THE UNIVERSITY of ADELAIDE

Annual Report 2013

Waite Research Institute

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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 Campus is the largest agricultural research and teaching precinct 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
- CSIRO (parts of the Agriculture and Land & Water flagships)
- 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
- Urrbrae House historical precinct
- Food SA

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)
- FOODplus Research Centre
- Wine Innovation Cluster (WIC)

Over the last 90 years, the Waite Campus has developed through the pursuit of excellence in agricultural science and through collaboration between the collocated 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;
- The centre of research capability for both grains and wine research within Australia.

12 world-class research organisations and centres

1100 research and technical staff

550 undergraduate students

295 postgraduate students

$150 million research income/expenditure per annum

$265 million research and teaching infrastructure

Waite-derived cereal varieties comprise approximately **80%** of southern Australian production

A high-impact publication record

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

WRI highlights and key outcomes in 2013

WRI initiatives and targeted strategic investment over the last three years have been highly effective in producing significant outcomes for the University's School of Agriculture, Food & Wine and the Waite since 2010:

- The past two years have marked the most productive for the Waite in its history in terms of the number of its peer-reviewed publications (featuring in Web of Science).
- Competitive research grant income to the School of AFW has increased by more than $3m or 10% since 2011.
- Outcomes from graduates of the WRI's Research Leadership Development Program now include an ARC Industrial Transformation Training Centre in Innovative Wine Production ($2.4m funding over 5 years) and two prestigious Future Fellowships.
- The WRI's weekly *Harvest* community radio program, featuring Waite research, was the second most popular program (based on podcast downloads) on Radio Adelaide in late 2013.
- WRI-sponsored projects have so far delivered four manuscripts submitted to high-impact journals such as *Nature* and *Science*.
- Income from industry-funded research and industry partnerships to the School of AFW has increased more than 10-fold since 2009 to $8.5m in 2013.
- Researchers in the School of AFW were awarded two Future Fellowships and two DECRA Fellowships in 2013 – three of these four applications had direct WRI support via the assistance of a grant writer.
- The WRI sponsored, organised and hosted events that brought more than 1000 people to the Waite Campus in 2013, and connected many more with Waite research online and via social media.

The WRI allocated **$623,402** in three competitive funding rounds during the 2013 calendar year.

Major funding successes in 2013

* Early-mid career scientists that have benefited from the Research Leadership Development Program funded and initiated by the WRI

^ Applications made with the assistance of the WRI-funded grant writer

ARC Industrial Transformation Training Centre

Innovative Wine Production: Responding to Climate, Water, Market and Economic Challenges

Prof Vladimir Jiranek (Director) – 2013-16*^

Total Funding - $2,405,204

Project Summary

Australia's grape and wine industry earns $4 billion annually (half as exports) and employs 60,000 - largely inregional areas. The industry's rise from the '80s via new plantings and production of well-made, full-flavoured varietal wines has faltered: key threats are climate extremes, water restrictions, a high dollar, markets access difficulties (eg China and India) and evolving consumer preferences. A new wave of innovation is needed to reinvigorate the industry. The ITTC for Innovative Wine Production will capture the expertise and facilities of Australia's key 'wine' universities along with grape, wine and allied companies to train researchers and yield applied research to reinstate Australia as a world leader in branded premium wines.

ARC Future Fellowships

Dr Matthew Tucker – 2014-18*

Total Funding – $772,104

Project Summary

Unlike animals, individual somatic cells in plants have the remarkable ability to regenerate into entire new plants, depending on the signals they perceive. This developmental plasticity is particularly important during normal plant growth, when mature cells adopt new identities within multicellular environments. Tissue complexity is critical for the utilisation of plants in society as food, fuel and fibre, but how and why plant cells adopt or change identity has been difficult to determine. In this study, next-generation molecular methods will be employed to identify pathways driving differentiation of specific ovule and seed cell-types, which directly impact crop quality, yield and end-use.

Dr Matthew Gilliham – 2013-17*^

Total Funding - $735,032

Project Summary

Chloride and nitrate are central to physiological processes that determine crop yield and food production, but their uptake and transport within the plant body are antagonistic. This project will gain a fundamental understanding of the mechanisms underlying this antagonism. This will provide new tools for improving salinity tolerance and the efficiency of fertiliser use, which can be used for the development of new crop varieties. Improving these traits will be essential if we are to successfully address the threats to Australian and global food security posed by salinity, and the rising economic and environmental costs of inefficient fertiliser use.

Dr Iain R Searle – 2013-17

(Joint appointment with MBS)

Total Funding - $752,520

Project Summary

Elucidating the molecular events underlying the biology of seed development is important in both understanding plant development and in developing new methods to enhance the productivity and qualities of grain crops. In recent years it has become clear that various classes of non-coding RNAs have important roles in gene regulation. Of these non-coding RNAs, small RNAs (20-25 nucleotides) are beginning to be understood however less is known about the role and complexity of long non-coding RNAs. This project would identify new regulators of seed development that may lead to novel methods to increase grain yields, ultimately benefitting the Australian grains industry.

ARC DECRA Fellowships

Dr Wayne M Crismani – 2014-16^

Total Funding - $395,220

Project Summary

Introducing genetic diversity from wild species into elite lines of wheat and barley may increase their resistance to the stresses they are exposed to in the field. Modern breeding cultivars could capture up to ten times more genetic variation. This project aims to gain fundamental insights into the genetic and environmental factors that limit the rates at which new genomic combinations can be made. This will transform wheat and barley breeding methods, unlocking available genetic diversity to produce new varieties.

Dr Megan C Shelden – 2014-16^

Total Funding - $394,575

Project Summary

The root system is the first part of the plant to sense high concentrations of sodium and chloride ions in saline soils. The ability of roots to maintain growth in response to salinity is an important adaptation, increasing root soil exploration for nutrient and water uptake. The aim of this project is to identify the molecular mechanisms that control and regulate root growth in response to salinity using barley as a cereal model. The knowledge gained in barley will provide important information for increasing salinity tolerance in other Australian cereal crops, most notably wheat.

GRDC Research Grant

Dr Stuart Roy* et al (ACPFG) – 2013-16

Total Funding - $2,549,415

Development of salinity tolerant wheat and barley

Saline soils contain high concentrations of NaCl. By 2050, the area of Australian agricultural land classified as saline is likely to triple. Salinity-affected crops grow more slowly and senesce more quickly than non-stressed plants, resulting in substantially lower yields than for the same crop on non-saline soils. The CRC for Soil and Land Management has estimated that transient salinity costs the Australian farming economy approximately $1.3 billion per year. If the yield reduction due to salinity stress is alleviated by 10%, this would be worth an estimated $130 million per annum to Australian growers; our research will lead to crop yield improvements that exceed these targets. This research will initially concentrate on improving the salinity tolerance of the major cereal crops, wheat and barley, but will identify information that will be useful in improving the salinity tolerance of other crops

The WRI's vision and objectives

Mission:

To deliver the science, education and innovation to transform Australian agriculture in global markets

Vision: Continued Excellence

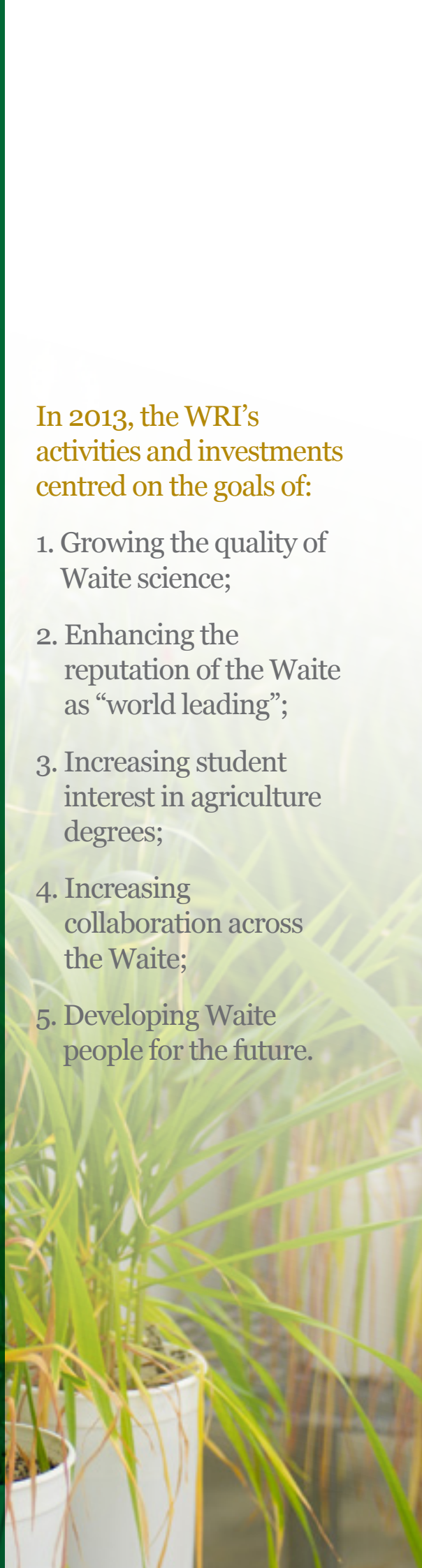
"The University has all the elements of a global partnership at its Waite Campus, where research departments, research institutes and the R&D arms of government and business in the agricultural, food and wine field are co-located. In 2013, it will propose leverage of these organisations and selected international partners into a Waite consortium, which will likely become one of the most powerful concentrations of agriculture, food and wine research in the world."

The University of Adelaide Strategic Plan 2013-2023 "Beacon of Enlightenment"

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

In 2013, the WRI's activities and investments centred on the goals of:

1. Growing the quality of Waite science;
2. Enhancing the reputation of the Waite as "world leading";
3. Increasing student interest in agriculture degrees;
4. Increasing collaboration across the Waite;
5. Developing Waite people for the future.



Staffing, Structure and Governance

With the transition to a new Director and set of KPIs at the start of 2013, the Institute's structure and reporting arrangements were streamlined to more closely align the WRI with the University's School of Agriculture, Food and Wine. Professor Mike Wilkinson assumed the dual roles of Head of School and Director of the WRI and in his capacity as Director of the WRI, reported direct to the University's Deputy Vice-Chancellor (Research) Professor Mike Brooks and Executive Dean of Sciences (Professor Bob Hill).

The WRI was supported by a team of four staff (2.3 FTE) with strengths in strategic planning, research leadership and project management, people development, science communication, research administration and financial reporting.

Proposals for funding considered by the WRI in 2013 were sought and assessed on a competitive basis in three targeted rounds by the WRI Scientific Advisory Committee (WRI SAC). The WRI SAC advises the WRI on scientific opportunities and their alignment with the WRI's strategic objectives/goals and comprises representatives of all major research disciplines on the Waite Campus plus two of the Waite collocated partner research institutions (CSIRO and SARDI). The assessment process is transparent and operates according to documented criteria and processes.

