008). Vineyard Identification System. http://www.dpi.nsw.gov.au/agriculture/horticulture/grapes/vineyard-id-system

Quirk, L. and **Somers, A.** (2006). Grapevine Management Guide. Agdex 241/10. ISSN 1036-7551

Quirk, L. and **Somers, A.** (2007). Grapevine Management Guide. Agdex 241/10. ISSN 1036-7551

Quirk, L. and **Somers, A.** (2008). Grapevine Management Guide. Agdex 241/10. ISSN 1036-7551

Quirk, L. and **Somers, A.** (2009). Grapevine Management Guide. Agdex 241/10 September 2009. ISSN 1036-7551

Quirk, L. and **Somers, A.** (2010). Grapevine Management Guide. Agdex 241/10. ISSN 1036-7551

Somers, A. and **Steel, C.** (2010). Answers to frequently asked questions about the identification and management of this disease in vines. GWRDC innovators network Fact Sheet

Somers, A., Steel, C. and **Greer, L.** (2011). Identification Poster: Common fruit rots of Wine Grapes in Australia. June. NWGIC

Regional media

Contact	Title/description	Media	Date
2007			
Connellan, J.	Sourcing grapevine planting material.	Area News, Griffith.	5 July.
Connellan, J.	Grapevine scale in Australian vineyards.	Area News, Griffith.	16 August
Connellan, J.	How will viticulture in the Riverina be affected by climate change	Area News, Griffith.	18 October
Connellan, J.	Promotion of drought response workshop	Radio 2RG Griffith	27 April
Connellan, J.	Sourcing grapevine planting material	Radio 2RG Griffith	28 June
Connellan, J.	Monitoring scale in the vineyard	Radio 2RG Griffith	17 August
Connellan, J.	Promotion of farm safety workshop	Radio 2RG Griffith	11 October
Connellan, J.	Promotion of climate change forum	Radio 2RG Griffith	19 October
Weckert, M.	Tackling young vine decline	Agriculture Today	September
O'Malley, K.	Mudgee organic grape production	Agriculture Today	September
Somers, T.	Vineyards adopting sustainable practises	Agriculture Today	September
Hutton, R.	Winegrowers looking to a better future	Agriculture Today	September
Holzapfel, B.	Vine roots under study	Agriculture Today	September
Beckingham, C.	Weed tactics part of long term plan	Agriculture Today	September
Quirk, L.	Wine survey defines growers' needs	Agriculture Today	September
Hutton, R.	Making News box: No Murrumbidgee shortages	Agriculture Today	September
York, B.	New horticulturist brings international perspective to Mudgee	DPI press release	
York, B.	New appointments to boost wine industry	DPI press release	
Hon. Ian MacDonald	Vineyard Identification System		

Contact	Title/description	Media	Date
2011			
	Vintage update during wet and difficult seasonal conditions	WIN Television	21 February
	Vintage update, weed management and future vineyard viability and industry considerations discussed	On Target in Agriculture radio interview	25 February

Public presentations

Phylloxera workshops

Advisor	Senior Inspector	Location	Month in 2007
L. Ullio		Sydney	May
J. Bright	P. Anderson	Orange	May
L. Ullio	R. Bowman	Bowral/Camden/Berry	May
J. Dart	P. Anderson	Tumbarumba	May
A. Somers	T. Grant	Tenterfield/Armid	May
A. Somers	R. Bowman	Hunter/Port Macquarie	May
L. Quirk	T. Rafferty	Wagga/Gundagai	April
S. Hackett	P. Anderson	Canberra	April
L. Quirk	P. Anderson	Cowra/Young	April
J. Connellan	T. Rafferty	Griffith/Moama	April
C. Beckingham	P. Anderson	Mudgee/Dubbo	April
G. Moulds	T. Rafferty	Sunraysia/Menindee	March

Meetings/extension activities

Extension Officer(s)	Extension Activity	Date
2007		
Tony Somers	Phylloxera workshops; Lower Hunter, Armidale and Tenterfield	1–3 May
Tocal Agricultural College	Tocal Field Days	4–6 May
Tony Somers	Hunter Valley Vineyard Association Viticulture seminar.	5 June
Tony Somers and Alison Deegennars	Accredited pruning training; Mudgee	6 June
Tony Somers and Alison Deegennars	Accredited IPM training; Mudgee	14 June
All Extension staff	Extension planning meeting; Wagga Wagga	19–20 June
All Extension Staff	NWGIC Symposium	21 June
Julian Connellan	Phylloxera workshop; Bilbul for De Bortoli viticulturists	10 July
Tony Somers	Trunk disease management workshop; Hunter Valley	17- 20 July
Jeremy Bright	Hand pruning of vines; workshop; Orange	24 July
	Wine Industry Technical Conference	28–31 July
Tony Somers	Integrated pest management; training workshop; Griffith, Mudgee and Hunter Valley	13–17 August
Allison Deegenaars and Jeremy Bright	Integrated pest management; training workshop; Orange and Young	16–17 August
Tony Somers	Water relations in Semillon vines; workshop; Griffith and Hunter Valley	20–24 August
Julian Connellan	Phylloxera workshop; Pericoota for growers	11 September
Shayne Hackett	Vine physiology and plant water use; Murrumbateman/Canberra Vignerons Association	25 September
Shayne Hackett	Vine physiology and plant water use; Tumbarumba	8 October
Julian Connellan	Gauging water quality, new agri-chemicals, pest and disease issues for coming season; Wine Grapes Marketing Board; presentation; Yenda, Hillston, Hanwood and Whitton	9–10 October

