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The UWA Institute of Agriculture

From the vast expanse of space to the fields of WA's grainbelt, the quest for advances in agriculture knows no bounds. As UWA scientists pioneer ways to cultivate crops in the compromising conditions of space, their research holds promising implications for farming practices here on planet Earth.
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THE UNIVERSITY OF WESTERN AUSTRALIA

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Front cover photo:

Dr Samalka Wijeweera and Professor Harvey Millar with lettuce grown for high CO_2 simulation experiments in plant growth chambers.

From the Director

My heart goes out to all those who are affected by the uncompromising and debilitating drought gripping Western Australia.

Our State recently recorded its hottest and driest summer on record, which has put an enormous strain upon our agricultural community. The UWA Institute of Agriculture stands alongside farmers in calling for a strong, practical, and swift government response in setting up its Dry Season Taskforce. It felt like we all breathed a collective sigh of relief at the first drops of rain this week.

Without a doubt, one of the greatest elements of my role as Director of the Institute is meeting and interacting with young researchers and students. In March, it was my pleasure to deliver a lecture titled 'Can Australia feed Asia?' to a group of new UWA Agriculture Master's students, as invited by Professor Martin Barbetti. Many of these students had arrived in Australia from their home countries across Asia and Africa just a few weeks before the start of semester. Their fantastic questions and enthusiasm were truly infectious.

It has once again been a very busy start to the year for the Institute. Our events 2024 calendar kicked off with the Mike Carroll Travelling Fellowship Presentation Evening (page 4), we attended the GRDC Grains Research Updates (page 10) and Agrifutures evokeAg (page 14), as well as hosting a special lecture delivered by Dr Duncan Hickman (page 14). I am eagerly anticipating our annual Postgraduate Showcase on 29 May, followed by our 18th annual Industry Forum on 17 July. Experts from across the WA and national farming and scientific communities will tackle the complex and oft-controversial question: 'Can agriculture reach Net Zero?' Registrations are open for both events.

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Shade and shelter focus at Ridgefield

More than 750 sheep at UWA Farm Ridgefield are fully kitted-out with biosensors, GPS and accelerometers as part of the Shade and Shelter Project.

The project is a collaboration between UWA, Murdoch University (MU), CSIRO and NSW DPI, and encompasses both the UWA-led heat stress and sheep reproduction project and the MU-led project around edible shelter to improve lamb survival.

UWA Lefroy Fellow Dr Kelsey Pool said the project had been running for about four years and aimed to quantify the effects of heat events on sheep reproduction, thermoregulatory capacity, behaviour and wellbeing.

Murdoch University Dr Lea Labeur and Dr Kelsey Pool after a hard day's work collecting samples at Ridgefield.

"This is being achieved through long term-data collection while the sheep will be exposed to a range of climatic conditions in diverse production settings," Dr Pool said.

"The edible shelter component investigates the impacts of different types of edible shelter on the physiology, behaviour, welfare and survival of sheep, along with the nutritional benefits of the feedbase in mixed farming enterprises."

Dr Pool said much was not yet known about animals' physiological and behavioural response to its immediate environment.

"Outcomes of this research may be used to inform management strategies to minimise the impact of heat stress on reproductive performance and animal welfare and improve lamb survival," she said.

"It will also help us understand animal behaviour and resource use in response to a changing environment."

The physiological and behavioural data collected from several thousand sheep, along with information on paddock micro-climate and pasture composition, is currently being analysed.

Dr Stephanie Payne and Hatem Al-Khazraji prioritising sheep wellbeing while collecting rumen samples.

MERiL makes strides in methane-reduction research

Can a common feed additive used to improve appetite in sheep – based on essential oils from coriander and wild carrot – also reduce the methane that ruminants produce?

A UWA research team, led by Dr Zoey Durmic, were recently awarded a $1.5 million Methane Emissions Reduction in Livestock (MERiL) federal grant to develop feeds and feed supplement solutions to lower methane emissions from livestock.

The project, based at UWA Farm Ridgefield, is evaluating if the feed additive Agolin® Ruminant can lead to potential benefits of methane mitigation, sheep health, performance, and welfare.

Researcher Dr Suyog Subedi said the results from MERiL preliminary study where feed additive was delivered to sheep in pen trial via loose lick, pellets or grain supplements were encouraging. The project is now progressing to larger trial do deliver additive in a practical, year-round grazing conditions.

"Successful outcomes will contribute to the development of sustainable practices for extensively grazed livestock across Australia, promoting carbon neutrality in the sheep industry and ensuring market access for environmentally certified products like wool and sheep meat," Dr Subedi said.

"Additionally, the study will provide valuable data for future regulatory methods and offer producers clear options for methane mitigation strategies.

"The knowledge gained can be applied to other antimethanogenic additives, fostering a long-term reduction in the greenhouse gas footprint of the Australian sheep industry."

> "Overall, this research will advance our understanding of plant-based additives for methane mitigation across the broader Australian livestock sector."

Dr Subedi said UWA Farm Ridgefield played a central role in the success of the now-complete MERiL preliminary trial.

"Every aspect, from the paddocks and sheep sheds to the yards, was integral to our study, with the sheep themselves belonging to the UWA Ridgefield flock," he said.

"The collaboration between researchers and farm management was exceptionally close, with the latter providing extensive support, ensuring our comfort, and supplying necessary farm machinery."

Sheep accessing the GreenFeed unit at Ridgefield.

A GreenFeed unit – the latest technological equipment in measuring methane in grazing sheep – has been stationed at UWA Ridgefield to extend the UWA Methane Hub and support MERiL trials and beyond, with a second unit to be installed soon.