Staff

Professor Mike Wilkinson

Director

Professor Rob Lewis

Strategic Projects Manager (0.4FTE)

Dr Heather Bray

Community Engagement and Researcher Development Officer (0.6FTE)

Ms Carolyn Gadd

Executive Officer (0.6FTE)

Mrs Lisa Dancer

Administrative Officer (0.5FTE)

Mr Jason Dancer

Financial Accountant (0.2FTE)

Science Advisory Committee

Professor Mike Wilkinson

(Chair)

Director, WRI and Head, School of Agriculture, Food & Wine

Professor Eileen Scott

Group Leader, Plant Pathology, School of Agriculture, Food & Wine

Professor Mike McLaughlin

CSIRO Land & Water, and Soil Science, School of Agriculture, Food & Wine

Professor Vladimir Jiranek

Professor of Oenology and Group Leader, Wine Science, School of Agriculture, Food & Wine

Dr Olena Kravchuk

Group Leader, Biometry Hub, School of Agriculture, Food & Wine

A/Prof Jason Eglinton

Group Leader, Barley Program, School of Agriculture, Food & Wine

Professor Rob Lewis

Strategic Projects Manager, WRI

A/Prof Chris Preston

Group Leader, Weed Science, School of Agriculture, Food & Wine

Professor Diane Mather

Group Leader, Plant Breeding and Genetics, School of Agriculture, Food and Wine

Professor Bob Gibson

Professor of Functional Food Science, School of Agriculture, Food and Wine

A/Prof Brent Kaiser

Group Leader, Wine and Horticulture, School of Agriculture, Food & Wine

Professor Simon Maddocks

Director, Science Partnerships, SARDI

Director's Report

These are testing times in the Australian Higher Education system and it is becoming increasingly difficult to conduct the kind of high quality research that competes effectively on the global stage. However, research excellence provides Universities with the primary basis for domestic and international brand recognition and increases marketability to students and parents across all disciplines.

Put simply, excellent research disproportionately enhances Institutional reputation in a way that no other approach can and disproportionately attracts the more able students. In this context, the challenge for all research institutes operating within the University is to deliver the greatest value add to the research profile of the University at the lowest possible cost.

When attempting to evaluate effectiveness in this endeavour, the temptation is simply to claim credit for all outputs and income achieved by the various members (individual staff and also research groups/Centres) that are supported by the initiative. The WRI certainly emerges with considerable credit and kudos if this approach is adopted. The members of the WRI (all research-active staff of the School of Agriculture, Food & Wine) have collectively attracted an impressive income in 2013 and have generated a substantial number of high-quality publications.

More significantly from the perspective of brand recognition, research represented primarily by the WRI membership provided by far the best performance of any discipline in the University in the latest QS global rankings, with The University of Adelaide featuring 29th in the world and 3rd in Australia for Agriculture and Forestry. This achievement is made even more impressive by the fact that the Waite does not have any significant presence in Forestry.

Outstanding though these achievements are, the question remains: how to establish whether the presence of the WRI significantly contributed to this success? The relatively short tenure of the WRI in terms of the long history of the Waite provides a useful platform from which to seek evidence of impact. The WRI was established in 2009/2010 at a time when there was a common misconception that the Waite was fading as a powerhouse of research excellence. Comparison of standard metrics of research performance from the Waite Campus as a whole prior to the existence of the WRI therefore provides a useful benchmark for the efficacy of the Institute.

The first and arguably most direct measure of research productivity is a simple measure of the number of publications generated in recognised international journals. The publication outputs from the Waite Campus over the past decade (from Web of Science) show a marked increase in the past couple of years, with more papers being published in 2013 than at any time in the history of the Waite (Figure 1).

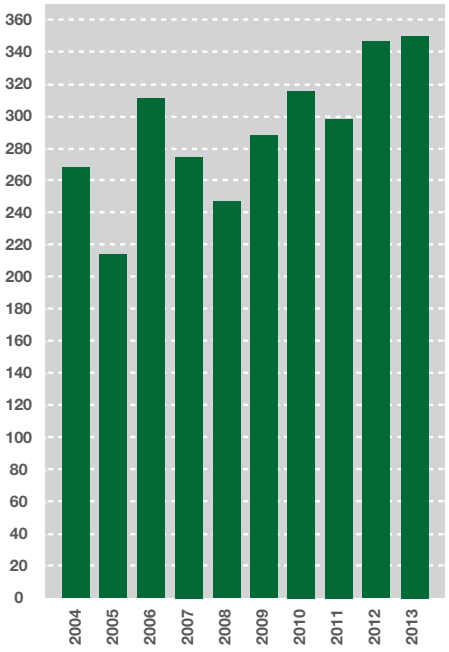


Figure 1. Total publications from the Waite (Web of Science search results for 'Waite' and the postcode)

We see a similar pattern in terms of grant success, with research income jumping from the establishment of the WRI to reach the highest total ever in 2013, according to University data (Figure 2). Impact on student recruitment is most readily seen in fields closely associated with research activity. Here again, student enrolments into undergraduate degrees hosted at the Waite Campus have grown, with the leap in numbers starting a year after inception of the WRI and again culminating with the largest recruitment on record for our undergraduate courses in 2013 (Figure 3).

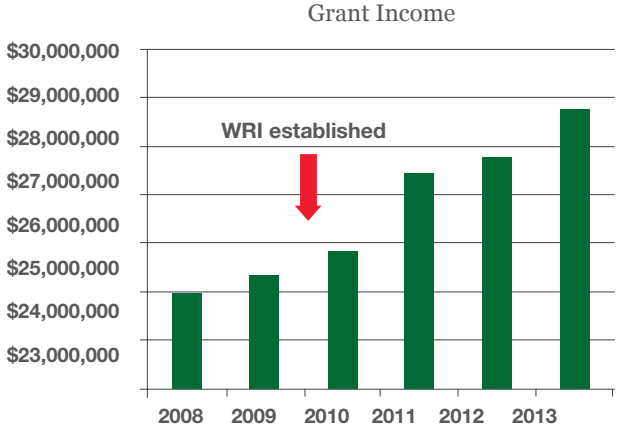


Figure 2. Total grant income to the WRI members

However, perhaps the most compelling evidence of the positive influence of many activities of the WRI lies in the advancement of its members. At the time of the WRI's formation, the Waite Campus was facing a potentially serious issue with the pending retirement of two or three of its foremost research stars. The WRI consequently invested in research leadership coaching for the most promising early to mid-career scientists within the School, recognising that while this move was unlikely to generate visible returns in the short-term, it was nonetheless critical for succession planning and developing a new generation of Waite leaders. This move has undoubtedly reaped earlier than expected and substantial rewards, with two of the scientists benefiting from this initiative since securing prestigious ARC Future Fellowships. Through the personal contacts of others, the University was able to attract a further two Fellows to the Waite. This means that the Waite now hosts more ARC Fellows than at any time in its history, and also now boasts a new NHMRC Fellow.

Since 2011, the WRI has funded members' access to a dedicated grant writer, a move which has undoubtedly contributed to the increased research grant application success rate at the Waite. Indeed, University staff at the Waite have since won two ARC Centres of Excellence, an ARC Industrial Transformation Training Centre in Innovative Wine Production and an ARC Industrial Transformation Research Hub for Genetic Diversity and Molecular Breeding for Wheat in a Hot and Dry Climate. In summary, since the formation of the WRI, the Waite Campus has accelerated its research performance as assessed across a range of standard metrics and has undoubtedly strengthened the research prowess of the University as a whole.

It must be remembered that a key strength and feature of the Waite is that is not simply a University campus, but a research precinct with an impressive array of high-quality institutions that collectively add substantially to the Waite brand and provide our undergraduate and post graduate students with an unparalleled opportunity to broaden their horizons beyond the academic setting. Much of the activity of the WRI has therefore been focussed on strengthening links and communications between the Waite partner organisations to ensure that the Waite collective amounts to more than the sum of its parts.

Three notable areas of activity have been particularly important in achieving this aim in 2013. First, the WRI has facilitated enhanced cooperation and communication between key personnel across the organisations, ensuring more effective cross-referencing of websites, coordination of events and Campus visits, dissemination of shared successes, shared newsletters and activities to improve local community relations, and shared interactions with sponsors, policy makers and international collaborators.

Second, the WRI opened up the third and most recent cohort of its highly successful Research Leadership Development Program to include staff members from Waite partner organisations. This has not only helped build a shared sense of ambition across the Waite but also acted as a conduit for effective collaboration among the emergent talent working in different organisations on site.

Third, the WRI has organised and sponsored events such as Debate@The Waite, Waite Winedown and Peter Waite Day as a means of fostering a collective sense of brand ownership and pride, and to improve interactions with local community and industry.

To conclude, the year 2013 marked a century since Peter Waite wrote his letter of intent to bequeath his property at Urrbrae, the land on which the Waite stands, to The University of Adelaide. It is a measure of the Waite's achievements in agricultural research in that time that a University event staged to celebrate this milestone was attended by state and national leaders of industry, national bodies and governments. It is also entirely fitting that in the same year, the Waite is in a stronger position than at any time in its history, judged by publications, grant income, student recruitment, prestige indicators and the collective will of its valued collocated partners. It is my most sincere hope that the momentum catalysed in part by the WRI will be allowed to grow in the coming years and that the Waite will achieve even greater heights.

Professor Mike Wilkinson

Director, Waite Research Institute

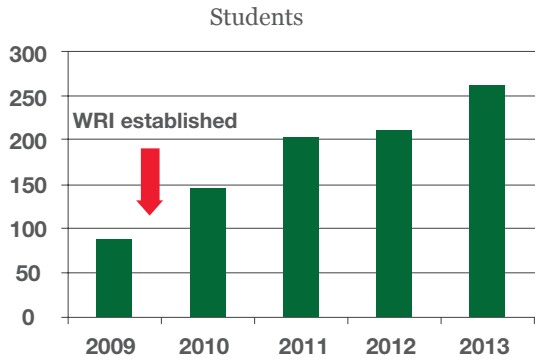


Figure 3.Student first preference enrolments in undergraduate Agriculture degrees

WRI activities in 2013

In 2013, the WRI invested in activities and initiatives aligned with its designated Goals. Some of these built on progress from the WRI's first two full years of operation, and all were designed to assist the University and the wider Waite achieve greater success across a range of measures. With targeted use of limited resources, the WRI has generated, catalysed, supported or facilitated:

- **timely transition between two generations of research leaders, ensuring succession from a small number of key senior researchers to a larger pool of rising stars;**
- **prestige grant and fellowship outcomes, including two Future Fellowships and a $2.4m ARC Industrial Transformation Training Centre;**
- **publication submissions to high-impact journals;**
- **improved communication and collaboration at the Waite, as demonstrated by multi-partner applications and bids for both internal and external opportunities.**

The WRI's investments and their outcomes to date are listed on the following pages.

Goal 1: Growing the quality of Waite Science

1.1 Collaborative and Strategic Initiatives

National Soil-Plant Interactions Program

The WRI brokered the development of a draft concept and plan identifying key themes, project questions and outcomes with relevance to farming system improvement for a national Soil-Plant Interactions Program. The Program is geared to addressing the following challenges:

1. Delivering plant-soil interventions to revolutionise agricultural benefit from soils management. It needs to attract funding;
2. Generating a mean 10 per cent enhancement of yield across Australia within 10 years that is directly attributable to changed soil management, whilst also significantly reversing the rate of soil degradation during the same period;
3. Developing a predictive understanding of key interdependencies in Australian cropping systems that drive plant performance and yield, a "unified theory" of plant soil interactions – no longer just agronomy, physics, plant physiology, but an integrated set of tools needed to bring about the step change in understanding. Integrating data collection, systems modelling, being able to predict changes;
4. Building the capacity and tools to achieve this – also using existing expertise and personnel;
5. Attracting/maximising massive co-investment from GRDC, States, ARC and the MLA with a proposed quantum of $20m funding sought over the first five years, with an overall 10-year timeframe. Out-year funding will be sought based on the result of the first five-year tranche.