Extension Officer(s)	Extension Activity	Date
Julian Connellan	Climate change and viticulture; article; *Focus on Farming;* promotion of climate change forum	12 October
Julian Connellan	Radio program promoting the climate change forum	17 October
Julian Connellan	Practical farm safety; workshop; presented by Workcover NSW, organised by Wine Grapes Marketing Board; and hosted at DPI	18 October
Allison Deegenaars	Certified irrigation managers' workshop; Griffith	18 October
Julian Connellan	Climate Change Forum; organisation of viticulture component; Griffith	1 November
Allison Deegenaars	Soils and irrigation; workshop; Young	7 November
Julian Connellan	Murrumbidgee Irrigation Area Vine Improvement Society general meeting; technical input	28 November
Julian Connellan	Downy Mildew in grapevines; article; *Focus on Farming*	29 November
Julian Connellan	Downy Mildew and the risk to crops in the region; radio program	29 November
Julian Connellan	Riverina viticulturist meeting; technical input; Murrumbidgee Irrigation Area Vine Improvement Society farm	12 December
Julian Connellan	Murrumbidgee Irrigation Area Vine Improvement Society general meeting; technical input	13 December
2008		
Duncan Farquhar	Signposts meeting	6–7 February
Julie Dart	Drought assistance meeting with Tumbarumba vignerons to explain MDB irrigation management grants	7 February
Shayne Hackett	Assisted other themes with harvest activity and data collection	1 April
Shayne Hackett	Phylloxera; workshop; Canberra region	2 April
Duncan Farquhar	National Wine Extension Network; meeting; Melbourne	16 April
Duncan Farquhar	National Extension Group; planning meeting; Attwood	16 April
Julie Dart	Meeting with Shane Hetherington, Leo Quirk, Julie Dart and members of TVA to discuss RITA proposal for crop loss problem – could be either Pseudomonas syringae infection or Molybdenum deficiency affecting fruit set	17 April
Julian Connellan	Phylloxera; workshop; Griffith	23 April
Clarrie Beckingham	Phylloxera; workshop; Mudgee	30 April
Shayne Hackett	Pruning after frost; workshop; Murrumbateman/Canberra Vignerons Association	7 May
Shayne Hackett and Julian Connellan	Vine physiology and plant water use; drought Response workshop; ASVO/NSW DPI/WGMB; Griffith	11 May
Julie Dart	Phylloxera; workshop; Tumbarumba	17 May
Duncan Farquhar	National Wine Extension Network; meeting; Perth	3–4 June
Jeremy Bright	Orange baseline survey progress; ORVA	7 June
Jeremy Bright	Managing in the drought and phylloxera; workshop; Orange	7 June
Jeremy Bright	Winegrowing Futures Theme 6 Baseline survey; symposium; Wine and Grape Industry Centre	21 June
Tony Somers	Vine and Water; Innovators Network Training; Griffith	17 September
Tony Somers	Viticulture Extension; planning meeting; Wagga Wagga	18–19 September
Tony Somers	Hunter Valley Vineyard Association Technical Committee; meeting	24 September
Tony Somers	Queensland fruit fly management; workshop; Hunter Valley	24 September
Tony Somers	Technical Committee; meeting; Hunter Valley Vineyard Association	23 October
Tony Somers	Queensland fruit fly management; workshop; Hunter Valley	23 October
Tony Somers	Hunter Regional Councils Climate Change Project; meeting	23 October
Tony Somers	Community fruit fly management; workshop; Cessnock and Singleton	1–2 November
Tony Somers	Organic waste recycling; meeting; Hunter Valley Vineyard Association Technical Committee and CMA	13 November
Tony Somers	Barossa Viticulture Group; meeting	21 November
Tony Somers	Grapevine Physiology and Biotechnology Symposium	23–28 November
Tony Somers	Orange Sauvignon Blanc; workshop	2 December

Extension Officer(s)	Extension Activity	Date
Tony Somers	State and Regional Development and Northern Inland Development Board Meeting	17–18 December
Tony Somers	Hunter Regional Councils Climate Change Project; meeting	22 December
Tony Somers	Viticulture extension and education opportunities; meeting; New England	
Shayne Hackett	Hunter Valley Vineyard Association Technical Committee; meeting	
Shayne Hackett	Winegrowing Futures Yield Forecasting Project; industry meeting	
Shayne Hackett	Drought response; workshops	
Shayne Hackett	Bunch rot; workshop	
Shayne Hackett	Phylloxera biosecurity; workshop	
Shayne Hackett	Quality management; workshop; Mudgee	
Shayne Hackett	Hunter Valley Vineyard Association Technical Committee; meeting	
Shayne Hackett	Bunch rots identification and control; workshops; Queensland.	
Shayne Hackett	Fungicide specialist from Bayer, Germany, Ludgar Treibus; meeting	
Shayne Hackett	Vine Health Program; meeting	
Shayne Hackett	Phylloxera; meeting; Orange	
2009		
Tony Somers	Hunter Valley Wine Industry Association; mini workshop	1 April
Tony Somers	Hunter Valley Vineyard Association, Viticulture Committee; meeting	1 April
Tony Somers	HVWIA Climate Change; meeting	12 May

Appendix 2
Intellectual Property

Not applicable

Appendix 3
References

Bennett, C. (1976) Up the hierarchy, Notes from Managing and Planning Projects handbook QM739/REC66, Rural Extension Centre, UQ Gatton.

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Linehan, C. and Kaine, G. (2003). The key to reducing the gap between research and application. National Landcare Conference, Darwin, NT.

