

2021 Highlights

About TIA

The Tasmanian Institute of Agriculture (TIA) is a specialised institute at the University of Tasmania with the mandate to progress the agricultural industry through the provision of industry relevant research and development, encouraging the industry adoption of findings, and through agricultural education.

TIA was established in 1997 as a joint venture between the University of Tasmania and the Tasmanian Government. Our vision is to enable Tasmanian food producers and processors to accelerate primary sector productivity while maintaining and improving Tasmania's land and water quality for future generations.

Our researchers, educators, technical and professional staff work closely with partners across the agriculture and food value chain at a local, national, and international level, ensuring that TIA's research and education priorities are responsive to industry needs, contemporary challenges and future opportunities.

TIA is home to the University of Tasmania's agricultural teaching discipline and has responsibility for undergraduate education and the training of higher degree research candidates who are vital to the industry's future prosperity.



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Message From TIA's Director

The Tasmanian Institute of Agriculture has a mandate to deliver agri-food research, industry development and education for the agri-food industry of Tasmania. From the advantages that Tasmania offers us, we deliver to the world. 2021 has proved to be a pivotal year for TIA as we doubled down on that mandate by embarking on the delivery of several key initiatives. These include:

- The establishment of the Tasmanian Drought Resilience Adoption and Innovation Hub. This is a partnership between many key stakeholders in Tasmania who will contribute time and money to the Hub. This has been leveraged to draw down \$8M of Commonwealth funding over four years through the Future Drought Fund. The Hub will build the capabilities of farmers and rural communities to better prepare for drought. It will do this by bringing together researchers, farmers, industry, natural resource managers and traditional owners to co-design relevant and innovative solutions.
- A five-year \$6.5M research agreement with Dairy Australia to focus on forage platform research to help dairy farmers in Tasmania to maintain efficient, profitable, and sustainable pasture based dairy systems into the future.
- A five year \$7.8M investment in TIA's research farms, in partnership with the Tasmanian Government and University of Tasmania, to modernise their infrastructure, and maximising their potential for delivering better outcomes for Tasmanian agriculture research, industry development and education. The first stage of the farms investment will see a new dairy facility and irrigation system installed on the TIA Dairy Research Facility, with further investments in the TIA Vegetable Research Facility planned for 2021 and onwards.
- TIA is leading the Sustainable Pathways to Carbon Neutrality by 2030 project for Meat and Livestock Australia. This is a \$26.8M project across multiple universities in Australia to enable the carbon neutrality of the Australian livestock industry.
- TIA is leading a \$0.5M project to develop novel approaches to extend the shelf life of vacuum-packed meat. These involve laboratory scale projects to determine their underpinning science, to studies of their implementation on a commercial scale.

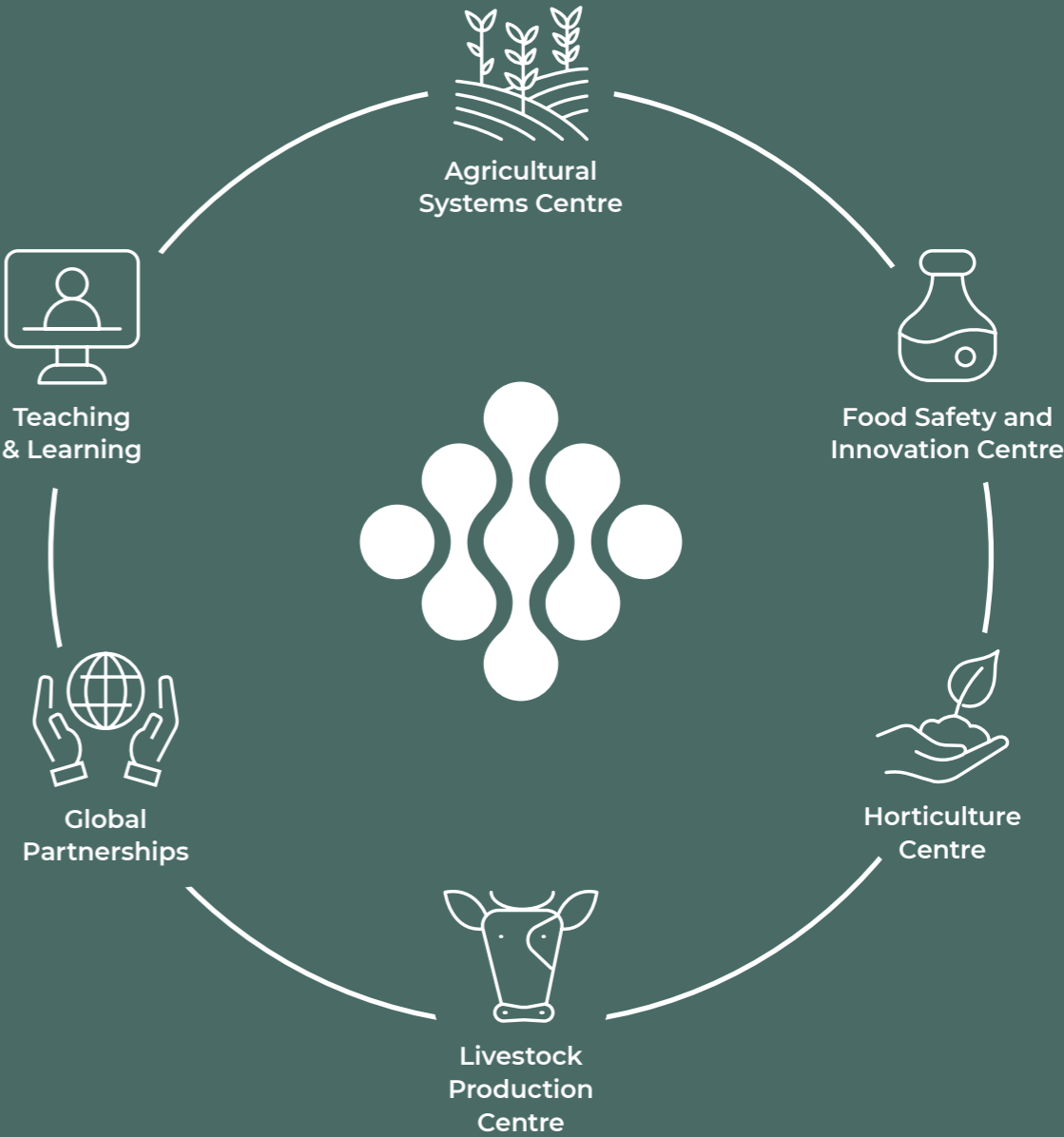


- Not least, the TIA Strategy was published in 2021. This contained six individual strategies that will: 1. Deliver to the value of agriculture in Tasmania, and Agrivision 2050; 2. Lead Tasmanian agriculture to develop resilience to climate change and abating the emissions of greenhouse gasses; 3. To shift the perception of agriculture amongst young people in Tasmania and to make the opportunities of the industry clearer; 4. To focus the educational offerings of TIA to the needs of industry; 5. to better establish links of TIA with industry; and 6 To better connect TIA with the world.

We look forward to working with our key industry partners to build on this success in 2022 and beyond.

TIA Director
Professor Michael Rose

Organisational structure



Message from the Minister

What a superb year we have had!

The latest Tasmanian Agri-Food ScoreCard shows that we are making excellent progress as we strive towards the Government's target of increasing the farmgate value of the agricultural sector to \$ 10 billion a year by 2050. Just in 2019-20 alone, we have seen a 13% increase in value to \$2. 15 billion.

Agricultural Research, Development and Extension (RD&E) is absolutely central to this strategy's success.

What a time to be the new Primary Industries and Water Minister!

Our partnership with the Tasmanian Institute of Agriculture (TIA) is the cornerstone of our agricultural RD&E approach. This partnership, established through a joint Venture Agreement between the University of Tasmania and the Tasmanian Government, has supported world-class agricultural RD&E and education that has been delivering practical, on-farm benefits to our state's agri-food producers for more than two decades.

I would like to thank TIA Director, Professor Mike Rose, for his leadership in 2021, and acknowledge the hard work of all researchers, technical staff, and professional staff at TIA. I also would particularly like to congratulate TIA and the University of Tasmania on the successful bid to establish a Drought Resilience Adoption and Innovation Hub with support from the Australian Government's Future Drought Fund.

The Hub will play a strategic role in Tasmania's agricultural RD&E landscape, helping to deliver on- farm adoption of research that improves drought resilience and benefits regional communities.

In 2021, the Tasmanian Government signed a Memorandum of Understanding with the University of Tasmania to deliver a nation-leading agricultural precinct in northern Tasmania that will co-locate agricultural science, water management, industry development, and biosecurity functions into a single precinct.



The development of this new precinct complements our \$7 million commitment to upgrade our public research farms. It is pleasing to note that these upgrades commenced in 2021 and I look forward to TIA's Elliott and Forthside Research Farms developing into centres of excellence for dairy and vegetable RD&E.

The Tasmanian Government's Agricultural Development Fund was also launched in 2021, to provide direct support to industry-driven RD&E projects that will promote sustainable growth and innovation in Tasmanian agriculture.

Congratulations to TIA on a successful year of delivering RD&E and education to support a prosperous, innovative, and sustainable agri-food sector in Tasmania.