The Program will address four major Themes:

1. Scaling Cellular Interactions;
2. Plant/Soil Interactions;
3. G*E*M;
4. Legacy/Sustainability.

Key national collaborators are The University of Adelaide, Sydney and New England Universities, SARDI and CSIRO.

The WRI sponsored two Waite partner workshops, one national partner workshop and two Soil Plant Interaction Framework Working Group meetings during 2013 to develop the proposal and collaborative relationships.

State Government support will be sought for inclusion in an application for major funding from GRDC's annual call in 2014.

Alkaline Soils workshop sponsorship

The WRI, GRDC, and Australian Society of Soil Science co-sponsored a workshop on 'Chemistry, amelioration and management of alkaline soils' at the Waite Campus on 27 June 2013. Presenters at the workshop were sourced from Adelaide and Latrobe Universities, the Department of Primary Industries Victoria, CSIRO and DAFWA.

The 65 people attending the workshop included consultants, researchers and students. The purpose of the workshop was to review the current knowledge about alkaline soils and their limitations as a means of identifying ways of improving productivity on these soils. The program covered soil chemistry, soil pedology, soil biology, plant nutrition, breeding and agronomy.

Soil mapping and pedology

Soil types can change quickly over relatively short distances. There are problems with the current system of soil classification that hinder their use by agronomists and land managers. The formation of alkaline sodic soils may occur more rapidly than is commonly thought: under the right conditions irreversible change to alkaline, sodic soils can occur rapidly over relatively short distances. These changes occur on localised 'reaction zones'.

Breeding

While cereal breeders do not currently select for yield on alkaline soils specifically, there was a general recognition that overcoming many of the constraints of alkaline will require a breeding solution. Genetic variation for a number of traits such as bicarbonate tolerance, tolerance to Al at high pH, is still unknown and the agronomic value of greater tolerance the soil limitations still has to be assessed.

Diagnosis of micronutrient limitations

Alkaline soils have a range of nutritional problems but the reliability of many of the diagnostic tools (soil and plant tests) is still far from satisfactory. It was generally felt that plant testing was more satisfactory that either grain or the current soil tests for most micronutrient deficiencies. Data are available through ASRIS on the micronutrient concentrations in soils at a 250m resolution which could be used to produce maps of soil properties and which could assist with risk management on alkaline soils.

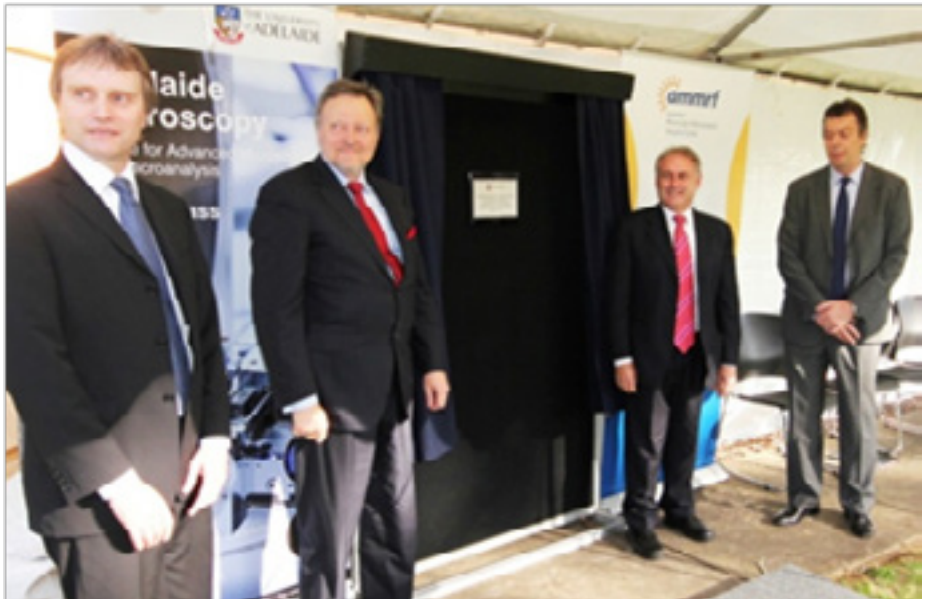
Agronomy

The response of crops to the constraints of alkaline soils varies spatially and seasonally which can make empirical research difficult. Genetic solutions to some of the problems are considered important but there is debate as to the most appropriate traits to target. The importance of subsoil amelioration to improve productivity is well established. Significant and sustainable yield improvements are possible by improvements in the nutrient and organic matter levels in the subsoil. The challenge is to translate these into commercial practice.

ARC Linkage successes on barley and ancient cereal crop projects

Professor Geoff Fincher from the ARC Centre of Excellence in Plant Cell Walls and Associate Professor Jason Eglinton from the School of Agriculture, Food and Wine were awarded an ARC Linkage grant ($675,000) during 2013 to study the physiology and genetics of barley grain germination in the malting and brewing industries. The project involves collaboration between The University of Adelaide, The University of Western Australia, Viterra and Carlsberg. WRI provides salary supplementation for Professor Fincher's appointment.

WRI Director Prof Mike Wilkinson is also an investigator on two projects based at the Australian Centre for Ancient DNA, identifying the diversity and evolution of loci associated



L to R: Prof Mike Wilkinson, Prof Warren Bebbington (VC&P), Hon Don Farrell MP and Prof Mike Brooks (DVCR) at the official opening of the Waite Node of Adelaide Microscopy

with adaptation to aridity/heat and salinity in ancient cereal crops and the role of epigenetic modifications in bovid adaptation to environmental change.

ARC Industrial Transformation Training Centre for Innovative Wine Production

The WRI supported the development of a successful ($2.4 million) ARC Industrial Transformation Training Centre application for a new Centre focused on innovative wine production at the Waite. The Centre involves all of the Wine Innovation Cluster (WIC) partner organisations on the Waite Campus, and will provide new knowledge, methods and technologies, as well as skilled researchers, to help the wine industry tackle its big challenges. Key objectives are to better manage flavour and alcohol content in Australia's wines. WRI's contribution in 2013 comprised $26,000 for the recruitment and development of postdoctoral research staff and PhD students.

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

Ongoing support of the Waite node of Adelaide Microscopy

The Waite node of Adelaide Microscopy was officially opened in September 2013 by then Federal Minister for Science, Hon Don Farrell MP and The University of Adelaide's Vice-Chancellor & President, Professor Warren Bebbington, in the presence of senior staff of the University and invited guests. WRI Director, Professor Mike Wilkinson, also spoke at the opening ceremony.

The WRI co-funds the annual costs of staffing Adelaide Microscopy at the Waite with a full-time technical officer/supervisor.

The WRI also funded the purchase of new equipment late in 2013 via a competitive funding round; one of the results is a state-of-the-art stereo microscope with extended depth of focus for use by all Campus staff on a user-pays basis and housed at Adelaide Microscopy.

National Genomics Network - next generation sequencing in partnership with AGRF

During 2013, the WRI facilitated discussions with the Australian Genome Research Facility (AGRF) for the Waite to assume the pivotal role (Agriculture and Environment fields) in delivering a new national genome network supporting Australian science post-NCRIS2 from 2016. The national discussions are seeking to have agreed on a conceptual model for Australia's future genomics infrastructure investment by June 2015, with formal negotiations with the Australian government planned for the last six months of 2014. These discussions involve contributions from senior researchers using genomics in the biomedical, agricultural and environmental fields. The Waite is being considered as taking a national lead in the agricultural and environmental areas.

1.2 Sponsored projects

The WRI reviewed its funding priorities, processes and mechanisms early in 2013 to reflect the key performance indicators set for the WRI by its new Director, Professor Mike Wilkinson. The cornerstone of the 2013 plan was the allocation of a significant proportion of the total available funding to establishing and developing research projects and infrastructure likely to lead to game-changing outcomes for agriculture, high-impact journal articles and kudos for the Waite.

This was done via competitive calls in three rounds:

- Large/high-impact publication project proposals
- Smaller 'platform project' proposals
- Equipment grants

The WRI Science Advisory Committee (WRISAC) was the key body for the assessment of applications and allocation of funding, and was expanded in 2013 to include representation from all major research disciplines on campus and increased Waite collocated partner representation.

High Impact Publication Projects Investment – May 2013

The WRI invited applications from Waite researchers (open to all researchers on the Waite Campus via collaboration with AFW/UA) for project proposals designed to lead to a single high-impact paper in a targeted/identified journal.

The projects and were assessed against the following selection criteria:

- Novelty;
- Perceived likelihood of success;
- The standing of the target journal;
- Perceived impact of the work to the scientific and/or agricultural communities;
- The capacity of the project to raise the profile of the Waite Campus.

Nineteen extremely high quality proposals were received and assessed/selected for further consideration by the WRISAC, six were shortlisted and 'pitched' their proposals to the WRISAC. The Committee agreed that the available funding be allocated in full to the four highest-ranked projects.

These were:

- M Gilliham – Identification of gamma-aminobutyric acid (GABA) gated anion channels in plants and characterisation of some of their physiological roles ($198,600 over 18 months);
- K Hoogendoorn, E Scott & C Collins – Honeybees deliver targeted control of Botrytis bunch rot in grapes ($146,000);
- R Smernik, A Doolette & T McLaren – Rethinking the nature of soil organic P: A new model of the terrestrial P cycle ($73,500);
- B Gibson, B Muhlhausler, T Bianco-Motto, I Pentilla, C Collins, A McPhee, M Makrides, J Zhou – Understanding the effect of gut microbiotia on genomic regulation of epithelial cells of pre-term infants ($70,000).

All these projects were assessed as delivering science excellence that has the potential to transform our understanding of the systems and issues being addressed with subsequent high probability of publication in the highest impact journals (eg Nature). These commitments and activities were carried forward into 2014.

Shared Platform Technologies Investment – July 2013

In June 2013, the WRI invited applications from Waite researchers aimed at utilising shared Waite platform technologies and infrastructure to significantly enhance and complete existing projects and build collaboration on the Campus. This round was designed to encourage applications in the $10-15K range for projects where existing data required further work to generate a high-impact publication or to prove a concept for patent filing. The use of Waite facilities such as Adelaide Microscopy, Waite Analytical Services, Australian Genome Research Facility (AGRF), Metabolomics Australia, the Plant Accelerator or MiSeq Next-Gen sequencing was considered mandatory for these applications.

Seven proposals were submitted and considered by the WRISAC – three were funded on merit and on the likelihood of delivering successful outcomes and maximum impact for the Waite, for a total of $45,956.

These were:

- C Collins, R De Bei, C Marcelino, R Lopez, J Breen – We prefer them old: Epigenetic control of wine quality in response to grapevine age ($14,560);
- Y Nagarajan, N Shadiac, J Hayes, T Sutton, SD Tyerman, G McPhee, NH Voelcker, HDT Mertens, YG Yingling, M Hrmova – A multifunctional borate transporter from barley mediates efflux of amions and exhibits channel-like characteristics ($15,000);
- A McNeill, M McLaughlin – High-resolution three-dimensional visualisation of fine roots in soil amended with novel fertiliser formulations ($16,396).

