



ARC Research Hub for
Smart Fertilisers

NEWSLETTER

ISSUE 2

AUGUST 2024



Australian Government
Australian Research Council

The ARC Research Hub for Smart Fertilisers
is funded by the Australian Government
through the Australian Research Council
Industrial Transformation Research
Program



PREPARED BY

Communications team,
ARC Research Hub for Smart Fertilisers

....



www.smartfertiliserhub.org.au



ARC Research Hub for

Smart Fertilisers



Directors Welcome

Dear colleagues and friends of the ARC Research Hub for Smart Fertilisers,

The Research Hub has just progressed past its mid-term point and it is a pleasure to provide an update to our friends and supporters on our progress.

Mid-Term Review – The Hub is committed to performing cutting edge research and translating these fundamental findings to develop smart new fertilisers to have impact, and benefit farmers and the agricultural sector. To accelerate this pipeline and progress to commercialisation of some of our novel products, the Hub held a comprehensive two-day mid-term review in mid-July to assess progress, the way forward, develop action plans, focus and prioritise on our most promising leads and align resources to achieve our objectives. The review was chaired by a member of the Hub’s Scientific and Industry Advisory Committee, Stephan Titze, and included the Hub Leadership team, the Hub’s Theme leaders, La Trobe University, and industry representatives from IPF and Elders. The review was very constructive and resulted in changes to priorities in research areas, improvements in monitoring progress, analysis of expenditure to date and discussions on resources going forward to achieve the Hub goals. The Hub Leadership team has finalised conclusions and recommendations from the review, for endorsement by the Hub Management Committee and implementation.

Research Progress and Translation – In line with the commercialisation focus of the Hub, significant progress has been made in developing new coatings for controlled release of nitrogen (N) fertilisers and the development of new nitrification inhibitors. Prof Uta Wille’s research in developing new nitrification and urease inhibitors was successful in securing \$150,000 in Strategic Funding to engage the Australian consultancy firm, Prudentia Engineering, to facilitate multi-discipline engineering services across all phases of chemical production and scale up for commercial production of the nitrification inhibitor, MPT. Prof Wille is also working with Boron Molecular to scale up production of MPT for glasshouse and field trials. MPT outperforms current commercial nitrification inhibitors in laboratory testing and has significant potential for application in various agricultural settings. The work with Prudentia Engineering and Boron Molecular will provide processes for scaling up for field trials, as well as mapping commercialisation pathways. Importantly, it will also serve as a template for developing commercialisation pathways for other novel coating materials and nitrification and urease inhibitors emerging from the Hub.





ARC Research Hub for

Smart Fertilisers

Directors Welcome - *continued*

New industry partners, industry placements and engagement – The Hub has been active in pursuing new partnerships with industry and government. Following an industry placement program in 2023 organised by IPF, various members from the Hub visited Townsville and Burdekin in Queensland to engage in discussions with the Queensland Department of Agriculture and Fisheries (QDAF) and Sugar Research Australia (SRA). This has led to ongoing collaboration, culminating in two recent funding applications including the ARC Hub, QDAF, SRA and IPF to the SRA 10th anniversary research fund. This research, led by Prof Deli Chen and A/Prof Raymond Lam, focuses on assessing the potential of dual nitrification inhibitors in reducing nitrogen loss in the Australian sugarcane industry and AI and data-driven mapping of nitrogen hotspots in Australian sugarcane and the Great Barrier Reef.

The investigation of the benefits of dual inhibitors in sugarcane, also forms the basis of research by the Hub PhD student, Pongsathorn (Sam) Sukdanont. These projects will help improve effective fertiliser management for improving sugarcane productivity, profitability and environmental sustainability.

New funding, prizes and major articles – Hub researchers have continued their ongoing success in research excellence, through new funding successes, disseminating research findings through publications and invited presentations at international conferences and developing new relationships, nationally and internationally. The Hub's deputy-director, A/Prof Helen Suter, was successful in securing a \$8M grant from the Grains Research and Development Corporation to work with several organisations to examine the ability of commercially available enhanced efficiency N fertiliser technology to improve crop N uptake, reduce nitrous oxide emissions and nitrate leaching, whilst making economic sense for farmers.

