

# QAAFI

ANNUAL REPORT 2015



# Vice-Chancellor's message

The Queensland Alliance for Agriculture and Food Innovation (QAAFI) is dedicated to improving the competitiveness and sustainability of Queensland's tropical and subtropical agriculture and food sectors through high-impact science.



Conceived as a strategic joint-initiative, QAAFI benefits from the collective strengths of the Queensland Government and The University of Queensland (UQ), forging direct links to the agriculture industry that the university could not achieve on its own.

QAAFI has grown rapidly over the past five years, and now contributes more than seven per cent of the University's research income and supervises 2.4 per cent of UQ's Research Higher Degree students.

QAAFI makes a significant contribution to UQ's consistent placement well inside the top 100 in research-focussed global university rankings, and in the top 50 in several of these. Agriculture-related research at UQ is consistently ranked among the best in the world: QS World Universities Ranking by Subject (15); Academic Ranking of World Universities (35); National Taiwan University Performance Ranking of Scientific Papers (7).

The 2015 Excellence in Research for Australia (ERA) evaluation conducted by the Australian Research Council (ARC) confirmed UQ's outstanding breadth and depth in agricultural science fields. UQ was the only university in Australia to be rated at, or above, world standard in six of the eight fields of research that combine to make up the agricultural science discipline.

QAAFI's drive for scientific excellence is connected to a strong focus on what I call 'Excellence-Plus' – the translation of great research into impact. QAAFI embeds senior agricultural scientists in the regions across Queensland, where they are well-placed to understand industry needs and develop the best scientific solutions. While they target local problems, they have a wider global reach, as many of the climate and geography challenges found in Queensland are mirrored globally.

Examples of impact in 2015 from QAAFI's collaboration with the Queensland Government include:

- › Licensing of sweet corn that contains ten-times the amount of zeaxanthin than occurs naturally. High zeaxanthin protects against age-related macular degeneration;
- › QAAFI researchers have worked seamlessly with Biosecurity Queensland to diagnose and help manage the Panama Race-4 outbreak that has threatened the \$584 million Queensland banana industry;
- › QAAFI leads the breeding program for the \$432 million Queensland sorghum industry and now contributes germplasm to 100 per cent of commercial hybrid seeds planted each year in Australia. The industry has achieved a four per cent improvement yield/Ha per annum since 1990; and
- › QAAFI has completed the largest Australian bovine respiratory epidemiological study, which has informed industry risk-management plans to minimise losses in the \$2.7 billion feedlot sector.

It's an exciting time for tropical agriculture and food science as we strive to address some of the biggest challenges of our lifetime, such as feeding a growing population in an increasingly variable climate. QAAFI has helped to establish UQ as global leader in agriculture and food science and we are well placed to create positive change.

I congratulate Professor Robert Henry and his team for their many successes in 2015, in delivering high-impact science for collaborators and industry. I also thank our colleagues in the Queensland Government and our industry and private collaborators for their ongoing support of the QAAFI initiative.

Professor Peter Høj  
**Vice-Chancellor and President**

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QAAFI

### **Cover image**

*A digitised macadamia tree coloured by branching order from the DAF-UQ Small Trees High Productivity Initiative. Image credit: QAAFI Adjunct Professor Neil White and Associate Professor Jim Hanan. Digitising the tree allows researchers to model production characteristics such as the canopy's light environment, flowering and fruit set under different conditions.*



# Smaller, highly productive tropical fruit trees

A quantum leap in production of tropical fruit crops is the goal of the long-term multi-disciplinary Small Tree High Productivity Initiative, led by the Queensland Government, which aims to achieve similar yield gains made with “high density” apple crops in temperate climates for relatively new tropical crops such as mangoes, avocados and macadamias.

Over a 50 year period, apple growers in temperate climates have achieved yield increases from 25 to over 100 tonnes per hectare, and Queensland researchers are on track to achieve similar productivity gains for tropical crops over a matter of years, rather than decades.

The Small Trees High Productivity Initiative project leader Dr John Wilkie, from the Department of Agriculture and Fisheries (DAF), said that the program has field work based at DAF field stations in Bundaberg and the Atherton Tableland.

It is anticipated that the project will result in incremental productivity gains over a program timeframe of up to 20 years. The project has the support of the Queensland and NSW State Governments, QAAFI, UQ and Horticulture Innovation Australia.

Small trees are easier to manage, making much more intensive use of finite land resources. They also put a greater proportion of their productive effort into fruit, rather than stems and branches.

The wide-ranging Small Trees High Productivity Initiative project covers many aspects of crop growth and fruit production. It addresses tree architecture, root development, crop vigour, optimises canopy light distribution and improves crop load.

The project is still in its early development stages with the first experimental crops of mangoes planted in 2013 and macadamias and avocados planted in 2014.

With the long term nature of these tree crop cycles, a major plank in the research relies on the development of sophisticated modelling by a team of specialists at QAAFI's Centre for Plant Science led by Associate Professor Jim Hanan.

While simulations are being developed to look at specific tree crops and their obvious physical differences, Associate Professor Hanan said the work would also pinpoint underlying similarities between species.

“Modelling will also let us integrate different parts of the overall productivity equation such as the interaction between canopy light environment, flowering and fruit set.”

Laboratory simulations would help in the design and targeting of field experiments to optimise research outcomes.

“This approach will help shorten the time to achieve really meaningful results by many years,” Associate Professor Hanan said.

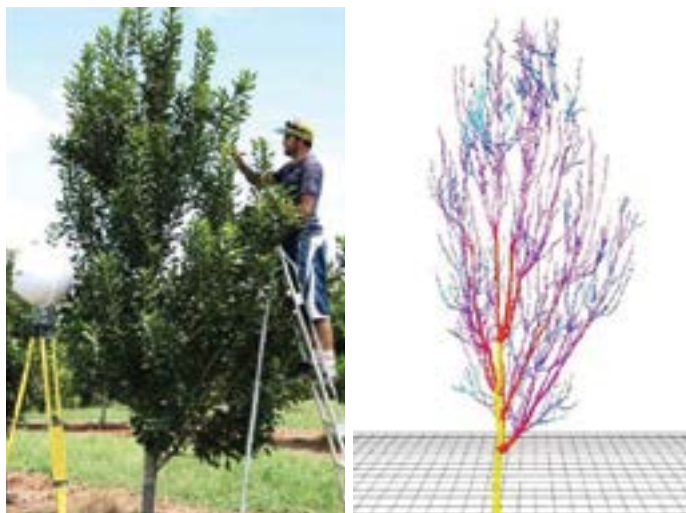
QAAFI is also playing a collaborative role in genetic research with scientists from the University of Queensland's School of Biological Sciences.

It is expected that a new understanding of genetic switches and crop physiology could result in productivity gains in the years ahead.

The UQ team led by Professor Christine Beveridge also studies the role of plant hormones in crop development.

They recently discovered a novel plant hormone, strigolactone, which is important for nutrient uptake and has a role in shoot architecture and root development.

This project is led by the Queensland Government and jointly supported by the Department of Agriculture and Fisheries, the University of Queensland and Horticulture Innovation Australia.



*Digitising a macadamia tree using a Polhemus Fasttrack with Long Range transmitter and Foradig software*

# Innovation to support Queensland's agriculture and food industries



*The Honourable Leanne Donaldson MP*

Queensland's agricultural Research and Development capability ranks among the best in the world, with The University of Queensland (UQ) a leader in agricultural research in Australia and globally.

The Queensland Alliance for Agriculture and Food Innovation (QAAFI), a research collaboration between UQ and the Queensland Government, brings together world-class expertise and research equipment from UQ to work with Department of Agriculture and Fisheries agricultural science teams on key industry challenges.

QAAFI represents one of our largest and most important university partnerships, with over 80 agricultural and food innovation projects focussed on delivering industry impact. An example of this innovation is the Queensland Government's Small Tree High Productivity Initiative, where the Department of Agriculture and Fisheries and QAAFI researchers are working together to change the way fruit and nuts are grown with higher yielding, smaller trees which are ultimately more profitable for growers.

This research is currently focused in tropical fruit trees like mango, avocado and macadamia and the project aims to generate similar gains to that achieved with "high-density" apples, where yields have increased from 25 to over 100 tonnes per hectare over a 50 year period. Our researchers are on track to achieve similar productivity gains in these relatively new tropical crops in a matter of years, rather than decades.

The Small Tree High Productivity Initiative is led by the Queensland Government with QAAFI contributing expertise in molecular physiology, genomics and modelling of tree architecture to help create the step change required for these industries.

It is these types of projects that continue to strengthen and drive innovation within the sector by underpinning ongoing productivity and profitability. Future innovation opportunities for the Department of Agriculture and Fisheries and QAAFI to further boost agricultural and food productivity include technologies such as remote sensing, robotics, unmanned aerial vehicles and industrial biotechnology.

Recently my Department renewed its research contract with UQ, to enable QAAFI to continue its valuable work in supporting agricultural and food innovation throughout Queensland.

Congratulations to Professor Robert Henry and the team at QAAFI.

**The Honourable Leanne Donaldson MP**  
**Queensland Minister for Agriculture and Fisheries**

# Director's Message

QAAFI attracts significant industry income. QAAFI reached \$100 million in external funding during our fourth year of operation, and is on track to reach \$200 million of external funding in our sixth year of operation, during 2016. The fact that QAAFI continues to achieve sustained industry funding for our research is an indicator that industry recognises and values the quality and impact of QAAFI research for tropical agricultural and food industries.

The Queensland Government, through the Department of Agriculture and Fisheries, provided funding for QAAFI through an initial extendable five-year fixed term contract and in 2015, QAAFI entered into a new contract with the Queensland Government to enable the organisation to continue to provide research for Queensland on an ongoing long term basis.

QAAFI also continues to achieve success in international funding with significant support from the Bill & Melinda Gates Foundation funding during 2015.

With the support of UQ Science and many others, QAAFI hosted in Brisbane the first of a new global tropical agriculture and food conference, TropAg, which attracted nearly 500 delegates from around the world – well over the projected target of 300 delegates. Over 300 papers were presented at the 2015 conference covering the latest advances in science impacting tropical agriculture and food production.

Another highlight for QAAFI, which has been in planning during 2015 and will take place in the first quarter of 2016, is a move into a new purpose built headquarters within the Queensland Bioscience Precinct building on the St Lucia campus.

QAAFI's research in the tropical agriculture and food industries is among the best in the world, and this is reflected in the high international ranking of UQ in the field of agriculture, as detailed in the Vice Chancellor's message and elsewhere in this report.

Many QAAFI staff, new to UQ, were successful in being promoted within the UQ system in 2015. Postgraduate students have become an important part of the research of QAAFI. Following our first enrolments in 2014, QAAFI now has over 200 students. This represents a significant body of research and research training on topics of relevance to agriculture and food industries.

I would like to thank the Vice-Chancellor, Queensland Government, our industry and commercial collaborators, and our dedicated researchers, students and staff at QAAFI for their outstanding contributions during 2015, and over the life of the institute.



## **QAAFI's Director, Professor Robert Henry**

is an expert in the study of DNA-based methods for identification of plants and their pathogens, and the development of molecular markers for plant breeding and the genetic transformation of plants. A common focus of much of this work has been using molecular techniques to capture novel diversity for crop improvement. His laboratory made significant progress contributing to global food security in 2015 by developing technologies for the world's two major crops, wheat and rice, greatly expanding the gene pool for rice through discovery of wild ancestral relatives in northern Australia; and discovering in wheat key genes that control performance and quality that will facilitate increased wheat production globally. Locally this should translate into higher yielding premium wheat varieties for the north and rice varieties with resistance to endemic diseases for the emerging northern Australian rice industry.





# DISCOVERY

QAAFI's high impact science

## Research at QAAFI

- › Our mission is to significantly improve the competitiveness and sustainability of tropical, sub-tropical agriculture and food sectors through high-impact science.
- › Our vision is sustainable agriculture and food achieved through science and innovation.
- › We aim to be a world leading research institute in plant science, animal science, and nutrition and food sciences, delivering outcomes in discovery, learning, and engagement.

# Research overview

QAAFI is a unique Australian research institute, and among only a handful of similar scientific organisations anywhere in the world. Formed from the combined scientific expertise of researchers from The University of Queensland and the Queensland Government, QAAFI is comprised of three inter-related research centres with a focus on the challenges facing tropical and sub-tropical food and agribusiness sectors in the tropical and subtropical systems.

To date QAAFI has contracted nearly \$200 million dollars of research and in 2015 had more than 90 active research projects.

## Some key achievements during 2015 included:

Of particular note, QAAFI's flagship cereal breeding programs continue to deliver new advanced germplasm to benefit the Queensland grains industry. The sorghum crop has shown productivity gains in the order of 3-4 percent per year over the last 20 years.

QAAFI's winter cereal breeding programs are also identifying new root traits for better drought adaptation and analysing the genetic drivers for rust resistance in barley. The modelling research programs continue to deliver crop forecasts for cereals including complex risk maps for Late Maturity Alpha-amylase (LMA), a grain quality defect in wheat.

Complementing the cereal breeding program, QAAFI continues to provide tactical agronomic management solutions for cereals and legumes across Queensland in the 19 large farming systems research projects covering soils, weeds, agronomy and farming decision making. One core feature to this area of research is the Agricultural Production Systems sIMulator (APSIM) initiative that continues to grow in its capacity to impact farming decision-making, regional forecasting and plant breeding decisions.

In horticulture of particular note, QAAFI continues to contribute cutting edge science to the Small Tree High Productivity Initiative to deliver more efficient tree systems for macadamia, mangoes and avocados. QAAFI manages the macadamia breeding program, which remains on track to release the first commercial varieties in 2017, with an expected 30 percent improvement in productivity, and QAAFI projects are delivering new genetic solutions to improve disease management and productivity of avocado. QAAFI has eleven ongoing programs delivering new solutions to the banana, citrus, macadamia, vegetables and avocado industries for the major diseases affecting those crops.

In the Centre for Animal Science, QAAFI continues to focus on the animal health diseases that are most important to the industries of Queensland. Cattle ticks are identified as having the biggest economic impact on the health of the northern beef herd and QAAFI has important projects ongoing in this area.

New vaccines are being developed for bovine respiratory disease complex as well as management strategies for feedlots. Feedlots will also benefit from novel fly control biopesticides that have been developed.

The pork industry in Queensland will benefit in the future from new diagnostics and management systems to improve porcine respiratory disease and the sheep industry will benefit from lice control programs. Six projects continue to advance the knowledge of fertility and calf loss in the northern herds with both genetic/genomic and management solutions for the future.

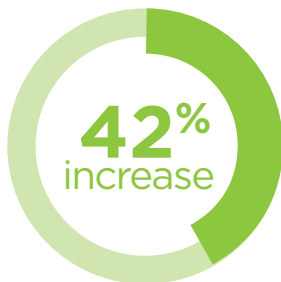
The Centre for Nutrition and Food Science (CNAFS) continues to deliver new ways to identify and analyse quality traits in barley, sorghum, coffee, strawberries and rice. New products are being conceptualised for the native food industry to provide extracts for various purposes such as preservation, tenderisation and flavour enhancement.

The "Super Gold" high zeaxanthin corn program is currently being commercialised and new breeding programs are being initiated to develop a purple corn line and high-lycopene tomato variety as part of CNAFS goal to provide higher value nutritionally advanced horticulture products.

# 2015 HIGHLIGHTS

## Research Block Grants

**2015** \$4,821,676  
**2014** \$3,390,695



## Tuition Fees

**2015** \$925,359  
**2014** \$726,760



## Research Income

**2015** \$27,072,044  
**2014** \$22,631,342



## QAAFI AT A GLANCE



**#1**

agricultural research  
institution in Australia – UQ  
*(NTU rankings 2015)*



**#7**

global agricultural  
research institution – UQ  
*(NTU rankings 2015)*



**#1**

agriculture patents  
lodged in Australia – UQ  
*(2015 Thomson Reuters)*



**450**  
people



**200+**  
RHD students  
advised to date



**\$180+ M**  
external research  
funding

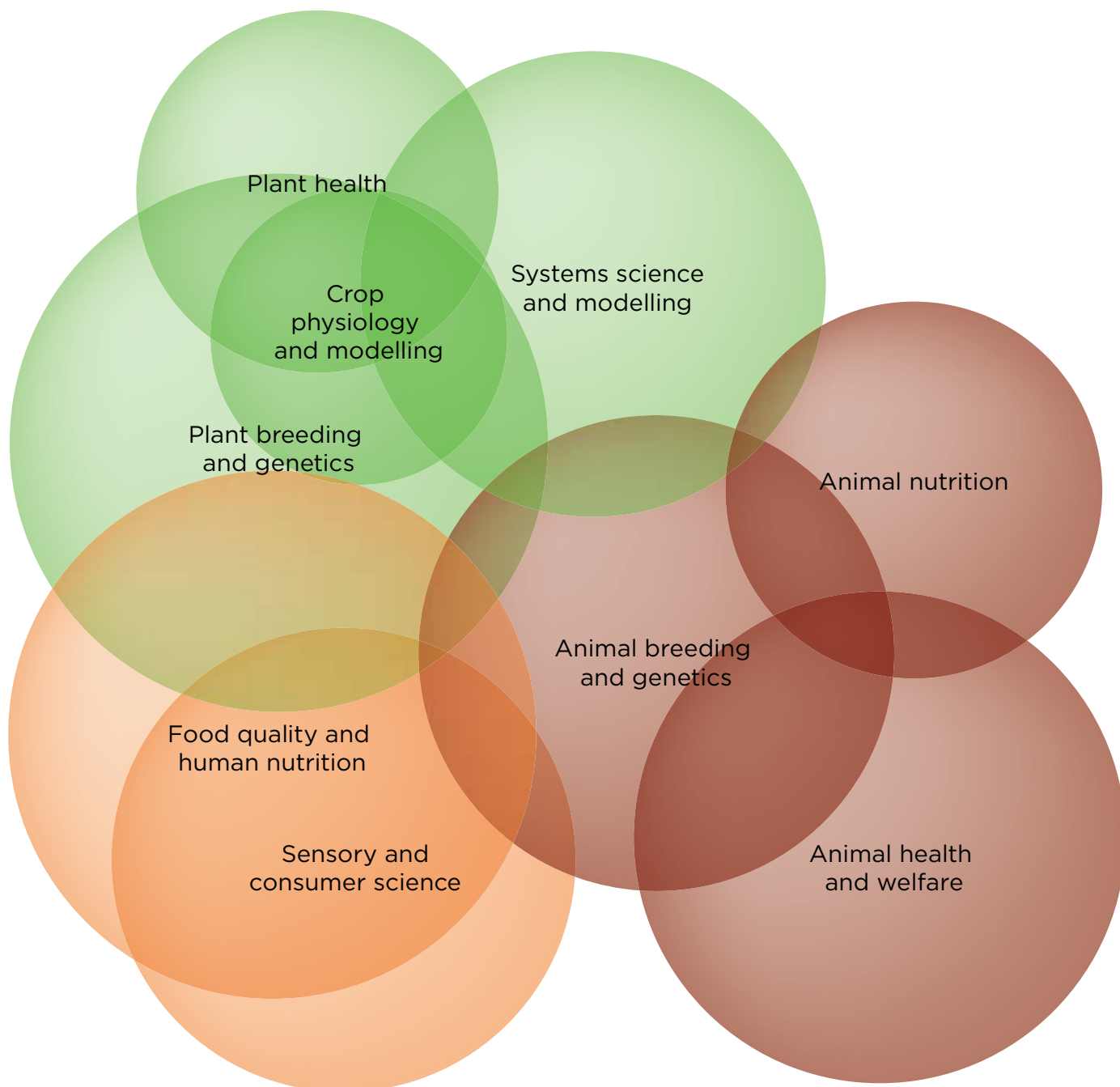


**90+**  
active research  
contracts



**30+**  
countries  
collaborating  
in research

# QAAFI's Research Expertise



- Centre for Plant Science
- Centre for Animal Science
- Centre for Nutrition and Food Sciences