Pitt, C and Nelle, SV (2008). Applying a sectoral system of innovation (SSI) approach to the Australian red meat industry with implications for improving innovation and entrepreneurship in the Australian agrifood industry. International Food and Agribusiness Management Review, 11, (4) pp. 1-24. ISSN 1559-2448 https://www.ifama.org/publications/journal/vol11/cmsdocs/20081019_Formatted.pdf

Appendix 4
Staff

Staff member (staffing changes included)	Position	Time on Theme (in kind) (%)
Murray Spicer	Theme 6 Leader	10
Delia Dray	Director	5
Clarrie Beckingham/ Sue Marte	Viticulture Extension Officer	20
Shayne Hackett	Viticulture Extension Officer	80
Greg Moulds	Viticulture Extension Officer	80
Leo Quirk	Viticulture Extension Officer	80
Julian Connellan/ Jason Cappello	Viticulture Extension Officer	80
Anthony Somers	Viticulture Extension Officer	90
Sue Marte/ Sean Brindle	Viticulture Extension Officer	40
Julie Dart/ Kevin Dodds	Viticulture Extension Officer	15
Jeremy Bright/ Anne Mooney	Viticulture Extension Officer	15
Duncan Farquhar	National Extension Coordinator	100 GWRDC
Allison Blake	Education Officer	50

Appendix 5
Other Relevant Material

1. Participatory process to manage Queensland fruit fly

Using participatory processes to manage a new pest of wine grapes

Anthony Somers[1,3], Leo Quirk[2,3], Andrew Loch[2,3], Liz Riley[4], Jenny Bright[4], Ken Bray[4] and Nathan Fries[5].
[1]Industry and Investment NSW, Tocal Agricultural Centre, Paterson NSW 2421
[2]Industry and Investment NSW, Locked Bag 588, Wagga Wagga NSW 2678
[3]National Wine and Grape Industry Centre, Locked Bag 588, Wagga Wagga NSW 2678
[4]Hunter Valley Wine Industry Association, P.O. Box 352, Cessnock NSW 2325
[5]Ace Olson, 1 Hampton Court, Aberglasslyn NSW 2320

Hear all voices

Queensland Fruit Fly (QFF) *Bactrocera tryoni* has become a significant new pest of grapevines in the Hunter Valley of NSW. This insect poses new issues including quarantine requirements for movement of fruit and control in the vineyard. Industry and Investment NSW, grape growers, viticultural consultants, a commercial reseller and the Hunter Valley Wine Industry Association developed an integrated management strategy for the 2009 season.

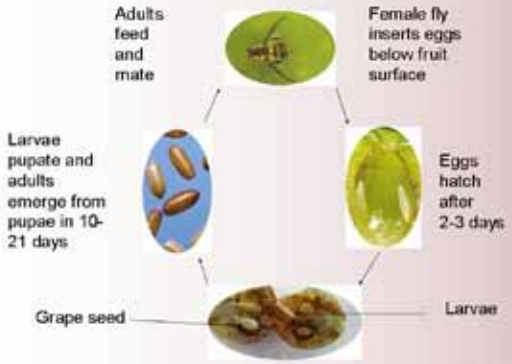


Figure 1. Queensland fruit fly lifecycle

Share the pain

Wide industry involvement in the QFF monitoring and control program was achieved. A total of 77 growers and consultants collected weekly QFF trapping numbers. This provided data from 144 individual vineyard sites.

Participants required considerable time and commitment for data collection. Monitoring results were emailed weekly to an industry volunteer for collation using Microsoft Excel (*Figure 4*). Regional results of adult QFF were fed back to participants. This allowed peaks and "hot spots" of QFF activity to be identified. Management of infestations could then be controlled in the critical early season period.

Roadside and neglected fruit hosts close to vineyards were identified and removed. Bait for application around infestation sites and vineyards was distributed by volunteers. Demonstration field days were held to inform participants on technical aspects of the program.

Workshops were held for home gardeners on QFF at nurseries by the District Horticulturist from Industry and Investment NSW. This reduced the QFF population in the two major towns close to vineyards.

Participation of the majority of vineyards in this QFF program successfully controlled this major fruit pest during the 2009 harvest. The program is now ongoing.

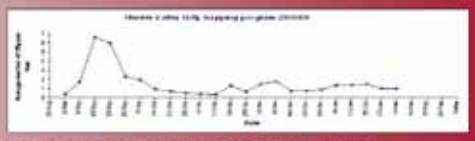


Figure 4. Average number of QFF per trap 2008-09

Key Learning's

- Hear all voices
- Use all hands
- Share the pain
- Celebrate the gain

Use all hands

The industry driven strategy was funded by the Grape and Wine Research and Development Corporation using local skills and resources.
The simplest and most effective and monitoring tool for QFF is the Lynfield trap (*Figure 2*). These traps were made by vineyard managers for distribution to other grape growers.



Figure 2. Lynfield trap

Essential resources for the Queensland Fruit Fly (QFF) control program were sourced and distributed by industry volunteers.

Central collection points for lure and bait collection were organised. Traps and bait were also distributed by commercial resellers.

The work load was shared.

Regular mini workshops and field demonstrations were held (*Figure 3*).

Topics included biology of QFF, identification of QFF, application of bait, collection and reporting, monitoring coordination, review, reflection and future direction.



Figure 3. Field demonstration on monitoring.

Celebrate the gain

Bennett's hierarchy (Bennett & Rockwell 1995) was used to evaluate the program. Key evaluation questions were asked to measure participation, practice change and process improvement.

Of those that participated in the evaluation workshop, 76% changed their practices as a result of the program. Knowledge of QFF significantly increased, but 82% needed to know more about QFF and 88% knew where to get the information.

All participants thought that QFF was important to their job or business. At the start of the program 65% of participants could not identify QFF but 100% could identify QFF at the end of the season.

Participants indentifying limitations on managing QFF was 24% however 100% intended to continue with the monitoring program next season.

The program is now ongoing and will be further developed using the systematic framework provided by Bennett's hierarchy. There results will help further decision making about program performance, program improvement and provide feedback to the industry.

Reference.

Bennett C. and Rockwell K (1995). Targeting outcomes of programs (TOP). An integrated approach to planning and evaluation. (Draft paper): USDA-CSREES-PAPPP.

