Cooperative Research Centre for Viticulture: achievements and opportunities

Hugh Armstrong
Industry Communications and Extension Co-ordinator

This paper will present some information about the Cooperative Research Centre for Viticulture and discuss what it has done in the past, as well as its plans for the future.

The Cooperative Research Centre's Program is an important Commonwealth Government program which is so effective that it has survived successive federal governments since the days of Bob Hawke's leadership. It has survived without a name change and without significant funding cuts.

The CRC program was set up to ensure that organisations, universities, the CSIRO and various state agencies are not duplicating research, and that they are actively engaged in projects that have a direct relevance to the needs of Australian industry. The CRC program ensures that this happens by providing funding which is conditional upon groups of agencies aligning themselves with a specific industry, sharing resources and aiming towards common goals. This is a government program that actually works, and recent independent reviews indicate that there is no better system in the world.

The Cooperative Research Centre for Viticulture (CRCV) began its life seven years ago in 1992. What has happened in the ensuing time? In the world of strategic fundamental research and development, scientists do not usually hope for frequent huge breakthroughs in their field of endeavour. Rather they look towards incremental improvements. Over the last seven years there have been significant improvements in many aspects of our business and everyday life especially with the introduction of modern communication tools like e-mail and the increasing use of mobile phones.

The same comment could be made concerning the Australian viticulture industry in respect to issues such as irrigation scheduling, measuring colour, quality bonuses, automatic weather stations, lightbrown apple moth egg mass monitoring, PCR analysis etc.

These techniques were exceptional breakthroughs of their time but are now increasingly essential to everyday viticultural life.

A look at the 1992 Annual Technical Issue of the Australian Grapegrower and Winemaker gives some clues about the issues faced by the Australian wine industry at that time, e.g. 'Merlot disorder in the Hunter Valley'; 'Can wine-grape production be profitable?'; 'Viruses, viroids and grapevines'; 'Winegrape pricing arrangements in the irrigated regions of Australia'. In many ways some issues have not changed in the last seven years.

The 8th Australian Wine Industry Technical Conference in 1992 debated a new technique called the GG assay as a potential measure of grape and wine quality.

Stepping back a further seven years to 1985, the 1985 Annual Technical Issue of the Australian Grapegrower and Winemaker included an article on a 'pioneering development' and told of 'the possibility of linking weather data with detailed vineyard observations to construct a simulator of important diseases'. Readers would also have seen an article claiming that 'it can pay to mechanise your vineyard'. At the same time a wine quality seminar was held at Mudgee, attended by 30 makers and growers, and they were asked to 'ponder the wine styles which suited the area best'.

In 1985 the scheduled minimum price for Shiraz in the Murray region of South Australia was $175 per tonne, which was 10% less than the price for Sultana grapes from the same region; whilst in the Barossa Shiraz fetched $275 per tonne.

In 1985 a spokesman from Sunraysia's newest winery in 1985 said that 'the Buronga Hill development allowed plenty of room for expansion in the future if it is necessary!' (Simeon wines crushed almost 100,000 tonnes in the 1999 vintage). An Austrade report claimed that: 'Capable new winemakers and exporters can find worthwhile sales in the US market', and the Winegrape Growers Council advised that 'if you have good quality fruit it is up to you to negotiate a better price from your winemaker'.

In 1985 a South Australian government inquiry recommended that the industry develop long term plans, and advised that:
- vineyard registration was supported
- sales tax should not be increased above 10%, and
- mechanisms for industry funding of viticultural research and extension be established without delay.

At this time Berri released Karooma cream sherry in three-litre casks and Kaiser Stuhl proposed that a 'grape quality assessment system was essential'. It was further reported after discussion with growers that they wanted reasons why a load of grapes was rated at a certain level.

The Australian Grape Grower and Winemaker also reported the possibility of producing tissue-cultured, virus-free grapevines. Wineries were also exploring new products and attracting new market segments into consumption of grape-based beverages.

So what has the CRCV done over the last seven years? Furthermore, in 2006, what will be said about the previous 14 years?

A major, but intangible outcome of seven years of CRCV operation has been the construction of a network of intellectual links that capitalises on the individual strengths of agencies based in Adelaide, Sunraysia, Riverland, Tatura, Wagga, Griffith, Orange, and Melbourne. The people working in these regional sites now have a reason (and a responsibility) to talk to, work with, and be challenged by a whole new group of partners all of whom are working towards a range of common viticultural industry outcomes. The test of real co-operation comes when a group of like-minded scientists agrees on sharing a budget and agrees on final performance outcomes, as well as interacting with industry opera-
tors outside their usual sphere of influence. This has been one of the CRCV's outstanding successes.

It takes time to build these relationships, but there is now a team of people who are benefiting from the exchange of information and access to a range of new resources. It is an exciting innovation to have a wine-flavour chemist, a plant physiologist, a hydrologist, an entomologist, a fermentation microbiologist, a viticulturist and a training specialist, meeting to design and implement a multi-region, multi-discipline, multi-agency research project.

Now that a framework for real co-operation has been established the industry can more rapidly embark on new programs. The wine business is becoming increasingly integrated with production, processing, distribution and marketing carried out through partnerships, joint ventures and contracts and the industry's research structures have mirrored this approach successfully.

Over 300 individual pieces of new knowledge have been generated by the CRCV. Some of these findings will be used directly in grape growing and processing, some will be used for further investigation, and some will assist other groups to develop ideas in the future. Although there have been 40 projects of the CRCV, this paper will highlight just a few examples.