### QAAFI's Centre for Plant Science

CPS integrates strong disciplinary capabilities to target improved crops, crop protection systems, and sustainable production systems. Our expertise includes:

- › Plant breeding and genetics
- › Plant health
- › Crop physiology and modelling
- › Farming systems science



### QAAFI's Centre for Nutrition and Food Sciences

CNAFS delivers enhanced health outcomes and economic benefits by undertaking fundamental and applied research, drawing upon the physical, chemical and biological disciplines. Our expertise includes:

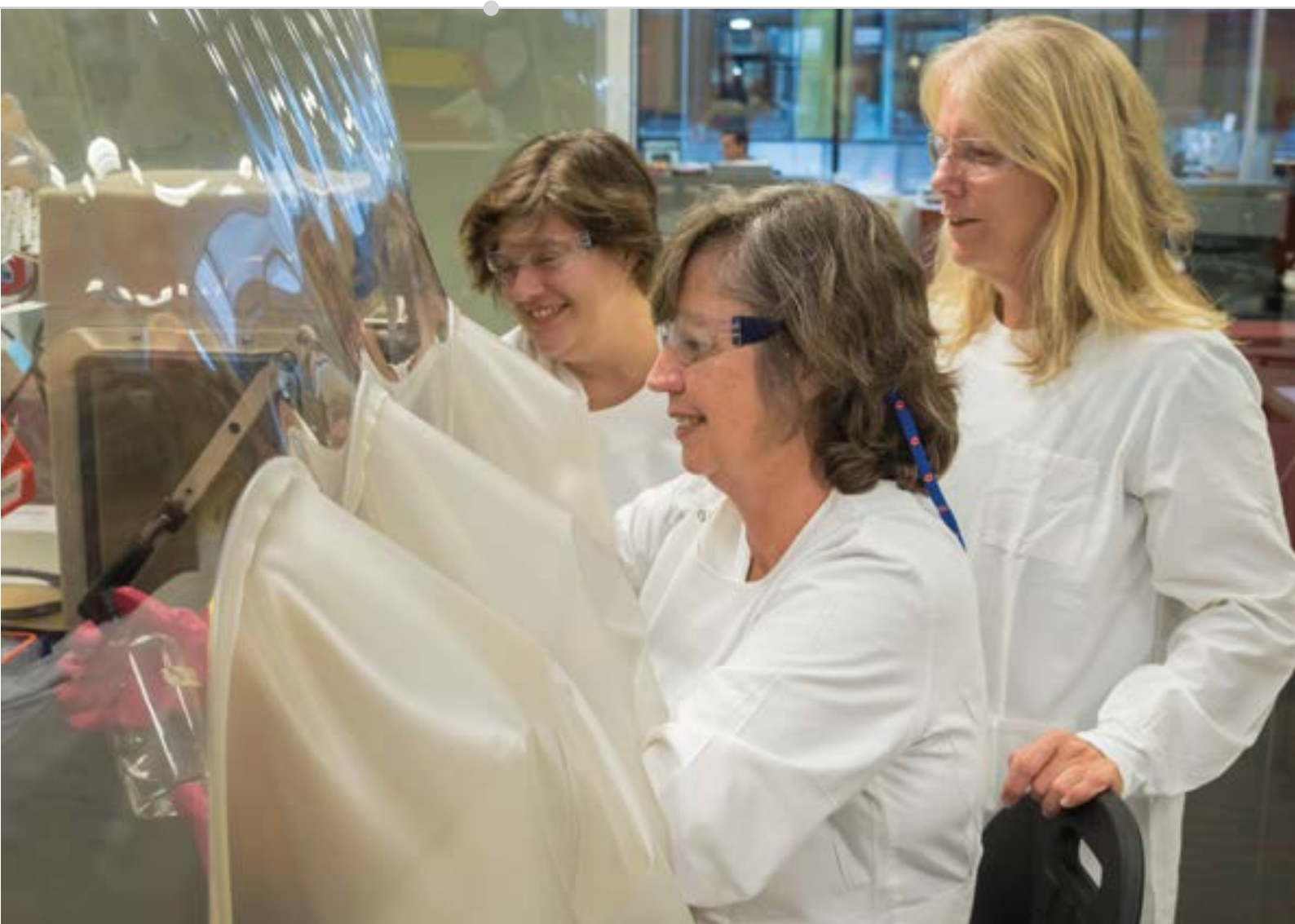
- › Food quality and human nutrition
- › Sensory and consumer science



### QAAFI's Centre for Animal Science

CAS works to improve animal health, welfare and productivity outcomes in the animal industries, and lead tropical livestock research and development in Australia. Our expertise includes:

- › Animal breeding and genetics
- › Animal health
- › Animal nutrition
- › Animal welfare

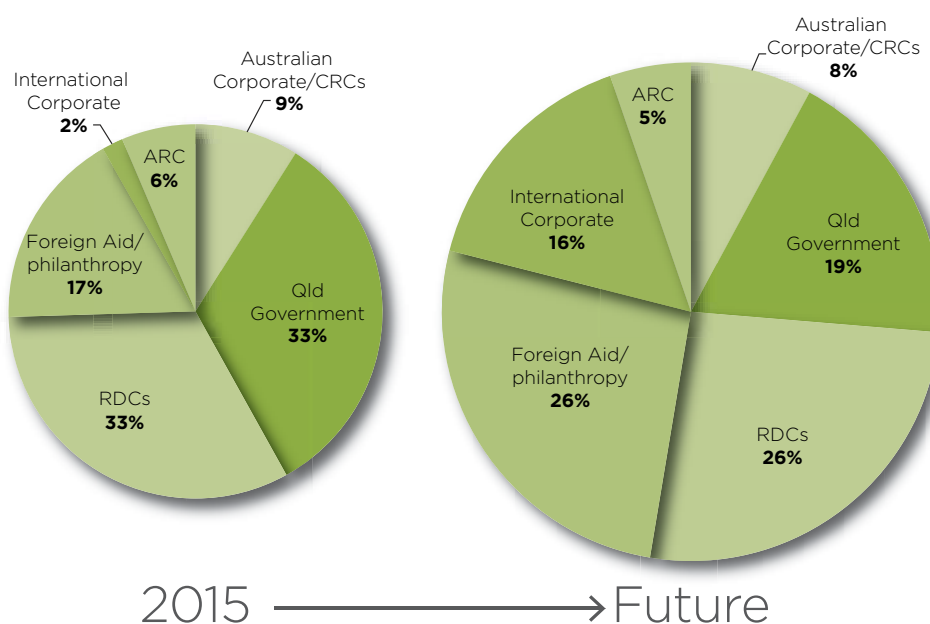


# UQ – A WORLD CLASS INSTITUTION

## Taiwan University Ranking – Field of Agriculture

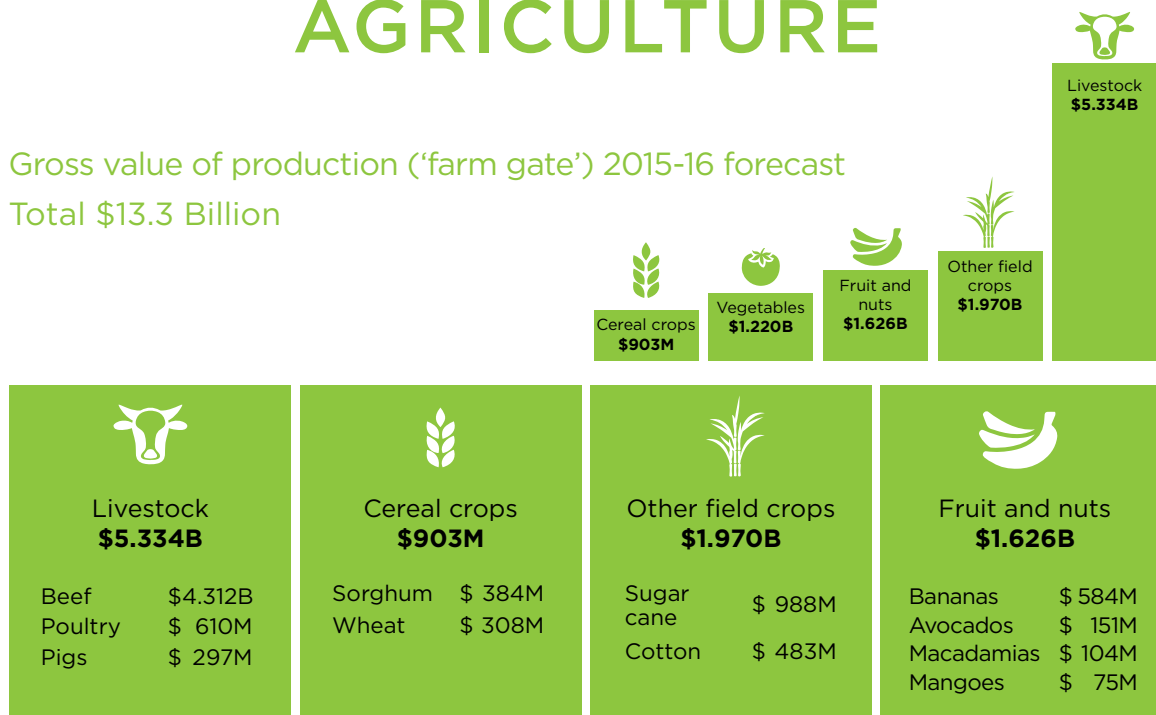
World	Australia	University
1		Wageningen University
2		University of California-Davis
3		Cornell University
4		University of California-Berkeley
5		Ghent University
6		University of Florida
7	1	University of Queensland
30	2	University of WA
38	3	University of Melbourne
44	4	ANU
45	5	JCU
49	6	University of Sydney
206	12	Griffith University
242	13	UNE

QAAFI generates seven percent of UQ's income  
– and the figure is growing

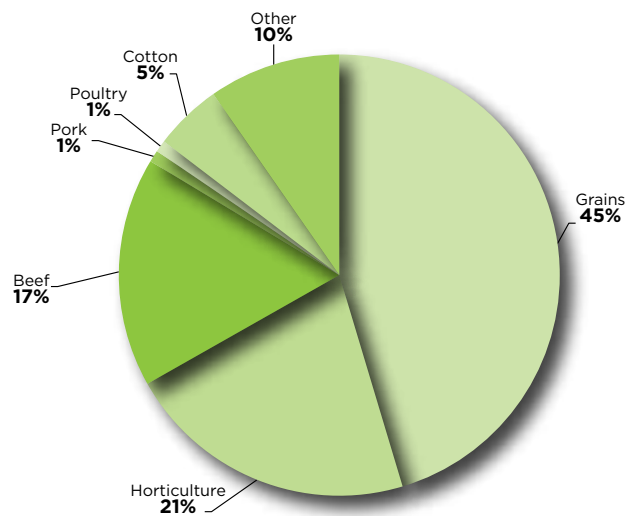


# QUEENSLAND AGRICULTURE

Gross value of production ('farm gate') 2015-16 forecast  
Total \$13.3 Billion



## QAAFI Research Income by Commodity



# QAAFI researcher is honoured

2015 proved a successful year for QAAFI's Dr Alice Hayward.

She won the 2015 Minister's Award at the Science and Innovation Awards for Young People in Agriculture, Fisheries and Forestry and received a Science and Innovation Award from Horticulture Innovation Australia Limited. Deputy Prime Minister and Federal Agriculture Minister Barnaby Joyce presented Alice with award at the Science and Innovation Awards for Young People in Agriculture, Fisheries and Forestry in Canberra.

Dr Hayward was also the recipient of a UQ Foundation Research Excellence Award in 2015 worth \$95,733. for her project,

*MICROpropagator - a small RNA application for plant propagation.*

The prestigious award aims to provide funds to advance and facilitate the research agenda of excellent, individual early career researchers, particularly where there is evidence of the strategic importance and significance of their research.

Dr Hayward has been recognised for her use of next-generation sequencing technologies to map the avocado genome and target a root-rot fungus that costs the industry more than \$10 million a year.





# Queensland scientists tackle global banana disease threat

Queensland scientists are tackling one of the world's worst threats to banana crops — “bunchy top disease” — with help from the Bill & Melinda Gates Foundation.

Agriculture Minister Leanne Donaldson said Queensland research could help the rest of the world, aided by a \$US5.7 million donation from the philanthropists.

“This new project will strengthen our ability to control and eradicate the disease in Australia and globally and I would like to thank the Bill and Melinda Gates Foundation for helping us with that goal,” the Minister said.

“Research into the bunchy top virus is another way the Palaszczuk Government is continuing to advance Queensland by supporting our world-class researchers.”

Aphids spread the bunchy top virus, causing stunted plants with ‘bunchy’ leaves at the top and deformed fruit.

It was first identified in Fiji in 1889 and has spread around the world in infected plant material.

“Bunchy top almost wiped out Queensland’s banana industry more than 100 years ago,” the Minister said.

“A world-leading containment strategy saved our national banana industry and confined the disease to a small area in southern Queensland and northern NSW.”

QAAFI’s Associate Professor John Thomas will lead the program.

“The project will look to south-east Asia, where many bananas and their diseases originate, to identify wild species of seeded bananas which may have natural resistance to bunchy top,” he said.

“Such resistance will help to limit any future outbreaks, safeguarding banana production in Queensland and overseas.”

Dr Thomas said the project would also pilot eradication strategies at the village level to limit the effect and spread of bunchy top in Africa.

“That is where bananas are an important food source for more than 100 million people and a source of income for more than 50 million small holder farmers,” he said.

“The virus is controllable and with considerable effort you can get rid of it in a defined area, but history shows us that once the disease is established in one place it usually stays there, so this work may provide the breakthrough we need to get on top of this disease once and for all.”

# ARC Centres of Excellence

ARC Centres of Excellence involve significant collaboration which allows the complementary research resources of universities, publicly funded research organisations, other research bodies, governments and businesses to be concentrated to support outstanding research.

The ARC Centre of Excellence in Plant Cell Walls (2011-2017) is a \$32 million collaboration between the Universities of Adelaide, Melbourne and Queensland in partnership with South Australian State Government and seven international institutions.

Professor Mike Gidley, Director for QAAFI's Centre for Nutrition and Food Sciences is a Chief Investigator in the ARC Centre of Excellence in Plant Cell Walls and heads up the UQ node.

The ARC Centre of Excellence in Plant Cell Walls aims to advance fundamental scientific understanding of plant cell wall biology to enable sustainable biomass production for:

- › Food security
- › Human health
- › Energy biomass conversion.

QAAFI is a core partner in the ARC Centre of Excellence for Translational Photosynthesis, which is building future markets for Queensland's agricultural industries through transformational science.

Professor Graeme Hammer is node leader and a co-leader of the CoE's research in Program 4 which focuses on linking leaf function and field performance of crops. Professor David Jordan is a co-leader of program 3, which focuses on exploiting photosynthetic variation in C3 and C4 plants.

"If we get it right, crops might grow more quickly, use less water, and be 25 percent bigger and higher yielding which is a probably a conservative estimate."

*Professor Graeme Hammer, Director of the Centre for Plant Science, QAAFI*

## All eyes are on UQ sweet corn innovation winner

A nutritionally-enhanced sweet corn developed by DAF and UQ to help prevent blindness in the elderly has won a national innovation award.



*Dr Tim O'Hare (centre), with team members Kent Fanning (left) and Philippa Tyler (right) - both from DAF.*

QAAFI senior researcher Dr Tim O'Hare and his team have developed sweet corn varieties that contain 10 times the amount of the antioxidant zeaxanthin than occurs naturally in sweet corn.

Dr O'Hare won the *The Australian* and *Shell Innovation Challenge* Environment, Agriculture and Food category.

He said the Super Gold sweet corn varieties slowed the onset of advanced macular degeneration and should be available in supermarkets in the next few years.

"Zeaxanthin, which is one of the yellow pigments in corn, is also a macular pigment contained in the eye and is believed to reduce the risk of light-induced damage that could lead to macular degeneration," he said.

"When we first started we had no idea how the corn would change by increasing the levels of zeaxanthin. "We ended up increasing it by 10 times - or 1000 per cent, which no-one had ever tried before."

The SuperGold sweet corn varieties were developed through a collaborative breeding program between DAF and QAAFI.

# QAAFI researcher amongst the nation's best

Professor Christine Beveridge (School of Biological Sciences and QAAFI) was honoured as one of five UQ scientists named as Australian Academy of Science Fellows in 2015.

The prestigious fellowships are given to a select group of scientists each year, recognising leading and innovative research.

UQ Vice-Chancellor and President Professor Peter Høj said UQ had more 2015 Fellows than any other institution.

"Our new Fellows are thought leaders in the scientific community and their work delivers results that benefit society."

The Australian Academy of Science comprises Australia's leading research scientists including several Nobel Prize winners. Fellows are elected by academy members.

Professor Beveridge is a world leader on the hormonal control of plant development and shoot architecture which underpins the yield, productivity or ornamental value of crops, trees and shrubs. Her discovery of strigolactone as a novel plant hormone involved in shoot branching could assist in crop production and the propagation of endangered plant species.



Professor Christine Beveridge, pictured with her Small Trees High Productivity Initiative, Associate Professor Jim Hanan.

## Poultry researcher honoured



At the 26th Annual Australian Poultry Science Symposium in Sydney, on 9-11 February 2015, noted QAAFI researcher, Dr Pat Blackall, was awarded the Australian Poultry Award from the World's Poultry Science Association.

## Outstanding young scientist award



QAAFI's Dr Bhagirath Chauhan was awarded the Asia Pacific Weed Science Society Young Scientist Award-2015 by the Asia Pacific Weed Science Society for his outstanding contributions in the field of weed science at 25th APWSS Conference held at Hyderabad, India during 13-16 October, 2015.

# All-seeing ‘tractor’ takes crop science to the future

There is not much left to be known about a new sorghum plant ‘on trial’ after being straddled by the Gekko phenotyping tractor – an all-seeing mobile platform bristling with lenses and sensors probing for the visible and the invisible secrets of crop performance.

The tractor, which was developed by QAAFI, is a remote-sensing vehicle that can drive over trial plots during different growth stages and compile a composite ‘picture’ from the visible to the infrared light spectrums, from thermal and chemical imaging, and laser reflectance (or Lidar as it is known) for high-definition 3D profiles of the plant canopy.

This data can then be correlated with a crop’s production performance (for example, grain yield) by identifying links with these measured properties – such as plant structure, biochemical and physiological characteristics, photosynthesis efficiency – and the response overall to environmental conditions such as limited water or high temperatures.

The objective is to better understand why a particular variety (genotype) performs a certain way, then address identifiable causes for underperformance that can be rectified or isolated from other data so a genotype that might otherwise have potential is not simply discarded on the rudimentary evidence of grain yield alone.

For example, explains QAAFI’s Director for the Centre of Plant Science Professor Graeme Hammer, for a genotype that yields less than others would under the usual selection process be thrown out.

“But the data collected by the phenotyping tractor may tell us this particular genotype is growing more leaf area, so it runs out of water faster, gets hotter quicker, and that’s why it yields less.”

“So what if we take that leaf area influence away from the results? We might find we have a genotype of significant potential in other trait areas: possessing genetic potential that under current screening practises could be lost.”

Professor Hammer is a node leader with the Australian Research Council (ARC) Centre of Excellence for Translational Photosynthesis, and a specialist in crop modelling. He co-leads the phenotyping tractor project with the head of QAAFI’s sorghum breeding program and co-program leader in the ARC Centre of Excellence for Translational Photosynthesis, geneticist Professor David Jordan. QAAFI’s sorghum breeding program is a collaborative program with the Queensland Department of Agriculture and Fisheries and is supported by the Grains Research Development Corporation (GRDC).

Professor Hammer’s job is to run the data collected by the phenotyping tractor through analytical models to identify ‘confounding’ factors and stop them from obscuring the identification and potential use of other genetic gains that are bound to exist in the tens of thousands of genotypes that are screened.

