



TROPAG

INTERNATIONAL TROPICAL
AGRICULTURE CONFERENCE

11 - 13 NOVEMBER 2019

BRISBANE CONVENTION & EXHIBITION CENTRE

PRELIMINARY PROGRAM

SUBJECT TO CHANGE

tropagconference.org

 SHAPING THE SCIENCE OF TOMORROW



Incorporating
AgFutures

PRELIMINARY PROGRAM

Monday 11 November 2019

07:00-20:00	Registration desk open	▶ Plaza Auditorium foyer, Plaza level, Brisbane Convention & Exhibition Centre, Grey Street, South Brisbane
08:30	Conference welcome	▶ Prof Robert Henry, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI)
09:15	Keynote speaker	▶ Dr Lawrence Haddad, Executive Director, Global Alliance for Improved Nutrition (GAIN), Switzerland [sponsored by ILRI]
09:45	Keynote speaker	▶ Dr Usha Zehr, Director and Chief Technology Officer, Maharashtra Hybrid Seeds Company Private Limited (MAHYCO), India

10:15	Morning tea
10:30-12:30	Concurrent symposia session 1

FIELD CROPS	HORTICULTURE	LIVESTOCK	NUTRITION AND FOOD	AGFUTURES
<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>Transformational adaptation in agriculture under climate change</p> <p>▶ Prof Mark Howden, Australian National University, Australia</p>	<p>Application of tissue culture for genetic improvement of bananas</p> <p>▶ Dr Leena Tripathi, International Institute of Tropical Agriculture, East Africa Hub, Kenya</p>	<p>Let them eat meat? A solution or a problem for a sustainable healthy future?</p> <p>▶ Dr Lawrence Haddad, Global Alliance for Improved Nutrition (GAIN), Switzerland</p>	<p>Africa-Australia nexus for agricultural innovation</p> <p>▶ Prof Siddique Kadambot, University of Western Australia, Australia</p>	<p>Successfully facilitating agricultural investment in northern Australian landscapes</p> <p>▶ Dr Allan Dale, CRC for Developing Northern Australia; James Cook University, Australia</p>
<p>Ecological boundaries to the transformation of agricultural systems</p> <p>▶ Dr Grant Hamilton, Queensland University of Technology, Australia</p>	<p>Cryopreservation of <i>Persea</i> genus</p> <p>▶ Dr Raquel Flogado Casado, The Huntington Botanical Gardens, USA</p>	<p>Policy and public expenditure opportunities to support implementation of sustainable livestock and aquaculture interventions</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</p> <p>▶ Dr Jean Claude Rubyogo, International Centre for Tropical Agriculture (CIAT); Pan Africa Bean Research Alliance (PABRA), Tanzania</p>	<p>Northern Australia beef industry situation analysis</p> <p>▶ Dr Chris Chilcott, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia</p>
<p>Transforming agricultural systems in the tropics and sub tropics</p> <p>▶ Prof Daniel Rodriguez, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>Coconut tissue culture for conservation and utilisation of valuable germplasm</p> <p>▶ Prof Steve Adkin, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>Facts and myths: Livestock and the environment</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</p> <p>▶ Prof David Jordan, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>Northern Australia aquaculture industry situational analysis</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 landscapes through irrigation</p> <p>▶ Prof Holger Meinke, University of Tasmania, Australia</p>	<p>Developments in banana tissue culture in Australia</p> <p>▶ Ms Sharon Hamill, Department of Agriculture and Fisheries, Queensland Government, Australia</p>	<p>Success example: The potential for livestock methane mitigation</p> <p>▶ Prof Richard Eckard, The University of Melbourne, Australia</p>	<p>Introducing market-led approaches into postgraduate plant-breeding education programs in Africa</p> <p>▶ Prof Shimelis Hussein, Africa Centre for Crop Improvement (ACCI), South Africa</p>	<p>Northern Australia forestry industry situational analysis and outlook</p> <p>▶ Mr Mick Stephens, Timber Queensland, Australia</p>
<p>Food systems failure: Can we avert future crises?</p> <p>▶ Ms Kiah Smith, The University of Queensland, Australia</p>	<p>Micropropagation of recalcitrant <i>Persea Americana</i> rootstock cultivars</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?</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</p> <p>▶ Dr Nasser Yao, International Livestock Research Institute (ILRI), Kenya</p>	<p>A situational analysis for developing a rice industry in northern Australia</p> <p>▶ Prof Robert Henry, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>
<p>Speaker to be confirmed</p>	<p>Speaker to be confirmed</p>	<p>Informing tomorrow's livestock science: Opportunities to transform food systems in tropical developing regions</p> <p>▶ Dr Anna Okello, Australian Centre for International Agricultural Research (ACIAR), Australia</p>	<p>Creating compelling business cases for investment in crop improvement</p> <p>▶ Prof Gabrielle Persley, The University of Queensland, Australia</p>	<p>Business on country: Land use diversification on the Indigenous estate</p> <p>▶ Mr Ricky Archer, North Australian Indigenous Land and Sea Management Alliance Ltd, Australia</p>



