

PROGRAM*



*Program may be subject to change. Current at time of printing.



► **Lawrence Haddad**, Executive Director
Global Alliance for Improved Nutrition (GAIN)

Dr Lawrence Haddad is a South African-born British economist. He was appointed the Executive Director of the Global Alliance for Improved Nutrition (GAIN) in October 2016. Working with partners around the world, GAIN aims to make healthier food choices more affordable, more available, and more desirable. GAIN's purpose is to improve nutrition outcomes by increasing the consumption of nutritious and safe food for all people, especially the most vulnerable.

Prior to this, Dr Haddad was the founding co-chair and lead author of the Global Nutrition Report and was the Director of the Institute of Development Studies (IDS), the world's leading development studies institute. Before joining IDS in 2004, he was Director of the Food Consumption and Nutrition Division at the International Food Policy Research Institute and was a UK representative on the Steering Committee of the High Level Panel of Experts of the UN's Committee on World Food Security.

In 2018, the World Food Prize Foundation awarded the World Food Prize to Dr Haddad and Dr David Nabarro, former special adviser to the UN Secretary General. They received the award for their individual and complementary global leadership in elevating maternal and child undernutrition to a central issue within the food security and development dialogue at national and international levels.

Why animal-source foods need to be part of the global food security and nutrition agenda

A number of recent reports on diets and food systems have generated a great deal of divisive debate about the role of animal source foods in the human diet. The media have latched on to these debates and have, in some cases, accentuated the divides. This presentation will emphasise not division, but inequality. It is the inequality in what people eat that needs to be addressed. Many people eat far too much animal sourced food: too much for their health and too much for the planet's environmental health. But many also eat too little animal sourced food—these foods are rich sources of micronutrients that are essential for young infant and child growth and are not available in other affordable foods for these populations who tend to be low income. So a nuanced approach to animal sourced foods is needed. Those who eat too much for their good health and who put unnecessary stress on the planet's environmental resources should eat less and those who are undernourished with very monotonous diets would benefit from eating more. This presentation explores this contested terrain and aims to improve clarity in the policy space surrounding animal source foods.



► **Usha Zehr**, Director and Chief Technology Officer
Maharashtra Hybrid Seeds Company Private Limited (Mahyco)

Dr. Usha Barwale Zehr is the Director and Chief Technology Officer at Maharashtra Hybrid Seeds Company Private Limited (MAHYCO) in India. She received her PhD from the University of Illinois at Urbana-Champaign.

For the past 20 years, she has been utilising new technologies and tools including biotechnology for improving the quality and productivity of seeds and agriculture. In addition, Dr. Zehr serves as Director of the Barwale Foundation, a non-profit research foundation. She also serves on the Board of the Donald Danforth Plant Science Center and Alliance for

Green Revolution in Africa.

Mahyco focuses on research and development, production, processing, and marketing of seeds for Indian farmers. Founded in 1964, Mahyco is the pioneer of high-quality hybrid and open pollinated seeds, through the use of cutting-edge technology and intensive research activities.

Dr. Zehr served as a geneticist at Purdue University, studying sorghum and millet and focusing on the application of plant biotechnology for improving agricultural production. During her graduate and post-graduate studies, she worked in the area of tissue culture and transformation. Her group at the University of Illinois was the first to develop a system for soybean regeneration. As a result of her work at Purdue University, the first transgenic sorghum plant was produced. Her work in plant biotechnology is aimed toward implementing emerging technologies in the developing world.

Small holder farmers and science of tomorrow

Small Holder farmers in India have benefited from the scientific advances be it the high yielding varieties of Green revolution or the most recent revolution with the use of Bt cotton leading to livelihood improvement. The small holder farmers in India will continue to feed the nation and more under several environmental constraints which require rededicated effort in agricultural sciences. Application of new science to agriculture is critical be it New Breeding Technologies, greater focus on soil health, water use efficiency and more. Farmers are also constrained by what they have access to, where their inputs come from and where they will go to market their harvest. Indian farmers are using mobile phones in large numbers, from basic to smart phones and with relatively cheap access to data, are using these devices to share information. Digital platforms which provide information on weather, soil health, carbon status, predict yield, financial transactions or market opportunities in addition to the genetic improvements are being delivered to farmers in local languages and impacting their decision making and improving lives. Policies around new innovation must be clear to deliver the benefits of these advances to the farmers. These innovations are shaping the future of science for small holder farmers and may even entice the youth to continue to farm.

07:00-20:00 **Registration desk open** ► Plaza Auditorium foyer, Plaza level, Brisbane Convention & Exhibition Centre, Grey Street, South Brisbane

08:00 **Conference welcome** ► The University of Queensland

Conference opening ► Queensland Government

08:45-10:00 Plenary session 1

Room Plaza Auditorium

Chair ► Prof Robert Henry, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI)

08:45 **Keynote speaker** **Why animal-source foods need to be part of the global food security and nutrition agenda - 100**

► Dr Lawrence Haddad, Executive Director, Global Alliance for Improved Nutrition (GAIN), Switzerland

09:20 **Keynote speaker** **Small holder farmers and science of tomorrow - 101**

► Dr Usha Zehr, Director and Chief Technology Officer, Maharashtra Hybrid Seeds Company Private Limited (MAHYCO), India

10:00 **Morning tea**



10:30-12:30 Concurrent symposia session 1

FIELD CROPS Room ▶ P7-8	HORTICULTURE Room ▶ P9	LIVESTOCK Room ▶ P10	NUTRITION AND FOOD Room ▶ P11	AGFUTURES Room ▶ Plaza Auditorium
<p>1.1 ▶ Agricultural systems research: A transformative approach to the sustainable intensification of agriculture</p> <p>Chair ▶ Prof John Dixon, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>1.2 ▶ Tissue culture for propagation, conservation and crop improvement</p> <p>Chair ▶ Prof Neena Mitter, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>1.3 ▶ Sustainable, healthy diets for all: Tomorrow's livestock science</p> <p>Chair ▶ Prof Lindsay Falvey, International Livestock Research Institute (ILRI), Kenya; The University of Melbourne, Australia</p>	<p>1.4 ▶ Market-led breeding for value chains: Africa-Australia nexus for innovation</p> <p>Chair ▶ Dr Vivienne Anthony, Syngenta Foundation for Sustainable Agriculture, Switzerland</p>	<p>1.5 ▶ Strategic issues facing agricultural development in northern Australia</p> <p>Chair ▶ Ms Sheriden Morris, CRC for Developing Northern Australia, Australia</p>
<p>Agricultural systems research: A transformative approach to sustainable intensification - 104</p> <p>▶ Prof Daniel Rodriguez, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>In vitro approaches for papaya crop improvement - 108</p> <p>▶ Dr Puthiyarambil Josekutty, Skybury Coffee Pty Ltd, Australia</p>	<p>Let them eat meat? A solution or a problem for a sustainable healthy future? - 114</p> <p>▶ Dr Lawrence Haddad, Global Alliance for Improved Nutrition (GAIN), Switzerland</p>	<p>Australia-Africa Universities Network: Providing sustainable solutions to challenges jointly facing Australia and Africa - 120</p> <p>▶ Prof Kadambot Siddique, University of Western Australia, Australia</p>	<p>Successfully facilitating agricultural investment in northern Australian landscapes - 126</p> <p>▶ Dr Allan Dale, CRC for Developing Northern Australia; James Cook University, Australia</p>
<p>Food systems failure: Can we avert future crises? - 106</p> <p>▶ Dr Kiah Smith, The University of Queensland, Australia</p>	<p>The use of cryobiotechnology to conserve plant genetic resources: Opportunities and challenges - 109</p> <p>▶ Dr Raquel Folgado, The Huntington Botanical Gardens, USA</p>	<p>The quest for policy and public expenditure opportunities to support implementation of sustainable smallholder livestock and aquaculture interventions - 115</p> <p>▶ Dr Robyn Alders, Centre for Global Health Security, Australia</p>	<p>Delivering market requirements: Product profiling with market foresight for bean value chains in East Africa - 121</p> <p>▶ Dr Jean Claude Rubyogo, International Centre for Tropical Agriculture (CIAT); Pan Africa Bean Research Alliance (PABRA), Tanzania</p>	<p>A situational analysis for developing a rice industry in northern Australia - 127</p> <p>▶ Prof Robert Henry, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>
<p>Farming systems analysis for problem-solving in the R4D context - 107</p> <p>▶ Dr Sarina Macfadyen, Australian Centre for International Agricultural Research, Australia</p>	<p>Tissue culture for the collection, conservation and multiplication of elite coconut germplasm - 110</p> <p>▶ Prof Steve Adkins, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>Facts and myths: Livestock and the environment - 116</p> <p>▶ Dr Mario Herrero, Commonwealth Scientific and Industrial Research Organisation (CSIRO); The University of Queensland, Australia</p>	<p>Public-private breeding transition in sorghum in Australia and lessons for sub-Saharan Africa - 122</p> <p>▶ Prof David Jordan, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>Northern beef industry emerging market, supply chain gap analysis & sector capacity baseline study - 128</p> <p>▶ Dr Chris Chilcott, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia</p>
<p>Transformational adaptation in agriculture under climate change - 102</p> <p>▶ Prof Mark Howden, Australian National University, Australia</p>	<p>Developments in banana tissue culture in Australia - 111</p> <p>▶ Ms Sharon Hamill, Department of Agriculture and Fisheries, Queensland Government, Australia</p>	<p>Success example: The potential for livestock methane mitigation - 117</p> <p>▶ Prof Richard Eckard, The University of Melbourne, Australia</p>	<p>Introducing market-led approaches into postgraduate plant-breeding education programs in Africa - 123</p> <p>▶ Prof Shimelis Hussein, Africa Centre for Crop Improvement (ACCI), South Africa</p>	<p>Preparing the way for growth in aquaculture in northern Australia: Industry priorities and vision 2028 - 129</p> <p>▶ Prof Dean Jerry, Centre for Sustainable Tropical Fisheries and Aquaculture; ARC Research Hub for Advanced Prawn Breeding, James Cook University, Australia</p>
<p>Transforming agricultural biosecurity - 103</p> <p>▶ Assoc Prof Grant Hamilton, Queensland University of Technology, Australia</p>	<p>Micropropagation of recalcitrant <i>Persea Americana</i> rootstock cultivars - 112</p> <p>▶ Dr Jayeni Hiti-Bandaralage, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>Productivity - intensification - animal welfare: Synergies or trade-offs? - 118</p> <p>▶ Dr Rebecca Doyle, The University of Melbourne, Australia</p>	<p>Africa's plant breeders and their variety portfolio for farmers and markets: Opportunities and challenges - 124</p> <p>▶ Dr Nasser Yao, International Livestock Research Institute (ILRI), Kenya</p>	<p>Northern Australia forestry situational analysis project - 130</p> <p>▶ Mr Mick Stephens, Timber Queensland, Australia</p>
<p>Transforming landscapes through irrigation - 105</p> <p>▶ Dr Matthew Harrison, Tasmanian Institute of Agriculture (TIA), Australia</p>	<p>Enhancing product development by use of double haploid - 113</p> <p>▶ Dr Usha Zehr, Maharashtra Hybrid Seeds Company Private Limited (MAHYCO), India</p>	<p>Informing tomorrow's livestock science: Opportunities to transform food systems in tropical developing regions - 119</p> <p>▶ Dr Anna Okello, Australian Centre for International Agricultural Research (ACIAR), Australia</p>	<p>Demand led breeding - 125</p> <p>▶ Prof Gabrielle Persley, The University of Queensland, Australia</p> <p>Panel discussion</p>	<p>Business on country: Land use diversification on the Indigenous estate - 131</p> <p>▶ Mr Ricky Archer, North Australian Indigenous Land and Sea Management Alliance Ltd, Australia</p>
				