Hon Jo Palmer MLC
Minister for Primary Industries and Water

Message from TIA's Advisory Board

The TIA Advisory Board is made up of representatives from the University of Tasmania, the Tasmanian Government, and the state's agricultural sector. The Advisory Board provides advice on the strategic direction of agricultural research, development, and extension activities undertaken by the TIA.

The Advisory Board is chaired by the Secretary of the Department of Natural Resources and Environment Tasmania, and I would like to acknowledge the work of Tim Baker as Chair throughout 2021 prior to his departure from the Department in early 2022. Professor Michael Pervan will commence in the role of Secretary in 2022 and will be the Chair of the TIA Advisory Board going forward.

On behalf of the Advisory Board, I would also like to welcome the three new industry members appointed to the Advisory Board in 2021: Elizabeth Skirving, Peter Skillern, and Angelique Korpershoek. Along with continuing member Marcus Griffin, each of these industry members will bring valuable skills and knowledge to the Board and its work of implementing the Actions identified in the *Growing Tasmanian Agriculture: Research Development and Extension for 2050* White Paper.

Industry members continued to act in a liaison role with TIA Centre Leaders in 2021, providing an avenue for industry input and strengthening the TIA's industry relationship across the agriculture and food value chain.

Ongoing work on the development of the TIA's Impact Reporting approach was a focus for the Advisory Board in 2021 to help ensure that the RD&E undertaken by the TIA continues to support productivity improvements for Tasmanian farmers and agribusinesses.

The successful *Extension Accelerator program* concluded in 2021, delivering on another Action from the RD&E White Paper. This program received very positive feedback from employers and participants. On behalf of the Advisory Board, I would like to acknowledge the hard work that went into the delivery of this program for early-stage extension professionals.



My thanks go to Professor Mike Rose for his leadership during the ongoing COVID-19 disruptions of 2021, and for the work he has done to ensure that the TIA remains at the forefront of agricultural research and education.

I look forward to continuing to work with the Advisory Board in 2022 and I am confident that members will continue to provide strategic advice that helps to deliver on the RD&E objectives of the joint venture.

Deidre Wilson
Deputy Secretary, Primary Industries and Water

The Tasmanian Institute of Agriculture (TIA) will enable Tasmanian food producers and processors to accelerate primary sector productivity while maintaining and improving Tasmania's land and water quality for future generations.





Agricultural Systems Centre



Leading the way to a carbon neutral livestock industry

Project: Seven projects will be undertaken as part of this national partnership producing innovative economic, environmental, and socially acceptable pathways to a carbon neutral red meat sector by 2030

Partnership: Carbon Storage Partnership – Sustainable Pathways to CN30

Funding body: Meat and Livestock Australia Ltd

Industry partners: CSIRO-Commonwealth Scientific & Industrial Research Organisation; Department of Primary Industries NSW; Integrity Ag & Environment; RM Consulting Group; Queensland Government; South Coast Natural Resource Management; The Mullion Group; and several universities including: The University of Melbourne, Australian National University, University of Technology Queensland, and The University of Queensland, among others.

Research team: Harrison MT, Christie KM, Hovenden MJ, Eisner R, Liu K, Bowen-Butchart D, Badgery W, McDonald S, Sinclair K, Fletcher K, Tomlinson J, Eckard RJ, Meyer R, Meier E, Mokany K, O'Grady A, Paul K, Sawley B, Grace P, Rowlings D, Lewis T, Pachas N, Magett O, Zhuk A, Kellner J, Wiedemann S, Doran-Browne N, Waterworth R, Roberts G, Keenan R, McMillan H, among others.

TIA leads a national consortium, the Carbon Storage Partnership. One of the seven projects within the Carbon Storage Partnership is called 'Sustainable Pathways to Carbon Neutrality by 2030', which is also led by TIA.

The Carbon Storage Partnership is a \$31M transdisciplinary consortium that brings together several universities in Australia and overseas to develop the skills, technologies and practices needed to progress the Australian red meat sector towards the carbon neutrality by 2030. The research, development, extension and adoption engendered through the Partnership is being achieved through the creation of opportunities to promote natural resource management, people and the community, the health and welfare of animals, and the drive for continuous improvement.

Overall, the CSP aims to improve carbon storage, raise productivity and profitability through creation of opportunities for enhancing natural capital on farm and improved environmental stewardship.

Program preparing next generation of professionals

Project: Extension Accelerator Program

Funding body: Department of Primary Industries, Parks, Water & Environment

Research team: Mohammed, CL; Kumar, S; Richardson, E; Hall, AF.

A partnership program for the development of early career agricultural extension professionals has left its participants not only better prepared to work within the agriculture industry, but better prepared for life.

Developed as an action in response to the needs identified in the Tasmanian Government's white paper *Competitiveness of Tasmanian Agriculture for 2050*, the highly successful Extension Accelerator Program has fast-tracked the development of young Tasmanian agricultural professionals.

Created in partnership with the Tasmanian Government, which funded the program, and industry employers, the Tasmanian Institute of Agriculture (TIA) coordinated delivery of the pilot program.

The program's co-coordinators Elya Steel - who is also a PhD candidate with TIA - and Dr Saideepa Kumar, Lecturer in Agricultural Systems, delivered the 14-month program to nine participants.

"The Extension Accelerator Program was developed to build the skills and capabilities of early career ag graduates working in extension," Elya Steel said.

"Throughout the program we have included elements of personal development to build their skills and capabilities, not only for them personally, but for the ag industry as a whole."





\$8 million poured into drought resilience in agriculture

Project: Drought Resilience Tasmania – Actionable Knowledge and Solutions for Sustainable Prosperity

Funding body: Department of Agriculture Water and the Environment

Industry partners: Beanstalk Agtech Pty Ltd; Bush Heritage Australia; Cape Herbert Pty. Ltd.; Definium Technologies Pty Ltd; Highland Conservation Pty Ltd; Horticulture Innovation Australia; Hydro Tasmania; NRM Cradle Coast; NRM North; NRM South; Private Forests Tasmania; Rural Business Tasmania Inc; Soils for Life Trust; Southern Cross University; Tasmanian Agricultural Productivity Group; Tasmanian Farmers & Graziers Association; Tasmanian Irrigation; Tasmanian Women in Agriculture Inc; TasWater; The Derwent Catchment Project.

Research team: Evans, KJ; Mohammed, CL; Kumar,S; Field, B; Harris, R; Jones, ME; Anders, RJ; Higgins, VJ; Bryant, M; Harrison, MT; Gracie, AJ; Wilson, MD; Jordan, GJ; O'Reilly-Wapstra, JM; Barmuta, LA; Remenyi, TA; Kang, BH; Amin, M; Maiti, A; Fraser, SP; Kilpatrick, SI; Barnes, NR; Beasy, KM; Coleman, BJ; Stoeckl, NE; D'Alessandro, SP; Tian, J; Chuah, S; Norris, K; Ferguson, SG; Auckland, SRJ.

The Adoption and Innovation Hub for Drought Resilience – Tasmania (the Hub) is designed to improve regional drought resilience, with the support of \$8 million in funding from the Australian Government's Future Drought Fund.

The Drought Hub comprises of researchers, primary producers, and community groups, working together to enhance drought resilient practice adoption and research in Tasmania.

The Hub is part of a strong national network of eight hubs located in key agricultural and climatic zones around Australia, funded under the Commonwealth Government's Drought Resilience Research and Adoption program.

With a strong focus on collaboration, each hub will be regionally focused and aim to ensure agricultural research is useful and accessible, increasing opportunities to commercialise innovation.



Associate Professor Kathy Evans, Senator Johnathon Duniam, and TIA Director Professor Michael Rose.

Tasmanian Chief Project Investigator, TIA's Associate Professor Kathy Evans, said the Hub would provide a unique opportunity to establish a strong community network to improve drought resilience.

"The Tasmanian Adoption and Innovation Hub for Drought Resilience, for the first time, brings together the major players – farmers, land and water managers, researchers, and Tasmanian Aboriginal people – who, together can reduce the risks associated with drought in Tasmania," she said.

"As hot and dry years increase in number, a multi-stakeholder partnership is needed to innovate for drought resilience, optimal water management and self-reliance.

"Our Hub will enable drought preparedness in Tasmania through collective actions that sustain Tasmania's high-value, clean, green international brand."

The creation of the Hub is also supported by partner co-contributions of \$13.2 million over 4 years, including more than \$1 million in funding from the University of Tasmania.

Research into yield and quality a boon for barley producers

Project: Barley waterlogging tolerance improvement program

Funding body: Seed Force Pty Ltd

Industry partners: Seed Force Pty Ltd.

Research team: Zhou, M.

TIA, in partnership with Seed Force, is developing a new variety of barley that will withstand extreme wet conditions with no negative impacts on its yield and quality.

The research will see the addition of a waterlogging tolerance gene to RGT Planet barley and builds on a previous TIA-led project that identified a major gene controlling the tolerance of waterlogging in barley.

With waterlogging a huge issue in high-rainfall zones around Australia yielding losses in barley crops of up to 50 per cent, the discovery has received significant interest from farmers and plant breeders eager for the gene to be incorporated into commercial varieties.



Professor Meixue Zhou

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The Tasmanian Adoption and Innovation Hub for Drought Resilience, for the first time, brings together the major players – farmers, land and water managers, researchers, and Tasmanian Aboriginal people – who, together can reduce the risks associated with drought in Tasmania.