With the preliminary farm trial now complete, Dr Subedi said the research team already will present this data at the animal conference in Melbourne in July and will be submitting its comprehensive report later in the year.

"Moving forward, our next steps involve leveraging the insights gained from this project to initiate MERiL 3," he said.

"This phase will focus on a long-term grazing study in WA, specifically measuring the commercial application of the Agolin® Ruminant in grazing sheep.

"Alongside the research grazing trial, we plan to establish a producer demonstration site in the final year. This site will showcase the on-farm application of the anti-methane tool, demonstrating its effectiveness in reducing methane emissions while ensuring the health, wellbeing, and production efficiency of grazing sheep."

In addition to Drs Durmic and Subedi, the dedicated research team includes Dr Stephanie Payne, Dr Joy Vadhanabhuti and seven co-investigators.

The field trial for MERiL 3 commenced in April 2024.

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Fellowship travels inspire and enrich research

Junrey Amas, Manish Sharma, Professor Kadambot Siddique, Manu Magar, Felipe Castro Urrea, Marie-Louise Carroll, Helen Carroll and Coco Divola.

A captivated audience at the recent Mike Carroll Travelling Fellowship presentation evening were taken on a journey to the Scottish Highlands, over to Cambridge University, across the pond into France and through the streets of Melbourne.

To date, 30 UWA PhD students have benefitted from the Fellowship since the first recipient was awarded in 2003.

It was established as a memorial to former Director General of the WA Department of Agriculture, the late Dr Mike Carroll, in recognition of his commitment to agriculture.

Last month, The UWA Institute of Agriculture held a special event for Carroll family and friends, during which four recent awardees delivered presentations on their Fellowship-sponsored travels.

Having now completed his PhD on identifying disease resistance genes in crops, Junrey Amas described his trip to France to learn from Dr Thierry Rouxel's lab.

Felipe Castro Urrea explained how he spent six weeks at the Highlander Lab in Scotland learning new techniques to assist his research into developing statistical models to analyse breeding data.

Manu Magar, whose research is focused on identifying heat responsive genes in wheat, participated in the 23rd International Congress of Genetics and Genomics Conference held in Melbourne.

In September, Manish Sharma attended an international conference at Cambridge in the UK, which has helped support his PhD to evaluate the potential of struvite as a sustainable phosphorus fertiliser source.

Looking to the stars for advancements in agriculture

The UWA Plants for Space research team are part of an international consortium developing 'autonomous agriculture technologies' to grow plants as food in space, which has the potential to inform and innovate Earth-bound agricultural practices.

Led at UWA by Professor Harvey Millar from the School of Molecular Sciences and The UWA Institute of Agriculture, as part of the ARC Centre of Excellence in Plants for Space and UWA International Space Centre, the project aims to optimise and predict plant production under controlled conditions with less human monitoring.

While there is a clear need for autonomous agriculture in space provisioning, Professor Millar said these same principles were also relevant on Earth.

"There are applications for vertical farming, protected cropping and other intensive horticulture or seedling raising systems," he said.

"Additionally, remote monitoring of plant production can be important for deployment of food growing systems in remote environments on Earth, in which local production is more desirable than the transport logistics to supply needs."

UWA scientists are using high CO_2 simulated plant growth chambers, hydroponic growth systems and camera systems to monitor how algorithms used to predict plant growth would perform under high CO_2 conditions expected in space stations.

"One of the unique aspects of space stations, and potentially a future Lunar base, is the high level of CO_2 that exists in their controlled atmospheres due to human activities," Professor Millar said.

"Typically, these levels are near 4000 parts per million, compared to only 420 parts per million on Earth.

"Plants use CO_2 to grow through photosynthesis, but they also contain complex biochemistry that normally coordinates growth with the low CO_2, high O_2 levels found on Earth."

The facility is being designed for the Axiom Station, a series of modules for human habitation that will be launched into orbit in stages from 2025 and will replace the International Space Station.

"Growing plants as food in space stations or a future Lunar base requires robust processes to ensure crops are available on-time and in the expected quantity to meet demand," Professor Millar said.

"The collaboration between plant scientists, the vertical farming company Vertical Future and space technology providers from the UK, Australia, and the US aims to create new commercial options for automating plant growth at scale in space and on Earth."

Professor Millar delivered a research presentation on Plants for Space at the Institute's Industry Advisory Board meeting in March.

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Professor Patrick Finnegan and Dr Yupin Li demonstrate macadamia roots as part of their hydroponic study.

Nitrogen impact on macadamia found

'Cracking the case' of how different forms of nitrogen (N) impact macadamia growth has been a satisfying challenge for UWA adjunct lecturer Dr Yupin Li.

Dr Li is a visiting researcher from Yunnan Agricultural University in China.

Alongside Head of School of Biological Sciences Professor Patrick Finnegan (with support from Emeritus Professor Hans Lambers), she has uncovered the preferred form of N to improve macadamia growth and nutrient uptake efficiency.

Macadamia spp. belong to family Proteaceae and originates from rainforests along the east coast of Australia.

Due to the flavour and nutritional value of the edible nuts, macadamia has tremendous commercial value.

Root morphology and plant growth of macadamia integrifolia under different N treatment.

N is one of the three major nutritional elements indispensable for plant growth and development.

However, the demand and preference of N source for macadamia was unclear – until now.

Through hydroponic experiments, the research team treated macadamia with various amounts of ammonium or nitrate fertilisation and found significant differences in root system and overall plant growth between the two forms of N.

Dr Li said it was very exciting to be at the forefront of innovative research to identify forms of N fertilisers that best matched the needs of macadamia.