12:30 Lunch and poster presentations
 Poster themes: Livestock and AgFutures

13:30-15:30 Concurrent symposia session 2

FIELD CROPS Room ▶ P7-8	HORTICULTURE Room ▶ P9	LIVESTOCK Room ▶ P10	NUTRITION AND FOOD Room ▶ P11	AGFUTURES Room ▶ Plaza Auditorium
<p>2.1 ▶ Climate-smart wheat Chair ▶ Dr Karine Chenu, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>2.2 ▶ Beyond pretty pictures: Horticulture tree crop mapping, from individual fruit to a national database Chair ▶ Dr Anthony Kachenko, Hort Innovation, Australia</p>	<p>2.3 ▶ Nutrition strategies to mitigate high environmental temperatures in cattle, pigs, and chickens Chairs ▶ Assoc Prof Eugeni Roura and Assoc Prof John Gaughan, The University of Queensland, Australia</p>	<p>2.4 ▶ Creating an Australian cuisine through traditional Australian foods Chair ▶ Assoc Prof Yasmina Sultanbawa, ARC Training Centre for Uniquely Australian Foods, Australia</p>	<p>2.5 ▶ Value-adding opportunities for agriculture through Biofutures Chair ▶ Prof Ian O'Hara, Queensland University of Technology, Australia</p>
<p>Transformational wheat agronomy: Success from system synergy - 132 ▶ Dr John Kirkegaard, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia</p>	<p>Matching technology with need - 138 ▶ Mr Chad Simpson, E.E. Muir & Sons Pty Ltd, Australia</p>	<p>Management of cattle exposed to high environmental temperatures - 144 ▶ Prof Terry Mader, University of Nebraska, USA</p>	<p>Can we create a sustainable functional food market using Australian native plant foods? - 150 ▶ Dr Mridusmita Chaliha, ARC Training Centre for Uniquely Australian Foods, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>Wastes to profits – delivering advanced bioproduct technologies for agriculture - 156 ▶ Mr Doug McNicholl, Meat and Livestock Australia, Australia</p>
<p>Delivering traits for improved adaptation to future climates - 133 ▶ Dr Greg Rebetzke, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia</p>	<p>Forward estimation of mango crop load and harvest timing based on in-field machine vision and handheld spectroscopy - 139 ▶ Prof Kerry Walsh, Central Queensland University, Australia</p>	<p>Nutritional strategies to mitigate effects of high environmental temperature - 145 ▶ Assoc Prof John Gaughan, The University of Queensland, Australia</p>	<p>Integration of Aboriginal culture and history through bush food enterprises - 151 ▶ Ms Madonna Thomson, Jagera Daran, Nyanda Aboriginal Cultural Tours and Bush Food Experience, Australia</p>	<p>Energy and feed products from waste: Applying the circular economy to agricultural industries - 157 ▶ Dr Paul Jensen, Advanced Water Management Centre, The University of Queensland, Australia</p>
<p>Combining trait physiology, crop modelling and molecular genetics to improve wheat adaptation to terminal water-stress by targeting stay-green and root traits - 134 ▶ Dr Jack Christopher, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>Efficient and detailed orchard maps: Flowers, fruit, ripeness, canopy light interception and yield - 140 ▶ Dr James Underwood, The University of Sydney, Australia</p>	<p>Metabolism and endocrinology of cattle in high environmental temperatures - 146 ▶ Dr Gene Wijffels, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia</p>	<p>Australian cuisine and traditional food flavours - 152 ▶ Dr Heather Smyth, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Centre for Nutrition and Food Sciences (CNAFS), Australia</p>	<p>Low cost and flexible production of biofuels and biochemicals - 158 ▶ Dr Darryn Rackemann, Queensland University of Technology, Australia</p>
<p>Increasing heat tolerance in wheat to counteract recent and projected increases in heat stress - 135 ▶ Dr Najeeb Ullah, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>The appropriate use of UAVs and Lidar for mapping tree crop canopy structure and health - 141 ▶ Ms Dan Wu, The University of Queensland, Australia</p>	<p>Physiological adaptations of pigs under high environmental temperatures - 147 ▶ Dr Jeremy Cottrell, The University of Melbourne, Australia</p>	<p>Nutritional value of Australian traditional foods and diet diversification from a global perspective - 153 ▶ Prof Michael Rychlik and Dr Michael Netzel, Technical University of Munich, Germany</p>	<p>How synthetic biology will transform the Australian biotechnology industry - 159 ▶ Assoc Prof Claudia Vickers, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia</p>
<p>Tracking a major gene increasing wheat biomass and yield in hot environments - 136 ▶ Dr Penny Tricker, The University of Adelaide, Australia</p>	<p>Exploring the potential of high resolution satellite imagery for yield prediction of Avocado and Mango crops - 142 ▶ Dr Moshir Rahman, Applied Agriculture Research Centre (AARSC), University of New England, Australia</p>	<p>Nutritional strategies to mitigate heat stress in pigs - 148 ▶ Prof Frank Dunshea, The University of Melbourne, Australia</p>	<p>Influence of traditional South African food preparation methods on functional compounds - 154 ▶ Prof Dharini Sivakumar, Tshwane University of Technology, South Africa</p>	<p>Mapping biomass resources in Queensland - 160 ▶ Ms Kelly Bryant, Department of Environment and Science, Queensland Government, Australia</p>
<p>New advances in phenotyping technologies - 137 ▶ Dr Xavier Sirault, Australian Plant Phenomics Facility; Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia</p>	<p>National scale mapping of horticulture tree crops in Australia - 143 ▶ Mr Craig Shephard, The University of New England, Australia</p>	<p>Nutritional strategies to mitigate heat stress in chickens - 149 ▶ Assoc Prof Eugeni Roura and Assoc Prof Chiara Palmieri, The University of Queensland, Australia</p>	<p>Designing meal plans for the food service sector using traditional Australian foods - 155 ▶ Dr Olivia Wright, The University of Queensland, Australia</p>	<p>Lignocellulosic biomass as a bioeconomy platform – industry perspectives - 161 ▶ Mr Alex Baker, Leaf Resources Ltd, Australia</p>





15:30 Afternoon tea

16:00-18:00 Concurrent symposia session 3

FIELD CROPS Room ▶ P7-8	HORTICULTURE Room ▶ P9	LIVESTOCK Room ▶ P10	NUTRITION AND FOOD Room ▶ P11	AGFUTURES Room ▶ Plaza Auditorium
<p>3.1 ▶ Farming system intensification for small-holders</p> <p>Chair ▶ Sarina Macfayden, Australian Centre for International Agricultural Research (ACIAR), Australia</p>	<p>3.2 ▶ Future orchards: Advances in horticultural tree research</p> <p>Chairs ▶ Dr Bruce Topp, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia ▶ Dr Jose Chaparro, University of Florida, USA</p>	<p>3.3 ▶ Advancing animal productivity and welfare with genomics</p> <p>Chair ▶ Dr Marina Fortes, The University of Queensland, Australia</p>	<p>3.4 ▶ Biofortification of crops for human health</p> <p>Chair ▶ Prof Roger P Hellens, Queensland University of Technology, Australia</p>	<p>3.5 ▶ Innovation in food safety and traceability</p> <p>Chair ▶ Mr Jim Dodds, Safefood Queensland, Australia</p>
<p>Trees for food security: How is it stacking up in East Africa? - 162</p> <p>▶ Prof Catherine Muthuri, World Agroforestry Centre (ICRAF), Kenya</p>	<p>Understanding early orchard productivity in macadamia - 168</p> <p>▶ Dr John Wilkie, Department of Agriculture and Fisheries, Queensland Government, Australia</p>	<p>Genome editing in poultry: Opportunities and impacts - 174</p> <p>▶ Dr Kristie Jenkins, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia</p>	<p>The inside and out of folate in strawberries and avocados - 180</p> <p>▶ Dr Michael Netzel, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>Food tampering – what we can learn from strawberries - 186</p> <p>▶ Ms Clare Hamilton-Bate, Freshcare Ltd, Australia</p>
<p>Fostering sustainable agricultural intensification in Eastern and Southern Africa: Agronomic, institutional and policy enablers - 163</p> <p>▶ Dr Paswel Marenja, International Maize and Wheat Improvement Center (CIMMYT), Africa</p>	<p>Genomics and the macadamia orchard of the future - 169</p> <p>▶ Dr Cathy Nock, Southern Cross University, Australia</p>	<p>Selecting for behavioural traits in animals – what could we change and should we? - 175</p> <p>▶ Dr Jill Fernandes, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>Zeaxanthin-biofortified popcorn for eye health - 181</p> <p>▶ Dr Tim O'Hare, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>Supply chain integrity – managing food safety and food fraud risks - 187</p> <p>▶ Ms Margaret Balfour, Integrity Compliance Solutions, Australia</p>
<p>Sustainable intensification in the Eastern Gangetic Plains: Key to food security and livelihood improvement of smallholders - 164</p> <p>▶ T.P. Tiwari, International Maize and Wheat Improvement Center (CIMMYT), Bangladesh</p>	<p>Benchmarking and farm economics of Australian macadamia production: What makes a modern orchard productive? - 170</p> <p>▶ Mr Shane Mulo, Department of Agriculture and Fisheries, Queensland Government, Australia</p>	<p>Castration free swine through gene editing of porcine KISS1 - 176</p> <p>▶ Dr Tad Sonstegard, Acceligen a Recombinetics Company, USA</p>	<p>Folate in durian and other tropical exotics - 182</p> <p>▶ Prof Michael Rychlik, Technical University of Munich, Germany</p>	<p>Innovative technologies to mitigate microbial food safety risks in fresh produce - 188</p> <p>▶ Dr Sukhvinder Pal Singh, NSW Department of Primary Industries, Australia</p>
<p>Sustainable intensification in rice production and processing chains (Laos and Cambodia) - 165</p> <p>▶ Ms Jaquie Mitchell, The University of Queensland, Australia</p>	<p>Extending a breeding information management system to combine international data for global performance predictions - 171</p> <p>▶ Dr Craig Hardner, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>Naturally Polled TM – improving the welfare of dairy cattle - 177</p> <p>▶ Dr Carl Ramage, Rautaki Solutions Pty Ltd, Australia</p>	<p>Super-sweet purple sweetcorn: Breaking the genetic link - 183</p> <p>▶ Mr Apurba Lal Ray, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>A biocontrol option to control a food-borne pathogen, using bacteriophages to control Campylobacter in poultry - 189</p> <p>▶ Dr Nalini Chinivasagam, Department of Agriculture and Fisheries, Queensland Government, Australia</p>
<p>Assessments of lowland rice-based farming systems and prospects for future research and development priorities - 166</p> <p>▶ Van Touch, The University of Sydney, Australia</p>	<p>Improvement of citrus cultivars through introgression of wild germplasm - 172</p> <p>▶ Dr Jose Chaparro, University of Florida, USA</p>	<p>Differences in thermoregulatory responses between Dorper and second cross lambs to heat stress challenges - 178</p> <p>▶ Ms Aleena Joy, The University of Melbourne, Australia</p>	<p>Filling the void – boosting the nutritional value of blueberry - 184</p> <p>▶ Dr Richard Espley, The New Zealand Institute for Plant and Food Research Limited (PFRL), New Zealand</p>	<p>Technologies that improve food safety and compliance - 190</p> <p>▶ Mr Keith Gemmell, Safe Food Production QLD, Australia</p>
<p>Outcomes of agroforestry and monocropping - Comparison and assessment - 167</p> <p>▶ Dr La Nguyen, World Agroforestry Centre (ICRAF), Vietnam</p>	<p>Breeding macadamia cultivars for orchards of the future - 173</p> <p>▶ Dr Mobashwer Alam and Ms Katie O'Connor, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>A study on DNA methylation from bovine tail hair and liver tissues - 179</p> <p>▶ Dr Loan Nguyen, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>Soil and foliar Zn fertiliser application as strategies of agronomic biofortification for sweetcorn grown in soils with varying Zn status - 185</p> <p>▶ Mr Zhong Xiang Cheah, The University of Queensland, School of Agriculture and Food Sciences, Australia</p>	<p>Taking food safety to a new level – the application of genomics and big data - 191</p> <p>▶ Prof David Burt, Office of the Deputy Vice-Chancellor (Research), The University of Queensland, Australia</p>
				

18:00-20:00 Welcome reception and poster viewing



▶ **Alfred de Vries**, Senior Program Officer for Animal Production
Bill & Melinda Gates Foundation

Alfred de Vries works at the Bill & Melinda Gates Foundation as Senior Program Officer for Animal Production. He leads the Foundation's efforts in R&D for Animal Production (genetics, reproduction, feed) aimed at increasing livestock productivity in Sub-Saharan Africa and South-Asia. Alfred has extensive experience in animal breeding across many geographies from his time at international breeding companies (CRV, Topigs Norsvin and PIC). He had management positions in R&D, technical service and operations. He obtained his MSc and PhD degrees in Animal Sciences from Wageningen University and holds a

Global Certificate in Management from INSEAD.