All are underway but at an early stage – completions are expected by mid-late 2014.

Admiral barley grain, micropylar end (SMZ25 extended depth of focus)

Equipment investment – September 2013

In September 2013, an equipment round was announced, with a total pool of up to $100K made available for items of small or large equipment that provided a new platform/technology available for use by Waite researchers. Applications based on collaboration with (and the support of) one or more of the Waite collocated partner organisations were favoured. Six applications were received, with four funded, for a total of $91,346.

These were:

- D Taylor – UV-Vis Spectrophotometer GBC Cintra 4040 plus integrated sphere ($29,490)
- R Burton, T Okada, S Tyerman, A Koltunow, G Mayo – Nikon SMZ25 microscope ($31,582)
- M Hrmova, S Tyerman, G Fincher, G Booker, A Koltunow, D Johnson, K Oldach – Isothermal Titration Micro-Calorimeter System iTC200 ($20,000)
- B Kaiser, G Mayo, T Okada, S Tyerman, M Gilliham, C Collins, M Wirthensohn – Zooming port addition to the A1 confocal (Ni-E microscope) and Nikon DS camera system ($10,274)

Two of these successful proposals were joint/multi-partner applications, involving CSIRO and/or The Australian Wine Research Institute as well as a number of University groups.

Vineyard of the Future

The Vineyard of the Future (VOF) project was initially established with WRI funding in 2012. The WRI continued to support its operation throughout 2013.

To adapt to climate change the wine industry requires better vineyard management systems that allow rapid response to climatic events and associated risks. There is also a requirement to improve the efficiency of grape quality measures, harvest timing and yield monitoring. The VOF has explored cutting edge continuous remote monitoring systems in order to develop more efficient vineyard management systems for adaptation to climate change, as well as to address the wine industry's demand for more efficient grape production with improved quality.

Through continuous monitoring, the VOF also facilitated new discoveries in vine biology and vine physiology that would have otherwise been missed by discrete sampling. There is now the opportunity with current image analysis systems, wireless technologies and integration of continuous measurement systems, to discover new processes in vine function, which may well have broader impacts in other crop systems.

The VOF has also been a test-bed for new measurement technologies that were trialled against more established techniques. In this way it has attracted the very latest technologies and has formed partnerships with industry and State Government to accelerate and validate these technologies for the wine industry and other horticultural crops. The new technologies have also facilitated more efficient monitoring and discovery.

International Collaboration and Spin-off projects

The Vineyard of the Future has developed into a National and International collaborative effort. There is much more to do than can be accomplished by one institution alone and there is a better chance of securing more significant funding through such collaboration. A Memorandum of Understanding (initially prepared by the WRI) has been signed between The University of Adelaide, The University of Melbourne, University of Talca (Chile) and University of La Rioja (Spain) on the operation of this collaboration. Subsequently, the National Wine and Grape Industry Centre (Wagga Wagga, NSW) has been incorporated into the partnership.

The primary postdocs and researchers originally employed on the WRI-funded VOF have now left the University or are working on other projects. Dr Sigfredo Fuentes has secured a tenured position at The University of Melbourne where he is driving the international VOF collaboration and focussing more on UAVs, and Dr Roberta De Bei is now working on a spin-off project funded by the GWRDC to Collins, Tyerman, Gilliham and Fuentes ($708,763). This project utilises some of the technology developed in the VOF for the measurement of Vine Balance, which is related to the harvest index of grapevines.

Upward-looking vine canopy picture taken using an iPhone 4S for use with the CanopyLAI® app

Two PhD projects supervised by Steve Tyerman are also utilising the VOF investments. One (GWRDC and Chilean Government funded) is investigating the mitigating effects of shading on heat wave events and also using impedance spectroscopy to measure cell death in grape berries as a measure of quality. Another funded by the ARC is investigating the causes of cell death in grape berries and is also further developing the impedance spectroscopy technique.

Industry and State Government Collaboration

Industry partners, primarily Treasury Wine Estates (Wynns Coonawarra), have now been provided with selected components of the VOF outcomes. The non-destructive Near-Infrared (NIR) Spectroscopy technique to measure plant water potential developed and proven as part of the VOF project is being extensively used in the Coonawarra vineyards with new calibrated instruments. There is ongoing collaboration with technology suppliers in the provision of instruments and advice in their calibration in the field, with Wynns providing the labour costs. This NIR technique was featured on Catalyst (ABC television).

The VOF research has also contributed to the development of an i-phone app for the measurement of leaf area index, which is also being tested by Treasury Wine Estates. The SA State Government has also shown recent interest in the VOF as part of a wine and grape industry proof of concept of the SenSA vision.

A number of new and non-destructive imaging, mapping and monitoring techniques resulting from the VOF initiatives are currently being tested in commercial vineyards in Australia and Chile as part of a beta testing stage. Some of these techniques will be soon commercially available to growers to be applied in the field (i.e. WPA® and CanopyLAI®). In the meantime, the VOF International is currently working on other emerging technologies with exciting preliminary results that will add to these newly developed tools.

1.3 Catalysing new activity

North Carolina State University (NCSU) visits/reciprocal arrangements

As part of a larger program of exchange and partnership between The University of Adelaide and North Carolina State University, discussions have commenced with representatives of NCSU on arrangements for a 50/50 matching funding program to facilitate joint projects aligned with the Waite's strategic directions and research competitive advantages. These will be assessed and awarded through the established WRI process.

A two-day visit to the Waite by six senior staff/researchers from NCSU took place in October 2013 as part of a wider UA/NCSU exchange visit.

Proposed activities include:

- Undergraduate and postgraduate placements;
- Teaching/sabbatical exchanges for staff;
- Mutual research themes identified, being pursued for inclusion in more formal agreement.

Planning for the next phase of discussions is underway, coordinated by Chris Ford, Deputy Head of AFW (Learning & Teaching).

Visits by national and international collaborators

The WRI provided support for the following visitors to the Waite in 2013 to discuss collaborative opportunities;

- Prof Gerry Ritchie, CalPoly San Luis Obispo – wine sensory science (and a background in soil science), working with Dr Sue Bastian;
- Prof Steve Oliver, Cambridge University – wine yeast, working with Vladimir Jiranek on a joint ARC Discovery project ;
- Prof John Crawford, University of Sydney – Debate@The Waite involvement, Soil-Plant Interactions proposal development;
- Prof Iain Young, University of New England – Soil-Plant Interactions proposal development.

Sponsors and Industry partners

The WRI has been instrumental in establishing two new relationships with local industry partners during the reporting year,

with both initiatives arising from personal contacts made during the course of the Waite Centenary Dinner.

Jurlique became interested in much of the work at the Waite that is focussed on the use of epigenetic profiling as a means of diagnosing plant stress and quality traits in plants. Initial contacts were followed by the funding of a pilot study on the use of the approach for the improved agronomy of calendula plants for use in cosmetics. The company is also exploring a possible tripartite arrangement with a company in China that already has strong links with the University.

S&W Seeds were similarly impressed by the research prowess of the Waite, its reputation for training and also the international contacts for business and science. The company has contributed substantially to the Peter Waite Scholarship endowment and is now in detailed talks with the University to investigate the possibility of co-investing to ensure exploitation of the recent advances in almond and ornamental eucalypt breeding on the campus.

An academic opinion piece/thought leadership item

Members and staff of the WRI were involved in the development of a position paper by the Wine Innovation Cluster (WIC) during 2013. The WIC, a collaborative partnership of the four organisations engaged in grape and wine science on the Waite Campus – CSIRO, SARDI, The Australian Wine Research Institute and UA's School of Agriculture, Food & Wine – endeavours to create synergies and reduce duplication for the benefit of the Australian wine and grape-growing sector. The WIC incorporates 62% of Australia's capability in wine and grape R&D, which has kept the Australian industry at the forefront of global winemaking technology and know-how since the 1970s.

Under the leadership of Independent Chairman Brian Walsh and in the lead-up to the formation of the Australian Grape and Wine Authority (a merger of GWRDC and the Wine Australia Corporation) in July 2014, the WIC has attempted to articulate a timely synthesis of the global short and long-term challenges facing the sector to demonstrate the necessity of a longer-term vision and R&D funding system for continued success and survival. In attempting to collectively influence policy makers, the WIC is effectively providing thought leadership on behalf of R&D agencies and the wine and grape sector.

Goal 2: Enhancing the reputation of the Waite as 'world-leading'

2.1 Communications

The WRI maintains an extensive multi-media presence aimed at marketing the Waite and its science to the wider community. In 2013, the WRI achieved a significant increase in social media followers and media mentions of the Waite and its research.

A highlight of the WRI's 2013 activity in the area of communications and media was *Harvest*, a weekly community radio program which first went to air in August. *Harvest* features Waite researchers and general-interest and topical agriculture stories. The program has attracted a strong following, particularly among students, and generated significant online content and many hits on the *Harvest*/Radio Adelaide site. It's also been an effective training ground for early career researchers, including several graduates of the WRI's Research Leadership Development Program, who were making their first forays into media.

Online and social media

Metrics – 1 January to 31 December 2013

Unique WRI website page views	13,145
Twitter Followers	1120
Facebook Likes	240
LinkedIn Members	107
Total Blog Posts	132
Blog Visitors in 2013	7228

In addition to the WRI's online presence and reflecting the importance of the Waite to the University of Adelaide in the centenary year of Peter Waite's bequest, the University established a new Waite Research Precinct website at http://waite-research-precinct.org/ in November 2013. This site had a further 1,317 unique page views in its first nine months.

Media stories

The University of Adelaide produced (and promoted) 19 media stories featuring the Waite in 2013, compared to 11 for 2012. At least one of these (on maternal junk food consumption and addiction in the progeny) achieved significant international attention.

The WRI continues to identify Waite research outcomes and package them for relevant media including broad sheet newspapers, local and national (eg Catalyst) television, regional and rural publications (eg Stock Journal) and extension material (eg GRDC Crop Update).

2011-12 Biennial Report

The WRI produced a substantial and well-received Biennial Report covering the first two years of operation. This report was published online with a limited supplementary hard copy print run in mid-2013. It featured research stories from across the Waite and is perhaps the first document to summarise the extensive breadth of the organisations, expertise, infrastructure and activity on the Waite Campus, as well as capture its collaborative flavour.

Arris Pty Ltd Marketing & Communications, also located on the Waite Campus, was responsible for the graphic design and printing of the 2011-12 WRI Biennial Report.

Chris Brunner and Heather Bray in the Radio Adelaide studio

Matt Tucker being interviewed on *Harvest* after winning his Future Fellowship

Waite Communicators Group

The WRI is an active leader and participant in the Waite Communicators Group, comprising media, communications and marketing personnel from all the Waite partner organisations. During 2013, work was done on a collective proposal on knowledge mining, transfer and exchange, with potential applicability across sectors and industries.

Members of this Group have also contributed significantly to recent improvements in the quality and flow of information between the organisations at the Waite. With shared and overlapping interests in events, media liaison, high-profile visitors to the Campus, publications and display materials, the Group 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.