Professor Kathy Evans

Regenerative agriculture

Project: Regenerative grazing trail & dryland pasture monitoring from satellite, via calibration to field observations & biomass measurements, to improve rotational grazing & stocking decision making

Funding body: Department of Agriculture Water and the Environment

Industry partners: Rockpool Land & Water Services Pty Ltd.

Research team: Harrison, MT; Melville, B.

Imaging traditionally used in space exploration and defence will be harnessed to capture the impacts of regenerative agriculture as part of a trial to improve future drought resilience in Tasmania’s south-east.

The project aims to assess the impact of regenerative agriculture (regen ag) on animal welfare, soil carbon, landscape function, pasture biomass and long-term agricultural sustainability and includes researchers from the Tasmanian Institute of Agriculture (TIA), the University of Tasmania, Enviro-dynamics, the Regenerative Agriculture Network of Tasmania (RANT), Cibo Labs and others.

The project will also develop new approaches for merging imagery from drones and satellites to develop new digital approaches for managing livestock from afar. These approaches will reduce labour and time required from farm managers.

The project will use several imaging tools, including drone and satellites to conduct hyperspectral imaging



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“We are working toward being better at looking after our pastures, but also a more cost-effective agistment arrangement with our farming tenants, so we have cash flow and reduced costs associated with pasture regeneration and reseedling.”

Jason Whitehead

(a technique that analyses a wide spectrum of light to provide more information on what is imaged), to collect digital imagery of grasslands at Okehampton, a sheep grazing property near Triabunna, with a goal to optimise pasture management, improve how the landscape functions and improve drought resilience.

Systems Modelling Team Leader at TIA Associate Professor Matthew Harrison leads the research team.

“The purpose of these trials is to examine the effectiveness of regen ag and cell grazing relative to conventional grazing and to develop new methods for remote monitoring of grazing management using drone and satellite imagery,” Associate Professor Matt Harrison said.

“In concert with regenerative agricultural approaches, the technology will improve ground cover and productivity, as well as animal welfare, which collectively can lead to improved sustainability.”

Jason Whitehead, the owner of Okehampton, said the project will see them working toward a whole of property management plan.

“We are working toward being better at looking after our pastures, but also a more cost-effective agistment arrangement with our farming tenants, so we have cash flow and reduced costs associated with pasture regeneration and reseedling.”

Installing fencing at the Triabunna property.





Food Safety and Innovation Centre



Assessing storage risks for even longer-life milk

Project: Risk Assessment for a Novel Milk Pasteurisation Process

Funding body: Naturo Pty Ltd

Industry partners: Wholey Milk Pty Ltd; Naturo Pty Ltd

Research team: Ross, T.

The project involves a quantitative microbiological risk assessment of a new technology (thermal high-pressure processing) to deliver a more natural milk (less affected by heat) and with a much longer shelf life.

Wholey Milk/Naturo wish to assess the feasibility of the process, with consideration of the effect of spore-forming bacteria (esp. the endospore forming pathogens *Bacillus cereus* and non-proteolytic *Clostridium botulinum*) to survive the process and to grow to dangerous levels during the shelf life and storage of the milk.

Ancient grain the focus for non-alcoholic beverages

Project: Expanding options for Sorghum

Funding body: Charles Sturt University (GRDC Pty Ltd.)

Industry partners: Charles Sturt University

Research team: Yousif, A; Blanchard, C*; Waters, D*.

Food and beverage innovation postgraduate research will use sorghum as a base ingredient and will focus on product development consistent with strategic goals (health, value addition) of TIA and the University of Tasmania.

Currently to produce non-alcoholic malt drinks, wort is fermented and back distilled to reduce the alcohol level to below 0.5%.

Because of fermentation, most nutrients are lost due to the removal of the biomass which is converted to nutritional products such as Vegemite.

Development of innovative non-alcoholic flavoured and carbonated malt drink prototypes is appropriate for consumption as a nutritious non-alcoholic drink suitable for pregnant and breast-feeding women; people who do not drink alcohol and for export markets such as, American, European, and African continents, Middle East, Far East and the Indian subcontinent.

The aim of this study is to:

- Develop a non-alcoholic flavoured and carbonated drink from malted sorghum.
- Understand the nutritional quality of the sorghum malt non-alcoholic flavoured drink in relation to the retention of the sorghum grain nutritional properties.
- Prepare a business case to produce non-alcoholic malt drink (potentially in partnership with a major brewing company).
- Understand the related chemical composition, physical properties, and sensory qualities of the non-alcoholic flavoured malt drink.



Opposite: Dr Chawalit 'Jay' Kocharunchitt.

Professor Adel Yousif



Strong seedlings the first step for forestry productivity

Project: Eucalypt plantation rhizosphere characterisation

Funding body: Forico Pty Ltd

Industry partners: Forico Pty Ltd

Research team: O'Reilly-Wapstra, JM*; Barry, KM, Bowman, JP.

This project focuses on developing microbially based solutions to improve the vigour and survival of eucalypt seedlings for forest plantations. It hopes to identify rhizosphere microorganisms in soil samples associated with growth promotion in plantation communities of *Eucalyptus nitens* and *E. globulus*, as a preliminary step in developing a microbial inoculant to be used to promote health and productivity of hardwood forest plantations. The project is led by the University's Biological Sciences team, in collaboration with the TIA staff from the Centre for Food Innovation and Horticulture Centre.

Novel intervention investigated for longer life lamb products

Project: Application of glucose as a novel approach for shelf-life extension of vacuum-packed chilled sheep meats

Funding body: Meat and Livestock Australia

Industry partners: MLA, Tasmanian-based meat processors

Research team: Kocharunchitt, C; Ross, T; Bowman, JP, Pagnon, J; Mellefont, L.

This project seeks to evaluate and develop glucose application as an effective and reliable intervention for shelf-life extension of vacuum-packed (VP) chilled sheep meats.

Specifically, we will evaluate and optimise the potential of this intervention, including use of various lamb cuts from multiple sources at other storage temperatures to augment the evidence for addition of glucose as an intervention.

Studies to evaluate the potential for further acidification of meat by lactic acid as an intervention for shelf-life extension are also important, i.e., to develop underpinning science to support the proposed intervention.

The effectiveness of the proposed intervention on a commercial scale and how this affects the eating quality of VP lamb will also require rigorous investigation and optimization before commercial uptake.



Fresh packaging explored in pork project

Project: Development of a predictive model for vacuum-packed pork

Funding body: Australian Pork Limited

Industry partners: Australian Pork Limited

Research team: Kocharunchitt, C; Ross, T; Bowman, JP.

The Australian pork industry aims to produce pork efficiently and sustainably to meet consumer demand, while assuring its high quality (freshness).

This is constantly challenged by the need to minimise the loss of product quality (including shelf life) along different supply chains and to meet a wide range of shelf life-related specifications imposed by intended markets.

Accordingly, being able to assure required quality remaining for product is critical for the success of the Australian pork industry.

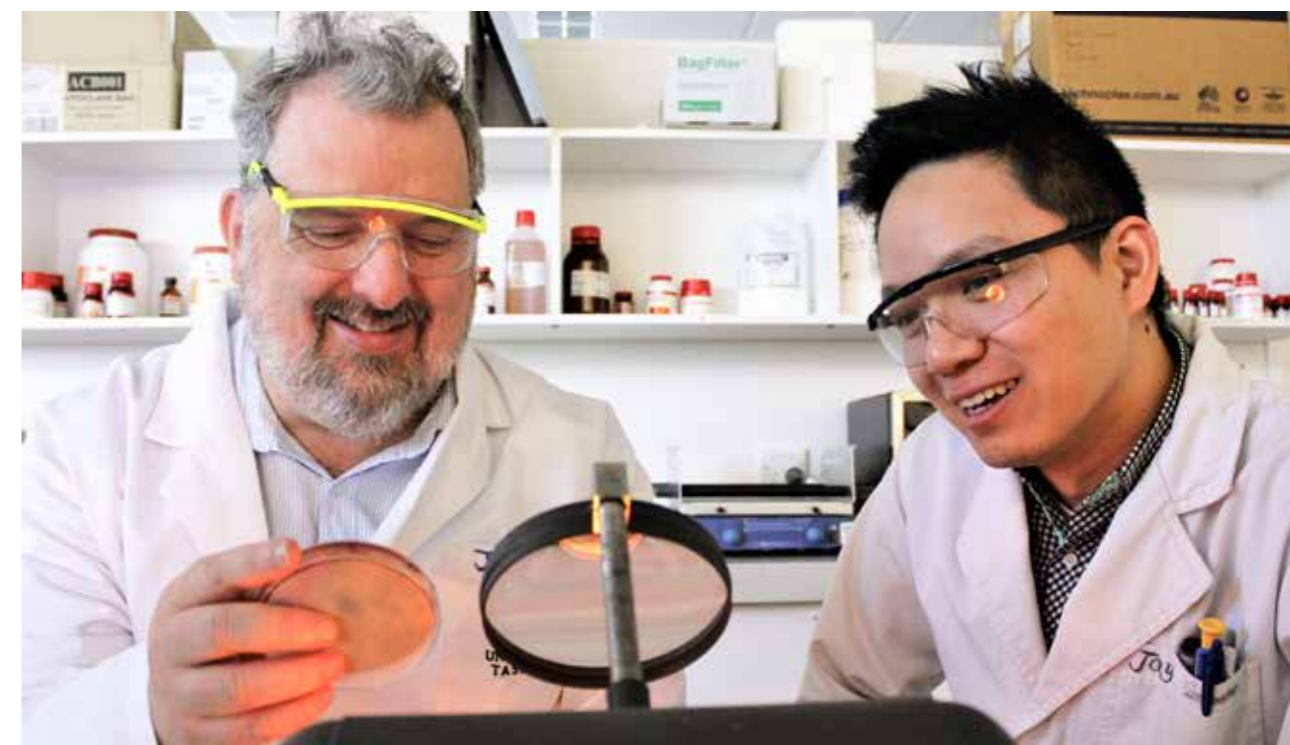
Through our previous projects with Meat and Livestock Australia, shelf-life predictive models for vacuum-packed (VP) beef and lamb were successfully developed based on the growth rate of microorganisms present and processes of spoilage (based on odour) as a function of temperature.