Tropical livestock for wealth in developing countries

The Agriculture Development program at the Gates Foundation strives to empower smallholder farmers with the tools and technologies they need to boost productivity, farm income and food quality. We partner with governments, local NGOs and businesses to give farmers better access to the markets, distribution networks, and the inputs they need.

Our investments in livestock started in 2012. The reasons for including livestock in the program were:

- 60% of people in extreme poverty own livestock
- livestock is often their most important asset
- 30-40% of Agricultural GDP
- important source for high quality nutrition
- opportunity to empower women
- enormous potential for yield improvement

Most animals in developing countries have health challenges and very low yields (~10 times lower compared to other countries), resulting in low farmer income, poor resource efficiency, high GHG emission intensity and high consumer prices.

The major constraints for higher productivity are in animal health, genetics and feed quality. To address these constraints, we have made investments in new technologies, products and delivery systems. Examples in genetics are genomic selection, sex sorted semen and artificial insemination for dairy cows and buffaloes. Important investments in poultry genetics are in the delivery of locally adapted chicken with 5-10 times more egg production. Other promising investments are in digital platforms that link farmers to the formal market as well as to financial services.

These technologies help to overcome barriers for successful farming in tropical countries, but much more innovation and investments are needed to give every farmer the chance of healthy and productive livestock.



▶ **Pamela Ronald**, Founding Director of the Institute for Food and Agricultural Literacy
University of California, Davis

Pamela Ronald, is a Distinguished Professor, in the Dept. of Plant Pathology and the Genome Center, and Founding Director of the Institute for Food and Agricultural Literacy at the University of California, Davis. She also serves as a Key Scientist at the Joint Bioenergy Institute in Emeryville, CA.

Pamela studies rice genes that control resistance to disease and tolerance to environmental stress. Pamela and colleagues received the 2008 USDA National Research Initiative Discovery Award and the 2012 Tech Award for innovative use of technology to benefit humanity. In 2011, she was selected as one of the 100 most creative people in business by Fast Company Magazine. She is the recipient of the 2012 Louis Malassis International Scientific Prize for Agriculture and Food, a Guggenheim Fellowship, the National Association of Science Writers Science in Society Journalism Award, and the Fulbright-Tocqueville Distinguished Chair Award.

In 2014 she was named one of the world's most influential scientific minds by Thomson Reuters, in 2015 was selected by Scientific American as one of the world's 100 most influential people in biotechnology and in 2016 was named one of the 50 innovators and visionaries who will lead us toward a more sustainable future by Grist magazine. She is co-author, with her husband, Raoul Adamchak, an organic farmer, of *Tomorrow's Table: Organic Farming, Genetics, and the Future of Food*. Bill Gates calls the book "a fantastic piece of work" and "important for anyone that wants to learn about the science of seeds and challenges faced by farmers. In 2012, *Tomorrow's Table* was selected by The New Earth Archive as one of the 25 most powerful and influential books with the power to inspire college readers to change the world. Her 2015 TED talk has been viewed by more than 1.7 million people and translated into 26 languages.

Engineering crops for resistance to disease and tolerance to environmental stress

A major goal for food and agricultural research is to increase the resiliency of agricultural systems to adapt to rapid changes and extreme conditions. Prof. Ronald will describe how genetic approaches are being used to generate the next generation of crops that will help farmers thrive in these challenging conditions.

Her laboratory at UC Davis studies genes that control resistance to disease and tolerance of environmental stress. Together with her collaborators, she has engineered rice for resistance to disease and tolerance to flooding. Ronald will describe isolation of a rice immune receptor, its similarity to animal immune receptors and the microbial molecule that binds to and activates the rice immune receptor. She will describe isolation of the Sub1A gene and the development of a flood tolerant rice variety (known as 'Sub1' rice) produced by the International Rice Research Institute that was cultivated by over six million farmers in India and Bangladesh in 2017. Under submerged conditions, these 'Sub1' varieties have enhanced yield and can prevent total crop failure.

07:30-18:00 Registration desk open ▶ Plaza Auditorium foyer, Plaza level, Brisbane Convention & Exhibition Centre, Grey Street, South Brisbane

08:30-10:00 Plenary session 2

Room Plaza Auditorium

Chair ▶ Prof Robert Henry, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI)

08:30 Keynote speaker Tropical livestock for wealth in developing countries - 200
▶ Mr Alfred de Vries, Senior Program Officer for Animal Production, Bill & Melinda Gates Foundation, USA

09:15 Keynote speaker Engineering crops for resistance to disease and tolerance to environmental stress - 201
▶ Prof Pamela Ronald, Founding Director of the Institute for Food and Agricultural Literacy, University of California, Davis, USA

10:00 Morning tea



FIELD CROPS Room ▶ P7-8	HORTICULTURE Room ▶ P9	LIVESTOCK Room ▶ P10	NUTRITION AND FOOD Room ▶ P11	AGFUTURES Room ▶ Plaza Auditorium
<p>4.1 ▶ From enzymes and cells to entire crops: Integrative approaches to redesigning photosynthesis for better yields</p> <p>Chair ▶ Dr Robert Sharwood, ARC Centre of Excellence for Translational Photosynthesis, Australian National University, Australia</p>	<p>4.2 ▶ Digital horticulture</p> <p>Chair ▶ Assoc Prof Jim Hanan, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>4.3 ▶ Understanding livestock microbiomes for health, welfare, and sustainability</p> <p>Chair ▶ Assoc Prof Mary Fletcher, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>4.4 ▶ Wild crop relatives: The next frontier for crop improvement</p> <p>Chairs ▶ Prof Wallace Cowling, The University of Western Australia ▶ Prof Ros Gleadow, Monash University, Australia</p>	<p>4.5 ▶ Insect protein: Reducing waste and feeding the future</p> <p>Chair ▶ Dr Peter James, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>
<p>Recent advances in predicting stomatal behaviour - 202</p> <p>▶ Prof Belinda Medlyn, Western Sydney University, Australia</p>	<p>Modelling orchard light environment - 208</p> <p>▶ Dr Neil White, Department of Agriculture and Fisheries, Queensland Government, Australia</p>	<p>Breeding low-emitting ruminants: Predicting methane from microbes - 214</p> <p>▶ Dr Suzanne Rowe, AgResearch, New Zealand</p>	<p>Diversity breeding program on common bean (<i>Phaseolus vulgaris</i> L.) targeting rapid cooking and iron and zinc biofortification - 220</p> <p>▶ Dr Clare Mukankusi, International Center for Tropical Agriculture (CIAT), Uganda</p>	<p>Black soldier flies for waste recycling and protein: Livestock for livestock - 226</p> <p>▶ Dr Peter James, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>
<p>Leaf 3D imaging and modelling to increase crop photosynthesis and water-use efficiency - 203</p> <p>▶ Prof Margaret Barbour, The University of Sydney, Australia</p>	<p>Using virtual plants to understand how fruit trees grow - 209</p> <p>▶ Dr Inigo Auzmendi, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>Identifying plants that reduce methane production using an in vitro system - helping the challenge to become C neutral - 215</p> <p>▶ Prof Phil Vercoe, University of Western Australia, Australia</p>	<p>Meta-analysis of genome-wide association studies for pre-breeding in agricultural crops - 221</p> <p>▶ Dr Hans Daetwyler, Agriculture Victoria, Australia</p>	<p>Insect farming is here, but are we ready for it? - 227</p> <p>▶ Ms Olympia Yarger, GoTerra, Australia</p>
<p>Improving light use efficiency in C₄ plants by increasing electron transport rate - 204</p> <p>▶ Dr Maria Ermakova, Australian National University, Australia</p>	<p>Robotic sensing and acting in protected cropping systems - 210</p> <p>▶ Dr Chris Lehnert, Queensland University of Technology, Australia</p>	<p>A novel method to predict high-value traits, including methane emissions and feed efficiency, from rumen microbiome profiles - 216</p> <p>▶ Dr Elizabeth Ross, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>The diverse functions of prussic acid in Australia's native sorghums: Lessons for domestication - 222</p> <p>▶ Prof Ros Gleadow, Monash University, Australia</p>	<p>Insect nutrition, feeding and artificial diets - 228</p> <p>Dr Elsje Pieterse, Stellenbosch University, South Africa</p>
<p>High-throughput phenotyping tools to test whether leaf-level photosynthesis traits are measurable at the crop level - 205</p> <p>▶ Dr Barbara George-Jaeggli, ARC Centre of Excellence for Translational Photosynthesis; Queensland Alliance for Agriculture and Food Innovation (QAAFI), The University of Queensland, Australia</p>	<p>Simulating bee pollination for horticultural applications - 211</p> <p>▶ Assoc Prof Alan Dorin, Monash University, Australia</p>	<p>Moving from clouds to the microbiome - an animal health perspective - 217</p> <p>▶ Assoc Prof Pat Blackall and Dr Lida Omaleki, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>Potential use of Australian crop wild relatives in agriculture and food production - 223</p> <p>▶ Prof Robert Henry, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>Nutritional value of black soldier fly from abattoir waste - 229</p> <p>▶ Dr Luis Prada e Silva, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>
<p>New tools can easily detect photosynthetic diversity in wheat - 206</p> <p>▶ Dr Gonzalo Estavillo, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia</p>	<p>From real-time precision mapping to robotic actuation - examples from vegetable and tree crops - 212</p> <p>▶ Prof Salah Sukkarieh, University of Sydney, Australia</p>	<p>The genetics of rumen phage populations - 218</p> <p>▶ Dr Rosalind Gilbert, Department of Agriculture and Fisheries, Queensland Government, Australia</p>	<p>Evolving gene banks - a continuously-improving genetic resource for crop breeders - 224</p> <p>▶ Prof Wallace Cowling, The University of Western Australia, Australia</p>	<p>Impact of insect larvae on meat quality - 230</p> <p>▶ Dr Louwrens Hoffman, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>
<p>Integrative leaf photosynthesis-to-crop yield modelling to help accelerate yield improvement - 207</p> <p>▶ Dr Alex Wu, ARC Centre of Excellence for Translational Photosynthesis; Queensland Alliance for Agriculture and Food Innovation (QAAFI), The University of Queensland, Australia</p>	<p>The relevance of dominance to genomic selection in breeding clonally propagated plant species - 213</p> <p>▶ Dr Christian Werner, The University of Edinburgh, UK</p>	<p>Innate variability in animal performance and rumen microbiota across seasonal changes in a northern Australian grazing system - 219</p> <p>▶ Dr Stuart Denman, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia</p>	<p>Challenges of collecting and preserving crop wild relatives - 225</p> <p>▶ Dr Sally Norton, Australian Grains Genebank, Agriculture Victoria, Australia</p>	<p>Enzymatic fractionation of protein, fat and chitin from <i>Hermetia illucens</i> (L.) (Diptera: Stratiomyidae) - 231</p> <p>▶ Mr Michael J Woods, Stellenbosch University, South Africa</p>
				