2. NSW Grape Grower Production and Cultural Practice Survey 2007



NSW DEPARTMENT OF
PRIMARY INDUSTRIES



NSW GRAPE GROWER PRODUCTION & CULTURAL PRACTICE SURVEY 2007

This survey on vineyard production & cultural practises has been designed by NSW DPI and the staff of the National Wine and Grape Industry Centre to help determine research and development options for NSW vineyards.

The survey is being conducted to establish base line data for future R&D programs and is part of the Winegrowing Futures Program funded by GWRDC. The information will be used for extension purposes and deliver practical outcomes.

All information provided will be treated confidentially.

Survey number

1. Property Details

1. Please tick the region / s where your property / properties are located

☐ Hunter ☐ Mudgee ☐ Cowra ☐ MIA ☐ Sunraysia ☐ Orange

☐ South West Slopes ☐ Canberra District ☐ Other (please indicate)

2. Please tick the box that best describes your business

☐ Generational family business (including Family trusts) that supplies grapes to wineries on the open market

☐ Family business that supplies grapes to wineries on the open market

☐ Partnership (with people other than family members) supplying grapes to wineries on the open market

☐ Company (Pty Ltd), but not with family members that supplies grapes to wineries on the open market

☐ Winery only (family owned, company or partnership) with all grapes supplied and grown by others Please go to **Question 120**. All other questions are relevant to grape growers only

☐ Other (please define)

3. Please indicate how long you have been involved in the wine industry

☐ 1 to 5 years ☐ 5 to 10 years ☐ 10 to 15 years ☐ greater than 15 years

4. Where do you access information to help you make decisions about your enterprise?

Tick all relevant responses

1. Other family members	☐
2. Neighbours and other growers	☐
3. Websites, newspapers and journals	☐
4. NSW DPI Grapevine Management Guide	☐

5. Product suppliers ☐

6. Nurseries ☐

7. Government departments ☐

8. Experience ☐

9. Other (please describe) ☐

5. Please describe the size of your property / properties in hectares (if your properties are located in different regions, as identified in Question 1, please also indicate the region)

Property 1 (ha) (region)
(ha planted)

Property 2 (ha) (region)
(ha planted)

Property 3 (ha) (region)
(ha planted)

Other properties:

6. Please list the area and production per variety in tonnes that you are currently growing

Variety	**Hectares**	**Total Tonnes Produced / Sold**	**Total Tonnes sold / used**	**Tonnes not utilised**
eg Chardonnay	25 ha	250 tonnes	220 tonnes	30 tonnes

7. Please list varieties by vine age and indicate what has been contracted?

Variety	**Area of vines 1- 3 years old (ha)**	**Under Contract Yes / No**	**Area of vines 4 years and older (ha)**	**Under Contract Yes / No**
e.g. Chardonnay	25 ha	15 ha yes / 10ha no	30 ha	Yes

2. Records

8. Do you use any of the following business plans?

Whole Farm	☐ Yes	☐ No
Property business	☐ Yes	☐ No
Annual pest and disease	☐ Yes	☐ No
Annual fertiliser and amendments	☐ Yes	☐ No
Redevelopment	☐ Yes	☐ No
Environmental Management System	☐ Yes	☐ No

9. Will you revise any of these in the next 2 to 3 seasons?

☐ Yes ☐ No (go to question 11)

10. If yes, which plan / s will you revise?

3. Pruning and Trellis System

11. What proportion of your vineyard has the following pruning methods?

Pruning method	**Area of vineyard (eg ½, ¼, All, etc)**
Minimal pruned	
Machine pruned	
Machine pruned followed by hand clean up	
Hand pruned only	
No pruning	

12. Did your pruning method change this year?

☐ Yes ☐ No (go to question 14)

13. If yes, how?

14. Do you plan to change your pruning methods in the next 2-3 seasons?

☐ Yes ☐ No (go to question 16)

15. If yes, why and how will you change your pruning methods?

4. Irrigation Management

16. What percentage of irrigation system is used?

Irrigation system	Percentage (%) used on vineyard
Drip	
Furrow	
Micro	
Overhead	
None (dry land)	
Other (Please indicate)	

17. What is your current water allocation? ML/hectare

18. How much of your allocation do you use? ML/hectare

19. Do you plan to sell part of your water allocation?

☐ Yes ☐ No

20. Have you ever applied Regulated Deficit Irrigation (RDI) or Partial Rootzone Drying (PRD) in your vineyard?

☐ Yes ☐ No

21. Do you plan to use RDI or PRD in the next 2 to 3 years?

☐ Yes ☐ No

22. Can you further reduce irrigation without affecting yield or quality?

☐ Yes ☐ No

23. How might you achieve this?

24. What irrigation monitoring do you use?

☐ Evaporation figures ☐ Tensiometers
☐ Neutron probe ☐ Readily available water
☐ EnviroScan ☐ None
☐ Gypsum blocks /G bugs ☐ Other (Please indicate)

25. Do you use simpler methods such as a digstick or visual observations to schedule irrigation?

☐ Yes ☐ No

26. Have your vines ever suffered from severe heat stress leading up to harvest?

☐ Yes ☐ No

27. Do you apply your first irrigation based on soil moisture readings?

☐ Yes ☐ No

28. How often do you carry out maintenance on the irrigation system?

☐ Annually ☐ Monthly ☐ Weekly ☐ Other

29. What percentage of the vineyard has surface or subsurface drainage? %

30. What percentage of the drainage still operates? %

31. Do you carry out nutrient monitoring from the drains?

☐ Yes ☐ No

32. How much water (on average) do you apply in ML/Ha to the following varieties?
If unsure write “unknown” in box.

Variety	ML/hectare
e.g. Chardonnay	5ML/Ha
Chardonnay	
Shiraz	
Cabernet sauvignon	
Merlot	
Semillon	
Other white	
Other red	

