



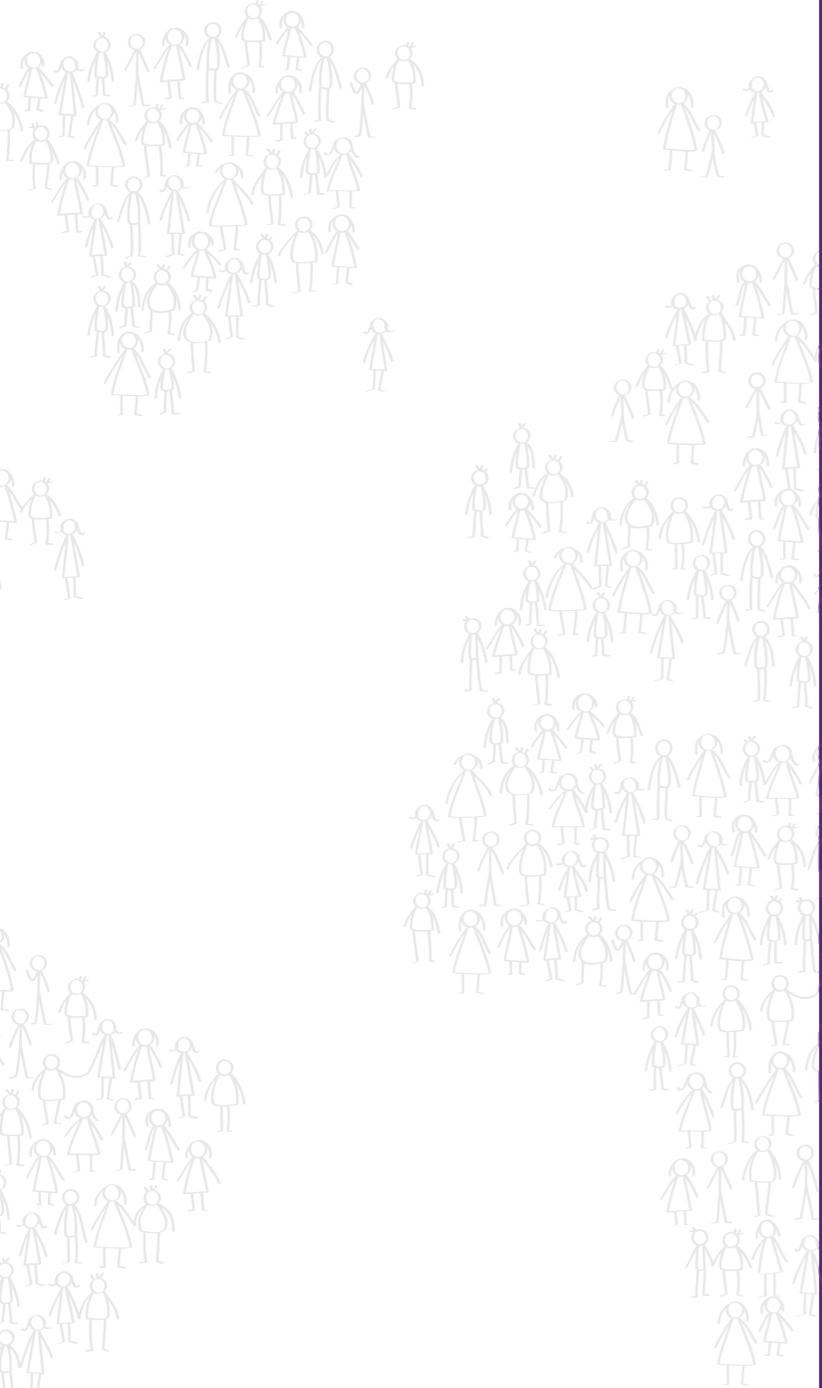
THE UNIVERSITY
OF QUEENSLAND
AUSTRALIA

CREATE CHANGE

UQ School of Agriculture
and Food Science

Securing the Future of Food





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Overview

The world faces a significant challenge over the coming decades. It is a challenge that will impact every single person on the planet regardless of their nationality, culture, status, or wealth.