12:30 Lunch and poster presentations
Poster theme: Field Crops

13:30-15:30 Concurrent symposia session 5

FIELD CROPS Room ▶ P7-8	HORTICULTURE Room ▶ P9	LIVESTOCK Room ▶ P10	NUTRITION AND FOOD Room ▶ P11	AGFUTURES Room ▶ Plaza Auditorium
<p>5.1 ▶ Science, technology and process innovation in identification and management of emerging pest and disease threats</p> <p>Chair ▶ Dr Harjeet Khanna, Sugar Research Australia, Australia</p>	<p>5.2 ▶ Using precision information systems for advanced decision making in vegetables</p> <p>Chair ▶ Dr Julie O'Halloran, Department of Agriculture and Fisheries, Queensland Government, Australia</p>	<p>5.3 ▶ Opportunities to improve efficiency of phosphorus in animal agriculture</p> <p>Chairs ▶ Assoc Prof Mary Fletcher and Assoc Prof Stephen Anderson, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>5.4 ▶ Provenance of meat</p> <p>Chair ▶ Prof Louwrens Hoffman, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>5.5 ▶ Innovative climate products for improving risk management for the red meat industry in the tropics and subtropics</p> <p>Chair ▶ Prof Roger Stone, University of Southern Queensland, Australia</p>
<p>The confluence of drivers of change on the emergence, re-emergence and geographic redistribution of pathogens and pests - 232</p> <p>▶ Dr James P Stack, Kansas State University, USA</p>	<p>Yield forecasting using remote sensing in vegetables - 238</p> <p>▶ Dr Angelica Suarez Cadavid, University of New England, Australia</p>	<p>The outlook for global scarcity of phosphorus reserves for agriculture - 244</p> <p>▶ Assoc Prof Brent Jacobs, University of Technology Sydney, Australia</p>	<p>Provenance: The Australian flavour story for meat - 250</p> <p>▶ Dr Heather Smyth, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>Queensland's investment in managing drought, climate variability and adapting to climate change - 256</p> <p>▶ Mr Vern Rudwick, Department of Agriculture and Fisheries, Queensland Government, Australia</p>
<p>Yellow Canopy Syndrome: A physiological disorder, not a disease - 233</p> <p>▶ Dr Friskkie Botha, Sugar Research Australia, Australia</p>	<p>Using precision information technologies to understand crop variability - 239</p> <p>▶ Ms Celia van Sprang, Department of Agriculture and Fisheries, Queensland Government, Australia</p>	<p>Phosphorus in northern Australian soils supporting pastures or grain cropping - 245</p> <p>▶ Prof Michael Bell, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>Provenance of meat in Europe - 251</p> <p>▶ Dr Sara Erasmus, Wageningen University, Netherlands</p>	<p>Turning on farm data into valuable insights. How the opportunity is being addressed today, and where it is heading - 257</p> <p>▶ Mr Michael Wang, The Weather Company, Australia</p>
<p>Current understanding of grain legume disorders in eastern Australia, and association to phytoplasma infection - 234</p> <p>▶ Dr Murray Sharman, Department of Agriculture and Fisheries, Queensland Government, Australia</p>	<p>Application of precision agriculture techniques and variable rate technology in horticultural production in north Queensland - 240</p> <p>▶ Mr Chris Monsour, Prospect Agriculture, Australia</p>	<p>Phosphorus in the nutrition of poultry and pigs in intensive production systems - 246</p> <p>▶ Dr David Cadogan, Monogastric Technical Services, Feedworks, Australia</p>	<p>Provenance in sheep: The Karoo lamb story - 252</p> <p>▶ Prof Louwrens Hoffman, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>Prediction of northern Australian rainfall onset using the ACCESS-seasonal model - 258</p> <p>▶ Dr Tim Cowan, University of Southern Queensland; Bureau of Meteorology, Australia</p>
<p>Understanding of dieback in grass-pastures across Queensland - 235</p> <p>▶ Mr Stuart Buck, Department of Agriculture and Fisheries, Queensland Government, Australia</p>	<p>Adoption of precision information technologies: The grower's journey - 241</p> <p>Speaker to be confirmed</p>	<p>New-generation phytases for improved utilisation of diet phosphorus - 247</p> <p>▶ Assoc Prof Robert Speight, Queensland University of Technology, Australia</p>	<p>The effect of diet on meat provenance - 253</p> <p>▶ Dr J Jeannine Marais, University of Stellenbosch, South Africa</p>	<p>Mechanisms of multi-year wet/dry conditions over northern Australia - 259</p> <p>▶ Dr Sharmila Sur, University of Southern Queensland; Bureau of Meteorology, Australia</p>
<p>Smart surveillance to support plant biosecurity - 236</p> <p>▶ Dr Brendan Rodoni, Agriculture Victoria, Australia</p>	<p>Drones for more vegetables - pathways to a commercial reality - 242</p> <p>▶ Mr Nathaniel Parker, Airborn Insight, Australia</p>	<p>Phosphorus nutrition in ruminants grazing tropical rangelands - 248</p> <p>▶ Dr Rob Dixon, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>What provenance means to the consumer - 254</p> <p>▶ Ms Lisa Sharp, Meat and Livestock Australia, Australia</p>	<p>The value of the Australian Drought Monitor to the cattle industry - 260</p> <p>▶ Dr Christa Pudmenzky, University of Southern Queensland, Australia</p>
<p>From colony collapse to complex syndromes: Pollinator health and disease transmission management in agricultural landscapes - 237</p> <p>▶ Dr Vincent Doublet, University of Ulm Institute of Evolutionary Ecology and Conservation Genomics, Germany</p>	<p>Challenges and opportunities for PA adoption in vegetables - 243</p> <p>▶ Dr Julie O'Halloran, Department of Agriculture and Fisheries, Queensland Government, Australia</p>	<p>Using digital soil mapping to estimate available soil phosphorus across Australian rangelands - 249</p> <p>▶ Mr Peter Zund, Department of Environment and Science, Queensland Government, Australia</p>	<p>The role of Provenance of beef in a niche market: The OBE beef story - 255</p> <p>▶ Andrew Blinco, OBE Organic Beef, Australia</p>	<p>Climate mates: Bridging the gap between scientists and producers - 261</p> <p>▶ Dr Chelsea Jarvis, University of Southern Queensland, Australia</p>
				

15:30 Afternoon tea

16:00-18:00 Concurrent symposia session 6

FIELD CROPS Room ▶ P7-8	HORTICULTURE Room ▶ P9	LIVESTOCK Room ▶ P10	NUTRITION AND FOOD Room ▶ P11	AGFUTURES Room ▶ Plaza Auditorium
<p>6.1 ▶ Stress physiology: Designing crops for a hotter and drier world - 262 Chair ▶ Prof Andrew Borrell, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>6.2 ▶ Horticultural tree genomics Chair ▶ Dr Craig Hardner, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>6.3 ▶ Growing human capital for tropical animal industries Chair ▶ Dr Dianne Mayberry, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia</p>	<p>6.4 ▶ Vertically integrated R&D platforms for underutilised and niche crops Chair ▶ Assoc Prof Sean Mayes, University of Nottingham, UK; Crops for the Future, Malaysia</p>	<p>6.5 ▶ Innovations in biosecurity Chair ▶ Mr Malcolm Letts, Department of Agriculture and Fisheries, Queensland Government, Australia</p>
<p>Genotype and management adaptation of wheat to heat and drought in current and future climates -262 ▶ Dr Karine Chenu, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>Advances in macadamia genomics - 268 ▶ Dr Agnelo Furtado, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>Challenges of breaking into industry from early career perspective - 274 ▶ Ms Rebecca Clapperton, Salisbury Plains Grazing, Australia</p>	<p>Advanced technologies to increase profitability of the Australian tea tree industry - 280 ▶ Assoc Prof Tobias Kretzchmar, Southern Cross University, Australia</p>	<p>The RD&E response to Queensland's Panama disease TR4 incursion - 286 ▶ Mr Stewart Lindsay, Department of Agriculture and Fisheries, Queensland Government, Australia</p>
<p>Modelling heat and drought adaptation in crops - 263 ▶ Dr Erik van Oosterom, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>Breaking and flowering: The budding story of macadamia - 269 ▶ Dr Francois Barbier, The University of Queensland, Australia</p>	<p>Opportunity and investment in the next generation of livestock scientists - 275 ▶ Dr Shannon Landmark, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>Australian native plant foods and their contribution to diet diversity - 281 ▶ Assoc Prof Yasmina Sultanbawa, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), ARC Training Centre for Uniquely Australian Foods, Australia</p>	<p>Alternative diagnostic tools for White Spot Disease - 287 ▶ Dr Beth Fowler, Department of Agriculture and Fisheries, Queensland Government, Australia</p>
<p>How do crops balance water supply and demand when water is limiting? - 264 ▶ Prof Andrew Borrell, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>The avocado genome: An update - 270 ▶ Dr Alice Hayward, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>Career mobility to grow human capital in the tropical animal industries - 276 ▶ Mr Peter Johnston, Department of Agriculture and Fisheries, Queensland Government, Australia</p>	<p>Genetic improvement and application of genomic tools for Bambara groundnut improvement in West Africa - 282 ▶ Dr Stephen Amoah, Crops Research Institute, Ghana</p>	<p>Start clean, stay clean - 288 ▶ Mr Mark Whattham, Department of Agriculture and Water Resources, Australian Government, Australia</p>
<p>The role of hydraulics in crop water use under drought - 265 ▶ Dr Vincent Vadez, Institute for Development (IRD), France</p>	<p>CRISPR kiwifruit – new opportunities for cultivation, breeding and research - 271 ▶ Dr Erika Varkonyi-Gasic, The New Zealand Institute for Plant and Food Research Limited (PFR), New Zealand</p>	<p>International perspective of future career opportunities in animal science - 277 ▶ Dr Anna Okello, Australian Centre for International Agricultural Research (ACIAR), Australia</p>	<p>Knowledge representation and data management adding value to global niche crops - 283 ▶ Prof Graham King, Southern Cross University, Australia</p>	<p>Future systems for traceability in the red meat supply chain - 289 ▶ Ms Jo Quigley, Integrity Systems Company, Meat & Livestock Australia, Australia</p>
<p>Phenotyping the hidden half: Measuring roots from long hairs to deep cores - 266 ▶ Dr Anton Wasson, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia</p>	<p>Mango genomics: Drafting Kensington Pride - 272 ▶ Dr David Innes, Department of Agriculture and Fisheries, Queensland Government, Australia</p>	<p>Mentoring and succession planning - talking from experience - 278 ▶ Emeritus Prof Alan Bell, (retired) Cornell University, Australia</p>	<p>A systematic approach to defining nutritional quality of underutilised crops - 284 ▶ Ms Razlin Azman Halimi, Southern Cross University, Australia</p>	<p>New technologies for weed eradication - invasive plants have no place to hide when DNA is involved - 290 ▶ Dr Laura Simmons, Department of Agriculture and Fisheries, Queensland Government, Australia</p>
<p>Root responses of durum wheat ideotypes defined by contrasting root angles to localised phosphorus availability and dynamic soil profile moisture - 267 ▶ Dr Frederik van der Bom, The University of Queensland, Australia</p>	<p>Genetics of almond - 273 ▶ Dr Shashi Goonetilleke, The University of Adelaide, Australia</p>	<p>Building beef industry capacity in northern Australia - 279 ▶ Mr Andrew Gatenby, Indigo Australia, Australia</p>	<p>Orange capsicums and chillies as a potential source of dietary zeaxanthin, an important macular carotenoid for eye health - 285 ▶ Ms Rimjhim Agarwal, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Centre for Nutrition and Food Sciences (CNAFS), Australia</p>	<p>Collaborative planning and shared decision making in biosecurity emergency management - 291 ▶ Dr Suzy Perry, Department of Agriculture and Fisheries, Queensland Government, Australia</p>
				

19:00-23:00 TropAg2019 conference dinner ▶ Plaza Ballroom, Plaza level, Brisbane Convention & Exhibition Centre



▶ **Mark Howden**, Director of the Climate Change Institute
Australian National University

Professor Mark Howden is a Director of the Climate Change Institute at the Australian National University. He has been a major contributor to the Intergovernmental Panel on Climate Change (IPCC) since 1991, with roles in the Second, Third, Fourth, Fifth and now Sixth Assessment Reports, sharing the 2007 Nobel Peace Prize with other IPCC participants and Al Gore.

He is also an Honorary Professor at Melbourne University, a Vice Chair of the IPCC and a member of the Australian National Climate Science Advisory Committee. He is a former Chief Research Scientist at CSIRO Agriculture.

Professor Howden was on the US Federal Advisory Committee for the 3rd National Climate Assessment and contributes to several major national and international science and policy advisory bodies.

Professor Howden is an expert on how climate variability and climate change will impact on food production and food security and how to adapt to those impacts. He has also developed the national and international greenhouse gas inventories for the agricultural sector and assessed sustainable methods of reducing net greenhouse gas emissions from agriculture.

Professor Howden has worked on climate variability, climate change, innovation and adoption issues for more than 30 years in partnership with many industry, community and policy groups via both research and science-policy roles. Issues he has addressed include agriculture and food security, the natural resource base, ecosystems and biodiversity, energy, water and urban systems.

Professor Howden has authored more than 420 publications. The national and international greenhouse gas inventories he helped develop are a fundamental part of the Paris Agreement, helping inform sustainable ways to reduce emissions.

