Crawford Fund FOR A FOOD SECURE WORLD

The Crawford Fund
2024 Annual Conference

Food and Nutrition Security: Transformative Partnerships, Local Leadership and Co-Design

12-13 August 2024

Parliament House, Canberra, Australia, and online

Editor: A. Milligan

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The Crawford Fund

The Crawford Fund was established by the Australian Academy of Technological Sciences and Engineering (ATSE) in June 1987. Named in honour of the late Sir John Crawford, the Fund commemorates his outstanding services to international agricultural research.

We are a not-for-profit organisation and a registered charity and operate with the financial support of the Australian Government, with overseas development assistance monies allocated through the Australian Centre for International Agricultural Research (ACIAR). We also appreciate grants and donations and the support we receive from some State governments, industry and private individuals as well as in-kind support from Australian and international universities, research institutions, the private sector and many individual experts.

The Fund seeks to increase Australia's engagement in international agricultural research and development, which is designed to benefit developing countries' farmers, environments and economies, and to foster mutual understanding. We raise awareness of the benefits – for both Australia and developing countries – of investment and involvement in work for food and nutrition security and the many other impacts of agricultural research.

Our training and mentoring programs build capacity with practical and highly focused training by Australians and partners across a variety of topics in agricultural research and management in Australia and the developing world.

The Crawford Fund has an active 'next-gen' program, offering scholarships and student awards to encourage passionate students and early career researchers in their studies and careers in agriculture for development. We also deliver opportunities through our partnership with the Researchers in Agriculture for International Development (RAID) Network.

The Fund promotes and supports international R&D activities in which Australian research organisations and companies, including ACIAR, are active participants. It supports the work of the CGIAR Consortium and other international research centres. Through collaboration and training, we can achieve more productive and sustainable agriculture, less poverty and hunger, and a more secure world.

The annual conference is a key part of the Fund's public awareness campaign, and each conference addresses a key issue related to food security and the importance and potential of international agricultural research.

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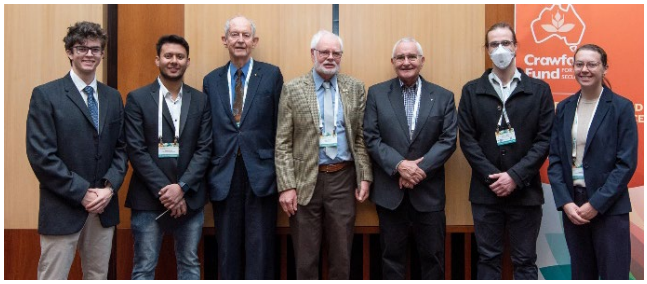
SUMMING UP

From our Conference Scholarships in 2024
Left-right, top-bottom: The Crawford Fund Board, staff and conference scholars; NT Scholars; ACT Scholars; Tasmania Scholars; NSW Scholars; WA Scholars; Victoria Scholars; SA Scholars; Queensland Scholars.



Foreword

The Crawford Fund, the conference speakers and the delegates acknowledge the traditional owners of the land on which this conference was held.

Our theme for this our 30th conference is 'Food and nutrition security: Transformative partnerships, local leadership and co-design'. The theme emphasises the importance of partnerships and collaboration for co-designing and delivering high quality agricultural research, for development projects and capacity building programs. We believe strongly that such projects can have more impact and be better integrated into local cultures and local structures. Families, communities, policies, government departments, strategies, success and impact all depend on ensuring that research is relevant, credible, and effective – as well as being open and accessible to everyone. Such accessibility is a big part of what we try and facilitate at the Crawford Fund.

As Dr Wendy Craik AM says in her summary of the conference at the end of the day's talks, the overall message is that '*It's all about partnerships and focusing first on the partnership: making sure that the researcher has a really good relationship with the people they are working with*'. And as Dr Line Gordon points out in the Sir John Crawford Memorial Address, '*By learning from successful examples and committing to collective action, we can build a future where both people and planet can thrive.'*

This year's conference papers advocate for and describe examples of true and strategic partnerships to build resilience and sustainability everywhere, including in the Pacific, the Global South, Indonesia, Vietnam, Solomon Islands, Papua New Guinea and Torres Strait, India, Bangladesh, Pakistan, the horn of Africa, as well as Australia and the Global North. Special thanks to these distinguished conference speakers, who travel here, or join us via video-link, from across the world.

Again, this year, delegates include around 40 conference scholars who also experience the Crawford Fund's especially developed mentoring, networking and learning activities. We also welcome groups of other next-gen participants – students from Western Sydney University and Charles Sturt University, as well as members of the RAID Network (Researchers in Agriculture for International Development). Two 'keynote listeners' from RAID – John Yaxley and Anna Mackintosh – have summarised the conference as a whole for the website (see https://www.crawfordfund.org/news/2024-conference-keynote-listeners-report/) before the Proceedings are produced.

Our annual conferences are possible because of the contributions of our partners and sponsors. They and the supporters of our Scholars program are listed in the Acknowledgements below, and we sincerely thank them all. Many of these people and organisations are also involved with our State and Territory Programs in supporting the Crawford Fund's training and next-gen activities. We truly appreciate their ongoing collaboration. The Fund also greatly appreciates the new Henzell Awards, donated by Ted and Francis Henzell. Their generosity provides new national awards to help fund visits by Australian undergraduate students to food-security-related projects in developing tropical countries, which we know from our post-graduate awardees will be life changing and unbelievably enriching experiences. A special mention to the CGIAR System Organization; its Executive Managing Director, Dr Ismahane Elouafi, presents the Keynote Address of this conference and gives valuable insights in the Panel Discussion (Session 5). Special mention also to our partner ACIAR, which plays an incredible role in taking partnership-based agricultural research out into the international community.

Hon John Anderson AC FTSE
Chair, The Crawford Fund

Acknowledgements

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SIR JOHN CRAWFORD MEMORIAL ADDRESS

Building resilience of the biosphere in an interdependent patchwork Earth through diverse food systems

Dr Line Gordon

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Professor in Sustainable Food Systems, Stockholm University

ABSTRACT

Human actions are profoundly transforming the biosphere upon which humanity depends. While many of these changes have led to significant improvements in human well-being, they have also created a new risk landscape that threatens to undermine the well-being of current and future generations. At the heart of the interaction between people and the biosphere are our food systems. My talk focuses on the changes needed from fork to farm, to build resilience for long-term human prosperity in the Anthropocene – the era of human dominance over the planet. Drawing on my work with the EAT-Lancet Commission on healthy diets within planetary boundaries, I emphasise the necessity of coming together on a global scale to agree on science-based targets for food systems that integrate health, sustainability, and justice ('resilience *of* what'). These targets must be general enough to apply globally, yet flexible enough to accommodate diverse local contexts. Achieving these targets in an era of unprecedented turbulence will require an improved capacity of all actors in food systems to deal with complex systems and a deeper understanding of how our risk landscape is evolving in this complex interconnected world ('resilience *to* what'). Creating healthy, sustainable and just food system futures will demand significant shifts in how humans live within, and interact with, the biosphere and each other. Envisioning desirable futures that help us reach global targets is a crucial step toward creating such futures. However, we must recognise the diverse patchwork of local and regional contexts worldwide, each with different value priorities. Any global sustainability transition will emerge from the interactions among geographically variable, but interconnected, pathways of change. Drawing on my interactions with chefs, farmers, innovators, and investors I highlight why recognising this plurality of approaches is crucial for building resilience. Diversity, especially response diversity, is at the core of resilience-building. Ultimately, building resilience is about stimulating the imagination of what a good food system in the Anthropocene can be, and nurturing the diverse pathways that can lead us to this future in a world that consists of a patchwork of solutions. I also emphasise the role of learning and experimentation in navigating this world of fundamental uncertainty and why transdisciplinary science, with strategic partnerships among academia, public agencies, private corporations, and civil society, is vital for resilience-building. I build on lessons learned from the Stockholm Resilience Centre initiatives, such as bringing together academics and CEOs of the world's largest seafood companies to foster ocean stewardship.