33. Do you need more information to be able to reduce irrigation applications?

☐ Yes ☐ No (go to question 35)

34. What further information do you require to reduce irrigation applications?

5. Floor Management

35. How many times did you spray for weeds 2 to 3 years ago?

☐ One ☐ Two ☐ Three ☐ Four ☐ As required

36. What chemicals did you use for weed control 2 to 3 years ago?

☐ Glyphosate eg. Roundup

☐ Spray seed

☐ Residual herbicide (eg Surflan)

☐ Other (Please indicate)

37. How many times do you plan to spray for weeds in the 2007/08 season?

☐ One ☐ Two ☐ Three ☐ Four ☐ As required

38. What type of chemicals do you plan to use in the 2007/08 season?

☐ Glyphosate eg Roundup

☐ Spray seed

☐ Residual herbicide

☐ Other (Please indicate)

39. Will you slash weeds this season instead of spraying?

☐ Yes ☐ No

40. Do you think that vineyard neatness is essential for potential sales opportunities?

☐ Yes ☐ No

41. Will your weed control change over the next 2-3 years?

☐ Yes ☐ No (go to question 43)

42. If yes, in what way will it change?

43. Have you traditionally grown a cover crop?

☐ Yes ☐ No (go to question 47)

44. What type of cover crop do you grow?

☐ Permanent grass sward ☐ Cereal ☐ Medic

☐ Legume ☐ None ☐ Other (Please indicate)

45. Have you discontinued using a cover crop?

☐ Yes ☐ No (go to question 47)

46. What was the reason for discontinuing?

47. How do you managed your cover crop or mid row area?

☐ Slash only ☐ Spray only ☐ Cultivate

48. How many times per season did you slash the cover crop 2 to 3 years ago?

☐ One ☐ Two ☐ Three ☐ Four ☐ As needed

49. What do you plan to do in the next 2 to 3 years?

☐ Continue doing the same

☐ No cover crop

☐ Reduce slashing

☐ Other

6. Soil Amendments

50. What soil amendments have you used in your vineyard?

☐ Animal manure ☐ Compost ☐ Gypsum

☐ Grape Marc ☐ None ☐ Other (Please indicate)

51. How often do you apply these soil amendments?

☐ As required ☐ Yearly ☐ Every 2 years

52. What do you plan to use in the next 2 to 3 years?

☐ Stay the same ☐ No use of soil amendments ☐ Use one application

7. Vine Nutrition

53. What types of fertiliser do you use?

☐ Nitrogen ☐ Super ☐ N P K fertiliser

☐ DAP or MAP ☐ Other (Please indicate)

54. How do you apply fertilisers to your vineyard?

☐ Fertigation ☐ Broadcast ☐ Foliar

55. When are these normally applied?

☐ At Budburst ☐ Between flowering and veraison

☐ Post-harvest ☐ Other (Please list)

56. How often have you applied the following fertilisers? (Please tick)

Fertiliser	**Annually**	**Every 2-3 years**	**Every 3 + years**	**Never**
Nitrogen				
Phosphorus				
Potassium				
Trace elements				
Other (please				

list)				

57. When do you apply nitrogen to the following vines?

	Fertilizer Type	**Rate per ha (season total)**	**Growth Stages**	**No of applications**
e.g. Chardonnay	*Urea*	*40kg/ha*	*Pre flowering & Post harvest*	*2*
Young vines				
Chardonnay				
Shiraz				
Cabernet sauvignon				
Merlot				
Semillon				
Other white				
Other red				

58. How much nitrogen will your vines receive this season?

☐ None ☐ 10-20kg/ha ☐ 30-40kg/ha ☐ 40-50kg/ha
☐ more than 50kg/ha

59. How often do you use petiole analysis?

☐ Yearly ☐ Every two years ☐ Every three or more years
☐ Never

60. How often do you use soil analysis?

☐ Yearly ☐ Every two years ☐ Every three or more years
☐ Never

61. Do you use either soil or petiole analysis results to modify your fertiliser program?

☐ Yes ☐ No

62. Do you apply micro-nutrients to your vineyard?

☐ Yes ☐ No (go to question 66)

63. How many micro-nutrient applications do you normally use in a season?

☐ None ☐ 1 ☐ 2 ☐ 3 ☐ 4 or more

64. How many micro-nutrient applications do you plan to use this season?

☐ None ☐ 1 ☐ 2 ☐ 3 ☐ 4 or more

65. What micro-nutrients do you apply?

8. Crop Regulation

66. Do you have problems achieving consistent cropping levels?

☐ Yes ☐ No

67. Do you conduct crop estimates for your vineyard?

☐ Yes ☐ No (go to question 72)

68. If yes, what method do you use for crop estimates?

☐ Experience ☐ Bunch counts ☐ Winery ☐ Other (please indicate)

69. How often do you take crop estimate measurements in a season?

☐ None ☐ 1 ☐ 2 ☐ 3 ☐ At harvest only

70. How do you regulate crop loads to meet yield requirements?

☐ Bunch removal ☐ Chemical thinning ☐ Irrigation use

☐ Machine thinning ☐ At Pruning ☐ Shoot removal

71. Do you use bud dissections to estimate yield?

☐ Yes ☐ No

72. Have your yields exceeded your winery requirements in the past?

☐ Yes ☐ No

73. What was done with any excess fruit?

☐ Harvested onto ground ☐ Left on the vines ☐ Sold to another winery

74. If this year's crop is higher than the winery requirements, do you plan to:

☐ Harvest onto the ground?

☐ Remove the crop before harvest?

☐ Remove bunches with a machine harvester at pea-size?

☐ Leave the excess fruit on the vine (remove at pruning)?