12:30 Lunch and poster viewing

13:30-15:30 Concurrent symposia session 2

FIELD CROPS	HORTICULTURE	LIVESTOCK	NUTRITION AND FOOD	AGFUTURES
<p>2.1 ▶ Climate-smart wheat</p> <p>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</p> <p>Chair ▶ Dr Anthony Kachenko, Hort Innovation, Australia</p>	<p>2.3 ▶ Nutrition strategies to mitigate high environmental temperatures in cattle, pigs, and chickens</p> <p>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</p> <p>Chair ▶ Assoc Prof Yasmina Sultanbawa, ARC Training Centre for Uniquely Australian Foods, Australia</p>	<p>2.5 ▶ Value-adding opportunities for agriculture through Biofutures</p> <p>Chair ▶ Prof Ian O'Hara, Queensland University of Technology, Australia</p>
<p>Transformational wheat agronomy: Success from system synergy</p> <p>▶ Dr John Kirkegaard, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia</p>	<p>A focus on solving industry issues, not the technologies</p> <p>▶ Mr Chad Simpson, E.E. Muir & Sons Pty Ltd, Australia</p>	<p>Management of cattle exposed to high environmental temperatures</p> <p>▶ Prof Terry Mader, University of Nebraska, USA</p>	<p>Bringing Indigenous peoples' traditional foods and culture back to life</p> <p>▶ Prof Odette Best, University of Southern Queensland, Australia</p>	<p>Wastes to profits – delivering advanced bioproduct technologies for agriculture</p> <p>▶ Mr Doug McNicholl, Meat and Livestock Australia, Australia</p>
<p>Physiological breeding in wheat</p> <p>▶ Dr Greg Rebetzke, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia</p>	<p>On-ground sensing for assessing fruit quality and quantity</p> <p>▶ Prof Kerry Walsh, Central Queensland University, Australia</p>	<p>Nutritional strategies to mitigate high environmental temperatures in cattle</p> <p>▶ Assoc Prof John Gaughan, The University of Queensland, Australia</p>	<p>Integration of Aboriginal culture and history through bush food enterprises</p> <p>▶ Ms Madonna Thompson, Jagera Daran, Nyanda Aboriginal Cultural Tours and Bush Food Experience, Australia</p>	<p>Energy and feed products from livestock wastes</p> <p>▶ 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</p> <p>▶ 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</p> <p>▶ Dr James Underwood, The University of Sydney, Australia</p>	<p>Metabolism and endocrinology of high environmental temperatures in cattle</p> <p>▶ Dr Gene Wijffels, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia</p>	<p>Australian cuisine and traditional food flavours</p> <p>▶ 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>Production of chemicals from biomass – Mercurius REACH technology</p> <p>▶ Dr Darryn Rackemann, Queensland University of Technology, Australia</p>
<p>Increasing heat tolerance in wheat to counteract recent and projected increases in heat stress</p> <p>▶ 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 health</p> <p>▶ Prof Stuart Phinn, The University of Queensland, Australia</p>	<p>Physiological adaptations of pigs under high environmental temperatures</p> <p>▶ Dr Jeremy Cottrell, The University of Melbourne, Australia</p>	<p>Nutritional value of Australian traditional foods and diet diversification from a global perspective</p> <p>▶ Prof Michael Rychlik and Dr Michael Netzel, Technical University of Munich, Germany</p>	<p>Synthetic biology in agriculture</p> <p>▶ 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</p> <p>▶ Dr Penny Tricker, The University of Adelaide, Australia</p>	<p>Tree crop yield and quality mapping and forecasting using very high-resolution satellite imagery</p> <p>▶ Dr Moshir Rahman, Applied Agriculture Research Centre (AARSC), University of New England, Australia</p>	<p>Nutritional strategies to mitigate heat stress in pigs</p> <p>▶ Prof Frank Dunshea, The University of Melbourne, Australia</p>	<p>Southern African food preparation methods</p> <p>▶ Prof Dharini Sivakumar, Tshwane University of Technology, South Africa</p>	<p>Mapping biomass resources in Queensland</p> <p>▶ Ms Kelly Bryant, Department of Environment and Science, Queensland Government, Australia</p>
<p>New advances in phenotyping technologies</p> <p>▶ 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</p> <p>▶ Mr Craig Shephard, Department of Environment and Science, Queensland Government; The University of Queensland, Australia</p>	<p>Nutritional strategies to mitigate heat stress in chickens</p> <p>▶ 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</p> <p>▶ Dr Olivia Wright, The University of Queensland, Australia</p>	<p>Value adding in the sugar industry</p> <p>▶ Mr Hywel Cook, MSF Sugar, Australia</p>