Climate change impacts, adaptation and mitigation for tropical agriculture

As climate change gains pace globally, many of the first and most severe impacts are falling on tropical regions. In particular these impacts are occurring in tropical agriculture and food systems with assessments of falling crop yields, decreases in the productivity of livestock and fisheries and increased climatic disruptions. This is likely to have already increased stresses in relation to food security and natural resource management, both on land and in the adjacent oceans. Unfortunately, increasingly negative changes appear to be likely, with projections of widespread and substantial negative future impacts of climate change on tropical agriculture. There are many potential adaptations to climate change, covering options ranging from incremental to transformational change each with different risk vs return profiles. Limits to adaptation and barriers to action are increasingly being seen as critical issues that will need a focus over the next decade. Similarly, integration of practices that reduce greenhouse gas emissions, enable effective adaptation to a variable and changing climate and enhance sustainable and stable agricultural production will likely become more important as climate change progresses. Furthermore, there will be a need to re-frame the science we do and the way we generate and deliver it. For example, science that is 1) demand-driven rather than supply driven, 2) that aligns with the values, needs or capability of users, 3) that is not presented as suitable for operational use when it is not. We can also better connect knowledge and action via co-learning that links closely the users and producers of climate information so as to address the correct time and spatial scales and climate variables and embed this information into the social and institutional processes through which decisions are made.



▶ **Derrick Thompson**, Senior Manager – Key Accounts & Business Development
Hitachi Australia Pty Ltd

Derrick Thompson is an internationally experienced manager with more than 25 years of global business success. His work at Hitachi Australia has seen the development and implementation of game-changing strategies and programs across the world.

Most recently those programs have involved introducing multiple Hitachi solutions and services into the Australian agribusiness sector. The solutions cover Internet of Things (IoT) deployment, innovative unmanned aerial vehicle (UAV) solutions for data capture, decision support systems and supply chain optimisation.

Derrick collaborates with organisations to develop strategies that succeed and position them for the next level of performance improvement.

Next Era Livestock Production

Data. Data. Data. Data is everywhere but producers are often overwhelmed by the sheer volume of raw data. What is needed is easily usable and valuable decision-making information. The ever-increasing range of digital tools to assist producers in the decision-making process with improved data based decision-making knowledge requires the use of numerous platforms that are not integrated, nor able to communicate with each other nor able to interpret and analyse information at a high level. This makes the use of such tools complicated, tedious and can at times be somewhat misleading, with the result of discouraging widespread adoption of data sourced technology. By integrating these tools, so that they are accessible through one Control Centre, such data driven digital transformation greatly improves the efficiency of using the available tools, results in increased adoption of data usage – all leading to increases in productivity and profitability, on farm and across the supply chain. Data is the next “Era in Livestock Production”. Hitachi’s presentation will look at a few case studies that demonstrate the value of intelligent use of data in daily farm operations.

08:00-17:00 Registration desk open ▶ Plaza Auditorium foyer, Plaza level, Brisbane Convention & Exhibition Centre, Grey Street, South Brisbane

08:30-10:00 Plenary session 3

Room Plaza Auditorium

Chair ▶ Dr Beth Woods, Director-General, Department of Agriculture and Fisheries, Queensland Government

08:30 Keynote speaker **Climate change impacts, adaptation and mitigation for tropical agriculture - 300**
▶ Prof Mark Howden, Director of the Climate Change Institute, Australian National University, Australia

09:15 Keynote speaker **Next era livestock production - 301**
▶ Mr Derrick Thompson, Senior Manager – Key Accounts & Business Development, Hitachi Australia Pty Ltd, Australia

10:00 Morning tea

10:30-12:30 Concurrent symposia session 7

FIELD CROPS Room ▶ P7-8	HORTICULTURE Room ▶ P9	LIVESTOCK Room ▶ P10	NUTRITION AND FOOD Room ▶ P11	AGFUTURES Room ▶ Plaza Auditorium
<p>7.1 ▶ Modelling to improve crop adaptation in changing environments Chair ▶ Dr Peter Thorburn, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia</p>	<p>7.2 ▶ Nano-containers to deliver plant genetic cargo Chair ▶ Prof Neena Mitter, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia ▶ Prof David Cahill, Deakin University, Australia</p>	<p>7.3 ▶ The highs and lows of maternal nutrition in beef cattle Chair ▶ Dr David McNeill, The University of Queensland, Australia</p>	<p>7.4 ▶ Research for innovative rice-based food systems and nutrition amid climate change Chair ▶ Antonio Costa de Oliveira, Federal University of Pelotas, Brazil</p>	<p>7.5 ▶ Future horticulture production systems Chairs ▶ Dr Lynne McIntyre and Dr Peyman Moghadam, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia</p>
<p>Cropping systems modelling: Past, present and future - 302 ▶ Dr Peter Torburn, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia</p>	<p>Nanoplatfroms for large and small molecule delivery to plant cells - 308 ▶ Prof David Cahill, Deakin University, Australia</p>	<p>Pregnancy nutrition affects calf survival in the tropics - 314 ▶ Dr Geoffry Fordyce, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>Genetics and metabolomics of aroma in rice - 320 ▶ Prof Melissa Fitzgerald, The University of Queensland, Australia</p>	<p>Why AgTech has disappointed us so far, why we need it, and how we can improve adoption rates - 326 ▶ Mr Matthew Fealy, Blue Sky Produce, Australia</p>
<p>Integrating crop modelling, physiology, genetics and breeding to aid crop improvement for changing environments - 303 ▶ Dr Karine Chenu, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>Nanomaterials enable delivery of genetic material without transgene integration in mature plants - 309 ▶ Asst Prof Markita Landry, University of California-Berkeley, USA</p>	<p>Maximising reproduction under extensive grazing conditions, regardless of rainfall - 315 ▶ Dr Kylie Schooley, The University of Queensland, Australia</p>	<p>SNPs linked to key traits in hybrids between African and Asian rice - 321 ▶ Ms Hayba Badro, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>The Small Trees High Productivity Initiative: Principles and practice in high-density orchard design - 327 ▶ Ms Helen Hofman, Department of Agriculture and Fisheries, Queensland Government, Australia</p>
<p>Drivers of phosphorus efficiency in tropical and subtropical cropping systems - 304 ▶ Ms Bianca Das, Commonwealth Scientific and Industrial Research Organisation (CSIRO); The University of Queensland, The School of Agriculture and Food Sciences, Australia</p>	<p>Novel nanoparticle platforms for chloroplast-targeted transgene delivery and expression across varied plant systems - 310 ▶ Assoc Prof Seonyeong Kwak, Seoul National University, South Korea</p>	<p>Nutritional programming of beef heifers - 316 ▶ Dr Tryon Wickersham, Texas A&M, USA</p>	<p>Introgression of large grain size from Australian wild rice and its agronomical importance - 322 ▶ Mr Ryuji Ishikawa, Hiroasaki University, Japan</p>	<p>Intelligent systems for commercial application in perennial horticulture - 328 ▶ Dr Everard Edwards and Dr Peyman Moghadam, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia</p>
<p>Improving crop adaptation through improved phenology prediction: A case study with chickpea - 305 ▶ Dr Yash Chauhan, Department of Agriculture and Fisheries, Queensland Government, Australia</p>	<p>Encapsidation of heterologous nucleic acids in virus-like particles: The potential for plant protection - 311 ▶ Dr Frank Sainsbury, Griffith University, Australia</p>	<p>Prepartum supplementation to improve transfer of passive immunity and growth - 317 ▶ Dr Luis Prada e Silva, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>Iron responsive genes in rice: The multiple roles of WRKY factors - 323 ▶ Prof Antonio Costa de Oliveira, Federal University of Pelotas, Brazil</p>	<p>Increasing the diversity of crops that can be grown in urban and vertical farms - 329 ▶ Dr Cathryn O'Sullivan, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia</p>
<p>Learning through modelling to help on farm decisions in North Queensland - 306 ▶ Dr Keith Pembleton, University of Southern Queensland, Australia</p>	<p>Clay nanoparticles facilitate delivery of antiviral RNA for crop protection - 312 ▶ Prof Zhiping (Gordon) Xu, The University of Queensland, Australian Institute for Bioengineering and Nanotechnology (AIBN), Australia</p>	<p>Risk factors for dystocia in cattle - 318 ▶ Assoc Prof Scott Norman, Charles Sturt University, Australia</p>	<p>Rice biofortification – progress and challenges in improving the nutritional value of rice - 324 ▶ Dr Russell Reinke, International Livestock Research Institute (ILRI), Philippines</p>	<p>Robots and autonomous technology in orchards – the future is here, so what does it really look like? - 330 ▶ Mr Andrew Bate, SwarmFarm Robotics, Australia</p>
<p>From fields to farms: Informing the trade-offs across the multiple functions of agriculture - 307 ▶ Prof Daniel Rodriguez, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>A perspective on risks associated with RNAi-based biopesticides - 313 ▶ Mr Stephen Fletcher, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>Strategic supplementation enhances rumen microbiome efficiency in pregnant tropical beef cows - 319 ▶ Dr Christopher S McSweeney, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia</p>	<p>Meeting the consumer preference of high quality rice grown in a tropical environment - 325 ▶ Mr Russell Ford, SunRice, Australia</p>	<p>Future of horticulture production systems from an RDC perspective - 331 ▶ Mr Byron de Kock, Hort Innovation, Australia</p>
				

12:30 Lunch and poster presentations
Poster themes: Horticulture and Nutrition and Food

13:30-15:30 Concurrent symposia session 8

FIELD CROPS Room ▶ P7-8	HORTICULTURE Room ▶ P9	HORTICULTURE Room ▶ P10	AGFUTURES Room ▶ P11	AGFUTURES Room ▶ Plaza Auditorium
<p>8.1 ▶ AgTech - feeding the future Chair ▶ Prof Sagadevan Mundrye, Queensland University of Technology, Australia</p>	<p>8.2 ▶ Strengthening value chains in tropical Australia with protected cropping systems Chair ▶ Dr Elio Jovicich, Department of Agriculture and Fisheries, Queensland Government, Australia</p>	<p>8.3 ▶ Overcoming barriers to growth in horticulture Chairs ▶ Assoc Prof Andrew Geering and Assoc Prof Femi Akinsanmi, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>8.4 ▶ Women in Agribusiness Chair ▶ Tamanna Monem, Women in Business Queensland Chapter, Australia India Business Council, Australia</p>	<p>8.5 ▶ Innovations in waste management and recycling in Queensland agriculture</p>
<p>Expedited crop improvement through deep learning and editing - 332 ▶ Dr Tengfang Huang, Elo Life Systems, USA</p>	<p>Benefits and challenges for expanding protected cropping in the Australian tropics - 338 ▶ Dr Elio Jovicich, Department of Agriculture and Fisheries, Queensland Government, Australia</p>	<p>Overcoming barriers to growth in horticulture - 344 ▶ Ms Marie Piccone, Manbulloo Ltd, Australia</p>	<p>What are key attributes to be successful agribusiness supply chain in a highly competitive market such as India? ▶ Dr Usha Zehr, Maharashtra Hybrid Seeds Company Private Limited (MAHYCO), India</p>	<p>The role of science in understanding the multidimensional challenges of agrifood waste - 350 ▶ Prof Paul Bertsch, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia</p>
<p>Harnessing asexual seed formation to preserve hybrid vigour and complex yield traits - 335 ▶ Prof Anna Koltunow, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>Automated retractable greenhouses and cooling-houses in mild to hot climates - 339 ▶ Mr Bede Miller, Cravo Australia, Australia</p>	<p>The future of avocado - 345 ▶ Dr Antony Allen, The Avolution, Australia</p>	<p>How research and collaboration help companies in Australia to be competitive in accessing USA supply chain ▶ Prof Pamela Ronald, Founding Director of the Institute for Food and Agricultural Literacy, University of California, Davis, USA</p>	<p>Fighting food and packaging waste through the agricultural supply chain - 351 ▶ Mr Ben Baldwin, Department of Agriculture and Fisheries, Queensland Government, Australia</p>
<p>Integrating gene editing techniques into modern cereal breeding - 336 ▶ Prof Ian Godwin, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>Our experiences testing protected cropping where nobody uses it - 340 ▶ Josh, Chris and Ross Pirrone, Pirrone Brothers Produce, Australia</p>	<p>Deploying new technologies to secure the banana industry - 346 ▶ Dr Rosie Godwin, Australian Banana Growers' Council, Australia</p>	<p>Industry and Academia engagement to deliver a competitive world class agribusiness industry ▶ Prof Bronwyn Harch, Deputy Vice Chancellor - Research, The University of Queensland, Australia</p>	<p>Creating opportunities for resource recovery in the Queensland agriculture sector - 352 ▶ Mr Pravin Menon, Department of Environment and Science, Queensland Government, Australia</p>
<p>In-plant insect-proofing by trans-kingdom RNAi - 337 ▶ Dr Julia Bally, Queensland University of Technology, Australia</p>	<p>How can protected cropping ensure an export supply of high quality melons in the tropics? - 341 ▶ Ms Heidi Wittl, Department of Agriculture and Fisheries, Queensland Government, Australia</p>	<p>Increasing macadamia production through thick and thin - 347 ▶ Mr Robbie Commens, 2 Tonnes Enterprise, Australia</p>	<p>Skills development in agribusiness ▶ Prof Neena Mitter, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>Transforming food waste into higher value products - 353 ▶ Dr Paul Luckman, Fight Food Waste Cooperative Research Centre, Australia</p>
<p>▶ Speaker to be confirmed</p>	<p>6 marketing steps to ensure profit - 342 ▶ Mr Mike Evans, Fresh Partners Marketing, Australia</p>	<p>Innovation in plant protection in the citrus industry - 348 ▶ Dr Andrew Miles, 2PH Farms, Australia</p>	<p>Disruptions, entrepreneurs and women participation in policy change, reshaping agribusiness competitiveness ▶ Dr Beth Woods, Director-General, Department of Agriculture and Fisheries, Queensland Government</p>	<p>What is needed to make the Circular Economy for Organics a reality? - 354 ▶ Mr Johannes Biala, The University of Queensland, Centre for Recycling of Organic Waste and Nutrients, Australia</p>
<p>▶ Speaker to be confirmed</p>	<p>Innovative control systems for protected cropping systems in the tropics - 343 ▶ Mr Odin Franssen, Powerplants Australia, Australia</p>	<p>Cross sectoral biosecurity RD&E to protect the Australian horticulture industry - 349 ▶ Dr Jo Luck, Hort Innovation, Australia</p>	<p>Panel discussion</p>	<p>AATLIS Precinct: Helping navigate pathways to sustainable solutions through digital technology adoption - 355 ▶ Mr Thomas Hall, FKG Group, Australia</p>
				