"In the context of sustainable agriculture, improving resource utilisation efficiency is a key concern," she said.

"Farmers often have an imperfect knowledge of science-based cultivation practices and environmental protection awareness.

"This underlies excessive application of fertilisers and pesticides in macadamia plantations, which has led to nutritional imbalance and disease susceptibility in macadamia trees."

In a practical sense, Dr Li said their research would help clarify the N fertilisation practices best suited for macadamia plantations and improve sustainability development of the industry.

> "Knowing the results of this research will contribute to optimising macadamia nutrients management is very fulfilling."

The researchers' next steps are conducting field trials over two years – providing nitrate, ammonia, ammonium nitrate and urea to see how these treatments impacted macadamia in a plantation setting.

"We will also examine the effects of these treatments on the plantation soil microbial profile," Dr Li said.

"Microbial function in soil and their impact on plant growth have been overlooked for too long.

"They have tremendous potential in terms of protecting plants against pathogens, as well as help plant use nutrients more efficiently."

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Emanuel Gomez (pictured in Northam) interviewed farmers across the wheatbelt.

Gathering growers' insight into grain traceability

For the past nine months, UWA PhD candidate Emanuel Gomez has been driven by a single objective: connecting with as many WA growers as possible.

This ambition has seen him zigzag across the wheatbelt visiting farms, speaking with local and state news journalists, and shaking hands at field days, expos, community events and more.

Through these interactions, Mr Gomez has been collecting survey responses on graingrowers' views and expectations on adopting information-sharing technologies.

He aims to understand their perspectives on these technologies, such as traceability systems, which could potentially differentiate the Australian grain market in the eyes of domestic and international buyers.

The project is supported by a South-West WA Drought Resilience Adoption and Innovation Hub bursary through the Grower Group Alliance, and a research scholarship from the GRDC.

Now, at the midway point of his three-year postgraduate journey and armed with 85 completed surveys, Mr Gomez has begun his analysis.

"This primary dataset promises to provide deeper insights into the perceptions and attitudes of WA grain growers regarding data sharing and traceability," he said.

"The immediate challenge ahead is to disseminate the findings from this analysis within the grain industry, including producers, and identify critical factors for facilitating adoption should traceability emerge as a key element for market differentiation."

Simultaneously, Mr Gomez is working with his supervisors Associate Professor Michael Burton, Dr Amin Mugera and Professor Ross Kingwell on a trade model to forecast the economic implications of traceability under anticipated regulatory changes.

"This modelling stage will shed light on how traceability could potentially enhance market access and improve market differentiation to benefit Australia's position in the global grain market," he said.

"This step in the analysis has also led to a research collaboration with CBH operations and logistics."

Given that this research spans the entire supply chain, Mr Gomez said his focus for 2024 was to design a new survey to gauge consumer preferences regarding the sustainability credentials behind grain production.

This survey will be conducted in Indonesia and Australia – two of the largest market destinations for Australian grains.

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Award relaunched on salinity research centenary

The prestigious WE Wood Award for Excellence in Salinity Research was relaunched last month, coinciding with 100 years since the first publication on Australian salinity processes.

The UWA Centre for Water and Spatial Science (CWSS) and Centre for Environmental Economics and Policy are responsible for the WE Wood Award, which is open to researchers from all disciplines and any organisation.

It recognises outstanding research in salinity and any aspects of water processes and management, and water-related land management, in the WA landscape and the implications for agriculture, environment and society.

CWSS Co-Director Associate Professor Nik Callow said it was important to recognise work on salinity and its impact.

"Historical land clearing continues to impact groundwater across Australia," Associate Professor Callow said.

"We need new innovative solutions alongside recognition of the significant work already accomplished in this field."

Submissions close on 31 May 2024, nominate online.

International Plant Dormancy Symposium attendees at the University Club of WA.

Dormancy Symposium a blooming success

It was especially fitting that the International Plant Dormancy Symposium was held in the heart of Western Australia's wildflower season last September.

Lead event organiser, The UWA Institute of Agriculture and DPIRD Principal Research Fellow Associate Professor Michael Considine, explained that dormancy (or 'quiescence') is an important adaptive trait in plants.

"Remarkably, our understanding of what stops or slows plant growth is vital to agriculture and ecology," Associate Professor Considine said.

"The regulation of dormancy determines climate resilience and resource partitioning, as well as the timing and extent of germination, bud burst, branching/ tillering, flowering and seed set."

The University of Queensland PhD candidate Olalekan Amoo discussing his research poster.

"The opportunity to collaborate and talk face-to-face with leading scientists was brilliant and knowing that they all enjoyed the natural context really pulled it together."

Held every four to five years, the International Plant Dormancy Symposium brought together scientists and agronomists working on various aspects of seed, bud, tuber, root and shoot dormancy.

It focussed on recent advances on the regulatory mechanisms, its role in plant growth and development, weed management and crop production, as well as impact of seasonal and climate change on dormancy, fruitfulness and adaptation.

The 7th symposium was held at The University Club of WA from 11 to 15 September and sponsored by UWA, DPIRD, GRDC, the Journal of Experimental Botany, Tree Physiology journal, the International Society for Seed Science and Business Events Perth.

It was attended by more than 40 international scientists, together with 40 national and local scientists and agronomists.

Associate Professor Considine said one of his personal highlights was the Welcome to Country by Olman Walley, who opened the symposium by showcasing some of the valuable properties of indigenous plants, as well as connection to country.

The UWA Institute of Agriculture Director Hackett Professor Kadambot Siddique presented a welcome address before the main sessions commenced.

Five keynote seminars were presented across the three major themes of the symposium: Environment, Ecology and Evolution; Genetics and Epigenetic; and Metabolite and Hormone Signalling.

