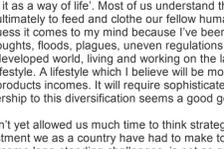


# Georgika



Edition 1, September 2020

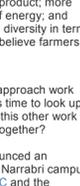


**Georgika - a new online newsletter for those interested in academic aspects of the Ag sector**

## From the Director

[Alex McBratney](#)

Welcome to Georgika! The University of Sydney Institute of Agriculture has been in existence for three years. As part of our ongoing development we are now launching our online newsletter, Georgika, for our external stakeholders and Agriculture alumni. This will appear every 5 to 6 weeks. If you have any feedback, please [contact us](#).



Often I say to people 'I believe in agriculture - I believe in it as a way of feeding and clothing humanity - and I believe in it as a way of life'. Most of us understand the first part, we work on this via our disciplinary bases ultimately to feed and clothe our fellow humans. A lot of us don't think about the second part. I guess it comes to my mind because I've been brought up in agriculture. Despite the vagaries of droughts, floods, plagues, uneven regulations and unexpected tariffs; in Australia and most of the developed world, living and working on the land and helping those who do, provides a rewarding lifestyle. A lifestyle which I believe will be more valued in the future with the diversification of farm products incomes. It will require sophisticated farmers and land managers. Providing leadership to this diversification seems a good goal to pursue.

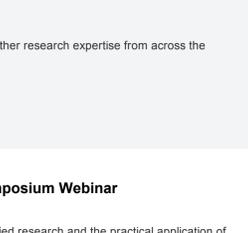
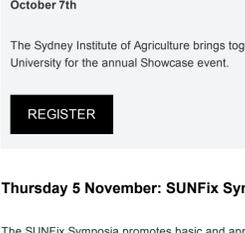
The COVID pandemic hasn't yet allowed us much time to think strategically except perhaps to realise that given the investment we as a country have had to make to get us through, that the investment needed to overcome long-standing challenges, is not as great relatively as we previously thought. I guess climate change is the obvious contender here. In this context we can also think of public reinvestment in our landscapes to make them more sustainable.

At the turn of the 20th century perhaps a fifth of farm production was given over to energy production. This production was used to feed animals which in turn provided the energy for on-farm operations. With the advent of diesel and petrol motors, on-farm production of energy slipped away and to some extent agriculture became less self-sufficient - less circular. I think the redesign of Australia's agriculture and agricultural landscapes energy once again has to be part of the mix. Contemporary energy captured from the sun is less likely to impact greenhouse gases. Farms can produce energy on-farm from bioreactors or arrays of solar panels or wind turbines. Optimal locations for solar panels taking into account productivity and ecosystem services seems like a challenging and fruitful research problem. Lining up ducks in a row - apparently a metaphor from 1900's shooting galleries or early bowling alleys. The farms of the future will need to line up a few ducks if they are to prevail. Post-COVID we have a huge opportunity to build a hugely-skilled diverse profitable and sustainable farming sector.

It will require lining up a few ducks. More quality, provenance and profitability of product; more monitoring and improvement of the agroecosystem on farms; local production of energy; and improved use of scarce water resources; carbon neutrality or better. I think farm diversity in terms of products will increase markedly. The biodiversity of farms will also increase. I believe farmers will accept and address this multi-goal optimisation problem.

We have our part to play to make sure all the components of this more diverse approach work well, but more importantly, that they can be joined up with other components. It's time to look up and over our shoulders, to look around, and ask how does my work join up with this other work or that work to build up to a new exciting synthesis? Can we as researchers put it together?

On Tuesday 1 September 2020 the Deputy Premier of NSW [John Barilaro](#) announced an investment of \$9.45M towards a new \$13M building and research facility on our Narrabri campus. Other key co-investors are the NSW Wheat Research Foundation (WRF), GRDC, and the University of Sydney. [Rob Lang](#), Chair of WRF and [John Woods](#), Chair of GRDC both spoke enthusiastically about the potential of this new investment. It was an exciting day for agriculture and a tremendous recognition of our research and development efforts. This announcement is a wonderful reaffirmation by the NSW Government of the long-term importance of science and its role in the regeneration of agriculture and regional communities. (Australia is world-leading in ag research). The University of Sydney has made a 110 year contribution to agriculture in the state of NSW; and has already made a continuous 60-year research and development effort at Narrabri (in partnership with WRF), and this new building and investment heralds a strong and lasting future for transformational world-beating agricultural research and outreach in this pre-eminent agricultural region. A new building replete with cutting-edge scientific instrumentation, and enthusiastic researchers with the freshest ideas, located strategically at the vital centre of the agricultural heartland promises a white-hot future for agriculture and those engaged in it. It will bring new crops, new businesses, stimulating AgTech. It will help regenerate rural communities and landscapes and provide the consumer in Australia and overseas with safer and more nutritious food. The work in Narrabri will diversify and intensify, to exploit the opportunities brought about by this exciting new infrastructure coupled with the opportunities of digital and bio technologies, the inland rail, and the challenges of climate change and water security.