15:30-15:55 Afternoon tea

16:00-18:00 Concurrent symposia session 3

FIELD CROPS	HORTICULTURE	LIVESTOCK	NUTRITION AND FOOD	AGFUTURES
3.1 ▶ Farming system intensification for small-holders Chair ▶ Sarina Macfayden, Australian Centre for International Agricultural Research (ACIAR), Australia	3.2 ▶ Future orchards: Advances in horticultural tree research Chairs ▶ Dr Bruce Topp, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia ▶ Dr Jose Chaparro, University of Florida, USA	3.3 ▶ Advancing animal productivity and welfare with genomics Chair ▶ Dr Marina Fortes, The University of Queensland, Australia	3.4 ▶ Biofortification of crops for human health Chair ▶ Prof Roger P Hellens, Queensland University of Technology, Australia	3.5 ▶ Innovation in food safety and traceability Chair ▶ Mr Jim Dodds, Safefood Queensland, Australia
Trees for food security: How is it stacking up in East Africa? ▶ Prof Catherine Muthuri, World Agroforestry Centre (ICRAF), Kenya	Research directing tree design for the modern orchard ▶ Dr John Wilkie, Department of Agriculture and Fisheries, Queensland Government, Australia	Applications for genome editing in animal agriculture and vertebrate pest control ▶ Dr Tim Doran, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia	The inside and out of folate in strawberries and avocados ▶ Dr Michael Netzel, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia	Food tampering – what we can learn from strawberries ▶ Ms Clare Hamilton-Bate, Freshcare Ltd, Australia
Sustainable intensification of maize-legume cropping systems ▶ Dr Paswel Marenya, International Maize and Wheat Improvement Center (CIMMYT), Africa	Identification of macadamia domestication pathways through chloroplast genome sequencing ▶ Dr Cathy Nock, Southern Cross University, Australia	What's next in animal welfare for Australia? ▶ Dr Jill Fernandes, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia	Zeaxanthin-biofortified popcorn – a cinema favourite for eye-health! ▶ Dr Tim O'Hare, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia	Supply chain integrity – managing food safety and food fraud risks ▶ Ms Margaret Balfour, Integrity Compliance Solutions, Australia
Sustainable intensification in the Eastern Gangetic Plain ▶ T.P. Tiwari, International Maize and Wheat Improvement Center (CIMMYT), Bangladesh	Benchmarking and farm economics of Australian macadamia production: What makes a modern orchard productive? ▶ Mr Shane Mulo, Department of Agriculture and Fisheries, Queensland Government, Australia	Castration-free pigs ▶ Dr Tad Sonstegard, Acceligen a Recombinetics Company, USA	Folate in durian and other tropical exotics ▶ Prof Michael Rychlik, Technical University of Munich, Germany	Innovative technologies to mitigate microbial food safety risks in fresh produce ▶ Dr Sukhvinder Pal Singh, NSW Department of Primary Industries, Australia
Sustainable intensification in rice production and processing chains (Lao and Cambodia) ▶ Ms Jaquie Mitchell, The University of Queensland, Australia	Global prediction of genetic performance in Rosaceae ▶ Dr Craig Hardner, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia	Genetically dehorned cattle in Australia ▶ Dr Carl Ramage, Rautaki Solutions Pty Ltd, Australia	Super-sweet purple sweetcorn: Breaking the genetic link ▶ Mr Apurba Lal Ray, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia	A biocontrol option to control a food-borne pathogen, using bacteriophages to control Campylobacter in poultry ▶ Dr Nalini Chinivasagam, Department of Agriculture and Fisheries, Queensland Government, Australia
Sustainable intensification of rice systems (Cambodia) ▶ Van Touch, The University of Sydney, Australia	Improvement of citrus cultivars through introgression of wild germplasm ▶ Dr Jose Chaparro, University of Florida, USA	Oral presentation from abstracts	Filling the void: Boosting the nutritional value of blueberries ▶ Dr Richard Espley, The New Zealand Institute for Plant and Food Research Limited (PFR), New Zealand	Technologies that improve food safety and compliance ▶ Mr Keith Gemmell, Safe Food Production QLD, Australia
Outcomes of agroforestry and monocropping ▶ Dr La Nguyen, World Agroforestry Centre (ICRAF), Vietnam	Breeding macadamia cultivars for orchards of the future ▶ Dr Mobashwer Alam and Ms Katie O'Connor, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia	Oral presentation from abstracts	Oral presentation from abstracts	Taking food safety to a new level – the application of genomics and big data ▶ Prof David Burt, Office of the Deputy Vice-Chancellor (Research), The University of Queensland, Australia

