

The Queensland Alliance for Agriculture and Food Innovation  
**CENTRE FOR CROP SCIENCE**



# Queensland Alliance for Agriculture and Food Innovation

**QAAFI is an agricultural and food sciences research institute of The University of Queensland – one of the world’s leading research providers in tropical and subtropical agriculture and food production.**

At QAAFI, our mission is to harness high tech science for sustainable agriculture and food production. To achieve this, we use game-changing technologies like artificial intelligence (AI), nanotechnology, genomics, gene editing and big data to produce safer, more nutritious food, using less resources.

Not only is UQ number one for agricultural science in Australia and one of the most highly ranked institutions in the world in this field, it is located in tropical and subtropical environments and, therefore, well placed as a hub for digital agriculture and delivering step-change innovations for the growth and production of sustainable and nutritious food.

Through our alliance with the Queensland Government, QAAFI researchers utilise world-class research field station facilities throughout tropical and subtropical environments in Queensland.

*QAAFI delivers high-impact science to significantly improve the productivity, competitiveness and sustainability of tropical and subtropical food, fibre and agribusiness industries.*

## High impact science for sustainable agriculture and food

**QAAFI is comprised of four 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.**

- Centre for Animal Science
- Centre for Crop Science
- Centre for Horticultural Science
- Centre for Nutrition and Food Sciences

## Centre for Animal Science

### Leading tropical livestock research and development

The Centre for Animal Science delivers world-class research to Australia’s animal industries. We aim to increase on-farm productivity and sustainability in the northern Australian beef industry and across the livestock industries, including pigs and poultry.

We have major programs and capability in genetics and genomics; breeding and reproductive capability of northern Australian cattle breeds; welfare and ethics; pest and disease control through improved detection; monitoring and vaccine technologies; nutrition; metabolism and growth.

## Centre for Crop Science

### Integrated research for cereal and legume cropping systems

The Centre for Crop Science conducts world-leading research targeting enhanced profitability and sustainability of cereal and legume cropping systems in tropical and sub-tropical environments.

We pursue excellence in crop science at molecular, whole plant, and production system levels. Our integrated research capabilities include crop genetics, physiology, and modelling, along with soil science and weed biology. We work closely with industry and government, and seek synergies to meet challenges in crop science at a national and international level.

## Centre for Horticultural Science

### Driving innovation and industry adoption

The Centre for Horticultural Science delivers improvements to productivity, profitability and sustainability of horticulture industries.

Our world-class researchers drive innovation and industry adoption to increase the competitiveness of Australia’s horticultural industries globally. Our expertise includes; Horticulture crop breeding and agronomy, Plant protection and Emerging technologies.

## Centre for Nutrition and Food Sciences

### Consumer ‘fork to farm’ research focus

The Centre for Nutrition and Food Sciences supports enhanced health outcomes and economic benefits for Australia, by conducting integrated fundamental and applied research to improve the taste, quality, appearance, nutritional value and safety of food.

We aim to understand the fundamental characteristics of food that influence processing, food quality, consumer perception and nutritional value.

## Our Rankings



**UQ is ranked #2 worldwide and #1 in Australia for agriculture**

*According to the NTU Performance Ranking of Scientific Papers for World Universities 2021.*



**UQ is ranked #17 worldwide and #1 in Australia for environmental sciences**

*According to the QS World University Rankings by Subject 2021.*



**UQ is ranked #26 worldwide and #1 in Australia for life sciences**

*According to the QS World University Rankings by Subject 2021.*



**UQ is ranked #14 worldwide and #1 in Australia for food science and technology**

*According to the 2021 Shanghai Ranking’s Global Ranking of Academic Subjects.*



# Our research capabilities in crop science



## Crop improvement

Integrated pre-breeding research programs delivering advanced lines to industry based on advanced genetics, phenotyping, bioinformatics, trait physiology and modelling

### Our research includes:

- Germplasm development with structured populations, advanced phenotyping, and speed breeding in sorghum, barley, and wheat
- Traits delivering adaptation to water limited environments and resistance to pests and diseases
- Strong industry and international links



## Crop physiology and modelling

Integrating crop science from the molecular to whole plant levels to enhance food production in the face of climate change

### Our research includes:

- Exploring the physiological and molecular bases of drought adaptation in the world's major cereals
- Combining phenotype-to-gene and gene-to-phenotype approaches
- Evaluating the efficiency with which resources (radiation, water and nitrogen) are utilized by crop plants



## Farming systems and agronomy

Integrating field experimentation, modelling tools, and socioeconomic data, to generate new science that supports decision-making for economic, environmental, and social outcomes

### Our research includes:

- Designing farming systems better able to deal with production, climate and market risks
- Working with farmers to reduce yield gaps, manage risks, and enhance resilience and sustainability of production systems
- Collaborations with farmers, industry, CGIAR institutes, and national and international Universities

# Highlights of QAAFI's research into crop science

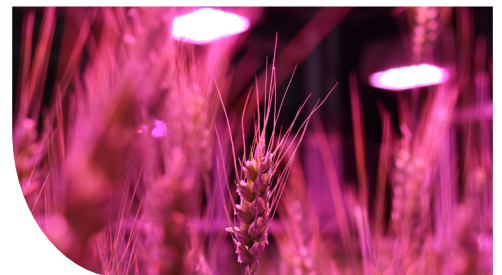
## Speed breeding for crops

To minimise the impacts of drought and climate change on crops, QAAFI researchers are speeding up the life cycle of crops to develop more resilient crop varieties.

This world-first speed breeding technique uses light and temperature controlled greenhouses to accelerate plant growth and deliver more tolerant crops varieties.

This technology is being shared with Asian and African nations. By using speed breeding techniques in specially modified glasshouses we can grow six generations of wheat, chickpea and barley plants, and four generations of canola plants in a single year – as opposed to two or three generations in a regular glasshouse, or a single generation in the field.

[qaafi.uq.edu.au/speed-breeding](http://qaafi.uq.edu.au/speed-breeding)



## Scientists tweak photosynthesis and boost crop yield

In the next two decades, crop yields need to increase dramatically to feed the growing global population. Wouldn't it be incredibly useful if we had a crystal ball to show us what are the best strategies available to increase crop yields?

A team of scientists have just developed exactly that: a dynamic model that predicts which photosynthetic manipulations to plants will boost the yields of wheat and sorghum crops.

The development of reliable, biologically rigorous prediction tool that can quantify the yield gains associated with manipulating photosynthesis in realistic crop environments.

[qaafi.uq.edu.au/tweak-photosynthesis](http://qaafi.uq.edu.au/tweak-photosynthesis)



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