Professor Jordan’s work is to try to find the genetic regions controlling variation in traits measured by the tractor. “What is exciting is that this equipment allows us to see how the crop develops over time because the tractor’s sensors allow us to measure non-destructively and regularly so we can see not just the end point, such as leaf area at maturity, but also how a plant gets to a certain end point. For this research we can progressively log the interactions that are determining, for example, a leaf’s final dimensions. It is important to know if leaf area, or shape, is affecting photosynthesis, which is a key determinant of yield.

“In effect we are now able to deconstruct a phenotype into its parts and from this learn how, through breeding or management, we can change the way a plant develops to optimise its use of land, light, water and nutrients.”

However, before then Professor Jordan says the challenge is to make sense of the vast amount of data coming in, which is why it needs to be a multidisciplinary effort: “My team is on the genetics, Graeme’s team is on the crop physiology and modelling, and we’re also working with the photosynthesis group at the Australian National University in Canberra.





“An example of how the physiological data collected by the phenotyping tractor and genetics research will come together could be, say, measuring leaf temperature at a particular crop growth stage. If we can find the gene associations with that growth stage we can delve into the species natural gene diversity to find even ‘better’ performing versions of those genes. In this way we can incrementally improve or optimise the different plant processes that contribute to a particular goal such as higher yield,” Professor Jordan explains.

“We are looking for the genetic changes we can make to improve photosynthesis, which drives productivity.”

Professor Hammer says the tractor can cover thousands of plots relatively quickly and take genotype selection to a whole new level of efficiency: “My team’s job is to use our crop-modelling expertise to make this massive amount of data useful for David’s team,” he says.

“The data has to be able to connect to selection strategies in the breeding program, from which David will package superior germplasm for use by commercial breeders.”

Sorghum is Queensland’s most valuable cereal crop, worth an estimated \$432 per year. The phenotyping tractor, built onto the frame of a modified self-propelled sprayer, represents a \$500,000 investment by UQ. Professor Jordan says that the tractor will also be applicable to other crops, including barley, wheat and pulses.

Sorghum is the fifth most important cereal worldwide and a critical food security crop in parts of Africa and Asia. The sorghum research in Queensland will directly contribute to lifting the crop’s climate resilience.

This project was funded by UQ and is being delivered by scientists jointly supported by the DAF, Australian Research Council, GRDC and UQ.

# Promising results on two tick vaccine fronts

A new vaccine offering season-long protection could play an important role in the battle against cattle ticks by reducing reliance on acaricides – pesticides which target ticks and mites – and allowing producers to move cattle from tick free to tick endemic areas. Researchers are also trialling a new single-dose tick vaccine delivery system.

A reformulated long-lasting cattle tick vaccine, which could be in commercial production within four to five years, promises a major advance against the number one cattle pest in the country – and significant progress has been made on a longer term, more effective vaccine.

Ticks are estimated to cost the Australian cattle industry at least \$175 million a year and they have a major animal health and welfare impact on herds in tropical cattle regions worldwide.

A team of Queensland scientists led by QAAFI's Associate Professor Ala Lew-Tabor is developing new improved antigens which produce antibodies to induce an immune response in the animal to protect against ticks.

Associate Professor Lew-Tabor said the long running research, which began twelve years ago within the Queensland Department of Agriculture and Fisheries, was now showing promise and attracting commercial interest.

A range of different combinations of tick antigen have been trialled for their effectiveness on live cattle ticks.

The trials have included modified antigens developed originally in research conducted by the Beef Cooperative Research Centre (Beef CRC) and involves collaborations with the United States and Brazil in evaluations of the effectiveness of different antigen combinations.

Associate Professor Lew-Tabor noted that a superior tick vaccine was still many years from commercial release.

"A breakthrough tick vaccine will be a game changer for northern Australian beef producers and bring many benefits for the industry," Associate Professor Lew-Tabor said.

Meanwhile, another QAAFI research group is making promising progress on developing a new single-dose delivery mechanism for a tick vaccine.

The controlled-release formulation research is based on the use of bio-polymer technology developed by the Cooperative Research Centre for Polymers, and using the active ingredient from the pioneering tick vaccine that is no longer manufactured.

The original vaccine required at least two doses and a booster to give effective protection against ticks, making its use for cattle herds across extensive northern Australia grazing areas unfeasible.

QAAFI's Dr Tim Mahony, who leads the project, said a new vaccine offering season-long protection could play an important role in the battle against cattle ticks.

"It may not be a complete panacea, but it is important to have new treatment options when chemicals used are under a growing threat of resistance," Dr Mahony said.

The research objective is to have a vaccine with a strong initial impact while also giving a sustained immune response.

"It is a matter of releasing enough active ingredient for an immediate response while offering on-going control without the need to re-vaccinate," Dr Mahony said.

A number of different formulations using polymer technology have been tested over the past three years and if results of the latest trial due mid-2016 continue to show promise, wider field-scale evaluation is expected to follow.

A combination of these approaches will be a major breakthrough for Northern cattle producers – not just from saving the expense of dipping and cattle disease loss, but allowing producers to easily move cattle between tick free and tick endemic areas.

It may even one day open the door for in some areas of Queensland for cattle producers to run high value *Bos taurus* cattle on land that would only once have ever run *Bos indicus* cattle.

These projects are jointly supported by the Department of Agriculture and Fisheries, The University of Queensland, Meat and Livestock Australia, The Polymer Cooperative Research Centre and Virbac.





# Pushing the potential of pulses

In the International Year of Pulses, scientists are aiming to double the area in Queensland's tropics and subtropics sown to these healthy, and often very profitable, legume crops.

Grain growers and researchers have increasingly come to understand the valuable role that legumes can play in crop rotations, and a continued run of record high prices in recent years, particularly for mungbeans and chickpeas, have pushed their popularity even higher.

This increasing demand for productive pulse varieties and information on how to manage them has added urgency to the research effort, which historically has been done in a somewhat piecemeal way.

The GRDC-funded Queensland Pulse Agronomy Initiative, conducted by QAAFI in collaboration with DAF, NSW DPI, Pulse Australia and the Peanut Company of Australia (PCA), is seeking to increase the reliability and yield of summer and winter pulses. The work takes a whole-systems approach, examining the interactions between genetics and agronomy. It has had considerable success

to date in identifying narrow row spacing and other management practices – all of which have contributed to a bumper crop this past summer.

Professor Graeme Hammer, Director of QAAFI's Centre for Plant Science, says the team is now looking to take that work to the next level. "We want to look at how we intensify the use of legumes in northern systems, because they provide so many benefits: disease breaks, weed control, nitrogen fixation – a range of system-level improvements."

Leading the current project is Dr Rao (RCN) Rachaputi, Senior Research Fellow in QAAFI's Centre for Plant Science. Dr Rachaputi's project is concentrating on five major pulse crops: chickpeas and faba beans (winter) and mungbean, soybean and peanut (summer).

“It’s a state-wide project and we are doing both summer trials and winter trials,” Dr Rachaputi says. “For all of the crops tested, we have solid data that shows the current recommendation for plant populations, such as 30 plants per metre square, are in fact delivering the best yields. However for row spacing, we have found narrow rows are achieving higher yields than wide rows.”

Dr Rachaputi adds that more work is needed on mungbeans, where the row spacing recommendations have worked in Southern, but not Central Queensland.

“I think there could be a couple of reasons for this,” he says. “The first relates to varietal adaptation: maybe the varieties produced here are not suited for Central Queensland. The second reason is late sowing. We found that the crops planted beyond January, even on a full moisture profile, produced poor yield. This is mainly due to low minimum temperatures starting from February, which affect reproductive growth and development of mungbean. So early planting in December at full moisture profile is actually more productive.”

Even though earlier sowing results in higher plant biomass, converting this biomass into yield remains problematic, particularly in chickpeas, and Dr Rachaputi is keen to understand why.

“We seem to have a yield ceiling with our existing chickpea varieties, producing a maximum of four tonnes per hectare irrespective of the amount of biomass produced,” he says. “Why is this? We don’t know, but we’d like to test some of our theories: how can we make plants partition more by planting early?”

In addition to improving the performance of established pulse crops, Professor Hammer says there is a need to look outside the square for additional legume options for northern systems.

“There is some more basic physiology research we could do to understand legumes better, and to try to figure out what would be the best types to bring in, and how best to fit them into a plausible crop rotation system.”

Because legumes comprise a substantially smaller share of the cropping area and market share than cereals in Australia, to date there has not been the same level of investment in research. However Professor Hammer says the collaborative nature of the Pulse Agronomy Initiative will allow them understand the true potential role of legumes in northern cropping systems.

“The skill base we bring together is around genetics and breeding, physiology and modelling, and agronomy,” he says. “We use modern genetics, information technologies and computational systems to get the best out of our crops.”

“In legumes, we haven’t had the same level of resources as we have in cereals. But we get that through collaboration with GRDC, DAF and others,” he says. “Through this work, we can ultimately move beyond knowing just how to grow mungbean and chickpea to understanding how to best intensify the use of legumes in our cropping systems.”





# IMPACT

**QAAFI's mission** is to significantly improve the competitiveness and sustainability of tropical, sub-tropical agriculture and food sectors through high-impact science.

Research  
quality



Industry  
impact



QAAFI  
mission





# Overview

Some of QAAFI's outcomes include increasing the profitability of the \$5 billion dollar northern Australian cattle industry by improving the reproductive performance of their cows; improving the profitability of the \$500 million sorghum industry by creating sorghum germplasm that will meet the yield and quality expectations under variable climates; safeguarding the \$600 million banana industry from pests and diseases; and bringing novel science solutions to integrated plant breeding and plant protection solutions for the \$120 million dollar macadamia industry.

## Tropical agriculture

The 2014 'State of the Tropics' report predicts that by 2040, the population of the world's tropical regions will have exceeded that of the rest of the world and by the end of the century, the tropics will be home to many of the world's largest economies.

The Tropics covers only 40% of the world's surface area, but hosts approximately 80% of its terrestrial biodiversity and more than 95% of its mangrove and coral reef-based biodiversity. The tropical world's economy is growing 20% faster than the Rest of the World and many tropical nations are important contributors to world trade, politics and innovation. The Tropics is home to 40% of the world's population, and 55% of the world's children under the age of five years old. By 2050, some 50 per cent of the world's population and close to 60% of the world's children are expected to reside in the Tropics.

## Northern Australia

Northern Australia presents an untapped opportunity for agricultural industries. Around 80 percent of the agriculture in northern Australia takes place in Queensland, and there are opportunities to further sustainably intensify agriculture in the tropical and sub-tropical regions.

UQ is one of only a few leading research universities in the world located in the tropics, and is ranked a leader in agricultural research within Australia, and globally. The University recently initiated the first of global TropAg conferences on food and agriculture in the tropics, to be held in Brisbane every two years. TropAg2015 attracted top international speakers and nearly 500 delegates.

Australia's connections, particularly in the north, offer geographic proximity and trade, investment and cultural links to the fast growing Asia Pacific region.

## QAAFI in Queensland

- › Cairns
- › Mareeba
- › Townsville
- › Charters Towers
- › Mackay
- › Rockhampton
- › Bundaberg
- › Maryborough
- › Kingaroy
- › Nambour
- › Warwick
- › Dutton Park
- › St Lucia
- › Coopers Plains
- › Goondiwindi



# How sorghum became Queensland's top crop

The sorghum story is a strong example of what is possible when there is significant targeted investment in breeding and agronomic research, and a long-term commitment.

When casting around for grains industry success stories, it could be difficult to top the story of sorghum.

Productivity gains in Australian sorghum are the highest in the world, and industry growth is also among the highest, globally, for any cereal crop. In 2015, for the first time, sorghum overtook wheat to become Queensland's most important cereal crop, with a farm gate value of \$432 million.

The Queensland Government initiated the sorghum-breeding program back in 1958 at the Hermitage Research Station near Warwick, and the program began delivering to Australian grain growers through the private seed industry in the mid-1960s.

The GRDC began funding the program in 1993 and in 2010 QAAFI took over the program leadership. Over this period it has evolved to become the most successful public sorghum-breeding program in the world in terms of lines licensed to industry, uptake in commercial varieties and benefits delivered to grain growers.

With a focus on improved yield and climate resilience, commercial licensing of new sorghum lines started in 1989. Since then more than 2400 lines have been licensed, with more than 100 sorghum lines licensed to commercial seed companies in the past year alone.

To put these figures in context, there is more use of the genetic material coming out of the sorghum-breeding program than any other public pre-breeding program in the world.

Germplasm licensed by the program is used directly as hybrid parents and also indirectly, by crossing licensed lines to commercial material to produce new parents within a company's breeding program.

All Australian hybrid sorghum varieties have genetics from the program, including traits such as midge resistance and stay-green traits (a feature of modern hybrids, which can be traced to program germplasm).

About 90 per cent – or 16 of 18 commercial varieties – are now generating royalties to the core breeding program partners.

One of the challenges for Australia is the small size of the seed market and the potential for companies to introduce parent lines from international programs and not to breed parents under local conditions. This was common from the 1970 to the early 1990s, but from the late-1990s onwards all commercial hybrids contain parents bred in Australia.

The system now encourages companies to continue breeding locally and most hybrids comprise genetics from pre-breeding and from company proprietary genetics, meaning Australian growers get the best of both public and private systems.

More important from the grower's perspective, however, is that Australian sorghum has shown productivity gains in the order of three to four per cent per year over the past 20 years, due to the breeding and agronomic improvements that have been achieved. Sorghum now holds the status as one of Queensland's most valuable agricultural industries.

One of the growers who has seen firsthand the benefit of the research investment is grower Glenn Milne from Dalby, Queensland. Glenn's family has been hosting breeding trials on his 600-hectare property on Queensland's Darling Downs since the early 1980s, and he lists midge resistance, standability (reduced lodging) and stay-green as the most important traits the program has delivered.

Australia is currently the only country in the world with midge-resistant sorghum as standard.

"Midge resistance has been the biggest benefit," he says. "Many people say it's cheap to spray but the combination of the midge-resistance traits and spray gives you a really robust defence.

"Stay-green also helps in tough conditions, and provides better resistance to Fusarium," he says. "There is less lodging among varieties that have the stay-green trait."

Glenn says climate resilience has improved over the years, which he believes is a result of enhanced genetics and an improved understanding of sorghum agronomy.

"We get better seedset under tough conditions," Glenn says, "and that is also due to better agronomy. With the introduction of zero-till and knowing how much water the soil can hold, we now understand the right conditions for the plant, so the combination of the breeding and agronomy has pushed productivity up."

Professor Graeme Hammer, director of the Centre for Plant Science at QAAFI, echoes the grower's sentiments about the focus on both strands of crop science.

"QAAFI's strategic research interest in field crop improvement spans genetic improvement as well as agronomic systems," Professor Hammer says. "Our big-picture focus is around optimising interactions of genetics and management to get the best out of our variable cropping environment."

In 2013, the outstanding cumulative results demonstrated by the sorghum improvement program were recognised internationally when the Bill & Melinda Gates Foundation awarded the program US\$4.6 million (A\$6.4 million) to improve breeding programs in Africa, and to map the genes controlling two drought-resistance traits in sorghum.

In 2016, the foundation awarded the team a further US\$3.8 million (A\$5.3 million) to assess plant-breeding programs in developing countries and identify the best avenues to improve them.

Bill & Melinda Gates Foundation program officer Dr Jeff Ehlers said the foundation chose UQ because of its worldwide reputation for excellence in plant breeding, particularly in tropical crops such as sorghum: "Very few organisations have the range of technical expertise and history of success in delivery of improved varieties to farmers as UQ and its partner the Queensland Department of Agriculture and Fisheries," he said.

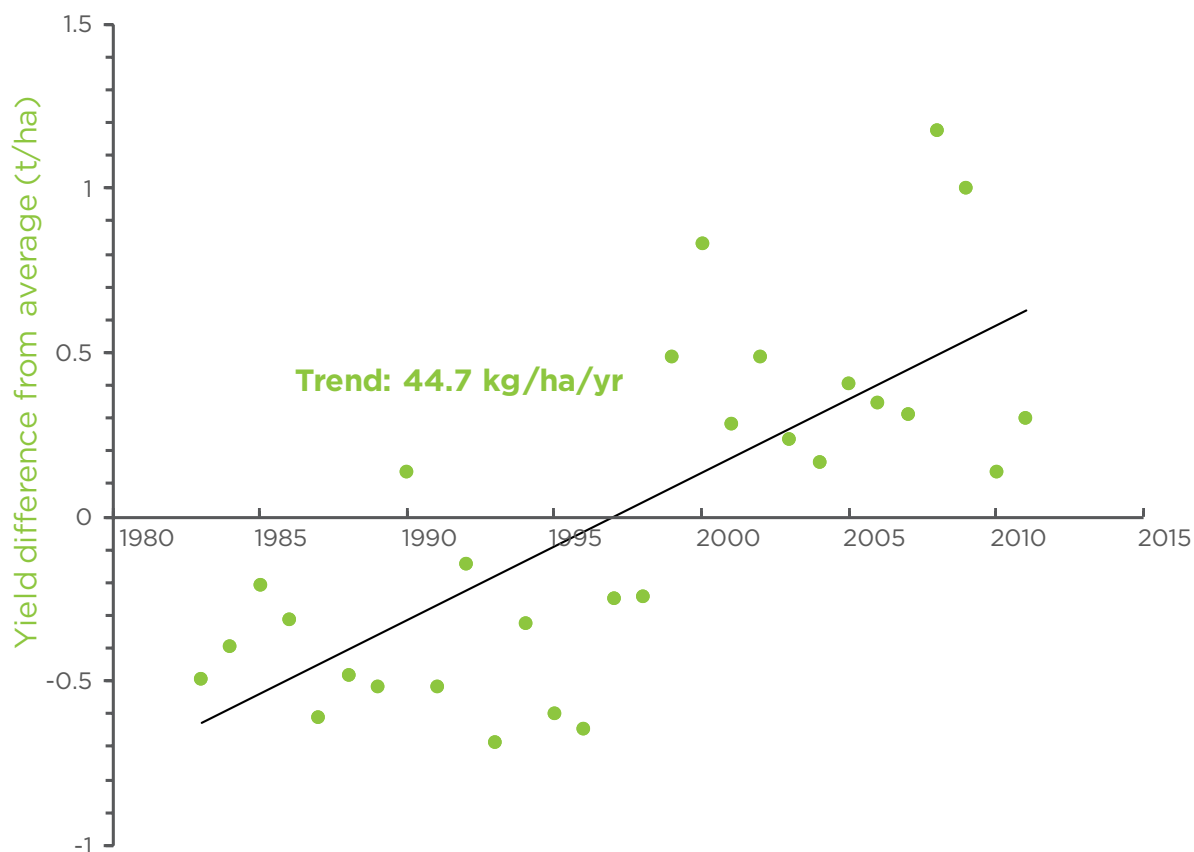
For geneticist and plant breeder Professor David Jordan, QAAFI's sorghum team leader, the grants are a testament to the value of long-term investment into high-quality research.

"Australian sorghum's productivity gains demonstrate the advantages of simultaneously improving both management practices and genetics in an integrated way. It is a long-term investment by both public and private-sector researchers, and if done well, it also generates large returns and lays the foundation for future improvements," Professor Jordan says.

*This project is jointly supported by the Department of Agriculture and Fisheries and UQ, and the GRDC.*



### Seasonally adjusted yield difference (t/ha) from average yield for sorghum in Australia (1983-2011)



# Extending the applications for Australia's unique Kakadu Plum

A multi-year collaborative project between QAAFI and Queensland Department of Agriculture and Fisheries (DAF) and, more recently, social enterprise Kindred Spirits Foundation has been researching the unique properties and applications of the indigenous bush food species, the Kakadu Plum (*Terminalia ferdinandiana*).

In the first stage of the project activities, DAF scientists supported by QAAFI, the Seafood CRC and the Rural Industries Research and Development Corporation (RIRDC) have come up with an innovative use for the Kakadu Plum as a natural processing aid, and have demonstrated an application which significantly extends the retail shelf life of cooked and frozen prawns.