The global population will reach 9.6 billion people by 2050, so food production must increase by 56 per cent between now and then to cater to this demand. At the same time, we must decrease our carbon emissions, knowing that agriculture is a significant contributor to these outputs. Just doing 'more of the same' is not going to work.

We must also provide better nutrition for the millions of people who grapple with food insecurity and make it safer for those who suffer the debilitating effects of food poisoning.

The University of Queensland's (UQ) School of Agriculture and Food Sciences (SAFS) is focusing on feeding the world and the future of food. It is through research, teaching, and learning that we are working to unlock the enormous potential of Australia's agriculture and food manufacturing industries. It is critically important work that will touch all of our lives.

With your support, we can transform our food systems and move towards a more sustainable and healthier future. We need the support of donors like you who share our vision to create meaningful change. Come and learn with us about the ways in which SAFS is working to change the world.



Partner with us to feed the world

These are just some of the priorities and projects our experts are working on to help feed the world.

Harnessing the positive power of legume crops

We must find a way to increase production without increasing carbon emissions.

One part of the solution is for farmers to integrate legume crops, which include many varieties of beans, chickpeas, lentils, and peanuts into their farming systems. They are high in protein, dietary fibre and carbohydrates. As an example, just 100 grams of cooked chickpeas contains almost 20 per cent of an adult's daily protein needs and 30 per cent of their daily dietary fibre.

While impressive, the transformative power of legumes does not end with their nutritional value. Legumes grow in a symbiotic relationship with soil-dwelling bacteria. The bacteria take nitrogen from the atmosphere and feed it to the legume in exchange for delivering carbohydrates back to the bacteria.

For that reason, legumes do not require nitrogen fertilisers. After harvesting, they return all of their unused nitrogen into the soil. The result is reduced contaminations from fertilizers, naturally healthier and fertile soil, fewer greenhouse gas emissions, and better adaptation to drier climates. Farmers also gain these benefits if they use legumes as part of their crop rotations.

These environmental benefits, combined with their nutritional value, means we must continue to scale our research to uncover how legumes can become an increasing part of global agriculture.

Spread the positive power of legumes by supporting further research in this area.

Together we can make important breakthroughs...





Supporting the future of Australian agriculture

Students at The University of Queensland are the future leaders of the Australian agricultural industry, and partner Costa Group is investing in their careers.

Costa Group provides two scholarships at UQ — the Costa Avocado Horticulture Scholarship and the Costa Berries Scholarship in Horticultural Science — each worth \$5000 a year.

For many agriculture students, there are pressures associated with moving away from home to study.

Costa Group provides ongoing financial assistance to relieve these pressures for students who are pursuing a career in horticulture.



2020 Costa Avocado Scholarship in Horticulture recipient, Rebekah Ash

Support the next generation of agriculturalists by creating a scholarship or funding path-breaking research.

Build up our regional communities by supporting research into social resiliency.

Building social resiliency in rural areas

The key to a healthy agricultural sector extends well beyond the production of commodities. Just as important are the communities of people who are essential to the success of this sector.

Because of their relative isolation and their greater reliance on agriculture for their livelihoods, people in these communities are more vulnerable to change than their urban counterparts.

Vulnerable to natural disasters such as floods, droughts or bushfires. Vulnerable to sudden falls in visitor numbers such as those we have seen in a pandemic. Vulnerable to cuts in government funding for infrastructure, the loss of essential services, falling commodity prices or a deteriorating economy.

The consequences for these regions are often increases in unemployment, poverty and homelessness, crime and violence, declining education outcomes and mental health issues.

While regional Australians make up only a third of the nation's population, they account for almost half of the nation's deaths by suicide. They are also nearly three times more likely to seek help for mental health issues than those from larger urban areas.