Good evening everyone. This address is about the role of the food system in building resilience of our interdependent patchwork Earth, and I hope at the end of it you may know the difference between resistance and resilience.

For me, this feels like a 'full circle' moment. Even though I grew up in Sweden and have spent most of my time in northern Europe, it was actually here in Australia almost 35 years ago that I decided that I wanted to dedicate my life to understanding of how nature supports human well-being, and to use that understanding to help people thrive through the management of ecosystems.

In the year 1990 I was an exchange student in Far North Queensland, on the edge of the Atherton Tablelands. I went to high school in a small village called Ravenshoe, surrounded by stunning unique Australian ecological diversity (such as in the photo here). This was at the time, as many of you already know, a region that had just seen intense conflicts between environmental conservation and timber workers, as the area had recently been declared a World Heritage Site. I found myself in the middle of tensions between the use, the abuse and the

conservation of nature, and it was here that I really started to understand the critical interdependence of people and nature, and the importance of balancing conservation for the sustainable use of natural resources.

Risks to the biosphere

I think everyone in this room is really lucky to be able to experience life for a short period of time in the history of this planet, which is 4.6 billion years old. Yet in such a short time, i.e. in the life span of a generation, there has been so much fundamental change in the biosphere, the thin layer of life that surrounds the planet.

We often talk about the Great Acceleration of human impact, which has taken us into the era of the Anthropocene, the time of human dominance on this planet, during which we have reshaped the biosphere. Today, the weight of plastics on this planet equals the weight of animals on the planet. If you take all the human-made materials on the planet, it weighs as much as the biomass on the planet. These human-made materials are increasing exponentially.

The year 1990, when I was in far north Queensland, is almost halfway between the start of the Great Acceleration (in the 1950s) and where we are today, and the world had just started to come together on environmental issues. The year 1990 was two years after the Montreal Protocol on reducing impacts on the ozone layer. It was the first year that the Intergovernmental Panel on Climate Change (IPCC) published a report on climate change, and it was two years before the Rio conference, where the world came together to establish three new conventions – on climate, on biodiversity and on desertification. While we have seen great and significant progress since 1990, we also know that we are very far from achieving what we need to do. As the IPCC stated, with very high confidence, in its latest report (IPCC 2023): 'There is a rapidly closing window of opportunity to secure a liveable and sustainable future for all'. Now, more than ever, we need collective action at a global scale.

Resilience and planetary boundaries

I think we all know the huge risks that humanity is facing on this planet right now. We have really changed the whole risk landscape that we are dealing with. We have climate crises and ecological degradation, pandemics and increasing geopolitical tensions. Many of these things are aggravated through the loss of resilience of our biosphere. For example, consider the loss of forest, and the importance of forests in mitigating climate change and even reducing water scarcity.

The way I and my colleagues at Stockholm Resilience Centre use 'resilience' is to mean the capacity to keep developing in ways that support human well-being, even in the face of crises. The understanding of resilience of interdependent social or ecological systems is rooted in complex adaptive systems, and it highlights the non-linear behaviour of ecosystems, or any type of system. Complex systems such as ecosystems or societies can

undergo so-called 'regime shifts'. A regime shift is often seen as a relatively sudden, long-lasting change in how a system functions, in which there is a hysteretic behaviour, which means that it is relatively easy for the shift to happen and it is much more difficult to get the system back to where it was before after the shift. One example of a regime shift is a freshwater lake that can absorb a certain amount of nutrients without any obvious impact. But once pollution levels cross a threshold, there can be a tipping point, and the lake suddenly shifts from a clear-water lake sustaining fisheries to an algae-dominated state with insufficient oxygen for fish life. When the system is close to such a tipping point, even a small disturbance, such as climate fluctuation or a big storm, can tip the system into a new regime.

Loss of resilience is often invisible to us before the system tips and we end up in a state where we did not want to be. These kinds of tipping points are found in most ecosystems. We see them in coral reefs: from beautiful reefs with lots of fish life to algae-dominated or bleached areas. We see them in rainforests tipping to more savanna-like systems; grasslands changing to more deep-rooted vegetation with less capacity to support livestock. We can also see this type of tippings in society. One can think about trust as a good example. Trust takes a long time to build up, but it is very easily lost.

At the Stockholm Resilience Centre, we study resilience on scales ranging from local to global. As we move from being a small world on a big planet to a big world on a small planet, we are adjusting the resilience of the Earth system as such, and we now know that there are risks of tipping points at the Earth system scale.

In 2009, the first paper on planetary boundaries was published, led by Professor Johan Rockström, who was a co-founder of the Stockholm Resilience Centre, and Professor Will Steffen of the Australian National University here in Canberra. They brought together a group of scientists who identified thresholds of the safe operating space on this planet: that is, the boundary between the space where humanity can thrive, and where it risks destabilising the self-regulating processes on this Earth in ways that potentially unleash changes that would put humanity at risk.

Planetary boundaries are people-centric. Defining them is about ensuring that the planet remains in a state that can support and be liveable for future human generations. It also takes a systemic approach, by considering not just climate but nine different variables that are relevant to how the Earth system operates: biodiversity, land use, biogeochemical cycles, water, etc. (Figure 1).