Harvest on Radio Adelaide

In August 2013, the WRI commenced an access program with Radio Adelaide. The hour-long program, *Harvest*, has been broadcast weekly on Wednesday afternoons ever since and features interviews with Waite researchers, feature stories and topical issues. There are now over 40 podcast interviews from the program on the website at www.radio.adelaide.edu.au/harvest. The most popular have more than 120 online hits. Content generated by *Harvest* has also been shared via the Waite partner organisations.

Harvest is put together by the WRI's Dr Heather Bray and journalist Chris Brunner, along with student volunteers.

The debate teams in action during the October 2013 event.

2.2 Events

Debate@The Waite

The Debate@The Waite is a highly successful public event series run by the WRI which aims to engage the broader community in agricultural issues in an informative, interactive and entertaining way. The debate format provides an ideal vehicle for engagement because many agricultural issues are complex and involve both scientific and social aspects. The debates are based on traditional Oxford rules, consisting of two teams that argue for or against a proposition with the audience voting to decide the winning team.

The Debate@The Waite series continued in 2013, with three debates held on the following topics:

- Cutting Australia's meat consumption by half will be better for us and the planet (March)
- Australian soils are more fertile now than they've ever been (July)
- Grape and wine quality doesn't matter – it's marketing that sells wine! (October)

The Debate@The Waite series is also proving to be an effective vehicle for enhancing collegiality between the Waite partner organisations, with speakers from The Australian Wine Research Institute and SARDI taking to the lectern in 2013 alongside University and industry speakers.

Audiences have continued to average around 150 per event, with a large proportion from the general public. The Debates are run in collaboration with the RiAus and achieve greater dissemination through real-time Twitter, live-streaming and podcast posting on the WRI website. The two later debates from this year were also broadcast as hour-long specials on Radio Adelaide's Public Domain program.

Professor Geoff Fincher was among the Waite researchers who talked with the ACIAR Policy Advisory Council as part of a WRI-hosted visit

The Waite Centenary Dinner – November 2013

2013 marked the centenary of Peter Waite's 'letter of intent' to the State Government of SA and The University of Adelaide, formalising his decision to bequeath his family home and property to the University for the purposes of agricultural research and teaching. The Waite bequest is the largest individual donation/act of philanthropy in the history of South Australia; Urrbrae House, the beautifully preserved family home of Peter Waite, and the 300 acres of land the Waite Campus is sited on are a unique and valuable asset to the University and the State, and much treasured by the local community.

The WRI was a major sponsor of the Waite Centenary Dinner, a gala University event held to celebrate this milestone and reflect on 100 years of world-leading agricultural research at the Waite. Peter Waite's descendants joined an impressive gathering of politicians (including no less than three former SA Premiers) and dignitaries, industry partners, business leaders, and past and present luminaries of the Waite on a balmy November evening on the lawns of Urrbrae House. They came together to hear the University's Vice-Chancellor, Professor Warren Bebbington, praise the foresight and generosity of Peter Waite, the unique collaboration and partnerships of the Waite and toast its bright future. The University also took the opportunity to launch new branding and promotional material for the Waite Research Precinct.

The key note speaker for the evening was the former Federal Minister for Agriculture, Hon John Kerin, with the eminently distinguished and capable Keith Conlon AO presiding as MC.

2.3 Awards and Honours

Professor Geoff Fincher – As well as being a nominee for SA Scientist of the Year in 2013, Geoff Fincher was awarded the prestigious international Thomas Burr Osborne Medal. This award, established in 1926, recognises distinguished contributions in the field of cereal chemistry and was named after the outstanding protein chemist Thomas Burr Osborne, who received the first award in 1928. Geoff was also accepted as a Fellow of the American Association of Cereal Chemists (AACC) International at the US ceremony in October.

Dr Kerry Wilkinson – Kerry received a 2013 Citation for Outstanding Contributions to Student Learning from the Office of Learning & Teaching for innovative assessment and learning support that fosters excitement for discovery and inspires wine science students to engage with research and industry practice.

Image courtesy AACC International. L to R: Dr Deborah Rogers, Chair of the AACC International Board, Professor Geoff Fincher and Dr David Hahn, President of AACC International at the award ceremony.

2.4 Campus tours and visits

Given the large number of organisations, centres and facilities on the Waite site, 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 be a key ambassador for and 'front door' of the Waite Campus in 2013, planning and hosting 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 institutions.

During 2013, the WRI hosted, facilitated and/or coordinated the Waite visits of the following state politicians and others:

- Hon Grace Portolesi, SA Minister for Science & Higher Education;
- Hon David Ridgeway, SA Shadow Minister for Agriculture;
- Members of the SA House of Assembly Standing Committee for Sustainable Agricultural Practices (Ivan Venning, Stephen Griffiths, Adrian Pederick);
- Peter Schulz and Russell Dean from the Melbourne Food Innovation Precinct;
- The Australian Centre for International Agricultural Research (ACIAR) Policy Advisory Council (pictured below);
- GRDC Capacity Building Team;
- A West Java government delegation;
- A Brand SA media group;
- An ARMS national conference site visit;
- The Playford Trust;
- Senior represenatives of Jurlique.

Goal 3: Increasing Student Interest in Agricultural Degrees

Interest in studying Agricultural Sciences at The University of Adelaide significantly increased in 2013, with first preference applications and offers up more than 50 per cent on 2012. Ongoing WRI initiatives which have contributed to this increase include the following:

WRI website

The upgraded WRI website went live in October 2013. WRI staff are also supporting the upgrade of the School website and once the School of AFW site is revised, the two will be better aligned, linked and cross-referenced.

In addition, student information in various University pages, such as the Faculty of Sciences and the University Course Planner was linked to and from the relevant School and WRI pages, ensuring that web traffic is more effectively directed.

I'm a Scientist, Get Me Out of Here!

In 2013, two Waite scientists participated in "I'm a Scientist Get Me Out of Here", a reality show inspired, online activity to increase awareness of science careers and deepen science understanding through talking to scientists. AFW Associate Professor Brent Kaiser participated in the 'Agriculture Zone' in the March session, which was sponsored by ABARES and included ABARES' Chief Agricultural Officer. Brent was a runner-up in his zone, and his 'home page' had 235 views during the session. Dr David Jeffery, Senior Lecturer in Wine Science, participated in 'Nitrogen Zone' in the August session and was sponsored by the WRI ($2000). David's 'home page' had 219 views during the session.

Harvest on Radio Adelaide

The WRI facilitated two Radio Adelaide interviews promoting the Waite Information Day on 21 July 2013, highlighting the Waite's education and career opportunities for potential students. Undergraduate student achievements have regularly been featured in the *Harvest* radio program. *Harvest* was one of the strongest performers on Radio Adelaide in 2013.

Social Media

Social media refers to a group of internet-based applications that allow the creation and exchange of content among users. The use of social media by both the general public and organisations has been increasing rapidly over recent years. The most common applications used by Australians include Facebook, LinkedIn and Twitter.

The WRI has maintained a Facebook page, Twitter profile and WordPress blog since its launch in 2010, as well as a YouTube channel (for video sharing) and Flickr profile (photo sharing). A Waite Research Institute LinkedIn group was started in May 2012.

In 2013 the WRI Wordpress blog had 7,715 visits, almost 800 more than the previous period. There were 29 posts in all during the 12 months.

In 2013 we expanded the successful combination of live-tweeting the debates with the generation of additional social media content through the *Harvest* radio program. This has in turn grown our Twitter following to over 1200 and our Facebook likes to over 260.

Goal 4: Increasing Collaboration across the Waite

The WRI continued to play a key role in increasing and enhancing collaboration at the Waite Campus during 2013 by:

- supporting the development of potential joint initiatives, applications and other responses to external opportunities via sponsored workshops and/or co-funding;
- providing a central coordination and communication point for the Waite partner organisations on such initiatives;
- stimulating collaborative activity and proposals with internal competitive, merit-based funding opportunities such as the platform proposals and equipment grant rounds;
- facilitating and supporting the Waite Strategic Leadership Group and the Waite Communicators Group;
- facilitating, sponsoring and organising a range of ad hoc activities that are of mutual benefit to the Waite partners or which build trust, communication, a collegiate atmosphere and shared interests. These include Debate@The Waite, Peter Waite Day and the Research Leadership Development Program.

4.1 Major new initiatives involving two or more Waite partners

Future Australian Genomic Platforms

The Commonwealth government has yet to announce its policy on funding of major national infrastructure beyond 2016. A critical capability in this category includes the provision of advanced genomics services and collaboration to Australian science and industry. The Australian Genome Research Facility (AGRF) is currently to provide this. AGRF's Agricultural Node is located on the Waite Campus, and the WRI is working with AGRF in collaboration with senior researchers from the biomedical, agricultural and environmental research sectors to develop a proposal to the Commonwealth government .

The model is expected to complement the institutions' retaining in house capabilities for specialist research and teaching needs as well as ensuring Australia having access to capability of the scale, new platform evaluation and complementing research program development to optimise outcomes from the platforms and bioinformatics. In addition the group recognises the need to service those researchers that are not as well versed on the technologies and how they can get the best for their research from them.

The discussions have identified and endorsed in principle the designation of a major site as the national focus for particular sectors, preferably associated with a leading university. The Waite is emerging as the designated focus for the agricultural/ environmental sectors.

4.2 Reciprocal/shared investment and activities with Waite partners

A number of potential projects and activities requiring co-investment, such as the Waite Water Management Plan, have achieved in-principle support and agreement at the Waite Strategic Leadership Group, which is supported by the WRI (see activity 4.4). Current financial constraints at the University and other Waite organisations have meant these cannot move forward without external and alternative sources of funding.

In 2013, the WRI initiated a merit-based selection process on proposals for available funding of large projects, smaller platform proposals and equipment (see activity 1.2). The Waite partner organisations were encouraged to apply on collaborative bids with AFW researchers and several joint proposals between the Waite organisations were received and assessed. Two of the successful equipment proposals involved CSIRO and AWRI researchers as well as AFW staff.

The new Applied Biology degree to be offered by The University of Adelaide from 2015 will include an industry placement for second-year students. The Waite partner organisations have agreed to support these placements, both within their own facilities on the Waite site and also via their industry contacts.

4.3 Shared infrastructure and use of Waite science platforms

One of the major benefits arising from the unique collocation of several complementary R&D organisations at the Waite is the ability to share resources and co-invest in infrastructure and technology to mutual benefit with reduced cost and duplication.

The WRI's July 2013 investment in shared Waite platform technologies and infrastructure was designed to significantly enhance and complete existing projects and build collaboration on the Campus. The use of Waite facilities such as Adelaide Microscopy, Waite Analytical Services, Australian Genome Research Facility (AGRF), Metabolomics Australia, the Plant Accelerator or MiSeq Next-Gen sequencing was mandatory in applications for that funding round.

The WRI's equipment round in September also stimulated joint applications from across the Waite partner organisations, with nearly $100K allocated to purchases of microscopes and other specialist equipment that is already being well utilised by multiple groups.

4.4 Waite Strategic Leadership Group

The Waite Strategic Leadership Group is a consultative and advisory group comprised of the leaders of the Waite organisations that aims to foster communication about and develop 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 and support services. The WRI also coordinates and hosts regular site visits incorporating Waite partner institutions' facilities and personnel (these are noted elsewhere in this report – see activity 2.4).