The total funding for the project, including in-kind contributions, is \$17.33M. Dr Emma Liang, was successful with a \$3M grant from the Australian Centre for International Agricultural Research (ACIAR) with research to promote the green growth ambitions of Laos. This aims to enhance nitrogen management practices in rice production in Laos.





ARC Research Hub for

Smart Fertilisers

Directors Welcome - *continued*

(Cont.) New funding, prizes and major articles - Hub researchers continue to publish their research in top tier journals. Of note, A/Prof Raymond Lam and Prof Deli Chen recently published an opinion piece entitled “Crop migration and environmental consequences”, in the prestigious international journal, “Nature Food”. The authors make recommendations for alleviating environmental pressures from agriculture, by accounting for the social costs and benefits of new fertiliser technologies for addressing agricultural pollution and their contribution to climate change. Congratulations to Dr Roya Khalil, Director of Research and Development at IPF, who was recently awarded the 2024 Chemistry Australia Leader in STEM Scholarship Award, for her deep experience and leadership in STEM, mentoring, advisory roles and her passion for industry. Dr Khalil will use the \$25,000 award to travel to the United Kingdom to attend the Women Transforming Leadership Program at Oxford University.

Going forward - I am keen to work with all our Hub researchers, students, industry partners and colleagues on realising and translating our research successes, with a focus on commercialising our novel new smart fertilisers to achieve real impact. Our commitment is steadfast in making major contributions to benefit agriculture, the environment and society and we thank all our partners and supporters for their ongoing support.



Credits: Faculty of Science Media and Communications Team



Credits: Faculty of Science Media and Communications Team

Yours sincerely,

DELI CHEN
Hub Director



Australian Government
Australian Research Council

The ARC Research Hub for Smart Fertilisers is funded by the Australian Government through the Australian Research Council Industrial Transformation Research Program

smartfertiliserhub.org.au



Zhixing Lin | Theme 1

'Outside of work, I enjoy exploring new technologies and traveling. One fun fact about me is that, despite being a scientist, I believe in the existence of unknown intelligent species, like aliens, and I hope to visit them someday.'

Contact: [linkedin.com/in/zhixing-lin-75b823200](https://www.linkedin.com/in/zhixing-lin-75b823200)

Research Area

My research centers on exploring and controlling the relationships between material composition, structure, and performance at the nanoscale. By deepening our understanding of these interactions, we aim to design functional nanomaterials with customizable properties for applications in agriculture, environmental protection, and biomedicine. These advancements have the potential to address pressing global challenges and improve quality of life through innovative solutions.

Research Impact

My research aims to generate significant new knowledge in advanced materials, potentially leading to the creation of low-cost and high-value nanomaterials. These advancements could benefit diverse sectors such as agriculture, food safety, and healthcare by providing innovative and sustainable solutions.

'What excites me most about my research is the opportunity to use nanotechnology to create novel nanomaterials that have never existed before. These innovations hold the potential to benefit society and enhance daily life by offering new solutions and applications.'

Zhixing's Science Journey

I completed my master's degree at Shanghai Jiao Tong University and earned my PhD at the University of Melbourne in 2021 under the guidance of Prof. Frank Caruso. I joined the Hub in 2021, coinciding with its launch. My passion for scientific research and its practical applications has driven my career, and I am dedicated to advancing my contributions in the field of materials science. Looking ahead, I aspire to establish an independent academic career and continue making significant discoveries.



Fatemeh Golshahi Hosseini | Theme 2

"I love exploring diverse cuisines and restaurants, which is why I chose Melbourne. Trying food from around the world here has been a fantastic experience. A fun fact about me is that I enjoy creating my own playlists for different moods and activities, whether it's for working out, relaxing, or cooking up a new recipe. Music has a profound impact on me, often inspiring dance, bringing me to tears, or motivating me to keep pursuing my goals."

Contact: [linkedin.com/in/fatemeh-golshahi-51920897](https://www.linkedin.com/in/fatemeh-golshahi-51920897)

Research Area

The research tackles the challenge of the unpredictable performance of commercial inhibitors and their short-lived efficacy in soil. Aiming to discover superior soil nitrification inhibitors, the study successfully developed products that outperform commercial options. As a result, the findings hold significant promise for improving agricultural sustainability and productivity.