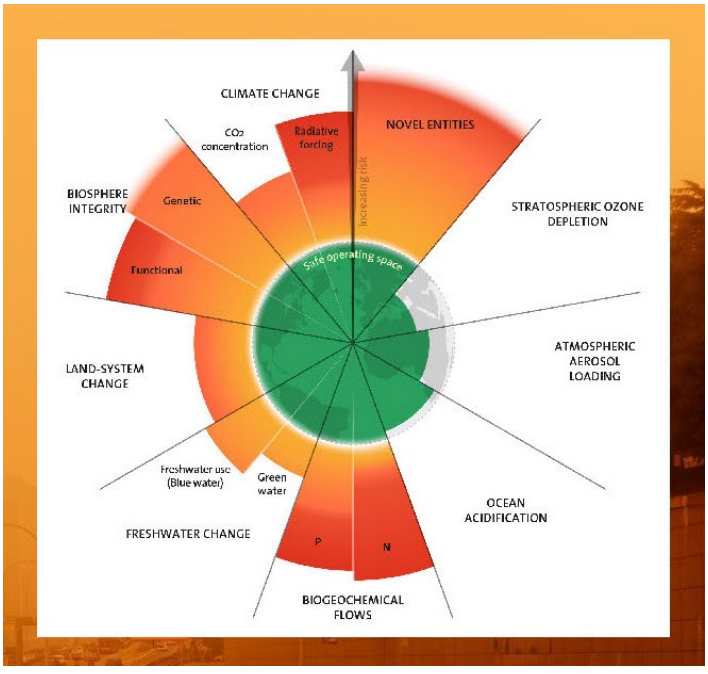

Figure 1. Planetary boundaries: we are transgressing the safe operating space for humanity.

So how are we doing? Well, not that great. In 2009, out of nine boundaries, six of them had been assessed and we had crossed four of them. They all have been assessed now. The latest assessment published last year shows that now we have crossed six of the nine boundaries.

Food and the Planetary Health Diet

Food production lies at the heart of the pressures on the planetary boundaries. It contributes up to 30% of the impacts on climate; around 70% of the pressures on water resources; around 75–80% of the pressures on biodiversity and land use change; and about 100% of the pressures on nitrogen and phosphorus. We also know that poor diets are a major global health risk, with 2 billion people being obese and 735 million undernourished – numbers that we know have been growing rapidly over the past few years.

We have, since the 1990s, global conventions and targets for many of the aspects that I have mentioned, but we do not have a target for a healthy diet that it would be possible to produce within the planetary boundaries. But what if we could come up with something that is globally relevant and agreeable, and that considers both the health of people and the planet? Would it then be possible to feed the 10 billion people that are expected to be living on this planet by 2050?

Eight years ago, we started to work on the first EAT-Lancet Commission on food in the Anthropocene. The Commission was set up by the EAT Foundation, whose mission is to unite health and sustainability through food systems across science, policy and business. The Secretariat for the Commission was based at the Stockholm Resilience Centre.

We gathered a group of nearly 40 scientists, including nutritionists, agronomists, sustainability scientists and others that worked on these questions for over three years. The EAT-Lancet Commission was published in 2019, and it introduced the concept of a Planetary Health Diet outlining healthy ranges for food group intakes. The Planetary Health Diet is designed for human health. It is a plan for a diet with ample room for whole grains, fruits, vegetables, nuts, pulses, but also some room for red and white meat, eggs, seafood and dairy. Figure 2 is an example of one day's intake of the Planetary Health Diet.

The results showed that if we just shifted to this diet, everyone globally would be healthier and it would also ease pressure on the climate boundary. However, it is not enough to let us stay within the other environmental boundaries. In order to also reduce the pressures across all of the boundaries, we need substantial and transformative change also in agriculture, especially closing the yield gaps in low-income countries and reducing the pressure on the environment in high-income countries. We also need to halve food loss and waste. If we do those things, we could, basically, eat and produce a healthy diet within planetary boundaries.

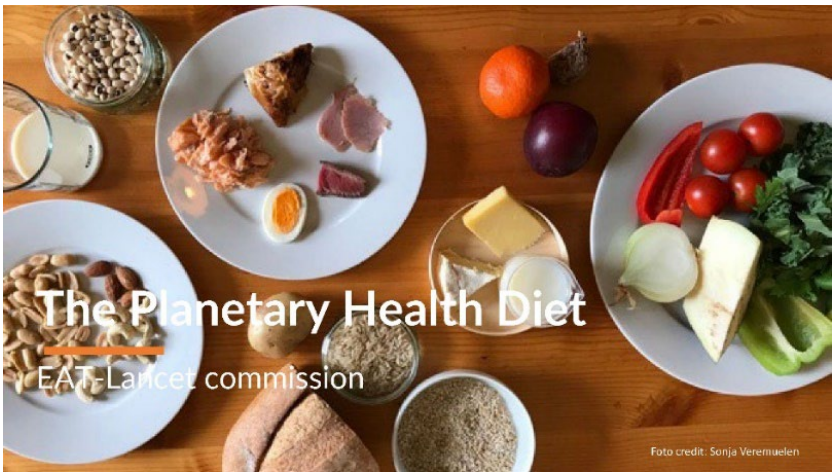

Figure 2.

When the scientific journal *Nature* recently looked at the ten most cited non-economic papers in policy documents of all times, the EAT-Lancet report was one of them, along with two of the initial planetary boundary papers. These global frameworks are being used by companies, countries, governments, public authorities and civil society around the world to develop guidelines and assess progress towards sustainability and health targets.

However, one of the main criticisms of the EAT-Lancet report was that the Planetary Health Diet was seen as a one-size-fits-all global diet, implying that everyone would be eating basically the same thing. That was a misconception. The planetary diet allows for plenty of different adaptations (Figure 3).

Figure 3. A healthy diet can be eaten in a diversity of ways.

Right now, we are working on an update of the EAT-Lancet diet, and there is also an effort led by Professor Wen-Harn Pan from Taiwan, in collaboration with scholars worldwide, to create a two-day meal plan that can be tailored to different parts of the world. This project highlights how the Planetary Health Diet can be adapted for different contexts.

Changing people's diets

We have been working on a two-day meal plan for Sweden. Currently, the Swedish per capita consumption exceeds our 'fair share' of the planetary boundaries by up to four times in all areas except water use. This is largely due to the high meat and dairy consumption in Sweden, which has doubled since the 1990s.

So how do we create a meal plan that is rooted in Swedish culture, that people recognise and could aspire to, but yet is transformative enough to bring us within our fair share of the planetary boundaries?

We have been working with an experimental farm, and a philanthropic organisation called Axfoundation to explore the most popular Swedish dishes. We have adapted them to be more future oriented and in line with the Planetary Health Diet. For example, one of the most Googled recipes in Sweden is Pasta Bolognese! So we have taken Pasta Bolognese as one of the main dishes on this two-day meal plan but we have exchanged the minced meat for minced pulses (legumes), using four different pulses, and we are working with some of the best chefs in Sweden to ensure that we also get the taste right. We also looked at fish stew, which is another very popular dish in Sweden. We exchange some of the fish most commonly used for the fish stew (such as salmon), for mussels and clams and fish that are being grown from larvae fed on food waste.

One thing that has struck me when I have worked on Swedish diets is the enormous number of snacks that we eat in Sweden. 'Fika' is central to Swedish culture (Figure 4). It is a tradition that involves taking a break with coffee and something sweet. The key element of fika is not really the coffee or the treat but rather the time spent connecting with others. It is basically a social-care institution.

Obviously fika is not healthy, nor sustainable. Many of the products grown for fika have decreasing supply and increasing demand globally. We are now looking at how we can adapt fika to be more in line with the

challenges of the Anthropocene, because we really want to maintain this institution and way of eating but we also need to see a change.

