Sydney Institute of Agriculture

Georgika

Edition 3, December 2020

Georgika

Georgika - an online newsletter for those interested in academic aspects of the Ag sector

From the Director

Alex McBratney

Please enjoy the latest edition of Georgika where we highlight our research work in agriculture, our people and our ongoing links to our alumni and collaborators and stakeholders in the agricultural sector. This has been an unparalleled year in many ways – a pandemic and record yields on our farms. Something to remember forever. Some of us think the sooner we get to a new one the better. I'd like to thank everyone for all their diligent hard work over such a difficult year – despite the challenges I believe we are in a stronger position institutionally and nationally in relation to our agricultural effort, commitment, and standing than we were at the beginning of the year. So, I wish you a wonderful break. Take it – enjoy it. Wishing you a very happy and successful 2021 – it's got to be better than this one.

Distant links to Sydney

I have been to loads of agriculture conferences around the world and we are often reminded of the phenomenal pioneering crop-breeding work of the Iowan, Norman Borlaug and his many colleagues and co-workers that led to his being awarded the Nobel Peace Prize in 1970. Often this is stated as the first, and the only, Nobel prize in agriculture.

In the nineteen twenties and thirties John Boyd Orr was Director of the Rowett Research Institute, famous for its work on animal nutrition. During the Second World War he was a member of Churchill's Scientific Committee on Food Policy and helped to formulate food rationing. His job was to make sure everyone had an adequate diet, and that Britain could produce an adequate and nutritious food supply. Although rationing was difficult, the nutritional health of the nation was excellent. For this work Boyd Orr was knighted and then ennobled, becoming Baron Boyd-Orr.

The United Nations set up its Food and Agriculture Organisation headquartered in Rome in 1945. Boyd Orr was its first Secretary General. For his work with FAO Boyd Orr was awarded the 1949 Nobel Peace Prize – so probably the first Nobel Prize related to agriculture. (He donated the entire associated financial award to organizations devoted to world peace and a united world government.)

John Boyd Orr was Scottish, like our first Professor of Agriculture (1910-1946) Sir Robert Dickie Watt. They both came from farming communities in Ayrshire. Indeed they both came from the same village, Kilmaurs in Ayrshire, and as they were almost contemporaries – Boyd Orr was one year older (born in 1880) – I believe they attended the same schools (Kilmaurs School and Kilmarnock Academy) at the same time. So, I imagine they knew each other. There must have been something in the water or the soil...

Farm Facts

Friday 20 November was National Agriculture Day. The associated website suggests a few interesting Farm Facts which are worth considering:

Australian farmers invest $3.5 billion a year in research and development.
This is a huge number – much bigger than say the ARC budget. Of course it's not clear how much of this is research and how much is development, but it does suggest a very large pool for potential R&D investment. If we have good ideas we should be able to see them taken up, and it's probably better to be pro-active rather than reactive.

On behalf of Australians, farmers care for 51% of Australia's land mass.
So Australia is roughly 50:50 agriculture; non agriculture. An interesting number – I would have guessed agriculture at a higher percentage, say 70. It does highlight the importance of engaging with the agricultural community on developing options on how best to manage our landscapes, and how to facilitate the investment for that landscape care.

More than 99% of Australian agricultural businesses are Australian owned.
I guess this number arises because most agricultural businesses are family-owned farms. That number is dropping – and farm businesses are getting bigger. The statistic does not imply that there are not large farm businesses.

319k people are employed in agriculture accounting for 2.5% of the national workforce.
This is a good healthy number. Nevertheless there is a skills gap – there is always a shortage of agriculture graduates, probably of the order of one to two thousand per year. As agriculture becomes more technical and knowledge-based even more graduates will be required. So there is a big future for those who are suitably skilled.

