THE UNIVERSITY of ADELAIDE

Waite Research Institute
AGRICULTURE FOOD WINE

Annual Report 2016

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seek LIGHT

The Peter Waite Legacy and Vision

Peter Waite was a visionary. The son of a Scottish farmer, he immigrated to Australia in 1859 and prospered in the fledging colony of South Australia. Throughout his journey from the pastoral lands of the mid-north of South Australia to the boardroom of the "General and Commission Agent Company", later to become Elders Smith & Co Ltd, Peter Waite embraced and developed innovative and contemporary farming practices.

Peter Waite gifted his homestead, Urrbrae House, and the surrounding property of 299 acres (121 ha) to The University of Adelaide in 1923 for education and research purposes. The Waite Agricultural Research Institute commenced operations on the site in 1924.

In explaining his gift, Peter Waite wrote:

"I have been much influenced by the wonderful work our agriculturalists and pastoralists have accomplished hitherto in the face of the very great odds they have had to meet. With comparatively little scientific training they have placed our wheat, wool and fruit in the highest estimation of the world: our sheep have been bought to such perfection that they are sought after not only by all our sister states, but South Africa. Our agriculture machinery has been found good enough even for Americans to copy; and our farming methods have been accepted by other states as the most up-to date and practical for Australian conditions. We have now reached a point when it behoves us to call science to our aid to a greater extent than hitherto has been done, otherwise we cannot hope to keep in the forefront."

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The Waite at a glance

The Waite is Australia's most recognised and respected agricultural research and teaching brand

The Waite is the largest concentration of agricultural research and teaching expertise in the Southern Hemisphere. Located in the south-eastern suburbs of Adelaide, South Australia, the Campus hosts:

- The University of Adelaide's School of Agriculture, Food and Wine (AFW)
- CSIRO (Agriculture & Food, Land & Water, and Mineral Resources)
- South Australian Research and Development Institute (SARDI)
- Australian Wine Research Institute (AWRI)
- Australian Genome Research Facility (AGRF)
- Australian Grain Technologies Pty Ltd (AGT)
- Arris Pty Ltd
- Food SA
- Urrbrae House Historic Precinct, including the Waite Arboretum

In addition, the Waite hosts the following specialist research centres of national significance:

- Australian Centre for Plant Functional Genomics (ACPFG)
- Australian Plant Phenomics Facility (The Plant Accelerator)
- ARC Centre of Excellence in Plant Cell Walls
- ARC Centre of Excellence in Plant Energy Biology (node)
- ARC Industrial Transformation Training Centre in Innovative Wine Production
- FOODplus Research Centre
- Wine Innovation Cluster (WIC)
- ARC Industrial Transformation Research Hub for Wheat in a Hot, Dry Climate
- The University of Adelaide/Shanghai Jiao Tong University Joint Lab for Plant Science and Breeding
- The Fertiliser Technology Research Centre

Over the last 90 years, the Waite Campus has developed through the pursuit of excellence in agricultural science and collaboration between the co-located organisations to become:

- Australia's most recognised and respected agriculture research and teaching brand
- A global leader in agriculture, food, wine and natural resources science, exploring and informing critical national and global issues and challenges such as Australian agriculture industry competitiveness, food security, sustainable intensification of agricultural production, food, nutrition and health, advanced agricultural systems, and adaptation to climate variability and change
- An international model of research, development, industry application and teaching through co-location of institutional partners, with capability in whole of value chain approaches from gene discovery to consumer needs
- Renowned for high-quality education and training in agriculture, food and wine through undergraduate and postgraduate coursework and research degree programs
- A leading centre of research capability for grains, plant breeding, soil and wine science and natural resource management within Australia.

15 world-class research organisations and centres

1100 research and technical staff

550+ undergraduate students

295+ postgraduate students

$120+ million research income/ expenditure per annum

$270 million research and teaching infrastructure

A consistent high-impact publication record

Internationally recognised for delivering transformational and high impact agricultural technologies and systems

The WRI aims to contribute solutions to the emerging challenges of global food security and agricultural sustainability by stimulating and supporting internationally-competitive research.

WRI's vision, mission & strategic objectives

Vision

Our vision is to assist the agriculture, food and wine sectors in creating valuable, high-quality products and meeting the challenges of global food security, climate and environmental change, and providing nutritious food for a healthy community.

Mission

Our mission is to deliver world-class advances in plant biology, agricultural production, and wine, food and nutrition sciences to inform and support these sectors and policy makers – for the benefit of consumers and global communities.

Strategic Objectives

Waite Research Excellence

- Support strategic appointments, visitors and partnerships to maximise the opportunities for innovative and significant research at the Waite
- Build key strengths to support the development of research excellence in agriculture, food and wine
- Invest in new research fields and technological innovations with high potential and relevance to agriculture, food and wine
- Attract outstanding research students to ensure future excellence of expertise in agriculture, food and wine
- Enhance interdisciplinary research activity by supporting existing and potential collaborations across the University of Adelaide and Waite Campus partners

Waite Research Innovation

- Support interactions between the University and industry, particularly with the involvement of research students
- Attract relevant and well-resourced local and global agriculture, food and wine industry partners to the Waite Campus to support fundamental and applied research and related infrastructure
- Enhance partnerships that promote the uptake of research outcomes for greater impact

Waite Research Global

- Support international research collaborations for the benefit of the Australian and global agriculture, food and wine sectors
- Extend the capability and capacity of our researchers through targeted global engagement, especially with University of Adelaide priority partners (the University of Nottingham, Shanghai Jiao Tong University and North Carolina State University)
- Encourage and support international exchanges of staff and students to build research excellence, and enhance the scope and scale of global research collaboration

Waite Research Enabled

- Support and promote a culture of mentoring at all levels of career development
- Support future research leaders through targeted development programs and talent renewal initiatives
- Support investment in major and unique research infrastructure and services that attract leading researchers and enable research excellence

Waite Research Engaged

- Communicate the findings, benefits and significance of our research and education initiatives to our full range of stakeholders
- Ensure the research and education at the Waite are visible and widely known for excellence in agriculture, food and wine
- Maintain continuous links with Waite alumni for mutual benefit

Where does the WRI fit in?

Established in 2009, the Waite Research Institute (WRI) is an initiative of The University of Adelaide. It aims to bring together world-leading researchers with a multi-disciplinary focus, to support collaboration between the Waite Campus partners and other organisations, to drive research for the benefit of Australia's agriculture, food and wine sectors and to facilitate the career development of the next generation of Waite researchers.

The WRI is closely aligned with the University's School of Agriculture, Food & Wine, but also plays a pivotal role on the campus, providing a much-needed 'front door' service for the precinct, supporting strategic and collaborative research initiatives between the collocated partners, investing in infrastructure, and coordinating shared communications and events.

As the 21st century successor to the world-renowned Waite Agricultural Research Institute, the WRI nurtures both the vision of Peter Waite and the University's efforts to assist in delivering agriculture, food and wine research outcomes for the benefit of all.

WRI's goals, structure and governance

WRI Goals

In 2016, the WRI's activities continued to be focussed on the broad goals of:

1. Growing the quality of Waite science
2. Enhancing the reputation of the Waite
3. Increasing collaboration across the Waite
4. Developing Waite people for the future

WRI Structure and Governance

In 2016, the WRI's investment decisions were managed by the School of Agriculture, Food and Wine's Research Committee. The Research Committee, convened by Professor Diane Mather, the School's Deputy Head (Research), met quarterly to assess opportunities and review applications.

The WRI, in conjunction with the School's Research Committee, continues to seek, assess and support opportunities

- for building research excellence and capacity in areas that align with existing and emerging strengths in agriculture, food and wine
- that have strategic value for the School of AFW, the Waite and the University
- that can demonstrate breadth of impact
- that offer value for money through leveraging co-investment
- that deliver tangible returns
- that foster multi-disciplinary efforts to address important problems.

The School of AFW also has financial reporting responsibility for the WRI.

WRI Staff

The WRI was supported by a small, multi-skilled team of two staff (1.9 FTE) in 2016.

Professor Mike Keller

Director

Ms Carolyn Mitchell

Executive Officer

Mrs Keryn Lapidge

Communications Officer (0.9 FTE)

Director's Report

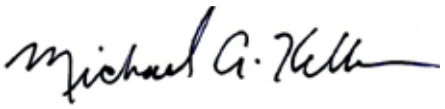
Members of the Waite Research Institute (WRI) continued to do great work in 2016. The WRI plays a key role in boosting research excellence by developing its people - all research-active staff and affiliates within the School of Agriculture, Food & Wine and its related Centres at the Waite. The WRI continued to invest in research leadership, coaching and mentoring programs for the School's early to mid-career scientists. The WRI's flagship and highly successful Research Leadership Development Program ran again in late 2016 for a fifth cohort and was supplemented by a series of workshops such as 'The Strategic Researcher' and '12 weeks to publication'.

The WRI also has a mission that extends beyond the School of Agriculture, Food & Wine, to foster and support the important partnerships with the other organisations based at the Waite Research Precinct. Building on the resolve of the Waite leaders to develop more shared and collaborative activities for the campus, two important initiatives were launched by the WRI in 2016. The Waite website (www.thewaite.org) is now used by all partners. It is an online entry point to the precinct that both enhances communication among the organisations and clearly enunciates the Waite brand to a wide range of external stakeholders. The WRI led the development and delivery of this collective portal and will continue to support and resource it.

The other shared initiative was the inaugural Waite in the Spotlight event held in July 2016. This program of short talks presented Waite research, raised the profile of the campus and communicated why agricultural science matters to a diverse audience. The audience included secondary school students, members of the public, scientists and politicians. The event was very well received. In addition to the substantial live and Twitter audiences, the recorded talks have been viewed 884 times on YouTube and the Waite website. Waite in the Spotlight will be an annual fixture on the Waite calendar from now on.

The School of AFW continues to contribute around 50% of the Faculty of Sciences and 18% of the University's total research grant income. The School's total annual research income is consistently $3-$5 million higher than in the years prior to the establishment of the WRI (Figure 1), and much of this increase can be traced to WRI-funded initiatives.

In an important transition in 2016, we restructured grains research to focus on plant breeding science and pre-breeding research that directly assists commercial breeders of a range of crops. This strategic realignment will form the basis of a significant research initiative in the years ahead and ensure that The University of Adelaide continues its leadership in this area of agricultural science.



Professor Mike Keller

Key WRI/AFW achievements in 2016

Since its establishment in 2009, the Waite Research Institute (WRI) has generated, catalysed, supported and facilitated a wide range of initiatives and made targeted investments that are continuing to produce significant outcomes for the University's School of Agriculture, Food and Wine (AFW) and the wider Waite precinct.