We have learned in this work that we need to pay more attention to the role of intermediate meals. We should also focus more on the role of food as being more than just nutrition, and we should explore whether leading with 'culture' in our messaging around food system transformation could help drive the change that we need to see.

Figure 4.

That day in January of 1990 when I met my Australian host family for the first time is still so strong in my memory. I was completely exhausted after not sleeping on the long flights, and I found myself sitting in a very noisy pickup truck with my new host father speaking in a very deep Australian accent, and I just could not understand anything.

When we finally arrived at the house, the first thing we did was to head to the kitchen. They offered me a mango. It was cut in a way that I had never seen before, and I can still remember that feeling of the juice running down my fingers as I leant over the kitchen sink to eat it. In Sweden I had had mangoes before, but just in tiny pieces. My parents worked for Thai Airways and they sometimes brought home a mango. We would split it between the four of us in the family and we would each get a small piece of mango. And here I was, suddenly slurping one all down by myself – a whole mango! I felt an overwhelming sense of gratitude and calmness, and I realised 'I can do this year of exchange!'.

Just as with the example of fika, food can be so much more than merely the energy and the nutrition that it provides. Food is culture. It is an expression of generosity, compassion, community and flavour. It is something that really binds us together.

Since 1990, mango imports to Sweden have increased by a factor of more than 15. This reflects a broader trend of increased global food trade. Trade has significantly enhanced food security and has the potential to produce more food with less environmental impact. It is fascinating to see that trade has increased the diversity of food available in every single location around the world, but globally we are eating more and more in the same way.

Diversity for food security

Essentially, we eat more diverse food but in an increasingly similar way. The global food system is homogenising and simplifying, with overall fewer species and genetic varieties being used. Today, nearly 50% of the calories that we consume are based on just three species – wheat, maize and corn – and somewhere between 40 and 75% of the production volumes come from only six 'bread baskets' around the world. With Russia's invasion of Ukraine, there is currently war in one of these bread baskets. We know that the risk of synchronous droughts happening across multiple bread baskets at the same time has massively increased with climate change. We also see a simplification of the transport system around the world, with several marine chokepoints making us vulnerable to food supply transportation. Just think of the Evergreen company's container ship being stuck in

the Suez Canal; and political tensions in the Red Sea; or drought limiting passage through the Panama Canal. For far too long we have focused too much on optimisation and efficiency.

As we enter an era of unprecedented turbulence on this planet, we need to shift our focus towards building diversity of solutions. A fundamental concept in resilience thinking is 'response diversity'. This idea comes from ecology and refers to the variety of responses to environmental changes. Most species perform similar functions. A high response diversity ensures that if some species are negatively impacted by a disturbance like climate change, others can compensate and maintain the ecosystem function and stability. In many ecosystems, species that may seem redundant in the current operation actually ensure that system can function also in disturbances, because of the diversity of responses and built-in redundancy. They reduce risks associated with any single strategy failing. In a world that not only needs stability but also demands new ways of action, building resilience through response diversity is about sparking imagination and envisioning what a good food system in the Anthropocene could look like, and nurturing a diversity of pathways to lead us there.

In this context, I would like to highlight a project called Seeds of Good Anthropocenes. It is a Future Earth initiated project led by Stockholm Resilience Centre, McGill and Stellenbosch universities. At the heart of this project is the idea that most of the visions of the future that we see today are dystopian and merely extensions of our current world. The Seeds of Good Anthropocenes project collects inspirational examples of alternative futures that are already happening but are on the margins today. These examples are then analysed to understand how and why they work, and how they could be nurtured to grow into new positive futures.

The 'seeds' represent a diverse mix of disciplines, worldviews and values. There are over 500 examples now in our database. Figure 5 shows examples: urban rivers resurfacing in Korea; Svalbard Global Seed Vault; an indigenous example, the Gwaii Haanas Tribal Park in British Columbia, Canada; rewilding of Scottish rainforest; and the Foundation for Ecological Security in India. The scientists behind the Seeds of Good Anthropocenes project are now bringing together stakeholders from these various cases to build positive and plausible scenarios, in different regions around the world.

Figure 5.

I asked one of the leaders of this project about the insights gained so far, and they said they have learnt three lessons.

- First, you need to invest in experimentation, and you need to ensure learning is happening. It is crucial to monitor, evaluate and learn from these experiments.
- Second, identify and reduce the barriers for solutions that are now on the margin. We need to 'level the playing field' with more conventional approaches: most resources today still go into traditional approaches.

- Third, we need to facilitate networking and collaboration among these different 'seeds', enabling them to learn from each other and find potential collaboration. That is vital.

However, the world is not moving towards encouraging a diversity of solutions. Instead, we are becoming more and more homogenous, as I already said. It is not just in terms of species, but also in terms of the actors that are driving our global production ecosystems. A few years ago, I and my colleagues published a paper (Folke *et al*. 2019) which showed how just a few companies are dominating the production chains of many commodities. For instance, five companies now control 90% of the world's palm oil market; ten companies control 83% of all animal pharmaceuticals; and three companies control 60% of global cocoa production.

Driving transformative change

The research for that paper was inspired by another project at the Stockholm Resilience Centre in 2012. My colleagues asked an intriguing question: Could there be keystone actors within the seafood industry that are capable of driving transformative change towards better ocean futures? A keystone species is a species that is low in abundance but has a really strong impact on the ecosystem. The research uncovered that a small number of companies had a significant influence over the seafood industry: 13 companies were found to control between 20% and 40% of the largest and most valuable fish stocks, as well as 11–16% of the overall global marine catch. This concentration of power represents both a challenge and an opportunity.

On the one hand, it raises questions of legitimacy and agency. On the other hand, what if these keystone actors – defined by their dominance in global production revenues, their control over crucial production segments and their influence over global governance processes – could be mobilised to become stewards of the oceans and drive transformative change? After years of bilateral contacts and lobbying, my colleagues managed to bring eight CEOs of the world's largest seafood companies together to meet for the first time. They made a shared commitment to ocean stewardship.

This meeting marked the beginning of SeaBOS, a global science business initiative dedicated to driving sustainable practice within the seafood industry. Today, SeaBOS facilitates annual CEO-level dialogues with scientists, across nine companies, bridging the gap between research and industry. The approach is about mutual learning, co-design and sustainable practices. It is about fostering change through collaboration and dialogue. The CEOs have agreed on five timebound goals, including: the reduction of illegal, unreported and unregulated fishing; advancing the protection of biodiversity and ecosystems; combating antimicrobial resistance; building climate resilience; and reducing ocean plastics. In their latest annual reports, all companies have advanced towards the targets (there is one tiny exception).

However, we still regard this as a big experiment. We need to see the results of the hypothesis that it is possible to mobilise these companies. They have come a long way, but there is a much longer journey ahead of them.

As we navigate the complexities of the Anthropocene, it is clear that our food systems are at the heart of both the challenges and the solutions. For resilience, the current direction of a strong focus on simplification and efficiency is one of the problems. Achieving sustainable and resilient food systems demands transformative change, embracing a diversity of solutions, fostering global collaboration and envisioning new pathways for the future.

