

Climate Change and the Australian Wine Industry



Capabilities and Proposed Research Initiatives for the Wine Innovation Cluster (WIC)

The WIC - A National Resource for Grape and Wine Research

The Wine Innovation Cluster (WIC) is an alliance of five major Research and Development organisations on the Waite Campus, Adelaide South Australia. It provides state of the art facilities and capabilities for integrated grape and wine research across the production value chain ... "from vine to palate". The partners are:

- AWRI - The Australian Wine Research Institute
- CSIRO
- SARDI - The South Australian Research and Development Institute
- The University of Adelaide
- Provisor Pty Ltd





The Australian Wine Industry

The Australian Wine Industry is a significant industry and employer with international recognition. Characteristics are:

- Value of industry (direct) - \$5bn pa
- Export
 - Sales 2007-2008, \$2.657bn
 - 3rd largest wine exporter in the world by value
 - 3rd largest food export category for Australia
- Employment: 57,000 direct and 100,000 indirect
- Tourism value of approx \$1bn pa
- Regionally based production with wine styles specific to regional soils and climate
- Long lead times for change and mitigation due to significant capital investment in vineyards, wineries and associated infrastructure

Challenges

Grape production, wine quality and importantly flavour or "style" are very dependent upon climate. There is a major impact of climate on wine style and flavour and this distinguishes wine from other agriculture products. Key challenges affecting grape growing, wine production and quality are:

Climate Challenges

- Grape quality is more sensitive to temperature change than most other crops
- An increase in average temperature by 2-3°C in a region will significantly change grape quality and wine style
- Increased severity and frequency of heat stress during the growing season
- Forecast increase in unusual weather events such as frost, hail and summer rainfall
- Reduced winter rainfall, increased dependence on scarce irrigation water, decreasing water quality
- Increases in salinity and resultant soil degradation

- Increased water use per hectare
- Increasing levels of atmospheric CO₂ will directly impact grape production and water use
- Potential new threats from pests and diseases
- Shorter growing season and earlier ripening causing compression of harvest dates and an overload on picking, crushing, transport and winemaking resources

Market and Regulatory Challenges

- Impact on productivity and competitiveness
- Changes in wine flavours and styles for current key regions
- Maintaining prominence of key wine regions
- Global sourcing of grapes
- The carbon economy, carbon trading and the implications for price and exports
- Meeting regulatory requirements in domestic and export markets



WIC Research Initiatives

By harnessing its large range of capabilities, the WIC will develop and deliver innovative solutions to enable the wine industry across the whole value chain to adapt to and mitigate the effects of climate change.

To fast track the development, validation and adoption of innovative solutions the WIC partners will collaborate with other agencies on a program and project basis.

The WIC will focus in the following areas to provide tools and techniques that will enable the grape and wine industry to meet the climate and market challenges. Some of the tools and techniques will be able to be utilised in a range of primary industries.

Adapting to a Changing Climate

Within the Vineyard

- Techniques to adapt to effect of reduced water supply and rising temperatures on grapevine performance and grape quality
- Methods to manage grape composition under climate extremes
- Management of wine grape yield variation due to climate change
- Effective management of nitrogen fertiliser use, pests, diseases and weeds

- Management of grapevine growth, production and grape quality with increasing CO₂ levels
- Model potential adaptive management strategies and impacts on grape varieties and wine style
- Selection criteria for potential new rootstocks and grape varieties

At the Winery

- Techniques for maintaining wine composition, quality and style from grapes grown under changed climate conditions
- Improved capacity to manage the production of wine made from grapes grown in a drier, warmer and more variable climate to meet market demand and consumer preference
- Enhanced capacity and capability to produce wine styles suited to emerging markets and changing consumer preferences
- Tools to assist in improving the cost-effective and sustainable production of wine
- Model industry capacity requirements and develop techniques to manage vintage compression and a shift in ripening times

Regional and Wine Style Impacts

- Model the impact of climate change on grape varieties and wine styles across current and potential regions

Managing Emissions

- Tools to undertake life cycle assessments of carbon, nitrogen etc and manage emissions
- Techniques to reduce greenhouse gas emissions (CO₂ and nitrous oxides) across the whole production chain
- Techniques to improve the industry's ability to comply with regulatory requirements and respond to changing market demands
- Integration of greenhouse emission management with efficient and effective grape and wine production

wineinnovationcluster.com
Synergy in grape & wine research

The Cluster Partners

The WIC partners are all located on the Waite Campus in Adelaide, South Australia. They collaborate under a Charter of Participation.

AWRI

The Australian Wine Research Institute (AWRI) is a private company owned by the Australian grape and wine industry. For over 50 years, AWRI has contributed substantially to the success of the Australian wine sector. Priorities for research, development, extension and commercial services are driven by the Australian grape and wine sector. AWRI's staff aim for fundamental understanding and direct industry application and are specialists in traditional and cutting edge disciplines such as: winemaking, sensory science, organic and analytical chemistry, chemical engineering, mass spectrometry, spectroscopy, chemometrics, biochemistry, molecular biology, metabolomics and systems biology, microbiology, fermentation management and knowledge and information management.

CSIRO

CSIRO is Australia's national science agency and one of the largest and most diverse scientific research organisations in the world. CSIRO grape and wine research is focused on improving the performance of grapevines along the entire production, processing and marketing chain. Key areas of research include plant performance and response to stresses, flowering and fruitfulness, berry development and ripening, disease control and fruit composition – especially quality characteristics such as berry colour and flavour – as well as addressing sustainability issues such as water and nutrient use.

The University of Adelaide

Established in 1874, the University of Adelaide is Australia's third oldest. It has a rich tradition of excellence in education and research with world-class academic staff and a vibrant student life. The University's research is at the leading edge of knowledge, with research earnings consistently the highest per capita of any university in Australia. Analysis of the impact of publications and citations shows that the University of Adelaide is ranked in the top 1% in the world in 11 research fields. Through activities initiated at Roseworthy from the 1930's and re-located to the Waite campus in the early 1990's the University has been engaged in grape and wine teaching and research for over 70 years. Today wine is a major strength and research focus of the university along with food and agriculture and the biological, environmental, health, physical and social sciences. Present research expertise spans most of the wine production chain.

SARDI

SARDI is the South Australian Government's principal research organisation providing robust solutions for primary industries. The Institute

offers unique skills in viticulture with core expertise in water and irrigation efficiency, salinity management, vine physiology, climate modelling and climate risk management. A network of regional sites and connections to growers provides researchers with the necessary field space to explore the links between heat and water stresses on grape production and quality, and to test theories on how to alleviate the impact of these stresses. Climate change will influence the dynamics of pest and disease incursions and SARDI is at the forefront of research to protect viticulture from these threats. The Plant and Soil Health program specialises in pathology, molecular diagnostics and microbiology; and the Entomology program focuses on sustainable biosystems, molecular biology and biosecurity.

Provisor

Provisor is a leading technical, engineering and processing services supplier to the Australian wine industry. It specialises in evaluating the technical performance of packaging, improving manufacturing efficiency, environmental management, product development and carbon management. Provisor is the leading Australian supplier of life cycle assessments, carbon foot printing, identifying carbon reduction strategies and carbon education within the wine sector. Provisor developed the International Wine Carbon Calculator and has conducted life cycle carbon assessments for some of Australia's largest wine brands.

Provisor supply small-scale winemaking capability to the Australian wine industry in conjunction with the University of Adelaide, using tightly controlled and highly automated processes. It also provides sensory evaluation support to vineyard and winemaking projects through expert sensory panels.