The models have now been adopted by many red meat processors as a reliable and cost-effective decision-support tool for better management of their cold chains, i.e., to optimise product quality, to avoid an unexpected loss of quality, to reduce wastage, reduce the need for markdowns, and, more importantly, reduce customer complaints.

To develop a model for shelf-life prediction of Australian VP pork, the proposed project aims to expand the applicability of the existing tool to quantify rates of spoilage of pork in VP. Specifically, we will systematically assess shelf-life of VP pork across storage temperature ranges to define its best-before dates.

The data generated and the interpretation based on this can then be used to modify and/or refine the existing predictive models to enable reliable and accurate predictions of shelf life of VP pork. Achieving this, and being able to demonstrate its scientific basis, would enable the industry to further develop the APIQ Programme (i.e., standardising methodology used for shelf-life assessment and development of national standards), while having the ability to better understand and manage cold chains.

Professor John Bowman and Dr Chawalit 'Jay' Kocharunchitt.



Innovation key to monitoring and managing shelf-life of meat

Project: Development of shelf-life models for beef, lamb, and pork

Funding body: Meat and Livestock Australia

Industry partners: MLA, Tasmanian-based meat processors

Research team: Kocharunchitt, C; Ross, T; Bowman, JP; Pagnon, J.

This project seeks to exploit the science underpinning red-meat shelf life and well-validated predictive models for shelf life of Australian vacuum-packed red meat in supply chains.

Specifically, it will expand the applicability of existing models to predict shelf life of meat in other common packaging systems such as vacuum skin packs, modified atmosphere packs and overwrap trays.

Due to recent advances in data logging and wireless communication, the project also intends to develop a user-friendly interface and/or app that can directly receive data from a temperature data logger via Bluetooth or Cloud systems and translate this into a useful information for industry QA managers in real time.

The new knowledge and decision-support tool developed will bring innovation to the Australian red meat industry to monitor and manage cold chains for various products including those required for further processing.

The tool would have equal utility in both short and long distribution chains and would be easily accessible by the industry across all sectors (i.e., processors, transport partners, retail customers etc.) to minimise associated losses and to maintain, or enhance, customer trust.

Tai Gardner and Professor Tom Ross





Horticulture Centre



Turning a feral pest into fertiliser

Project: Assessing the benefits of sea urchin processing waste as an agricultural fertiliser and soil ameliorant

Funding body: Fisheries Research and Development Corporation (FRDC)

Industry partners: Abalone Reinvestment Fund; Ralph's Seafoods.

Research team: Swarts, N; Walker, H (TIA); Campus, P (IMAS).

Collaborators: Institute of Marine and Antarctic Studies.

TIA in collaboration with IMAS is turning a spiny problem into a potential fertiliser for horticulture. The long spined sea urchin is a voracious ocean pest decimating reefs along Tasmania's east coast and threatening our abalone and rock lobster industries. Whilst urchins are now being harvested for their roe, the remaining 95 per cent currently goes to waste.

TIA scientist Dr Harriet Walker wants to change this with her research testing the use of urchin waste as fertiliser.

"It is rich in a lot of important plant micronutrients, such as boron and zinc, and is relatively high in nitrogen, which tends to be the most limiting nutrient when it comes to plant growth," Ms Walker says. "It's full of calcium, and for that reason we see its potential as an agricultural liming product." Dr Walker is testing the dried urchin waste under both controlled glasshouse conditions and in commercial apple orchards and vineyards.

Junior Research Fellow Dr Harriet Walker in the lab.





Dr Sally Bound and Dr Nigel Swarts

Nurturing apples and pears from the orchard floor

Project: Productivity, Irrigation, Pests and Soils (PIPS) 3 Program

Funding body: Hort Innovation

Industry partners: Agriculture Victoria; NSW DPI, Ag Victoria, Apple and Pear Growers Association of South Australia Inc, Pomewest and R and R Smith

Research team: Swarts, N; Bound, S; Close, D; Buntain, M; Hardie, M; Glen, M; Quarrell, S.

Collaborators: WA Department of Primary Industries and Regional Development; NSW Department of Primary Industries; R&R Smith.

- Strengthening cultural and biological management of pests and diseases in apples and pears
- Improved Australian apple and pear orchards soil health and plant nutrition

In its first year, apple and pear growers from around Australia have participated in TIA led research and demonstrations exploring the benefits of healthy soils and ecological diversity in orchards.

The two projects connect at the orchard floor where different plant species, mulches and management techniques are being tested alongside traditional grower practices.

The plant species range from native Australian understorey species through to exotic flowering meadow mixes aimed at supporting diverse beneficial fauna, including insect and microbial communities.

In the treeline, non-traditional hemp mulch and more traditional compost is compared to conventional bare soil. The research team is gathering data on how the orchard floor impacts apple tree health and productivity.

Project lead Dr Nigel Swarts says the systems approach is more functionally relevant to growers as it considers many factors rather than looking at components in isolation.

The crossover of these integrated projects will help increase our understanding and develop future management practices that enhance soil health and achieve more sustainable pest and disease management through plant diversity.

Hemp as forage increases returns to growers

Project: Investigating the potential of hemp as a forage crop (2020 – 2022)

Funding body: Agrifutures

Research team: Penrose, B; Donoghue, A.

Tasmania produces ~80% of the total Australian hemp seed production, and approximately 1400 ha of hemp was grown in Tasmania in 2018.

Hemp provides an excellent option for short summer gaps in the cropping sequence and becomes mature around 90 days after sowing.

There is also anecdotal evidence to suggest that their fibrous roots can improve soil structure and function.

However, it is not possible for Tasmanian farmers to make >\$2000/ha gross margin as now only the seed is harvested and utilised- the vegetative parts are left in the paddock and burnt.

It is possible that hemp could be used as a forage crop exclusively, or as a dual-purpose crop (such as canola) for both forage and seed, or forage and fibre. However, there has been no research regarding the nutritional value of hemp for animal feed in Tasmania, except for a current honours project that focusses only on one variety. This project will investigate the effects of genotype, grazing time, and environment on the nutritional value (fibre, protein, minerals etc) of five genotypes. Growing these crops in two locations across the state and over two years will provide scientifically robust data regarding the nutritional value.

Using two simulated grazings (performed by manually cutting the plants) will enable us to give information to growers about when the best grazing time is to suit their priorities regarding seed yield and forage production. Working in conjunction with the Tasmanian Hemp Association, producing factsheets and holding field days will ensure that the industry will be engaged and informed about the research, and that the most important research questions are being asked.

Dr Beth Penrose





Research digs into ancient medicines for modern markets

Project: Ecophysiology and quality of traditional Chinese herbs

Funding body: Australian Education Management Group

Research team: Close, D; Garland, S; Eyles, A; Law, H.

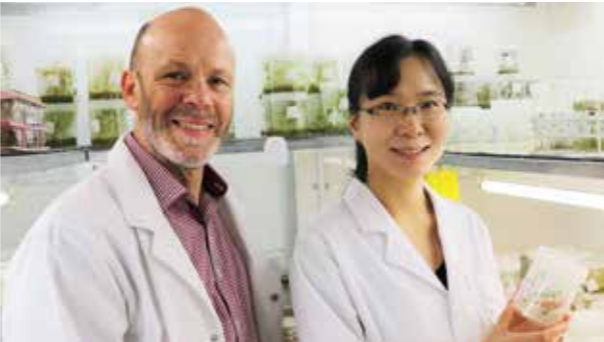
Collaborators: Nanjing University of Chinese Medicine.

The ancient practice of Chinese medicine is a \$130 billion global industry feeling the impact of rising demand and shrinking resources. A selection of traditional Chinese medicinal herbs for this market have found a new and potentially lucrative home at TIA's Vegetable Research Facility at Forthside.

TIA has embarked on a 10-year research program to determine if traditional Chinese medicinal herbs are a profitable alternative crop for Tasmanian growers. Project lead Professor Dugald Close says the project has selected eight herbs matched to our climate growing conditions and market demand.

“At this very early stage of the project we are investigating the best establishment techniques for each of the herbs. The long-term aim is to prove they have bioactive qualities, taste, and aesthetic properties similar to traditionally sourced herbs. The challenge will be developing profitable growing systems to support their cultivation and extraction in Tasmania.”

TIA's Vegetable Research Facility farmhand Ian Donoghue.



Professor Calum Wilson and PhD Candidate Xian Yu.

Rapid screening to prevent spread of potato disease

Project: Mechanisms and manipulation of resistance to powdery scab in potato roots

Funding body: Hort Innovation

Research team: Wilson, C; Tegg, R; Eyles, A; Wilson, A; Yu, X (TIA); and Baldwin, S (New Zealand Plant and Food).