Our journey toward a more resilient Earth through sustainable food systems requires imagination and commitment from all sectors of society, large and small. By learning from successful examples and committing to collective action, we can build a future where both people and planet can thrive.

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Line Gordon has over 20 years of experience leading interdisciplinary teams in Sustainability Science. Her leadership focuses on investing in a collaborative, trust-based and creative working culture that enables us to achieve impact, while ensuring that scientific integrity underpins all our work. Line Gordon's research focuses on water and food systems as key entry points to build Biosphere resilience and improve governance of social-ecological systems, livelihoods, and public health. Her research is problem-oriented, interdisciplinary, and highly collaborative. She often leads and contributes to collaborations that bridge disciplines and technical skills to advance scientific frontiers. Gordon's current research focuses primarily on the role of food system transformation for public and planetary health. This work includes leading the Just transformation working group of the EAT-Lancet 2.0 Commission, developing national Swedish food systems scenarios in the Mistra Food Futures program, and working on gastronomic landscapes. She has previously done research on livelihood resilience and ecosystem services in sub-Saharan Africa (Burkina Faso, Tanzania, South Africa, Senegal, and Ghana), and on the critical roles of 'invisible water flows' across local to global scales, in particular highlighting how global land use change, and evaporation and precipitation interact. Line Gordon has an undergraduate degree in biology, and a PhD (in 2003) in Natural Resources Management, Department of Systems Ecology, Stockholm University. She was a postdoctoral fellow at the International Water Management Institute (IWMI) in Colombo, Sri Lanka. She has also been a visiting researcher at University of Kwa-Zulu Natal, South Africa, CIRAD in France, McGill University in Canada, and STIAS – the Stellenbosch Institute for Advanced Study in Stellenbosch, South Africa. She was appointed the Curt Bergfors Professor in Sustainability Science with a focus on food systems in 2021. Line Gordon serves on many different boards and advisory boards.

MINISTER'S OPENING ADDRESSS
&
CRAWFORD FUND MEDAL PRESENTATION

The Hon Pat Conroy MP

Minister for International Development and the Pacific
& Minister for Defence Industry and Capability Delivery

I begin by acknowledging the traditional custodians of the land on which this conference takes place, the Ngunnawal people. I also recognise any other people with connection to the lands of the ACT and region. I pay my respects to Elders past and present and extend that respect to all Aboriginal and Torres Strait Islander people who are attending this event.

I acknowledge the rich and ongoing contribution of First Nations people who for thousands of years have cared for Country. There is much to learn from First Nations people who have been involved in agriculture on this land for thousands of years.

It's a delight to be here and welcome you all to Parliament House. The Crawford Fund annual conference holds an important position as Australia's key international agricultural development and food security event. I congratulate you on your thirty years of delivering this conference and bringing national attention to critical food and nutrition security issues. I would like to thank the team at the Crawford Fund for putting together a deeply relevant program on transformative partnerships, local leadership and co-design for food security. And I extend my thanks to the Crawford Fund Patrons and Board too.

I would like to acknowledge Dr Line Gordon, Director of the Stockholm Resilience Centre, and Dr Ismahane Elouafi, Executive Managing Director of CGIAR. Very pleased to have you here. And a big welcome to all our international guests from the Pacific, South East Asia and beyond. It's wonderful to have such expertise from around the world. And I also applaud the Crawford Fund NextGen program participants and members of the RAID Network who are attending today.

It's a pleasure to welcome you all on behalf of the Australian Government; and I also have the honour to present the Crawford Fund Medal, which I will come to shortly.

Agriculture and food security continue to be central to the Australian Government's development agenda. With such a high number of people still facing food and nutrition insecurity, locally led solutions will be more important than ever. Alarming figures released just a few weeks ago show we are not making progress on reducing food insecurity like we need to. In 2023, 864 million people suffered from severe food insecurity – around 11 per cent of the world's population. In our region, over half of the Pacific population experienced moderate to severe food insecurity in the 2021 to 2023 period with 44 per cent of Pacific children under 5 experiencing stunting in 2022. That's nearly half of all children in the Pacific have experienced stunting due to food insecurity.

We cannot talk about food security without talking about climate change. Climate change is impacting food insecurity now. From less predictable and longer periods of drought to more intense storm and flood events, agricultural producers need to adapt their practices urgently. The changing climate is accelerating pressure on global food security, threatening access, affordability and nutritional value of food supply. Extreme weather threatens food and water security, with grave implications for global stability. Farmers and producers across the globe and of all sizes are keenly aware of these changing conditions and are concerned about what this means

for their livelihoods. They experience firsthand these changes to their local environment; they see the impacts. And of course, it is not just farmers but also local policy makers, governments, businesses and other members of the community who need to grapple with these challenges now and into the future.

This year's conference theme goes to the heart of Australia's development approach and recognises the importance of locally led solutions: partnerships, local leadership and co-design. It's fantastic to see the focus on these principles at this conference.

Our Australian international development policy champions locally led efforts to drive change. As a development partner, Australia understands that the way we do development matters. We know listening and responding to our partners' priorities matters, as does growing partnerships – be that in research or between governments or with local civil society groups – to deliver outcomes.

The work of ACIAR – the Australian Centre for International Agricultural Research – is a great example. I am pleased to acknowledge the CEO of ACIAR, Professor Wendy Umberger, who is with us today.
For well over 40 years, partnerships have been the foundation of ACIAR's success. Fostering and implementing research collaborations and partnerships with organisations all over the world has led to stronger and more equitable agriculture, food, forestry and fishery systems; improved food and nutrition security; and more sustainable management of natural resources.

Australia is increasingly focused on supporting our partners to mitigate and adapt to climate change and implement more resilient agricultural practices, improving food security and livelihoods. We are working with governments, researchers, communities, smallholder farmers and other stakeholders in our partner countries to deliver their priorities in agriculture. We do this by providing financial and technical assistance to our region to help build long-term food system resilience.

And so I am very pleased to announce Australia is investing a further $2.6 million into the Centre for Pacific Crops and Trees (CePaCT). This investment supports the Pacific Community's regional genebank, ensuring the long-term conservation and distribution of key crops and trees of the Pacific. With a changing climate, the ability to conserve a diverse range of food plants will mean Pacific countries can access food crops that are better adapted to new conditions. This investment directly supports local scientific expertise and the regional architecture. This is one of many investments we are making. Our emphasis on climate partnerships is also on display through the Pacific Climate Infrastructure Financing Partnership, delivering off-grid renewable energy infrastructure to boost food security and rural livelihoods in remote Pacific islands.

When the scale of the challenge is immense, we need more solutions developed through partnerships, collaboration and cooperation. So I hope you have many discussions today that lead to strong partnerships. It looks like a great program. And I was particularly struck by the topic of the final session: Achieving Transformational Outcomes. *Transformation* is what it will take if we are to reach the Sustainable Development Goal of Zero Hunger. No one in today's modern world should suffer from hunger. But food security goes beyond hunger alone. It is connected to many of the challenges our world is facing, and it matters for Australia and our region. Improving food security is critical for stability; for stronger economic ties and opportunities for trade; for better health outcomes; and for promoting innovative and sustainable solutions to build a safer and more resilient region – for all.