WRI funding (allocated through the School of AFW's Research Committee since 2015) has been invested in projects, individuals, strategic initiatives and groups that are undertaking vital research for the benefit of Australia's diverse agricultural sector, with spin-off projects, centre funding, valuable partnerships and high-impact publications among the benefits for the School and University.

A strategic planning workshop was held in March 2016 for research leaders and members from across the School of AFW's broad range of scientific disciplines to refresh the WRI's mission, vision and strategic goals and more closely align with the University's new research strategy.

Towards the end of the calendar year, the University initiated a review of its five Research Institutes, including the WRI, to assess performance, return on investment and outcomes in a range of areas.

In between, the WRI managed the development and mid-year launch of the new Waite website to streamline campus communication and provide an online portal to the wider precinct. The website (www.thewaite.org) has become a go-to resource for all campus partners and external stakeholders, with the number of subscribers to its weekly e-mail roundup of news and events climbing steadily.

The WRI also developed and coordinated a successful TEDx-style public event called *Waite in the Spotlight*, and ran its flagship Research Leadership Development Program for a fifth cohort of selected early-mid career AFW researchers. Outcomes from graduates of this program now include prestigious fellowships, promotions, award recognition, leadership of ARC Centres of Excellence and an impressive array of large grant wins.

In mid-2016, the Federal Department of Agriculture announced grant support of $5.2 million (through RIRDC) through the Australian Government's 'Rural R&D for Profit' programme for a national, multi-partner project that will look at ways to secure pollination through biodiversity for a more productive agricultural sector. The SA part of the project is jointly led by Professor Andy Lowe (School of Biological Sciences) and Dr Katja Hogendoorn (School of Agriculture, Food and Wine) and will actively involve numerous industry stakeholders, including O'Connor NRM, DEWNR, PIRSA, the Native Vegetation Council, Trees for Life, Greening Australia and the Apple and Pear Growers of South Australia. The WRI has long supported Dr Hogendoorn's research on native bees, which forms an essential part of the project, and also co-contributed $50K per year to this application.

The 2016 year also saw the first Australian Research Council grant success for Professor Dabing Zhang, the University of Adelaide—Shanghai Jiao Tong University Joint Laboratory for Plant Science & Breeding leader — another win directly attributable to the WRI, which supports Professor Zhang's appointment and group.

The WRI's key investments, outcomes and activities in 2016 are detailed from page 10.

WRI initiatives and targeted investments have been highly effective in producing significant outcomes for the University's School of Agriculture, Food and Wine (AFW) and the Waite.

A selection of AFW projects funded in 2016

^ Applications that received WRI input/support/investment in development

*** Graduates of the WRI's Research Leadership Development Program**

Reflecting the breadth and diversity of the School of AFW's research and funding sources, the following list is a representative sample of projects funded in 2016.

Rural Industries Research & Development Corporation

Rural R&D for Profit Program

Project title: Securing pollination for a more productive agricultural sector^
Funding amount: $1,228,648 (for the School of AFW)
Project summary:
This four-year pollination project will increase the profitability and security of pollinator-dependent crops by managing and improving natural resources on or near farms to improve the health, diversity and abundance of managed and wild pollinators. The project should realise significant productivity gains for farmers and will re-establish native vegetation to support pollinator food and nesting resources. Knowledge gathered by monitoring these resources will then lead to information packages that detail revegetation strategies that are tailored to the crop and region and that benefit growers.

Revegetation on or around farms that supports pollinators has been shown to enhance crop pollination and is an established strategy in major horticultural regions in Europe and the USA, but not yet in Australia.

Australian Research Council

ARC Discovery Grant

Project title: The role of SEPALLATA-like genes in determining cereal inflorescence architecture
Primary Investigator: Prof Dabing Zhang^
Funding amount: $513,500
Project summary:
This project aims to understand the morphological diversity of inflorescence architecture between cereal crop species. To do so, this project will identify functions and analyse the regulatory networks of conserved SEPALLATA genes (SEPs). This will enable them to determine cereal inflorescence morphogenesis of rice (branching) and barley (non-branching), representing the most important cereals. Identifying and understanding rice and barley SEPs, their direct targets and interactors, and how they regulate inflorescence branches and spikelets in both species is expected to provide evolutionary and developmental insights and targets to improve for crop yield.

A molecular understanding of the regulatory network that underpins inflorescence shape and grain number will advance fundamental biology, and could form the basis for significant yield improvements by manipulating key points in the developmental pathway.

ARC Linkage Grant

Project title: Adding value to waste products from the brewing industry
Primary Investigator: Prof Vincent Bulone
Funding amount: $520,000
Project summary:
This project aims to extract value from spent barley grains, the major by-product of the brewing industry. Currently sold as animal feed, this waste stream is a raw source of valuable carbohydrates and proteins for functional foods, packaging materials and liquid biofuels. This project will combine multidisciplinary approaches to characterise spent grain components and optimise release of bioactive molecules for use as prebiotics, antioxidants, nutraceuticals, and modifiers of beer quality. The research is expected to generate resources for studying barley grain, intellectual property, patents and new in-line processes for the brewing industry.

Picture: Dr Jayakumar Bose

ARC DECRA Fellowship

Recipient: Dr Jayakumar Bose*
Project title: Improving salt tolerance by optimising ion transport in chloroplasts
Funding amount: $372,000
Project summary:
Soil salinity is a major threat to agriculture throughout the world. Given the narrow nature of genetic diversity for salt tolerance within crops, salt-tolerant genes from halophytes introduced into traditional crops have major potential as a profitable source. Yield losses in crop plants are linked to the effects of salt stress on their chloroplasts.

The aim of this project is to discover the ion transport mechanisms and their molecular origins in chloroplasts that differentiate halophytes from glycophytes, allowing halophytes to optimise photosynthesis during salt stress. Novel biophysics and molecular techniques will be applied to characterise mutants deficient in targeted chloroplast ion transporters, comparing a model glycophyte and closely related halophyte. These fundamental molecular insights are likely to have significant impact on the development of salt-tolerant crop plants.

Grains Research & Development Corporation

Project title: GRDC Tender - Managing legume and fertilizer nitrogen in the southern region
Primary Investigator: Dr Matthew Denton*
Funding amount: $329,366
Project summary:
Grain growers in the Southern Region have a high level of uncertainty about the amount of nitrogen (N) supply required for cereal crops and the value of legume N in their cropping systems, including the amount of N contributed by legumes and when that N is available to the following crop. A significant amount of research has been done in quantifying amounts of N fixed by different legume crop and pasture species. In order to supply appropriate N to cereal and canola crops in the southern region, growers need to know what proportion of the legume N is made available to the following crop or crops and the timing of the N availability and how this compares with fertiliser and mineral N.

The project will assist advisors and growers through improved knowledge and tools to assist the prediction of N supply from legume and fertiliser in the Southern Region.

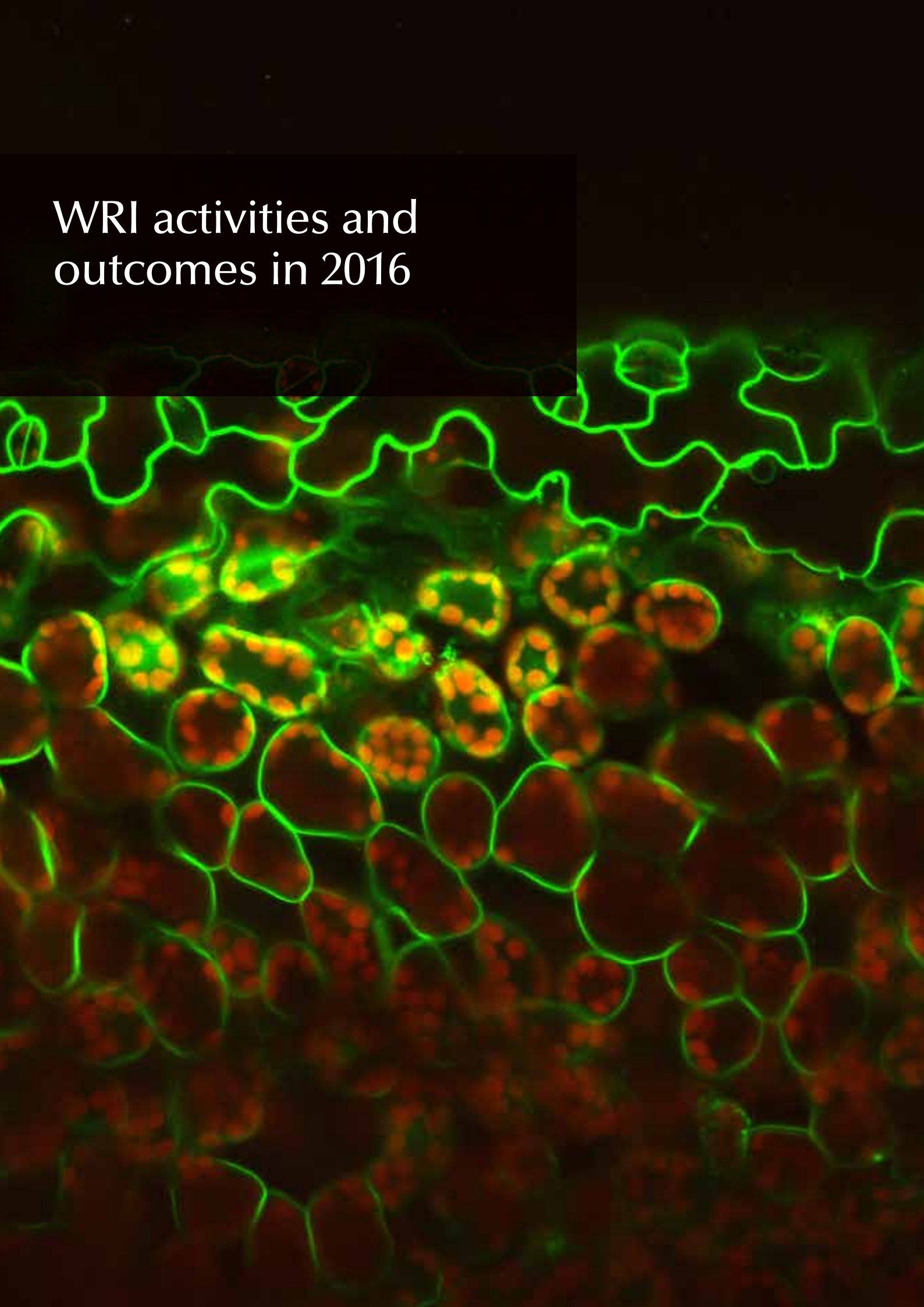
Wine Australia

Project title: Using In-Canopy Misters to Mitigate the Negative Effects of Heatwaves on Grapevines
Primary Investigator: Dr Vinay Pagay*
Funding amount: $222,609
Project summary:
This project proposes to use in-canopy misters to mitigate the negative effects of heatwaves on grapevine performance, grape ripening and composition. The project addresses the question of how heatwaves should best be managed and builds on previous independent trials which used in-canopy sprinklers and under-vine sprinklers, respectively, for canopy cooling during heatwaves.