TIA has developed a new laboratory test to rapidly screen potato varieties for resistance to powdery scab disease. The new test is performed at the early root infection phase, reducing the need for expensive glasshouse or field trials, and speeding up testing time from months to just a few days. Powdery scab disease is currently one of the biggest constraints to potato production in Australia resulting in multi-million-dollar losses annually across all potato industry sectors.

Program lead Professor Calum Wilson says understanding the early root infection phase of powdery scab disease was critical to the development and successful management of the disease.

“Interventions at this early stage can provide major benefits in disease management as this is when the powdery scab pathogen releases its motile spores that swim through the soil water and bind to potato roots leading to infection and disease.”

- In addition, the research project is
- assessing genetic variants of commercial cultivars with enhanced disease resistance
 - investigating the nature and mechanisms of zoospore binding to potato roots and how this might be disrupted; and
 - searching for gene markers associated with resistance to root infection that could be used by breeders for selection of new varieties in the future.

Native pepper population holds key to disease resistance

Project: Developing tools to screen native pepper for resistance to *Phytophthora cinnamomi* and drought tolerance

Funding body: Diemen Pepper

Industry Partners: Diemen Pepper

Research team: Barry, K; Sinhalagoda, C (PhD Candidate).

Collaborators: David Cahill, Deakin University.

Native pepper (*Tasmannia lanceolata*), an indigenous food and medicine, is wild harvested in Tasmania for both culinary use of the pepper and the pungent oil extracted from leaves. You can even find native pepper flavouring local gin and cheeses. Commercial harvesters are looking to cultivate native pepper in small plantations to overcome variable supply from season to season and environmental concerns over wild harvest. TIA is researching two major limitations to successful cultivation of native pepper, sensitivity to the dieback disease *Phytophthora cinnamomi* and drought tolerance.

In 2021, TIA researchers screened more than 40 clones of native pepper from around Tasmania for resistance to *P. cinnamomi*. Of these, seventeen show promise of resistance and will undergo further testing. The study successfully adapted a novel soil-free plant growth system to apply disease inoculum directly to roots rather than into soil. Infection levels were measured by visually inspecting roots and using image analysis coupled with a machine learning system. To better understand how native pepper resists disease, TIA PhD candidate Chiranthika Arachchilage is isolating and measuring known disease defence compounds from infected plants.

The team has also been trialling grafting techniques to explore whether more resistant clones can be used as rootstock for preferred cultivars, however plant survival has been low.



PhD Candidate Chiranthika Sinhalagoda with native pepper.

Crystal clear pyrethrum extraction

Project: Accumulation of STLs in pyrethrum extract

Funding body: Botanical Resources of Australia Pty Ltd

Research team: Garland, S; Close, D; Dar, N.

Collaborators: Botanical Resources of Australia Pty Ltd

Tasmania produces the majority of pyrethrum worldwide and it is a lucrative crop for Tasmanian farmers. TIA research has been helping Botanical Resources Australia (BRA) overcome a sticky problem in pyrethrum extracts. The active components of pyrethrum oil are pyrethrin esters, but the plants also produce a compound (sesquiterpene lactone – STL) called pyrethrosin. This compound is a costly nuisance as it co-extracts with the oil forming a white crystalline slurry at the base of containers. If it then transfers through to the final product, it can block spray nozzles during insecticide application.

Industry stores the refined oil at -10°C, then filters out the crystals prior to distribution. This presents significant costs and logistical challenges. In a collaborative study, TIA PhD student Nabeela Dar has shown that most of the crystals are formed within the first few days of storage at -10°C and, more importantly, demonstrated that the rate of formation is independent of storage temperature. This means that BRA may be able to store the oil without the added expense of maintaining low temperature for extended periods of time, saving on energy costs.

In addition, Nabeela used high-powered microscopy and genetic analysis to distinguish two distinct pyrethrum seed lines that produced either very high, or very low levels of pyrethrosin. This has provided insights into the localisation and control of pyrethrosin biosynthesis and oil production in pyrethrum flowers.





Livestock Production Centre



Designing profitable, productive farms that adapt to climate change

Project: NEXUS project: exploring profitable, sustainable livestock businesses in an increasingly variable climate

Funding body: Meat and Livestock Australia Donor Company and Tasmanian Institute of Agriculture

Research team: Harrison, M; Turner, L; Christie, K; Ball, P; Sinnett, A; Malcolm, B; Hall, A.

The NEXUS Project, led by Associate Professor Matthew Harrison, examines the nexus between profitability, productivity, and greenhouse gas emissions of livestock businesses under an increasingly variable climate. Working directly with beef and sheep farmers, the project team are co-designing multiple whole farm adaptations to improve economic outcomes under higher frequencies of extreme climatic events, including drought, heatwave, and extreme rainfall.

Adaptations have been suggested and refined with farmer groups. These include various combinations of improving soil fertility, increasing the proportion of legumes in grass pastures, improving soil carbon, planting trees on farm, supplementary feeding over summer to conserve ground cover, providing red algae as a feed supplement to reduce enteric methane, to income diversification approaches, such as incorporation of vineyards on farm.

The team has developed results that have been highly commended by the farmers involved. One such result was that historical land management over the last 100 years has improved soil carbon (on a beef farm near Stanley, in north-western Tasmania) by around 27% relative to the level it would have been in the absence of sustainable management.

Another result has been that although incorporation of lucerne in typical pastures in the Tasmanian Midlands reduces total available feed supply, the legume results in greater pasture digestibility per hectare, and when managed at appropriate stocking densities, results in improved liveweight gains per hectare. Even better, the deep tap root of lucerne (relative to existing pasture grass roots) allows greater storage of soil carbon at depth. When assessed over the long-term, lucerne reduces net farm greenhouse gas emissions and improves liveweight production, suggesting a win-win solution to climate change.

Part of the NEXUS project involves on-farm demonstration. The team are examining the implications of feeding biochar as a feed supplement to dairy calves: biochar can reduce enteric methane and transition through the animal, resulting in improved soil carbon. Biochar manufacturers also claim that biochar improves liveweight gain. The NEXUS team are measuring the impact of biochar as a feed supplement on soil carbon and liveweight gain and will also model the impacts of biochar on net farm greenhouse gas emissions, productivity, and profitability.

Although still in progress, the project has already provided significant value to the Tasmanian livestock sector through the co-development of contextualised climate change adaptation approaches.





Grazing project investigates legume quality across regions

Project: Growing red meat productivity through the selection and establishment of perennial legumes

Funding body: \$1.5 million investment between Tasmanian Institute of Agriculture and Meat & Livestock Australia

Research team: Smith, R; Penrose, B; Langworthy, A; de Hayr, B; Martin, G; Talbot, J; Le Huu, H.

Collaborators: Meat and Livestock Australia, University of Tasmania

Led by Research Fellow Rowan Smith, this project seeks to address the low proportion of perennial legumes in rainfed red meat grazing systems and in doing so improve feed quality, increase feed quantity, and reduce seasonality of feed supply; ultimately increasing red meat productivity and resilience.

The project is being undertaken in the sheep producing low-medium rainfall Midlands' region and the beef producing high rainfall north-west region.

The focus in the Midlands region is on establishing and re-establishing perennial legumes in mixed pasture swards for lamb production using a range of sowing techniques and adapted species. In the north-west the focus is on improving the quality of winter wet pastures for beef production using waterlogging tolerant species.

An experiment that re-establishes legumes into Phalaris-dominant swards has shown a heavy competition effect, with plots that received a herbicide pre-sowing to reduce phalaris vigour containing significantly more (more plants and more legume DM) of the target-sown legume than untreated plots. The effect of three different sowing methods appears to be diminishing over time, while plant counts of direct-drill and strip-till plots were significantly higher than broadcast plots three months after sowing, this difference appears to have declined.

Two field days were held, the first in conjunction with the Circular Head Beef Group with around 40 attendees focused on raising awareness of the project and discussing perennial legumes options for the high rainfall zone. The second field day with around 70 attendees was held at Campbell Town and focused on findings of the re-establishment experiment and establishment of suitable legumes for the low rainfall environment and under irrigated systems. Numerous producers have expressed an interest in being involved in partner activities in both regions, with many inviting the project team to visit properties and document recent sowing experiences as part of case studies.



Guests at a legumes field day at "Fosterville" near Campbell Town.



TIA's Livestock Production Centre Leader James Hills (right), and Westbury farmer Jarom Rhind.

Smarter irrigation for profit

Project: Smarter Irrigation for Profit Phase 2 – Beyond water smart advancing irrigation – dairy

Funding body: Rural R&D for Profit Program (Smarter Irrigation for Profit - Phase 2 Cotton Research & Development Corp) TIA and Dairy Australia

Industry partners: Dairy Australia

Research team: Hills, J; Langworthy, A; Raedts, P; Borojevic, R; Jones, S; Kerstan, T.

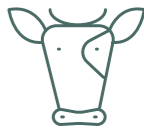
The objective of the three-year SIP2 program is to realise significant productivity and profitability improvements for primary producers, through generating knowledge, technologies, products, or processes that benefit primary producers; strengthening pathways to extend the results of rural R&D, including understanding the barriers to adoption; establishing and fostering industry and research collaborations that form the basis for ongoing innovation and growth of Australian agriculture.