Because of this I am very pleased to present the Crawford Fund Medal. The Crawford Fund Medal recognises Australians who have made a considerable and continued contribution to international agricultural research.

This year's highly deserving recipient is **Dr Tony Fischer**. This award recognises his significant contribution to global wheat production and agricultural development. Coming from a wheat–sheep farm at Boree Creek in southern New South Wales, Tony worked with Nobel Prize Laureate Dr Norman Borlaug leading the International Maize and Wheat Improvement Center's global wheat program.

Tony has also made a substantial contribution to Australia's impact in international agricultural research through various roles with ACIAR, CSIRO, the Crawford Fund and ANU, mentoring and guiding many young scientists along the way.

Tony will be adding the Crawford Fund Medal to many esteemed awards including the C.M. Donald Medal, the William Farrer Memorial Medal and his Member of the Order of Australia.

I now call Dr Fischer to receive this award.
Congratulations, Dr Fischer.

CRAWFORD FUND MEDAL for 2023

Acceptance speech, 13 August 2024

Dr Tony Fischer FAIAST FTSE AM

Honourable Pat Conroy, Minister for International Development and the Pacific, Colleagues, I am deeply honoured to receive this award from the Crawford Fund and grateful for the chance to say a few words at this important conference.

First, an acknowledgement from the past. As I finished studying agricultural science at The University of Melbourne, my animal science lecturer and later founder of the Crawford Fund, Derek Tribe, posed a question I had never before considered seriously.

'Tony', he asked, 'how are we going to feed the world?' A seed was sown in Derek's office that afternoon in December 1960.

A decade later, the boy from a wheat farm at Boree Creek in southern NSW arrived to work at CIMMYT in Mexico just two weeks before his boss, the wheat breeder Dr Normal Borlaug, was awarded the Nobel Peace Prize for his pivotal role in the Green Revolution in South Asia, undoubtedly averting more famine in that populous region of small farmers.

For me the course was set for a lengthy career in wheat agronomy, physiology, breeding and farming systems, grappling with the challenge of delivering impact through the sciences of agriculture and socioeconomics.

But first, another memorable message from December 1960: at a farewell dinner for the rowdy new agricultural graduates, our biochemistry professor Michael Birt dared to deliver a valedictory speech entitled simply 'Measure it'; excellent advice that I have never forgotten.

However, I have learned over the years that measurement must be augmented by data analysis, unrelenting curiosity, and reporting and publication, followed by promotion of your conclusions when the evidence is sound. And my final lesson was to not lose sight of the big picture goals in agriculture, which include positive impacts on food security, the welfare of farmers, and sustainability of the natural resource base of agriculture. This inevitably involves us agricultural scientists collaborating with other scientists and other people – connecting our research to the real world. I stumbled in some of these lessons myself, but was lucky much of the time.

One good fortune was my early experiences from the family wheat farm, which especially helped me early on with Norman Borlaug. Another was encountering inspirational and collaborative people along the way.

I could mention many such people, but one example suffices. I refer to my 630-page book, *Crop yields and global food security*: *Will yield increase continue to feed the world?*. It was coauthored by CIMMYT colleagues, namely Derek Byerlee an agricultural economist from Eurelia, near Orroroo in South Australia, and Greg Edmeades a maize scientist from a dairy farm in Cambridge in New Zealand. ACIAR and GRDC generously published the book 10 years ago; more good fortune! It is free to download from the ACIAR website and has now been cited extensively.

In finishing I want to express my gratitude to the Crawford Fund, not only for this award but also for being true over its almost 40 years to the wonderful maxim 'Doing well by doing good', promoted very early on by Professor Derek Tribe, and leading to his 1991 book of the same title. Enlightened self-interest was the blunter summary that Derek often used.

Australia does good with its overseas agricultural aid program, principally delivered by ACIAR, which supports, in neighbouring developing countries, partnership agricultural research. This helps lift their agricultural productivity and their research capacity. As a result, Australia does well: for example, gaining new insights into common agricultural problems; early warning on exotic biotic agents which threaten our agriculture; and access to novel crop germplasm. And the benefits go beyond agriculture, to strengthening our security, building trust and invaluable soft power with our neighbours and especially contributing to their economic growth.

I also wish to acknowledge the strong effort that the Crawford Fund has made in the last 20 years or so to engage the refreshing idealism of early career scientists in the task of Australia's international agricultural research. I especially highlight the foresight and energy of Cathy Reade in this. Forty of you are here today on Crawford Fund scholarships, representing the many others linked to the Crawford Fund and upon whom our regional future, as good neighbours through agricultural research and development aid, depends.

Finally, I wish to express my enduring gratitude to my wife Miriam, who is here this morning: an *ingeniero agronomo* from Chile, dedicated plant pathologist, and pioneer plant molecular biologist, as well as strong and loving mother and indispensable partner in my career.

KEYNOTE ADDRESS

Transformative international agriculture R&D: the road to future success

Dr Ismahane Elouafi

Executive Managing Director, CGIAR

ABSTRACT

The climate, biodiversity, and health crises are deeply interconnected, demanding integrated solutions. But in overcoming these crises, agricultural R&D faces its own tests: the interconnectedness and complexity of food system challenges; funding constraints; policy and regulatory barriers; and the need to ensure equity and inclusivity. Overcoming these will hinge on collaboration, partnership, and co-design in developing holistic, systems-based solutions. Successful examples can be found in crop breeding partnerships, landscape management collaborations, climate smart villages, capacity sharing in Africa, and more. By highlighting the transformative power of genuine partnerships and participatory research, this keynote aims to demonstrate how collaborative approaches lead to sustainable and impactful outcomes. Through many examples, we can see that robust partnerships, co-designed strategies, and sufficient investment can help ensure food, nutrition, and environmental security for future generations.

Good morning. First, I want to say that I am an alumnus of the Grains Research & Development Corporation (GRDC), which provided a fellowship for me to do my PhD on a project that was run by CIMMYT and ICARDA. So I am grateful to all Australian grain producers for their support, via GRDC.

I am here today as the Executive Managing Director of the CGIAR, which is the world's largest research partnership for a food secure future, dedicated to transforming food, land and water systems in a climate crisis. We gather today at a very critical juncture in our collective efforts to address the profound challenges that define our era.

Our climate, biodiversity loss and health crises are deeply interconnected. These challenges demand holistic food security, food systems solutions that we in this room have been working on, and we need to deliver. People are looking up to us to deliver those solutions, and more than ever it requires collaboration, partnership and co-design – the main theme of the conference this year.

As agricultural research and development professionals, we need to recognise both the great contributions that were made in the past, and also the challenges that we have. This morning, in accepting the Crawford Fund Medal, Dr Tony Fischer took us back to the Green Revolution with Borlaug, and the Minister mentioned the alarming numbers: that 50% of the kids in the Pacific region are not eating well and are never likely to develop to their full potential.