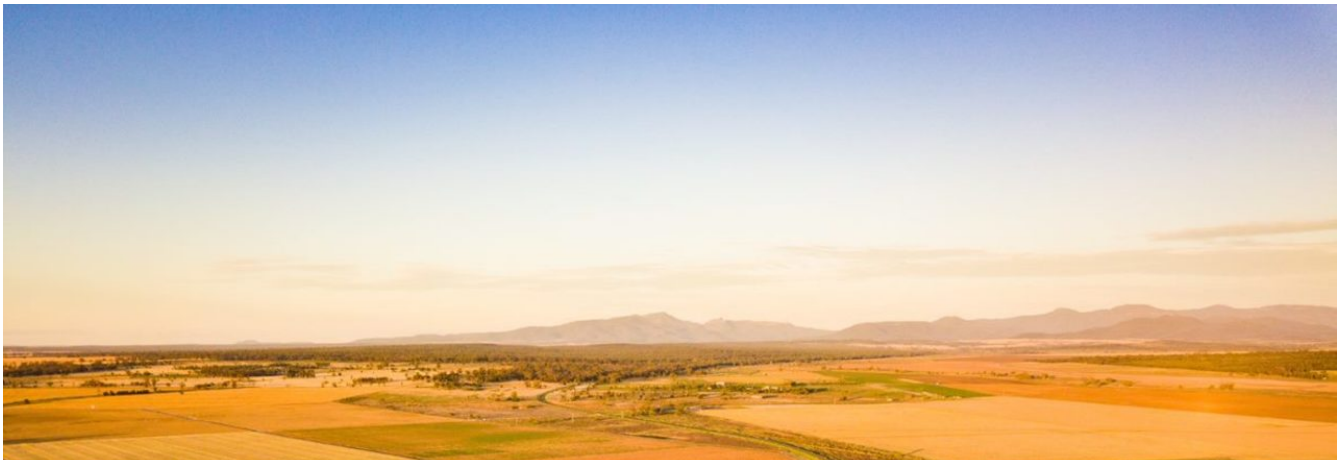


Image: Kieran Shepherd, Commercial Cropping Manager, Narrabri

Celebrating 60 years of field experiments at Narrabri

The University of Sydney is celebrating 60 years since field experiments were first grown at our Narrabri site. To mark the occasion, the team at Narrabri grew two wheat varieties (Sunprime and Sunlamb), which have differing maturities, using the same involved process they use to plant field experiments. The lettering in this picture is made up of 1456 six by two metre plots which covers a total area of 1.75Ha.

In 2019 the team celebrated World Soil Day with a similar activity which involved ploughing the letters into a bare paddock using the GPS guidance system of the tractor.

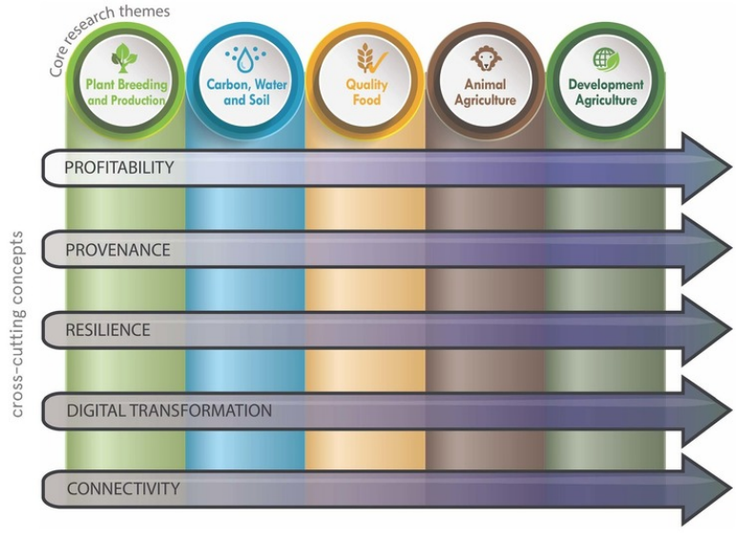
In 2018 our landscape art farmers marked Australia's first national agricultural day, with their FOOD image, which was carved out in the wheat using all the guidance technology of the header.

The Narrabri team involved in these spectacular agricultural technology images include Guy Roth, Rebecca Thistlethwaite and Kieran Shephard.

Image: Josh Smith

Image: Josh Smith

Theme Leader Updates



Plant Breeding and Production

Brent Kaiser

Carbon, Water and Soil

Budiman Minasny

Quality Food

Robyn McConchie

Animal Agriculture

Sergio (Yani) Garcia

Development Agriculture

David Guest

Plant Breeding and Production

Heat tolerance in Wheat

Periods of extreme high-temperature, particularly short periods of heat shock, are a major threat to wheat yield and grain quality throughout much of the Australian wheat belt. Rebecca Thistlethwaite and the team at The Plant Breeding Institute in Narrabri have been developing new material from diverse genetic backgrounds using field-based phenotyping and genomic selection methods. They phenotype each line for various traits including yield (see photos below) using a three-tiered strategy.

Firstly, thousands of lines are evaluated in the field in replicated yield plots at Narrabri in northwestern NSW at different times of sowing. Later, sown materials are exposed to greater heat stress. Subsets of materials, based on performance in the previous year and estimated genetic values, are then sown at sites in Western Australia and Victoria to assess the transferability of traits. Each year, high performing lines are retained from the previous year, intolerant materials removed, and new materials added. Materials identified as heat tolerant in times of sowing experiments are subsequently evaluated in the field using heat chambers (see heat chamber photos) to induce heat shock during reproductive development to confirm heat tolerance. Finally, those lines that maintain heat tolerance in the heat chambers are screened in temperature-controlled greenhouses to assess pollen viability under heat stress. We consider the materials that survive all three stages of testing to be highly heat tolerant.