15:30 Afternoon tea





► **Birgitte Skadhauge**, Vice President, Adj. Prof.
Carlsberg Research Laboratory

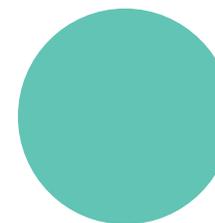
Birgitte Skadhauge completed her studies (M. Sc degree) at the Royal and Veterinary Agricultural University, Copenhagen in 1992. This was followed by a Ph.D. degree in biochemistry and genetics at the Carlsberg Laboratory in Copenhagen (1993-1996). Since 2003 she has been responsible for Carlsberg Raw Material Research, and since 2011 Director for Applied Research activities in Carlsberg, including Raw materials, Yeast, Ingredients and Brewing Technology and sustainability in 2012 she was appointed Honorary Adjunct Professor at Århus University. Since 2014 she held the position as Vice President for Carlsberg Research Laboratory and Baltika Research and she is the Founder of Traitomics.

She is a member of several scientific advisory boards and committees, appointed member of e.g. 'Danish Science and Innovation Political Counsel' (Ministry for Science and Innovation); Danish Industry, Committee for Research, Innovation and Education; Board Member for Danish Malting Group A/S; DMG (2008-2016), Denmark and DMG Poland (2008-2016), Board member in Sejet Plant Breeding I/S, Board member in "Association for Danish Variety Owners", Board member in Scandinavian Brewing School, Board member in Carlsberg's Bequest for Brewer J.C. Jacobsen, advisory board member at DTU, Bioengineering, Board member in Secobra Recherche (France).

Advancing brewing science

Cereals were some of the first crops to be domesticated by humans. Today, cereals represent the biggest starch source in the world and are the primary raw material for food and feed. Modern breeding techniques produced high yielding varieties, but were based on a limited genetic background, which resulted in significant loss of genetic diversity. This could potentially result in major challenges due to recent climate changes and altered growing conditions. It is estimated that an increased global temperature will lead to dramatic loss in plant productivity in many parts of the world.

The barley breeding effort of the Carlsberg Research Laboratory combines decades of expertise to provide new varieties with unique quality and sustainability traits such as e.g. drought tolerance. Combining traditional breeding, genome data and a new method for screening genetics variants, we have radically shortened the development time of varieties with new traits. This has already resulted in the identification of several hundred genetic variants related to climate, sustainability, productivity and brewing quality. This accelerated approach can easily be applied for the development of other crops in both developing and matured markets around the globe, and help securing a sustainable supply of food and other agricultural products.



15:50 - 17:00 Plenary session 4		
	Room	Plaza Auditorium
	Chair	► Prof Glen Fox, UC Davis We invite you to share a beer whilst hearing about the science behind a good brew
15:50	Keynote speaker	Advancing brewing science - 356 ► Ms Birgitte Skadhauge, Vice President, Carlsberg Research Laboratory, Carlsberg Group, Denmark
16:25	Panel discussion Facilitator Panelists	Towards 2050: Shaping the science of tomorrow ► Mr Peter Lewis, Way with Words ► Prof Robert Henry, Dr Beth Woods, Prof Mike Gidley, Prof Ian Godwin, Prof Neena Mitter
17:00	Conference close	► Prof Robert Henry, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia

SYMPOSIA OVERVIEW





FIELD CROPS

1.1 ▶ Agricultural systems research: A transformative approach to the sustainable intensification of agriculture

In this symposium, we propose that complex problems within our food-social-political systems require more transformational research approaches that simultaneously address multiple interlinked drivers (Garnett et al., 2013). We bring together a group of leaders on transformational systems research in agriculture to: (i) analyse and dissect the constraints on the development of more transformational research approaches across the dry, semi-arid, subtropical and tropical regions around the globe; (ii) identify optimum pathways in research for development that are more conducive to meeting the SDG targets; and (iii) develop a negotiated way forward and framework for developing and scaling innovative solutions to complex problems in agriculture through agricultural systems research (ASR). Here we define ASR as a framework for the application of component research (Drinkwater et al., 2016), having the overall aim to have impact across the multiple functions of agriculture and sustainable development goals. In contrast to incremental forms of adaptation, we propose a focus on the more transformational changes in structure, function, and intensity of agricultural systems (Frelat et al., 2016; Rodriguez et al., 2017; Rodriguez and Sadras, 2011).



HORTICULTURE

1.2 ▶ Tissue culture for propagation, conservation and crop improvement

Tissue culture has many applications, both in research and production sectors of horticulture. These include embryo rescue of recalcitrant seeds, genetic transformation of crops, cryo-preservation of plants, clonal propagation, mutational breeding, and haploid plant production.

This area of science has been advancing over the last 50 years, greatly influencing plant propagation. In recent years, new technologies and mechanised systems have been developed to boost this conventional biotechnology stream. Other technologies linked to tissue culture, e.g. energy, light and aeration systems, have also stepped up in innovation. The application of tissue culture for conservation is also highly important, especially for recalcitrant plant species in seed conservation. Researchers have tried to preserve many crop wild relatives as cryobanks to eliminate practical and environmental limitations of conventional ex-situ conservation strategies. Mutational breeding for new varieties using tissue culture is another important application for crop improvement.

This symposium will highlight the innovations, importance and potential of research and development. We will also address the new support technologies developed for tissue culture in recent years.



LIVESTOCK

1.3 ▶ Sustainable, healthy diets for all: Tomorrow's livestock science

Was Malthus right? But centuries too early? When the 18th century philosopher and economist contrasted geometric population growth with arithmetic food provision growth, he predicted disaster. Thanks largely to the power of science to transform food production, which Malthus overlooked, we are still here today. But for how much longer? Recent research and mainstream media are proposing a radical rethinking of diets to avoid overstepping planetary boundaries, and focusing on a drastic reduction or exclusion of livestock-derived foods. Indeed, planetary, environmental and human health could all benefit if there was a reduction in consumption of milk, meat and eggs by the over 30% of the global population who consume too much. But for the most vulnerable 35% of the population, most of whom live in tropical environments, a healthy diet can be achieved only by increasing their intake of such foods – and that means increasing sustainable livestock productivity across much of the world. This symposium will explore how smart application of tomorrow's livestock science can deliver healthy, equitable, sustainable diets that include sensible amounts of safe livestock-derived foods for every citizen. It will consider how to strengthen partnerships between advanced Australian institutes and CGIAR research centres to create transformative science for livestock production.



NUTRITION AND FOOD

1.4 ▶ Market-led breeding for value chains: Africa-Australia nexus for innovation

Australia and Africa are both major food-producing regions of the world, growing many common crops with value chains at different stages of maturity and development. Innovation is key for market and economic development, food security and agricultural sustainability. This symposium brings together leading Australian and African authorities on market-led approaches to drive innovation in crop improvement. Understanding changing market needs and close connectivity between researchers and value-chain players is vital for the development of successful varieties and to achieve returns on research investment. Presentations focus on sharing successes, experiences and lessons learned from both continents. Core topics include the following: exploring the collaboration landscape between sub-Saharan Africa and Australia; the challenges of designing varieties to better serve farmers and their value chains; the importance and changing roles of public and private breeders as markets develop; investment-based approaches to attract support and public-private partnerships; and integrating demand-led approaches into African postgraduate breeding education programs. The symposium also provides an opportunity to hear about the emerging community of African market-orientated breeders, their portfolio of varieties, and challenges delivering future supply and demand for food and nutrition. In this forum, we hope to create a focal point for new ideas, stimulate collaboration, and further strengthen the Africa-Australia nexus for innovation.



AGFUTURES

1.5 ▶ Strategic issues facing agricultural development in northern Australia

The future of agriculture across northern Australia is bright, and the opportunities are vast. To help identify and capitalise on these opportunities, the Cooperative Research Centre for Developing Northern Australia (CRCNA) has commissioned seven strategic situational analysis studies, focusing on the most significant northern agricultural industries: beef, rice, forestry, aquaculture, horticulture, broadacre cropping, and bushfoods. Each of the sectoral studies will explore past and current trends in the development of these sectors, identify barriers and challenges to further development, and propose strategic solutions and actions. The CRCNA expects these studies will provide a clear, strategic roadmap for effective agricultural growth across the north, and help the CRCNA identify synergies across and between these sectors, such as infrastructure, supply chains, land and resource use, and future research and development. In addition to these sectoral studies, the CRCNA has funded work with the North Australian Indigenous Land and Sea Management Alliance (NAILSMA), exploring business models and frameworks to support Indigenous-led development and diversification 'on Country'. This symposium will bring together the lead researchers from these strategic projects to discuss their preliminary research findings, and how the research fits within the broader strategic intent of the developing northern Australia agenda and the CRCNA. The audience will gain an understanding of how the CRCNA works with its collaborators, and will gain an awareness of the core research currently being funded by the organisation.



FIELD CROPS

2.1 ▶ Climate-smart wheat

Global food security relies on sustainable production of sufficient nutritious food for a growing world population, projected to exceed nine billion by 2050. Globally, wheat provides around 20% of calories, and is the most important source of protein for humans. However, yield improvement in crops such as wheat has slowed in major regions, e.g. Australia. In addition, climate change is projected to significantly affect crop growth and development, altering productivity, cropping systems and breeding requirements.

This symposium focuses on adaptation strategies to improve wheat productivity and sustainability in changing environments. It will present recent advances in developing integrated approaches, bringing together agronomists, engineers, physiologists, modellers, geneticists and breeders to tackle this important issue. Through a series of presentations, the symposium will show successful case studies for improving wheat adaptation, highlighting the importance of integrative approaches, and will present the latest developments in new technologies.



HORTICULTURE

2.2 ▶ Beyond pretty pictures: Horticulture tree crop mapping, from individual fruit to a national database

This symposium presents an overview of the multi-scale tree crop project funded by the Australian Government's Rural Research and Development for Profit scheme, and Horticulture Innovation. This project sets a strong example of how industry bodies, growers, researchers, and government agencies can work together to solve specific issues faced by the avocado, mango, macadamia, and banana industries. The audience will receive an initial overview of the specific industry needs that shaped the direction of this initiative, followed by presentations on the pros and cons of robotics, NIR, UAV, Light Detection and Ranging (LiDAR), and satellite remote-sensing technologies in response to those specific industry needs. The main outputs presented include the following: the national mapping of all orchards over 2 ha (goo.gl/rnqadK); the development of 'fruit maps' in conjunction with NIR technologies for spatial monitoring of mango maturation; the accuracies of satellite, UAV, and ground-based imagery and associated analytics for measuring tree health, fruit yield and quality; the appropriate flying protocols and image pre-processing of imagery when used over tree crops; and the where to from now.