Even when decision-makers try to direct resources to alleviate some of these problems, it is often done with little understanding of the real causes and without adequate community consultation.

Our researchers in SAFS are working to understand the needs of rural communities and solutions to these issues.

We want to build resilience, health and prosperity into these regions that, in many respects, are the backbone of our nation.





Transform the agricultural landscape of developing nations by supporting projects around the world.

Helping our closest international neighbours rise out of poverty

Partnering with developing nations to improve their agricultural sector is an absolute priority for UQ.

Our goal is to lift Australia's neighbouring subsistence farmers out of the cycle of poverty, to create an environment of agricultural entrepreneurship, and to develop local experts who can build on this knowledge.

Agriculture is often the economic backbone of developing countries, accounting for 30-60 per cent of their GDP while employing almost 70 per cent of their total workers. A steadily improving agricultural sector not only provides additional employment and reduces poverty, but it also addresses complexities around food security, nutrition, and women's empowerment given the important role females play in agriculture.

UQ employs a comprehensive approach to improving agricultural sectors. It extends beyond production though to sustainability, supply and value chains, the development of markets and even branding.



Improving the livelihoods of Timor-Leste livestock farmers

Recent collaborative research led by the University of Queensland aims to bolster smallholder farming – the lifeblood of Timor-Leste's agricultural centre.

The project, led by Dr Dominic Smith from the School of Agriculture and Food Sciences, evaluates livestock development initiatives, fosters international trade, and looks at new opportunities for the 87.2 per cent of households in Timor-Leste that keep livestock.

UQ researchers interviewed farmers and other stakeholders in Maliana and Baucau municipalities, collecting information on livestock and overall livelihoods. They believe the development of these markets will help create sustainable livelihood improvements for smallholders, improve women's economic empowerment and support health and nutrition security in the region.

The project was funded by the Australian Centre for International Agricultural Research in partnership with the Ministry of Agriculture and Fisheries Timor-Leste.



Jacinta Pereira, a smallholder farmer in Maliana town in Bobonaro municipality in Timor-Leste



Improving nutrition in remote communities

One of the most significant issues people living in remote communities face compared to those in urban centres is the lack of access to reasonably-priced healthy food.

With primary producers often located long distances away, logistical problems with supply chains not only reduce the supply of high-quality produce but the goods delivered are often significantly more expensive to purchase than in cities.

The increased cost of fresh foods means unhealthy options become the only realistic option.

Even when the cost is not as high of a factor, the lack of supermarkets and the prevalence of corner stores who offer a limited number of healthy options increases this difficulty.

The consequences are significant.

An unhealthy diet is one of the main contributing factors in the health gap between Aboriginal and Torres Strait Islanders and non-Indigenous Australians. Dietary risk factors and obesity contributed to at least 18 per cent of the burden of risk for Indigenous peoples and 31 per cent also experience food insecurity.

On top of this, all Australians living in rural areas suffer a higher prevalence of obesity and related diseases.

UQ is committed to helping those in remote communities overcome this serious issue.

Solutions include community gardens where they can grow affordable and accessible fresh fruit and vegetables, improve supply chains, and inform dietary decision-making.

Not only will this help improve the health of residents, but it will also create local employment and entrepreneurial opportunities.



The socioeconomic inequality of maintaining a healthy diet

A recent government study showed that a collection of items needed for a recommended balanced diet was 60 per cent more expensive in remote areas than in towns and cities. Given incomes in these remote areas are often significantly lower than in urban centres, it means we are forcing the most impoverished people to pay the highest prices.



With financial support, UQ can conduct pilot projects in remote communities to improve nutrition.

Help Us Secure The Future of Food

We are committed to improving the quality, safety, and nutritional value of foods. These are just some of the projects our experts are working on to help secure the future of food.