4.5 Peter Waite Day - Building the Campus Community

Peter Waite Day is an informal campus community-building exercise held to coincide with the anniversary of Peter Waite's birthday, 9 May each year. Held at the Lirra Lirra Café and adjacent McLeod House lawns, the event features a strongly-contested Bocce tournament between staff from across the Waite Campus organisations.

Peter Waite's generous bequest to The University of Adelaide for the purpose of agricultural research and the legacy embodied in the Campus are celebrated and remembered on this occasion; the 2013 event was widely acclaimed as the best yet, with live music accompanying the Bocce and outdoor festivities.

The Peter Waite Day Bocce Trophy went to the CSIRO Land & Water team in 2013.

Ruby's Mayhem **performing at Peter Waite Day, 2013**

Goal 5: Developing Waite people for the future

5.1 Targeted Support of Early to Mid-Career Researchers

The **Research Leadership Development Program (RLDP)** has been one of the outstanding successes of the Waite Research Institute's range of investment and activities. The program grew from a desire to develop research leadership capacity at the Waite and addresses the Waite's unique needs; it is not a generic leadership course similar to those at other institutions. From a list of a range of attributes of research leaders, we distilled four key areas of focus: developing a research/career vision; changing the work paradigm; harnessing ambition; and communicating with different audiences. The program is delivered by Karilyn Fazio, a top organisational coach from the Impetus Team.

In 2013, a third cohort of 10 early-mid career researchers participated in the WRI's RLDP, consisting of the two-day workshop, Dragons' Den pitch and coaching. Group 3 included two participants from AFW, three from SARDI, four from ACPFG and one from the APPF.

Groups 1 and 2, including participants from ACPFG and PCW, have now completed their coaching, with the exception of three participants selected for advanced coaching. The WRI is in the process of evaluating the program which will form the basis of a publication in a relevant journal.

These groups are now self-managing, providing peer-coaching and support and collectively identifying areas for further development. For one such area, working with the media, a workshop was held in May 2013 with 10 participants from Cohorts 1 and 2.

Analysis of the number of AFW grant applications and successes in 2013 shows a significant increase in the number of both, with the graduates of the WRI's Research Leadership Development Program prominently featured. A total of $22m was awarded to AFW researchers in the first six months of 2013, compared to the past average of $10-12m over the corresponding period.

It's clear that the School of AFW and the Waite more broadly are now less reliant on a small number of leading researchers than was the case three years ago.

Some of the RLDP's success stories in 2013 include:

- **Matthew Tucker** won a coveted ARC Future Fellowship on defining pathways that establish and maintain reproductive cell identity in plant ovules and seeds. Matthew was a winner of the Dragon's Den pitch award ($5,000) during the RLDP; he used the prize money to fund travel to meet with international collaborators, formalising their involvement in the Fellowship project.
- **Tim Sutton** led a project on the boron transporter gene in wheat to be featured in the world's highest-impact and most prestigious journal, *Science*, in late 2014. This will be the first Waite-led paper to appear in *Science* or *Nature* since 2007.
- **Brent Kaiser** published a 2013 paper describing the discovery of a gene responsible for nodule growth and nitrogen fixation by soy bean in the highly-ranked PNAS journal, which generated significant media attention and grant income. He has since left the Waite to take up a senior appointment at The University of Sydney.
- **Chris Ford** was appointed to the position of Deputy Head of School (L&T), and is coordinating the implementation of AFW's contributions to the new Applied Biology degree and also the Waite's bilateral arrangements with NCSU.
- **Vladimir Jiranek** led the multi-partner ARC Industrial Transformation Training Centre application (awarded in early 2013) and is now the Director of the $2.4 million Centre, one of only four funded nationally in that first round. Vlad is also active in leadership roles for the Wine Innovation Cluster and the University's Wine 2030 initiative.
- **Matt Gilliham** was appointed to a tenurable senior lecturer position in AFW, and then capped off a great year by winning a prestigious ARC Future Fellowship.
- **Kerry Wilkinson** and **Paul Grbin** developed and launched a iPad App called 'My Wine World', for the sensory evaluation of wine. The App is used by students in winemaking/sensory science and wine business, but is also a useful tool for wine lovers generally. Guiding users through the process of wine sensory evaluation using touch tools such as colour displays, sliders and input screens to characterise wine appearance, aroma, flavour, taste and mouthfeel, 'My Wine World' allows users to build up a searchable archive of their wine tasting experiences, with star ratings and photos as memory aids.

Grant writing assistance

Since late 2010, the WRI has covered the cost of an expert grant writer, Dr Tony Souter, to support the School of AFW's researchers in honing a range of new applications and revising 'near-miss' applications for funding.

This valuable resource for the School's researchers was well utilised again in 2013, with the WRI providing grant writing support for four Fellowship applications (including the successful ARC Future Fellowship application by Matt Gilliham), one Discovery grant and three CoE proposals from AFW staff. All applicants who accessed the grant writer have spoken positively of his contribution to their proposals, and this is reflected in the higher success rate for 2013.

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.

Highlights for 2013 are listed below for the University-funded centres with direct links to the WRI.

The WRI's most significant 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), one of five Schools within the Faculty of Sciences at The University of Adelaide, 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 currently comprises 45 academic staff, 165 research postgraduate students, 130 coursework postgraduate students, 700 undergraduates, and 380 externally registered students.

The School is organised into the following research themes:

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

Highlights 2013

The School of Agriculture, Food & Wine achieved a record total research income in 2013 – a total of $29,713,859. As well as significant funding from the Grains Research & Development Corporation (GRDC) and Grape and Wine Research & Development Corporation and further NCRIS funding for The Plant Accelerator, the total was bolstered by the big growth area, industry partnerships, which have increased by $5m since 2011.

The $2.4m ARC Industrial Transformation Training Centre for Innovative Wine Production was funded and established in early 2013. Based at the Waite and involving all the WIC partner organisations and another seven partners across the country, the Centre will provide cutting-edge training and development opportunities for postgraduate candidates and young researchers, with direct exposure to the grape and wine sector. This interface will also aid in informing the research on the sector's numerous challenges and ensure greater applicability and uptake of outcomes.

Awards and honours to AFW staff and students during 2013 included Professor Geoff Fincher's Thomas Burr Osborne Medal for distinguished contributions to cereal chemistry. There were also several researchers featured on print, television and radio outlets throughout the year.

The School also hosted numerous distinguished visitors and delegations throughout 2013, including groups from North Carolina State University, Shanghai Jiaotong University and Universitas Gadjah Mada in Indonesia.

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

FOODplus, a unit within the School of Agriculture, Food and Wine and joint venture of the Women's and Children's Health Research Institute and the University of Adelaide, develops research sustainability in food and nutrition as it relates to human health. It plays a key role in setting the national agenda in relation to Food and Nutrition. FOODplus identifies agricultural products that subscribe to the FOODplus mission and develop opportunities to leverage those products. Research focuses on translating nutrition research into food products with health outcomes and economic relationships with industry and coal-face agriculture.

Highlights 2013

Amongst other grant successes in 2013, FOODplus won a three-year grant worth $300,000 from the Premiers Research and Innovation Fund for International Collaboration to enable continued work with the University of Manitoba, Canada, on adding Omega-3s to chicken meat.

Staff and student recognition during 2013 included Professor Maria Makrides' appointment as theme leader for Healthy Mothers, Babies and Children at the new SA Health & Medical Research Institute (SAHMRI) and PhD student Jessica Gugusheff winning the SA Young Investigator's Award.

A FOODplus microbiome project was awarded seed funding by the WRI in mid-2013, leading to valuable preliminary data and proof of concept work enabling the development of a full grant proposal.

A patent was filed for the PUFAcoat method developed by FOODplus for stabilising fatty acids in a biological sample on special filter paper that has been treated with protectant chemicals. It keeps the long-chain polyunsaturated fatty acids stable at room temperature for at least nine weeks. This reduces blood sample collection, transport and storage costs, requires a less-invasive fingerprick rather than a needle in a vein and is quicker to analyse.

ACPFG
AUSTRALIAN CENTRE FOR PLANT FUNCTIONAL GENOMICS PTY LTD

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 (ACPFG), a unit within the University of Adelaide and its School of Agriculture, Food and Wine, is one of the largest cereal crop genomics facilities in the southern hemisphere, employing more than 150 research scientists and staff, with research nodes at The University of Adelaide, The University of Melbourne, The University of Queensland, and The University of South Australia. ACPFG is a joint investment by the Australian Research Council, Grains Research and Development Corporation, South Australian Government and University of Adelaide.

Highlights 2013

In 2013 ACPFG recruited over 30 new staff due to its expanded commercial relationships with international funding bodies. Funding was secured from the United States Agency for International Development to

apply transgenic technologies to enhance environmental stress tolerance in cereal crops as part of the US government's 'Feed the Future' initiative. ACPFG also signed a Memorandum of Understanding with the King Abdullah University of Science and Technology in Saudi Arabia to deliver salt tolerant cereal varieties to growers in both countries.

The University of Connecticut's vacuolar pyrophosphates (AVP1) technology which enhances salinity tolerance in cereals was licensed after field trials showed significant improvements in barley yields.

Dr Stuart Roy was awarded funding from the Grains Research and Development Corporation to deliver resources to breeders for novel salinity tolerance traits to include in their breeding programs.

Plant Cell Walls
ARC Centre of Excellence

ARC Centre of Excellence in Plant Cell Walls (PCW)

http://www.plantcellwalls.org.au

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

The ARC CoE PCW commenced as a 7 year $32million collaboration between the Universities of Adelaide, Melbourne and Queensland in partnership with SA State Government and seven international institutions in 2011. It is hosted by the University of Adelaide at its Waite Campus.

Highlights 2013

The Centre continued having an impact in the scientific arena and in forging links with national and international public and private sectors in the areas of biofuels production, human health and nutrition, malting and brewing technologies, and computational modelling. Research highlights included advances in our understanding of: the mechanisms and regulation of polysaccharide synthesis; cell wall modifications during fungal infection of barley; the three-dimensional relationships of plant cell wall components; and the molecular mechanisms of wall polysaccharide action in human health and nutrition. Research outputs from the Waite Campus Node included 7 invited talks and plenaries at major international meetings, contribution to 23 peer reviewed publications and numerous media articles, with particular focus on the Centre's involvement in integrated biofuels projects and its malting and brewing industry linkages. In 2013 the Waite Campus Node had 12 research staff, 10 support staff and mentored 21 HDR, Honours and visiting students. The Centre's international collaborative projects progressed and joint publications started to flow, facilitated with numerous exchange visits between its seven partner institutions in the UK, Europe and the USA; and the 3 Australian Universities.

The major new external grant awarded at the Waite Campus Node in 2013 was a 3-year, $2 million ARC Linkage Project with international malting and brewing companies, that also established links with the Waite Barley Breeding Unit and the LaTrobe University Node of ARC CoE for Plant Energy Biology.

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 The APPF is a national research facility established in 2009 under the Commonwealth National Collaborative Research Infrastructure Strategy (NCRIS). The Facility has two nodes; The Plant Accelerator at the Waite Campus and the High Resolution Plant Phenomics Centre located at CSIRO Plant Industry and the Australian National University in Canberra.