The Hon. John Barilaro MP, Alex McBratney and Guy Roth Official reveal of the new building plans

## Upcoming Events

### Wednesday 7 October: Research Showcase Webinar - Plant Health

The United Nations General Assembly declared 2020 as the [International Year of Plant Health](#) (IYPH). The year is a once in a lifetime opportunity to raise global awareness on how protecting plant health can help end hunger, reduce poverty, protect the environment, and boost economic development. Australia benefits strongly from an attentive research sector who manage plant health through directed breeding, basic research, applied intervention and community education. IYPH will set the benchmark for further study, investment and practical outcomes, which helps ensure greater Plant Health can be achieved to support food production and agricultural sustainability for the greater community.

The Sydney Institute of Agriculture welcomes your attendance to our annual Research Symposium series. This year we highlight the advances in Plant Health Research at the University of Sydney and across Australia. The symposium will include the following topic sessions, which stretch across the Plant Health and Plant Productivity spectrums so important to agricultural sustainability in Australia.

- \* National and Global Perspective on Plant Health
- \* Healthy Food Crops → Healthy Humans
- \* On-farm Plant Health Intervention
- \* Off-farm Plant and Environmental Health, Biodiversity and Resilience

In 2020, the symposium will be held via an online webinar to overcome the restrictions and ensure the safety of the attendees created by the Covid-19 pandemic.

**Sydney Institute of Agriculture Research Showcase - Plant Health**  
October 7th

The Sydney Institute of Agriculture brings together research expertise from across the University for the annual Showcase event.

**REGISTER**

### Thursday 5 November: SUNFix Symposium Webinar

The SUNFix Symposia promotes basic and applied research and the practical application of biological nitrogen fixation, an environmentally sustainable process depending on solar energy in ecosystems. The symposium supports mutual benefits through cooperative arrangements with researchers, students, inoculant manufacturers and farmers, fostering interaction between national and international institutions and agencies with industry.

SUNFix 2020 will represent a broad cross-sectional scope of research activity from Australia and New Zealand in this area of biological nitrogen fixation. Its objective is to ensure that consistent dialogue continues in the important research and agricultural activity, a case with increasing relevance as productivity and sustainability converge into common goals with level playing fields across cropping farmlands of Australia and elsewhere in the world. In light of the covid-19 pandemic, SUNFix 2020 will be delivered through an online webinar.

On behalf of the local program coordinators, the Sydney Institute of Agriculture, The Pulsford Lab and the ARC Industrial Transformation Research Hub - Legumes for Sustainable Agriculture, we invite you to register for this online webinar.

**SUNFix Symposium 20**  
November 5th

The SUNFix Symposia promotes basic and applied research and the practical application of biological nitrogen fixation.

**REGISTER**

## Theme Leader Updates

### Plant Breeding and Production

[Brent Kaiser](#)

### Carbon, Water and Soil

[Budiman Minasny](#)

### Quality Food

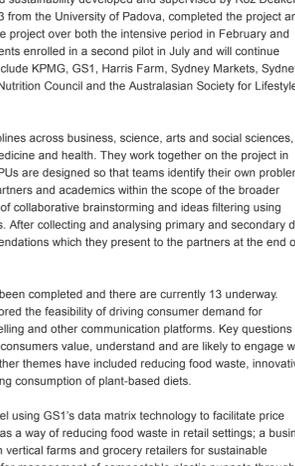
[Robyn McConchie](#)

### Animal Agriculture

[Sergio \(Yani\) Garcia](#)

### Development Agriculture

[David Guest](#)



## Plant Breeding and Production

### A Noble Reckoning Awaits Amongst the Midst of COVID Despair

The majority of crop plantings in NSW are in the ground and the plants appear to be growing rapidly. Data from the recent June ABARES report on the NSW 2020 season, looks promising with Autumn rainfalls at their highest since 2012, which would of ensured the majority of seeds were planted into good soil moisture reserves. Predictions for areas planned in NSW approach 6M Ha, a significant increase from the last 2-3 years and an increase of 11% over the last 10-year average for the state.