Associate Professor Considine said the event structure enabled seed, bud and tuber biologists to integrate across similar themes, in a way not often afforded in specialised symposia.

"Dormancy and quiescence are difficult to define experimentally – by their nature they refer to the 'absence' of growth," he said.

"Therefore, the use of precise language becomes extremely important in communicating between groups and systems. This was a major focus of communication throughout the meeting."

As a follow-up to the symposium, a Special Issue in the Journal of Experimental Botany on 'The diversity of developmental quiescence and dormancy in plants' has received nearly a dozen invited reviews, together with original research papers.

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Fond farewell to grains industry champion

Vale Pingelly farmer Ray Marshall.

The wheatbelt town of Pingelly and wider grains industry were thrust into mourning when a stalwart of their community did unexpectantly in March.

Ray Marshall was a passionate Pingelly farmer and industry leader who dedicated his three-decade career to advocating for WA growers.

Among his many roles, Mr Marshall was the Grain Producers Australia Western Region Grower Director from 2015 to 2019, and served as President of both the WAFarmers Grains Council and WA Grains Group.

He was also the inaugural President of the Western Oats Alliance (now the Grain Industry Association of WA Oats Council), during which his promotion of the benefits of oat consumption helped increase demand and on-farm production.

The UWA Institute of Agriculture Director Hackett Professor Kadambot Siddique said Mr Marshall was a remarkable man who leaves behind a powerful legacy.

"It was especially wonderful to speak with him recently at our UWA Farm Ridgefield Open Day last October," Professor Siddique said.

"Ray's presence at our events and earnest engagement with UWA Best Practice Farming Systems Project research at the farm was always very much appreciated.

"His interest in and commitment to supporting research at Ridgefield came as no surprise, as his long-time passion for advancing agricultural practices was renowned."

Professor Richard Vokes, HE Monday Semaya K Kumba, UWA VC Professor Amit Chakma and Professor Kadambot Siddique.

Opportunities abound with South Sudan

South Sudan has great potential for agricultural development through UWA research collaboration, exchange and training, according to The UWA Institute of Agriculture Director Hackett Professor Kadambot Siddique.

Professor Siddique shared his perspective with His Excellency Monday Semaya K Kumba, South Sudan's current Ambassador to China and non-resident Ambassador to Australia, during his visit to UWA last month.

He attended a special meeting, hosted by UWA Vice-Chancellor Professor Amit Chakma and organised by Professor Richard Vokes, alongside UWA colleagues including Pro Vice-Chancellor (Global Engagement) Jennifer Howell and Head of the School of Social Sciences Professor Amanda Davies.

According to the Food and Agriculture Organization of the United Nations, up to 95 per cent of South Sudanese rely on farming, herding or fishing.

Conflict and climate-driven shocks in South Sudan have significantly damaged agricultural production, which is the country's primary economic sector and source of livelihoods.

The Ambassador's delegation included WA Labour Member for the North Metropolitan Region The Hon Ayor Makur Chuot MLC, and South Sudanese Community Association of WA President John Akuot Aciek.

UWA is the number one ranked university in Australia for African Studies and has particularly strong ties with South Sudan and its diaspora communities.

The UWA School of Social Sciences' Ethnography Lab hosts the annual South Sudan Forum and the South Sudanese Stories project.

Associate Professor Fang Liu with a variety of Karibee Honey products.

Finding the sweet spot for marketing new honey products

With countless different varieties, brands and flavour profiles now on offer at your local supermarket, buying honey is no longer a straightforward experience.

UWA Business School Associate Professor Fang Liu has dedicated the past five years to getting "inside the minds" of honey consumers.

As part of her Cooperative Research Centre for Honey Bee Products research, Associate Professor Liu has engaged with about 5000 domestic and international consumers and found that honey is perceived by many as a traditional and conventional product.

"In other words, honey is not considered a 'sexy' product," she said.

"This perception has limited the growth of honey markets, particularly among younger consumers, and it is also why developing innovative products is particularly important for the honey industry."

It has now been rated by both external thesis examiners to be in the top 5 per cent of reviewed HDR theses.

Under the supervision of Associate Professor Liu and Dr Vincent Chong, Master of Philosophy student Yuanyuan Qin has completed a research project to understand how product innovativeness may influence consumers' decision-making process when regarding a new honey product.

The project assessed an innovative honey product Easysnap Jarrah Honey, patented by WA brand Karibee Honey.

Associate Professor Liu said developing innovative products was one of Karibee Honey's key brand strategies.

"In recent years, Karibee has invested in numerous innovations that have made significant improvements over existing products," she said.

The Easysnap® product is an innovative one-hand opening and dispensing portion pack and is new to the Australian market.

It differentiates itself from traditional honey products by providing convenience, flexibility and reduced leaking/mess in the consumption process.

Ms Qin collected data from consumers at various WA shopping centres and public venues to gather real consumer responses.

Results of this study found that consumer perceptions of product innovativeness influence their experiences, which subsequently led to stronger purchase intentions.

"In other words, if a honey brand introduces innovative products that are well accepted by consumers, the brand will achieve a strong level of competitiveness," Associate Professor Liu said.

"Brand competitiveness helps a brand in many aspects, such as market share, profitability and more."

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CAED member Montana Baddeley speaking with a farmer.

BeefLinks builds industry trust and transparency

When it comes to building understanding and relationships in the beef industry, there is no substitute for on-the-ground insight.

UWA Centre for Agricultural Economics and Development members Montana Baddeley and Dr Fiona Dempster have been visiting sites from the Midwest to the South-West of WA, as part of the BeefLinks' Feedlot Performance Project.