This has created the opportunity to capture a significant positive benefit for consumers as well as both the prawn and indigenous produce industries. In 2013-14 Australia produced over 28,676 tonne of prawns valued at over \$500 million (\$443 million, 24,902 tonnes wild caught and 3774 tonnes farmed \$64 million). Keeping these prawns fresh is a constant challenge for both domestic and export customers.

A growing number of Australian prawn farms have been using the Kakadu Plum invention for the past three years and last year \$12.5 million worth of prawns – up from \$10 million in 2013 – incorporated the Kakadu Plum based invention. The innovative application has been shown to substantially extend the shelf life and freshness of the prawns, and ensures they keep an attractive bright orange-red colour.

QAAFI is leading the further development of applications for Kakadu Plum and manages the program, including extension within the communities. DAF is providing core funding for the lead QAAFI researcher, along with technical expertise and infrastructure support. The Kindred Spirits Foundation is providing expertise and support for the indigenous business model.

Dr Yasmina Sultanbawa, from QAAFI's Centre for Nutrition and Food Sciences says the use of Kakadu Plums with seafood is a perfect marriage. "Australian prawns are now even more uniquely Australian," Dr Sultanbawa said.

Also known as Gubinge, Billygoat Plum or Murunga, the Kakadu plum is a flowering native which is widespread throughout the top end of Australia.

One of the challenges of this new product is supply and demand which requires building an indigenous supply chain to meet this growing need.

For the indigenous community from Wadeye, NT, this growing market provides a new revenue stream for the bush fruit. Dr Sultanbawa and the multi-organisational research project team are working with the Wadeye Palngun Wurnangat Association (Women's Centre) and rangers to refine wild harvest techniques, handling and processing.

Dr Sultanbawa says the harvesting – which takes place in April in the Northern Territory – is done in family units, including the children.

"It is a festive time, a time where people can share their stories," Dr Sultanbawa says. "In the 2015 season, Wadeye had 148 pickers registered of which 11 were men and 137 women."

Following the success of the Wadeye harvest and emerging business model there, another five communities, including Broome in Western Australia, are now harvesting Kakadu Plum. And while much of the fruit processing currently takes place in Brisbane, there are plans to extend the capabilities of the Wadeye and Broome communities by the development of new processing infrastructure, which would allow the fruit to be processed close to its source, cutting down on the substantial transport costs involved in the current arrangement.

Once the new processing plants are in place, Dr Sultanbawa says, there will be the potential to process other tropical fruits, such as mangoes, and thus build sustainable local industries within the communities.

Dr Sultanbawa is working with a Northern Territory business, Karen Sheldon Catering, to add Kakadu Plum extract to its pre-prepared meals. The natural antimicrobial properties of the fruit can improve nutritional value and extend the shelf-life of packaged meal products for up to three months. RIRDC has recently extended



funding for another two years for Kakadu Plum research, because of its potential for mainstream agriculture and its cross-industry applications.

For Dr Sultanbawa, the path that the Kakadu Plum research has taken has been both surprising and deeply rewarding.

“We have found an Australian plant extract that imparts no taste or smell but provides a strong antioxidant and colour to the product to extend the shelf life and maintain great colour for the consumer,” she said.

“There are many more Australian plant extracts out there that we can use to improve taste, texture, tenderness and preservation of Australian food products, making them even more uniquely Australian”.

This project has been jointly supported by the Department of Agriculture and Fisheries, The University of Queensland, The Kindred Spirits Foundation and RIRDC.

**Last year \$12.5 million worth of prawns – up from \$10 million in 2013 – incorporated the Kakadu Plum based invention. The innovation has been shown to substantially extend the shelf life and freshness of the prawns, and ensures they keep an attractive bright orange-red colour. QAAFI is leading the further development of applications for Kakadu Plum.**

## GROWER CASE STUDY

# From 'mongrel beans' to money beans

Grower Wade Bidstrup realised the true potential of mungbeans after treating them as a 'real' crop and applying specific research-based agronomy.

Wade Bidstrup's first experience growing mungbeans was not a good one. Sowing the seed directly into that season's wheat stubbles and with little moisture to draw on, they yielded 0.2 tonnes per hectare.

"It was a disaster," he says. "I swore I would never grow them again."

But that was ten years ago and since then intelligence around mungbean agronomy has grown, along with their market value and the development of superior varieties, to make the pulse a far more attractive option.

These days at Mr Bidstrup's Warra property on the Darling Downs in Queensland, mungbeans are a mainstay of his rotation and represent the majority of his summer cropping regime. This season, he is harvesting 310ha of mungbeans, along with 60ha of sorghum and 40ha of maize.

"If you grow them properly they are a really profitable crop," he says. "In fact, mungbeans are our main summer crop now."

Mungbeans are today a great asset to his enterprise, Mr Bidstrup says, with high prices providing a reliable income stream and flexible sowing times spreading risk.

On top of that, they leave the paddock in good shape for winter crops, helping to control weeds while adding organic matter through a shallow root system that does not remove too much moisture. The only downside, Mr Bidstrup believes, is that mungbeans produce minimal stubble and therefore minimal ground cover.

Mr Bidstrup reintroduced mungbeans seven years ago after witnessing a friend's success with the crop. And second time around, he took a more considered approach. "I started treating them like a 'real' crop," he says. "And I've never looked back."

As a mark of his respect for the crop, Mr Bidstrup became involved with mungbean research and this year, for the third consecutive year, he is hosting a series of agronomy trials lead by QAAFI's Dr RCN Rachaputi in collaboration with a field team from DAF, which he says, have helped establish best practice for mungbean row spacing and seeding rates.

Trials with mungbeans sown with 250-millimetre, 500mm, 750mm and one-metre row spacings showed that narrower row width resulted in higher yields. For Mr Bidstrup, the trials confirmed he was on the right track with the 500mm row spacings he had used since reinstating mungbeans into his system.

"We always thought the narrower row width was better," he says. "The plants have a bit more space to capture more sunlight so it just stood to reason for us."

Mr Bidstrup says that while narrower rows may cost more in new equipment for growers commonly growing mungbeans on 1m rows in line with other crops such as sorghum, cotton and maize, the outlay was worth it.

"It's a big expense setting up your planter differently, but if you can achieve a 20 per cent yield increase through narrower rows, that is a big jump in profits," he says.

The Bidstrup property has also been hosting plant population trials led by QAAFI's Dr Rachaputi, demonstrating the optimal rates for maximum pod production and corresponding yield gains. Seeding rates in the region can range from 150,000 to 400,000 seeds/ha, but if this number is too high, Mr Bidstrup says, the plants "choke each other out of sunlight and moisture" and if it is too low they will grow excess foliage and not enough pods.

"It's a balancing act," he says. "You can go too thick and you can go too thin — we've found what that right number is and that it's different for different varieties."

The trials on his property, he says, indicate peak yields for Crystal occur with a rate of about 240,000 seeds/ha, while for Jade-AU, 280,000 seeds/ha produce the highest yields. Mr Bidstrup has taken this advice on board, increasing his seeding rate and seeing yields up to 2.5t/ha.

"If you grow them with the right seeding rates, row spacing and on long fallow you'll get the high-yielding 1.7 to 2.5t/ha crops," he says. "But when you grow them on short fallow or double-crop them into wheat or barley, that's when you'll get the 0.5t/ha crop and that's when people decide to never grow them again."



*Grower Wade Bidstrup with QAAFI's Dr Rao Rachaputi*

Mr Bidstrup has no regrets giving mungbeans a second chance. He says the major step-change for his own fortunes came when he started treating them with respect, with specific agronomy and paddock preparation, rather than as a second thought.

"They yield really well and even if its dry over summer they hang in there and get a respectable yield. With the price of them lately, it's a lot more profitable than any other crop you could grow in summer," he says.

Growers and marketers have been able to capitalise on the increased price of mungbeans – fuelled by the growing middle class in Asia, and specifically India, to a consistent price about \$1300/t – by reliably providing a high-quality product.

This, Mr Bidstrup says, is thanks to DAF breeding research – some undertaken on his property – producing varieties that are higher yielding than the "pretty ordinary" varieties of the past and more resilient against variable weather and lodging.

Meanwhile the QAAFI trials, funded by the GRDC and in collaboration with DAF, continue this season at his property on row spacings and seeding rates as well as the role of mungbeans fixing nitrogen in the soil according to those widths and rates.

Rolling out the trials over several seasons ensures results are tested under a range of conditions, Mr Bidstrup says, adding to the growing bank of knowledge about the crop.

What he knows already, is that mungbeans will continue to play a big role in his system – providing the price stays right. "You just can't beat them with anything else," he says. "They are very compelling to grow."

This project is jointly supported by the Department of Agriculture and Fisheries, GRDC and UQ.



Photo: Phil Savory

# ENGAGEMENT

## TropAg2015 conference

Nearly 500 delegates attended the inaugural TropAg conference in Brisbane on 16-18 November 2015. Over 300 papers were presented at the 2015 conference covering the latest advances in science impacting tropical agriculture and food production. Delegates identified the opportunity for networking as one of the most valuable outcomes of the conference, and 65 percent of those who completed the evaluation form reported that they developed one or more potential new partnerships or collaborations arising from the conference. Many of these collaborations were estimated to be worth between \$100,000 and \$1 million.





# QAAFI collaborators

QAAFI collaborates with over 150 commercial companies. Other organisations we work with include:

Australian Agency for International Development (AusAID)

Australian Centre for International Agricultural Research

Australian Macadamia Society

Australian National University

Australian Nuclear Science and Technology Organisation (ANSTO)

Australian Pork Limited (APL)

Australian Research Council (ARC)

Austraning International

Bill & Melinda Gates Foundation

Commonwealth Scientific and Industrial Research Organisation (CSIRO)

Cooperative Research Centre for Polymers (CRC for Polymers Limited)

Cotton Research and Development Corporation (CRDC)

Department of Agriculture

Department of Agriculture and Fisheries (DAF)

Department of Agriculture and Food

Department of Industry and Science

Department of Science, Information Technology and Innovation

Department of the Environment

Grains Research and Development Corporation (GRDC)

Horticulture Innovation Australia Limited

International Crops Research Institute for the Semi-Arid Tropics

International Livestock Research Institute (ILRI)

International Maize & Wheat Improvement Center

International Plant Nutrition Institute (IPNI)

Meat & Livestock Australia Limited (MLA)

Ministry of Higher Education Kingdom of Saudi Arabia

Ministry of Education Malaysia

Pork CRC Ltd

Poultry CRC Ltd

Royal Thai Embassy

Rural Industries Research and Development Corporation (RIRDC)

Sea World Research and Rescue Foundation

Sugar Research Australia

UniQuest Pty Limited

University of Adelaide

University of Florida

University of Queensland

University of New England

University of Sydney

University of Western Australia



# Global engagement

## World leading expertise in starch chemistry of grains

QAAFI's largest collaboration in China is focused starch chemistry of grains and is led by Professor Robert (Bob) Gilbert.

Professor Gilbert runs a large well-equipped starch chemistry research centre in Wuhan province and a lab at UQ. His staff and students regularly travel between the two labs. Professor Gilbert works in Wuhan, China, under the highly prestigious 1000-Talents Program of the Chinese Foreign Experts Bureau. His Chinese research centre is based in the Wuhan Biolake Hi-Tech Development Zone.

Food with certain digestibility characteristics (including a low glycemic index and an appropriate amount of resistant starch) has major health benefits. Starch is the main component of food, and has a very complex structure over scales from nanometres to millimetres. Professor Gilbert's research program at QAAFI uses a battery of new experimental and theoretical techniques to identify and understand the structural characteristics of starches that influence beneficial digestibility. The research will enable meaningful information to be deduced about the structure of starch from previously uninterpretable data. This will lead to new tools for food and agricultural scientists to devise novel plant varieties and food processing procedures.

## Intensified agricultural systems

There are also many opportunities to improve our systems, says QAAFI's Associate Professor Daniel Rodriguez, who leads research into the 'sustainable intensification' of agriculture, or "how to do more with less." The focus of his work is on:

- › pathways to achieve food security and reduced poverty in Africa
- › identifying pathways to intensify the production of summer rainfall dominated – rainfed and irrigated, cropping and mixed grain-cropping systems
- › quantifying impacts and adaptation to climate variability, and change.

In Australia he collaborates with CSIRO and state/territory departments, and internationally with CIMMT, ILRI, ICRISAT, ICRAF and the National Agricultural Research Systems of eastern and southern African countries. His present international work focuses on reducing the poverty and food insecurity of maize-legume based farming systems across eastern and southern Africa.

## Boosting global sorghum yields

Sorghum is an ancient cereal grain that is gaining momentum in new and emerging markets, and feeds 500 million people in Asia and Africa each day.

A \$4 million international collaboration to improve sorghum productivity under drought conditions commenced in 2013 with funding from the Bill & Melinda Gates Foundation – one of the biggest international drought-tolerant sorghum research programs ever undertaken. Improved drought resistance is vital to global food security. Like Queensland, Africa needs improved drought-resistant sorghum varieties. The Gates Foundation funding will help secure food supply in Africa while at the same time benefiting Queensland's \$429 million sorghum crop (farm gate value) and the valuable livestock industries it supports.

In 2016, the foundation awarded the team a further US\$3.8 million (A\$5.3 million) to assess plant-breeding programs in developing countries and identify the best avenues to improve them.

Bill & Melinda Gates Foundation program officer Dr Jeff Ehlers said the foundation chose UQ because of its worldwide reputation for excellence in plant breeding, particularly in tropical crops such as sorghum: "Very few organisations have the range of technical expertise and history of success in delivery of improved varieties to farmers as UQ and its partner the Queensland Department of Agriculture and Fisheries," he said.

## A tail of two industries: outcomes from Australian and Philippines pig industries

Pork is an important meat in the Philippines, with an estimated 98 million Filipinos relying on the meat as their main source of dietary protein. Around 60% of all meat consumed and produced in the country is pork. In Australia the pig industry has an annual production value of \$1.24 billion, with around 17% of total production exported.

A major constraint common to pig industries in both countries is respiratory disease. In the Philippines an estimated 50% of all pig mortalities are caused by respiratory disease, while in Australia estimates provided to Australian Pork Limited are that these diseases cost between \$30 to \$100 per sow annually.

Although the underlying disease agents differ, the scientific skills and technologies to diagnose, control and protect pigs are the same. QAAFI's Dr Pat Blackall's **ACIAR project** 'Improved investigation, diagnosis and technical support for the control of respiratory diseases of pigs in the Philippines and Australia' has developed new rapid and specific molecular assays for the identification of *Actinobacillus pleuropneumoniae* and *Haemophilus parasuis* have been established and validated. The project also involved on-farm training activities, and field investigation, surveillance and diagnostic systems.

## Pioneering crops for drought adaptation

QAAFI's Professor Graeme Hammer has undertaken a 10-year collaboration with Pioneer which produces, markets and sells hybrid seed corn in nearly 70 countries.

The team modelled the breeding and prediction of performance of sorghum and maize, in the context of rapid advances in molecular technologies.

The project used enhanced genome-to-phenome modelling to deliver improved plant varieties for drought adaptation. The project also developed understanding of the genetics and physiology of drought adaptation traits in sorghum and maize by incorporating them into an existing crop modelling platform, that can be used internationally and in Australia.

## Rice one, Australia

The genetics of this ancient pure breed of rice may hold crucial secrets for helping prevent disease in the heavily cultivated rice species of Asia, in a time when rice production is declining.

As featured in 'New Scientist' on October 24, 2015, a science team, led by Professor Robert Henry, Director of QAAFI, has discovered a wild rice growing in the tropical north of Australia that appears to be the ancestor of the main rice species grown throughout Asia.

## Beef Genomics: QAAFI in Brazil

It has traditionally been the case that Latin America leads the world in Advanced Breeding Technologies and Australia leads the world in managing in very harsh environments – but Professor Stephen Moore, Director of QAAFI's Centre for Animal Science leads a team that brings together world experts in both fields.

Brazil is a market leader in beef production and the Queensland and Brazilian beef industries share many common issues, such as similar cattle (*Bos indicus* and their crosses), land pressures and environmental impact, product quality, parasite resistance, heat tolerance and market leadership – with both ranked as top exporters.

Professor Moore has a Visiting International Fellowships with Vicosia University, Brazil. He contributes to a collaborative project between QAAFI and the Universidade Federal de Viçosa (UFV) Minas Gerais (Brazil), studying the genetics of fertility in *Bos indicus* cattle and leads delegations – Sao Paulo State University (UNESP) and University of Viçosa, Brazil.

## QAAFI Professor's new role at Lawrence Berkley Laboratory

QAAFI Adjunct Professor Blake Simmons has taken up the role of Division Director for Biological Systems and Engineering (BSE) at Berkeley Laboratory Biosciences. Professor Simmons will retain his positions as Chief Scientific and Technology Officer and as the Vice President of the Deconstruction Division at the Joint BioEnergy Institute.

After earning his BS in Chemical Engineering from the University of Washington, Professor Simmons completed his PhD in Chemical Sciences at Tulane University. For the past 15 years, Professor Simmons has been part of the Senior Management team at Sandia National Laboratory, most recently serving as the Biomass Program Manager, as well as Adjunct Professor at QAAFI and the University of Queensland. His expertise includes chemical engineering, biomass pretreatment, enzyme engineering, biofuel cells, nanomaterials, microfluidics, desalination, and silica biomineralization.