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

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

08:30 **Keynote speaker** ▶ Mr Alfred de Vries, Senior Program Officer for Animal Production, Bill & Melinda Gates Foundation, USA
Keynote speaker ▶ Prof Pamela Ronald, Founding Director of the Institute for Food and Agricultural Literacy, University of California, Davis, USA

10:00 **Morning tea**

10:30-12:30 **Concurrent symposia session 4**

FIELD CROPS	HORTICULTURE	LIVESTOCK	NUTRITION AND FOOD	AGFUTURES
<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>Chairs ▶ Assoc Prof Mary Fletcher and Prof Ben Hayes, 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>Modelling water-use efficiency across scales</p> <p>▶ Prof Belinda Medlyn, Western Sydney University, Australia</p>	<p>Modelling orchard light environment</p> <p>▶ Adj Assoc Prof Neil White, Department of Agriculture and Fisheries, Queensland Government, Australia</p>	<p>Breeding low-emitting ruminants: Predicting methane from microbes</p> <p>▶ Dr Suzanne Rowe, AgResearch, New Zealand</p>	<p>Diversity breeding program for beans, targeting rapid cooking and Fe/Zn biofortification</p> <p>▶ Dr Clare Mukankusi, International Center for Tropical Agriculture (CIAT), Uganda</p>	<p>Black soldier flies for waste recycling and a new protein source</p> <p>▶ Dr Peter James, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>
<p>Exploring leaf 3D anatomy to optimise crop water-use efficiency</p> <p>▶ Prof Margaret Barbour, The University of Sydney, Australia</p>	<p>Using virtual plants to understand how fruit trees grow</p> <p>▶ Dr Inigo Auzmendi, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>Differences in the nutrient concentrations, in vitro methanogenic potential and other fermentative traits of tropical grasses and legumes for beef production systems in northern Australia</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</p> <p>▶ Dr Hans Daetwyler, Agriculture Victoria, Australia</p>	<p>Sustainable solution for food waste management</p> <p>▶ Ms Olympia Yarger, GoTerra, Australia</p>
<p>Engineering photosynthetic electron transport to improve light energy capture of C₄ plants</p> <p>▶ Dr Maria Ermakova, Australian National University, Australia</p>	<p>Robotic sensing and acting in protected cropping systems</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</p> <p>▶ Dr Elizabeth Ross, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>Bioinformatic challenges to the identification of disease resistance genes in wild relatives and cultivars of agricultural crops</p> <p>▶ Prof Jacqueline Batley, University of Western Australia, Australia</p>	<p>Converting waste streams into high-value products</p> <p>▶ Dr Luke Wheat, Future Green Solutions, Australia</p>
<p>High-throughput phenotyping tools to test whether leaf-level photosynthesis traits are measurable at the crop level</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</p> <p>▶ Assoc Prof Alan Dorin, Monash University, Australia</p>	<p>Real-time sequencing of microbial clouds for rapid diagnosis of disease in chickens</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</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</p> <p>▶ Dr Luis Prada e Silva, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>
<p>Screening photosynthetic traits in wheat using hyperspectral techniques</p> <p>▶ Dr Gonzalo Estavillo, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia</p>	<p>Oral presentation from abstracts</p>	<p>The genetics of rumen phage populations</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</p> <p>▶ Prof Wallace Cowling, The University of Western Australia, Australia</p>	<p>Impact of insect larvae on meat quality</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</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>Oral presentation from abstracts</p>	<p>The application of omics to rumen microbiota function</p> <p>▶ Dr Stuart Denman, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia</p>	<p>Challenges of collecting and preserving crop wild relatives</p> <p>▶ Dr Sally Norton, Australian Grains Genebank, Agriculture Victoria, Australia</p>	<p>Post-harvest processing of insects</p> <p>▶ Mr Michael J Woods, Stellenbosch University, South Africa</p>
				