Heat Chamber (HC)

HC Field Placement

HC Field Placement

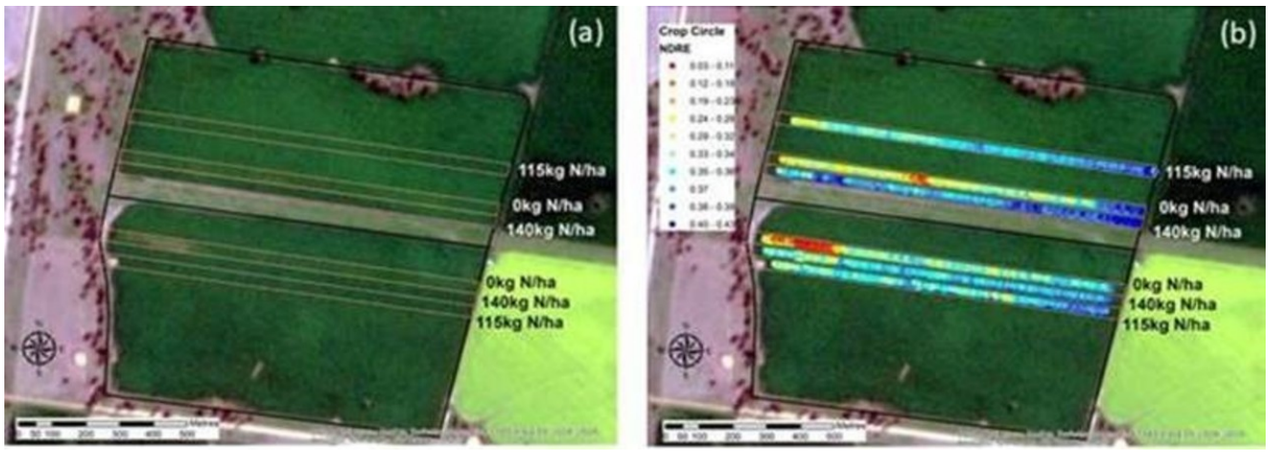
Plot Harvest

Plot Harvest

Future Farm

The Future Farm research program is a multi-institutional program involving USYD, GRDC, CSIRO, USQ, QUT, DPI-Vic. Its goals are to re-examine and improve the way in which historical digital farm data, in-season soil and crop sensors, and relevant data from off-farm, are used to inform decisions about input management and explore automation of the process from data acquisition, through analysis, to the formulation and implementation of decision options. The current focus is on nitrogen management.

Brett Whelan reports that work is advancing well with farms at Nowley and Llara involved in the research. A strip trial that has been established at Nowley this season is shown in Figure 1, where (a) shows a true colour image of the crop where any difference in crop response to N is difficult to see. Figure 1 (b) shows the information available from a tractor-mounted multispectral sensor driven over the strips. A response in the Normalised Difference Red Edge (NDRE) index is obvious. To gain a more continuous measurement over time, Mario Fajardo, an integral member of the USYD research team has developed a method for producing 10m resolution images of leaf area index (LAI) using freely-available data from a number of satellite platforms.



Precision Breeding with CRISPR Nanobiotechnology

Awarding the 2020 Nobel Prize for Chemistry to the discoverers of CRISPR gene editing was fitting recognition of the importance of the discovery to all biology. CRISPR has given us the capacity for the first time to make precise, targeted genetic modifications in almost any organism.

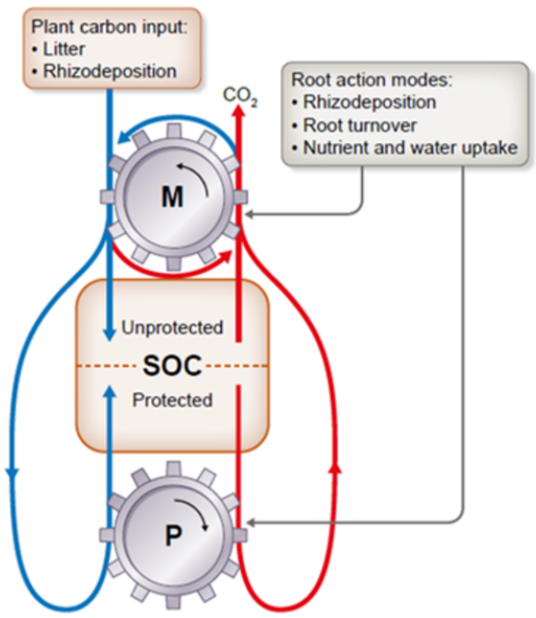
Previously in agriculture, incorporating targeted changes, for example in a trait-specific gene, required introgressing existing modifications from a known source or inducing multiple random mutations in the hope of finding one in the target gene. These methods are laborious and limited in scope.