We have four big challenges. The first is the intertwined climate change, environmental and health challenge. Agriculture is under immense pressure to develop solutions that mitigate and adapt to climate change. This includes creation of resilient varieties of crops and animals and fish; improving soil health; and developing sustainable farming systems.

Second, the funding constraints and sustainability. It is very important that we put in enough investment to find solutions for today and tomorrow.

The third challenge is policy and regulation. There often are inconsistent and restrictive regulatory environments that can hinder the adoption of new technologies and practices. Effective collaboration between research institutions, government and private sector capacity sharing is essential to align policies with scientific advancement.

The fourth challenge is equity and inclusivity. I think we all talk about many of the Sustainable Development Goals, but very few of us address SDG 10: Reduced inequalities. I think reducing inequalities is one of the most difficult SDGs to get to, because inequalities are growing instead of reducing. Inequalities could be solved globally but still exist within a country or within a community.

Partnership and co-design

Today's conference explores how partnership and co-design can help us meet these challenges. It is increasingly important to co-design solutions now. I think agricultural innovations cannot stand alone; they feed into and are a result of a systems approach, holistic solutions, that cannot be developed without broader partnership and co-design. Historically, many efforts to support our overstretched global food system focused on a single solution or a single aspect of a solution, such as developing better crops or reforming subsidies or reducing food waste. However, system transformation requires coordinated bundles of innovation – that is, not one solution but many solutions that together can do better. Those innovations can be technological, but that's not enough. We need social innovation, institutional innovation, political innovation. Partnership is crucial to bring those together.

CGIAR advocates systems thinking – a holistic approach that accounts for the interplay of all elements, assessing both the potential benefit and the potential harm of new developments. We should consider at the outset whether a particular innovation will be accessible and practical for women as much as men, and how it will impact the environment, the trade, the food prices, the livelihoods, the nutrition and so on and so forth. Likewise, new crop varieties, technologies or incentives to increase yield are meaningless if there is no water to irrigate, for example, if it's on irrigated land, or if there is no infrastructure to take the crop to the market.

Innovation systems rely on engagement among many actors, including farmers, communities, government, enterprise, universities, research institutions and much more. There is a growing understanding of the interconnection between food, land and water systems and how these then connect to climate, to gender, to policy, economics, etc. CGIAR recognises the need to shift away from a focus on single solutions developed by single entities, which might increase productivity at the expense of other elements of the food system, ecosystem, equity and climate goals.

Partnership needs to be much more than just a slogan. It is the cornerstone of effective agricultural research and development. It involves equitable participation, mutual respect, and a shared vision. Transforming food, land and water systems within a climate crisis must be undertaken together, with each stakeholder contributing their unique strengths and perspective. When we think about it logically, it makes sense: we all get together and each of us brings the best from us; but in reality it's very complicated.

One of the transformative approaches we and many others have adopted is the co-design of projects with local stakeholders. This participatory approach ensures that our research is not only scientifically sound but also culturally appropriate and socially accepted.

For example, our participatory breeding program increasingly involves women and men farmers in the design of crop varieties. Decisions aim towards meeting their market needs and their preferences. For example, in the breeding of common beans (*Phaseolus vulgaris*), participatory breeding has allowed us to develop quick-cooking common beans that take 30% less cooking time (and therefore less fuel). This is expected to be delivered to 1.8 million women farmers in East Africa. The project involved collaboration with several partners, including The University of Western Australia and a lot of support from ACIAR. Farmers' involvement from the outset ensures higher adoption rates and greater impact.

There are many other agrifood innovation examples. There are projects on irrigation technologies, soil management approaches, chicken breeding (which is doing wonderful work in Ethiopia and in East Africa), and agroforestry practices.

More and more research projects are aligning solutions with stakeholder needs, relying on deeper collaboration to drive impact and scaling.

Of course, organisational partnerships are often at the core of this work, and I want to give you two examples. The first one is with the African Development Bank with a program called TAAT, Technologies for African Agricultural Transformation, that established partnerships between the research institution, national system, private sector and development agencies in delivering proven technologies. And because it brought everybody together, it sped up the delivery process and it has delivered climate-smart seeds to 12 million farmers in 27 countries in only three years.

The other example is from the World Bank. It's a program called AICCRA that is scaling climate-smart agriculture and climate information services to reach millions of smallholder farmers in Africa. Teams in Senegal, Ghana, Mali, Kenya, Ethiopia and Zambia work with national and regional partners to increase access to life-changing innovations.

On a national level, IRRI recently launched a new partnership with Papua New Guinea National Agricultural Research Institute to boost adoption of high yielding, climate smart, healthier rice varieties and systems. This will include the latest production and post-harvest techniques, seed production, irrigation and infrastructure, and economic assessment, all tailored for Papua New Guinea's rice sectors.

This bottom-up and collaborative approach should also extend to capacity development, capacity sharing. We should no longer employ the traditional uni-directional transfer of knowledge and skills. It is time for the next generation approach: mutual learning, co-development and sharing evidence, innovation and technologies among partners. CGIAR research engagement in Africa takes this approach. CGIAR partners in Ethiopia, Rwanda and Senegal are prototyping a model with NARS (National Agricultural Research Systems) partners leading the research aimed at enhancing sustainable research, development and innovation capacities, catalysing investment and delivering impact. As well, we have 'citizen science', which is increasingly a powerful tool, a bottom-up approach that engages local communities in research. For example, we involved banana farmers in data collection for crop improvement and pest management. Farmers across Asia and Africa shared pest-sighting and crop-health data in real time using mobile apps. This helped improve pest management techniques, reducing crop losses and providing wonderful data for the scientists as well.

Multi-stakeholder platforms can boost inclusion by bringing together diverse groups such as farmers, researchers, policymakers, and private sector representatives to co-create and implement solutions. All these types of partnership-focused, inclusive approaches have led to smarter innovation, more equitable distribution and greater stakeholder buy-in, enhancing the sustainability and the impact of our science.

Partnership examples

To look at partnerships in more detail, first consider PABRA (Pan-Africa Bean Research Alliance). This very successful model of co-creation and partnership has successfully influenced policy, and delivers innovation to farmers. Africa needs new varieties of beans that can grow more quickly, produce higher yields and withstand climate impacts such as drought, as well as pests and diseases. Farmers and consumers also have preferences in the colour, shape or size of the beans, and the beans have to become more nutritious because they are a staple crop in many parts of Africa.

To meet these needs, PABRA unites farmers, researchers, policymakers and development partners to address the challenges of bean production across Africa. Its approach involves farmers in the research process, ensuring

that the bean varieties developed meet their preferences. They also wanted to shorten the life cycle: it has been reduced from 90 days life cycle to about 70 days. PABRA has helped 37 million farmers across the continent, 58% of whom are women, to feed their families and expand their businesses and strengthen their communities. Right now, we have about 650 bean varieties that are used by smallholder farmers and communities.