12:30 Lunch and poster viewing
 13:30-15:30 Concurrent symposia session 5

FIELD CROPS	HORTICULTURE	LIVESTOCK	NUTRITION AND FOOD	AGFUTURES
<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</p> <p>▶ Dr James P Stack, Kansas State University, USA</p>	<p>Yield forecasting using remote sensing in vegetables</p> <p>▶ Dr Angelica Suarez Cadavid, University of New England, Australia</p>	<p>The outlook for global scarcity of phosphorus reserves for agriculture</p> <p>▶ Assoc Prof Brent Jacobs, University of Technology Sydney, Australia</p>	<p>Provenance: The Australian flavour story for meat</p> <p>▶ Dr Heather Smyth, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>The value of the Australian Drought Monitor to the cattle industry</p> <p>▶ Dr Christa Pudmenzky, University of Southern Queensland, Australia</p>
<p>Yellow Canopy Syndrome: A physiological disorder, not a disease</p> <p>▶ Dr Frikke Botha, Sugar Research Australia, Australia</p>	<p>Using precision information technologies to assess and understand crop variability</p> <p>▶ Ms Celia van Sprang, Department of Agriculture and Fisheries, Queensland Government, Australia</p>	<p>Phosphorus in Australian soils, pastures and grain crops</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</p> <p>▶ Dr S Erasmus, Wageningen University, Netherlands</p>	<p>Prediction of Northern Australian rainfall onset using the ACCESS-seasonal model</p> <p>▶ Dr Tim Cowan, University of Southern Queensland; Bureau of Meteorology, Australia</p>
<p>Current understanding of grain legume disorders in eastern Australia, and association to phytoplasma infection</p> <p>▶ Dr Murray Sharman, Department of Agriculture and Fisheries, Queensland Government, Australia and ▶ Dr Graeme Wright, Peanut Company of Australia, Australia</p>	<p>Use of variable rate and sensor networks in vegetables</p> <p>▶ Mr Chris Monsour, Prospect Agriculture, Australia and ▶ Ms Sarah Limpus, Department of Agriculture and Fisheries, Queensland Government, Australia</p>	<p>Phosphorus in the nutrition of poultry and pigs in intensive production systems</p> <p>▶ Dr David Cadogan, Monogastric Technical Services, Feedworks, Australia</p>	<p>Provenance in sheep: The Karoo lamb story</p> <p>▶ Prof Louwrens Hoffman, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>Nature and possible mechanisms of multi-year wet/dry conditions over northern Australia</p> <p>▶ Dr Sharmila Sur, University of Southern Queensland; Bureau of Meteorology, Australia</p>
<p>Understanding of dieback in grass-pastures across Queensland</p> <p>▶ Mr Stuart Buck, Department of Agriculture and Fisheries, Queensland Government, Australia</p>	<p>Adoption of precision information technologies: The grower's journey</p> <p>Speaker to be confirmed</p>	<p>New-generation phytases for improved utilisation of diet phosphorus</p> <p>▶ Assoc Prof Robert Speight, Queensland University of Technology, Australia</p>	<p>The effect of diet on meat provenance</p> <p>▶ Dr J Marais, University of Stellenbosch, South Africa</p>	<p>Use of digital partners for product development in climate data capture and commercialisation</p> <p>▶ Mr Doug McNicholl, Meat and Livestock Australia, Australia ▶ Mr Jamie Azzopardi, The Weather Company, Australia</p>
<p>Smart surveillance to support plant biosecurity</p> <p>▶ Dr Brendan Rodoni, Agriculture Victoria, Australia</p>	<p>Application of drone technologies to vegetable systems</p> <p>▶ Mr Nat Parker, Airborn Insight, Australia</p>	<p>Phosphorus nutrition in ruminants grazing tropical rangelands</p> <p>▶ Dr Rob Dixon and Assoc Prof Stephen Anderson, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>What provenance means to the consumer</p> <p>▶ Ms Lisa Sharp, Meat and Livestock Australia, Australia</p>	<p>Queensland's investment in managing drought, climate variability and adapting to climate change</p> <p>▶ Mr Vern Rudwick, Department of Agriculture and Fisheries, Queensland Government, Australia</p>