TIA's James Hills leads the dairy component of this irrigation Australia-wide project, and TIA runs the project for the dairy industry in Tasmania.

A main feature of this project is to improve irrigation scheduling by farmers, and a free tool (IrriPasture) has been developed to help farmers achieve this. In 2021 the IrriPasture app rollout was successful with significant uptake of the app (there are now more than 400 users of the app).

The success of the rollout was also due to promotion activities during three successful field days organised by TIA in the main dairy regions of Tasmania.

During the irrigation season, TIA extension staff actively interacts on a weekly basis with five irrigation discussion groups of dairy farmers.



Simple tech a smart move for farmers

Project: TestLab SmartFarm

Funding body: Australian Government funded pilot project that enables the introduction and demonstration of industry 4.0 technologies and principles to SMEs across all manufacturing sectors

Industry partners: FarmPulse, Pasture.io

Research team: Raedts, P; Hills, J; Hardie, M; Millhouse, B.

This one-year \$300,000 project started in March 2021.

In 2021 TIA organised a successful field day at TIA's Dairy Research Facility (TDRF), showcasing the Dairy component of the SmartFarm project and its potential to dairy farmers and key industry stakeholders.

On display were the myriad sensors installed at TDRF and the dashboards that show the potential of smart sensor technology to support and improve efficient daily operation and management of a dairy farm. Included was a presentation of a novel SmartFarm application for the use of on-cow GPS trackers to automatically register which pastures are being grazed, by pasture management software (Pasture.io).



Richard Gardner, from FarmPulse, presents at the Elliott Smarter Farming Field Day.



Inspecting the effluent pond at the TIA Dairy Research Facility at Elliott.

Investment to transform research farms

Project: TIA Farms Upgrade

Funding body: University of Tasmania TIA, Tasmanian Government

Research team: Hills, J; Swarts, ND; Raedts, P; Millhouse, B; Clark, D; De Vries, J; Rose, M; Boon, S; Hardie, MA; Iten, J.

Commencing in 2021, a five-year partnership between the University of Tasmania (UTAS) and the State Government, will see \$7.8 million invested to modernise TIA's Forthside Vegetable Research Facility and Elliott Dairy Research Facility to enable them to underpin a Region of Excellence for applied agriculture research and demonstration to industry. The upgrades will enable TIA to continue to undertake valuable agricultural research, industry development and education programs to drive productivity and sustainability for the Tasmanian agricultural sector for the next decade.

Significant progress was made on this project in 2021, particularly at the TIA Dairy Research Facility at Elliott where most of the infrastructure upgrades are being fast tracked to be completed by mid-2022 for the farm to be ready for the \$6.5m, five-year Dairy Australia Dairy HIGH 2 research project. The Dairy HIGH 2 research project is an excellent example of how the project is attracting significant, new investment in agriculture research for the State of Tasmania.

Key items in the five-year project include:

- Elliott: new 50 bail rotary dairy complex including features to support research, 32Ha fixed irrigation system to enable farmlet trial work, irrigation dam expansion (from 24ML to 115ML), 2km of new farm laneways, fencing and pasture upgrades, new farming equipment and a flexible teaching space
- Forthside: Significant irrigation and fencing upgrades, new farming equipment and a flexible teaching space
- SMART Farm conversion at both Elliott and Forthside



Learning and Teaching



Dairy Masterclass

Project: Masterclass in Dairy Farm Management

Funding body: Dairy Australia

Industry partners: Dairy Australia and national industry steering committee

Research team: Gracie, AJ; Boersma, M; Acuna, TL; Hills, J.

The success of the Masterclass in Horticultural Business, which commenced in 2017, led to the national dairy sector requesting a similar program for its constituents and consequentially the development by TIA of a new Masterclass in Dairy Farm Management that opened to enrolments in 2021.

Through research, the dairy industry has identified a shortage of people and capability in farm management as one of the top four areas limiting growth of the industry over the next 10 years. Both programs are accredited as a Graduate Diploma in Agribusiness, with specialisations in Dairy Management or Horticultural Business.

TIA Dairy Research Facility Farm Manager Brad Millhouse.





Training and Education for the Future Forum

The primary recommendation arising from an agriculture education forum held in October 2021 has been realised with the formation of the Tasmanian Agricultural Education and Training Partnership (TAETP).

The Partnership held its first meeting in early 2022, with representation from TasTAFE, the Department of Education, Catholic Education, the Tasmanian Farmers and Graziers Association (TFGA), the Tasmanian Agricultural Productivity Group (TAPG) as well as recent graduates from various programs.

The Partnership will now begin the task of addressing and actioning solutions, where appropriate, to topics, issues and opportunities for education and training in agriculture and food.

More than 50 key members of the education sector and agriculture industry stakeholders attended the Tasmanian Institute of Agriculture's (TIA) Agriculture Training and Education for the Future Forum held in Launceston on 1 October 2021.

"The intention for the forum, and previous events, was to provide the opportunity for invited key stakeholders to participate in discussions about current and future agriculture education and training needs in Tasmania, and how these needs might be met," TIA's Associate Head Learning & Teaching, Associate Professor Alistair Gracie said.



Professor Michael Rose speaks at the 2021 Forum.



Feed Your Mind, feed the World

Attendees at the 2021 Feed Your Mind, Feed the World camp received a behind-the-scenes taster of the diverse and exciting career opportunities in agriculture.

The annual camp is an initiative of the Tasmanian Institute of Agriculture (TIA) to inspire future generations of agriculture leaders. The experience is free to attend and open to year 11 and 12 students.

It was attended by 12 students from Sheffield to the Tasman Peninsula and was held in North-West Tasmania from December 6-8. The group visited some of Tasmania's leading agricultural businesses, including a cider producer, vegetable processor, free-range piggery, and glasshouse capsicum producer.

Campbell Hills, a year-11 student from Hobart, plans to study agriculture science so that he can learn new ideas to bring back to his family farm.



"I have grown up on my family's merino farm and want to take over one day. I'm interested in studying agriculture because I love life on the farm and there are lots of things to learn and take back to the farm. You can always benefit from learning from others."

Campbell Hills

JM Roberts Seed Funding for Sustainable Agriculture

Max Edgley will study the opportunities for medicinal cannabis producers in Australia, thanks to a Nuffield Scholarship supported by JM Roberts Charitable Trust and the Tasmanian Institute of Agriculture.

As the cultivation manager at one of Australia's largest medicinal cannabis producers and manufacturers, Tasmanian Botanics Pty Ltd, Max oversees all aspects of the plants' cultivation.

"The medicinal cannabis industry in Australia is in its infancy, with only a handful of companies operating at a commercial level," Max says.

"Though the industry is small and lacks a well-resourced research organisation, I am active in discussions with professionals within the industry to learn of challenges faced by other producers and the industry as a whole."

Max will travel to Canada, the United States, the United Kingdom, Germany, and Spain as they are key countries that have a more mature medicinal cannabis industry than Australia. Through this travel, Max hopes to help the Australian industry to become globally competitive.

Professor Michael Rose, TIA Director, said TIA was proud to partner with the JM Roberts Charitable Trust to sponsor a Nuffield Scholarship to progress the sustainable growth of Tasmania's agriculture sector.

Max Edgley's Nuffield Scholarship is made possible with the generous support of the JM Roberts Charitable Trust and the Tasmanian Institute of Agriculture.



The medicinal cannabis industry in Australia is in its infancy, with only a handful of companies operating at a commercial level."

Max Edgley

2021 Nuffield Scholarship recipient Max Edgley.



Honours Seminar

An industry focused project that may play a key role in future proofing food production globally, took out top prize at the Tasmanian Institute of Agriculture's Honours Seminar held in Sandy Bay in October 2021.

Annick Witte presented her project, along with 11 Honours year students to in-person and online audiences, and the Australian Institute of Agriculture (AIA) for judging of the state Student Award.

Her project 'Optimising the reproductive output of *Eristalis tenax* (Diptera: Syrphidae) for commercial mass rearing systems', has focused on further developing the drone fly, *Eristalis tenax*, as an alternative pollinator for a variety of crops including various fruits, vegetables, and vegetable seed crops.

Annick was one of 12 Honours year students who presented during the Honours Seminar.

"Annick's project was very impressive, and her knowledge about her topic and the passion she shows for the industry is really inspiring," said Dr Beth Penrose, Lecturer in Pasture Science and TIA's Honours coordinator.

"Honours a great opportunity for students to really get their teeth into something they're super passionate about, and it is often a fantastic stepping-stone into a great job in industry - the skills the students learn and the networks they build during their Honours year sets them up really well for their next step."

TIA's 2021 Honours year students.



Financial Report

TASMANIAN INSTITUTE OF AGRICULTURE (TIA)

NOTES TO ACCOMPANY FINANCIAL DETAILS

The financial details reported here relate to TIA activities for 2021. The detail was prepared by TIA and checked by Financial Services, University of Tasmania.