9. Vineyard Management

75. Do you plan to continue growing grapes this year?

☐ Yes ☐ No

76. Do you plan to remain in the grape industry over the next 2 to 3 years?

☐ Yes ☐ No

77. What do you plan to do with any uncontracted fruit this year?

☐ Harvest ☐ Not grow the fruit ☐ Leave on vines

☐ Sell at reduced price ☐ Not sure ☐ Other (Please list)

78. Which varieties grown in your vineyard do you consider are of little or no commercial value?

Variety	Hectares
Chardonnay	
Shiraz	
Cabernet Sauvignon	
Merlot	
Semillon	
Other white (please list)	

Other red (please list)	

79. How much of your vineyard (%) would you or are you planning to:

Technique	% of vineyard
Mothball (if 0% go to question 84)	
Rework	
Replant	
Retrain	
Produce a crop at minimal costs on unwanted varieties	
Pull out	
Other (please list)	

80. What parts of your vineyard would you mothball?

☐ The whole vineyard ☐ Selected varieties only

☐ Varieties which are too old ☐ Low yielding vines

☐ No part of the vineyard now or in the future (go to question 83)

81. How long would you mothball your vineyard?

☐ 1 year ☐ 2 years ☐ 3 years ☐ As long as required

82. What type of information do you need to successfully mothball your vineyard?

☐ Financial ☐ Crop regulation

☐ Irrigation ☐ Nutritional

☐ Pest and disease ☐ Pruning

☐ None required ☐ Other (please indicate)

10. Vine Health

83. Has the vineyard experienced vines that suffer from dieback of the trunk or cordons?

☐ Yes ☐ No (go to question 89)

84. Did these vines continue to show these symptoms for several years?

☐ Yes ☐ No (go to question 89)

85. Were vines tested or sampled to determine a cause?

☐ Yes ☐ No (go to question 87)

86. What was the disease?

87. What was the age of the vines affected?

☐ 0-3 years ☐ 3-10 years ☐ 10-20 years ☐ Greater than 20 years

88. What area of the vineyard experienced this die back? ha

89. Have you heard of any of the following vine diseases? (Tick all applicable)

☐ Eutypa ☐ Petri Disease ☐ Esca ☐ Bot canker

90. What is your level of knowledge of these diseases? (Please tick the appropriate boxes)

Disease	Good knowledge	Some knowledge	No knowledge
Eutypa	☐	☐	☐
Petri Disease	☐	☐	☐
Esca	☐	☐	☐
Bot canker	☐	☐	☐

91. Have you had any of these diseases in the vineyard?

☐ Yes ☐ No (go to question 93)

92. If yes, what control measures did you apply?

☐ None ☐ Cut back affected vines ☐ Retrained ☐ Apply a chemical ☐ Replanted

10a. Pest and Disease Management

93. What pests and diseases do you routinely target? (Please tick)

Pest or Disease	Red Varieties	White Varieties
Powdery mildew	☐	☐
Downy mildew	☐	☐
Phomopsis	☐	☐
Botrytis	☐	☐
Light brown apple moth	☐	☐
Mealy bug	☐	☐
Vine scale	☐	☐
Other (list)	☐	☐
	☐	☐
	☐	

94. What chemicals do you use or plan to use? (Please tick)

	2-3 years ago	Plan for 07/08	2-3 years time
Sulphur	☐	☐	☐
Copper	☐	☐	☐
DMIs	☐	☐	☐
Mancozeb	☐	☐	☐
BT	☐	☐	☐
Oil	☐	☐	☐
Prosper	☐	☐	☐
Legend	☐	☐	☐
Other	☐	☐	☐

95. When do you normally apply fungicide sprays?

☐ At Bud burst

☐ 2, 4, 6, 8 and 10 weeks

☐ Every 10-12 days

☐ Every 14 days

☐ 2, 4, 6, 8, 10 weeks & every 14 days

☐ Other, please describe

96. How many insecticide sprays do you apply in a season?

☐ None ☐ One ☐ Two ☐ Three or more ☐ As required

10b. Young Vines

97. At establishment, did your vineyard or vines shown poor growth?

☐ Yes ☐ No (go to question 102)

98. Did this include any of the following? (tick all that apply)

☐ Leaf yellowing ☐ Stunted growth ☐ Poor bud burst

☐ Weak vines ☐ Vine death ☐ Uneven growth

99. Did these symptoms continue for more than 2 years?

☐ Yes ☐ No

100. How many hectares of vines showed symptoms? ha

101. Was any testing done to identify the problems?

☐ Yes ☐ No

102. What treatments do you carry out before planting a vineyard?

☐ Soil test ☐ Nematode test ☐ Deep ripping

☐ Fumigating ☐ Fertiliser application

103. When purchasing vines from a nursery, which of the following were requested:

☐ Hot water treatment ☐ Used improved material ☐ A standard of Quality

☐ Made no requests ☐ Other (Please indicate)

104. How many nurseries have you purchased vine material from?

☐ 1 ☐ 2 ☐ 3 ☐ More

105. Have you had any problems with nursery supplied planting material?

☐Yes ☐ No

10c. Bunch Diseases

106. Has your vineyard experienced bunch rot or fruit breakdown?

☐Yes ☐ No (go to question 110)

107. If yes, what area in hectares was affected? ha

108. Was the bunch disease formally identified by a laboratory?

☐ Yes ☐ No

109. What disease was identified as the cause of the bunch rot?

110. What is your knowledge of the following bunch diseases? (Please tick)

Disease	Good knowledge	Some knowledge	No knowledge
Botrytis	☐	☐	☐
Ripe Rot	☐	☐	☐
Bitter Rot (Greenaria)	☐	☐	☐
Sour Rot	☐	☐	☐

111. Do you need any further information on bunch diseases?

☐ Yes ☐ No (go to question 113)