They recently visited two feedlots and a backgrounding property and participated in an organised tour by the WA Lot Feeders Association.

The purpose was to learn more about the industry, including the various production systems and data collection techniques used, as well as building relationships throughout the beef industry.

BeefLinks is a four-year research and development collaboration between UWA, Meat & Livestock Australia and the MLA Donor Company.

This project aims to improve the quality and efficiency of rangelands cattle in the domestic supply chain by working together with all stakeholders, from producer to processor, to understand how rangeland cattle perform in feedlot and processing operations.

The property visits provided Ms Baddeley and Dr Dempster the opportunity to understand how smaller scale feedlots and backgrounders operate, along with some of the challenges faced with relation to data collection and analysis.

The research team hopes to assist in overcoming these challenges through establishing methods for the feedlots and backgrounders to analyse the data collected in a meaningful way.

Ms Baddeley said this analysis would not only assist that business, but also add to the overall understanding of the challenges and opportunities for data collection and sharing within the WA North-South supply chain.

"By understanding key aspects of cattle performance, the producer can choose to make management and genetic improvements, which may improve their profitability by access to higher value markets," she said.

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GRDC Grains Updates open with UWA honour

Mathieu Rousseau-Gueutin, Professor Kadambot Siddique, Tahira Rasheed, PhD candidates George Mercer and Agyeya Pratap, and Dr Fiona Dempster at the Institute info stall.

There was much to celebrate at the Grains Research and Development Corporation (GRDC) 2024 Grains Research Updates in February.

Highly respected agricultural economist, UWA School of Agriculture and Environment Professor Ross Kingwell, was honoured with the Seed of Light Award for his outstanding contribution to Australia's grains industry.

Professor Kingwell, who is also chief economist with the Australian Export Grains Innovation Centre, will present at The UWA Institute of Agriculture's upcoming Industry Forum on 17 July, speaking to the theme 'Can WA agriculture reach Net Zero?'

Communications Officer Rosanna Candler and visiting researcher Tahira Rasheed were kept very busy discussing UWA-based agricultural research with visitors to the Institute's information stall.

The stall featured research posters from PhD candidate Manish Sharma and Master's student Angelia Tanu – who both presented at the 'Snapshots from new or early career researchers' on the second day.

Associate Professor Fay Rola-Rubzen, Associate Professor Marit Kragt, and Dr Fiona Dempster at the CAED launch in 2021.

Full speed ahead for ag-economics think tank

The Centre for Agricultural Economics and Development (CAED) is putting UWA firmly on the map as a base for world-leading agricultural economics research.

Now in its third year, the CAED delivers scientific advice that strengthens the social, economic, and environmental sustainability and resilience of farming systems and food supply chain participants in developed and developing countries.

Director Associate Professor Marit Kragt said much of their research was driven by industry questions and executed in collaboration with industry partners and farmer groups.

"Our people have extensive experience and capacity to deliver on a range of themes, such as farmers' adoption of innovations, commodity markets and international trade, consumer preferences, and productivity analyses," Associate Professor Kragt said.

"We are focused on real-world issues and contributing to improved decision-making in the agricultural sector."

Associate Professor Kragt, along with CAED deputy directors Associate Professor Fay Rola-Rubzen and Dr Fiona Dempster, are involved in numerous national and international programs, including nationwide projects such as the CRC for Zero Net Emissions.

One such project is the GRDC-funded national risk management initiative RiskWi$e.

Launched in 2023, RiskWi$e is a five-year national initiative to help Australian grain growers better understand and manage risks and to improve on-farm decision-making.

The CAED research team manage the behavioural science component and are currently convening a 100-grower panel of grain growers with the help of the 25 grower groups.

Another important project is the Behavioural Insights for Technology Adoption (BITA), which is an ARC-funded Industrial Training and Transformation Centre administered through the Queensland University of Technology.

CAED leads the agriculture stream in BITA, which applies behavioural science to better understand reasons and barriers to adoption of agtech innovations.

They work with agricultural partners, including the Grower Group Alliance, to better understand reasons and barriers to adoption of agtech innovations by addressing questions such as:

'What should we consider in the development of our technological innovation to increase uptake by farmers?',

'What is holding back the use of innovative agtech solutions on-farm and how can we resolve this?', and

'What can agricultural extension and outreach learn from behavioural science to become more effective?'.

At the conclusion of BITA, the CAED will have trained three PhD students and a postdoctoral fellow on the benefits and use of behavioural science in agriculture.

Associate Professor Kragt said their ambition was to become recognised nationally and internationally as the leading Australian think tank for economics research and policy advice related to agriculture, agri-environmental management, agricultural development, and food systems.

"We hope to become the port of call when industry and government have questions about farmer behaviour, farming systems productivity, risk analysis, and sustainable agribusiness and farm management," she said.

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White Research Conference participants at Boola Bardip WA Museum

Critical conversations at Critical Zone conference

Investigations into the Critical Zone – the vertical span from the atmospheric boundary to bedrock – were explored at the Australian Academy of Science 2023 Elizabeth and Frederick White Research Conference hosted by UWA in November.

Five new Critical Zone Observatories (CZO) have recently been installed in Australia, joining the established Avon CZO located at UWA Farm Ridgefield in West Pingelly.

The Avon CZO located at UWA Farm Ridgefield.

Co-Director of the UWA Centre for Water and Spatial Science and The UWA Institute of Agriculture research theme leader Associate Professor Sally Thompson organised the conference.

Associate Professor Thompson said the event brought together a diverse group of scientists including undergraduate students and leaders of national research networks to exchange knowledge about the Critical Zone.