Evaporative cooling is the most effective technique to lower canopy temperatures during heatwaves since it takes advantage of the high latent heat of vaporisation of water to convert sensible heat to latent heat. In-canopy misters takes advantage of this cooling mechanism during heatwaves to maintain both canopy function and the integrity of grape aroma and flavour compounds that contribute to wine quality. In-canopy misting is more efficient and sustainable than other water-based cooling methods, e.g. overhead or under-vine sprinklers, as it uses the least amount of water per degree of cooling resulting in cost savings to both vineyards and wineries.

This project will investigate the effects of in-canopy misting during heatwaves on vine physiology and fruit composition using an evaporative cooling model to obtain a range of canopy and fruit temperatures that will allow us to study how temperature (independently of light) affects grape flavour and volatile compounds that are key attributes of wine quality.

WRI activities and outcomes in 2016



1 Growing the quality of Waite science

1.1 Collaborative and strategic partnerships

Through targeted co-funding support for initiatives and activities of strategic importance, as well as supporting the continuously available and well-utilised practical assistance of a professional grant application writer, the WRI continues to invest in and support a range of projects, events, individuals and groups from across the multiple research disciplines of the School of AFW.

Some of the key centres, groups and activities benefiting from WRI funds in 2016 are listed below.

ARC Industrial Transformation Training Centre for Innovative Wine Production

The WRI's support of the $2.4 million ARC Industrial Transformation Training Centre for Innovative Wine Production continued through the Centre's third year with a $26K contribution towards the development of postdoctoral research staff and PhD students.

The Centre involves no less than 12 partner organisations, and will provide new knowledge, methods and technologies, as well as skilled researchers to work at the interface with industry, to help the wine sector tackle challenges such as climate change, compressed harvests, water scarcity, changing consumer preferences, and reducing alcohol levels.

See www.adelaide.edu.au/ittc-iwp/ for more details on the ARC Training Centre.

The Waite node of Adelaide Microscopy

The Waite node of Adelaide Microscopy provides an invaluable local service to Waite researchers. The WRI co-funds the annual costs of Adelaide Microscopy at the Waite, which include a full-time technical officer/ supervisor, and has supported the purchase of microscopes and ancillary equipment through past equipment rounds.

Adelaide Microscopy's Waite Facility supports researchers on the Waite Campus, providing microscopy instrumentation, expertise, technical advice and training in advanced microscopy. The facility provides a conduit to the North Terrace-based Adelaide Microscopy facility, and nationally to NCRIS-funded Australian Microscopy and Microanalysis Research Facilities.

The facility continues to be highly utilised, with more than 130 projects supported and numerous related journal articles, book chapters and theses published since its September 2013 opening. The confocal and stereo microscopes were particularly heavily used in 2016 by researchers from across the School of AFW, CSIRO and other parts of the University. Demand is growing, with more than 50 users actively accessing the facility at any given time.

The mages on this page were taken on WRI-funded microscopes by Dr Stefanie Wege, one of the School's DECRA Fellows. Stefanie is working on an Arabidopsis transport protein that is vital for normal plant development in order to understand how it impacts plant growth, root architecture, leaf shape, fertility and inflorescence architecture.

Global engagement with priority partners

As part of a larger program of exchange and partnership between The University of Adelaide and **North Carolina State University** (NCSU), the WRI has committed to the development of this partnership via travel support and seed funding for projects, and a matched funding program to facilitate joint projects aligned with the Waite's strategic directions and delivering mutual benefit and complementarity.

In 2016, the School of AFW had four students from the second year of the Bachelor of Applied Biology program take a semester of study abroad at NCSU; one NCSU student from the NCSU Horticulture program came to UA for a semester. A joint PhD student, Cara Levin, co-supervised by Diane Mather (UA) and David Bird (NCSU) has also commenced.

Image right: Arabidopsis leaf with trichomes, stereo microscope by Stefanie Wege.

Opposite Picture: Arabidopsis leaf, confocal microscope image by Stefanie Wege

A FOODplus study showed early exposure of infants to cooked egg reduces the incidence of egg allergy at 12 months of age

The University of Adelaide's partnership with **Shanghai Jiao Tong University** (SJTU) led to the establishment of a Joint Centre in Agriculture and Health in mid-2014. To date, this Centre is primarily embodied in the **UA-SJTU Joint Lab in Plant Science and Breeding**, which is substantially supported by the WRI through the half-time appointment of Professor Dabing Zhang.

Working primarily on the mechanism behind the development of cereal inflorescences, and molecular control of male fertility in rice, Professor Zhang's lab also promotes substantial collaboration between UA and SJTU in the agricultural, food and health sciences by organising regular joint workshops between UA and SJTU, the most recent held in Shanghai in late 2016.

Since its establishment in 2014, the UA-SJTU Joint Lab has produced 13 publications with both UA and SJTU affiliation, and Professor Zhang is now co-supervising six PhD students and actively collaborating with seven AFW researchers. External funding has now been obtained from sources including the Australian Research Council, the Grains Research & Development Corporation, the International Research and Research Training Fund and the European Commission.

A/Professor Tim Cavagnaro is one of four AFW researchers actively collaborating with colleagues at the Sutton Bonington campus of **Nottingham University**. He spent time there during 2016 progressing a range of projects and collaborative initiatives, including joint PhD supervisions, a LIEF bid and other grant proposals and joint publications. Four joint PhD students are currently undertaking the UA part of the shared program.

FOODplus Research Centre

The WRI supports the FOODplus Research Centre, a joint venture between the University of Adelaide and the South Australian Health and Medical Research Institute (SAHMRI). The range of FOODplus' research activity crosses from agriculture into human health and nutrition, with consumer research and commercialisation strands aiding in 'connecting the dots' between paddock and plate, growers and consumers, food and health.

FOODplus aims to enhance the nutritional value of food plants and animals through agronomic means and works with food manufacturers to develop these into new food products and prove the clinical value of foods through large scale, high-quality, randomised, controlled trials.

In 2016, FOODplus:

- published the results of a clinical trial which showed early exposure to cooked egg reduces the incidence of egg allergy at 12 months of age. This evidence, together with that of several other trials showing similar results, has helped to change the Infant Feeding Guidelines to encourage parents to introduce small amounts of cooked allergenic foods to infants between 4 and 12 months of age
- recruited the 5,000th pregnant woman in the world's largest randomised controlled clinical trial (the ORIP trial; target enrolment 5,540) to determine if fish oil reduces the incidence of early pre-term birth
- in association with Potatoes South Australia, developed a skin-on potato puree that has a refrigerated shelf life of at least 6 months. This product will be commercialised and sold as an ingredient for foods specifically formulated for infants, people with dysphagia (difficulty swallowing), and other purposes
- continued to work with Xerion Limited to commercialise the patented PUFAcoat dried blood spot technology.

Picture: The Plant Genomics Centre at the Waite

Picture: Native blue-banded bee pollinating lucerne. K Hogendoorn

1.2 Sponsored project outcomes in 2016

The following cross-section of research projects reflects both the diversity of the research undertaken by WRI members and the range of the WRI's support across multiple disciplines and sectors.

Securing pollination for a more productive agricultural sector

The recent research track record of Dr Katja Hogendoorn has been substantially supported by the WRI; along with a $50K per annum cash commitment for a multi-partner proposal to the Rural Industries Research & Development Corporation (RIRDC), this assisted in securing part of a large program grant, awarded in 2016. This multi-partner national program involves research collaborators from the School of Biological Sciences and Environment Institute at The University of Adelaide, as well as the Universities of Sydney and New England and numerous horticultural industry and NRM stakeholders.

The RIRDC's grant support of $5.2 million over four years for this project (including more than $1.2m to the School of AFW) will increase the profitability and security of pollinator-dependent crops by managing and improving natural resources on or near farms to improve the health, diversity and abundance of managed and wild pollinators. The project should realise significant productivity gains for farmers and will re-establish native vegetation to support pollinator food and nesting resources. Information gathered by monitoring these resources will then lead to information packages that detail revegetation strategies that are tailored to the crop and region and that benefit growers.

Revegetation on or around farms that supports pollinators has been shown to enhance crop pollination and is an established strategy in major horticultural regions in Europe and the USA, but not yet in Australia.

Origin and functional prediction of pollen allergens in plants

Pollen allergies have long been a major pandemic health problem for humans. However, the evolutionary events and biological function of pollen allergens in plants remain largely unknown. Professor Dabing Zhang's laboratory is working on the genome-wide prediction of pollen allergens and their biological function in the dicotyledonous model plant *Arabidopsis thaliana* and monocotyledonous model plant rice (*Oryza sativa*).

In total, 145 and 107 pollen allergens were predicted from rice and Arabidopsis, respectively. These pollen allergens are putatively involved in stress responses and metabolic processes such as cell wall metabolism during pollen development. Interestingly, these putative pollen allergen genes were derived from large gene families and became diversified during evolution.

Sequence analysis across 25 plant species from green alga to angiosperms suggest that about 40% of putative pollen allergenic proteins existed in both lower and higher plants, while other allergens emerged during evolution. Although these allergen coding genes appeared to undergo higher rates of gene duplication, their amino acid sequences have less non-synonymous mutations as evident by sequence analysis and comprehensive observation of two proven allergenic families, expansin and profilin. This implies a crucial role of conserved amino acid residues in both plant biological function and allergenicity. Finally a model explaining how pollen allergens were generated and maintained in plants is proposed.

This study provides insight into the phylogenetic and evolutionary scenario of pollen allergens that will be helpful to future characterisation and epitope screening of pollen allergens. (Plant Physiology. 2016, doi: 10.1104/pp.16.00625).

Improving food security: using male fertility for hybrid seed breeding

Using heterosis, or hybrid vigor, to develop hybrid plants has transformed agricultural practices and the seed industry. Manipulation of the male plant's fertility is a central component of hybrid seed production. For a self-pollinating plant species, one prerequisite for commercial hybrid seed production is

Picture: Arabidopsis flower taken on stereo microscope by Stefanie Wege

The WRI supports research that is diverse and multi-disciplinary with applied outcomes and real-world impact

to use male-sterile lines with normal female fertility that preclude self-pollination of the female plant, such that male reproduction is prevented. This ensures that the plant receives only pollen grains from the selected crossing partner (the male line). The scientific basis for employing male-sterile parental lines with normal female fertility to produce hybrids can be traced back more than 150 years. However, it is only recently that the molecular mechanisms underlying how male-sterile female fertility works have begun to be unraveled. Meanwhile, recent genomic, genetic, and biotechnological approaches have identified new molecular switches that determine male fertility, thus offering opportunities to create effective, novel hybrid production systems.