The Plant Accelerator offers state-of-the-art plant growth environments and high-throughput phenotyping (HTP) platforms which increase the speed and scale of plant physiological measurements, and help address the phenotyping bottleneck that is restricting the flow-through of genomics advances into improvements in crop performance. Carrying out projects with large populations of plants enables genetic studies to be undertaken to identify the molecular basis of complex physiological traits. Phenomics also provides a better understanding of how environmental components, both natural and artificial, affect plant growth and performance.

Highlights 2013

In 2013/14, The Plant Accelerator attracted $1.86M in government funding to support the operation of the facility and to help subsidise infrastructure access for publicly funded researchers. The operation of The Plant Accelerator requires expertise in a range of areas including plant physiology and phenomics, mechatronics, software engineering, horticulture, data analysis and business management. In 2013, our multidisciplinary team grew to fourteen staff members and the utilisation of our greenhouses reached full capacity, whilst demand for environmental growth rooms and HTP platforms reached approximately 70%. The Plant Accelerator team supported 34 projects in high-throughput phenotyping involving some 15,000 plants including wheat, barley, canola, maize, chickpea, rice and grapevine in projects investigating growth performance under drought, salinity, heat and other conditions.

The APPF is regularly consulted by similar facilities that are being established around the world for guidance and training in the development and use of our plant phenomics capabilities and in many cases to emulate the successes of the Australian investment. The Plant Accelerator hosted numerous visitors from international research organisations again this year, including staff and students from the University of Nebraska, KAUST Saudi Arabia, Technical University of Munich, and IPK Gatersleben.

plant energy biology
ARC CENTRE OF EXCELLENCE

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

The University of Adelaide became a node of the ARC Centre of Excellence in Plant Energy Biology (PEB) in 2011, with Professor Steve Tyerman becoming a Chief Investigator in the Centre in July of that year.

The Centre comprises The University of Western Australia, Australian National University and The University of Adelaide, seven Chief Investigators and over 110 internationally competitive staff and students. It is funded primarily through the Australian Research Council ($12.5 million (2005) + $9.8 million (2011-2013)) and $13.7 million from the partner universities to fund the Centre through to 2013.

The research focus of the Centre on the metabolic reactions that allow plants to use energy from the sun to produce the oxygen we breathe, the food we eat and remove waste carbon dioxide from the atmosphere. The long-term goal is to comprehend this system well enough to not only understand how plants function at a cellular level, but to be able to design optimal energy metabolism for particular functions (for example, starch, sugar or biofuel production), or in response to harsh environmental conditions.

wineinnovationcluster.com
Synergy in grape & wine research

The Wine Innovation Cluster

www.wineinnovationcluster.com

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 that just over 60 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 $25m+ external funding; strong industry partnerships on many of them attest to their relevance.

Co-location and infrastructure – non-University partners

The Waite Campus is unique in the number of non-University research partners located on it. 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 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.

CSIRO

Commonwealth Scientific and Industrial Research Organisation (CSIRO)

www.csiro.au

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

CSIRO, the national research provider, maintains a presence at the Waite which in 2013 was comprised of parts of four divisions - Ecosystem Sciences, Land & Water, Computational Informatics and Plant Industry.

CSIRO conducts agricultural research to help improve the profitability and sustainability of Australian farms and works to improve the quality and yield of Australian grain, horticultural and fibre crops aimed at improving Australia's food production and farming systems to ensure food and fibre are delivered to Australians on a sustainable basis. CSIRO's Waite-based research is also focussed on science and policy to underpin sustainable management of Australia's natural resources (soil, surface and groundwaters).

Government of South Australia
SARDI
RESEARCH AND DEVELOPMENT

South Australian Research and Development Institute (SARDI)

www.sardi.sa.gov.au

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 focusses on value-chain linkages, food security, natural resource and climate adaptation, product integrity requirements, innovation capability and enabling technologies, supplier competitiveness and biosecurity. SARDI research covers aquatic sciences, innovative food and plants, livestock and farming systems and sustainable systems. SARDI has 450 scientific, technical and support staff and has management responsibility for 13 regional research centres in South Australia.

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, incorporated in 1955, has contributed substantially to the success of the Australian wine sector since then, striving to deliver value to Australian grape and wine producers with world-class research and development, as well as integrated information and knowledge extension, education and commercial services activities. Priorities for research, development, extension and commercial services are driven by the Australian grape and wine sector. AWRI's staff aim for fundamental understanding and direct industry application and are specialists in traditional and cutting edge disciplines such as: winemaking, sensory science, organic and analytical chemistry, chemical engineering and life cycle analysis, mass spectrometry and spectroscopy, bioinformatics and chemometrics, biochemistry, molecular biology, metabolomics and systems biology, microbiology, fermentation management, and knowledge and information management.

Australian Grain Technologies Pty Ltd (AGT)

www.ausgraintech.com

LOCATION: Office GE09, Main Building, Waite Road, Waite Campus, Urrbrae

Australian Grain Technologies Pty Ltd (AGT) is Australia's largest wheat breeding company. AGT was established in June 2002 as part of a national initiative to re-focus and re-position Australia's wheat breeding efforts in a rapidly changing, highly competitive, global economy. The original shareholders of AGT were the Grains Research and Development Corporation (GRDC), the South Australian Research and Development Institute (SARDI), and the University Adelaide (UA). AGT began by consolidating more than 100 years of wheat breeding activities formerly managed by UA at both the Waite and Roseworthy Campuses with those undertaken by the Victoria Department of Agriculture (now Department of Primary Industries) at Horsham. These south-eastern Australia focussed programs have dominated the total area sown to wheat in Australia for more than 30 years. Through the consolidating of these three large former wheat-breeding programs AGT established major breeding operations at Roseworthy in South Australia and Horsham in Victoria. In 2003 AGT took over the management and operations of the National Triticale Improvement Program (NTIP) funded by GRDC and formerly conducted under the auspices of the UA. In 2005 AGT merged with SunPrime Seeds Pty Ltd. In 2007, the formal establishment of a major breeding operation in Western Australia was created in the form of a partnership between AGT and the Council of Grain Grower Organisation (COGGO). In July 2008, Vilmorin & Cie, a wholly owned subsidiary of Limagrain Holdings of France purchased a 25% shareholding in AGT. In 2009, both the University of Sydney and GrainCorp Limited sold their shareholdings to the GRDC and Vilmorin & Cie.

AGTs success depends on its ability to meet the current and future needs of the Australian grains industry and the demands of growers and their markets. With comprehensive wheat breeding operations based in each of Australia's four major wheat production zones, it is a national enterprise based at the Roseworthy and Waite campuses.

AGT is an independent company with governance oversight by a Board.

Australian Genome Research Facility (AGRF)

www.agrf.org.au

LOCATION: Plant Genomics Centre, Hartley Grove, Waite Campus

AGRF, a not for profit incorporated company established under the Commonwealth Major National Research Facility (NMRF) Program, is Australia's largest provider of genomics services and solutions. AGRF has laboratories in Brisbane, Sydney, Melbourne and Adelaide. The Adelaide node is the national centre servicing the agriculture and related industries provides a full range of applied genomics, array fabrication, bioinformatics, epigenomics and structural genomics, gene expression, genotyping, nucleic acid extraction, plant growth and stress, research and technology, sequencing and next generation sequencing services and long term storage.

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

Activities in 2014 will increase emphasis on establishing initiatives to attract new income streams to ensure that the considerable momentum gained over the past few years is maintained. These will include two major national initiatives in the areas of soil science and in the development of a new generation of environmental and agricultural genomics capability.

The WRI will also continue to play an active role in the development of bilateral initiatives between the University and its Waite partners, high-ranking international organisations and universities. In the immediate future, these will include assisting in major University-led efforts to generate increased research links with Shanghai Jiao Tong University and the North Carolina State University. Efforts to showcase the research capability and collective inventiveness of the Waite to address practical problems and provide new opportunities for the Australian agricultural sector will also continue. Recently formed interactions such as those with S&W Seeds and Jurlique will be built upon and new relationships sought. Industry partnerships like these will be increasingly important in a challenging and constrained financial environment.

The Waite is home to a dynamic and vibrant research and teaching community. In recognition of its many recent successes, The University of Adelaide has decided to create a new position of 'Dean of the Waite'. The new Dean will take overall responsibility for shaping the University's efforts to ensure continued growth and improvement at the Waite. The new appointee will undoubtedly play a leading role in determining the future direction of the WRI.

Together, we look forward to an exciting future with anticipation.

Professor Mike Wilkinson

Director, Waite Research Institute

Appendices

Appendix 1

WRI Members

(Active AFW researchers and academic staff in 2013)

Able,Amanda	Eagles,Howard
Able,Jason	Eales,Kathryn
Asenstorfer,Robert	Eckermann,Paul
Bastian,Susan	Eglinton,Jason
Baumann,Ute	Eini Gandomani,Omid
Berger,Bettina	Eliby,Serik
Betts,Natalie	Facelli,Evelina
Borysyuk,Nikolai	Fincher,Geoffrey
Boutsalis,Peter	Fleet,Benjamin
Breen,Jimmy	Fleury,Delphine
Burton,Rachel	Ford,Caroline
Byrt,Caitlin	Ford,Christopher
Chalmers,Kenneth	Fox,Rebecca
Chiasson,David	Franco Garcia,Alex
Clarke,Stephen	Garajova,Sona
Coleman,Desmond	Gardner,Jennifer
Collins,Cassandra	Garnett,Trevor
Collins,Helen	Gibson,Robert
Collins,Nicholas	Gill,Gurjeet
Coqui da Silva,Rodrigo	Gilliham,Matthew
Coventry,David	Gogel,Beverley
Coventry,Stewart	Grant,Cameron
Cozzolino,Daniel	Grbin,Paul
Croxford,Adam	Haefele,Stephan
Cu,Suong	Hayes,Julie
Culbert,Julie	Heuer,Sigrid
De Bei,Roberta	Hogendoorn,Katja
Dechorgnat,Julie	Hrmova,Maria
Degner,Sophia	Hsieh,Yves
Degryse,Fien	Huang,Chunyuan
Delaporte,Kate	Hussain,Syed
Denton,Matthew	Ismail,Ismail Ahmed
Donato,Adaweyah	Jeffery,David
Doolette,Ashlea	Jha,Deepa
Dundas,Ian	Jiranek,Vladimir