Although CRISPR has lived up to expectations in terms of a capacity to rewrite genetic sequences, its application has been hampered because researchers and breeders have been relying on decades-old transformation technologies like biolistics, protoplasting, Agrobacterium tumefaciens infection and other tissue culture-based techniques. These techniques have restricted the application of CRISPR to a limited range of species and cultivars.

Together with researchers from Sydney Nano and the Plant Breeding Institute, Brian Jones and his team have developed nanomaterials-based CRISPR transformation methods that replace these older, restricted technologies. They are working with companies and researchers in Australia and the US, applying our nanotechnology approach to CRISPR-based metabolic engineering in a range of species, from wheat, tomato and tobacco through to Agaricus bisporus (button) mushrooms and are actively developing protocols for a range of other species.

Read further about Plant Breeding and Production

Carbon, Water and Soil



Tansley Insight: Roots and soil organic carbon

Feike Dijkstra, Weixin Cheng (Paech visiting professor from University of California, Santa Cruz, who unfortunately was unable to visit due to covid-19), and Biao Zhu (Peking University) were invited to write the Tansley Insight in New Phytologist on the effects of roots on soil organic carbon. The recently published paper provides an explanation of the paradox of live plant roots, which can have strong positive and negative effects on soil organic carbon (SOC).

Feike wrote: We are excited with the development of a new framework, we called the Rhizo-Engine, where roots accelerate SOC turnover through both SOC stabilization and destabilization mechanisms. We believe that this framework could improve understanding of plant root effects on soil C sequestration and the sensitivity of SOC stocks to climate and land-use change.

Ed Jones, Vanessa Pino, Tom O'Donoghue and Alex McBratney have been monitoring soil biological conditions on L'lara farm. They established 58 sites throughout the farm and conducted various tests related to the soil biological conditions. They took DNA samples from the soil and found that the DNA concentration in the soil is strongly related to soil type and land use. Non-clayey soils (< 25% clay) under cropping had less diverse fungi communities but are more diverse in bacteria. The opposite was found for soils under native vegetation.

To study how the microbes operate, they buried teabags in the soil and observed how green tea was decomposed, as opposed to a rooibos tea. They found that cropping soils have a high decomposition rate but store less carbon in the soil. While microbes in pasture act more to store carbon in the soil. Overall the monitoring project has provided new insights on how the micrometer microbes' activities can be mapped.

The untapped potential of soil carbon

Could soil sequestration turn carbon into gold for farmers?

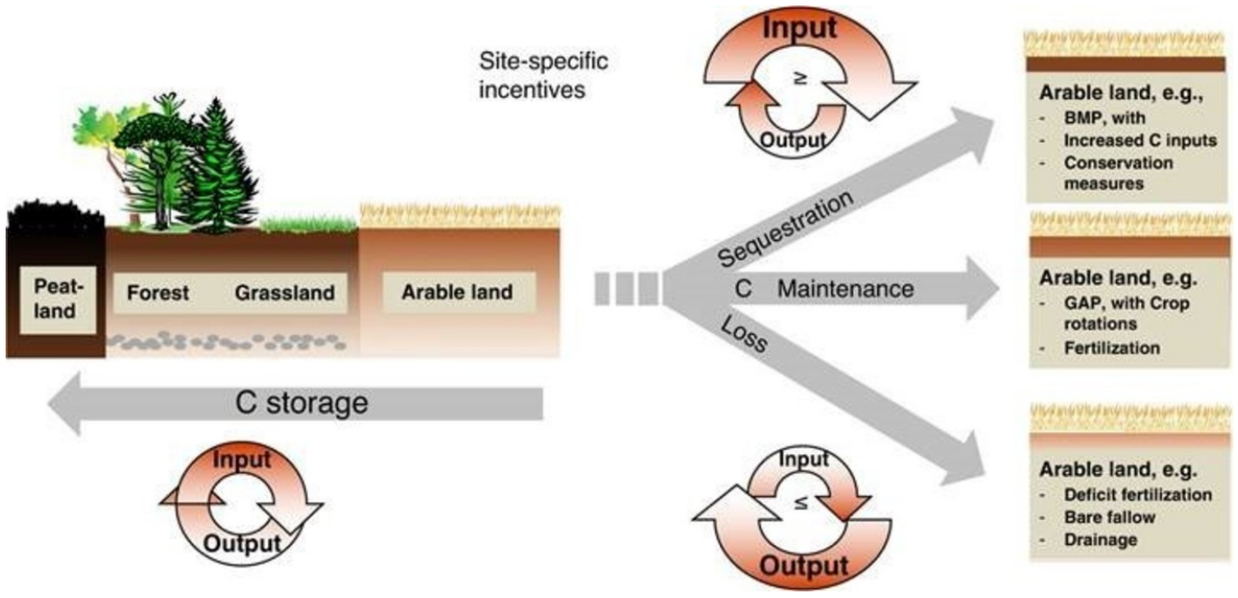
For National Agriculture Day this year, we highlighted our work on rethinking how the Earth's skin – our living soil – can be used in the fight to control climate change.