The predicted winter rainfalls across NSW growing regions are suggested to be average to above average. As I write, another significant low-pressure system is settling into coastal and in-land regions of NSW. I'm excited about the prospects that this extra moisture will have for NSW grain producers and the chance of a productive spring to top up a depleted soil network across the state. Winter crop forecasts for Wheat, Barley and Canola are encouraging with up to a ~300% production change from the 2019 season.

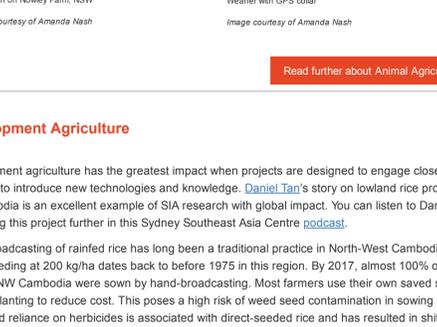
In light of the complications and intrusion of the current covid-19 pandemic on Australian life, well-being and safety, the present season for NSW holds much promise and opportunity. This is especially true for the farm sector who have stayed the brunt of successive droughts and poor returns in recent years. Let's hope for some stability in the weather to see out the rest of this season and for future seasons ambitions.

Winter crop forecasts, New South Wales, 2020-21

Crop	Area 000 ha	Yield t/ha	Production kt	Area change %	Prod. change %
Wheat	3700.0	2.2	8 288.0	94.7	296.6
Barley	900.0	2.3	2 034.0	55.2	192.2
Canola	550.0	1.5	803.0	120.0	256.9

Note: Yields are based on area planted. Area based on planted crop that is harvested, fed off or baled. Percent change is relative to last year. Percent change is relative to last year.  
Source: ABARES

### Winter crop production, Australia, 1989-90 to 2020-21

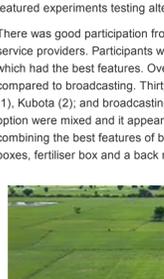


Note: Includes barley, canola, chickpeas, faba beans, field peas, lentils, lupins, oats, safflower, tribble and wheat. Sources: June 2020 ABARES, ABS

[Read further about Plant Breeding and Production](#)

## Carbon, Water and Soil

### Soil conditions after bushfires



Dry sclerophyll forest in east Gippsland after prescribed burning  
Image courtesy of Tina Bell

The [Australian Academy of Science](#) recently released a [brief](#) on the impact of bushfires on soil conditions. [Alex McBratney](#) and [Tina Bell](#) from SIA contributed to the brief.

"The bushfires severely damaged millions of hectares of land, not just above ground but the soil beneath us. This has clear implications for soil fertility, Australia's agricultural productivity and the recovery of native vegetation"; "As a nation we can do more to monitor our soils. Post-bushfires there are opportunities to improve and implement initiatives to better manage Australian soils as we develop a soils recovery plan," said Alex, who is also a fellow of the Academy.



A view down a furrow line of a failed checkerboard furrow scald reclamation trial from 1962

**Soil recovery from drought**  
Six months on from the end of an intense spring and summer dust storm in western NSW, the above-average rainfall across much of the state has nurtured lush pasture and crop growth and rendered the last months of the recent drought as a (somewhat) distant memory. But on a recent fieldtrip to Hay in the western Riverina for an Honours research project, the long-lasting effects of drought and wind erosion on the landscape were on full display; we examined a Soil Conservation Service demonstration site where a variety of scald (bare, eroded claypan area) reclamation treatments were trialed in the late 1950s and early 1960s, following the disastrous World War 2 drought of the 1940s. On some of the unsuccessful treatment sites, such as "checkerboard furrowing" areas, the soil surface between the furrow lines was as bare today as it was in the 1950s and the remnants of their entire soil is still visible on Google Earth. In this semi-arid climatic zone, "topsoil recovery" post-erosion is clearly a very slow process, with

aboriginal fire pits on some of these claypans a testament to the longevity of these erosional features.  
- [Stephen Cattle](#)

[Read further about Carbon, Water and Soil](#)