This project presents a holistic view of the molecular control of male sterility in cereal crops, which can help to translate fundamental knowledge into practical techniques to improve the efficiency of hybrid seed production and enhance crop productivity (Science, 2016, sponsored collection: 45).

The mystery of the non-selective cation channel solved?

Identification of the membrane transport proteins that allow Na^+ entry into plant cells under salinity stress remains an outstanding problem. This is important in terms of the energy costs of salt tolerance due to the energy costs involved in: pumping Na^+ out of the cell, the consequences of Na^+ influx in perturbing K^+ homeostasis, and the negative impact of high cytosolic Na^+ on energy organelles. One candidate for Na entry is a non-selective cation channel, the molecular identity of which remains elusive. Could this elusive mechanism be mediated by an aquaporin?

Aquaporins impart selective membrane permeability to water, which is essential for all life, and a subset of animal aquaporins function as dual ion and water channels but to date this function has not been reported for plant aquaporins. We have observed ionic conductance for a subset of plant plasma membrane intrinsic protein (PIP) aquaporins when expressed in heterologous systems. One of these PIPs is highly abundant in root epidermal cell plasma membranes. The non-selective cation channel that allows toxic entry of Na^+ into plant roots in saline conditions is inhibited by Ca^{2+} and low pH, as is the ionic conductance of this PIP of interest (with similar values of inhibitory constants).

The observation that Na^+ can permeate this PIP could explain a long-standing mystery in plant biology regarding the molecular basis for Na^+ fluxes during salt stress. It also opens interesting possibilities about energy coupling between water and ion flows. (Plant, Cell & Environment, 2016, doi: 10.1111/pce.12832 [IF 6.96, cites 5]

Controlling chloride build up in shoots

Chloride (Cl^-) is an essential nutrient and plays multiple regulatory roles in plants. In soils that contain significant sodium chloride (salt) concentrations, Cl^- can accumulate to high concentrations in plant shoots, leading to reductions in growth and potentially resulting in death. The molecular targets of Cl^- toxicity and transport are, however, largely unknown and as such research into chloride tolerance has for the most part been neglected in preference of studies on sodium tolerance.

Recently, PEB researchers have uncovered a series of transport proteins involved in regulating Cl^- accumulation in shoots. This includes the first proteins to directly load Cl^- from root-to-shoot, NPF2.4 and SLAH1, two proteins (CCC and CHX20) that indirectly control loading of Cl^-, and NPF2.5, which effluxes Cl^- from roots.

This work has been carried out in a variety of plants including grapevine, soybean and the model plant Arabidopsis. The studies have highlighted the multigenic nature of this single component of salt tolerance, and proposes targets for improving the salt tolerance of crop plants.

This work is supported by the WRI through funding to Matt Gilliham's Future Fellowship and the ARC Centre of Excellence in Plant Energy Biology (PEB).

Managing rising alcohol levels in wine

More frequent heat extremes and accelerated grape berry maturation contribute to "compressed vintages", and together these factors lead to increased alcohol levels in wines. Among various approaches to managing rising alcohol levels, the ARC Training Centre for Innovative Wine Production (ARC TC-IWP) has been investigating the effects of harvest blending regimes and water addition on wine quality attributes, and assessing the effectiveness of these approaches for decreasing the alcohol content of the resultant wines.

This PhD project is co-supervised by staff from AWRI and National Wine & Grape Industry Centre (NWGIC, Charles Sturt University Wagga Wagga) and conducted in collaboration with industry partners with WRI support.

The work involved winemaking trials with fruit from a commercial vineyard in McLaren Vale during the 2015-2017 vintages. The study revealed that a sequential harvest regime (i.e. harvesting grapes at earlier time points) or juice substitution with a green harvest "wine" (i.e. made from unripe grapes) or water prior to fermentation can be used for the production of wine with a lower alcohol content (up to 3% alcohol by volume), compared to fruit harvested at commercial ripeness. Particularly interesting was the apparent absence of dilution effects when using water, which enabled easy moderation of alcohol levels without significantly changing wine phenolic composition and sensory profile.

This pioneering work initiated further research into optimisation of the blending techniques, which is particularly interesting for winemakers in light of recent changes in the Australian and New Zealand Food Standard regulations that now permit the pre-fermentative addition of water under certain conditions.

The search for non-conventional yeast strains which will increase complexity of wine while reducing alcohol level, took one of the TC-IWP researchers all the way to France and the Institut de la Science de la Vigne et du Vin (ISVV) at the University of Bordeaux, which is famous for their cutting-edge work on non-Saccharomyces yeasts. One such yeast is *Lachancea thermotolerans*, a species of remarkable oenological potential, which in association with *S. cerevisiae*, can lead to wine acidification, lower ethanol content and increased aromatic complexity.

This study in France, supported by Laffort, Wine Australia and WRI partners, examined the genetic and phenotypic diversity of a large set of *L. thermotolerans*. The isolates, sourced from a variety of habitats worldwide, were found to group based on the geographic localisation and the isolation substrate. Some interesting patterns emerged that may represent significant opportunities to modulations of wine chemical and sensory profile, and as such may even offer solutions for some of the challenges faced by the global wine industry.

High impact publications in Peer-Reviewed Journals

Key research publications accepted and/or published in 2016 arising from projects directly funded by the WRI included:

- Sato K, Yamane M, Yamaji N, Kanamori H, Tagiri A, Schwerdt JG, Fincher GB, Matsumoto T, Takeda K & Komatsuda T (2016). Alanine aminotransferase controls seed dormancy in barley. ***Nature Communications*** 7: 11625
- Chen M, Xu J, Devis D, Shi J, Ren K, Searle I and Zhang D (2016). Origin and Functional Prediction of Pollen Allergens in Plants. ***Plant Physiology***, 172(1): 341-357
- Li B, Qiu J, Jayakannan M, Li Y, Mayo GM, Tester M, Gilliham M, Roy S (2016). AtNPF2.5 modulates chloride efflux from roots of *Arabidopsis thaliana*. ***Frontiers in Plant Science*** 7:2013
- Qiu J, Henderson SW, Tester M, Roy SJ and Gilliham M (2016). SLAH1, a homologue of the slow type anion channel SLAC1, modulates shoot Cl^- accumulation and salt tolerance in *Arabidopsis thaliana*. ***Journal of Experimental Botany*** 67: 4495-4505
- Liu Y, Yu L, Qu Y, Chen Y, Liu X, Hong H, Liu Z, Chang R, Gilliham M, Qiu L, and Guan R (2016). GmSALT3, which confers improved soybean salt tolerance in the field, increases leaf Cl^- exclusion prior to Na^+ exclusion but does not improve early vigor under salinity. ***Frontiers in Plant Science*** 7:1485
- Li B, Byrt C, Qiu J, Baumann U, Hrmova M, Evrard A, Johnson AAT, Birnbaum KD, Mayo GM, Jha D, Henderson SW, Tester M, Gilliham M, and Roy SJ. (2016). Identification of a stelar-localised transport protein that facilitates root-to-shoot transfer of chloride in Arabidopsis. ***Plant Physiology*** 170:1014-29
- Byrt CS, Betts NS, Tan H-T, Lim WL, Ermawar RA, Nguyen HY, *et al*. (2016). Prospecting for Energy-Rich Renewable Raw Materials: Sorghum Stem Case Study. ***PLoS ONE*** 11(5): e0156638
- Leghi GE, Muhlhausler BS (2016). The effect of n-3 LCPUFA supplementation on oxidative stress and inflammation in the placenta and maternal plasma during pregnancy. ***PLEFA*** 113: 33-39

2 Enhancing the reputation of the Waite

2.1 Communications and media

In 2016, the WRI's investment and activity in this area increased with the appointment of Keryn Lapidge, a specialist science communicator with a CRC background, from May 2016. The decision to resource this position arose in conjunction with the development of a shared Waite Campus website (see below), to be overseen and managed by the WRI. However, the role also encompasses the development and translation of Waite research stories for a broad audience, the use of a range of media to raise the profile of the University's agricultural science and the Waite precinct, event and publication support, and informal leadership of the Waite's communication efforts and strategy.

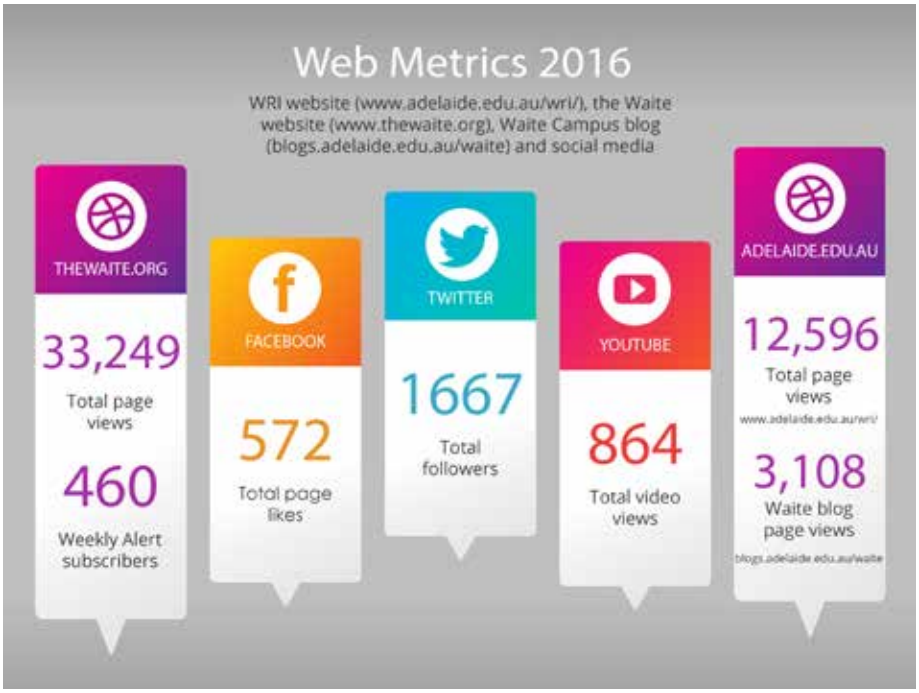
2016 also saw the WRI refresh it's strategy, priorites and visual identity. The current report has been designed within the new brand guidelines.