New Treasure Maps, a soil carbon tricorder, and New Sequestration Methods. Read it here.

Towards a global-scale soil climate mitigation strategy

Last year, Budiman Minasny was invited to give a presentation at the 4per1000 conference in Poitiers, France. As an outcome of the meeting, several scientists worked together and wrote a perspective article on how we can scale up global soil carbon sequestration. The paper is now published in Nature communication.

We recommend a diverse set of options for global soil C sequestration; each option is adapted to local soil conditions and management opportunities.



Read further about Carbon, Water and Soil

Quality Food

The ARC Training Centre for Food Safety in the Fresh Produce Industry held its final Industry Partners Day on 24 November in conjunction with the Fresh Produce Safety Centre. The Centre commenced in 2017 and is due to wind up in February 2021. The aims for the centre are: to undertake industry-focused research to develop practical solutions to minimise food safety risks across the value chain, and to educate a new generation of research professionals to drive future food safety research. The Centre comprises nine Chief Investigators, five Postdoctoral Associates, eight PhD students and 19 industry partners from Australia and abroad. The conference was opened by Dr Robert Mun, ARC Executive Director, Engineering and Information Sciences.

The Zoom Conference provided the opportunity for research outcomes of the Centre to be shared. The videos and presentations will be made available soon. Below are two examples of the industry focussed research conducted by the Centre.

Plasma as a sanitiser for fresh produce

Postdoctoral Associate, Hannah Sassi, along with students, Kate Cousins and Rose Fuggle (Year 3 Bachelor of Science, majoring in advanced microbiology), are investigating whether plasma gas is effective in inactivating non-enveloped viruses on surfaces. This group of pathogens represents typical enteric, foodborne and waterborne viruses.

PhD student, Joanna Rothwell is conducting experiments to test the effectiveness of Plasma

Activated Water (PAW) in the fresh produce industry to reduce the reliance on chemical sanitisers. She has designed trials to determine how to kill gram-positive and gram-negative bacteria using PAW. To date, the time, frequency and voltage parameters that effectively kill bacteria have been defined. In 2021 students will trial an on-farm PAW at a leafy green processing facility, led by Anne Mai-Prochnow and PJ Cullen.

A quantitative microbial risk assessment for leaf greens

Hayriye Bozkurt has been working with the leafy greens industry to develop a QMRA model that will identify situations that contribute to an increased risk of illnesses from consumption of cos lettuce in Australia. An understanding of the main risks will allow resources to be prioritized toward interventions to reduce risks. Her modelling has shown that soil contact via irrigation splash, rainy days, lower solar radiation and short growing time are the key risk factors affecting transfer of E.coli O157:H7 onto cos lettuce in the field. During postharvest the key risk areas were appropriate washing and sanitising systems, and maintaining the cool chain during transport and storage, including in the consumer's home. Her published work Bozkurt et al. 2020. Assessment of microbial risk during Australian industrial practices for Escherichia coli O157:H7 in cos lettuce: A stochastic quantitative approach, Food Microbiology can be found here.

Native Grains Introduction - From Paddock to Plate - Webinar Series

The Native Grains Knowledge Series was held last month and received an outstanding response of support and excitement from the online audience.

The webinars are available for viewing, along with shorter video highlights, on their youTube playlist.

Read further about Quality Food

Animal Agriculture

How do animals cope with heat?

Cameron Clark, Sabrina Lomax, Ashraful Islam and Rafiq Islam have been using the latest agtech to work out how animals cope with heat. As our environment warms, new systems and resilient animals are required to maintain animal performance and welfare. Panting is considered a robust animal response indicator of heat stress; however, continuous visual monitoring is impractical on a commercial scale. Current thermal indices are good predictors of heat stress at a herd level but have limited application at the individual level. The automated monitoring of heat stress responses of individual cattle based on animal response and environmental parameters are required for strategic management and genetic selection.

The researchers validated an ear tag-based sensor for the monitoring of panting in cattle and determined the individual variability in panting duration for heat stress events, comparing with existing thermal indices. Sensors were able to monitor differences in cattle panting due to breed, coat colour, and individual variability. High variation in panting responses between and within genotype and coat category highlights the opportunity for targeted heat amelioration based on breed and coat colour grouping of animals, and selection within breeds and types for heat resilience. The next phase of research will reveal the ways in which this diversity is enabled. The group is also linking with Ollie Jay, focussing on human heat, leveraging expertise between species and creating a focal point for heat focused research in Australia. Read the full publication here.

There aren't plenty more fish in the sea

Joy Becker was interviewed recently on ABC Regional News about the Australian aquaculture industry. Watch the interview here (time stamp 07:45).

Read more about Joy's work in the University News, and as featured in Sydney Alumni Magazine (SAM).