# QAAFI Science Seminars 2015

Date	Speaker	Position	Organisation	Title of the talk
10-Feb-15	Professor Robert Henry	Institute Director	Queensland Alliance of Agriculture and Food Innovation (QAAFI)	Genomics of food security
17-Feb-15	Dr Simon Foster	Post-Doctoral Researcher	School of Biomedical Sciences, Faculty of Medicine and Biomedical Sciences	Taste receptor systems in the heart: investigation of novel cardiac G protein-coupled receptors
24-Feb-15	Dr Mario Herrero	Chief Research Scientist and OCE Science Leader	CSIRO Agriculture Flagship	Sustainable intensification of smallholder mixed crop-livestock systems
3-Mar-15	Associate Professor Tim Mahony	Principal Research Fellow	QAAFI Centre for Animal Science	Future biosecurity strategies for the Australian beef industry
10-Mar-15	Professor Miguel Perez-Enciso		Centre for Research in Agricultural Genomics, Barcelona (Spain)	The sequence of a 16th century pig
24-Mar-15	Dr Christine Dudgeon		UQ School of Veterinary Science	Genetic effective population size approximates census size in sharks
31-Mar-15	Dr Bruno van Swinderen		UQ Queensland Brain Institute	Sleep and nutrition in Drosophila melanogaster
2-Apr-15	Dr Sam Periyannan	Postdoctoral Fellow CSIRO, Adjunct Fellow UQ, Adjunct Lecturer USyd	CSIRO	Sustaining global food production through stem rust resistance from wild wheat relatives
7-Apr-15	Dr Andries Potgieter	Research Fellow	QAAFI Centre for Plant Science	An integrated approach in predicting the major crops of Australia
14-Apr-15	Dr Greg Bishop-Hurley	Research Fellow	CSIRO	Precision Livestock Management
21-Apr-15	Professor Mike Gidley	Centre Director	QAAFI Centre for Nutrition and Food Sciences	Dietary fibre polysaccharides in the digestive tract: physical properties and nutrition implications
24-Apr-15	Dr Ian Dodd		Lancaster Environment Centre (United Kingdom)	Root system distribution and root-to-shoot signalling
28-Apr-15	Associate Professor Victor Galea		UQ School of Agriculture and Food Sciences	A novel approach to developing bioherbicides for invasive woody weeds using endemic fungi
5-May-15	Dr Hisayuki Uneyama	Principal Researcher	Ajinomoto Co., Kawasaki (Japan)	Umami taste and health: nutritional and physiological benefits of the umami taste substance, monosodium glutamate (MSG) for healthier life
12-May-15	Associate Professor Rowland Cobbold	Associate Professor in Veterinary Public Health	University of Queensland	In vivo trials of a vaccine to reduce bovine shedding by enterohaemorrhagic E. coli

Date	Speaker	Position	Organisation	Title of the talk
22-May-15	Professor Jenny Martin	Professorial Research Fellow	UQ Institute for Molecular Bioscience	Gender Equity in Science - Make it happen
26-May-15	Dr Sushil Dhital	Post-Doctoral Research Fellow	QAAFI Centre for Nutrition and Food Sciences	Healthy starch: Molecular and processing aspects
2-Jun-15	Dr Roger Shivas	Curator of Plant Pathology Herbarium	Department of Agriculture and Forestry	Enlightenment follows revolution - changing concepts in the taxonomy of plant pathogenic fungi
9-Jun-15	Dr Helle Bielefeldt-Ohmann	Senior Lecturer in Infectious Diseases Pathobiology	University of Queensland	Transplacental persistent infection with BVDV upregulates innate and adaptive immune response pathways
16-Jun-15	Dr Ram Mereddy	Senior Scientist	Innovative Food Technologies (IFT), Queensland Department of Agriculture and Fisheries	Processing innovation for adding value to food waste
23-Jun-15	Associate Professor Bruce Topp	Principal Research Fellow	QAAFI Centre for Plant Science	Breeding macadamia and peach in Queensland
28-Jul-15	Assistant Professor Wanchai Assavalapsakul		Chulalongkorn University Thailand	RNA interference: the biomolecular approach for in vitro endogenous gene knockdown
4-Aug-15	Dr Claudia Vickers		UQ Australian Institute for Bioengineering and Nanotechnology	From basic biology to industrial biotechnology: Lessons learned through engineering synthetic biological networks and pathways
11-Aug-15	Dr John Thomas	Principal Research Fellow	QAAFI Centre for Plant Science	Banana bunchy top virus a century on and still a major problem. Where to from here?
18-Aug-15	Associate Professor Simon Reid		UQ School of Public Health	One Health: Approaches to tackle wicked problems at the human, animal and ecosystem interface
25-Aug-15	Associate Professor Jason Stokes		UQ School of Chemical Engineering	Oral processing, texture and mouthfeel: From rheology to tribology and mucosal films
1-Sep	Associate Professor Neena Mitter		QAAFI Centre for Plant Science	From Cows to Beans: Nanoparticles to the rescue
8-Sep-15	Dr Karine Chenu	Research Fellow	QAAFI Centre for Plant Science	Crop physiology and modelling to assist breeding in changing environments
15-Sep-15	Dr Pat Blackall		Research Manager at Poultry CRC Principal Research Fellow at QAAFI Centre for Animal Science	A Tail of Two Pig Industries
22-Sep-15	Dr Zyta Ziora	Senior Research Officer	UQ Institute for Molecular Bioscience	Silver, Wine, and Bacteria: what do we know about them?
6-Oct-15	Associate Professor Simon Phipps		UQ School of Biomedical Sciences	Danger molecules from a damaged airway epithelium contribute to viral bronchiolitis and predispose to subsequent asthma
13-Oct-15	Professor Ian Godwin		UQ School of Agriculture and Food Sciences	Forget Mars: what's life like inside a sorghum grain?
20_oct-15	Graeme Hammer	Centre Director	QAAFI Centre for Plant Science	Adapting field crops to drought and heat - do we have the GEMs?
27-Oct-15	Dr Justine Gibson		UQ School of Veterinary Science	Antimicrobial resistance in Australian food producing animals
20-Nov-15	Michelle Grant	Director	World Food System Centre, Zurich (Switzerland)	More than Chocolate: Switzerland's Contribution to the World Food System
24-Noc-15	Dr Deanne Whitworth		UQ School of Veterinary Science	A Stem Cell Zoo: basic and translational research on comparative mammalian specie
1-Dec-15	Professor Hans Brauner-Osborne		University of Copenhagen (Denmark)	Characterization of the orphan GPRC6A receptor - from cell culture to human studies
8-Dec-15	Dr Nilesh Nirmal	Postdoctoral Fellow	QAAFI Centre for Nutrition and Food Sciences	Plant phenolics; Natural replacement to synthetic food additives



# LEARNING

## QAAFI welcomes Research Higher Degree students

QAAFI's Cecile Richard (pictured) won the prestigious UQ All-Institutes 3 Minute Thesis Competition in 2015. The 3MT is held annually and cultivates students' academic, presentation, and research communication skills to explain their research in three minutes, in a language appropriate to a non-specialist audience. Cecile researches the adaptation of grain crops, such as wheat, to drought conditions. In a great 3MT result for QAAFI in 2015, Louisa Parkinson took out the runner up of the all-Institutes final and people's choice winner was Madeleine Gleeson.



As part of our  
Research Higher  
Degree program  
QAAFI welcomes  
PhD and MPhil  
students.

Scientific evidence shows that fibre can help to alleviate obesity and its offshoot conditions.

### The path from taste-sensing to food intake



### OBJECTIVE

TO INVESTIGATE THE EFFECT OF INSOLUBLE AND SOLUBLE FIBRE ON TASTE THRESHOLDS IN A REAL FOOD



### HYPOTHESIS

THE PRESENCE OF BOTH TYPES OF FIBRES REDUCES TASTE PERCEPTION OF ALL THE TASTES IN HUMAN SUBJECTS

### METHODOLOGY

A standard protocol, the "forced-choice ascending concentration series method" was used to determine taste thresholds in a panel



Plain flour cookies



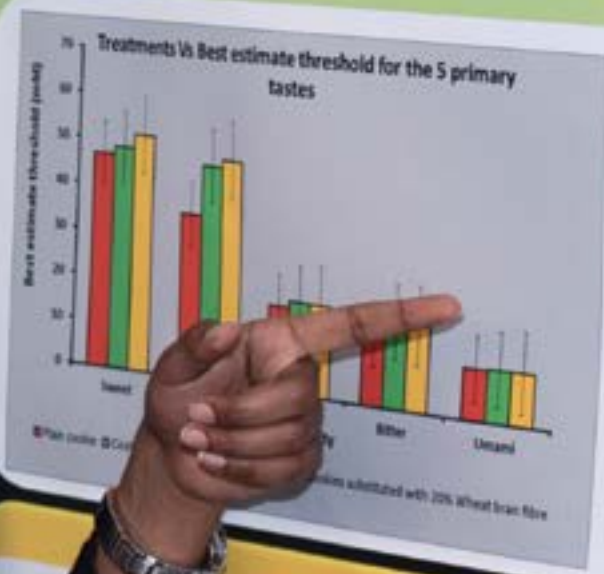
Cookies with 20% flour substituted with soluble oat fibre



Cookies with 20% flour substituted with insoluble wheat bran

25 untrained subjects participated in a series of 8 sets. Every set contained 2 blank samples. Subjects had to choose the sample containing the highest concentration. The 1st concentration was used to identify the odd sample in a series of 3 or more sets with the best estimate threshold. Group BET's were determined for each product and each taste quality.

### RESULTS



Product	Sweet	Salty	Sour
Plain cookie	46.79	35.36 <sup>b</sup>	18.22
Cookies substituted with 20% Oat fibre	48.41	46.22 <sup>a</sup>	19.64
Cookies substituted with 20% Wheat bran fibre	51.29	47.76 <sup>a</sup>	19.50
Standard error	6.92	4.87	1.68

- Both types of fibres increased the thresholds of all five tastes
- They significantly increased the thresholds in salt and bitter tastes
- Soluble and insoluble fibres influenced taste sensitivity in a similar manner

### CONCLUSION

The study proved to be suitable and repeatable for determining taste thresholds in a real food. The presence of both types of fibres- insoluble and soluble, significantly increased the taste threshold in all the primary tastes, thereby supporting the hypothesis that fibres blunt taste perception in solid foods.

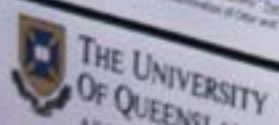


### Take home message

Soluble and insoluble fibre significantly alters taste perception, thereby increasing sensitivity to the 5 basic tastes, particularly decreases sensitivity to sweet and bitter tastes

### References and acknowledgements

1. WHO (2015) "Obesity and obesity-related diseases" <http://www.who.int/mediacentre/factsheets/fs104/en/>  
 2. de Angelis, L. et al. (2014) "The effect of fibre on satiety: A systematic review of clinical studies" <http://www.ncbi.nlm.nih.gov/pubmed/25000000>  
 3. WHO (2015) "Standard Protocol for Determination of Taste Thresholds by a Forced-Choice Ascending Concentration Series Method" <http://www.who.int/mediacentre/factsheets/fs104/en/>



# How an avocado researcher became the face of UQ's advertising campaign

She chose plant science because she wanted to “feed the world”, and now QAAFI PhD student Louisa Parkinson is the face of UQ's new brand and student recruitment campaign.

With its tagline of ‘create change’, the advertising now features across a range of media including television, outdoor and digital.

“I follow UQ on Facebook and saw a post about auditioning for the television commercial, so I sent in a photo,” Ms Parkinson said.

A successful audition followed and then Louisa joined other chosen students for filming.

“They filmed part of my featured scene with remote-controlled flying camera drones. Having a floating camera hover in the air in front of me as I stood in front of the Forgan Smith building was an unforgettable experience. The film crew were 100 metres away and the director was shouting “action,” “cut” and directional cues through a speaker, just like in the movies. They also filmed me up close and with special lighting equipment and the whole film crew standing in front me, watching. It was very exciting, and nerve-wracking.”

Ms Parkinson said the “create change” branding was appropriate to her story, as her desire to make a difference was what prompted her decision to become a plant scientist and to study avocados.

“By 2050 the world's population is expected to double, which means we'll need to produce up to twice the amount of food than we already are,” Ms Parkinson said.

“Plant diseases are a significant threat to food security, reducing yield and negatively impacting global food production. I want to improve food security through plant pathogen research and contribute to helping feed the world,” Ms Parkinson said.

Her research focus is black root rot disease of nursery avocado trees, caused by soil-borne fungal pathogens, and its effect on avocado tree mortality during early field establishment.

“My research will provide a better understanding of the causal agents of black root rot in avocado. From fungal DNA sequence data, I am also developing a molecular diagnostic so that we can help avocado growers rapidly test for the presence of these pathogens in their avocados.”

Consumption of avocado in Australia has doubled in the last 10 years, thanks to some clever industry marketing, and the demonstrated health properties. The ancient fruit that once fed dinosaurs is often labelled a “super food” due to its rich source of potassium, omega-3 fatty acids, and lutein.

Avocados also contain good amounts of soluble and insoluble fibre. In Mexico and Chile, the trade in Hass avocados is so lucrative, the fruit is called *oro verde*, or green gold.

Queensland, with its tropical and subtropical climate similar to the Central American origin of avocado, accounts for the majority of total production. It is estimated that about 60 per cent of avocados produced are sold through supermarkets. Only around 5000 tonnes of fruit is exported overseas.

Ms Parkinson presented her research at the 8th World Avocado Congress in Lima, Peru in September 2015.

“I really feel avocado research gives me the best of both worlds – the lifestyle of being involved with agricultural production in Queensland as well as the science. I love talking to growers and being in the field as much as I love being in the laboratory.”

Ms Parkinson, who is of Filipino heritage, grew up enjoying avocados as a dessert fruit.

“My favourite avocado recipe is a sweet Filipino dessert made of mashed avocado, mixed with sugar or honey and a splash of evaporated milk. Mum used to make this dessert for me as a child and I still love to eat it.”

Ms Parkinson is supported by an Australian Postgraduate Award and her experimental activities are funded through a project led by her supervisor Dr Elizabeth Dann from Horticulture Innovation Australia Limited, using the avocado levy and funds from the Australian Government.

# I want to improve food security through plant research

Louisa Parkinson  
PhD Student, UQ



THE UNIVERSITY  
OF QUEENSLAND  
AUSTRALIA

Create change

# Supporting information

QAAFI Research Staff

QAAFI Honorary and Adjunct Appointments

QAAFI Affiliates

Research Higher Degree Students 2015-2016

Publications

# QAAFI Research Staff

## Centre for Plant Science

### Professor Graeme Hammer

Dr Olufemi Akinsanmi

Dr Mohammad Alam

Dr Robert Armstrong

Dr Inigo Auzmendi

Associate Professor Andrew Borrell

Dr Marie Bouteille-Pallas

Dr Terri Cameron

Dr Bhagirath Chauhan

Dr Karine Chenu

Dr Jack Christopher

Dr Myrna Constantin

Dr Elizabeth Dann

Associate Professor Ralf Dietzgen

Professor Andre Drenth

Dr Joseph Eyre

Dr Ariel Ferrante

Dr Andrew Geering

Dr Barbara George-Jaeggli

Associate Professor Jim Hanan

Dr Craig Hardner

Dr Adrian Hathorn

Dr Alice Hayward

Dr Juliane Henderson

Dr Lee Hickey

Dr Stuart Irvine-Brown

Professor David Jordan

Dr Sudheesh Manalil Velayudhan

Dr Andrew Miles

Associate Professor Neena Mitter

Dr Andries Potgieter

Dr Nageswararao (RCN) Rachaputi

Dr Karl Robinson

Associate Professor Daniel Rodriguez

Dr Vijaya Singh

Dr Yongfu Tao

Associate Professor John Thomas

Associate Professor Bruce Topp

Dr Conny Turni

Associate Professor Steven Underhill

Dr Erik Van Oosterom

Dr James Watson

Dr Chung-Chi Wu

Dr Yuchan Zhou

### Director of QAAFI Centre for Plant Science

Senior Research Fellow

Research Officer

Research Officer

Postdoctoral Research Fellow

Principal Research Fellow

Postdoctoral Research Fellow

Research Officer

Principal Research Fellow

Senior Research Fellow

Senior Research Fellow

Postdoctoral Research Fellow

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Research Officer

Principal Research Fellow

Research Officer

Postdoctoral Research Fellow

Principal Research Fellow

Principal Research Fellow

Senior Research Fellow

Principal Research Fellow

Senior Research Fellow

Research Fellow

Research Officer

Research Fellow

## Centre for Animal Science

### Professor Stephen Moore

Associate Professor Patrick Blackall

Dr Brian Burns

Dr Robert Dixon

Dr Mary Fletcher

Dr Geoffry Fordyce

Dr Peter James

Associate Professor Alicja Lew-Tabor

Associate Professor Timothy Mahony

Associate Professor Stuart McLennan

Dr Jessica Morgan

Dr Carol Petherick

Dr Manuel Rodriguez Valle

### Director of QAAFI Centre for Animal Science

Principal Research Fellow

Senior Research Fellow

Senior Research Fellow

Senior Research Fellow

Senior Research Fellow

Senior Research Fellow

Principal Research Fellow

Principal Research Fellow

Principal Research Fellow

Research Fellow

Senior Research Fellow

Senior Research Fellow

## Centre for Nutrition and Food Sciences

### Professor Mike Gidley

Dr Sushil Dhital

Dr Nadia De Jager

Dr Bernadine Flanagan

Dr Glen Fox

Dr Agnelo Furtado

Professor Robert Gilbert

Dr Purnima Gunness

Professor Robert Henry

Dr Marta Martinez-Sanz

Dr Deirdre Mikkelsen

Dr Michael Netzel

Dr Timothy O'Hare

Associate Professor Eugeni Roura

Dr Kinnari Shelat

Dr Heather Smyth

Dr Yasmina Sultanbawa

Dr Barbara Williams

### Director of QAAFI Centre for Nutrition and Food Sciences

Research Fellow

Research Officer

Postdoctoral Research Fellow

Senior Research Fellow

Senior Research Fellow

Professorial Research Fellow

Postdoctoral Research Fellow

Professorial Research Fellow

Postdoctoral Research Fellow

Research Fellow

Senior Research Fellow

Senior Research Fellow

Principal Research Fellow

Research Fellow

Senior Research Fellow

Senior Research Fellow

Senior Research Fellow

# QAAFI Honorary and Adjunct Appointments

## Honorary appointments

Associate Professor Rafat Al Jassim	Honorary Associate Professor
Associate Professor Philip Banks	Honorary Associate Professor
Associate Professor Benjamin Hayes	Honorary Associate Professor
Associate Professor Slade Lee	Honorary Associate Professor
Associate Professor Michael Mackay	Honorary Associate Professor
Dr Francesca Sonni	Honorary Fellow
Dr Francisco Vilaplana	Honorary Fellow
Mr Wai Yong	Honorary Fellow
Professor Frederik Botha	Honorary Professor
Professor Scott Chapman	Honorary Professor
Professor Steven Chen	Honorary Professor
Professor Geoffrey Fincher	Honorary Professor
Professor Mario Herrero	Honorary Professor
Professor Kemal Kazan	Honorary Professor
Honorary Professor Birger Lindberg Møller	Honorary Professor
Professor Maurizio Rosetto	Honorary Professor
Professor Blake Simmons	Honorary Professor
Professor Vincent Vadez	Honorary Professor
Professor Colin Wrigley	Honorary Professor
Dr Ian Chivers	Honorary Senior Fellow
Dr Yingbin He	Honorary Senior Fellow
Dr Ardashir Kharabian-Masouleh	Honorary Senior Fellow
Dr Peter Sopade	Honorary Senior Fellow
Dr Stephen Were	Honorary Senior Research Fellow
Emeritus Professor Roger Swift	Emeritus Professor

## Adjuncts

Associate Professor Ian Bally	Adjunct Associate Professor
Mr Barry Blaney	Adjunct Senior Fellow
Professor Graham Bonnett	Adjunct Professor
Associate Professor David Butler	Adjunct Associate Professor
Dr Rosalind Gilbert	Adjunct Fellow
Dr Lisa-Maree Gulino	Adjunct Fellow
Dr Jagger Harvey	Adjunct Senior Research Fellow C
Professor Wayne Jorgenson	Adjunct Professor
Associate Professor Alison Kelly	Adjunct Associate Professor
Dr Izabela Konczak	Adjunct Senior Fellow
Associate Professor Darren Kriticos	Adjunct Associate Professor
Associate Professor Zivile Luksiene	Adjunct Associate Professor
Associate Professor Emma Mace	Adjunct Associate Professor
Professor Lynne McIntyre	Adjunct Professor
Dr Ram Mereddy	Adjunct Senior Fellow
Dr Michael O'Shea	Adjunct Senior Research Fellow
Dr Selina Ossedryver	Adjunct Fellow
Ms Diane Ouwerkerk	Adjunct Fellow
Dr Sambasivam Periyannan	Adjunct Fellow
Dr Richard Silcock	Adjunct Senior Fellow
Professor John Skerritt	Adjunct Professor
Associate Professor Youhong Song	Adjunct Associate Professor
Associate Professor Neil White	Adjunct Associate Professor
Dr John Wilkie	Adjunct Senior Fellow
Professor Graeme Wright	Adjunct Professor

# QAAFI Affiliates

Dr David Adamson	Affiliated Senior Research Officer	Dr Michael Furlong	Affiliated Associate Professor
Professor Stephen Adkins	Affiliated Professor	Associate Professor Victor Galea	Affiliated Associate Professor
Associate Professor Elizabeth Aitken	Affiliate Associate Professor	Associate Professor John Gaughan	Affiliated Associate Professor
Dr Stephen Anderson	Affiliated Senior Lecturer	Professor Elizabeth Gillam	Affiliated Professor
Professor Stephen Barker	Affiliated Professor	Professor Ian Godwin	Affiliated Professor
Professor Ross Barnard	Affiliated Professor	Dr Margaret Hardy	Affiliated Research Fellow
Professor Kaye Basford	Affiliated Professor	Dr Christopher Lambrides	Affiliated Research Fellow
Professor Michael Bell	Affiliated Professorial Res Fellow	Professor Neal Menzies	Affiliated Professor
Professor Christine Beveridge	Affiliated Professor	Professor Murray Mitchell	Affiliated Academic Level E
Professor Jose Botella	Affiliated Professor	Professor Dennis Poppi	Affiliated Professor
Professor Wayne Bryden	Affiliated Professor	Dr Simon Quigley	Affiliated Research Fellow
Professor Bernard Carroll	Affiliated Professor	Professor Peer Schenk	Affiliated Professor
Dr Judy Cawdell-Smith	Affiliated Senior Fellow	Professor Susanne Schmidt	Affiliated Professor
Dr Marisa Collins	Affiliated Senior Fellow	Dr Harry Shelton	Affiliate Associate Professor
Dr Bruce D'Arcy	Affiliated Senior Fellow	Professor Bradley Sherman	Affiliated Professor
Dr Mark Dieters	Affiliated Senior Fellow	Associate Professor Kathryn Steadman	Affiliated Associate Professor
Dr Marina Fortes	Affiliated Research Fellow	Dr Mark Turner	Affiliated Associate Professor
Professor Shu Fukai	Affiliated Professor	Dr Olivia Wright	Affiliate Lecturer