Waite website, online and social media

The WRI, with support from Arris and members of the Waite Communicators Group, has resourced, designed and developed a new shared Waite website (www.thewaite.org), which now provides a streamlined and comprehensive online portal to the Waite research precinct. The site offers an overview of the Waite's history and key features, contact information and details for all the organisations and centres based at the Waite, a cross-institutional capability directory, a list of user-pays services and facilities and prospective student and visitor information. As well as providing a landing place for a wide range of external stakeholders, the site is also designed to be a useful resource to staff and students, with a news feed, campus notices, employment opportunities and a shared events calendar.

The website was in development for the first half of the year, and was officially launched in July 2016. Usage grew steadily over the second half of the year averaging approximately 2000 visits per month. The website is supported by the Weekly Alert – an emailed digest of the Waite website news and events which had some 460 subscribers at the end of 2016.

Social media is also an important aspect of the WRI's online presence with the WRI managing active @WaiteResearch accounts on Facebook, Twitter, Instagram and YouTube platforms in 2016. In addition, the WRI also maintains WRI and School of AFW pages, and a Waite Campus blog on



Picture: Prof Mike Keller with Andrew 'Cosi' Costello

the University of Adelaide website. A major update of the research content of the School website was carried out in 2016.

South Aussie with Cosi

To further enhance the public profile and reputation of the Waite Research precinct in the broader community, the WRI commissioned a film crew to visit in October 2016 and film a segment for the popular Channel 9 program *South Aussie with Cosi*. The history of the campus and the Waite bequest, the Waite as a world-class agricultural research precinct and teaching and learning centre, and collaboration across the campus partners were key focus points for the segment, which aired in April 2017. The segment was filmed with the view to producing high quality video that we can post online and continue to use in various digital formats into the future.

Waite Communicators Group

The WRI convenes and facilitates the Waite Communicators Group, comprising media, communications and marketing personnel from all the Waite partner organisations. Members of this Group have contributed significantly to improvements during the last few years in the quality and flow of information between the organisations at the Waite. The Group has shared and overlapping interests in events, media liaison, high-profile visitors to the Campus, science communication, publications and display materials, and has made progress in the linking of various websites and the consistency of online content, as well as developing ideas for shared resourcing of activities.

In 2016, members of this Group worked together on the new Waite website, providing content and obtaining internal approvals where applicable. Discussions around a shared Waite Festival in 2018 are also underway, with the Waite Communicators set to lead the organisation of that large public event (last run in 2006).

'The Waite' newsletter

To better reach the Waite's large range and number of external stakeholders, including alumni, staff of relevant organisations, government departments, funding bodies and primary producers, and keep them up to date with all things Waite, a quarterly School of AFW newsletter was established in early 2015. '*The Waite*' newsletter incorporates news items from across the campus partners and captures the 'flavour' of the wider Waite precinct. The publication has been well received and its circulation (500 direct recipients, plus several hundred more staff and members of various associations and organisations) continues to grow. The newsletter is produced and disseminated by the WRI.

2.2 Awards and Honours

Awards and recognition of AFW researchers and academics in 2016 included the following:

Picture: Dr Roberta De Bei & Assoc Prof Cassandra Collins.

Waite researchers **Dr Roberta De Bei** and **A/Professor Cassandra Collins*** were named Researchers of the Year in the Australian Women in Wine 2016 Awards for their work in developing innovative techniques for vineyard management and to unveil the link between canopy size, yield and grape and wine quality. With the support of Wine Australia funding, they co-developed the VitiCanopy smartphone App, which enables users to measure grapevine canopy architecture and leaf area in the vineyard using only their mobile. This can then be associated with final yield and grape quality. The app has been well received and had good uptake by grape growers.

Picture: Dr Michelle Wirthensohn

Dr Michelle Wirthensohn* was recognised with the inaugural SA Science Excellence Award for Research Collaboration. Michelle is Program Leader of the Australian Almond Breeding Program, funded through Horticulture Innovation Australia.

Professor Dabing Zhang was named in the Thomson Reuters Highly Cited Researchers list for 2016.

Emeritus Professor Geoff Fincher was elected as a new Fellow of the Australian Academy of Science, recognised for his scientific leadership and outstanding research on plant cell walls.

Dr David Jeffery* was elected as a Fellow of the Royal Australian Chemical Institute.

Dr Olena Kravchuk* won a Barbara Kidman Fellowship for 2017.

**Cassandra, Michelle, Olena and David are graduates of the WRI's Research Leadership Development Program (see section 4.1).*

2.3 Campus tours, events and visits

Given the large number of organisations, centres and facilities co-located at the unique and beautiful Waite precinct, and the critical mass in plant science, wine, natural resource management and agricultural research they represent, the Waite receives hundreds of visitors each year, from secondary school students to prominent politicians and international researchers and business leaders.

The WRI continued to provide a 'front door' service to the Waite Campus in 2016, planning and hosting many tours of the Campus' joint facilities in collaboration with the Waite partner institutions. This activity supports the development of new collaborative relationships with national and international researchers and institutions.

During 2016, the WRI hosted, facilitated and/or coordinated the Waite visits of the following visitors/groups:

- The Governor of SA, His Excellency Hieu Van Le
- A group of 20 Eynesbury College Chinese Agents

Picture: Assoc Prof Jason Able with His Excellency Mr Najeeb Al-Bader, the Ambassador of Kuwait

Picture: The Governor of SA, His Excellency Hieu Van Le, tours Waite glasshouses

- Andrew Sharpley, President of the Soil Science Society of America
- Three candidates for the Federal electorate of Boothby
- The Rajasthan Minister for Agriculture and delegation
- A delegation from Priority Partner Shanghai Jiao Tong University to discuss plans for a Joint Laboratory for Viticulture and Oenology in Shanghai
- The International Plant Propagators Society brought 80 of their members to the Waite as a site tour for their annual conference
- A large group of Chinese University leaders visited the Waite as part of their UA leadership program in early June
- His Excellency Mr Najeeb Al-Bader, the Ambassador of Kuwait, hosted by the Department of State Development, met with grains researchers at UA and ACPFG
- 200 Year 9 students from Urrbrae Agricultural High School visited the ARC Centre for Excellence in Plant Energy Biology in August as part of their Global Sustainability Project
- The Indonesian Consul-General
- A Canadian/North-Western US Rotary Group
- Thirteen members of the Federal Government's Agricultural Industry Advisory Council (AIAC) visited the Waite in October, touring some of our facilities and learning about the world-class research of the Campus Partners.
- A senior delegation from Balitar University in Balitar, Indonesia, including the Chancellor and three Vice Chancellors, visited in November
- A group from the Agriculture and Biology Departments at the University of Lavras, Brazil
- A group of farmers from Aapresid – a no-till association in Argentina – toured the campus and met with Waite researchers to discuss comparative farming practices
- More than 50 International Student Recruitment agents from countries such as China, India, Malaysia and Singapore visited the Waite during The University of Adelaide's Agents Week.
- Over 70 year 9 & 10 students from across the State visited the Waite in December as part of the ConocoPhillips Science Experience hosted by the University of Adelaide.
- Several school groups visited the campus across the year and participated in activities with the *Why Waite?* program and other campus partners. Some of the schools involved were Caritas College in Port Augusta, Lameroo Regional Community School, and Urrbrae Agricultural High School, Mark Oliphant College and St Columba College.

Visits like these are an important part of the Waite's outreach and engagement activity.

Wine label launch

The University of Adelaide's new wine label was launched in November at the Waite winery by The Hon. David Ridgway, Shadow Minister for Agriculture, Food and Fisheries and University Vice Chancellor Professor Warren Bebbington, with the support of the WRI.

While not a commercial enterprise, the University makes over 400 different wines from sparkling whites through to fortified wines and liqueurs for research and teaching purposes, many of them of high quality.

The launch of the new label coincides with the first showing of plans for expansion and refurbishment of the winery with the aim of making it the best facility in the world for students and researchers working in the wine and allied sciences. The WRI has also supported the development of the business case for the winery expansion and will be facilitating fundraising efforts and ongoing industry engagement over the coming months.

Biofortification: Nutrition for the World

In August, the WRI hosted Dr Howarth Bouis, Director and Founder of HarvestPlus and 2016 World Food Prize Laureate, the equivalent of the Nobel Prize for Agriculture. Dr Bouis headlined a symposium on biofortification and global nutrition.

His fascinating presentation got straight to the heart of the global challenges presented by population growth, poverty, agricultural constraints, nutritional shortfalls and the consequences for human health and development. Dr Bouis highlighted the successes in plant breeding and human nutrition research, with challenges remaining in the areas of delivery, manufacturing and uptake.

The other presenters included Dr James Stangoulis from Flinders University, Dr Ross Welch (a former USDA Scientist of the Year from Cornell University), Dr Graham Lyons and Dr Chuenyuan Huang (University of Adelaide).

Waite in the Spotlight

The major 2016 Waite precinct event was the inaugural Waite in the Spotlight, which featured speakers from CSIRO, the Australian Wine Research Institute and The University of Adelaide. They gave engaging presentations on topics as diverse as soil, beer yeast, plants vs parasites and growing plants in salt water, all loosely drawn together around the theme of the unseen but important microbial activity going on around us.

Held at Lirra Lirra on Waite Road, the event attracted a live audience of around 150 to hear the short talks, which were delivered in the TEDx style. The event was also trending on Twitter as the Waite did its bit to raise awareness of some surprising and concerning facts around food consumption and security.

The talks were filmed, and the resulting short videos have been viewed nearly 900 times on YouTube, giving the event a much longer and wider reach than most. The videos can be seen at www.thewaite.org/waite-in-the-spotlight-2016

Picture: Waite in the Spotlight speakers (L-R) Dr Gupta Vadakattu, Dr Anthony Borneman, Dr Caitlin Byrt, Dr Laura Davies

3 Increasing collaboration across the Waite

The WRI continued to play a key role in increasing and enhancing collaboration at the Waite Campus during 2016 by:

- providing a central coordination and communication point for the Waite partner organisations on a wide range of matters, including developing joint initiatives, applications and other responses to external opportunities
- stimulating collaborative activity and proposals by supporting internal competitive, merit-based funding opportunities for joint projects and shared equipment purchases
- facilitating and supporting the Waite Strategic Leadership Group and the Waite Communicators Group
- leading and resourcing the development of the shared Waite website (see p16)
- facilitating, sponsoring and organising a range of ad hoc activities that are of mutual benefit to the Waite partners or which build trust, communication, networking, a collegiate atmosphere and shared interests. Examples include the annual Peter Waite Day event and seminars organised around eminent visiting scientists such as the *Biofortification: Nutrition for the World* event in August 2016.

Picture: Dr Howarth Bouis (left) and Dr Ross Welch (right), visiting speakers at the Biofortification seminar in August.