Creating innovative foods

Plant-based proteins

Protein is an essential part of our diet, but it is also vital that we source it sustainably. With a move towards flexible diets, demand for plant-based foods has grown by 31 per cent over the last two years, compared to just four per cent for all food sales over the same period.

One of the most significant barriers to a broader uptake of plant-based proteins, particularly those mimicking meat products, is the difference in their texture and taste. Together with an industry partner, UQ is testing and identifying new formulations to improve the texture of plant-based meat products through its unique in vitro processing.

Typically, new products are derived after a series of in vivo tests which consists of trained panellists who describe how well the new product simulated the base version. Apart from being expensive and time-consuming, it is also highly subjective. UQ's oral processing and sensory evaluation techniques focus more on the 'physics' of the composition rather than on opinion for superior outcomes.

Growing algae as a sustainable food

Microalgae are the world's most productive photosynthetic organisms and can double in biomass daily. Significantly, they can grow in freshwater, brackish water or seawater without competing for arable land.

*Support the development
of innovative foods
through funding
the next generation
of food scientists.*



Our research teams undertake work in the lab and large-scale outdoor cultivation facilities to optimise the production of algae-derived products. These include biofuel, protein-rich animal feed and importantly, innovative food for human consumption.

An example of this innovation is the production of the essential fatty acid Omega-3, which is typically associated with the consumption of fish. What is lesser known is fish only contain Omega-3 because they consume algae. Therefore, growing algae and providing this nutrient in such a sustainable way means people can bypass eating fish for this purpose and still gain all the health benefits.

PERKii

One of UQ's most high-profile success stories with food innovation has been PERKii. This product is enabling 'good-for-gut' bacteria to be cheaply and easily added to lactose-free food and drinks, allowing more people to experience the benefits of probiotics.

Our researchers had a significant challenge to overcome: how to ensure these 'good-for-gut' bacteria could safely make their way to a person's gut. Probiotics were known to provide many health benefits. Still, they could not survive the trip to the intestine due to the highly acidic environment of the stomach.

This issue means they would have to be transported via needle or suppository – which are much more expensive and inconvenient methods than simple swallowing.

Enter PERKii – the world's first non-fermented, low-calorie probiotic water that incorporates UQ's novel protective coating ProGel technology to deliver beneficial bacteria safely to the gut.

PERKii is now sold in more than 2000 stores across Australia and New Zealand. It provides a pleasant-tasting alternative to traditional dairy-based probiotic products and is just one application of UQ's world-first ProGel encapsulation method that has the potential to revolutionise gut health on a global scale.



Safer foods

We not only have a responsibility to provide nutritious food to communities far and wide, but also to ensure that this food is safe to consume for as long as possible.

There are more than four million cases of food poisoning every year in Australia, resulting in one million visits to the doctor, almost 32,000 hospitalisations, and 86 deaths on average.

Globally the impact is far more significant. The World Health Organisation estimates that almost one in ten people fall ill from eating contaminated foods which causes 420,000 deaths every year. Tragically, about 30 per cent of these fatalities are children under the age of five.

Our researchers are investigating ways to eliminate pathogens in foods, to discover alternative ways of processing them (such as different ways of pasteurising dairy products), as well as developing new technologies to improve safety and quality.

... and this includes safer salads

It is not only meat and dairy foods which need significant improvement with safety. Several years ago, 300 people in Queensland, Victoria and South Australia fell ill after an outbreak of Salmonella in bagged salads and sprouts. The effect was immediate, and sales of packaged salads in supermarkets plummeted by 30 per cent. One Queensland farm even saw their sales drop an alarming 50 per cent.

UQ quickly initiated a research project called 'ProbiSafe' to investigate whether 'friendly' bacteria could be introduced to bagged salad mixes to prevent Salmonella or Listeria outbreaks. Researchers used lactic acid bacteria, which is naturally occurring in fruit and vegetables and already safely consumed by humans.