LIVESTOCK

2.3 ▶ Nutrition strategies to mitigate high environmental temperatures in cattle, pigs, and chickens

In the context of global climate change, high environmental temperature events have increased in severity and frequency to become one of the main challenges of modern animal production systems in tropical and subtropical climates. Over recent years, nutritional and management expertise has been growing that may help animals cope with the stress, and help producers prevent production losses and high mortality rates. The symposium will cover recent advances in nutrition, digestive physiology and endocrinology to help manage heat stress in cattle, pigs and chickens.



NUTRITION AND FOOD

2.4 ▶ Creating an Australian cuisine through traditional Australian foods

An important component in the creation of a truly Australian cuisine would be the incorporation of the foods consumed by Indigenous Australians over the past 65,000 years. The diet of the Australian Aboriginal and Torres Strait Islanders has included a broad diversity of flora, as well as fauna, combined with traditional knowledge of the function and properties of these foods. Australian cuisine has a unique opportunity to benefit from this knowledge, where marketing and branding of the meal experience links traditional foods to proven functional properties, story lines and culture. Indigenous Australian foods also fit well with sustainable production systems, which makes them inherently environmental friendly and future-focused. Importantly, a mainstream Australian cuisine would support the concept of developing traditional food enterprises that are owned and controlled by Indigenous Australians, and result in stronger communities throughout regional Australia. The theme of this symposium is 'Developing an Australian Cuisine', understanding the Indigenous perspective in developing such enterprises, integrating the science involved, and learning from global experience.



AGFUTURES

2.5 ▶ Value-adding opportunities for agriculture through Biofutures

Australian agriculture must continually adapt and innovate to remain competitive in an environment of rising production and compliance costs, climate variability, pests and diseases, and changing global patterns of production and consumption. Biorefining generates valuable bioproducts from agricultural primary products and waste byproducts. This increases profitability, productivity and sustainability for primary producers while reducing environmental impacts. The Queensland Government has a vision to create a \$1 billion sustainable and export-oriented industrial biotechnology and bioproducts sector in Queensland, attracting significant international investment, and creating regional, high-value and knowledge-intensive jobs. Through the Biofutures program, the government is working with Queensland's world-leading agriculture and waste industries and the research sector to grow the state's emerging industrial biotechnology and bioproducts sector. This session will explore projects underway in Queensland to develop technology and to realise commercial biofutures projects of benefit to tropical agriculture.



FIELD CROPS

3.1 ▶ Farming system intensification for small-holders

Although a range of technologies can help farmers increase production from the same unit of land, the trade-offs associated with intensification can be complex. For small-holder farmers, issues to do with access to mechanisation, availability of seed for alternative crop types, crop rotations, weed and pest control, and access to markets can all constrain the options potentially available to them. In this symposium, we will explore how to understand these trade-offs and, in some cases, suggest ways that small-holder farmers can intensify production in a sustainable manner. These studies emphasise the importance of integration of technology into existing farming systems that are at different stages of intensification.



HORTICULTURE

3.2 ▶ Future orchards: Advances in horticultural tree research

The rate of change in orchard genetics and design has varied greatly across crops. Fruits such as apple have increased production ten-fold with altered rootstocks, tree architecture, and orchard management. In contrast, macadamia genetics and tree form are still similar to wild ancestors. This symposium will focus on recent advances in tree fruit and nut research in a diverse range of fields. The diversity of R&D topics in this symposium will allow exploration of synergies from multiple disciplines.



LIVESTOCK

3.3 ▶ Advancing animal productivity and welfare with genomics

The increasing demand for protein is placing demands on the livestock industry to increase productivity. However, consumers are also concerned with ensuring that production is undertaken in a manner that is sustainable and that animal welfare is a high priority. This symposium will examine, through examples, the use of genomics and gene editing to tackle animal welfare issues.



NUTRITION AND FOOD

3.4 ▶ Biofortification of crops for human health

Biofortification is the process of increasing the phytonutrient or mineral concentration in the edible portions of plants while they are actively growing. Nutrient concentration can be increased through genetic improvement, agronomic manipulation, exposure to different environments, or a combination of these approaches. Although much research has been directed at improving the phytonutrient content of staple crops of developing countries and addressing the health issues of these regions, there is now more interest in biofortification of crops targeting the very different health issues of the urban middle class. Biofortified crops are often colourful, due to phytonutrients' common association with plant pigments, especially within the wide range of horticultural crops available. This symposium addresses some of the fascinating crops that are currently undergoing biofortification, and the issues being overcome to achieve potential increases in dietary health.



AGFUTURES

3.5 ▶ Innovation in food safety and traceability

Traceability for food safety, provenance, and anti-fraud purposes is becoming increasingly important for market access to export and domestic markets for many products. At the same time, as supply chains globalise and become more complex, vulnerabilities increase. Efficient food safety and traceability systems are therefore increasingly important as a source of competitive advantage. This symposium will look at a range of innovations, including technological developments and innovations in supply chain organisation, in mechanisms to identify and manage vulnerabilities, and in regulatory environments.





FIELD CROPS

4.1 ▶ From enzymes and cells to entire crops: Integrative approaches to redesigning photosynthesis for better yields

As cereal yield advances from improved resource capture and harvest index approach their biological limits, next-generation research efforts are being directed to improve crop productivity by redesigning photosynthesis. Photosynthetic efficiency of plants grown in field crop production systems has not previously been a direct breeding target. Additionally, even the most efficient photosynthetic pathways have several major shortfalls, so improving photosynthesis is now seen as the next frontier in increasing crop yields. In this symposium, we will present speakers who report on recent advances in synthetic biology and phenotyping for redesigning plant photosynthesis at various levels of organisation. Most importantly, we will show that integrative modelling assessment is needed to accelerate translation of changes at the biochemical and cell level up to actual yield improvements at the field level. The symposium will be chaired by Dr Robert Sharwood, a Senior Lecturer in the ARC Centre of Excellence for Translational Photosynthesis. We will invite a list of international and national experts in this field.



HORTICULTURE

4.2 ▶ Digital horticulture

This symposium will provide a snapshot of how growers and researchers will be able to take advantage of innovative tools at all stages of the horticultural crop cycle, from variety selection through planting systems to post-harvest. It will cater for advances, such as data sensing and IoT, genomic and genetic research, modelling from cell to orchard systems, advances in weather and climate forecasting, automation from crop care to harvesting, and through the supply chain in the field and under-protected cropping.

Attendees will learn about new research and potential sources of information that will help the industry make better decisions to avoid crop loss, enhance market access and increase profitability.



LIVESTOCK

4.3 ▶ Understanding livestock microbiomes for health, welfare, and sustainability

There is increasing evidence that the commensal microbiomes that cattle, chickens, sheep, pigs and other livestock harbour affect their health and wellbeing, production performance, and for ruminants, the level of methane emissions an animal emits. This symposium will explore state-of-the-art methods to sequence, analyse, and modify livestock microbiomes, and to potentially improve health, welfare, production, and sustainability of livestock.



NUTRITION AND FOOD

4.4 ▶ Wild crop relatives: The next frontier for crop improvement

In the face of global environmental change, wild crop relatives are an important source of traits for improving their cultivated counterparts for the development of resilient crops. Analysis of diversity and evolution of wild relatives is providing new insights into how plants have adapted to environmental challenges across diverse environments. Methods for identifying and using these valuable alleles generate debate among crop breeders and pre-breeders. Pangenomics suggests that crop and wild relatives vary in genomic structure and presence/absence of a large numbers of genes. How can we best identify and use valuable wild alleles in modern crop improvement?



AGFUTURES

4.5 ▶ Insect protein: Reducing waste and feeding the future

With a looming world protein deficit, there is rapidly increasing interest in insect farming to fill the supply gap for high-quality protein. A growing shortage of high-quality protein, in particular fish meal and soy protein, is causing a rapid global increase in the cost of aquaculture and livestock feed rations. With the need for alternative protein sources to support the \$500 billion world livestock feed industry, there is also growing interest in the more widespread use of insect protein for human consumption. In addition, dealing with food waste and waste from intensive livestock production is a huge worldwide issue. The UN's Food and Agriculture Organization estimated that one-third of the food produced globally is wasted (1.3 billion tonnes). An Australian Cooperative Research Centre, the Fight Food Waste CRC with UQ and the Queensland Government as Research Partners and UQ leading the Transforming Waste Resources program was recently established to address this issue. This symposium will bring world-leading experts together to discuss the current research, obstacles, and opportunities for transforming waste streams into high-quality animal feed and high-value products.



FIELD CROPS

5.1 ▶ Science, technology and process innovation in identification and management of emerging pest and disease threats

Emerging pests and diseases pose a threat for field crops, horticulture and livestock: we may know there is a problem (crops are dying), but not the causal agent. Alternatively, we might not yet have recognised a problem that is 'under the radar'.

Emerging pests and diseases may result from different, unknown, and sometimes multiple factors, both biotic and abiotic, making it difficult to identify and manage undiagnosed 'syndromes'. This is a particular issue as tropical agriculture adapts to new crops, changing climate, and our changing ecosystems.

This symposium will address 'the threat of the unknown'. It will discuss the use of advanced technology and cross-disciplinary processes to identify and manage undiagnosed syndromes and emerging threats. It will include case studies on current and previous syndromes, with lessons learned for future detection, identification, and management of emerging pests and disease threats in tropical agriculture.



HORTICULTURE

5.2 ▶ Using precision information systems for advanced decision making in vegetables

This symposium will present on the current application and development of a range of precision information technologies in vegetable production systems. The information from these technologies facilitates opportunities for advanced management decisions and improved production.

Achieving maximum production efficiencies at the farm and field level requires an understanding of crop variability. Precision technologies have enabled the detection and management of significant spatial variability in crop performance for many vegetable crops.

This symposium will outline the way spatial-sensing technologies are providing a greater level of detail on soil resources and crop performance at the field level, and how the use of spatial information is supporting decision-making and management interventions. Topics include the prediction of yield from remotely sensed early season data, and the use of harvester-derived yield data, both of which provide opportunities for in-crop management interventions in underperforming areas. The implementation and adoption of drone technologies has been in advance of research and interpretation of the way they are being applied to intensive production systems. This symposium will discuss ways that agronomic service providers are using drone technologies in commercial vegetable businesses.



LIVESTOCK

5.3 ▶ Opportunities to improve efficiency of phosphorus in animal agriculture

Phosphorus is essential for plants and animals, but is often scarce in natural ecosystems. Global reserves of phosphorus are being rapidly depleted. Across tropical Australia, soil phosphorus is often low, with adverse consequences on production of grain crops and pastures. However, the concentrations and the nutritional availability of phosphorus in grains and forages could be improved by manipulating and managing soil and plants. Adverse (antinutritional) factors in grains might reduce the availability of P in the diets of monogastric animals, but nutrition technologies can mitigate the effects. Similarly, the efficiency of use of mineral sources of phosphorus (e.g. calcium phosphates) for livestock needs to be better defined and improved. Ruminants grazing pastures growing on low soil-phosphorus soils are often deficient in phosphorus; removing this nutritional limitation often improves productivity significantly. New technologies – such as for mapping the available soil P in landscapes, treatment of antinutritional factors that reduce P digestion in animals, and better approaches to understanding the effects of P deficiencies on animal health – all contribute to better use of P as a nutrient in livestock. Progress in improving phosphorus efficiency will be discussed.



NUTRITION AND FOOD

5.4 ▶ Provenance of meat

Australia has an international reputation for consistently delivering high-quality meat, thanks largely to the work of Meat Standards Australia (MSA). In export markets, Australia has a safe, clean and green image. However, competition from other countries that can also claim a green image and high quality is increasing. So, what is the point of difference for Australian meat? The answer – provenance (regional flavour).

Consumers are aware of the origin of food products and associated quality aspects. Consequently, the demand in food is shifting from quantity to quality. Food quality is linked to objective (i.e. must be safe and nutritious) and subjective (i.e. desirable aroma, flavour, texture, and colour) parameters. Subjective parameters can be measured using objective methods, such as analytical techniques. But subjective parameters are difficult to establish because they vary considerably, depending on the production method and various factors influencing it. Hence, for objective and subjective parameters, provenance can be defined as an objective parameter that is perceived subjectively. This refers to the aspects that make a product authentic, such as production method, specific ingredients and the food origin. Consumers who buy fresh meat are the most concerned about authenticity or quality reassurance.