Research Impact

The research has made a significant impact by developing synthesised compounds that outperform commercial nitrification inhibitors. These advanced inhibitors show promise, effectively maintaining ammonium for longer periods and addressing ammonium loss. This improvement in soil nutrient management enhances agricultural efficiency.

'I'm excited by the challenge of developing nitrification inhibitors that outperform existing ones, as it offers significant improvements in soil nutrient management. The potential real-world impact of reducing ammonium loss and enhancing agricultural efficiency makes this research both rewarding and motivating.'

Fatemeh's Science Journey

I completed my studies in Applied Chemistry in Iran and gained practical experience working as a chemist in a tea factory, where I ensured product quality and volunteered to help farmers improve their yields. My passion for environmental work led me to pursue a PhD focused on developing compounds that benefit the environment. Additionally, I've recently ventured into modelling, a new and exciting field for me, and I've found it incredibly rewarding.



Tharanga Bandara | Theme 3

'Outside academia, I love spending time in nature, especially exploring the beautiful Australian landscape. I'm also a big fan of coffee, which helps me stay energised and focused on my work.'

Contact: <https://www.linkedin.com/in/tharanga-bandara-71039977/>

Research Area

My research mainly focuses on conducting greenhouse experiments to compare the effects of different novel **nitrification and urease inhibitors** on **nitrogen use efficiency in crops** in different Australian soil systems.

Research Impact

Contribute to the discovery of new nitrification and urease inhibitors to improve nitrogen use efficiency in Australian agricultural systems, ultimately mitigating environmental issues associated with nitrogen fertiliser.

'In this field of research, each day brings on new and unique challenges, which makes it exciting. Furthermore, it contributes to the discovery or development of new knowledge that can significantly impact people's lives and bring about positive change in the world.'

Tharanga's Science Journey

'I obtained my PhD in Soil Science from La Trobe University in 2021 under the guidance of Prof. Caixian Tang and Prof. Ashely Franks. My doctoral research focused on investigating the effects of **biochar** on **heavy metal bioavailability** and **microbial properties in contaminated soils**. My research has been internationally acknowledged through numerous peer-reviewed publications, book chapters, and presentations at scientific conferences. Additionally, I have a Bachelor of Agricultural Sciences and a Master of Environmental Soil Science from Sri Lanka.

After completing my PhD, I started working as a post-doctoral researcher at the ARC Research Hub for Smart Fertilisers in October 2023. During this time, I collaborated closely with Prof. Caixian Tang, Dr. Hang-Wei Hu, and Associate Professor Shu Kee Lam. My aim is to continue my research in soil science and contribute to the advancement of agriculture and the environment in Australia in the future.'



Ben Rigby | Theme 4

'Outside academia, my main hobbies are bass guitar, archery and sailing, and I greatly enjoy socialising with friends over good food and drink. Before my science journey began, I was an aspiring musician.'

Contact: <https://www.linkedin.com/in/ben-rigby-06bab1108/>

Research Area

I am a PhD candidate in soil science with a background in **agronomy**. I am particularly interested in **soil nutrient dynamics**. My current research is investigating the impact of soil chemical, physical and biological variables on nitrification inhibitor efficacy. The research is focussed on factors which limit nitrification inhibitor performance when added to soil.

Research Impact

The main aim of my research is to clarify whether **soil properties** can be useful indicators of **nitrification inhibitor efficacy**, or not. Understanding the limitations to inhibitor efficacy could allow for both the more targeted use of nitrification inhibitors, and **provide information useful for the development of new inhibitors**.

'The best thing about soil science is that its cross-disciplinary and there is always more to learn. Through working with the Hub, I have had many conversations with experts from different fields and their perspectives have proven invaluable in informing my research.'

Ben's Science Journey

I completed a bachelors degree in agricultural science with honours at La Trobe University. There I worked with the Crop Agronomy and Soil Plant Interactions Groups on research investigating the influence of crop species on plant nitrogen utilisation from soil sources and fertiliser. My interest in soil nutrient dynamics led to me starting my PhD research on nitrification inhibitors before the Hub was launched.