Kaiser,Brent
Keller,Michael
Khoo,Kelvin
Kleemann,Samuel
Koopman,Darren
Kovalchuk,Nataliya
Kravchuk,Olena
Langridge,Peter
Langridge-Reimold,Ursula
Leigh,Roger
Lewis,Rob
Li,Yongle
Liccioli,Tommaso
Little,Alan
Lopato,Sergiy
Loveys,Beth
Luang,Jeab
Lyons,Graham
Malone,Jenna
March,Timothy
Mares,Daryl
Marschner,Petra
Mason,Sean
Mather,Diane
Mayo,Gwenda
McDonald,Glenn
McLaren,Tim
McLaughlin,Michael
McNeill,Ann
Melino,Vanessa
Morran,Sarah
Morris,Christina
Mrva,Kolumbina
Muhlhausler,Beverly
Niimi,Jun
Nuberg,Ian
Okada,Takashi
Okamoto,Mamoru
Ovchinnikova,Evgenia
Parent,Boris
Paull,Jeffrey
Pearson,Allison
Penfold,Chris
Petrovic,Tijana
Phillips,Alison
Plett,Darren
Preston,Christopher
Ramesh,Sunita
Randles,John
Rathjen,Anthony
Rengasamy,Pichu
Riggs,Gavin
Riggs,Karina
Ristic,Renata
Rodriguez Lopez,Carlos
Roy,Stuart
Rutley,David
Schultz,Carolyn
Schwerdt,Julian
Scott,Eileen
Sefton,Mark
Setia,Raj
Shahinnia,Fahimeh
Shelden,Megan
Shi,Bu-jun
Shirley,Neil
Singh,Rohan
Skouroumounis,George
Smernik,Ronald
Smith,Andrew
Smith,Sally
Sornaraj,Pradeep
Suchecki,Radoslaw
Sumby,Krista
Sundstrom,Joanna
Sutton,Timothy
Sweetman,Crystal
Taylor,Dennis
Taylor,Julian
Tilbrook,Joanna
Timmins,Andy
Tiong,Jingwen
Tricker,Penny
Tu,Wei-Chun
Tucker,Elise
Tucker,Matthew
Tyerman,Stephen
Unkovich,Murray
Valente,Peter
Van Zanten,Robert
Vandeleur,Rebecca
Vassos,Elysia
Verbyla,Arunas
Walker,Michelle
Washington,Jennifer
Watson-Haigh,Nathan
Whitford,Ryan
Wilkinson,Kerry
Wilkinson,Mike
Wirthensohn,Michelle
Xu,Bo
Yang,Nannan
Zhang,Qisen
Zhou,Jo
Zhu,Ying

Appendix 2

2013 Financial Statements

2013 Expenditure

	2013 Actual
	$
Goal 1 - Growing the Quality of Waite Science	216,651
Goal 2 - Enhancing the Waite's Reputation	65,980
Goal 3 - Increasing Student Interest in Agriculture	-
Goal 4 - Enhancing Waite Collaboration	211,173
Goal 5 - Developing Waite People for the Future	119,455
Staffing & Office Administration	275,937
2013 Net Operating Expenditure	**889,196**

2013 Income

	2013 Actual
	$
Category 1	18,137,234
Category 2	3,010,427
Category 3	8,560,726
Category 4	5,472
Total Research Income	**29,713,859**

Appendix 3

2013 publications from AFW researchers

Book Chapters

Cozzolino,Daniel; Smyth,Heather
Analytical and chemometric-based methods to monitor and evaluate wine protected designation, pp385-408 in Food Protected Designation of Origin: Methodologies and Applications (2013), M de la Guardia & A Gonzalvez Illueca (eds), Elsevier.

Wilson,George; Ryder,Maarten; Fitzgerald,Glenn; Tausz,Michael; Norton,Robert; O'Leary,Garry; Seneweera,Saman; Tausz-Posch,Sabine; Mollah,Mahabubur; Luck,Jo; Hollaway,G. Case Studies on Food Production, Policy and Trade, pp 353-364,in Food Security in Australia: Challenges and Prospects for the Future (2013), Q Farmar-Bowers, V Higgins, J Millar (eds), Springer.

Makrides,Maria; Anderson,Amanda; Gibson,Robert
Early Influences of Nutrition on Fetal Growth, pp 1-9, in Recent Advances in Growth Research: Nutritional, Molecular and Endocrine Perspectives (2013), M Gillman, P Gluckman, R Rosenfeld(eds), Karger.

McDonald,Glenn; Bovill,William; Huang,Chunyuan; Lightfoot,David
Nutrient Use Efficiency, pp 333-393 in Genomics and Breeding for Climate-Resilient Crops (Volume 2) (2013), C Kole (ed), Springer.

Christophersen,O; Lyons,Graham; Haug,A; Steinnes,Eililv
Selenium, pp 429-463, in Heavy Metal in Soils: Trace Metals and Metalloids in Soils and their Bioavailability (2013) B Alloway (ed), Springer.

Journal Articles

White,Thomas (2013)
'Anticipatory' Reproduction By Small Mammals Cannot Succeed Without Enhanced Maternal Access To Protein Food, 332-336, *New Zealand Journal of Zoology*, 40, 4.

Huang,Chunyuan; Kuchel,Haydn; Edwards,James; Hall,Sharla; Parent,Boris; Eckermann,Paul; Herdinda,x; Hartley,D; Langridge,Peter; McKay,A (2013)

A Dna-Based Method For Studying Root Responses To Drought In Field-Grown Wheat Genotypes, 1-7, Scientific Reports, 3.

McBeath,Therese; McLaughlin,Michael; Kirby,J; Degryse,Fien (2013)
A Stable-Isotope Methodology For Measurement Of Soil-Applied Zinc-Fertilizer Recovery In Durum Wheat (Triticum Durum), 756-763, *Journal of Plant Nutrition and Soil Science-Zzeitschrift fur Pflanzenernahrung und Bodenkunde*, 176, 5.

Hackenberg,Michael; Huang,Po-Jung; Huang,Chunyuan; Shi,Bu-jun; Gustafson,Perry; Langridge,Peter (2013)
A comprehensive expression profile of microRNAs and other classes of non-coding small RNAs in barley under phosphorous-deficient and -sufficient conditions, 109-125, *DNA Research*, 20, 2.

Gao,Xin; Zhang,Qisen; Newberry,Marcus; Chalmers,Kenneth; Mather,Diane (2013)
A cysteine in the repetitive domain of a high-molecular-weight glutenin subunit interferes with the mixing properties of wheat dough, 1061-1071, *Amino Acids*, 44, 3.

McBeath,Anna; Smernik,Ronald; Krull,E (2013)
A demonstration of the high variability of chars produced from wood in bushfires, 38-44, *Organic Geochemistry*, 55.

Martin,Antony; Palmer,William; Byrt,Caitlin; Furbank,R; Grof,C (2013)
A holistic high-throughput screening framework for biofuel feedstock assessment that characterises variations in soluble sugars and cell wall composition in Sorghum bicolor, 1-13, *Biotechnology for Biofuels*, 6, 1.

Gugusheff,Jessica Rose; Ong,Zhi Yi; Muhlhausler,Beverly (2013)
A maternal 'junk-food' diet reduces sensitivity to the opioid antagonist naloxone in offspring postweaning, 1275-1284, *The FASEB Journal*, 27, 3.

Roy,Stuart; Huang,Wenmian; Evrard,Aurelie Christiane Patricia; Schmoeckel,Sandra Manuela; Zafar,Zafar; Tester,Mark (2013)
A novel protein kinase involved in Na+ exclusion revealed from positional cloning, 553-568, *Plant Cell and Environment*, 36, 3.

Pou,Alicia; Medrano,Hipolito; Flexas,Jaume; Tyerman,Stephen (2013)
A putative role for TIP and PIP aquaporins in dynamics of leaf hydraulic and stomatal conductances in grapevine under water stress and re-watering, 828-843, *Plant Cell and Environment*, 36, 4.

Tey,Yeong Sheng; Li,Elton; Bruwer,Johan; Abdullah,A; Cummins,Jay; Radam,A; Ismail,M; Darham,S (2013)
A structured assessment on the perceived attributes of sustainable agricultural practices: a study for the Malaysian vegetable production sector, 120-135, *Asian Journal of Technology Innovation*, 21, 1.

Tucker,Matthew; Roodbarkelari,Farshad; Truernit,Elisabeth; Adamski,Nikolai; Hinze,A; Lohmuller,Barbara; Wurschum,Tobias; Laux,T (2013)
Accession-specific modifiers act with ZWILLE/ARGONAUTE10 to maintain shoot meristem stem cells during embryogenesis in Arabidopsis, 1-14, *BMC Genomics*, 14, 809.

Brien,C; Berger,Bettina; Rabie,Huwaida; Tester,Mark (2013)
Accounting for variation in designing greenhouse experiments with special reference to greenhouses containing plants on conveyor systems, 1-22, *Plant Methods*, 9.

Shi,Andong; Marschner,Petra (2013)
Addition Of A Clay Subsoil To A Sandy Top Soil Alters Co2 Release And The Interactions In Residue Mixtures, 248-254, *Science of the Total Environment*, 465.

Nguyen,Trung Ta; Marschner,Petra (2013)
Addition of a fine-textured soil to compost to reduce nutrient leaching in a sandy soil, 232-239, *Soil Research*, 51, 3.

Ma,Y; Lombi,Enzo; McLaughlin,Michael; Oliver,Ian; Nolan,A; Oorts,K; Smolders,E (2013)
Aging of nickel added to soils as predicted by soil pH and time, 962-968, *Chemosphere*, 92, 8.

Milne,Ricky; Byrt,Caitlin; Patrick,John; Grof,C (2013)
Are sucrose transporter expression profiles linked with patterns of biomass partitioning in Sorghum phenotypes?, 1-12, *Frontiers in Plant Science*, 4.

Hayasaka,Y; Parker,M; Baldock,G; Pardon,K; Black,Cory; Jeffery,David; Herderich,Markus (2013)
Assessing the impact of smoke exposure in grapes: Development and validation of a HPLC-MS/MS method for the quantitative analysis of smoke-derived phenolic glycosides in grapes and wine, 25-33, *Journal of Agricultural and Food Chemistry*, 61, 1.

Bruwer,Johan; Rawbone-Viljoen,Christopher Anthony (2013)
BYOB as a risk-reduction strategy (RRS) for wine consumers in the Australian on-premise foodservice sector: Exploratory insights, 21-30, *International Journal of Hospitality Management*, 32, 1.

Navarro,Divina; Kookana,Rai; Kirby,J; Martin,Sheridan; Shareef,Ali; Du,Jun; McLaughlin,Michael (2013)
Behaviour Of Fullerenes (C60) In The Terrestrial Environment: Potential Release From Biosolids-Amended Soils, 496-503, *Journal of Hazardous Materials*, 262.

Setia,Raj; Marschner,Petra (2013)
Carbon mineralization in saline soils as affected by residue composition and water potential, 71-77, *Biology and Fertility of Soils*, 49, 1.

Periasamy,Agalya; Shadiac,Nadim; Amalraj,Amritha; Garajova,Sona; Nagarajan,Yagnesh; Waters,Shane; Mertens,Haydyn; Hrmova,Maria (2013)
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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
ARC	Australian Research Council
APPF	Australian Plant Phenomics Facility (The Plant Accelerator)
AWRI	Australian Wine Research Institute
CSIRO	Commonwealth Scientific & Industrial Research Organisation
DENR	Department of Environment & Natural Resources
EIF	Education Investment Fund
GRDC	Grains Research & Development Corporation
GWRDC	Grape and Wine Research and Development Corporation
HAL	Horticulture Australia Limited
LIEF	Large Infrastructure & Equipment Funding
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
PISC	Primary Industries Standing Committee
RIRDC	Rural Industries Research and Development Corporation
SARDI	South Australian Research & Development Institute
UA	The University of Adelaide
WIC	Wine Innovation Cluster
WRI	Waite Research Institute

For further enquiries

Waite Research Institute

The University of Adelaide
SA 5005 Australia

Telephone: +61 8 8313 6729
Email: wri@adelaide.edu.au

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