# QAAFI Research Higher Degree students in 2015-2016

## Principally enrolled in Australian Institute of Bioengineering & Nanotechnology

First Name	Last Name	Program	Project Title	Advisor Role	Advisor Full Name
Yusilawati	Ahmad Nor	PhD	A novel multi-functional nano-biomaterials platform for bone therapeutic applications	Associate	Dr Donna Mahony
Weiyu	Chen	PhD	Development of a novel vaccine nano-adjuvant system to enhance immunity against Tumours	Associate	A/Prof. Timothy John Mahony
Manasi	Jambhrunkar	PhD	Protein delivery using designer peptide hydrogels	Associate	A/Prof. Neena Mitter
Liang	Zhao	PhD	Bioengineering of protein-modified nanoparticles on immune reactions	Associate	A/Prof. Neena Mitter

## Principally enrolled in Queensland Alliance for Agriculture & Food Innovation

First Name	Last Name	Program	Project Title	Advisor Role	Advisor Full Name
Muhammad Umair	Ahsan	PhD	Exploring the molecular control of the juvenile to adult phase change in subtropical/tropical trees	Principal	A/Prof. Neena Mitter
				Associate	Dr Alice Hayward
Jing	Ai	PhD	Techniques for delivery of high-moisture lower energy density shelf-stable rice snacks	Principal	Prof Mike Gidley
Galih Kusuma	Aji	MPhil	Relationship between salivary α-amylase activity and sweet taste sensitivity	Principal	A/Prof. Eugeni Roura
				Associate	Dr Frederick Warren
Samir	Alahmad	PhD	Rapid trait pyramiding in durum wheat ( <i>triticum turgidum</i> )	Principal	Dr Lee Thomas Hickey
Fahad	Al-Asmari	PhD	Assessment of natural antimicrobials and photosensitization on the microbial contamination of dates ( <i>Phoenix doctylifera</i> L.)	Principal	Dr Yasmina Sultanbawa
				Associate	Dr Kinnari Jigneshkumar Shelat
Fahad	Alderees	PhD	Elucidating mechanisms of antimicrobial activity of Australian native plant extracts	Principal	Dr Yasmina Sultanbawa
Mubarak Abkar H.	Alzubaidi	PhD	Biotechnological approach to isolate and identify <i>Ixodes holocyclus</i> (Australian paralysis tick) proteins implicated in tick-host interactions for the development of anti-tick treatments	Principal	Dr Manuel Rodriguez Valle
				Associate	A/Prof. Alicja Elzbieta Lew-Tabor
Naveenkumar	Athiyannan	PhD	Molecular genetic characterisation of a broad stem rust resistance gene derived from the D genome progenitor <i>Aegilops tauschii</i> of bread wheat	Associate	Dr Lee Hickey
Hayba	Badro	PhD	Applications of Genotyping by Sequencing in rice	Principal	Prof. Robert Henry
Yeming	Bai	PhD	Mechanistic exploration of effects of ginseng (a traditional Chinese food additive and medicine) on the digestion rate of starch containing foods	Principal	Prof. Robert Gilbert
Rewati	Bhattarai	PhD	Effect of food structure on enzymatic digestion of starches	Principal	Prof. Mike Gidley
				Associate	Dr Sushil Dhital
Marta	Brozynska	PhD	Genomic characterization of Australian wild rice species	Principal	Prof. Robert Henry
				Associate	Dr Agnelo Furtado

First Name	Last Name	Program	Project Title	Advisor Role	Advisor Full Name
Paula Georgina	Calvo Brenes	PhD	Factors affecting colour in zeaxanthin-biofortified sweet-corn	Principal	Dr Timothy O'Hare
				Associate	Dr Kinnari Shelat
Carla	Castro Tabilo	MPhil	Influence of training procedures on amino acid and sweetener preferences in pigs	Principal	A/Prof. Eugeni Roura
Mridusmita	Chaliha	PhD	A metabolomic approach to assess the efficacy of Australian native plant extracts in intervening spoilage in a model feed system	Principal	Dr Yasmina Sultanbawa
				Associate	Dr Heather Smyth
Si-Qian	Chen	PhD	Comparison of the structure and mechanical properties of bacterial cellulose produced by different <i>Gluconacetobacter xylinus</i> strains	Principal	Prof. Mike Gidley
				Associate	Dr Deirdre Mikkelsen
				Associate	Dr Patricia Lopez-Sanchez
Bing	Cheng	PhD	Genetic and environmental factors influencing coffee quality	Principal	Prof. Robert Henry
				Associate	Dr Heather Smyth
Sungbo	Cho	PhD	Nutrient specific appetite in feather pecking hens	Principal	A/Prof. Eugeni Roura
				Associate	Dr Jun-Mo Kim
William	Davidson	MPhil	Alternative uses of group H and L herbicides on glyphosate-resistant weed species	Principal	Dr Bhagirath Chauhan
Eric	Dinglasan	PhD	Understanding the genetic control of quantitative resistance to yellow spot ( <i>Pyrenophora tritici-repentis</i> ) in wheat ( <i>Triticum aestivum</i> L.)	Principal	Dr Lee Hickey
Trung Kien	Do	PhD	Investigation of disease resistance mechanisms in mango and related species	Principal	Dr Elizabeth Dann
Patricia	Eats	PhD	Understanding the molecular basis of differing the virulence potential of bovine herpesviruses	Principal	A/Prof. Timothy Mahony
Mesfin Dejene	Ejigu	PhD	Utilization of crop residues as ruminant feeds and/or for conservation forming in crop - livestock farming systems	Principal	Dr Robert Dixon
Titilayo Diana	Falade	PhD	Aflatoxin detection using Near-infrared Spectroscopy and High Performance Liquid Chromatography - correlations and implications in reduction of aflatoxin contamination through sorting	Principal	Dr Glen Fox
				Associate	Dr Jagger Harvey
				Associate	Dr Mary Fletcher
				Associate	Dr Yasmina Sultanbawa
Shulang	Fei	PhD	Identification of candidate genes for blackleg resistance in canola ( <i>Brassica napus</i> )	Principal	A/Prof. Neena Mitter
				Associate	Dr Myrna Constantin
Guangli	Feng	PhD	Bacteria mediated metabolism of polysaccharides and associated micronutrients in plant cell walls under in vitro and in vivo large intestine conditions	Principal	Prof. Mike Gidley
				Associate	Dr Barbara Williams
				Associate	Dr Bernadine Flanagan
				Associate	Dr Deirdre Mikkelsen
Andrew	Ferguson	PhD	Immunogenetic differences underlying susceptibility of cattle to respiratory disease	Principal	A/Prof. Timothy Mahony
Andrew Lincoln	Fletcher	PhD	Understanding transpiration efficiency in wheat to enhance future breeding	Principal	Dr Karine Chenu
				Associate	Dr Jack Christopher



First Name	Last Name	Program	Project Title	Advisor Role	Advisor Full Name
Ryan	Fowler	PhD	Pathogenicity of Net Form of Net Blotch ( <i>Pyrenophora teres f. teres</i> )	Principal	Dr Lee Hickey
Minghai	Fu	PhD	Manipulation of the preference of piglets for herbal compounds through maternal flavour conditioning to decrease the use of feed antibiotics	Principal	A/Prof. Eugeni Roura
				Associate	Dr Nadia De Jager
Ghanendra	Gartaula	PhD	Relationship between cereal dietary fibre solubility and phenolic compounds: Methods of increasing the amount of soluble dietary fiber in cereal flours to improve bioactive function	Principal	Prof. Mike Gidley
				Associate	Dr Gabriele Netzel
				Associate	Dr Sushil Dhital
Mekonnen	Gebremariam	PhD	Enabling rational food design by connecting dynamic sensory perception, oral physiology and food oral processing	Principal	Dr Heather Smyth
Geetika		MPhil	Role of photosynthesis in determination of genotypic differences in transpiration efficiency in sorghum	Principal	Dr Erik van Oosterom
				Associate	Prof. Graeme Hammer
Madeleine	Gleeson	PhD	Regulation of adventitious rooting in avocado for improved clonal propagation technologies	Principal	A/Prof. Neena Mitter
				Associate	Dr Alice Hayward
Cecile	Godde	PhD	Assessing the potential for pasture intensification in the tropics	Principal	A/Prof. Daniel Rodriguez
				Associate	Dr Randall B Boone
John	Gorham	PhD	Microbial interaction with plant cell walls	Principal	Dr Deirdre Mikkelsen
				Associate	Dr Barbara Williams
				Associate	Prof. Mike Gidley
Lucas	Grant	PhD	Elucidating the relationship between the physico-chemical structures of dietary fibres and the molecular profiling and function of gut microbial communities	Principal	Dr Barbara Williams
				Associate	Dr Deirdre Mikkelsen
				Associate	Prof. Mike Gidley
Mingxia	Han	PhD	Carotenoid bioavailability related to molecular organisation	Principal	Prof. Mike Gidley
				Associate	Dr Timothy O'Hare
Pengfei	Han	PhD	The Australian pork meat flavour: the flavour wheel, retronasal release and satiety	Principal	A/Prof. Eugeni Roura
Solomon	Hassen	PhD	Rules and incentives: managing risks and opportunities in maize-legume dominant farming systems of central and southern Ethiopia	Principal	A/Prof. Daniel Rodriguez
				Associate	Dr John Dimes
Adam	Healey	PhD	Analysis of variation in genes for biofuel traits in the Eucalypt genome	Principal	Prof. Robert Henry
Jayeni	Hiti Bandaralage	PhD	Tissue culture as an efficient, cost effective and disease free alternative for clonal avocado rootstock production	Principal	A/Prof. Neena Mitter
				Associate	Dr Alice Hayward
Nam Van	Hoang	PhD	Analysis of genes controlling the biomass traits in the sugarcane genome	Principal	Prof. Robert Henry
				Associate	Dr Agnelo Furtado
Colleen	Hunt	PhD	Statistical analysis of sorghum breeding trials with complex genetic components	Principal	Prof. David Jordan

First Name	Last Name	Program	Project Title	Advisor Role	Advisor Full Name
Amjad	Iqbal	PhD	Dietary manipulation of nutrient-specific appetite in broiler chickens	Principal	A/Prof. Eugeni Roura
Dilani	Jambuthenne Gamaralalage	PhD	Mining novel genes for adult plant resistance to stripe rust in wheat landraces	Principal	Dr Lee Hickey
Thomas	Karbanowicz	PhD	Biotechnological approach to isolate and identify <i>Ixodes holocyclus</i> (Australian paralysis tick) proteins implicated in tick - host interactions for the development of anti-tick treatments	Principal	Dr Manuel Rodriguez Valle
				Associate	A/Prof. Alicja Lew-Tabor
Emmy Hainida	Khairul Ikram	PhD	Evaluation of potential health benefits of different Papaya Cultivars selected in vitro assays	Principal	Dr Michael Netzel
				Associate	A/Prof. Roger Stanley
Wanporn	Khemmuk	PhD	The co-evolution of wild rice and its pathogens	Principal	Dr Andrew Geering
				Associate	Prof. Robert Henry
Tom Danga	Kukhang	PhD	Genetic analyses of an 8 x 8 set of full diallele crosses and mass propagation via somatic embryogenesis of elite ( <i>Coffea Arabica L.</i> ) hybrids from the CIC Coffee Breeding Program	Principal	Prof Robert Henry
				Associate	Dr Agnelo Furtado
Emily Kathryn	Lancaster	PhD	Epidemiology, impact and management of myrtle rust in Lemon Myrtle plantations	Principal	Prof. Andre Drenth
Hongyan	Li	PhD	Rice proteins: value adding through new science	Principal	Prof. Robert Gilbert
Zhi Xian	Lim	PhD	Topical application of bioclay to protect crop plants from insect pests	Principal	A/Prof. Neena Mitter
				Associate	Dr Karl Robinson
Dongjie	Liu	PhD	Effect of plant tissue drying on nutrient release	Principal	Prof. Mike Gidley
				Associate	Dr Patricia Lopez-Sanchez
Mukund	Madhav	PhD	Transinfection of buffalo flies with Wolbachia and characterisation of its biological effects	Principal	Dr Peter James
Annelie	Marquardt	PhD	The molecular analysis of yellow canopy syndrome-induced yellowing in the sugarcane leaf	Principal	Professor Frederik Botha
				Associate	Prof. Robert Henry
Patrick John	Mason	PhD	Diversifying cane sugar production systems: identifying carbon partitioning in a number sugar cane varieties in order to optimize production for a number of processes	Principal	Prof. Robert Henry
				Associate	Professor Frederik Botha
				Associate	Dr Agnelo Furtado
James	McLean	MPhil	Proximal and remote sensing as tools to assist data collection in extensive maize and sorghum agronomic trials	Principal	A/Prof. Daniel Rodriguez
				Associate	Dr Andries Potgieter
Oliver	Meldrum	PhD	Defining the disassembly of plant cell walls and component polysaccharides within the digestive tract, their influence on the resident microflora and the host immune system	Principal	Prof. Mike Gidley
Anahita	Mizani	PhD	Towards high density production systems for mango: architectural analysis of vigour management techniques	Principal	A/Prof. Jim Hanan
				Associate	Dr Ian Bally
Ali	Mohammad Moner	PhD	Exploring gene diversity in the genome of wild rice populations	Principal	Prof. Robert Henry
				Associate	Dr Agnelo Furtado
Jarud	Muller	MPhil	Hydration as a factor in survival of neonatal calves in tropical Australia	Principal	Dr Geoffrey Fordyce



First Name	Last Name	Program	Project Title	Advisor Role	Advisor Full Name
Merran	Neilsen	PhD	Mechanisms of cultivar-and race-based disease resistance in avocado	Principal	Prof. Andre Drenth
				Associate	Dr Elizabeth Dann
Shahram	Niknafs	PhD	Nutrient-specific appetite in poultry	Principal	A/Prof. Eugeni Roura
Ravi	Nirmal	PhD	Genomics of wheat quality for bread production.	Principal	Prof. Robert Henry
				Associate	Dr Agnelo Furtado
Daniel	O'Connor	PhD	Integration of rapid phenotyping and genotyping tools for peanut genetic improvement	Principal	Dr RCN (Nageswararao) Rachaputi
				Associate	Dr Agnelo Furtado
				Associate	Prof. Robert Henry
Katie	O'Connor	PhD	Application of genomics in genetic improvement of Macadamia	Principal	Prof. Robert Henry
				Associate	A/Prof. Bruce Topp
				Associate	Dr Craig Hardner
Adam	O'Donoghue	PhD	The role of lycopene and ketosamines in tomatoes as a protective agent against prostate cancer	Principal	Dr Timothy O'Hare
Sarah Karen	Osama	PhD	Identifying genes for resistance to pre-harvest sprouting and black point in barley ( <i>Hordeum vulgare</i> )	Principal	Dr Glen Fox
Rousset	Palou Egoaguirre	PhD	Use of plant derived compounds to condition piglet intake at weaning and reduce post-weaning use of therapeutics	Principal	A/Prof. Eugeni Roura
				Associate	Dr Conny Turni
Louisamarie	Parkinson	PhD	Investigating avocado tree mortality during early field establishment	Principal	Dr Elizabeth Dann
				Associate	Mr Alistair McTaggart
Nia	Patriyawaty	MPhil	Impact of abiotic factors on reproductive growth and development of mung bean ( <i>Vigna Radiatia</i> )	Joint Principal	Dr RCN (Nageswararao) Rachaputi
				Associate	Mr Colin Douglas
Anh Dao	Phan	PhD	Mango wine processing: Influences of enzyme treatments and processing steps on volatile aroma compounds and sensory quality	Associate	Dr Gabriele Netzel
				Associate	Prof. Mike Gidley
David	Poppi	PhD	Elucidation of the roles and requirements of sulphur amino acids in the diet of barramundi	Principal	Prof. Stephen Moore
				Associate	Mr Brett Glencross
Prudence	Powell	PhD	A plant model for diabetes	Principal	Prof. Robert Gilbert
				Associate	Dr Frederick Warren
Vishal	Ratanpaul	PhD	Cereal food innovation through understanding mechanisms underlying nutritional value	Principal	Prof. Mike Gidley
				Associate	Dr Barbara Williams
Andres	Reyes Ponce	PhD	The physiological basis of genetic improvement in maize yield in the US Corn Belt	Principal	Prof. Graeme Hammer
				Joint Principal	Dr Erik van Oosterom
Adnan	Riaz	PhD	Harnessing novel sources of adult plant resistance to leaf rust in wheat	Principal	Dr Lee Hickey
Cecile	Richard	PhD	Delivery of wheat root traits that contribute to water limited yield stability	Principal	Dr Jack Christopher
				Joint Principal	Dr Lee Hickey
				Associate	A/Prof. Andrew Kenneth Borrell
				Associate	Dr Karine Chenu

First Name	Last Name	Program	Project Title	Advisor Role	Advisor Full Name
Hannah	Robinson	PhD	Investigating root traits to improve drought adaptation in barley	Principal	Dr Lee Hickey
				Associate	A/Prof. Andrew Borrell
				Associate	Dr Glen Fox
Caspar	Roxburgh	PhD	Nutrient management under conservation agriculture systems in semi-arid areas of Queensland and Southern/Eastern Africa	Principal	A/Prof. Daniel Rodriguez
Samira	Samarfard	PhD	Interactions of viral and host proteins as novel targets for plant disease resistance	Principal	A/Prof. Ralf Dietzgen
Solomon	Seyoum	PhD	Characterization of production environments and genotypes to improve selection for drought and heat adaptation of maize in Sub-Saharan Africa and Australia	Principal	Dr RCN (Nageswararao) Rachaputi
Reema	Singh	PhD	Develop a MALDI-TOF serotyping method for <i>P. multocida</i> and <i>H. parasuis</i> that can be applied by front line diagnostic laboratories	Principal	Dr Conny Turni
				Associate	Dr Brett Hamilton
				Associate	Dr Mary Fletcher
Saira	Sultan	PhD	Breakdown of indospicine residues in meat products through processing and effects on its in vitro bioaccessibility and absorption.	Principal	Dr Mary Fletcher
				Associate	Dr Gabriele Netzel
				Associate	Dr Michael Netzel
Lijun	Sun	PhD	Studying the effect of phytochemicals on starch digestion in vitro and in vivo	Principal	Prof. Mike Gidley
				Associate	Dr Frederick Warren
Wenny-Bekti	Sunarharum	PhD	The compositional basis of coffee flavour	Principal	Dr Heather Smyth
				Associate	Dr Glen Fox
Abhijeet	Survase	PhD	Genomic strategies for reducing losses during processing and improving the nutritional value of wheat in human diet	Principal	Prof. Robert Henry
				Associate	Dr Agnelo Furtado
Eddie	Tan	PhD	Food Safety Assessment of Indospicine	Principal	Dr Mary Fletcher
Benigni	Temba	PhD	Tracking factors influencing Aflatoxin contamination profile along the maize value chain in Tanzania	Principal	Dr Mary Fletcher
				Associate	Dr Glen Fox
				Associate	Dr Jagger Harvey
				Associate	Dr Yasmina Sultanbawa
Pridhuvi	Thavaraj	PhD	Investigating the effect of casein micelle size on the physico-chemical and functional properties of milk gels	Principal	A/Prof. Eugeni Roura
				Associate	Prof. Mike Gidley
Tiparat	Tikapunya	PhD	Grain quality of Australian wild rice compared to domesticated rice	Principal	Prof. Robert Henry
				Associate	Dr Agnelo Furtado
				Associate	Dr Glen Fox
				Associate	Dr Heather Smyth
Alemu	Tirfessa Woldentensaye	PhD	Identification of sorghum plant types adapted to moisture stress areas in Ethiopia	Principal	Dr Erik van Oosterom
				Associate	Prof. David Jordan
				Associate	Prof. Graeme Hammer
Benjamin	Toft	PhD	Understanding macadamia architectural development and responses to manipulation to improve productivity and profitability	Principal	A/Prof. Jim Hanan
				Associate	A/Prof. Bruce Topp
				Associate	Mr John Wilkie