## Quality Food

### Food for thought:

[Rosalind Deaker](#) leads rethinking food systems for better health and sustainability with industry

This year, 116 students from across the campus have enrolled in Industry and Community and Project Units (ICPUs) on food, health and sustainability developed and supervised by Roz Deaker. In February 2020, 51 students, including 23 from the University of Padovena, completed the project and an additional four students completed the project over both the intensive period in February and semester 1. There are currently 61 students enrolled in a second pilot in July and will continue through semester 2. Industry partners include KPMG, GS1, Harris Farm, Sydney Markets, Sydney Fish Markets, the Grains and Legumes Nutrition Council and the Australasian Society for Lifestyle Medicine.

The students represent around 35 disciplines across business, science, arts and social sciences, engineering, architecture and design, medicine and health. They work together on the project in interdisciplinary teams of four or five. ICPUs are designed so that teams identify their own problem to explore, after being briefed by project partners and academics within the scope of the broader theme. They are led through a process of collaborative brainstorming and ideas filtering using design and systems thinking approaches. After collecting and analysing primary and secondary data, the teams propose solutions or recommendations which they present to the partners at the end of the project.

Since February, 12 group projects have been completed and there are currently 13 underway. Several of the student groups have explored the feasibility of driving consumer demand for sustainable food production through labelling and other communication platforms. Key questions have been around sustainability metrics consumers value, understand and are likely to engage with and how this varies with product type. Other themes have included reducing food waste, innovative or smart packaging options and increasing composition of plant-based diets.

Solutions include a dynamic pricing model using GS1's data matrix technology to facilitate price reductions as products approach expiry as a way of reducing food waste in retail settings; a business model proposing a joint venture between vertical farms and grocery retailers for sustainable production of niche products; a strategy for management of compostable plastic punnets through the supply chain including disposal; and a communication strategy to allow consumers to make informed decisions about the nutritional quality and sustainability of plant-based meat analogues which has recently been shortlisted for a student innovation prize. Examples of current projects include increasing access to healthy and nutritious food in remote indigenous communities; application of traceability systems to reduce food waste and limitations to roll out of technology; consumer acceptance of alternative proteins; and likelihood of personalised nutrition approaches to improve health outcomes.

[Read further about Quality Food](#)

## Animal Agriculture

SIA Animal Agriculture researchers and students are developing solutions to the big challenges of animal production through multidisciplinary research including beef and bushfire recovery.

The John and Betty Casey Research Trust Managing Pastures and Cattle for Maximum Productivity in NSW. The program is investigating energy efficiency of grazing legume cattle (mainly Angus) using advanced technologies. Weaners (mainly Angus), fitted with ear tags sensors and GPS tracking collars and weighed frequently will graze oats and pasture for ~6 months or until they reach their target weight of ~500kg. Individual animal's behaviour profiles will be matched with their average daily gain as a measure of performance.

[Luciano Gonzalez](#) has started a new project on feedlot cattle entitled Development of the Australian Optimal Carcass Endpoint and Sorting System. The project will use prediction models and data from advanced sensor technologies to determine the lime and carcass endpoint that maximise profits.

[Auriel Purdie](#) from Farm Animal & Veterinary Public Health, SIA School of Veterinary Science who, together with a multidisciplinary team including several Sydney soil and pasture researchers, has been granted over \$400,000 from [MIL](#) to investigate the impact of bushfires on soil pasture and the microbiome. The project seeks to enhance pasture recovery after bushfires in order to support animal wellbeing and to limit productivity losses on farm.

[Sonia Liu](#) secured a research grant from AgriFutures Australia Research to research the impact of climate on sorghum utilisation in poultry diet. Drought is a constant feature of the Australian environment, which makes Australian-based scientists well placed to lead the world in adapting to unavoidable changes that affect crop inclusion rates. In 2018, due to the shortage and price of wheat grains, sorghum was used in broiler diets with high inclusion rates. It was discovered that growth performance was depressed when drought-stressed sorghum was offered to broiler chickens. The project investigates anti-nutritive factors in drought-stressed sorghum. Sonia is leading this collaborative research with leading biochemists and crop scientists. It will deliver economic, environmental and social benefits.