112. What type of information do you require?

11. Semillon Vineyards (to be completed only if you grow Semillon)

113. What clones of Semillon are used in the vineyard?

☐ Unknown ☐ DA16162 ☐ TO9081 ☐ H781 ☐ Other

114. What rootstocks are used in the plantings?

115. What type of wine style are the grapes used for?

☐ White wine ☐ Blending ☐ Fortified ☐ Other

116. Do you use an inter-row cover crop to minimise heat damage?

☐ Yes ☐ No

117. What type of irrigation system do you use?

☐ Drip ☐ Furrow ☐ Flood ☐ Micro ☐ Overhead ☐ None

118. Has Regulated Deficit Irrigation or Partial Rootzone Drying been used? (Please select)

☐ No ☐ RDI ☐ PRD

119. Do you use a different pest and disease program for your Semillon?

☐ Yes ☐ No

If yes, please specify

120. What is your winery's required tonnes per ha for Semillon? t/ha

121. How many tonnes of Semillon do you produce per ha? t/ha

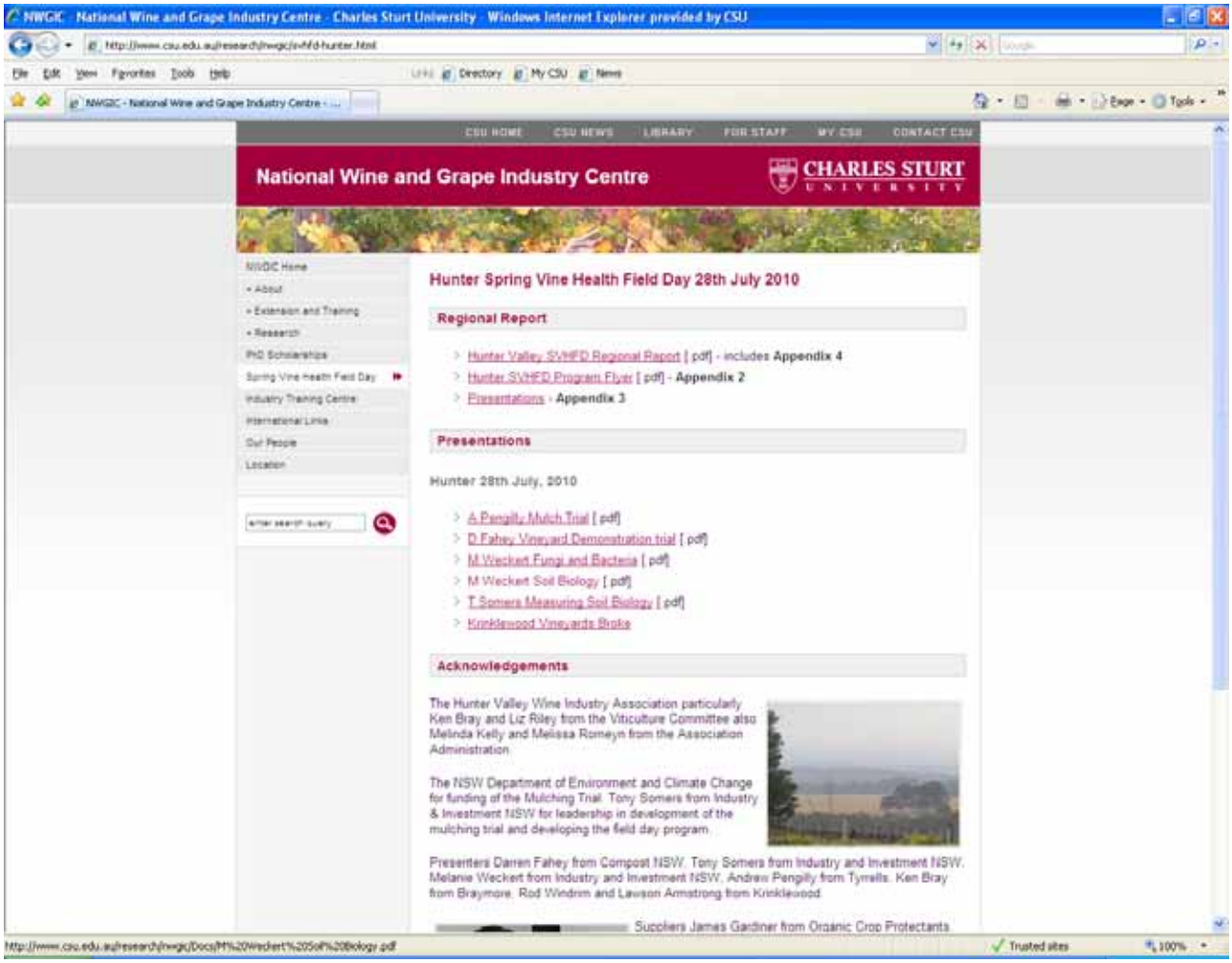
Further comments

If you have any further comments or require specific information, please let us know.

Thank you for taking the time to complete this survey. Please return in the stamp addressed envelope to:

Leo Quirk, Viticulture Extension, NSW Department of Primary Industries, NWGIC LOCKED BAG 588, WAGGA WAGGA NSW 2678

3. Web access to Spring Vine Health field day materials



4 Extension of Australian Grape and Wine research findings–a plan for coordinated national delivery, National Wine Industry Extension Steering Committee

Extension of Australian Grape and Wine Research Findings

- A plan for coordinated national delivery

Introduction

The Australian Wine Industry's National Extension Strategy aims to develop and maintain the industry's human technical capacity to sustain supply of high value wines to global markets representing 5% of world wine trade.

As part of this strategy the industry has engaged the extension resources of state government's and other stakeholders to deliver technical information and training to meet needs of grapegrowers and winemakers nationwide.