3.1 Shared investment, infrastructure and activities with Waite partners

Picture: The barrel room in the Hickinbotham-Roseworthy Wine Science Laboratory (Waite winery)

One of the major benefits arising from the unique co-location of several complementary R&D organisations at the Waite is the ability to share resources and co-invest in people, technology and infrastructure (such as the WIC Building and the Waite node of Adelaide Microscopy) to mutual benefit with reduced cost and duplication.

Some examples of shared achievements and activities facilitated and supported by the WRI during 2016 are:

- The development of a business case to support a forthcoming bid for expansion and redevelopment of the Waite winery. The winery is the home of WIC winemaking services, a joint venture between the University and the Australian Wine Research Institute, and is heavily used by researchers from across the campus.
- Support for and engagement with the South Australian Food Innovation Centre (SAFIC), which involves leaders and senior staff from some of the Waite partners as well as a number of external stakeholders. SAFIC won funding and support by the State Government in early 2016 and now has its headquarters located at the Waite.
- The development, resourcing and management of the new Waite website, www.thewaite.org, launched in July 2016.
- The inaugural Waite in the Spotlight event, which aims to showcase the breadth and quality of the research across the precinct for the widest possible audience, as well as communicate why agricultural science is important.
- The coordinating and hosting of regular tailored visits to the Waite by external stakeholders and VIPs; the WRI works closely with relevant staff at the Waite partner institutions' to incorporate their facilities and personnel in these tours for maximum exposure, impact and efficiency.

3.2 Waite Strategic Leadership Group

The Waite Strategic Leadership Group is a consultative and advisory group comprised of the leaders of the Waite organisations. Meeting quarterly, it aims to foster a shared strategic direction for collaborative research activities at the Waite Campus. The Group's goal is to identify emerging opportunities and ensure that the Waite organisations are working together to deliver on them, whilst building capacity for step improvements in Australian agriculture.

The WRI continues to facilitate and support the activities of the Waite Strategic Leadership Group through the provision of secretariat services.

3.3 Peter Waite Day - Building the Campus Community

Peter Waite Day is an informal campus community-building and networking exercise that coincides with the anniversary of Peter Waite's birthday on 9 May each year. Peter Waite's generous bequest to The University of Adelaide for the purpose of agricultural research and education and the legacy of his foresight embodied in the Waite Campus today are celebrated and remembered on this occasion each year.

Held in picturesque locations around the Campus, this WRI-sponsored annual networking event has become a highlight of the Waite calendar, enjoyed by an average of 140 staff from across the Waite partner organisations and featuring a fiercely-contested knockout bocce tournament. The 2016 event was held on the lawns of Urrbrae House, and featured a bocce team entry from The Australian Wine Research Institute for the first time. The crowd enjoyed the atmosphere, balmy weather and food and wine as the teams were put through their paces – the final was played between ACPFG and the CSIRO/UA soils 'Fertiliser Mafia' team, with the latter taking out the trophy and team prizes as twilight fell.

Picture: The 'Fertiliser Mafia', winning team in the bocce tournament at Peter Waite Day 2016

4 Developing Waite people for the future

The WRI has invested heavily in the leadership training and mentoring of the School of AFW's early to mid-career researchers since 2011, and continues to make the area of people development a priority. In addition to the flagship **Research Leadership Development Program**, developed by the WRI in conjunction with executive coach Karilyn Fazio of the Impetus Team, the WRI also funds short professional development workshops delivered each year on a range of relevant topics, open to researchers and HDR students from across the School.

In addition in mid-2016, the WRI supported the registration and travel costs for 10 HDR students and ECRs for the Winter School in Computational Biology, held in Brisbane.

Picture: Professor Vladimir Jiranek

4.1 Targeted Support of Early to Mid-Career Researchers

During 2016, a fifth cohort of 10 early to mid-career Waite researchers undertook the WRI's highly-successful **Research Leadership Development Program**. This program is tailored especially for the Waite's needs and research scientists working in a University environment. It consists of a two-day workshop followed up with small group coaching to help participants develop a research/career vision, change the work paradigm, harness ambition and communicate with different audiences.

Past graduates of the WRI's Research Leadership Development Program are now prominently and regularly featuring in promotion rounds, grant successes, high-impact publication results, media and industry engagement activities and awards.

The School of AFW and the Waite more broadly are reaping the rewards of investment in this younger generation of researchers.

Some of the career developments and highlights for graduates of the program in 2016 included:

- **Vladimir Jiranek**, Director of the ARC Industrial Transformation Training Centre for Innovative Wine Production, was appointed a Commissioner for the International Commission on Yeast (ICY), joining Prof Sakkie Pretorius of Macquarie University as representatives for Australia
- **Matt Gilliham**, currently an ARC Future Fellow supported by the WRI, was promoted to Professor at the end of 2016, and **Cassandra Collins, David Jeffery, Ron Smernik** and **Matt Tucker** were all promoted to Associate Professor
- **Delphine Fleury** now leads the ARC Industrial Transformation Research Hub for Wheat in a Hot Dry Climate following the departure of Sigrid Heuer
- **Jason Able** is demonstrating his leadership ability as Head, Department of Agricultural Science, as well as heading up the Durum Breeding Australia program
- **Tim Cavagnaro** was appointed to the role of Associate Dean (Internationalisation) for the Faculty of Sciences and also joined the editorial board of Scientific Reports which is part of the Nature group of publications
- **Caitlin Byrt** had a busy 2016 with a Faculty ECR Travel Award win, three invited public talks and an invited conference paper, and two high-impact publications arising from collaborative research

> "I learnt strategies that help me to think increasingly positively about what I can contribute as a research leader, and to remain goal oriented. As a result I have moved out of my comfort zone and created new opportunities that I might previously have talked myself out of!"
>
> *Dr Caitlin Byrt on her experience in the Research Leadership Developement Program*

Picture opposite page: Dr Caitlin Byrt

WRI and the Waite partnerships

The Waite Research Institute keeps alive the vision of Peter Waite by supporting the collective interests of the Waite Campus organisations. We do this by facilitating collaborative activity and communications, sponsoring and organising campus-community building exercises like Peter Waite Day and supporting collaborative initiatives such as conferences and workshops that bring the Waite organisations together or bring other scientists from the national and international arena to the Waite.

The Waite partnerships are an integral and valuable part of the Campus and its collegiate culture.

The WRI facilitates strategic partnerships on the Waite Campus.

University partners

The WRI's primary partner on the Waite Campus is The University of Adelaide's School of Agriculture, Food and Wine.

THE UNIVERSITY of ADELAIDE

The School of Agriculture, Food & Wine (AFW) is one of four Schools within the Faculty of Sciences at The University of Adelaide. The School is a world-class concentration of scientific research, education and product-conferring capability, the centrepiece of the Southern Hemisphere's largest collection of expertise in plant genomics, crop improvement, sustainable agriculture, animal science, dry land farming, horticulture, viticulture, oenology, wine business and food and health. The School comprises more than 220 research active staff, and several hundred postgraduate and undergraduate students move through the School's suite of degrees each year.

The School is organised into three departments – Agricultural Science, Plant Science and Food & Wine Science – and incorporates several research groups, including:

- Farming Systems
- Food & Nutrition
- Plant Breeding & Genetics
- Plant Protection
- Plant Physiology, Viticulture & Horticulture
- Soil Science
- Wine Science
- Biometry

The School of Agriculture, Food and Wine is involved in a number of specialist research centres and entities:

FOODplus RESEARCH CENTRE

FOODplus Research Centre

www.adelaide.edu.au/foodplus

LOCATION: Waite Main Building, Waite Road, Waite Campus, Urrbrae

The FOODplus Research Centre, a unit within the School of Agriculture, Food and Wine, is a joint venture between the University of Adelaide and the South Australian Health and Medical Research Institute (SAHMRI), and has research programs in human health food and nutrition with a particular focus on young families. FOODplus aims to enhance the nutritional value of food plants and animals through agronomic means and works with food manufacturers to develop these into new food products and prove the clinical value of foods through large scale, high-quality, randomised, controlled trials.

ACPFG
AUSTRALIAN CENTRE FOR PLANT FUNCTIONAL GENOMICS

Australian Centre for Plant Functional Genomics (ACPFG)

www.acpfg.com.au

LOCATION: Plant Genomics Centre, Hartley Grove, Waite Campus, Urrbrae

The Australian Centre for Plant Functional Genomics Pty Ltd (ACPFG) is one of the largest cereal crop genomics facilities in the southern hemisphere, employing more than 70 research scientists and staff. ACPFG works on delivering yield and yield stability to Australian breeders and growers in wheat and barley with a focus on yield loss due to environmental stresses. The company has a number of research projects including a longstanding research collaboration with DuPont Pioneer. The Centre also hosts the University of Adelaide's ARC Transformational Hub on Wheat in a Hot and Dry Climate which is jointly funded by ARC and GRDC with strong industry participation by Australian breeding companies.

Plant Cell Walls
ARC Centre of Excellence

ARC Centre of Excellence in Plant Cell Walls (PCW)

www.plantcellwalls.org.au

LOCATION: Level 4, WIC Building, cnr Paratoo Road and Hartley Grove, Waite Campus, Urrbrae

The ARC Centre of Excellence in Plant Cell Walls, established in 2011, is a seven-year collaboration between the Universities of Adelaide, Melbourne and Queensland in partnership with numerous domestic and international institutions. The Centre is hosted by the University of Adelaide at its Waite Campus and has nodes at both Melbourne and Queensland Universities.

The Centre's mission is to advance the fundamental scientific understanding of plant cell wall biology with particular focus on grasses and cereals. The overarching aim of the Centre is to understand how plants regulate the synthesis, assembly, re-modelling and degradation of their cell walls during normal development and in response to the environment. This fundamental knowledge, considered a 'holy grail' in Plant Sciences, is linked with socially, environmentally and commercially important applications in areas such as food security, human health, and biomass utilisation for renewable energy production.

The Centre activities are integrated in three interconnected programs underpinned by state-of-the-art platform technologies, implemented and made available across all three geographic nodes to maximise synergistic interactions and outputs not be possible through individual 'traditional' research groups.

Australian Plant Phenomics Facility

Australian Plant Phenomics Facility (APPF) - The Plant Accelerator

www.plantphenomics.org.au

LOCATION: The Plant Accelerator, Hartley Grove, Waite Campus, Urrbrae

The Plant Accelerator, a national facility established under the Commonwealth National Collaborative Research Infrastructure Scheme (NCRIS), is a world-leading plant phenomics facility offering state-of-the-art plant growth environments and the latest technology in high throughput plant imaging for the repeated measurements of the physical attributes (phenotype) of plants automatically and non-destructively. The services enable academic and commercial plant scientists to better understand the factors controlling the performance of particular crops, including: the genetic make-up of the plants, the soil

conditions, chemical and nutrient treatments, and environmental stresses. This facilitates an acceleration of crops improvement - generating crops that are more productive, disease tolerant and viable in marginal conditions.