Research on a cattle station

PhD student Christie Pearson has conducted her research on a cattle station in the Northern Territory since 2017, under the supervision of Luciano Gonzalez. Her research focussed on identifying the factors which contribute to calf mortality in northern Australia. Christie has been very lucky to be involved in such a range of experiences in her time up north, particularly being immersed in the industry, from mustering and yard work to helicopters. The range of skills Christie learnt in the past four years, not only academically, but on a personal level, has been a highlight, with remote travelling and bush mechanics all part of the inevitable learnings for her thesis. Christie found that the northern beef industry is filled with challenges, and that many of the solutions are complex and multifaceted. Christie has loved every minute and found that these challenges made her PhD that much more interesting and rewarding. Enjoy some of Christie's brilliant photographs which showcase her experiences.

Read further about Animal Agriculture

Development Agriculture

Cocoa classification in the Autonomous Region of Papua New Guinea

The Autonomous Region of Bougainville (ARoB), like the rest of Papua New Guinea (PNG) has suffered a series of events that have reduced cocoa production and yield, affecting thousands of smallholder farmers and plantations in many ways (Walton et al., 2020 - Science Direct)). One of these, cocoa pod borer, has been addressed by researchers, which has seen partial recovery in the industry. The continued global demand, and numerous policy and strategic interventions by the PNG government and industry organisations, has seen production increase to 40,000 tonnes/ha in 2017, where ARoB is a significant contributor (https://www.agriculture.gov.pg/cocoa/). Cocoa will play an important role in the future of Bougainville.

Opportunities for intensification to meet government's ambitious production goal

This renewed focus on cocoa production needs to embrace intensification, i.e. increased yield per hectare, rather than expansion through deforestation. An ACIAR project focused on improving soil fertility management to increase yields, is seeking to remotely identify areas where cocoa can be underplanted within established plantations to assist land managers and policy makers. Cocoa grows well under established coconut shade and the ease with which coconut plantations can be distinguished from forested areas means we are building a calibration data set to establish areas that are already growing cocoa, or potential areas using the classification maps being produced (see image below).

We are using existing local knowledge to assess this phenology-based mapping approach generated using Google Earth Engine (GEE), showing the areas suitable for cocoa by making use of information generated from Landsat 5, 7 and 8 data (freely available on GEE).

Why is this important?
1. Updated information on areas that have potential to grow cocoa for intensification.
2. Monitor land-use changes across the province for inventory purposes.

Classifying areas under cocoa

Read further about Development Agriculture

People

Robert Park wins Eureka Prize

Last month five University of Sydney finalists were named as Eureka Prize winners in recognition of their excellent scientific research, leadership and engagement.

Robert Park won the Eureka Prize for Leadership in Innovation and Science.

We hear from Robert below.

On 24 November I had the tremendous pleasure and honour of receiving a Eureka award that recognised leadership in innovation and science. There are many things that for me made this surprising (for example the two other finalists are amazing scientists), and possible (for example I have had the privilege and honour of leading a great team of people at the Plant Breeding Institute over the past 18 years or so).

The rust research program at the University of Sydney is quite possibly the University's longest running research endeavour. It was initiated by Professor Walter Waterhouse, who was appointed as a Lecturer and Demonstrator in Plant Pathology, Genetics and Plant Breeding, and Agricultural Botany here in 1921. Among the many research projects Waterhouse initiated, the longest running was to become the nation-wide race survey, which continues to this day. One of my many duties since joining the University in May 1988 has been to run these nation-wide surveys for most of the wheat, barley and oat attacking rusts. Documenting their evolution and spread throughout the country for the past 33 years has been a truly intriguing and fascinating experience, one so interesting that I could easily keep doing it for another 30 years. One of the most important things to emerge from this work has been the increasing frequency of exotic incursions of cereal rusts; for example, in the 100 years we have been monitoring the rust pathogens of wheat in Australia there have been 15 incursions of exotic wheat rust races, 10 since 1981. Of these, I have documented 6, determined their impact in Australian agriculture, and over time documented the evolution of virulence in each. The rust surveillance work has formed the basis of all of the genetics and pre-breeding work we do on rust, and has also been critical in extension and the post-release management of wheat cultivars. We have conducted similar work with the rusts of barley, oat and triticale.

A significant outcome of the early wheat rust research at the University of Sydney was the development of the wheat cultivar Gabo. This was used by Norman Borlaug in Mexico as a source of daylength insensitivity, and in this way played an important role in the Green Revolution. Its success in Australia led to a donation by the NSW Flour Mill Owners' Association that established the Plant Breeding Institute at Castle Hill, and then at Cobbitty. I feel truly lucky to have had the opportunity to build on this research legacy.

Ag Alum Area

In this section we aim to report on the activities of our alumni who are working in agriculture. If you have a story you would like others to hear about, please email us. In this edition we feature our links to the International Maize and Wheat Improvement Center (CIMMYT).