"Geomorphologists, ecologists and hydrologists explored how processes from deep time and past climates have left legacies shaping the contemporary landscape," she said.

> "There was palpable excitement as regolith scientists considered how their knowledge set the stage for contemporary studies of the structure and function of the Critical Zone."

Conference participants were challenged by former WA Chief Scientist Lyn Beazley to consider the 'four legs of the stool' for CZ science – the importance of partnership between community, academe, industry and government to build a lasting scientific enterprise.

Professor Bill Dietrich shared lessons from the United States' CZO projects and identified a rich suite of questions that Australian CZ science could answer for the global community.

Nyungar elder Professor Len Collard challenged those speaking the language of science to also learn to speak local indigenous languages and engage with stories about the soil, water and land.

UWA Dr Simone Gelsinari demonstrated the value of a CZ approach to gain insights into fundamental questions about water supplies as climate changes.

The conference then moved to the Boola Bardip WA Museum, where early career participants shared posters of their research, and concluded with small group workshops on the second day.

The University of Sunshine Coast Honours student Emily Collins said she was "beyond grateful" for the opportunity to attend the White Research Conference.

"The knowledge and networking I gained from this conference has been invaluable for not only my current project, but for my development as a scientist in general," Ms Collins said.

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Professor Eric Yirenkyi Danquah wearing his Cambridge University academic gown.

Adjunct honoured among Most Reputable Africans

The UWA Institute of Agriculture Adjunct Professor Eric Yirenkyi Danquah has been named on the 2024 list of the 100 Most Reputable Africans.

Professor Danquah is the founding Director of the West Africa Centre for Crop Improvement at the University of Ghana (UG).

The annual list features a diverse group of notable African individuals across various sectors, including politics, academia, business, entertainment, and human rights advocacy.

As Professor of Plant Genetics at the UG Department of Crop Science, Professor Danquah has dedicated his research career to helping train and lead a new generation of plant breeders to develop improved varieties of staple crops across West and Central Africa.

Last year, he received the Outstanding Agricultural Research Leadership Personality of the Year from the Ghana Chamber of Agribusiness' African Agribusiness Excellence and Leadership Awards.

Earlier that year, Professor Danquah won the Outstanding Achiever's Award at the African Genius Awards.

In addition to his adjunct professor role at The UWA Institute of Agriculture, he is also a visiting scientist at the College of Agriculture and life Sciences at Cornell University.

Symposium participants, with Professor Shane Maloney and Associate Professor Dominique Blache seated in the front row.

Animal welfare experts flock to international symposium

Five UWA researchers presented at the International Symposium on Ruminant Welfare Breeding and Sustainable Production held at Yangzhou University in Jiangsu, China last November.

More than 20 domestic and foreign universities, research institutes and enterprises attended the event, which was hosted by Yangzhou University and the State Key Laboratory of Sheep Genetic Improvement and Healthy Breeding.

A series of thematic forums were set-up around the issues of animal welfare breeding in intensive livestock production, environmental pollution, global climate change and heat stress, and low-nitrogen and high-efficiency breeding of ruminant livestock.

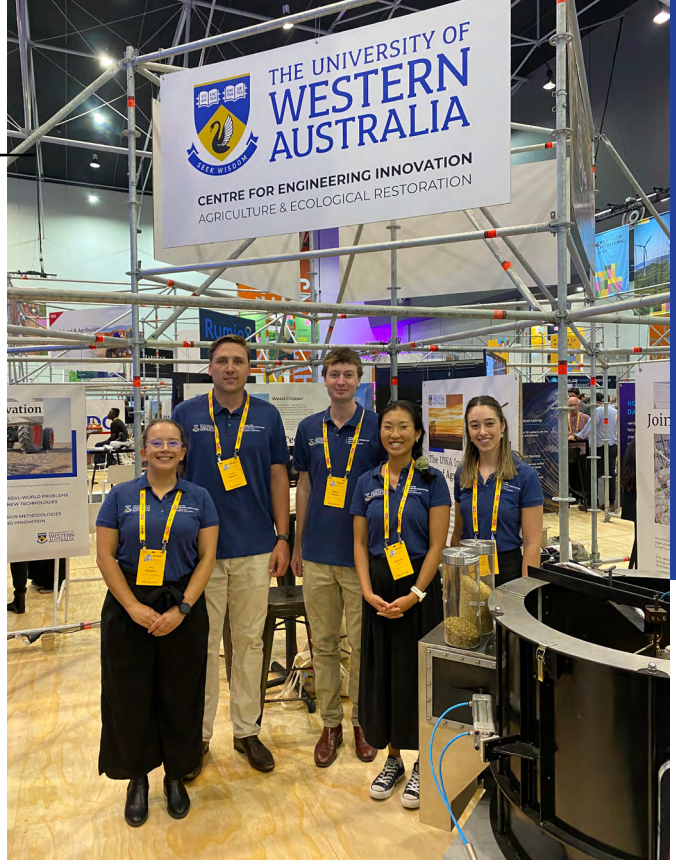
The UWA Institute of Agriculture research theme leaders Professor Shane Maloney and Associate Professor Dominique Blache presented on the 'Impacts of global climate change on livestock production' and 'Livestock behaviour, temperament and welfare' respectively.

Dr Luoyang Ding who, together with Associate Professor Blache served on the symposium organising committee, delivered a talk on 'Dietary supplementation of tryptophan improves temperament and meat production in sheep'.

In order to recognise emerging talents, doctoral and Master's students from different countries and expert teams were invited to present academic reports.