First Name	Last Name	Program	Project Title	Advisor Role	Advisor Full Name
Nga	Tran	PhD	Identity, population biology and development of molecular diagnostic tools for early detection and control of the citrus scab fungus <i>Elsinoe spp</i>	Principal	Prof. Andre Drenth
				Associate	A/Prof. Ralf Dietzgen
				Associate	Dr Andrew Miles
Thi Minh Hue	Tran	PhD	Genetics of biochemical compounds determining arabica coffee ( <i>C. arabia L.</i> ) quality	Principal	Prof. Robert Henry
				Associate	Dr Agnelo Furtado
				Associate	Dr Heather Smyth
Peterson	Wambugu	PhD	Analyzing molecular genetic diversity of cultivated and wild rice species	Principal	Prof. Robert Henry
				Associate	Dr Agnelo Furtado
Ji	Wang	MPhil	Bitter taste sensitivity and feed intake in pigs	Principal	A/Prof. Eugeni Roura
Ming	Wang	PhD	Pattern-oriented modelling of biological systems in Australian orchards	Principal	A/Prof. Jim Hanan
				Associate	Mr John Wilkie
				Associate	Mr Neil White
Xuemin	Wang	PhD	Enhancing genomic selection through the use of crop modelling	Principal	Prof. David Jordan
				Associate	Prof. Graeme Hammer
Amy	Watson	PhD	Understanding the genetics of grain quality and development of new breeding methodologies in wheat ( <i>Triticum aestivum L.</i> )	Principal	Dr Lee Hickey
				Associate	Dr Jack Christopher
Shirani	Widana Gamage	PhD	Thrips-tospovirus interactions	Principal	A/Prof. Ralf Dietzgen
Elizabeth	Worrall	PhD	Crop protection through topical application of clay based nanoparticles to deliver RNAi	Principal	A/Prof. Neena Mitter
				Associate	Dr Jagger Harvey
Samantha	Yap	PhD	The evolution of Australia's modern rainforest assemblages: competitive advantage vs rapid invasions	Principal	Prof. Maurizio Rossetto
				Associate	Prof. Robert Henry
Shiyao	Yu	PhD	Genetically modified corn using site directed mutagenesis	Principal	Prof. Robert Gilbert
				Associate	Prof. Robert Henry
Wen Wen	Yu	PhD	Towards new means of prevention and health maintenance for diabetes: new characterization techniques for starch and glycogen	Principal	Prof. Robert Gilbert
				Associate	Dr Glen Fox
				Associate	Prof. Mike Gidley
Honglei	Zhai	PhD	In vivo and in vitro studies of cereal grain effects on lipid metabolism	Principal	Prof. Mike Gidley
				Associate	Dr Purnima Gunness
Laura	Ziems	PhD	Dissecting the genetic interactions associated with Rph20 resistance to leaf rust ( <i>Puccinia hordei</i> ) in barley	Principal	Dr Lee Hickey
				Associate	Prof. Robert Park
Wei	Zou	PhD	Starches with improved nutritional and material properties	Principal	Prof. Robert Gilbert
				Associate	Prof. Mike Gidley

## Principally enrolled in School of Agriculture and Food Sciences

First Name	Last Name	Program	Project Title	Advisor Role	Advisor Full Name
Faisal	Alsenani	PhD	Screening and isolation of natural health products and new antibiotics from microalgae	Associate	Dr Michael Netzel
Tiago	Alves Correa Carvalho da Silva	PhD	Feeding strategies for the early-weaned calf	Associate	A/Prof. Stuart McLennan
Monia	Anzooman	PhD	Understanding physiological basis for wheat genotypes adaption on sodic, magnesic or dispersive soils	Associate	Dr Jack Christopher
Courtney	Bailey	PhD	Consumer insights to increase the success of Australian red meat products into China	Associate	Dr Heather Smyth
Ali Ahsan	Bajwa	PhD	Exploring the mechanism of <i>Parthenium hysterophorus</i> invasion in Pakistan	Associate	Dr Bhagirath Chauhan
Maria	Botero-Urbe	PhD	Developing a potato value chain from the raw material to the processed chip	Associate	Prof. Robert Gilbert
Jason	Ferguson	PhD	Optimising coarser sprays to reduce drift and improve efficacy in Australian cropping systems	Associate	Dr Bhagirath Chauhan
Deborah	Fisher	PhD	Ecology of <i>chloris spp.</i> weed seeds in southern and central Queensland broadacre cropping systems	Associate	Dr Bhagirath Chauhan
Nadeem	Iqbal	PhD	Development of organic herbicides by evaluating the allelopathic potential of some Australian native plants	Associate	Dr Bhagirath Chauhan
Lara-Simone	Pretorius	PhD	Identifying the phytotoxic metabolites of <i>Fusarium oxysporum</i> to develop new approaches for disease resistance in plants	Associate	A/Prof. Neena Mitter
Skye	Puskarz Thomas	PhD	Value chains and business models for red meat in Asia A.CIS 0048	Associate	Dr Andrew Geering
Anh	San	PhD	Aroma production in the mango fruit ripening process	Associate	Prof. Robert Gilbert
Benjamin	Schofield	PhD	A comparative study of the microbial functional genomics in the gastro-intestinal tracts of cattle and kangaroos	Associate	Dr Heather Smyth
Yadav	Sharma Bajagai	PhD	Effects of probiotics on productivity and health of poultry	Associate	Ms Diane Ouwerkerk
Nghia Khang	Tran	PhD	Bioactive compounds from rice bran	Associate	Ms Diane Ouwerkerk
Lourdes	Urban Alandete	PhD	Developing methods to maximize the shelf life of manufactured food products containing whole grains	Associate	Prof. Mike Gidley
Lu	Yu	PhD	Extending the shelf life of rice foods using high pressure processing	Associate	Prof. Mike Gidley
				Associate	Prof. Robert Gilbert

## Principally enrolled in School of Biological Sciences

First Name	Last Name	Program	Project Title	Advisor Role	Advisor Full Name
Tinashe	Chabikwa	PhD	An investigation into the role of sugars and hormones in plant architectural development from a molecular perspective	Associate	A/Prof. Jim Hanan
Tahsha	Say	PhD	Elucidating the molecular mechanisms underlying sponge-microbial signalling during settlement of <i>Amphimedon queenslandica</i> larvae	Associate	A/Prof. Eugeni Roura

## Principally enrolled in School of Chemical Engineering

First Name	Last Name	Program	Project Title	Advisor Role	Advisor Full Name
Piyali	Chakraborty	PhD	Tribology and sensory science of meal replacement beverages	Associate	Dr Heather Smyth

## Principally enrolled in School of Chemistry and Molecular Biosciences

First Name	Last Name	Program	Project Title	Advisor Role	Advisor Full Name
Jiangling	Cao	PhD	Genetic and molecular analysis of long-distance gene silencing in <i>arabidopsis</i>	Associate	A/Prof. Neena Mitter
Liang	Fang	PhD	Campylobacter typing/identification	Associate	A/Prof. Patrick Blackall
Chin Hong	Lee	PhD	Nonsense-mediated decay (NMD) is involved in epigenetic regulation of gene expression in <i>Arabidopsis thaliana</i>	Associate	A/Prof. Neena Mitter
To Loan	Nguyen	PhD	Whole genome differential gene expression and marker discovery associated with pubertal development in beef cattle	Associate	Prof. Stephen Moore

## Principally enrolled in School of Medicine

First Name	Last Name	Program	Project Title	Advisor Role	Advisor Full Name
Vincent	Lal	PhD	Health risk assessment of mixed contaminants: Interaction of metals on the uptake of poly-aromatic hydrocarbons (PAHs) in human liver cells	Associate	Dr Mary Fletcher

## Principally enrolled in School of Veterinary Science

First Name	Last Name	Program	Project Title	Advisor Role	Advisor Full Name
Leena	Awawdeh	PhD	Studies on avian pathogenic <i>Escherichia coli</i> in commercial broiler chickens in Southeast Queensland	Associate	Dr Conny Turni
Kate	Chaplin	PhD	A Hoof Tele-Health System: Using mobile phone image capture technology to remotely diagnose lameness lesions in dairy cows	Associate	Dr Tamsin Barnes
Lesley	Duffy	PhD	Campylobacter in poultry processing, selection and survival	Associate	A/Prof. Patrick Blackall
Kieren	McCosker	PhD	Risk factors affecting the reproductive outcome of beef breeding herds in Northern Australia	Associate	Dr Geoffrey Fordyce
Helen	Owen	MPhil	Characterization of expert's use of pathophysiological principles to improve teaching and assessment of clinical reasoning in pre-clinical years of a veterinary science program	Associate	Dr Tamsin Barnes
David	Wakeham	PhD	Multidrug resistant pathogenic <i>Escherichia coli</i> isolated from livestock - significance to animal and public health	Associate	Prof. David Jordan

## QAAFI students who have completed their PhD program in 2015

First Name	Last Name	Program	Project Title	Degree Award Date	Advisor Role	Advisor Full Name
Iu	Benet Duran	PhD	Analytical and sensory evaluation of pork cooked ham volatiles: Variations related to meat lipid profiles	03/12/2015	Principal	A/Prof. Eugeni Roura
Peter	Gous	PhD	Is starch structure and function affected by biosynthesis in genotypes expressing drought tolerance?	05/06/2015	Principal	Prof. Robert Gilbert
Karen	Hay	PhD	Epidemiology of bovine respiratory disease in Australian feedlot cattle	27/03/2015	Principal	Dr Tamsin Barnes
Cheng	Li	PhD	Facilitating the process of controlling starch structure through starch-branching enzymes	30/07/2015	Principal	Prof. Robert Gilbert
Ming	Li	PhD	Effect of starch structure on the processing, mechanical properties and biodegradability of thermoplastic starch films	30/01/2015	Principal	Prof. Robert Gilbert
Yanwen	Low	PhD	Phytonutrient bioaccessibility and metabolism in vitro and in vivo	05/06/2015	Associate	Prof. Mike Gidley, Dr Barbara Williams

First Name	Last Name	Program	Project Title	Degree Award Date	Advisor Role	Advisor Full Name
Karishma	Mody	PhD	Development of Nanoparticle based Vaccine Delivery Systems	09/10/2015	Principal	A/Prof. Neena Mitter
Anton	Pluschke	PhD	The impact of soluble dietary fibre on elements of digestive physiology	05/06/2015	Principal	Prof. Mike Gidley
Meghan	Schibrowski	PhD	Mycoplasma bovis in Australian feeder cattle	10/04/2015	Principal	Dr Tamsin Barnes
Murray	Sharman	PhD	Epidemiology and genetic diversity of Tobacco streak virus and related subgroup 1 ilarviruses	06/11/2015	Principal	A/Prof. John Thomas
Kai	Wang	PhD	Relationship between starch structure and biosynthesis	05/06/2015	Principal	Prof. Robert Gilbert
Chung-Chi	Wu	PhD	Theory of Starch Biosynthesis and their structures for the rational design of starches: A mathematical modelling approach	08/05/2015	Principal	Prof. Robert Gilbert
Tao	Xu	PhD	Identification, expression and characterisation of Rhipicephalus (Boophilus) microplus Serine Protease Inhibitors (Serpins)	28/05/2015	Principal	Dr Manuel Rodriguez Valle
Bin	Zhang	PhD	Molecular organisation, physical and digestion properties of less-ordered starch matrices	24/04/2015	Principal	Prof. Mike Gidley

# Publications

## Book Chapter

- Chenu, K. (2015). Characterising the crop environment – nature, significance and applications. In Victor O. Sadras, Daniel F. Calderini (Eds.), *Crop physiology: applications for genetic improvement and agronomy* 2nd ed. (pp. 321-348). London, United Kingdom: Academic Press.
- Dimes, J., Rodriguez, D. & Potgieter, A. (2015). Raising productivity of maize-based cropping systems in eastern and southern Africa: Step-wise intensification options. In Sadras, Victor O, Calderini, Daniel F (Eds.), *Crop Physiology Applications for Genetic Improvement and Agronomy* 2nd ed. (pp. 93-110). United States of America: Elsevier: Academic Press.
- Innes, D., Dillon, N., Smyth, H., Karan, M., Holton, T., Bally, I. et al. (2015). Mangomics: Information systems supporting advanced mango breeding. In Thangadurai, Devarajan, Sangeetha, Jeyabalan (Eds.), *Genomics and Proteomics - Principles, Technologies, and Applications* (pp. 281-307). Oakville, Ontario, Canada: Apple Academic Press/CRC Press.
- Martre, P., Quilot-Turion, B., Luquet, D., Ould-Sidi Memmah, M., Chenu, K. & Debaeke, P. (2015). Model assisted phenotyping and ideotype design. In Victor Sadras, Daniel Calderini (Eds.), *Crop physiology: applications for genetic improvement and agronomy* 2nd ed. (pp. 349-373). London, United Kingdom: Academic Press.
- Nevo E and Henry RJ (2015) Global warming and evolution of wild cereals. *Crop Wild Relatives and Climate Change Crop*, First Edition, Eds. Redden R, Yadav SS, Maxted N, Ehsan Dullloo M, Guarino L and Smith. P, Wiley, Hoboken, pp 44-60.

## Conference Paper

- Cooper, T., Furtado, A., Henry, R. & Crayn, D. (2015). Analysis of the chloroplast genome of a coffee relative from northern Australia. In *Acta Horticulturae*. International Horticultural Congress, Brisbane, QLD, Australia, (177-182). 17-22 August 2014.
- Moeiniyan Bagheri, S., Smith, G. & Hanan, J. (2015). Using Z in the development and maintenance of computational models of real-world systems. In Carlos Canal, Akram Idani (Eds.), *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*. 12th International Conference on Software Engineering and Formal Methods, Grenoble, France, (36-53). 1 - 2 September 2014.
- Russell, D., Bignell, G., Neal, J. & Topp, B. (2015). Testing low chill peaches and nectarines in subtropical and temperate Queensland, Australia. In C. Xiloyannis, P. Inglese, G. Montanaro (Eds.), *Acta horticulturae*. 8th International Peach Symposium, Matera, Italy, (357-360). 17-20 June 2013.
- Sultanbawa, Y., Duong, M., Sanderson, J., Cusack, A., Chaliha, M., Currie, M. et al. (2015). Evaluation of packaging films to extend storage life of Indigenous Australian vegetables and herbs. In J. D. H. Keatinge, R. Srinivasan, M. Mecozzi (Eds.), *Acta Horticulturae*. International Horticultural Congress, Brisbane, QLD, Australia, (183-189). 17-22 August 2015.
- Williams, D., Pun, S., Alotaibi, N., O'Hare, T. & Sultanbawa, Y. (2015). Benzyl isothiocyanate: maximising production in papaya tissue extracts. In T. J. O'Hare, M. E. Netzel (Eds.), *Acta Horticulturae*. International Horticultural Congress, Brisbane, QLD, Australia, (101-107). 17-22 August 2014.

## Journal Article

- Abberton, M., Batley, J., Bentley, A., Bryant, J., Cai, H., Cockram, J. et al. (2015). Global agricultural intensification during climate change: a role for genomics. *Plant Biotechnology Journal*: 1-4.
- Ahmad Nor, Y., Niu, Y., Karmakar, S., Zhou, L., Xu, C., Zhang, J. et al. (2015). Shaping nanoparticles with hydrophilic compositions and hydrophobic properties as nanocarriers for antibiotic delivery. *ACS Central Science*, 1: 328-334.
- Anacleto, R., Cuevas, R., Jimenez, R., Llorente, C., Nissila, E., Henry, R. et al. (2015). Prospects of breeding high-quality rice using post-genomic tools. *Theoretical and Applied Genetics*, 128(8): 1449-1466.
- Andersson, L., Archibald, A., Bottema, C., Brauning, R., Burgess, S., Burt, D. et al. (2015). Coordinated international action to accelerate genome-to-phenome with FAANG, the Functional Annotation of Animal Genomes project. *Genome Biology*, 16(1): 1-6.
- Bejerman, N., Giolitti, F., de Breuil, S., Trucco, V., Nome, C., Lenardon, S. et al. (2015). Complete genome sequence and integrated protein localization and interaction map for alfalfa dwarf virus, which combines properties of both cytoplasmic and nuclear plant rhabdoviruses. *Virology*, 483: 275-283.
- Benet, I., Ibanez, C., Guardia, M., Sola, J., Arnau, J. & Roura, E. (2015). Optimisation of stir-bar sorptive extraction (SBSE), targeting medium and long-chain free fatty acids in cooked ham exudates. *Food Chemistry*, 185: 75-83.
- Betts, N., Fox, G., Kelly, A., Cruickshank, A., Lahnstein, J., Henderson, M. et al. (2015). Non-cellulosic cell wall polysaccharides are subject to genotype times environment effects in sorghum (*Sorghum bicolor*) grain. *Journal of Cereal Science*, 63: 64-71.
- Blackburn, G. (2015). One-stop shopping for government services: strengths and weaknesses of the Service Tasmania experience. *International Journal of Public Administration*: 1-11.
- Boe-Hansen G.B., Rego J.P.A., Crisp, J., Moura, A., Nouwens, A., Li, Y. et al. (2015). Seminal plasma proteins and their relationship with percentage of morphologically normal sperm in 2-year-old Brahman (*Bos indicus*) bulls. *Animal Reproduction Science*, 162: 20-30.
- Boussiengui-Boussiengui, G., Groenewald, J. & Botha, F. (2015). Metabolic Changes Associated with the Sink-Source Transition During Sprouting of the Axillary Buds on the Sugarcane Culm. *Tropical Plant Biology*: 1-11.