National Extension Plan

A **National Extension Manager**, appointed within the industry's Winegrowing Futures Program, and based at the National Wine and Grape Industry Centre (NWGIC), at Charles Sturt University, has convened a **National Extension Steering Committee**, comprising nominees of each state government, representatives of the industry's peak organisations, the Winemakers Federation of Australia, Wine Grape Growers Australia, the key research extension providers, the Australian Wine Research Institute, NWGIC, and the Grape and Wine Research and Development Corporation (GWRDC).

The role of the **National Extension Steering Committe**e is to:

- Develop a **National Extension Plan** for coordinated national delivery of technical information generated by grape and wine research to support capacity-building.
- ensure implementation of this plan
- enhance coordination of extension networks,
- enhance the management of grape and wine extension against measurable outcomes
- encourage better communication of research, extension and industry development priorities

The **National Extension Plan** engages public and private providers, and funding sources throughout the wine extension system. The Plan commits those stakeholders to prescribed extension activities nationally.

The **National Extension Steering Committee** will have an ongoing role in reviewing the National Extension Plan and its implementation by the National Extension Manager with a view to re-alignment with industry priority capacities in two years time.

The Role of Extension

The role of extension is to develop the commitment to, and capacity for, a culture of innovation based on the findings of scientific research. It seeks to achieve that culture by continually improving the capability and performance of people to sustainably manage their grape and wine enterprises.

Currently, national extension is undertaken through the two following major innovation networks.

National Extension Network represented by the **National Extension Steering Committee** The National Extension Manager, is responsible for providing leadership and coordinating national extension activities via the state governments and industry association extension channels. The position works to ensure that the extension and knowledge management outputs of the Winegrowing Futures Program and other national viticulture research programs are delivered in a timely and effective way to industry. The National Extension Network is the focal point for national delivery of extension and training activities undertaken at the NWGIC and plays a key strategic role in providing a pathway for delivery of research findings.

National Innovators Network: The National Innovation Manager, appointed by the GWRDC, is responsible for delivering the products of R&D and industry innovations to grapegrowers and winemakers via service provider networks (i.e. 'innovation network' - grower liaison officers, industry suppliers, industry development officers, private consultants) and through GWRDC's website. The National Innovation Manager is also responsible for collaborating closely with the National Extension Manager to identify other products and services suitable for extension.

The National Extension Plan is concerned principally with the activities of the **National Extension Network**, although it is recognised that these activities are closely linked with those of the **National Innovator's Network**.

Extension Priorities

Development of Extension Priorities

The initial set of priorities for the **National Extension Network** was determined by the **National Extension Steering Committee**. The process involved an assessment and inventory of the extension capability and activities operating in each state. Initial priority areas for coordination were agreed upon and are described below.

Future priorities will be reviewed through a consultation process involving feedback from grapegrowers, winemakers, frontline members of the **National Extension Network** and the industry's **Strategic Directions Group**.



Four Key Priorities
Initial priorities focus on capacity building in four key areas required for future industry resilience and success:

Climate Change
- A coordinated approach to mitigation, including the calculation of greenhouse gasses, in preparation for an emissions trading environment for the wine industry
- Businesses prepared to make adaptive response to climate variation and change in both the physical and policy environment

Irrigation, Water Use and Drought Response
- Confidence to use less water, optimise catchments and storage, water budgeting, best practice, mulching and vineyard floor management and other water management practices

Grape and Wine Quality and Regionality
- Recognising the imperative to grow grapes according to specification and manage winemaking faults to maximise quality and regionality in the finished wine product for market. Focus areas include the capacity to understand and manage the:
  - o Effect of smoke on grapes and wine
  - o Final consumer preferences
- A whole value chain approach to winning long run sustainable positions of excellence in global wine for particular style (variety) region combinations

Vine Health
- Increasing the effectiveness of the annual cycle of adaptive management and capacity building in vine health (including chemical management)
- Growers aware of and actively fulfilling responsibilities in protecting the industry from:
  - o exotic diseases by surveillance
  - o regionally contained pests by implementing and progressing protocols
  - o planting pests by managing the nursery relationship

Timeframes and Key Performance Indicators (KPI's) to be Activity Based
The National Extension Plan focuses the Steering Committee towards increasing the capacities listed above on an ongoing basis. The committee will establish timeframes for coordinated **extension activities** to support capacity building. Evaluations of the effectiveness of those extension activities will inform the committee's future priorities. Prescribed activities are detailed in the tables below.

Outcome	Strategies	Measures of success
Increased Triple Bottom Line value for wine businesses and government stakeholders Extension stakeholders working together to deliver industry outcomes To ensure that the output of public sector grape and wine industry research is made available to all relevant stakeholders	Development of an extension and knowledge management system to deliver timely information for adoption by businesses Ensure a feedback loop so that industry through the extension networks and fed back to the SDG. Create pathways for industry access to research output and evaluate performance.	IIncreased R&D adoption rates and measurable cost benefit of R&D investments Continued support of National Extension Coordination Committee by states, GWRDC, industry members and representatives Well informed industry. Evaluating industry awareness of research outputs.

Priority capacities	Strategies	Measures of success
Climate change	To support an integrated industry approach to climate change issues so that producers are aware of new research on climate change and able to respond to the impacts of climate change on their business	By consensus rating of preparedness
Irrigation and water use	To support integrated communication about vine water use to ensure wine businesses manage risks associated with fluctuations in water availability/supply and price	By consensus rating
Quality and regionality	To support regional groups and associations with a focus on a particular variety or wine style to succeed with this style through the value chain. By encouraging the development of services targeted at these groups	By developing a capability to make integrated assessment of how research meets the needs of leaders of regional groups with a value chain and varietal focus
Vine health	To support regional groups and associations be developing a culture of continuous improvement and capacity building in vine health with a focus on regional spring field days and workshops	Numbers of growers attending spring workshops on wine health and NVHSC rating/10 of effectiveness of these workshops in achieving vine health agenda Rating/10 on effectiveness of eight vine health strategies



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