Specific contributions from each funding source are as follows: -

1. University of Tasmania

2021 Operating Grant Funds to TIA/School of Agricultural Science	\$4,952,549
2021 University Research Scholarships to PhD students studying in areas related to TIA activities	\$1,147,211

TOTAL University of Tasmania contribution	\$6,099,760
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2. Department of Primary Industries, Parks, Water & Environment (DPIPWE)

CRF funds granted to TIA for the 1 January 2021 to 31 December 2021 financial year under the TIA Joint Venture Agreement	\$5,758,672
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TOTAL DPIPWE contribution	\$5,758,672
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3. Industry - including private industry and National Competitive Research grants


2021 Industry research grants held by the University for TIA activities	\$10,671,266
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TOTAL Industry contributions	\$10,671,266
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CERTIFICATION OF FINANCIAL DETAIL

We certify that the financial detail contained in the 2021 Tasmanian Institute of Agriculture Research Annual Report has been prepared in accordance with detail held in the University of Tasmania's Financial Management Information System, and detail provided by TIA.


.....31 / 03 / 2022
Professor Michael Rose
Director TIA


.....30 / 03 / 2022.....
Ben Rose
Chief Financial Officer,
Financial Services
University of Tasmania



2021 TIA Research Projects

Agricultural systems

Funding body	Industry partners	Research team	Title of project
Australian Centre for International Agricultural Research	Centre for Agrarian Systems Research and Development; Centre for International Research Agronomic Development; National Institute of Animal Sciences; Northern Mountainous Agriculture and Forestry Science Institute; Tay Bac University; Thai Nguyen University of Agriculture and Forestry; University of Queensland; Vietnam National University of Agriculture	Ives, SW; Bonney, L; Eversole, R; Adhikari, RP; Nicetic, O; Cuong, VC; Huyen, LTT; Hung, PV; Quang, NH; Lan, DD; Xuan, CTT; Duteurtre, G; Smith, RW	Intensification of beef cattle production in upland cropping systems in North West Vietnam
Australian Research Council	Monash University; University of Adelaide; University of Southern California	Walker, J; Ng, B; Hills, JL	Towards an Active and Passive L- and P-band soil moisture satellite mission
Australian Research Council	Australian Wine Research Institute; AUSVEG Ltd; Bioplatforms Australia Ltd; Cotton Research and Development Corporation; Curtin University; Grains Research & Development Corporation; Griffith University; Horticulture Innovation Australia; La Trobe University; NUFARM AUSTRALIA LIMITED; Queensland Department of Agriculture & Fisheries; South Australian Research and Development Institute; University of California, Riverside; University of Queensland; Wine Australia	Mitter, N; Evans, KJ	BioClay Sustainable Crop Protection
CRC for High Performance Soils Ltd	Charles Sturt University; University of Southern Queensland	Higgins, VJ; Warman, R; Bryant, M; Allan, C; Cockfield, G; Leith, PB	Understanding Adoptability of Techniques and Practices for Improved Soil Management
CRC for High Performance Soils Ltd		Glen, M; Mohammed, CL; Corkrey, SR	Microbial changes associated with improved or reduced soil health
CRC for High Performance Soils Ltd	Federation University Australia; University of Southern Queensland	Hardie, MA; Cahoon, SC; Edwards, SJ; Gillespie, WJ; Manion, MJ; Kang, BH; Mohammed, CL; Ballard, RWJ	'Smart' soil sensors
CRC for High Performance Soils Ltd		Hardie, MA; Maya Alejandro, F; Gale, TJ	Mobile soil water extraction for biological and chemical analysis
CRC for High Performance Soils Ltd	Federation University Australia; University of Southern Queensland	Hardie, MA	Next Generation Below Ground Sensor Communication using Seismic Waves for Smart Soil Applications
Department of Industry, Innovation and Science	CRC for High Performance Soils Ltd; University of Newcastle	Doyle, RB; Mohammed, CL; Hardie, MA; Neumeyer, PG; Cotching, B; Cahoon, SC	CRC for High Performance Soils
Department of Primary Industries, Parks, Water & Environment		Mohammed, CL; Kumar, S; Richardson, E; Hall, AF	Extension Accelerator Program
Grains Research & Development Corporation		Zhou, M; Johnson, PG	Minimising the impact of major barley foliar pathogens on yield and profit: Screening of elite breeder material transitioning to a fee for service model
Grains Research & Development Corporation		Zhou, M; Johnson, PG	Minimising the impact of major barley foliar pathogens on yield and profit: Development of international pathogen / host diversity sets

Agricultural systems

Funding body	Industry partners	Research team	Title of project
Grains Research & Development Corporation		Zhou, M	Minimising the impact of major barley foliar pathogens on yield and profit: Surveillance and monitoring of pathogen populations
Grains Research & Development Corporation		Zhou, M; Johnson, PG; Fan, Y	Introgressing waterlogging tolerance gene to commercial barley varieties
Grains Research & Development Corporation	Department of Economic Development, Jobs, Transport and Resources	Armstrong, R; Wilhelm, N; Davenport, D; Sale, P; Tavakkoli, E; Das, BT; McPhee, JE; Hardie, MA; Johnson, PG	Understanding the amelioration processes of the subsoil application of amendments in the Southern Region
Grains Research & Development Corporation		Harrison, MT; Ara, I; Phelan, DC	Optimising farm scale returns from irrigated grains: maximising dollar return per megalitre of water
Department of Agriculture Water and the Environment	Beanstalk Agtech Pty Ltd; Bush Heritage Australia; Cape Herbert Pty. Ltd.; Cradle Coast Authority; Definium Technologies Pty Ltd; Highland Conservation Pty Ltd; Horticulture Innovation Australia; Hydro Tasmania; Moe Associates Trust; Private Forests Tasmania; Rural Business Tasmania Inc; Soils for Life Trust; Southern Cross University; Southern Regional Natural Resource Management Association Inc; Tasmanian Farmers & Graziers Association; Tasmanian Irrigation; Tasmanian Land Conservancy; Tasmanian Women in Agriculture Inc; The Northern Tasmanian Natural Resource Management Assoc Inc.	Evans, KJ; Mohammed, CL; Kumar, S; Field, B; Harris, R; Jones, ME; Anders, RJ; Higgins, VJ; Bryant, M; Harrison, MT; Gracie, AJ; Wilson, MD; Jordan, GJ; O'Reilly-Wapstra, JM; Barmuta, LA; Remenyi, TA; Kang, BH; Amin, M; Maiti, A; Fraser, SP; Kilpatrick, SI; Barnes, NR; Beasy, KM; Coleman, BJ; Stoeckl, NE; D'Alessandro, SP; Tian, J; Chuah, S; Norris, K; Ferguson, SG; Auckland, SRJ	Drought Resilience Tasmania – Actionable Knowledge and Solutions for Sustainable Prosperity
Department of Agriculture Water and the Environment	Rockpool Land & Water Services Pty Ltd	Harrison, MT; Melville, B	Regenerative grazing trail & dryland pasture monitoring from satellite, via calibration to field observations & biomass measurements, to improve rotational grazing & stocking decision making
Horticulture Innovation Australia		McPhee, JE; Monckton, DC	Wide Span farming: economic and logistics feasibility study
JM Roberts Charitable Trust		Rose, M; Leith, PB; Kumar, S	JM Roberts Seed Funding for Sustainable Agriculture
Meat and Livestock Australia	Meat and Livestock Australia; University of Tasmania	Harrison, MT; Turner, LR; Christie, KM; Ball, PD	NEXUS project: exploring profitable, sustainable livestock businesses in an increasingly variable climate
Meat and Livestock Australia	Meat and Livestock Australia; University of Tasmania	Harrison, MT; Turner, LR	NEXUS project part 2: involve and partner activities
Meat and Livestock Australia	CSIRO-Commonwealth Scientific & Industrial Research Organisation; Department of Primary Industries NSW; Integrity Ag & Environment; RM Consulting Group; South Coast Natural Resource Management; The Mullion Group; The University of Melbourne	Harrison, MT; Christie, KM; Hovenden, MJ	Sustainable pathways to CN30

Food Safety & Innovation

Funding body	Industry partners	Research team	Title of project
Australian Pork Limited		Kocharunchitt, C; Ross, T; Bowman, JP	Development of a predictive model for vacuum-packed pork
Australian Research Council	BioMar Ltd; University of California; University of Sheffield	Blanchard, JL; Cameron, D; Halpern, B; Carter, CG; MacLeod, C; Adams, LR; Leith, PB; Bowman, JP; Alexander, KA; Penrose, B	Optimising feeds to support ecosystem-based aquaculture
Forico Pty Ltd		O'Reilly-Wapstra, JM; Barry, KM; Bowman, JP	Eucalypt plantation rhizosphere characterisation
Naturo Pty Ltd		Ross, T	Risk Assessment for a Novel Milk Pasteurisation Process
Meat and Livestock Australia		Kocharunchitt, C; Ross, T; Bowman, JP; Pagnon, JC	Development of shelf life models for beef, lamb and pork
Meat and Livestock Australia		Kocharunchitt, C; Ross, T; Bowman, JP; Pagnon, JC; Mellefont, LA	Application of glucose as a novel approach for shelf-life extension of vacuum-packed chilled sheep meats
McCain Foods Limited		Stanley, RA; De Vries, J	MATS Foundation Year