Sydney Alumni contribution to CIMMYT

Over the course of several decades, the University of Sydney has been sowing seeds of scientific talent that have taken root at a wheat research centre based halfway around the world: the International Maize and Wheat Improvement Center (CIMMYT), a world-renowned international agricultural research and training non-profit headquartered in Mexico.

CIMMYT's origins go back to the work of Norman Borlaug, which helped spark the Green Revolution and led to a Nobel Peace Prize. Today, CIMMYT scientists with ties to the University of Sydney are conducting state-of-the-art wheat science that Norman Borlaug might only have dreamed of. Sanjaya Rajaram is CIMMYT's most legendary University of Sydney alumnus. Sanjaya, 2014 World Food Prize laureate and 33-year veteran of CIMMYT developed 480 wheat varieties released in 51 countries and served as Director of the Global Wheat Program, received his PhD in plant breeding in the 1960s for a project based in Narrabri.

From legendary breeders to brand-new leaders, the University of Sydney-CIMMYT pipeline appears to be strong and growing. We caught up with a few of the many CIMMYT scientists with ties to the University, to find out how their University connection impacts their work creating the future of wheat.

Ravi Singh

Ravi Singh is a distinguished scientist and head of CIMMYT's International Wheat Improvement Program, where he has been working for the last 37 years. Ravi earned his doctoral degree from the University of Sydney in genetics of rust resistance in wheat. In this role, his mission is to continue enhancing wheat productivity on 60 million hectares in Asia, Africa and Latin America by developing and distributing new more productive, disease resistant, climate resilient wheat varieties with processing and nutritional qualities to wheat researchers worldwide. Ravi has contributed to the development of more than 550 wheat varieties released by national program partners in many countries, including Australia.

"My University of Sydney scholarship and the opportunity to work under the supervision of Bob McIntosh gave me excellent knowledge of wheat rusts and resistance, which brought me to CIMMYT to continue working on it when I joined in 1983. Breeding rust resistant varieties with other necessary traits became a passion for me and that is what I do nowadays," Ravi said.

Sridhar Bhavani

Harbans Bariana, Urmil Bansal & Sridhar Bhavani

Sridhar Bhavani received a master's degree in Molecular Biotechnology and a doctoral degree in Wheat Rust Genetics and Breeding from the University of Sydney. As the head of rust research at CIMMYT, Sridhar Bhavani's objective is to develop improved bread and durum wheat germplasm with durable resistance to the three rust diseases: leaf rust, yellow rust and stem rust. This involves dissecting the genetic components of resistance in a wide range of germplasm to better understand the genetic architecture of the trait, developing breeder friendly markers for trait introgression, coordinating the rust phenotyping platforms and working closely with the global rust reference centers on improved survey and surveillance and capacity building of national programs.

Sridhar's 12-year collaboration with the University of Sydney's Plant Breeding Institute (PBI) continues to this day with PBI projects on wheat and barley with the Australian Cereal Rust Control Program; and with the Commonwealth Scientific and Industrial Research Organisation (CSIRO)-University of Sydney molecular marker program, funded by the Grains Research and Development Corporation (GRDC).

During his academic career at the University, Sridhar was awarded a Faculty of Science Student Fellowship for his master's degree research and the Thomas Lawrence Pawlett Scholarship for his doctoral research.

"The Plant Breeding Institute, University of Sydney has been instrumental in honing my theoretical and technical skills during my PhD study," Sridhar said. "It was a rewarding experience working with eminent rust researchers. PBI has a wide network of collaborations both with CGIAR centers and advanced research institutes and universities, providing opportunities for students to conduct research at other centers. It still continues to be a hub for training young researchers from all over the world on cereal rusts."

Alison Bentley and former Dean of Agriculture, Lester Burgess

Alison Bentley

Alison Bentley is one of the newest University alumni to join CIMMYT, taking over as Director of the Global Wheat Program in November 2020. Alison earned both a BScAgr and a PhD at the University of Sydney.

Prior to joining CIMMYT, Alison was the director of Genetics and Breeding at the UK National Institute of Agricultural Botany (NIAB), working on wheat pre-breeding and trait genetics. She serves as the UK representative on the International Wheat Initiative Scientific Committee, and is a committee member for the Genetics Society, the UK Plant Sciences Federation, the Society of Experimental Botany, and the Editorial Board of Heredity.

“My research centres on the major questions of how to mobilize new scientific tools and technologies to accelerate wheat breeding, how better to adapt wheat to increasing seasonal instability and how to optimise input use in cereal-based cropping systems. These research areas are closely aligned with the work of the Global Wheat Program at CIMMYT and I am really looking forward to working with the incredible team to continue to use research and breeding to drive wheat breeding gains and their associated impacts.”