- A number of key outcomes relate to molecular diagnostics of vines and vine pests and diseases to ensure clear identification of the problem and how best to manage the situation.
- DNA typing of grapevine varieties has developed into an international commercial service co-ordinated by the Australian Wine Research Institute.
- There is now a clearer understanding of the nature of clonal differences in important varieties.
- Grapevine leaf-roll associated viruses 1, 3 and 4 have become easier to detect through the use of PCR.
- The sex lives of powdery mildew and phomopsis have revealed different strains in powdery mildew and the geographical locations of phomopsis types 1 & 2. A cryogenic method for storing cultures of different powdery mildew strains has also been developed so that future testing for DM1 resistance can be carried out.
- Studies into the somewhat controversial arena of transgenic plants or genetically modified organisms (GMOs) have produced a world first in culturing transgenic grapevines. The first transgenic vines are still under close experimental control at CSIRO and approval for controlled field evaluation is being sought. This field is an exciting one which is being carefully managed whilst a watching brief is being kept on similar developments in Europe, Israel and the United States of America.
- Other molecular studies have uncovered some of the intricate pathways that occur during grape berry development. A vital enzyme affectionately known as UFGT is now known to be responsible for a step in the production of anthocyanins and has been recently characterised. In the future this could allow enhancement of the important flavour and colour compounds in developing grapes.
- Berry ripening studies have produced new information which shows that a specific group of genes is responsible for stress related responses at veraison and another group impacts on cell walls.
- Current research is investigating the reasons why some rootstocks are resistant to phylloxera with prospects of success in the near future.
- The products of fungicide breakdown in grapes and in wine are being investigated, starting with triadimenol which is the active ingredient for Bayfidan®. This should provide some guidance regarding import tolerances for overseas markets.
- Vineyard management studies have been widely reported and presented in other ASVO Seminars, and in Research to Practice™ workshops as well as through industry print media. A very quick summary includes a comprehensive study into the benefits of strategic versus calendar spraying. The major challenge has been to convince the cooperating growers to maintain their calendar-based programs once they had seen the outstanding success of the strategic approach using pest and disease monitoring and AuvIt™.
- The vexing issue of Australian Grapevine Yellows and Restricted Spring Growth has been tackled as an additional project half way through the CRCV's term, and has produced some sound information and is ongoing.
- A comprehensive study of the effects of various canopy attributes on grape and grape characters has been undertaken and although not fully published has provided industry with a lead on quality manipulation. This work has tied in with the CRCV's development and comparison of methods such as the Glycosyl-glucose (GG) assay, colour and Brix.
- A range of irrigation treatments trialled in commercial sites has been assessed at the wine consumption stage, with significant differences demonstrated.
- A model to simulate the complex pilgrimage of nitrogen through the vineyard has been constructed and is approaching release.
- Other studies on vine/soil/water relationships have been conducted earlier in the life of the CRCV.

Two of the most visible products of the CRCV are AuvIt™ and Research to Practice™.

AuvIt™ remains the world's only comprehensive vineyard decision support system and has synthesised the combined knowledge of many years' work. It also lists registered chemicals for viticulture. The Research to Practice™ suite of training workshops has been widely acclaimed from within industry and also externally, with almost 2,000 Australian industry participants attending either the Integrated Pest Management or Water Management for Grape Production workshop series. These interactive workshops have been run in over fifty locations across the viticultural regions of Australia. Grapevine Nutrition and Spray Application; two further workshop modules that have been added to the program will be run as pilots this year in eight to ten regions and will be fully available next year (2000).

The CRCV has only recently received the approval to create a new Centre for the next seven years. This was a very competitive selection round with only 28 CRCs being funded out of an original group of 100. While this is a very pleasing result for the Australian wine industry, one very clear message from Canberra is that there will be no third round after 2006.

In an attempt to predict the needs of industry in seven or fourteen years time the CRCV went back to the Strategy 2025 to look for direction and found some guiding principles and a motivating target pitched at sales of $2.5 billion of exports by 2025.

A 'swot' analysis of the industry identified opportunities revolving around the themes of defining quality and sustainability, and increasing the value of the end product. The new CRCV will undertake a program of work over
the next seven years with approximately $14m of direct Commonwealth support, a similar amount of support from its own partners and substantial funding via GWRDC, which invests the industry's levies from producers or processors of winegrapes, and the Commonwealth's matching funding. This will be directed into a range of projects.

The research and education has been divided into four programs, as well as a special program called Viticare.

Programs 1—Vineyard management to meet grape quality specifications
• reduce variability; precision agriculture
• grape colour, tannin, flavour specified
• rapid instrumentation and measurement
• minimise negative grape parameters
• vineyard techniques to meet specification

Program 2—Sustainable vineyard systems
• advanced irrigation scheduling
• protocols for sustainable management
• manage wood/root pathogens
• integrated vineyard management, regional trials and Viticare groups

Program 3—Molecular improvement of grapevines
• improved resistance to pathogens
• improved berry quality
• adoption and communication strategies developed

Program 4—Education and training
• training of 23 PhD graduates
• enhanced skills and understanding of personnel at all levels
• integration of training through 'Winetac' partnership

Viticare: action and involvement
• provide regional groups with direct access to researchers
• establish environmental management systems
• local assessment and input into grower evaluations

The new CRCV is made up of a large number of people which reflects the benefits seen by organisations and institutions in the industry. There are 150 staff including 23 PhD students, who will be directly involved, and there are ample opportunities for individuals as industry participants to take an active role in the program by being close to the action when it happens, signing up to a Viticare program or volunteering to be part of a project reference group. The new CRCV offers the industry a way to achieve its goals through the use of science and technology, but its success will be dependent on how well the industry involves itself to maintains its long-term future.