By making our foods safer for consumption under more circumstances while considering more variables, we can help to simplify the supply chain. The result is healthier and fresher food for people living in regional and remote communities.

With support, UQ can action many more problem-solving initiatives to make our foods safer.

Healthier foods

We are committed to meeting the challenge of improving the taste, quality, appearance and nutritional value of food and ultimately enhance global health outcomes and economic benefits.

Some of the outcomes to date include:

- Cholesterol-lowering muffins and dairy foods;
- Ultra-low-fat cheeses that taste like full-fat cheese;
- Fresher milk produced without heat pasteurisation; and
- Developing novel plant-based fermented foods;
- Reducing fungal spoilage of dairy foods.



A Pilot Plant: The Future of Food Sciences

An innovative food Pilot Plant will focus on advancement equipment currently unavailable at UQ. The new equipment will provide new technologies for the evaluation of food processing and analysis. The Pilot Plant will enhance student and staff training and allow for the development of new methods for enhancing the safety, quality, and nutrition of foods. This will assist the Australian food industry in their development of new products and processes to allow them to remain competitive and provide a sustainable food supply for the Australian population and export sector.



With your support, UQ can address many more problem-solving initiative to make our foods safer and healthier.





Help feed the next generation by supporting Associate Professor Dr Nidhi Bansal's research.



'Bioactive' breastmilk

Currently, our researchers are working on next-generation feeding for premature babies. This will use 'bioactive' breastmilk that has been pasteurised by nanosecond pulsed electric field rather than heat, helping it retain more of its nutrients. Biological mechanisms explain in part why breastmilk is superior to formula or pasteurised breastmilk for infant health. Complex metabolic infant saliva-breastmilk enzymes interactions during suckling constitute an important element of infant 'primal immunity.' This system is compromised in preterm infants. In neonatal intensive care units (NICU) babies are preferably fed unpasteurised maternal milk. In its absence, they are commonly fed heat-pasteurised donor breastmilk, formula milk or mixture of these. This pasteurisation destroys the milk's innate bioactivity, which relies on antimicrobial proteins and enzymes. Gastric intubation and saliva aspiration of preterm infants further reduces saliva-milk interactions.

Alternatives to heat pasteurisation, which preserve donor breastmilk enzymes (and biomolecules),

are necessary to address a looming health burden. Approximately 15 million babies are born preterm/year globally (>1 in 10 babies), of which around 1 million died in 2015. Despite gains in survival, number of preterm babies is rising and they continue to battle low weight deficits and high infection risk, often with lifelong health concerns.

Our studies at UQ are comparing classic thermal pasteurisation with a unique new process, 'nanosecond pulsed electric field', to produce microbiologically safe but bioactive donor breastmilk. A novel aspect will be the creation of dried bioactive breastmilk to improve its storage and transport. This study aims to optimise breastmilk processing that will improve preterm infant health by more closely imitating natural regulation of microflora. This will be significant for opening new options for NICU practices for lowering gastrointestinal disease risk via intra-gastric feeding and ultimately preserve innate immunity in babies who cannot receive maternal milk.





Towards an Indigenous-led bushfood industry

A \$1.5 million collaboration between Indigenous Traditional Owners and Custodians and The University of Queensland will boost the burgeoning bushfood industry, and create long-lasting Indigenous businesses.

Launched at UQ's Gatton campus, the Australian Research Council-funded (ARC) five-year project, 'A Deadly Solution: Towards an Indigenous-led bushfood industry', will see researchers work with Indigenous communities to commercialise native bushfoods and ornamental plants.

The project features ethnobotanist and Mbabaram Elder, Gerry Turpin and a team of academics, community members and business owners led by UQ Adjunct Professor Dale Chapman, an Indigenous chef, and CEO of My Dilly Bag.

"There are plenty of great bushfoods out there that most people have never heard of, seen or tasted," Adjunct Professor Chapman said.