PhD candidate Sarah Babington, who will share her research findings at the upcoming Postgraduate Showcase on 29 May, presented on 'Studying biomarkers for sheep welfare', while Master's researcher Triyan Jha reported on 'Heat stress and reproduction in sheep'.

Both UWA students were honoured with excellent report awards at the closing ceremony of the conference.



Members of the UWA Centre for Engineering Innovation: Agriculture & Ecological Restoration team at the exhibit.

Enthusiasm abounds for agriculture tech at evokeAG

With agriculture playing such a large part of the WA economy, and Australian farming at the vanguard of innovation, it was fantastic for evokeAG to be held in Perth in 2024, says Associate Professor Andrew Guzzomi.

The global agriculture technology conference was held in Perth for the first time in February.

Researchers and students, led by Director of the UWA Centre for Engineering Innovation: Agriculture & Ecological Restoration Associate Professor Guzzomi, shared insights into their ground-breaking research, industry collaborations, and collective impact on food security and sustainability.

The UWA exhibition, which showcased award-winning inventions the Seed Flamer and Weed Chipper, along with Discrete-Element-Modelling and 3D models, attracted steady traffic from farmers, original equipment manufacturers, venture capitalists, researchers, and more.

The UWA Institute of Agriculture research theme leader Associate Professor Guzzomi said evokeAG provided "the ideal networking and showcasing opportunity".

"It reiterated just how exciting it is to be part of this industry which is critical to sustainably feeding the growing population," he said.

Dr Duncan Hickman delivering his lecture.

Spectral variations for vegetation vitality

How are Vegetation Indices (VI) used to measure in remote sensing applications, such as the health assessment of crops in agricultural management?

The UWA Institute of Agriculture recently hosted academic and Tektonex Ltd Director Dr Duncan Hickman, who delivered a special lecture to answer this question at the UWA Agriculture Theatre.

The lecture, which was introduced by the Institute research theme leader Dr Dilusha Silva, explored the basis of VIs from the perspective of the spectral information content of an imaged scene.

The principles of how spectral variations can be analysed for feature classification and the estimation of vegetation vitality were described using selected imagery.

Broadband visible and near infrared cameras are widely used as a cost-effective basis for calculating VIs.

Dr Hickman reviewed the benefits of this multispectral combination and provided examples to illustrate the use of VIs within agricultural management.

He has more than 35 years of research and development experience of some of the most advanced and high-performance imaging systems for defence, security, and commercial applications.

His expertise includes sensor design, image and data fusion, image processing, and the mathematical modelling of complex systems.

"Spectral domain information offers a powerful means of assessing crop health."

Dr Duncan Hickman
duncan.hickman@tektonex.com

Lecture an ode to Father of Green Revolution

Professor Wallace Cowling drew upon a decade of experience developing a new crop breeding method BRIO in presenting the Norman Borlaug Lecture at the 6th International Plant Breeding Conference in Malaysia last month.

The UWA Institute of Agriculture Associate Director was invited by the Genetics Society of Malaysia (Persatuan Genetik Malaysia) to present his talk on 'Sustainable Genetic Gain in Modern Plant Breeding *con brio*.'

In his talk, he called upon examples of rapid and sustainable genetic gain that he and his colleagues had achieved based on the BRIO (based on *con brio*, meaning with vigour, vitality, energy, and strength) approach in canola, beans and peas.

The most important element of this process was the use of optimised mating designs among genetically diverse parent plants.

Professor Cowling referred to the dramatic genetic gain obtained by wheat breeder Norman Borlaug, whose wheat varieties transformed wheat production globally and alleviated malnutrition and poverty for millions.

As a result of his contributions, Borlaug became known as the Father of Green Revolution, and he was awarded the Nobel Peace Prize in 1970.

Following his talk, Professor Cowling said he was honoured to be presented with a certificate of appreciation by the President of the Genetics Society of Malaysia Dr Abd Rahman Milan.

Professor Wallace Cowling
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Bridging the micronutrient gap in Western Uganda

Since completing her Master's (Agriculture Science) at UWA almost a decade ago, Roseline Katusiime has been steadfast in her dedication to better understanding and reducing malnutrition in Western Uganda.

Thirty percent of the population in mid-western Uganda are malnourished, which is responsible for an estimated 60 per cent of infant deaths and 25 per cent of maternal deaths.

Ms Katusiime is completing her PhD at the University of Hohenheim in Germany on detecting and analysing micronutrient gaps in dietary patterns in Western Uganda.

"Micronutrient deficiencies lead to malnutrition," she said.

"Detecting micronutrient gaps in Uganda is challenged by a lack of empirical evidence, adequate data collection methods and user-friendly tools for obtaining insights on dietary intake at the individual level."

Ms Katusiime is using different approaches, including a novel smartphone application (Calculator of Inadequate Micronutrient Intake), to analyse micronutrient gaps in different dietary patterns, and identify typical diets.

With help from a regional nutritionist, she will also design nutrient adequate diet plans, and adjust costs of improved diets not to exceed 20 per cent of the originally consumed diet.

UWA graduate Roseline Katusiime.

The project will apply both quantitative and qualitative approaches to identify better strategies for promoting healthier diets among food insecure farming communities in mid-western Uganda.