Horticulture

Funding body	Industry partners	Research team	Title of project
Advanced Agricultural Systems Pty Ltd		Bound, SA	Developing Agri-tech solutions for the Australian apple Industry
AgAware Consulting Pty Ltd		Scott, JB; Clark, DD; Donoghue, A; Goulding, KJ	Trials to determine the efficacy and crop safety of Switch Fungicide (cyprodinil + fludioxonil) in hemp for the control of grey mould
AgAware Consulting Pty Ltd		Scott, JB; Clark, DD; Donoghue, A; Goulding, KJ	Trials to determine the efficacy and crop safety of Switch Fungicide (cyprodinil + fludioxonil) in hemp for the control of grey mould
BioAg Pty Ltd; Department of Industry, Innovation and Science		Quin, PR	Analysis of a proprietary liquid biostimulant
Biocontrol Australia Pty Ltd		Barry, KM	Validation of qPCR methodology for quantification of Trichoderma harzianum in soil
Botanical Resources Australia Pty Ltd		Garland, SM; Gracie, AJ; Close, DC	Accumulation of STLs in pyrethrum extract
Botanical Resources Australia Pty Ltd		Pearce, T; Pilkington, S; Scott, JB	Investigating the genetics of pyrethrum vernalisation
Botanical Resources Australia Pty Ltd		Scott, JB; Pearce, T	Mechanisms and spread of fungicide resistance in pyrethrum fungal pathogens
Botanical Resources Australia Pty Ltd		Pearce, T; Pilkington, S	Tissue culture techniques for pyrethrum

Horticulture

Funding body	Industry partners	Research team	Title of project
Cooperative Research Centre for Honey Bee Products; Tasmanian Beekeepers		Garland, SM; Close, DC; O'Grady, AP	The bioactivity and stability of the honey from Leatherwood (Eucryphia lucida)
Department of Agriculture		Fei, J; Close, DC; Cahoon, SC; Bonney, L; Kumar, S	Enhancing horticultural supply chain traceability and digital promotion of Australian horticultural products in overseas markets
Department of Agriculture and Water Resources	Hansen Orchards; Reid Fruits; Seed Purity; South Pacific Seeds Pty Ltd	Gracie, AJ; Allen, GR; Close, DC; Quarrell, SR; Jones, JE; Barry, KM	Novel technologies and practises for the optimisation of pollination within protected cropping environments
Department of Primary Industries, Parks, Water & Environment	Ralph's Tasmanian Seafood Pty Ltd	Keane, JP; Swarts, ND	Commercial upscaling of urchin fertiliser
Department of Primary Industries, Parks, Water & Environment		Barry, KM; Evans, KJ; Buntain, M	Expanding crop protection options for control of blueberry rust
Diemen Pepper		Barry, KM; Wilson, MD; Bro-dribb, TJ; Cahill, D	Developing tools to screen native pepper for resistance to dieback and tolerance to drought
Essential Oils of Tasmania		Close, DC; Menary, RC; Claye, CJ	Boronia germplasm collection re-vitalisation
Essential Oils of Tasmania		Garland, SM	Essential Oils of Kunzea Ecotypes
Essential Oils of Tasmania		Garland, SM; Buziak, D	Anti-microbial Properties of Essential Oils
Fisheries Research & Development Corporation	DPIPWE - Abalone Industry Reinvestment Fund; Ralph's Tasmanian Seafood Pty Ltd; Reid Fruits	Swarts, ND; Keane, JP	FRDC Sea Urchin Fertiliser Project
Horticulture Innovation Australia		Wilson, CR; Tegg, RS; Eyles, A; Baldwin, S	Mechanisms and manipulation of resistance to powdery scab in potato roots
Horticulture Innovation Australia	Fruit Growers Tasmania Inc	Bound, SA; Buntain, M; Cover, I; Tarbath, M; Westmore, G; Crisp, P; James, P	Pilot Sterile Codling Moth Releases for the Apple industry
Horticulture Innovation Australia		Gill, WM; Close, DC	Pest and disease management and research services
Horticulture Innovation Australia	Wageningen UR	Swarts, ND; Close, DC; Gracie, AJ; Acuna, TL; Bigsby, H; Boersma, M; Latham, R; Hall, AF	Global masterclass in horticulture
Horticulture Innovation Australia	Department of Agriculture and Fisheries (QLD); Department of Economic Development, Jobs, Transport and Resources; Department of Primary Industries and Fisheries, NT; Department of Primary Industry and Resources	Wilson, CR; Gambley, C; Constable, F; Tran Nguyen, L; Coutts, B	VG16086 - Area-wide management of vegetable diseases: viruses and bacteria
Horticulture Innovation Australia	Department of Jobs, Precincts and Regions	Goodwin, I; Bound, SA	Developing smarter & sustainable pear orchards to maximise fruit quality, yield & labour efficiency (AP19005)

Horticulture

Funding body	Industry partners	Research team	Title of project
Horticulture Innovation Australia		Bound, SA	Cost effective thinning for Nashi (desktop evaluation and grower workshops)
Horticulture Innovation Australia	Department of Jobs, Precincts and Regions	Lefoe, G; Quarrell, SR	Strengthening cultural and biological management of pests and diseases in apple and pear orchards
Horticulture Innovation Australia	Botanical Resources Australia Pty Ltd	Scott, JB; Pearce, T; Weichelt, PE	Development of regional risk models for fungal diseases in pyrethrum
Horticulture Innovation Australia		Tegg, RS; Rettke, M; Cotching, B; Beveridge, PW; Wilson, A; Wilson, CR	Investigating the soil pH and nutrition as possible factors influencing pink rot in potatoes – a pilot study
Horticulture Innovation Australia	Biocontrol Australia Pty Ltd	Barry, KM; Wilson, CR	Biopesticides in horticulture: efficacy of Trichoderma harzianum to control Botrytis cinerea in horticultural crops
Horticulture Innovation Australia	Apple & Pear Growers Association of South Australia ; Department of Primary Industries and Regional Development, Western Australia; Department of Primary Industries NSW	Swarts, ND; Bound, SA; Close, DC; Buntain, M; Hardie, MA; Glen, M	Improved Australian apple and pear orchards soil health and plant nutrition
Horticulture Innovation Australia	Fruit Growers Tasmania Inc	Close, DC; Bound, SA	Protected cropping for high value horticultural production: effects of climate modification and growing systems using cherry as a case study
Horticulture Innovation Australia		Allen, GR; Quarrell, SR; Gracie, AJ	Honey bee health and pollination under protected and contained environments
Martha Jane Medical		Garland, SM; Close, DC; Menary, RC	Understanding and manipulating environmental factors for targeted cannabinoid production
Simplot Australia		Wilson, CR; Wilson, A; Tegg, RS	Germinate to Exterminate - Simplot
Simplot Australia		Tegg, RS; Wilson, CR	Lily the pink
W & E Health Pty Ltd		Close, DC; Boersma, M; Garland, SM	Research Hub for Traditional Chinese Herbs
Wine Australia		Swarts, ND; Jones, JE	Science to inform decision making between synthetic and alternative nitrogen sources in vineyards: Top-up scholarship and operating

Livestock

Funding body	Industry partners	Research team	Title of project
Australian Research Council	Monash University; University of Adelaide; University of Southern California	Walker, J; Ng, B; Hills, JL	Towards an Active and Passive L- and P-band soil moisture satellite mission
Australian Wool Innovation Limited		Horton, BJ	Sheep Blowfly Chemical Resistance Communication Strategy
Australian Wool Innovation Limited		Horton, BJ; Bailey, AN	Management of sheep blowfly resistance to pesticides
Dairy Australia Limited		Hills, JL; Langworthy, A ; Raedts, PJM; Gee, CM; McLaren, D; Verdon, MJ; Snare, TA; Millhouse, BJ	Dairy High 2
Dairy Australia Limited		Irvine, LD; Jones, S; Flight, S	Tasmanian Dairy Farm Monitor Project 2020–2022
Dairy Australia Limited		Christie, KM	Towards carbon neutrality for the Australian dairy industry
Dairy Australia Limited		Rawnsley, RP; Hills, JL; Raedts, PJM; Irvine, LD; Turner, LR; Langworthy, A; Jones, S; Flight, S; Gee, CM; Verdon, MJ; Snare, RD; Hall, AF (AI); Cuin, TA (AI); McLaren, D (AI)	Dairy HIGH – High Integrity Grass-fed Herds
Department of Agriculture and Water Resources		Hills, JL; McLaren, D; Flight, S; Rawnsley, RP; Jones, S; Hardie, MA; Langworthy, A	Smarter Irrigation for Profit – Phase 2
Meat and Livestock Australia		Haling, R; Smith, RW; Penrose, B; Martin, GI; Hayes, R; Harris, C; Murray, C; Simpson, R; Stefanski, A	Serradellas for new environments
Meat and Livestock Australia		Smith, RW; Martin, GI; Ball, PD; Penrose, B; Langworthy, A	Growing red meat productivity through the selection and establishment of perennial legumes
Scion New Zealand Forest Research Institute Limited		Allen, GR; Quarrell, SR	Host relationships of the proposed biocontrol agent for New Zealand, Eadya paropsidis
South Australian Research and Development Institute		Smith, RW; Martin, GI	Australian Pastures Genebank –Temperate Regeneration and Characterisation Program
South Australian Research and Development Institute		Smith, RW; Martin, GI	Pilot Sterile Codling Moth Releases for the Apple industry

2021 TIA Publications

Journal Article

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Balotf, S and Wilson, R and Tegg, RS and Nichols, DS and Wilson, CR, "Quantitative proteomics provides an insight into germination-related proteins in the obligate biotrophic plant pathogen *Spongospora subterranea*", *Environmental Microbiology Reports* pp. 1-12. ISSN 1758-2229 (2021) (IF=3.541) [Refereed Article]

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