Chinthani Rathnayake | Theme 5

An alumna of the ARC Research Hub for Smart Fertilisers

'My career inspiration is to enhance my skills and knowledge to the point where I can make significant and meaningful contributions to a better society and planet.'

Research Focus

'I worked as the Post-doctoral Research Fellow (Agricultural Economics) in **Theme 5** of the Hub that aims at maximising sector wide value by translating findings to broad-based extension and public policy formulation. My role in Theme 5 was to conduct **social benefit cost analyses** of using different sources of nitrogen in Australian agricultural industries including cotton, sugarcane, and vegetables. As a part of the analyses, Professor Bill Malcolm and I developed a method to **assess economic surplus from N use in agriculture**, also accounting external costs associated with nitrous oxide emissions from N fertilisers. The incentive for farmers to use N fertiliser is significantly high given the yield response to fertilisers (price inelastic demand for N by farmers), was also reflected by high benefit cost ratios in our analyses. We also investigated potential policy options that could be used to address issues related to N use in agriculture, and the study suggested taking an approach with a public-private partnership would be essentially effective in lowering private and external costs of N use more rapidly than otherwise. Hence, investments by both public and private entities on research and development of advanced fertiliser **technologies such as Enhanced Efficiency Fertilisers is of paramount importance.**'

Chinthani's Science Journey

'Working at the Hub has been a great experience for me in professional, as well as personal development. I highly appreciate and am thankful for all the opportunities and experiences I had with the Hub for a period of two years, especially fortnight hub meetings and industry placements.'

'Currently I am working as a Research Fellow (Agricultural Economics) in the project titled 'Assessing the Social and Economic Implications of Changing to Low-input and Organic Rice Production in Lao PDR' funded by the Australian Centre for International Agricultural Research (ACIAR). The role is associated with conducting economic analyses at farm level and beyond in the Lao rice industry in capturing the effect of a change in input use at farm level at respective market levels. Additionally, I contribute as a Research Ethics Advisor at the Human Research Ethics Committee at the University by providing advice to researchers on the alignment of their applications with ethics requirements.'



CONFERENCES



9th International Nitrogen Conference

Delhi, India. 5 - 8 February 2024

Attended by:

Hub Deputy Director, A/Prof **Helen Suter** (photographed middle)

Hub Director, Prof **Deli Chen**

Dr **Clayton Butterly**

A/Prof Helen Suter presented on the "Challenges And Prospects For Next-Generation Enhanced Efficiency Fertilisers For Sustained Food Security".

Centennial Celebration and Congress of the International Union of Soil Sciences

Florence, Italy. 21 - 24 May 2024

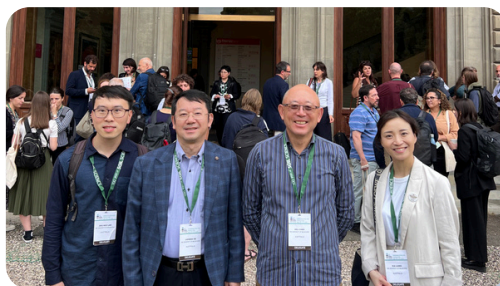
Attended by:

Hub Director, Prof **Deli Chen**

Dr **Xia (Emma) Liang**

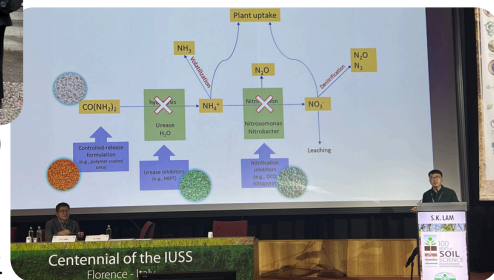
A/Prof **Shu Kee (Raymond) Lam**

Prof **Jizheng (Jim) He**



Dr Xia (Emma) Liang (pictured above on the right) presented on "Evidence-Based Nitrogen Indexes For Global Food Supply Chains: Production, Consumption, Spatial Distribution And Reduction".

A/Prof Shu Kee (Raymond) Lam (pictured below) presented on "Enhanced Efficiency Fertilisers For Sustainable Agriculture Responsibility".