Roseline Katusiime
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Awards and industry recognition

Name	Award
H/Prof Kadambot Siddique	Adjunct Professor in Plant Physiology – ICAR-Indian Agricultural Research Institute
E/Prof Hans Lambers	Life Member of the Australian Society of Plant Scientists
Peter Panizza	Westpac Future Leaders Scholarship
Professor Eric Yirenkyi Danquah	100 Most Reputable Africans – 2024 list
Professor Ross Kingwell	Grains Research and Development Corporation 2024 Seed of Light Award
Dr Zakaria Solaiman	2024 Australia New Zealand Biochar Industry Group (ANZBIG) Forum Best Research Award
Adj/Prof Susana Neto	International Eminent Scientist Award - World Congress 2023 (Water, Agriculture and Climate), India

Visitors to IOA

Name of visitor	Visitor's organisation and country	Host details	Dates of visit
Xiaoke Ping	Southwest University, China	The UWA Institute of Agriculture	January 2024 – January 2025
Andrew Doecke	Omnia Specialities Australia	UWA School of Agriculture and Environment & The UWA Institute of Agriculture	23 February
Duncan Hickman	Tektonex Ltd, Scotland	Dr Dilusha Silva & The UWA Institute of Agriculture	4 April
Dr Elizabeth Jackson	Curtin University, WA	UWA School of Agriculture and Environment & The UWA Institute of Agriculture	24 April
Marion Lewis	The Livestock Collective, WA	UWA School of Agriculture and Environment & The UWA Institute of Agriculture	24 April
Jianyu Zhao	China Agricultural University, China	Prof Wallace Cowling	October 2023 - September 2024
Xuda Chen	Shenyang Agricultural University, China	H/Prof Kadambot Siddique and Dr Jiayin Pang	January 2024 - January 2025
Yonglin Jia	North Western Agricultural University, China	H/Prof Kadambot Siddique and Dr Jiayin Pang	January 2024 - January 2025

Research Grants

Title	Funding period	Funding body	Investigators
Operations funding for Australian Plant Phenomics Facility	2024-2029	Australian Government	Dr Nicolas Taylor
Piloting a novel geospatial approach to assess climate change impacts on grasslands	2024	UWA Research Collaboration Awards	Dr Qiaoyun Xie
Development of "climate-smart" plants with improved nutrient acquisition	2024	UWA Research Collaboration Awards	Dr James Lloyd
Remote operations for unscrewed spaceflight control of plant growth	2024	Space Research SUPPORT Scheme (International Space Centre)	Prof Harvey Millar Dr James Lloyd

New postgraduate research students (PhD)

Student	Topic	School	Supervisor(s)	Funding body
Putri Setyowati	Rice Farmers' Resilience to Climate Change in Indonesia: Insights from a Social-Ecological Approach	UWA School of Agriculture and Environment	Dr Ram Pandit Assoc/Prof Fay Rola-Rubzen	CEFS, Ministry of Ed, Culture, Research and Tech, Indonesia
Oanh Nguyen	Technological Innovation in the Australian Wine Industry: A Study of CRM Platform and AR Labelling Adoption in SME Wineries	UWA School of Agriculture and Environment	Prof Michael Burton, Assoc/Prof James Fogarty Dr Amin Mugera	RTP Fees Offset - International Student Research Training Program Stipend - International Student
Pragya Poudel	Molecular and physiology aspects of tropical grapevines	School of Molecular Sciences	Assoc/Prof Michael Considine H/Prof Kadambot Siddique	Scholarship for International Research Fees UWA – CSC Innovating the Growth of Tropical Table Grapes HDR Scholarship
Darcy Lefroy	Human factors influencing the adoption and diffusion of novel biotechnology	UWA School of Agriculture and Environment	Prof David Pannell Dr Vanessa Bowden Dr Aditi Mankad	Commonwealth Research training stipend OPEX funding from the CSIRO Immune Resilience future science platform
Mostarak Munshi	Thesis title not yet confirmed	UWA School of Agriculture and Environment	Dr Zakaria Solaiman H/Prof Kadambot Siddique	RTP Stipend - International Student UWA International Fee Scholarship
Ruwani Hapuarachchige	Thesis title not yet confirmed	UWA School of Agriculture and Environment	Prof Nanthi Bolan H/Prof Kadambot Siddique Dr Zakaria Solaiman	ARC Linkage Higher Degree by Research Scholarship Scholarship for International Research Fees
Md Golam Azam	Characterising Cripps Pink apple and its mutants using advanced genetic and genomic tools	UWA School of Agriculture and Environment	H/Prof Kadambot Siddique Assoc/Prof Michael Considine Dr Sultan Mia Dr Zakaria Solaiman	RTP Stipend - International Student UWA International Fee Scholarship
Kamrun Nahar Sheuly	Thesis title not yet confirmed	UWA School of Agriculture and Environment	H/Prof Kadambot Siddique Dr Zakaria Solaiman	RTP Stipend - International Student UWA International Fee Scholarship
Boyu Zheng	Thesis title not yet confirmed	School of Biological Sciences	E/Prof Hans Lambers Dr Jiayin Pang H/Prof Kadambot Siddique	Scholarship for International Research Fees China (IRFSC) UWA - CSC HDR Top-Up Scholarship
Shuyan Li	Thesis title not yet confirmed	School of Biological Sciences	H/Prof Kadambot Siddique E/Prof Hans Lambers Dr Jiayin Pang	Scholarship for International Research Fees China (IRFSC) UWA - CSC HDR Top-Up Scholarship

UWA IOA 2024 Publications

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Previously unreported

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UPCOMING EVENTS

Lecture by IOA Adjunct Associate Professor Iqbal Khan

Wednesday, 22 May 2024

Agriculture Lecture Theatre, UWA

Postgraduate Showcase: Frontiers in Agriculture

Wednesday, 29 May 2024

Bayliss Lecture Theatre UWA

Industry Forum: Can Agriculture reach Net Zero?

Wednesday, 17 July 2024

The University Club of WA

Shenton Park Field Station 2024 Open Day

Friday, 13 September 2024

1 Underwood Ave, Floreat

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