The APPF has two nodes; The Plant Accelerator involving the research institutions at the Waite and The High Resolution Plant Phenomics Centre involving CSIRO Plant Industry and the Australian National University in Canberra.

plant energy biology
ARC CENTRE OF EXCELLENCE

ARC Centre of Excellence in Plant Energy Biology (Adelaide node)

www.plantenergy.edu.au

LOCATION: Plant Research Centre, 2b Hartley Grove, Waite Campus, Urrbrae

The University of Adelaide established a node of the ARC Centre of Excellence in Plant Energy Biology (PEB) in 2011. The current version of

the centre began in 2014 with Professor Steve Tyerman and Associate Professor Matthew Gilliham as Chief Investigators.

The Centre comprises The University of Western Australia, Australian National University, The University of Adelaide and La Trobe University, ten Chief Investigators and over 130 internationally competitive staff and students. It is funded primarily through the Australian Research Council ($26 million) and $14 million from the partner universities to fund the Centre through to 2020.

The research focus of the Centre is to better understand the way in which plants capture, covert and use energy in response to environmental change. The long-term goal is to enhance energy efficiency to improve sustainable productivity of plants. At the Adelaide node the aim is to improve the efficiency of plant energy use by manipulating the transport properties of gatekeeper cells for water, carboxylates, phosphate and salt.

ARC Industrial Transformation Training Centre in Innovative Wine Production

www.adelaide.edu.au/tc-iwp/

LOCATION: Roseworthy-Hickinbotham Wine Science Laboratories, Hartley Grove, Waite Campus, Urrbrae

Based at The University of Adelaide's Waite Campus, the ITTC for Innovative Wine Production has been made possible by $2.4 million from the Australian Research Council - Industrial Transformation Research Program, additional support from Wine Australia and $1.2 million in cash and in-kind support from the project partners. The Training Centre will provide new knowledge, methods and technologies as well as highly skilled PhD and postdoctoral researchers to tackle the main challenges for the Australian wine industry – climate warming, water restrictions, changing consumer preferences and rising wine alcohol content – leaving the industry better placed to make the wines that the market and consumers want.

Incorporating 12 partners (including all of the WIC members – see below), the Centre represents a unique and exciting training opportunity for 14 PhD and 4 postdoctoral researchers to work closely with leading research centres and Australian and international companies from the wine and food sector.

Wheat Hub
ARC Industrial Transformation Research Hub

ARC Industrial Transformation Research Hub for Wheat in a Hot and Dry Climate

www.wheathub.com.au/

LOCATION: Plant Genomics Centre, Hartley Grove, Waite Campus, Urrbrae

The Australian Research Council Industrial Transformation Research Hub for Wheat in a Hot and Dry Climate marks a new era in wheat breeding and research in Australia. It brings together researchers and Australia's three major wheat breeding companies to exploit global diversity for wheat and advanced genomic technologies for faster development of heat and drought tolerant varieties which make better use of nitrogen fertiliser.

It is funded by the Australian Government through the ARC's Industrial Transformation Research Hubs scheme and the GRDC. Partners include breeding companies AGT LongReach Plant Breeders and Intergrain, the Universities of Adelaide, Sydney, South Australia and the ACPFG.

The Research Hub aims to enhance productivity and secure high grain quality of wheat in the hot and dry Australian climate by:

- Developing wheat with combined heat and drought tolerance by advancing existing knowledge and technologies and transferring wheat material and knowhow to breeding programs
- Elucidating mechanisms and molecular markers for combined heat and drought tolerance by exploring wheat genetic diversity
- Identifying mechanisms and genetic diversity for high yielding wheat with efficient nitrogen recycling and high grain protein
- Building human capacity in molecular breeding and providing breeders access to the latest scientific developments and technologies
- Developing and testing high-throughput field phenotyping tools for Australian breeders

wineinnovationcluster.com
Synergy in grape & wine research

The Wine Innovation Cluster

www.thewaite.org/waite-partners/wine-innovation-cluster/

LOCATION: Wine Innovation Central Building, Cnr Hartley Grove and Paratoo Road, Waite Campus, Urrbrae

The WIC is a virtual entity and partnership of four leading Australian grape and wine research agencies. Based on the Waite Campus, the WIC strives to build collaboration and create synergies in research

and development across the co-located partner organisations for the benefit of Australia's multi-billion dollar wine industry.

The WIC represents critical mass in terms of national wine R&D capability; a 2012 audit showed 62 per cent of the total is located at the Waite Campus and incorporated in the WIC. The WIC was established in recognition of the fact that enhanced coordination and integration of R&D is necessary to build the quality outcomes and effective delivery needed by the wine and grape growing industries to meet the challenges of the future.

Collectively, the WIC partners cover the entire grape and wine research, development and extension spectrum and the WIC is continuously exploring opportunities for collaborative research projects. Since it was established in 2008, the WIC partners have worked on more than 35 collaborative projects that have attracted more than $27m external funding; strong industry partnerships on many of them attest to their relevance.

Non-University partners

The Waite Campus of The University of Adelaide is unique in the number of non-University research partners co-located there. These partners include Federal and State government agencies as well as national research centres and industry-funded organisations such as the Australian Wine Research Institute.

Some partners have been on the campus for many decades but, irrespective of their period of residency, all have added greatly to the richness of the research environment. They have co-invested in buildings and other infrastructure and have formed effective collaborative relationships with each other. The Wine Innovation Cluster is a recent example of the latter but there are also numerous bilateral links.

The co-location model that epitomises the Waite Campus is universally admired and has helped maintain the reputation of the campus, and therefore the University, as the leading academic agricultural research institution in Australia.

Commonwealth Scientific and Industrial Research Organisation (CSIRO)

www.csiro.au

LOCATION: Prescott, Taylor, Cornish and WIC West buildings, Waite Campus, Urrbrae

CSIRO, the national research provider, innovates for tomorrow and offers solutions and technologies today – for its customers, all Australians and the world. CSIRO's research at the Waite Campus seeks to create value for its customers through innovation that delivers economic, environmental and social impact, with particular focus on Australia's agricultural, environment (land and water) and mineral resources sectors.

CSIRO's Waite-based agricultural research is focused on southern farming systems, wine grapes and horticulture, genomic science for crop performance, soil carbon and nutrient cycling and agricultural adaptation to and mitigation of global change.

CSIRO Land and Water's research focuses on environmental resilience, environmental toxicology, managing terrestrial and aquatic ecosystems, water in the resources sector, economics, productivity and sustainability. In the minerals sector, CSIRO's Waite-based research focuses on intelligent mining and resource management.

All of this work is conducted in partnership with a range of research, industry and commercial partners, including the other organisations based at the Waite. Further information is available at: www.thewaite.org/waite-partners/csiro/

South Australian Research and Development Institute (SARDI)

pir.sa.gov.au/research

LOCATION: : Plant Research Centre, 2b Hartley Grove, Waite Campus, Urrbrae

SARDI, a Division of the South Australian Department of Primary Industries and Regions (PIRSA), is the SA Government's principal research institute for primary industries creating opportunities to ensure the agriculture, food, aquatic and bioscience industries are internationally competitive and ecologically sustainable.

SARDI focuses on value-chain linkages, food security, natural resource and climate adaptation, product integrity requirements, innovation capability and enabling technologies, supplier competitiveness and biosecurity. SARDI science programs are aquatic sciences, livestock and farming systems, and sustainable systems. SARDI has 350 scientific, technical and support staff working at 10 regional research centres in South Australia.

During 2016, SARDI appointed six regionally based research staff to deliver targeted grains research, addressing issues that affect grains production in regional SA. This was part of a five-year $50 million bilateral agreement between SARDI and the Grains Research and Development Corporation. Other highlights from the year included the development of new smart trapping technology that aims to support more effective surveillance of airborne pests and diseases threatening Australia's grains industries.

Australian Wine Research Institute (AWRI)

www.awri.com.au

LOCATION: Levels 2 & 3, Wine Innovation Central Building, cnr Paratoo Road & Hartley Grove, Waite Campus, Urrbrae

The Australian Wine Research Institute (AWRI) is the Australian grape and wine industry's own research organisation. It supports a sustainable and successful grape and wine industry through world class research, practical solutions and knowledge transfer. Established in 1955, the AWRI is governed by an industry-led, skills-based Board and is a member of the Wine Innovation Cluster located at the Waite Research Precinct in Adelaide. The AWRI's activities are guided by its mission and values, an industry-endorsed research, development and extension plan and an internal business plan. AWRI Commercial Services is the commercial arm of the organisation and provides advanced analytical and consulting services on a fee-paying basis.

The AWRI supports grapegrowers and winemakers by:

- Undertaking strategic and applied research based on the priorities of the Australian grape and wine industry
- Providing a helpdesk service to answer queries from producers and conducting problem-solving investigations
- Presenting roadshow workshops and seminars in Australian wine regions
- Delivering technical information via the John Fornachon Memorial Library, the AWRI website and regular email bulletins
- Producing publications including an Annual Report, AWRI Technical Review and the Agrochemicals 'Dog Book'
- Conducting events including the triennial Australian Wine Industry Technical Conference, the Advanced Wine Assessment Course and Research to Practice modules
- Providing NATA-accredited analysis and assistance with wine export
- Supervising postgraduate students and providing lectures to undergraduate students.

Australian Grain Technologies Pty Ltd (AGT)

www.agtbreeding.com.au

LOCATION: Level 1, WIC Building, Paratoo Road East, Waite Campus, Urrbrae

Australian Grain Technologies Pty Ltd (AGT) was first established in June 2002 by three shareholders: the Grains Research and Development Corporation (GRDC), the South Australian Government (PIRSA/SARDI) and the University of Adelaide (UA). The aim of AGT's inaugural shareholders initially was to ensure the long term future of wheat breeding in southern Australia. Over the subsequent years AGT has continued to grow through a merger and strategic licencing arrangements, creating greater critical mass and economies of scale. AGT now operates the largest wheat breeding program in Australia and, more recently, has expanded into barley and lupin breeding.

Currently, AGT has four major plant breeding stations, Northam (WA), Roseworthy (SA), Wagga Wagga (southern NSW) and Narrabri (northern NSW). The Roseworthy Campus program is the longest continually run wheat breeding program in Australia, running now for more than 130 years. Breeders and support staff based at each of these centres aim to address the needs of local growers through new and improved varieties. AGT also have a team of highly skilled regionally based marketing and seed production managers who are continuously seeking feedback from growers on how to better meet their needs, while an in-house quality assessment laboratory ensures that growers using AGT varieties can meet the needs of domestic and international markets.