Oppleweigh on Nowley Farm, NSW  
Image courtesy of Amanda Nash



Weanier with GPS collar  
Image courtesy of Amanda Nash

[Read further about Animal Agriculture](#)

## Development Agriculture

Development agriculture has the greatest impact when projects are designed to engage closely with partners to introduce new technologies and knowledge. [Daniel Tan](#)'s story on lowland rice production in Cambodia is an excellent example of SIA research with global impact. You can listen to Daniel explaining this project further in the [SIA Southeast Asia Centre podcast](#).

Hand broadcasting of rainfed rice has long been a traditional practice in North-West Cambodia and direct seeding at 200 kg/ha dates back to before 1975 in this region. By 2017, almost 100% of rice fields in NW Cambodia were sown by hand-broadcasting. Most farmers use their own saved seed of rice for planting to reduce cost. This poses a high risk of weed seed contamination in sowing seed. Increased reliance on herbicides is associated with direct-seeded rice and has resulted in shifts towards more difficult-to-control weeds and the potential for development of herbicide resistance. Planting with seed drills enables the seeding rate to be reduced to 80 kg/ha or less. This enables better quality seed to be used as well as less land preparation needed, drought tolerance, lower incidence of rice blast disease, easier weed control and reduced lodging.

A Field Day was held at Ou Ta Nhea village, Battambang province, Cambodia on Wednesday 12th August 2020. The Field Day was convened by the CamSID project 'Sustainable intensification and diversification in the lowland rice system in Northwest Cambodia', funded by the Australian Centre for International Agricultural Research (ACIAR) and implemented by the University of Sydney. Cambodian partners are the University of Battambang (UBB) and the Cambodian Agricultural Research and Development Institute (CARDI).

CamSID commenced on-farm research on machine planting of rice in 2016 and has now reached the scaling-out stage where there are currently 20 machine planting service providers in Battambang province. Scaling has been fast-tracked by the Australian Aid Cambodian Agricultural Value Chain Program (CAVAC) who have subsidised the purchase of 14 Kid planting machines in Battambang province. The Field Day was attended by about 80 people including farmers, agricultural cooperative leaders, machinery service providers, machinery distributors, researchers and representatives of Government agencies. The Field Day featured adjacent rice fields planted with two machine planting options (Kid and Kubota) which allow reduced seeding rates and the option to use weed-free rice seed for sowing. Weed problems are worsening in dry direct seeded rice and the Field Day also featured experiments testing alternative pre- and post-emergence herbicides.

There was good participation from the public sector and good interaction with the private sector service providers. Participants were very interested in the planting machines and were divided on which had the best features. Overall, they saw machine planting as being cheaper and safer compared to broadcasting. Thirty-four participants completed a survey and ratings out of 5 were: Kid (1), Kubota (2), and broadcast (4). The assessments of advantages and disadvantages of each option were mixed and it appears that farmers and contractors are looking for a hybrid planter combining the best features of both. The ideal machine would seem to have independent seed boxes, fertiliser box and a back roller.



Aerial view of the Kid planters field



Audience at the Planting Machine and Weed Management Field Day

[Read further about Development Agriculture](#)

## People



The significant contribution of the University of Sydney to world wheat through alumni/alumna working at CIMMYT continues, with [Alison Bentley](#) appointed as incoming Director Global Wheat Program. Alison completed her Bachelor of Science (Agriculture) and PhD here, with Lester Burgess as supervisor. She then joined the National Institute of Agricultural Botany (NIAB), where she progressed from Senior Research Scientist (2007) to Program Leader for Trait Genetics (2013), and Director of Genetics and Breeding (since 2016). Alison has worked on wheat - wheat genetics, wheat genetic resources and wheat pre-breeding - her entire career. She is the UK's representative on the International Wheat Initiative Scientific Committee, and is a committee member for the Genetics Society, UK Plant Sciences Federation, Society of Experimental Botany, and the Editorial Board of Hereditas.

Congratulations to former Dean of Agriculture and current Cotton RDC director [Emeritus Professor Les Copeland AM](#), who was honoured at the 70th Annual [Australasian Grain Science Conference](#), held online on 26 August 2020, with the award of the F B Guthrie Grain Science Medal. The award recognises outstanding scientific achievement and contribution to knowledge in the field of grain science. The Guthrie medal is the Australasian Grain Science Association's highest award honouring the contribution of pioneer cereal chemist F B Guthrie to grain science research in Australia. Guthrie worked closely with the famed agronomist and plant breeder William Farrer, whose wheat varieties made possible the great expansion of the Australian wheat industry.



[Read further about People](#)