<p>From colony collapse to complex syndromes: Pollinator health and disease transmission management in agricultural landscapes</p> <p>▶ Dr Vincent Doublet, University of Ulm Institute of Evolutionary Ecology and Conservation Genomics, Germany</p>	<p>Building capacity in PA in horticulture</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</p> <p>▶ Mr Peter Zund, Department of Environment and Science, Queensland Government, Australia</p>	<p>The OBE Beef story</p> <p>Speaker to be confirmed</p>	<p>Climate mates: Bridging the gap between scientists and producers</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	HORTICULTURE	LIVESTOCK	NUTRITION AND FOOD	AGFUTURES
<p>6.1 ▶ Stress physiology: Designing crops for a hotter and drier world 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 ▶ Dr Karine Chenu, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>Advances in macadamia genomics ▶ 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 ▶ Ms Rebecca Clapperton, Salisbury Plains Grazing, Australia</p>	<p>Advanced technologies to increase profitability of the Australian tea tree industry ▶ Assoc Prof Tobias Kretzchmar, Southern Cross University, Australia</p>	<p>Innovations in the management of Panama TR4 ▶ Mr Stewart Lindsay, Department of Agriculture and Fisheries, Queensland Government, Australia</p>
<p>Modelling heat and drought adaptation in crops ▶ 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 ▶ Dr Francois Barbier, The University of Queensland, Australia</p>	<p>Industry needs and wants ▶ Ms Alison Adie, S. Kidman & Co, Hancock Agriculture, Australia</p>	<p>Agrichemical biodiscovery using Australian flora and fauna – the NatureBank approach ▶ Assoc Prof Rohan Davis, Griffith Institute for Drug Discovery, Griffith University, Australia</p>	<p>Alternative diagnostic tools for White Spot Disease ▶ Dr Beth Fowler, Department of Agriculture and Fisheries, Queensland Government, Australia</p>
<p>How do crops balance water supply and demand? ▶ Prof Andrew Borrell, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>The avocado genome: An update ▶ Dr Alice Hayward, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>Human capital challenges for emerging animal industries: Goat case study ▶ Ms Julie Petty, Meat and Livestock Australia, Australia</p>	<p>Challenges in breeding Bamabara Groundnut for West Africa ▶ Dr Stephen Amoah, Crops Research Institute, Ghana</p>	<p>Securing profitability: Start clean ▶ Mr Mark Whattham, Department of Agriculture and Water Resources, Australian Government, Australia</p>
<p>The role of hydraulics in crop water use under drought ▶ Dr Vincent Vadez, Institute for Development (IRD), France</p>	<p>Flowering in temperate tree crops ▶ 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 ▶ Dr Anna Okello, Australian Centre for International Agricultural Research (ACIAR), Australia</p>	<p>Knowledge representation and data management adding value to global niche crops ▶ Prof Graham King, Southern Cross University, Australia</p>	<p>Data systems for traceability in the supply chain ▶ Ms Jo Quigley, Integrity Systems Company, Meat & Livestock Australia, Australia</p>
<p>Phenotyping the hidden half: New ways to measure roots ▶ Prof Michelle Watt, University of Bonn, IBG-2, Germany</p>	<p>On the mango genome ▶ Dr David Innes, Department of Agriculture and Fisheries, Queensland Government, Australia</p>	<p>Succession planning and mentoring—talking from experience ▶ Emeritus Prof Alan Bell, (retired) Cornell University, Australia</p>	<p>A systematic approach to defining nutritional capacity of underutilised legumes ▶ Ms Razlin Asman-Halimi, Southern Cross University, Australia</p>	<p>New technologies for weed eradication - invasive plants have no place to hide when DNA is involved ▶ Dr Laura Simmons, Department of Agriculture and Fisheries, Queensland Government, Australia</p>
<p>Roots for water and nutrient uptake ▶ Dr Frederik van der Bom, The University of Queensland, Australia</p>	<p>Genetics of almond ▶ Dr Shashi Goonetilleke, The University of Adelaide, Australia</p>	<p>Business plan for industry and young guns—cultivating young scientists ▶ Mr Andrew Gatenby, Indigo Australia, Australia</p>	<p>Speaker to be confirmed</p>	<p>We've all heard of blockchain, but what can it do for biosecurity and traceability? ▶ Mr Caile Ditterich, AgriChain – BlockGrain, Australia</p>
				