AGFUTURES

5.5 ▶ Innovative climate products for improving risk management for the red meat industry in the tropics and subtropics

Tropical and subtropical areas in Australia have one of the most variable climates in the world, especially for rainfall. Variability significantly affects our agricultural and pastoral industries. Substantial work is currently underway to develop and improve climate products for northern Australia and to communicate these products to producers and end-users. In far north Queensland, the February 2019 floods caused significant cattle losses and infrastructure damage, which highlights the importance of continuing to develop innovative climate variability responses in tropical and subtropical regions. Moreover, better understanding and predictive capability of multiyear-to-decadal climate variations will also be crucial in providing reliable information and application-ready products for decision makers and planners to manage their risks and planning frameworks.

This session invited contributions on all aspects of applied climate science with a geographical focus on the tropics and subtropics, including presentations incorporating end-user needs for new products that describe flash-drought, multi-year drought, monsoon onset and breaks, and drought monitors. Contributors should link findings to meat and livestock production.



FIELD CROPS

6.1 ▶ Stress physiology: Designing crops for a hotter and drier world

Crop grain yield can be defined as the product of resource capture, resource-use efficiency, and partitioning that resource into grain. The efficiency with which these resources (e.g. light, water and nitrogen) are captured and used to produce biomass, and the extent to which the biomass is ultimately partitioned into grain yield, is constrained by stresses such as heat and drought. Climate change is projected to affect Australian crops through higher temperatures, more CO₂, and more rainfall variability. This symposium will focus on three key areas of stress physiology research: drought, roots, and heat. To optimise performance under drought, crops must balance their supply and demand for water by modulating canopy development and root architecture. In the roots, three cellular processes control the root architecture – curving, elongating, and branching – which determine the extent to which crops can access water and nutrients. This raises another important issue: is there a trade-off between water and nutrient acquisition by roots? If so, can we define root ideotypes for specific contexts? Recent research has shown that heat, even more so than drought, is likely to constrain crop production in the coming decades. Strategies to combat both heat and drought will be discussed in this symposium, guided by the latest physiological research into stress adaptation.



HORTICULTURE

6.2 ▶ Horticultural tree genomics

Horticulture is a highly valuable industry within the Australian agricultural sector. Tree crops account for half of the horticulture industry's value, with mango, macadamia, avocado, almond, and citrus being the major Australian horticultural tree crops. Horticulture is also an important strategy for ensuring future global food security. Although it is currently profitable, continual improvement in management and breeding, including developing intensive production systems, is integral for maintaining profitability in a competitive and rapidly changing global market. A deeper understanding of the relationship between phenotype and the underlying genetic mechanisms has the potential to offer tools and opportunities to rapidly and more efficiently address current and future needs of the Australian horticulture industries. This symposium will highlight advances in avocado, macadamia, mango, citrus, and almond genomes, and the functional characterisation of flowering in tree crops.



LIVESTOCK

6.3 ▶ Growing human capital for tropical animal industries

This symposium will bring together industry and emerging young guns, to address the challenges of establishing and driving a fulfilling career in animal science. It will also address what producers and industry see as potential gaps and emerging areas for future employment growth in tropical animal industries. Speakers are drawn from Future Livestock Consultants Group (MLA) and from industry, including large-scale producers and industry consultants. This symposium is sponsored by the Queensland Branch of the Australian Association of Animal Sciences (AAAS).



NUTRITION AND FOOD

6.4 ▶ Vertically integrated R&D platforms for underutilised and niche crops

Underutilised niche crops have potential to enhance food security within specific regions by delivering key components of dietary nutrition. Global niche crop products can provide small but highly profitable market shares that collectively make a significant contribution to export growth, regional employment, and prosperity. For both, there is a need to understand the constraints and bottlenecks for vertically integrated added-value supply chains, for example, how to optimise nutritionally enhanced functional foods or processed plant extracts for domestic or export markets. Such bottlenecks may include securing and characterising sufficiently broad genetic resources to underpin structured breeding programs, together with targeted phenotyping and data management tools that provide the systematic evidence required for market discrimination. There is ongoing scope for speculative screening of plants for novel chemicals, bio-actives, aroma and flavour, as well as the capacity to identify adapted cultivars for specific regions/environments.



AGFUTURES

6.5 ▶ Innovations in biosecurity

Queensland's biosecurity system is facing unparalleled challenges in its response to the increasing scale and scope of exotic pests and diseases. The Queensland Biosecurity Strategy 2018–2023 will guide us in protecting Queensland's ecosystems, our industries, and our way of life while maintaining our reputation for product safety and integrity, and ensuring ongoing market access for our commodities. This symposium will look at bright ideas and better ways to meet the biosecurity challenge, including genomics, robotics, remote sensing, imaging, big data, and blockchain.



FIELD CROPS

7.1 ▶ Modelling to improve crop adaptation in changing environments

Crop models are powerful tools for complex agricultural systems. Such models are becoming increasingly important to understand and improve crop adaptation to variable and changing environments. They are used for decision support to help agriculture extension and crop improvement programs. This support includes short and longer-term strategic decisions, such as adaptation to highly variable climates, new environments for prospective crops, and new climatic scenarios due to climate change. They help policy makers, farmers, physiologists, geneticists, and breeders to identify best options and strategies in the face of uncertainty and partial knowledge. Models are also continuously evolving in response to different needs.

This symposium will bring key researchers using crop models to present new developments and applications in these areas. Through a series of presentations that will act as case studies, this symposium will highlight the power and guidance that using models in decision making brings, and facilitate greater engagement between agricultural modellers and the research and industry communities at the forefront of tropical agriculture.



HORTICULTURE

7.2 ▶ Nano-containers to deliver plant genetic cargo

Are nanomaterials the future gene-delivery platform for plants? The need to improve plants to be resistant to climate change and to feed a growing world population has never been more urgent. The development of a GM crop resistant to a pathogen(s) takes 13 years of R&D and costs \$136 million. Conventional gene delivery in plants using bacteria or biolistic approaches has critical drawbacks, such as low efficiency, narrow species range, limited success, and tissue damage. The development of nanocarriers to deliver genetic cargoes to mammalian cells has progressed extensively, however, in plants, the cell wall poses a dominant physical barrier. Recent innovations in nano-delivery of biomolecules to plant cells include use of DNA nanostructures, DNA origami and carbon nanotubes for DNA delivery to nucleus and chloroplast. Genetic engineering of the chloroplast is an exciting prospect for high-yield production of protein products. The advent of genome editing can be a significant benefit, and might even eliminate conventional delivery bottlenecks. Nano-containers are also emerging as effective and commercially viable translational tools for topical RNA interference as a non-GM approach for crop protection. The current sentiment to transition to chemical pesticide-free agriculture is gaining momentum, with both GM and non-GM approaches poised to contribute significant benefits to food security and safety.



LIVESTOCK

7.3 ▶ The highs and lows of maternal nutrition in beef cattle

The long-term influence of maternal nutrition and stressors during foetal development on postnatal growth and efficiency in offspring is being increasingly recognised. Epigenetics, or nutritional genetics, is a growing science that aims to provide a mechanistic link between environment, nutrition, and disease. Epidemiological studies have shown that not only our genetic inheritance but perturbations during foetal life can have persistent consequences. Recent research has demonstrated that changes in the nutrition of calves during foetal development and during the first days of life can determine dystocia, calf mortality rates, health, growth, reproductive efficiency, and future performance during feedlot. This symposium will discuss how to minimise the detrimental effects of stress and poor nutrition during the prenatal period.



NUTRITION AND FOOD

7.4 ▶ Research for innovative rice-based food systems and nutrition amid climate change

A slow achievement of food, income, and nutrition security, especially in the developing world, has posed consequences for food safety and human health. Efforts to address these issues are made worse by unfavourable climatic conditions and a rapidly increasing population. While limited use of productivity-enhancing agricultural technologies is one of the most pressing issues, the incomplete linkages in the food value chain remain an area of contention. The ability to accommodate consumer preferences during breeding and production is limited. Substantial losses occur in the food system and, with poor post-harvest management, more concerns about health and food safety are raised. Incidences of malnutrition have been rising despite available technologies to curb the situation. Research needs to play an active role in the support system that integrates farmers and all value-chain players to embrace science and technology to resolve these problems. Breeding for consumer-preferred traits such as aroma contents, besides addressing new problems relating to better food systems is needed. This will require innovative linkages in the food value chain to close the gaps.



AGFUTURES

7.5 ▶ Future horticulture production systems

This symposium, drawing on the experiences and perspectives of a diverse set of speakers from the public and private sector, will explore and discuss innovations with the potential to transform horticulture production systems. Focusing on current and future scientific and technological advances, the symposium will explore interventions that will transform productivity, revolutionise horticulture management, and personalise quality in orchards of the future, by using the latest digital, breeding, and science technologies. The symposium format is a combination of experts' presentations as well as a Q&A panel discussion. A diverse set of speakers, including startups, scientists and industry leaders, present at the Future Horticulture Production Systems symposium. Q&A panel discussion will provide the audience with an opportunity to interact with experts in their field.



FIELD CROPS

8.1 ▶ AgTech - feeding the future

Over the coming decades, droughts and other detrimental effects of climate change are predicted to occur more frequently globally. The International Water Management Institute predicts that by the year 2025, one-third of the world's population will live in regions that will experience severe water scarcity that will significantly affect crop production. Despite recent technological advances including improved varieties and irrigation systems, changing climatic conditions remain a dictating factor in agricultural productivity. In addition to errant climatic conditions, the ever increasing world-population is placing further pressure on global resources. As a result of food deficits, nearly 1 000 million people have insufficient food and over 400 million are chronically malnourished. Alternative strategies are required to assist current agricultural practices to meet increased global crop security and nutritional demands. It is imperative that we develop nutritionally rich crops that can survive future climates but continue to yield. Strategies involving a range of technologies will be discussed in this session.



HORTICULTURE

8.2 ▶ Strengthening value chains in tropical Australia with protected cropping systems

Horticulture farming near and north of the Tropic of Capricorn is conducted exclusively outdoors. Yield and quality consistency of vegetables, melons and berries remain a problem due to challenges farmers face in managing climatic conditions. Markets in Australia and overseas increasingly demand reliable high-quality vegetables. To address these challenges and opportunities, current and new growers would benefit from protected cropping agriculture, which cost-effectively mitigates risks linked to climate variability, and increased production that can be extended to year round. Although protected cropping in the tropics is incipient, there is emerging interest that has recently led to investments. Research organisations working in partnerships with industry can raise awareness and technical knowledge of protected cropping stakeholders. This is critical if adapted protected cropping technologies are to be more widely adopted, and to benefit farmers and communities. This symposium will present and discuss protected cropping in the tropics, highlighting a range of matters: its opportunities and challenges; recent research outcomes; available innovative technologies; and key value chain considerations. It will have industry representatives communicating their experiences using protected cropping in north-east Australia and overseas.



HORTICULTURE

8.3 ▶ Overcoming barriers to growth in horticulture

Continual innovation is necessary to overcome barriers to horticultural production and to stimulate growth in the businesses. In horticulture, innovation is shaped by a variety of motivations, such as reducing losses from weeds, pests and diseases, labour shortages, environmental regulations, increasing costs of fertilisers and agrochemicals, and water quality and availability. Considerable effort also needs to be put into supply-chain management, to ensure that the commodity reaches the market in good condition, and that demand is strong to ensure maximum return on investment. This symposium provides a platform for industry stakeholders to come together with growers, researchers, government agencies, and regulators to learn about how innovative research and development (R&D) approaches can help overcome the barriers that limit horticulture in Australia.



AGFUTURES

8.4 ▶ Women in Agribusiness

Understanding of successful supply chain from producers, exporters, intermediaries to consumers - what are key attributes to be successful in international markets?



AGFUTURES

8.5 ▶ Innovations in waste management and recycling in Queensland agriculture

The symposium will bring together a range of speakers delivering innovative policies and projects delivering real advances in agricultural waste management, including waste recycling, reuse and the role of agricultural supply chains in the circular economy. The symposium will present information on the growing interest in the field, the policy initiatives providing a platform for innovation, as well as a number of case studies illustrating the commercial opportunities available to agribusinesses.