Alison “hugely enjoyed” her time as an undergrad and postgrad student at Sydney; particularly noting the “welcoming, friendly, and collaborative environment in which to discover things.”

“Questions were always encouraged (at all levels) and staff were always happy to share opinions (not always positive, but always constructive).”

Alison’s relationship with the university began a weekend event hosted at PBI Cobbitty for high school students interested in agriculture. The opportunity to have hands-on experience extracting DNA, touring facilities and hearing from plant breeders and other scientists inspired her to pursue her education there, a decision with lifelong impacts.

“I enjoyed the focus on application of science into practice, which I have carried forward in my career.”
“Sydney Uni was also a great environment to combine different interests and gave me the opportunity to play international sport whilst studying as well as to travel and enhance both my personal and professional development. This was very important for developing my understanding of how to work with others and to lead and manage diverse teams.”

Mandeep Randhawa

Mandeep Randhawa earned his doctoral degree in Wheat Rust Pathology, Molecular Genetics and Breeding from University of Sydney. Mandeep currently manages and organizes the operational activities of the International Stem Rust Phenotyping Platform led by CIMMYT and the Kenya Agricultural and Livestock Research Organization (KALRO) in Njoro, Kenya.

“In a nutshell, I contribute to rust research through identification and characterization of new sources of rust resistance, development of breeder friendly markers, transfer of rust resistance genes in breeding lines, field evaluation of germplasm accessions (wheat, durum, barley and oat) from various countries, and facilitating delivery of improved high yielding wheat lines for identification and release in the country. I also promote biofortified wheat lines in the region and conduct monitoring and early warning through improved rust surveys and surveillance, and capacity building through annual training courses and supervising students,” Mandeep explained.

Mandeep's association with the University of Sydney began with his contribution to an Australian Centre for International Agricultural Research (ACIAR)-funded India-Australia collaborative research project on molecular marker technologies for faster wheat breeding in India, led by Sydney's Richard Trethowan. From there, Mandeep was awarded the John Allwright Fellowship from ACIAR to pursue his PhD at Sydney, where his studies covered genetic characterization and mapping of rust resistance genes to facilitate their marker-assisted transfer into Indian and Australian wheat cultivars.

His collaboration with the Plant Breeding Institute Cobbitty continues at CIMMYT, with GRDC-funded joint wheat rust projects with the Institute and CSIRO.

"The Plant Breeding Institute Cobbitty is considered a 'Mecca' of cereal rust research. It was an honour and privilege to work, learn and conduct research with the support and mentorship of well-known scientists in cereal rust research" such as Drs. Urmil Bansal, Harbans Bariana and Richard Trethowan, he said. "My interdisciplinary training --in pathology, molecular genetics and breeding for disease resistance – at Sydney has equipped me with skills and capabilities to pursue my current role."

Naeela Qureshi

Naeela Qureshi earned a doctoral degree in Molecular Genetics/Plant Breeding and Pathology from the University of Sydney and worked as a Research Associate at the Plant Breeding Institute. Naeela recently joined CIMMYT as an Associate Scientist in wheat rust molecular genetics and pathology, where she focuses on identifying and characterizing new sources of rust resistance genes and developing breeder friendly molecular markers linked with various rust resistance genes to facilitate marker-assisted breeding. She is recipient of the early career award from International Wheat Genome Sequencing Consortium (IWGSC), the Jeanie Borlaug Laube Women in Triticum (WIT) award, and the USDA Borlaug Fellowship -- but before these recognitions, she received the University of Sydney International Scholarship and Australian Endeavour Award that led her to her PhD.

After earning her doctoral degree in Molecular Genetics/Plant Breeding and Pathology, Naeela then became a PBI Research Associate working on discovery, characterization and molecular mapping of rust resistance genes. And, in a third role, Naeela went on to providing next-generation sequencing platforms to PBI collaborators at Agriculture Victoria Research.

"PBI played a very significant role in shaping and developing my capabilities in wheat rust research," Naeela said. "All my practical and academic research skills in wheat rust discipline comes from PBI and my supervisors, Dr. Urmil Bansal and Dr. Harbans Bariana. "I am looking forward to collaborating with University of Sydney researchers in the future under joint projects with CIMMYT," Naeela said, echoing her CIMMYT colleagues.

Richard Trethowan

Other Sydney alumni who have worked at CIMMYT include former CIMMYT wheat breeder David Bonnett and durum wheat and maize pathologist Sandro Loladze.

Richard Trethowan, undergraduate and postgraduate alumnus of the Faculty of Agriculture and now Professor of Plant Breeding and Director of the PBI, spent 13 years at CIMMYT and was the Principal Scientist and Head of Global Bread Wheat Breeding for Rainfed Areas

Social Media

The Sydney Institute of Agriculture recently joined Instagram (Sydney_Sia) and we are also on Twitter (Sydney Agriculture). Follow us at the links in the box below.

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