"So we're thrilled to be working hand-in-hand with Indigenous communities to get them into the marketplace, marrying Traditional Knowledge with Western science.

UQ is #1 in Australia and in the top 25 globally for agriculture, environmental sciences and food science and technology.

Backed by the best expertise

School of Agriculture and Food Sciences

We have built our ambition to overcome many of the world's agricultural and food challenges upon a history of proven research performance.

Four of the world's most prestigious higher education rankings lists UQ as being #1 in Australia and in the top 25 globally for agriculture, environmental sciences and food science and technology. UQ is ranked 4th in the world for agriculture.

In the latest Excellence in Research for Australia (ERA) assessment, our school was rated 'well above world standard' in plant biology, soil sciences, crop and pasture production, horticultural production, environmental sciences, and animal production.

Our researchers come from all over the world and are engaged in international partnerships in countries as diverse as Indonesia, the United States, China, Brazil, India and Germany.

We maintain strong links with rural communities, industry and government, both locally and abroad.





The University of Queensland

Ranked in the world's top 50, The University of Queensland is one of Australia's leading research and teaching institutions.

UQ has a strong focus on teaching excellence, having won more Australian Awards for University Teaching (AAUT) than any other in the country and attracts Queensland's highest academic achievers, as well as top interstate and overseas students.

The Federal Government's 2018 Excellence in Research for Australia exercise confirmed UQ as one of the nation's most comprehensive, research-intensive universities. The assessment rated 100 per cent of UQ's research above or well above world standard, across 22 broad disciplines.

Some more of our impactful breakthroughs

- Professor Mark Turner has developed new ways to reduce the incidence of food poisoning in ready-to-eat foods including leafy green vegetables and sliced meat products. By screening a large number of harmless bacteria naturally present on fruits and vegetable, his team has identified good bacteria which when applied back into food can inhibit and kill pathogenic bacteria. This provides a natural approach to improving food safety both in Australia and overseas.
- Dr Anthony Young is leading the charge against the fight against pasture dieback. His research team has discovered that a previously little known insect called pearl grubs is associated with severe root damage in

our grazing properties. His continued research will help us to better understand the nature of this devastating problem across our nation's pastures, and hopefully lead to a solution.

- Dr Ellie Soumeih is identifying new strategies to improve feed and animal production in a sustainable and efficient way. Within her research portfolio she investigates feed additives, supplements and novel ingredients which have beneficial effects on animal production, welfare, immune status, meat and egg quality, and gut health. Her research has shown significant improvement in the ability of poultry to cope with environmental stress.

- Professor Vic Galea and his team have developed a new, safer and environmentally sustainable method for removing invasive woody weeds from the environment. This approach uses both natural and synthetic herbicidal compounds formulated into capsules that are mechanically implanted in to tree trunks to bring about weed death. This approach is safe, rapid and environmentally sustainable, and will greatly improve the way we regenerate the landscape and create more sustainable grazing systems.



Reach out and learn more

Donors are remarkable people who have a common objective regardless of their background; they want to get things done.

When donors and UQ partner together to achieve a goal, amazing things happen. Environments are protected, futures are nurtured, families are supported, lives are made healthier, culture is enriched, and society's injustices are tackled head-on.

Like you, the School of Agriculture and Food Sciences will not sit back and just hope for the best. Like you, we want to take responsibility for our community and the future of our food.

To do that, we are asking for your support, and 100 per cent of donor contributions go towards your nominated cause.

How you secure the Future of Food

Create a permanent merit or needs-based scholarship to support our deserving students.

Fund impactful philanthropic research projects that align with your mission

Donate to capital projects to enhance facilities, secure equipment and accelerate the research, teaching and learning experience for our staff and students.

Thank you

UQ and the School of Agriculture and Food Sciences have the people, vision, expertise and passion to ensure we help overcome many problems facing our society. We need a visionary donor to join us on this journey.

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