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

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

08:30 **Keynote speaker** ▶ Prof Mark Howden, Director of the Climate Change Institute, Australian National University, Australia
Keynote speaker ▶ Ms Birgitte Skadhauge, Vice President, Carlsberg Research Laboratory, Carlsberg Group, Denmark

10:00 **Morning tea**

10:30-12:30 **Concurrent symposia session 7**

FIELD CROPS	HORTICULTURE	LIVESTOCK	NUTRITION AND FOOD	AGFUTURES
<p>7.1 ▶ Modelling to improve crop adaptation in changing environments</p> <p>Chair ▶ Dr Peter Thorburn, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia</p>	<p>7.2 ▶ Overcoming barriers to growth in horticulture</p> <p>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>7.3 ▶ The highs and lows of maternal nutrition in beef cattle</p> <p>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</p> <p>Chairs ▶ Prof Melissa Fitzgerald, The University of Queensland ▶ Antonio Costa de Oliveira, Federal University of Pelotas, Brazil</p>	<p>7.5 ▶ Future horticulture production systems</p> <p>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</p> <p>▶ Dr Peter Torburn, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia</p>	<p>How innovation contributes to improved mango productivity</p> <p>▶ Ms Marie Piccone, Manbulloo Ltd, Australia</p>	<p>Calf survival in tropical systems</p> <p>▶ Dr Geoffry Fordyce, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>Allele mining for stress tolerance genes in rice</p> <p>▶ Dr Ken McNally, International Livestock Research Institute (ILRI), Philippines</p>	<p>Revolutionising the horticulture industry through use of robotics and automation</p> <p>▶ Mr Matthew Fealy, Blue Sky Produce, Australia</p>
<p>Integrating crop modelling, physiology, genetics and breeding to aid crop improvement for changing environments</p> <p>▶ Dr Karine Chenu, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>The future of avocado</p> <p>▶ Dr Antony Allen, The Avolution, Australia</p>	<p>Science in action: Stories from our paddock</p> <p>▶ Dr Kylie Schooley, Chinchilla Vet Services, Australia</p>	<p>Drought tolerance in rice: A worldwide breeding initiative from IAEA</p> <p>▶ Dr Fatma Sarsu, Food and Agriculture Organization (FAO); International Atomic Energy Agency (IAEA), Austria</p>	<p>The small trees high-productivity initiative: Principles and practice in high-density orchard design</p> <p>▶ Ms Helen Hofman, Department of Agriculture and Fisheries, Queensland Government, Australia</p>
<p>Enhancing APSIM to better capture GxE interactions' fit</p> <p>▶ Dr Enli Wang, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia</p>	<p>Deploying new technologies to secure the banana industry</p> <p>▶ Dr Rosie Goodwin, Australian Banana Growers' Council, Australia</p>	<p>Nutritional programming of beef heifers</p> <p>▶ Dr Tryon Wickersham, Texas A&M, USA</p>	<p>Towards increasing rice productivity through use of conventional breeding and advanced appropriate technologies</p> <p>▶ Dr Jimmy Lamo, National Crops Research Resources Institute (NaCRRI), Uganda</p>	<p>Intelligent systems for commercial application in perennial horticulture</p> <p>▶ 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 in chickpea</p> <p>▶ Dr Yash Chauhan, Department of Agriculture and Fisheries, Queensland Government, Australia</p>	<p>Increasing macadamia production through thick and thin</p> <p>▶ Mr Robbie Commens, 2 Tonnes Enterprise, Australia</p>	<p>Prepartum supplementation to improve colostrum, calf health, and growth</p> <p>▶ 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</p> <p>▶ Prof Antonio Costa de Oliveira, Federal University of Pelotas, Brazil</p>	<p>Urban agriculture and its role in food security</p> <p>▶ Dr Cathryn O'Sullivan, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia</p>
<p>Learning through modelling: A case study of using modelling to help on-farm decisions in North Queensland</p> <p>▶ Dr Keith Pembleton, University of Southern Queensland, Australia</p>	<p>Innovation in plant protection in the citrus industry</p> <p>▶ Dr Andrew Miles, 2PH Farms, Australia</p>	<p>Dystocia-related risk factors in tropical systems</p> <p>▶ Dr Scott Norman, Charles Sturt University, Australia</p>	<p>Contributions towards human health by improved rice bio-fortification using breeding and plant nutrition</p> <p>▶ 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?</p> <p>▶ Mr Andrew Bate, SwarmFarm Robotics, Australia</p>
<p>From fields to farms: Informing the trade-offs across the multiple functions of agriculture</p> <p>▶ Prof Daniel Rodriguez, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>	<p>Contributions of biosecurity to protecting Australian agriculture</p> <p>▶ Dr Jo Luck, Hort Innovation, Australia</p>	<p>Strategic supplementation and rumen microbiome efficiency in pregnant tropical beef cows</p> <p>▶ Dr Christopher S McSweeney, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia</p>	<p>Current state of rice quality development and opportunities for further improvements through a value chain-wide integrated approach</p> <p>▶ Prof Melissa Fitzgerald, The University of Queensland, Australia</p>	<p>Future of horticulture production systems from RDC perspective</p> <p>▶ Mr Byron de Kock, Hort Innovation, Australia</p>
		<p>FEEDWORKS "Performance through Science"</p>		