2016 saw the first commercial plantings of Scepter, a variety developed at Roseworthy that offers consistent yield gains above its parent Mace (Mace is currently the most widely grown wheat variety in SA). AGT also made significant investment into infrastructure to continue its ability to deliver superior genetics to Australian farmers.

All enquiries are to be directed to the AGT Communications Officer, Rebecca Freeman, on 0414 844 425 or at: rebecca.freeman@agtbreeding.com.au.

Australian Genome Research Facility (AGRF)

www.agrf.org.au

LOCATION: Plant Genomics Centre, Hartley Grove, Waite Campus

AGRF is a not-for-profit company, established in 1997 under the Commonwealth Major National Research Facility (MNRF) Program, and currently supported by NCRIS through BioPlatforms Australia. It is Australia's largest provider of genomics services and solutions. AGRF has laboratories in Adelaide, Brisbane, Melbourne, Perth and Sydney.

The Adelaide node provides a range of services to industry and academia, including illumina and Ion Torrent "Next Generation" sequencing, Sanger DNA sequencing, nucleic acid extraction, controlled environment growth rooms, and varietal identification services. The Adelaide node provides a direct link to the specialist, large scale, and Bioinformatics services provided by AGRF's national network, and is accredited by NATA to ISO17025:2005.

Arris Pty Ltd

www.arris.com.au

LOCATION: Hartley Grove, Waite Campus, Urrbrae

Arris is an innovative Australian-owned consulting and communications company, providing services in two distinct areas: agricultural & environmental services, and marketing/communications. The Arris team has a unique mix of qualifications and experience in science, agriculture, communications, event management, education and training, graphic design, web design and computer technologies and provides services for a diverse range of clients.

The WRI and the Waite's Future

Message from the Director

After many strong years of activity, the Waite Research Institute will review its future direction in 2017 to ensure it is making the best strategic investments that are aligned with university, state and national priorities.

While we will continue to support research in agriculture and wine, the development of food science and technology will be a key focus for investment in the future. The food and beverage sector is the largest manufacturing industry in Australia. There is a critical need to support its growth, and scientifically to connect primary production with food storage, handling and processing.

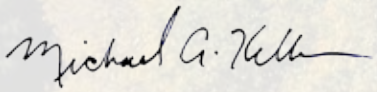
We will build on our historic strength in plant sciences and breeding to develop an integrated program of science for plant breeding that drives excellence in research and is aligned with the needs of plant breeders.

Our national leadership in oenology and viticulture will be reinforced through new strategic investments and our strong partnership in the Wine Innovation Cluster.

And most importantly, we will continue to invest in our people, helping them to realise their full potential through mentoring, leadership coaching, and targeted professional development activities.

Professor Michael Keller

J.A.T. Mortlock Professor of Plant Protection



Appendices

Appendix 1

WRI Members

(Active AFW researchers in 2016)

Able, Amanda
Able, Jason
Andelkovic, Ivan
Asenstorfer, Robert
Baldock, Jeffrey
Bartowsky, Eveline
Bastian, Susan
Baumann, Ute
Berger, Bettina
Betts, Natalie
Bianco-Miotto, Tina
Borysyuk, Nikolai
Bose, Jayakumar
Boutsalis, Peter
Breen, Jimmy
Brien, Chris
Buhl, Jerome
Bulone, Vincent
Burton, Rachel
Byrt, Caitlin
Cao, Shifeng
Cargill, Margaret
Cavagnaro, Timothy
Chalmers, Kenneth
Churchman, Gordon
Clarke, Stephen
Coleman, Desmond
Collins, Cassandra
Collins, Helen
Collins, Nicholas
Coqui da Silva, Rodrigo
Coventry, David
Coventry, Stewart
Cozzolino, Daniel
Croxford, Adam
Crump, Anna Marie
Cu, Suong
Culbert, Julie
Danner, Lukas
David, Rakesh
Davidson, Jennifer Anne
Davies, Kerrie
De Bei, Roberta
Degryse, Fien
Delaporte, Kate
Denton, Matthew
Dolman, Fleur
Doolette, Ashlea
Drew, Damien
Dry, Peter
Dundas, Ian
Eales, Kathryn
Eglinton, Jason
Facelli, Evelina
Fincher, Geoffrey
Fleet, Benjamin
Fleury, Delphine
Ford, Christopher
Fox, Rebecca
Franco Garcia, Alex
Garcia, Melissa
Gardner, Jennifer
Garnett, Trevor
Genc, Yusuf
Gibson, Robert
Gill, Gurjeet
Gilliham, Matthew
Glatz, Richard
Gogel, Beverley
Grant, Cameron
Grbin, Paul
Habili, Nuredin
Haefele, Stephan
Hanold, Dagmar
Hayes, Julie
Henderson, Sam
Henschke, Paul
Herderich, Markus
Hettiarachchi, Ganga
Heuer, Sigrid
Hogendoorn, Katja
Hrmova, Maria
Hsieh, Yves
Huang, Chunyuan
Islam, A
Ismail, Ismail Ahmed
Jefferies, Stephen
Jeffery, David
Jenner, Colin
Jiranek, Vladimir
Jones, Graham
Kaiser, Brent
Kalenahalli, Yogendra
Kastner, Christine
Keller, Michael
Khoo, Kelvin
Kitonyo, Onesmus
Kleemann, Samuel
Koltunow, Anna
Kookana, Rai
Koopman, Darren
Kovalchuk, Nataliya
Kravchuk, Olena
Krishnan, Mahima
Kuchel, Haydn
Langridge, Peter
Langridge-Reimold, Ursula
Leigh, Roger
Li, Gang
Li, Ruyi
Li, Yongle
Little, Alan
Liu, Haipei

Long, Yu
Longbottom, Mardi
Loveys, Beth
Lyons, Graham
Malone, Jenna
March, Timothy
Mares, Daryl
Marschner, Petra
Mason, Sean
Mather, Diane
Mayo, Gwenda
McBeath, Therese
McDonald, Glenn
McLaren, Tim
McLaughlin, Michael
McNeill, Ann
Melino, Vanessa
Milligan, Andrew
Mrva, Kolumbina
Muhlack, Richard
Muhlhausler, Beverly
Navarro, Divina
Niimi, Jun
Nuberg, Ian
Okada, Takashi
Okamoto, Mamoru
Oldach, Klaus
Ovchinnikova, Evgenia
Pagay, Vinay
Paull, Jeffrey
Pearson, Allison
Penfold, Chris
Petrie, Paul Robert
Petrovic, Tijana
Philp, Joshua
Plett, Darren
Potumarthi, Ravichandra
Preston, Christopher
Qiu, Jiaen
Ramesh, Sunita
Randles, John
Rengasamy, Pichu
Riggs, Karina
Ristic, Renata
Rodriguez Lopez, Carlos
Roy, Stuart
Sadras, Victor
Saucier, Cedric
Schilling, Rhiannon
Schultz, Carolyn
Schwerdt, Julian
Scott, Eileen
Shavrukov, Yuri
Shelden, Megan
Shi, Bu-Jun
Shirley, Neil
Singh, Rohan
Smernik, Ronald
Smith, Andrew
Smith, Sally
Sornaraj, Pradeep
Sosnowski, Mark
Stockley, Creina
Suchecki, Radoslaw
Sumby, Krista
Sundstrom, Joanna
Sutton, Timothy
Sznajder, Beata
Tate, Max
Taylor, Dennis
Taylor, Julian
Timmins, Andy
Topping, David
Tricker, Penny
Tucker, Matthew
Tyerman, Stephen
Unkovich, Murray
Vandeleur, Rebecca
Vassos, Elysia
Verbyla, Arunas
Walker, Michelle
Walker, Robert
Wallwork, Hugh
Watson, Tommaso
Watson-Haigh, Nathan
Watts-Williams, Stephanie
Wege, Stefanie
White, Thomas
Whitford, Ryan
Wilkinson, Kerry
Wirthensohn, Michelle
Wood, Katie
Xu, Bo
Yogendra, Kalenahalli
Zerner, Michael
Zhang, Dabing
Zhou, Jo
Zhou, Yi
Zhu, Ying
Zhu, Yongguan
Zwer, Pamela

Appendix 2

2016 Financial Statements

Expenditure

	2016 Actual
WRI Areas of Activity	**$**
Growing the quality of Waite science	401,962
Enhancing the Waite's reputation	13,343
Enhancing Waite collaboration	95,707
Developing Waite people for the future	52,218
Subtotal	**563,230**
Staffing & Office Administration	170,543
Total Spend in 2016	**$733,773**

Income (to members of WRI)

	2016 Actual
	$
Category 1	21,510,000
Category 2	1,634,000
Category 3	5,046,000
Category 4	-
Total in 2016	**28,190,000**

Appendix 3

2016 Publications

To view or download the full list of AFW publications from the 2016 calendar year go to www.adelaide.edu.au/wri/news/afw-2016-publications.pdf

Book Chapters
19

Journal Articles
432

Conference Proceedings 28

Books
3

Appendix 4

List of Relevant Acronyms

ACPFG	Australian Centre for Plant Functional Genomics
AFW	The University of Adelaide's School of Agriculture, Food & Wine
AGRF	Australian Genome Research Facility
AGT	Australian Grain Technologies
AGWA	Australian Grape & Wine Authority
ARC	Australian Research Council
APPF	Australian Plant Phenomics Facility (The Plant Accelerator)
AWRI	Australian Wine Research Institute
CSIRO	Commonwealth Scientific & Industrial Research Organisation
DEWNR	Department of Environment, Water & Natural Resources
GRDC	Grains Research & Development Corporation
HDR	Higher Degree by Research
LIEF	Large Infrastructure & Equipment Funding
NCRIS	National Collaborative Research Infrastructure Strategy
NCSU	North Carolina State University
NRM	Natural Resource Management
NWGIC	National Wine and Grape Industry Centre
PCW	ARC Centre of Excellence in Plant Cell Walls
PEB	ARC Centre of Excellence in Plant Energy Biology
PIRSA	Department of Primary Industries & Regions South Australia
RIRDC	Rural Industries Research and Development Corporation
SAFIC	South Australian Food Innovation Centre
SAHMRI	South Australian Health and Medical Research Institute
SARDI	South Australian Research & Development Institute
SJTU	Shanghai Jiao Tong University
TC-IWP	Training Centre for Innovative Wine Production
UA	The University of Adelaide
WIC	Wine Innovation Cluster
WRI	Waite Research Institute

For further enquiries

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