- Brozynska, M., Furtado, A. & Henry, R. (2015). Genomics of crop wild relatives: Expanding the gene pool for crop improvement. *Plant Biotechnology Journal*.
- Camporez Crispim, A., Kelly, M., Facioni Guimarães, S., Fonseca e Silva, F., Rufino Salinas Fortes, M., Rocha Wenceslau, R. et al. (2015). Multi-Trait GWAS and new candidate genes annotation for growth curve parameters in Brahman cattle. *PLoS ONE*, 10(10): e0139906.1-e0139906.19.
- Chauhan, B., Ahmed, S. & Awan, T. (2015). Performance of sequential herbicides in dry-seeded rice in the Philippines. *Crop Protection*, 74: 124-130.
- Chen, S., Wang, Y., Zhao, Z., Leon, C. & Henry, R. (2015). Sustainable utilization of TCM resources. *Evidence-Based Complementary and Alternative Medicine*, 2015: 613836.1-613836.2.
- Copetti, D., Zhang, J., El Baidouri, M., Gao, D., Wang, J., Barghini, E. et al. (2015). RiTE database: A resource database for genus-wide rice genomics and evolutionary biology. *BMC Genomics*, 16(1): 538-538.
- Cowley, F., Barber, D., Houlihan, A. & Poppi, D. (2015). Immediate and residual effects of heat stress and restricted intake on milk protein and casein composition and energy metabolism. *Journal of Dairy Science*, 98(4): 2356-2368.
- Crous, P., Wingfield, M., Guarro, J., Hernandez-Restrepo, M., Sutton, D., Acharya, K. et al. (2015). Fungal Planet description sheets: 320–370. *Persoonia: Molecular Phylogeny and Evolution of Fungi*, 34: 167-266.
- Dalar, A., Guo, Y., Esim, N., Bengu, A. & Konczak, I. (2015). Health attributes of an endemic orchid from Eastern Anatolia, *Dactylorhiza chuhensis* Renz & Taub. - in vitro investigations. *Journal of Herbal Medicine*, 5(2): 77-85.
- Dang, Y., Moody, P., Bell, M., Seymour, N., Dalal, R., Freebairn, D. et al. (2015). Strategic tillage in no-till farming systems in Australia's northern grains-growing regions: II. Implications for agronomy, soil and environment. *Soil and Tillage Research*, 152: 115-123.
- Dang, Y., Seymour, N., Walker, S., Bell, M. & Freebairn, D. (2015). Strategic tillage in no-till farming systems in Australia's northern grains-growing regions: I. Drivers and implementation. *Soil and Tillage Research*, 152: 104-114.
- Davis, R., Henderson, J., Jones, L., McTaggart, A., O'Dwyer, C., Tsatsia, F. et al. (2015). First record of a wilt disease of banana plants associated with phytoplasmas in Solomon Islands. *Australasian Plant Disease Notes*, 10(14): 1-6.
- Dayao, D., Dawson, S., Kienzie, M., Gibson, J., Blackall, P. & Turni, C. (2015). Variation in the antimicrobial susceptibility of *actinobacillus pleuropneumoniae* isolates in a pig, within a batch of pigs, and among batches of pigs from one farm. *Microbial Drug Resistance*, 21(4): 491-496.
- De Antoni Migliorati, M., Bell, M., Grace, P., Scheer, C., Rowlings, D. & Liu, S. (2015). Legume pastures can reduce N<sub>2</sub>O emissions intensity in subtropical cereal cropping systems. *Agriculture, Ecosystems and Environment*, 204: 27-39.
- de Camargo, G., Porto-Neto, L., Fortes, M., Bunch, R., Tonhati, H., Reverter, A. et al. (2015). Low frequency of Y anomaly detected in Australian Brahman cow-herds. *Meta Gene*, 3: 59-61.
- Dietzgen, R., Innes, D. & Bejerman, N. (2015). Complete genome sequence and intracellular protein localization of Datura yellow vein nucleorhabdovirus. *Virus Research*, 205: 7-11.
- Dorr, G., Wang, S., Mayo, L., McCue, S., Forster, W., Hanan, J. et al. (2015). Impaction of spray droplets on leaves: influence of formulation and leaf character on shatter, bounce and adhesion. *Experiments in Fluids*, 56(143).
- Doungsa-ard, C., McTaggart, A., Geering, A., Dalisay, T., Ray, J. & Shivas, R. (2015). *Uromycladium falcatarium* sp. nov., the cause of gall rust on *Paraserianthes falcataria* in south-east Asia. *Australasian Plant Pathology*, 44(1): 25-30.
- Duffy, L., Blackall, P., Cobbold, R. & Fegan, N. (2015). Mapping the carriage of *flaA*-restriction fragment length polymorphism *Campylobacter* genotypes on poultry carcasses through the processing chain and comparison to clinical isolates. *Food Microbiology*, 48: 116-122.
- Ferguson, J., O'Donnell, C., Chauhan, B., Adkins, S., Kruger, G., Wang, R. et al. (2015). Determining the uniformity and consistency of droplet size across spray drift reducing nozzles in a wind tunnel. *Crop Protection*, 76: 1-6.
- Finn, D., Dalal, R. & Klieve, A. (2015). Methane in Australian agriculture: current emissions, sources and sinks, and potential mitigation strategies. *Crop and Pasture Science*, 66(1): 1-22.
- Fitzgerald, T., Powell, J., Schneebeli, K., Hsia, M., Gardiner, D., Bragg, J. et al. (2015). *Brachypodium* as an emerging model for cereal-pathogen interactions. *Annals of Botany*, 115(5): 717-731.
- Fitzgerald, T., Powell, J., Stiller, J., Weese, T., Abe, T., Zhao, G. et al. (2015). An assessment of heavy ion irradiation mutagenesis for reverse genetics in wheat (*Triticum aestivum* L.). *PLoS One*, 10(2).
- Fletcher, M., Al Jassim, R. & Cawdell-Smith, A. (2015). The occurrence and toxicity of indospicine to grazing animals. *Agriculture*, 5(3): 427-440.
- Furtado, A., Bundock, P., Banks, P., Fox, G., Yin, X. & Henry, R. (2015). A novel highly differentially expressed gene in wheat endosperm associated with bread quality. *Scientific Reports*, 5(10446): 1-14.
- Gilbert, R., Ouwerkerk, D. & Klieve, A. (2015). Modulation of the rumen microbiome. *Australian Microbiologist*, 36(1): 18-21.
- Godwin, R. & Morgan, J. (2015). A molecular survey of *Eimeria* in chickens across Australia. *Veterinary Parasitology*, 214(1-2): 16-21.
- Gous, P., Hickey, L., Christopher, J., Franckowiak, J. & Fox, G. (2015). Discovery of QTL for stay-green and heat-stress in barley (*Hordeum vulgare*) grown under simulated abiotic stress conditions. *Euphytica*, 207(2): 305-317.
- Hall, R., Meers, J., Fowler, E. & Mahony, T. (2015). Identification of non-essential loci within the Meleagrid herpesvirus 1 genome. *Virology Journal*, 12(1): 130.1-130.12.
- Han, L., Chen, J., Mace, E., Liu, Y., Zhu, M., Yuyama, N. et al. (2015). Fine mapping of qGW1, a major QTL for grain weight in sorghum. *Theoretical and Applied Genetics*, 128(9): 1813-1825.

- Healey A, Lee DJ, Furtado A, Simmons BA and Henry RJ (2015) Efficient eucalypt cell wall deconstruction and conversion for sustainable lignocellulosic biofuels. *Frontiers in Biotechnology and Bioengineering Research* 3: 190.
- Hoang NV, Furtado A, Botha FC, Simmons BA and Henry RJ (2015) Potential for genetic improvement of sugarcane as a source of biomass for bioenergy. *Frontiers in Biotechnology and Bioengineering Research* 3: 182
- Hoang NV, Agnello Furtado A, McQualter R Henry RJ, (2015) Next Generation Sequencing of total DNA from sugarcane provides no evidence for chloroplast heteroplasmy. *New Negatives in Plant Science* 1, 33-45
- Ikram, E., Stanley, R., Netzel, M. & Fanning, K. (2015). Phytochemicals of papaya and its traditional health and culinary uses - A review. *Journal of Food Composition and Analysis*, 41: 201-211.
- Kemphorne, D., Turner, I., Belward, J., McCue, S., Barry, M., Young, J. et al. (2015). Surface reconstruction of wheat leaf morphology from three-dimensional scanned data. *Functional Plant Biology*, 42(5): 444-451.
- Kettle, A., Batley, J., Benfield, A., Manners, J., Kazan, K. & Gardiner, D. (2015). Degradation of the benzoxazolinone class of phytoalexins is important for virulence of *Fusarium pseudograminearum* towards wheat. *Molecular Plant Pathology*: 1-17.
- Kole, C., Muthamilarasan, M., Henry, R., Edwards, D., Sharma, R., Abberton, M. et al. (2015). Application of genomics-assisted breeding for generation of climate resilient crops: progress and prospects. *Frontiers in Plant Science*, 6(AUG): 1-16.
- Lau, E., Johnson, S., Stanley, R., Mikkelsen, D., Fang, Z., Halley, P. et al. (2015). Preparation and in vitro release of drug-loaded microparticles for oral delivery using wholegrain sorghum kafirin protein. *International Journal of Polymer Science*, 2015: 1-8.
- Lau, J., Omaleki, L., Turni, C., Barber, S., Browning, G., Francis, M. et al. (2015). Human wound infection with *mannheimia glucosida* following lamb bite. *Journal of Clinical Microbiology*, 53(10): 3374-3376.
- Lim, C., Awan, T.Cruz, P. & Chauhan, B. (2015). Influence of environmental factors, cultural practices, and herbicide application on seed germination and emergence ecology of *Ischaemum rugosum* salisb. *PLoS One*, 10(9): 1-28.
- Lim, Z., Robinson, K., Jain, R., Chandra, G., Asokan, R., Asgari, S. et al. (2015). Diet-delivered RNAi in *Helicoverpa armigera* – progresses and challenges. *Journal of Insect Physiology*, 85: 86-93.
- Lopez-Sanchez, P., Cersosimo, J., Wang, D., Flanagan, B., Stokes, J. & Gidley, M. (2015). Poroelastic Mechanical Effects of Hemicelluloses on Cellulosic Hydrogels under Compression. *PLoS One*, 10(3).
- Lo, R., Stanton-Cook, M., Beatson, S., Turner, M. & Bansal, N. (2015). Draft genome sequence of *Pseudomonas fluorescens* SRM1, an isolate from spoiled raw milk. *Genome Announcements*, 3(2): 1-2.
- Lupoi, J., Healey, A., Singh, S., Sykes, R., Davis, M., Lee, D. et al. (2015). High-throughput prediction of Acacia and eucalypt lignin syringyl/guaiacyl content using FT-Raman spectroscopy and partial least squares modelling. *Bioenergy Research*, 8(3): 953-963.
- Lupoi, J., Singh, S.Parthasarathi, R. Simmons, B. & Henry, R. (2015). Recent innovations in analytical methods for the qualitative and quantitative assessment of lignin. *Renewable and Sustainable Energy Reviews*, 49: 871-906.
- Lupoi, J., Smith-Moritz, A., Singh, S., McQualter, R., Scheller, H., Simmons, B. et al. (2015). Localization of polyhydroxybutyrate in sugarcane using Fourier-transform infrared microspectroscopy and multivariate imaging. *Biotechnology for Biofuels*, 8(98).
- Lyons, R., Rusu, A., Stiller, J., Powell, J., Manners, J. & Kazan, K. (2015). Investigating the association between flowering time and defense in the *Arabidopsis thaliana*-*Fusarium oxysporum* interaction. *PLoS One*, 10(6): 1-24.
- Lyons, R., Stiller, J., Powell, J., Rusu, A., Manners, J. & Kazan, K. (2015). *Fusarium oxysporum* triggers tissue-specific transcriptional reprogramming in *Arabidopsis thaliana*. *Plos One*, 10(4): 1-23.
- Mahony, D., Mody, K., Cavallaro, A., Hu, Q., Mahony, T., Qiao, S. et al. (2015). Immunisation of Sheep with Bovine Viral Diarrhoea Virus, E2 Protein Using a Freeze-Dried Hollow Silica Mesoporous Nanoparticle Formulation. *Plos One*, 10(11).
- Mann, K., Johnson, K. & Dietzgen, R. (2015). Cytorhabdovirus phosphoprotein shows RNA silencing suppressor activity in plants, but not in insect cells. *Virology*, 476: 413-418.
- Marini, D., Pippia, J., Colditz, I., Hinch, G., Petherick, J. & Lee, C. (2015). Randomised trial of the bioavailability and efficacy of orally administered flunixin, carprofen and ketoprofen in a pain model in sheep. *Australian Veterinary Journal*, 93(8): 265-270.
- McIntyre, C., Goode, M., Cordeiro, G., Bundock, P., Elliott, F., Henry, R. et al. (2015). Characterisation of alleles of the sucrose phosphate synthase gene family in sugarcane and their association with sugar-related traits. *Molecular Breeding*, 35(3).
- McTaggart, A., Doungsa-ard, C.Wingfield, M. & Roux, J. (2015). *Uromyces acaciae*, the cause of a sudden, severe disease epidemic on *Acacia mearnsii* in South Africa. *Australasian Plant Pathology*, 44(6): 637-645.
- Messina, C., Sinclair, T., Hammer, G., Curan, D., Thompson, J., Oler, Z. et al. (2015). Limited-transpiration trait may increase maize drought tolerance in the US corn belt. *Agronomy Journal*, 107(6): 1978-1986.
- Mindaye, T., Mace, E.Godwin, I. & Jordan D.R. (2015). Genetic differentiation analysis for the identification of complementary parental pools for sorghum hybrid breeding in Ethiopia. *Theoretical and Applied Genetics*, 128(9): 1765-1775.
- Mody, K., Mahony, D., Cavallaro, A., Zhang, J., Zhang, B., Mahony, T. et al. (2015). Silica vesicle nanovaccine formulations stimulate long-term immune responses to the bovine viral diarrhoea virus e2 protein. *PLoS One*, 10(12): 1-16.
- Ndungutse, V., Mereddy, R. & Sultanbawa, Y. (2015). Bioactive properties of mushroom (*Agaricus bisporus*) stipe extracts. *Journal of Food Processing and Preservation*, 39(6): 2225-2233.
- Nirmal, N., Benjakul, S.Ahmad, M. Arfat, Y. & Panichayupakaranant, P. (2015). Undesirable enzymatic browning in crustaceans: causative effects and its inhibition by phenolic compounds. *Critical Reviews in Food Science and Nutrition*, 55(14): 1992-2003.

- Petherick, J., Small, A., Reid, D., Colditz, I. & Ferguson, D. (2015). Welfare outcomes for 3- and 6-month-old beef calves in a tropical environment castrated surgically or by applying rubber rings. *Applied Animal Behaviour Science*, 171: 47-57.
- Powell, P., Sullivan, M., Sheehy, J., Schulz, B., Warren, F. & Gilbert, R. (2015). Acid Hydrolysis and Molecular Density of Phytoglycogen and Liver Glycogen Helps Understand the Bonding in Glycogen (Composite) Particles. *PLoS One*, 10(3): e0121337-e0121337.
- Rachaputi, R., Chauhan, Y., Douglas, C., Martin, W., Krosch, S., Agius, P. et al. (2015). Physiological basis of yield variation in response to row spacing and plant density of mungbean grown in subtropical environments. *Field Crops Research*, 183: 14-22.
- Richard, C., Hickey, L., Fletcher, S., Jennings, R., Chenu, K. & Christopher, J. (2015). High-throughput phenotyping of seminal root traits in wheat. *Plant Methods*, 11(13): 1-11.
- Roxburgh, C., Pratley, J. (2015). The future of food production research in the rangelands: Challenges and prospects for research investment, organisation and human resources. *Rangeland Journal*, 37(2): 125-138.
- Sadras, V., Dreccer, M. (2015). Adaptation of wheat, barley, canola, field pea and chickpea to the thermal environments of Australia. *Crop and Pasture Science*, 66(11): 1137-1150.
- Schiffman, R. & Henry, R. (2015). Australian rice to the rescue. *New Scientist*, 228(3044): 27-27.
- Sharman, M., Thomas, J. & Persley, D. (2015). Natural host range, thrips and seed transmission of distinct Tobacco streak virus strains in Queensland, Australia. *Annals of Applied Biology*, 167(2): 197-207.
- Singh, M., Bhullar, M. & Chauhan, B. (2015). Seed bank dynamics and emergence pattern of weeds as affected by tillage systems in dry direct-seeded rice. *Crop Protection*, 67: 168-177.
- Singh, V., Nguyen, C., van Oosterom, E., Chapman, S., Jordan, D. & Hammer, G. (2015). Sorghum genotypes differ in high temperature responses for seed set. *Field Crops Research*, 171: 32-40.
- Song, Y., Birch, C., Rui, Y. & Hanan, J. (2015). Allometric relationships of maize organ development under different water regimes and plant densities. *Plant Production Science*, 18(1): 1-10.
- Sultanbawa, Y., Cozzolino, D., Fuller, S., Cusack, A., Currie, M. & Smyth, H. (2015). Infrared spectroscopy as a rapid tool to detect methylglyoxal and antibacterial activity in Australian honeys. *Food Chemistry*, 172: 207-212.
- Tanveer, A., Khaliq, A., Ali, H., Mahajan, G. & Chauhan, B. (2015). Interference and management of parthenium: the world's most important invasive weed. *Crop Protection*, 68: 49-59.
- Temesgen, A., Fukai, S. & Rodriguez, D. (2015). As the level of crop productivity increases: is there a role for intercropping in smallholder agriculture. *Field Crops Research*, 180: 155-166.
- van Klinken, R., Panetta, F., Coutts, S. & Simon, B. (2015). Learning from the past to predict the future: an historical analysis of grass invasions in northern Australia. *Biological Invasions*, 17(2): 565-579.
- Vo, J., Mahfuz, N., Lockhart, B. & Geering, A. (2015). Improved methods for the purification and enrichment of banana streak virus for antibody production and protein detection. *European Journal of Plant Pathology*, 143(3): 619-626.
- Wambugu, P., Brozynska, M., Furtado, A., Waters, D. & Henry, R. (2015). Relationships of wild and domesticated rices (*Oryza* AA genome species) based upon whole chloroplast genome sequences. *Scientific Reports*, 5(Art No.: 13957).
- Wang, K., Wambugu, P., Zhang, B., Wu, A., Henry, R. & Gilbert, R. (2015). The biosynthesis, structure and gelatinization properties of starches from wild and cultivated African rice species (*Oryza barthii* and *Oryza glaberrima*). *Carbohydrate Polymers*, 129: 92-100.
- Wang, X., Mace, E., Platz, G., Hunt, C., Hickey, L., Franckowiak, J. et al. (2015). Spot form of net blotch resistance in barley is under complex genetic control. *Theoretical and Applied Genetics*, 128(3): 489-499.
- Warren, F., Perston, B., Galindez-Najera, S., Edwards, C., Powell, P., Mandalari, G. et al. (2015). Infrared microspectroscopic imaging of plant tissues: Spectral visualization of *Triticum aestivum* kernel and *Arabidopsis* leaf microstructure. *Plant Journal*, 84(3): 634-646.
- Waters, D., Subbaiyan, G., Mani, E., Singh, S., Vaddadi, S., Baten, A. et al. (2015). Genome wide polymorphisms and yield heterosis in rice (*Oryza sativa* subsp. *indica*). *Tropical Plant Biology*, 8(3-4): 117-125.
- Widana Gamage, S., Persley, D., Higgins, C. & Dietzgen, R. (2015). First complete genome sequence of a capsicum chlorosis tospovirus isolate from Australia with an unusually large S RNA intergenic region. *Archives of Virology*, 160(3): 869-872.
- Williams, D., Edwards, D., Chaliha, M. & Sultanbawa, Y. (2015). Measuring the three forms of ellagic acid: Suitability of extraction solvents. *Chemical Papers*, 70(2): 144-152.
- Worrall, E., Wamondje, F., Mukeshimana, G., Harvey, J., Carr, J. & Mitter, N. (2015). Bean common mosaic virus and bean common mosaic necrosis virus: relationships, biology, and prospects for control. *Advances in Virus Research*, 93: 1-46.
- Xu, C., Bai, S., Hao, Y., Rachaputi, R., Xu, Z. & Wallace, H. (2015). Peanut shell biochar improves soil properties and peanut kernel quality on a red Ferrosol. *Journal of Soils and Sediments*, 15(11): 2220-2231.
- Zhou, Y., Underhill, S. (2015). Breadfruit (*Artocarpus altalis*) gibberellin 20-oxidase genes: sequence variants, stem elongation and abiotic stress response. *Tree Genetics and Genomes*, 11(84): 1-13.
- Zhu, Y., Pham, T., Nhiep, T., Vu, N., Marcellin, E., Chakraborti, A. et al. (2015). Cyclic-di-AMP synthesis by the diadenylate cyclase CdaA is modulated by the peptidoglycan biosynthesis enzyme GlmM in *Lactococcus lactis*. *Molecular Microbiology*.
- Zhu, Y., Xu, J., Sun, C., Zhou, S., Xu, H., Nelson, D. et al. (2015). Chromosome-level genome map provides insights into diverse defense mechanisms in the medicinal fungus *Ganoderma sinense*. *Scientific Reports*, 5: 1-14.
- Zou, W., Sissons, M., Gidley, M., Gilbert, R. & Warren, F. (2015). Combined techniques for characterising pasta structure reveals how the gluten network slows enzymic digestion rate. *Food Chemistry*, 188: 559-568.



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