12:30	Lunch and poster viewing
13:30-15:30	Concurrent symposia session 8

FIELD CROPS	HORTICULTURE	HORTICULTURE	TO BE CONFIRMED	AGFUTURES
8.1 ▶ Symposium session to be confirmed	<p>8.2 ▶ Strengthening value chains in tropical Australia with protected cropping systems</p> <p>Chair ▶ Dr Elio Jovicich, Department of Agriculture and Fisheries, Queensland Government, Australia</p>	<p>8.3 ▶ Nano-containers to deliver plant genetic cargo</p> <p>Chair ▶ Prof Neena Mitter, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p> <p>▶ Prof David Cahill, Deakin University, Australia</p>	8.4 ▶ Symposium session to be confirmed	8.5 ▶ Symposium session to be confirmed
	<p>Adapting protected cropping technologies for the Australian tropics</p> <p>▶ Dr Elio Jovicich, Department of Agriculture and Fisheries, Queensland Government, Australia</p>	<p>Nanoplatfroms for large and small molecule delivery to plant cells</p> <p>▶ Prof David Cahill, Deakin University, Australia</p>		
	<p>Innovative cost-effective protected cropping structure designs for the tropics</p> <p>▶ Mr Bede Miller, Cravo Australia, Australia</p>	<p>Nanomaterials enable plant genetic engineering without transgenic DNA integration in mature plants</p> <p>▶ Asst Prof Markita del Carpio Landry, University of California-Berkeley, USA</p>		
	<p>Our experiences testing protected cropping where nobody uses it</p> <p>▶ Josh, Chris and Ross Pirrone, Pirrone Brothers Produce, Australia</p>	<p>Novel nanoparticle platforms for chloroplast-targeted transgene delivery and expression across varied plant systems</p> <p>▶ Assoc Prof Seonyeong Kwak, Seoul National University, USA</p>		
	<p>A 5-year journey since outdoor production went indoors</p> <p>▶ Mr Daniel Scavo, Young Sang & Co, Australia</p>	<p>Encapsulation of heterologous nucleic acids in virus-like particles: The potential for plant protection</p> <p>▶ Dr Frank Sainsbury, Griffith University, Australia</p>		
	<p>Ensuring you make profit – 6 steps to engage customers that make it rewarding: A case study for high value export melons</p> <p>▶ Mr Mike Evans, Fresh Partners Marketing, Australia</p>	<p>Nanocarriers to deliver RNA in plants</p> <p>▶ Prof Zhiping (Gordon) Xu, The University of Queensland, Australian Institute for Bioengineering and Nanotechnology (AIBN), Australia</p>		
	<p>Innovative control systems for protected cropping systems in the tropics</p> <p>▶ Mr Odin Franssen, Powerplants Australia, Australia</p>	<p>Speaker to be confirmed</p>		

15:30	Afternoon tea
15:50	<p>Keynote speaker ▶ Mr Derrick Thompson, Senior Manager – Key Accounts & Business Development, Hitachi Australia Pty Ltd, Australia</p>
16:25	<p>Facilitated panel discussion Towards 2050: Shaping the science of tomorrow</p> <p>Prof Robert Henry, Dr Beth Woods, Prof Mike Gidley, Prof Ben Hayes, Prof Ian Godwin, Prof Neena Mitter</p>
17:00	<p>Conference close ▶ Prof Robert Henry, The University of Queensland, Queensland Alliance for Agriculture and Food Innovation (QAAFI), Australia</p>



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 ▶ 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.



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 ▶ Symposium session to be confirmed



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 ▶ 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.

TO BE CONFIRMED

8.4 ▶ Symposium session to be confirmed



AGFUTURES

8.5 ▶ Symposium session to be confirmed