Circular Food System Network, by Global Research Alliance

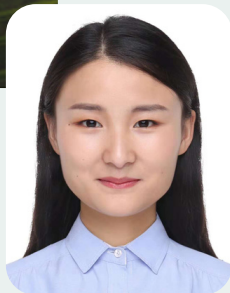
Netherlands (Online)

18 July 2024

Attended by:

Chuanzhen Zhang

Presentation on the "Recoupling of Livestock and Feed Production" under the theme, Crop-Livestock Integration.



Presentation on "Plant growth promoting members of the core *Brachypodium distachyon* root microbiome"

miCROPe 2024

Vienna, Austria

15 - 18 July 2024

Attended by:

Carl Pille



Highlight - Dr Zahra Islam

Organised three different conferences this year

"I feel a sense of achievement and am proud that I can contribute to the dissemination of science research. At each conference we highlight emerging technology and knowledge that allows us to advance our environmental and agricultural industries" - **Zahra**



The Australian Society for Microbiology
bringing Microbiologists together



Science Early Career Research Summit
2024 Conference Program



Credits: Faculty of Science Media and Communications Team



RESEARCH & INDUSTRY ENGAGEMENT

Incetec Pivot lab and Grenfell site visits

May 7th 2024, 29th - 31st May 2024

Attended by:
Dr Joses Nathanael
Lok Hang (Rex) Chan
Pongsathorn (Sam) Sukdanont



'It is a great experience to visit the experiment site. I have been working with the microbial Theme throughout my PhD, and it was my first time using the gas collection chamber. This also applied to the lab visit, with new skills learnt in chemical inhibitor testing and preparations.' - Rex

SOCIAL EVENTS

Hub Easter Games and BBQ

The **ARC Hub Social Committee** provides a way to informally connect people from all Themes and areas of the ARC Research Hub.

It provides a social outlet and creates a cohesive team environment that aims to benefit the Hub as a whole!



A riveting egg-and-spoon race



Can you spot the hidden chocolate Easter eggs?

Chinese New Year potluck



Look at all the delicious food!





Recent Hub News

NEW HUB MEMBERS



David McKeon

We are pleased to welcome **David McKeon, Head of Thomas Elder Sustainable Agriculture**, to the Hub. David has a background in farm management and has served on a wide range of senior industry and government advisory committees. He is is passionate about the role innovation plays in ensuring sustainable farm production and agribusiness in Australia. We look forward to David's contribution to the Hub in achieving its goals, in particular helping the Hub develop and commercialise some of its new smart fertiliser products.

Joining us in our Lab is soils technician **Dr. Narges Milani** who will be integral to testing Hub products suitability in real growing conditions. We also welcome two new Masters students, **Noa Abrahams** and **Ethan D'Souza** to Theme 2 and Honours student **Sam Sewell** to Theme 4.



Dr. Narges Milani
Soils Technician

Narges is deeply interested in research that aims at reducing agriculture's environmental footprint and ensuring a secure food supply for future generations. With a robust background in soil science, she combines scientific acumen with technical proficiency to conduct experiments to test new smart fertilisers developed by the ARC research Hub.



Noa Abrahams
Masters Researcher

"I am passionate about developing environmentally sustainable solutions to global food needs. Being part of the Hub and learning about the interdisciplinary approach is of great interest. I look forward to contributing chemistry knowledge in minimising greenhouse emissions via urease inhibition, while continuing to learn about all steps necessary for agricultural sustainability and success." - **Noa**



Sam Sewell
Honours Researcher

"My interest within the hub is to learn. Gathering skills and knowledge about the problems facing the industry Learning from those I have worked with, I hope to assist with solving some of these problems relating to efficiency and sustainability within the industry." - **Sam**

Questions & Contact

Hub Manager - Boris Sarcevic

email: smartfertiliser-hub@unimelb.edu.au

For regular updates on the ARC Hub, click below:

 www.smartfertiliserhub.org.au



[linkedin.com/company/arc-research-hub-for-smart-fertilisers](https://www.linkedin.com/company/arc-research-hub-for-smart-fertilisers)



<https://twitter.com/FertiliserHub>



<https://www.youtube.com/watch?v=iaXf2h46rOM>

OUR PARTNERS



Australian Government
Australian Research Council

The ARC Research Hub for Smart Fertilisers is funded by the Australian Government through the Australian Research Council Industrial Transformation Research Program