PABRA's success has significantly influenced agriculture policy in several African countries. For example, bio-fortified beans that are rich in iron and zinc have been integrated into national strategies to combat malnutrition. In Rwanda, PABRA's work led to the integration of improved bean varieties into the crop intensification program, boosting both food and nutritional security. By involving stakeholders at every stage, PABRA has created a model where science effectively informs and shapes policy, leading to sustainable agriculture and improved livelihoods, particularly of farmers. For this PABRA received last year, 2023, the Africa Food Prize in recognition of exceptional leadership in both expanding but also protecting the biodiversity of beans.

As a second example, CGIAR is actively engaged in reducing greenhouse gas emissions in livestock production through several innovative approaches. One of the key strategies involves the adoption of improved livestock farming practices and the selection of specific breeds that are more efficient in converting feed into meat or milk. We are aiming to have less methane emitted per unit of production, which is a huge challenge, particularly in most of the lowest-income countries. A combination of livestock genetic gains, drought tolerant and water-efficient forage species, the use of knowledge networks and pioneer households, and the use of comprehensive feed databases and tools to aid in decision making and environmental analysis, has allowed higher buy-in from the farming community.

We are integrating all these strategies, not just taking one approach. The genetics of the livestock; the forages, most of which are new, coming from the ACIAR genebank; the work with the communities; and the influence to the policies to align with it, will allow us to reduce greenhouse gas emissions from livestock by 30%, contributing to the global effort to combat climate change.

Another compelling example demonstrates co-design in technical innovation, in a concept called Agroecological Living Landscapes (ALLs), spanning seven countries. We have tried it in Zimbabwe, Tunisia, Burkina Faso, Kenya, Senegal, Peru and Laos. These agroecological living landscapes are spaces for multi-stakeholder engagement among actors who are part of territorial food systems. Participants exchange views and knowledge, and co-develop and adopt agroecological innovations.

ALLs integrates agriculture, environmental and socio-economic research to develop and achieve realistic and context-specific agroecological transition aligned with the 13 agroecological principles such as soil health or economic diversification. ALLs includes local farmers, researchers, policymakers, collaborative partners, communities; and the fact that we bring them all together allows us both to be scientifically robust and to meet local needs. This collaborative framework has led to significant policy impact by engaging with national authorities and stakeholders from the start. The initiative ensured that the policy shift was both impactful and sustainable.

These three examples demonstrate how collaboration can meet complex intertwined challenges. The interdependent nature of these challenges necessitates comprehensive approaches that cross partnerships, cross sectors, cross disciplines and cross continents.

About CGIAR

CGIAR works with about 3000 global partners to develop and deploy innovative strategies to adapt and mitigate these challenges. We work in over 80 countries. We have a staff of about 10,000 people across 15 centres. Here are a few examples of how our partnerships are addressing the interconnected challenges between food and nutrition, food security, nutrition security, health, climate and sustainability.

Our work harnesses the rich genetic resources available in nature. CGIAR has about 11 genebanks that provide genetic variation, across 3000 plant species, to researchers, to extension services programs, to communities and farmers around the world. These help users develop options for more resilient, diverse and environmentally sound agrifood systems. On a smaller scale, we also support community seed banks, which are essentially farmers' social networks designed to produce food and deliver seeds, especially to marginalised farming communities. As well, through our national breeding networks partnerships we are pioneering the development of nutritious crop varieties with higher tolerance to climate variability. For example, our drought-resistant super beans are maturing 33% faster; flood-tolerant rice has brought a yield increase of up to 1.2 tonnes per hectare; and we have distributed about 200 varieties of climate-smart maize across sub-Saharan Africa, with around 40% greater yield.

Looking ahead

Looking ahead, broad but strategic partnerships that integrate agriculture, environment and health will be pivotal in our effort to achieve food security and improve human well-being. We can develop and scale new innovations together. For example, new technologies and tools for mapping and discovering food composition offer immense potential.

I am very proud to be part of PTFI, the Periodic Table of Food Initiative that is led by the Rockefeller Foundation. PTFI addresses a crucial gap in our understanding of food biomolecular composition, through an easy standardised platform. It truly shows collaboration, engaging partners from both the Global South and the Global North, and a wide array of disciplines such as food, agriculture, environmental science, human health, data science and analytical chemistry.

One of its recent studies, published in *Nature Food*, included the meticulous curated list of 1650 nutritionally and culturally diverse foods. That paper shows that when you look at all the food and all the biomolecules, we know less than 1% of the biomolecules. So out of the 20,000 biomolecules that we found in the first thousand foods, we knew fewer than 50 of them. That has underscored a critical opportunity for our scientific understanding of nutrition.

When we talk about nutrition, we think we know that if I take vitamin D I can absorb it in the same way as another person. Well, that is not true. That is why we are bringing the American Health Association into alliance with CGIAR and with people from the agriculture sector, to better understand nutrition. I encourage you to look-up PTFI and access that paper (Jarvis *et al*. 2024) and see how over 40 years of analyses show that we know only about 1% of nutrition.

Another example is a collaborative project between the Alliance of Biodiversity International and CIAT (The International Center for Tropical Agriculture) with cultural support from Kenya's smallholders to co-design diversified maize mixed farming systems, to improve practices and policy support. The project uses on-farm participatory action research called the Mother-Baby approach (Rusike *et al*. 2005). Scientists first run the 'mother' demos and then the farmers later run their own experiments called 'baby' demos.

More than half of the participants were women in this example, and of the results one farmer said: 'Using crop diversification and water management technologies, I can harvest beans and follow up with maize. My family is assured of food.' This kind of co-design research is the future for improving sustainable practices and food security, and that is just a glimpse of the many methodologies that we are looking into and that we are trying in different parts of the world.

Global investment

We cannot discuss transformative international agricultural research and development, the subject of this session, without addressing a core need: global investment.

Myself, I am not just a science manager or CEO: I used to be a scientist. Throughout my career, I have watched as investment in agricultural research and development, particularly in low-income countries, has declined. According to the Status 2030 Report, we need to double investment in agricultural research and development to end global hunger and malnutrition. That is why a significant increase in funding is required to strengthen productivity, sustainability and resilience of global food systems, particularly for the Global South.

In 2023, for example, only 7.4% of the public funding Official Development Assistance (ODA) globally was spent on research and innovation. We need definitely more ODA to be spent on research and innovation to tackle the root causes of hunger and malnutrition, to build resilience in agrifood systems, and to prevent crises from occurring in the first place. And we cannot rely on ODA: ODA is very limited.

We need collaboration and contributions from across society. This means the promotion of public–private partnerships and innovative financing, and I think Australia is a very good example in that sphere. Further, the research and development overseen by people like us in this room must be better targeted toward the Global South, where climate impacts are most greatly felt, and particularly to small island and big ocean countries as well.

Only 5% of agricultural research and development is currently relevant to the Global South, where the world's most vulnerable people live. Therefore, as we navigate the complex landscape of agricultural research and development and the challenges it needs to meet, I call on all of you to invest, innovate, collaborate and be true partners to each other and to the Global South.

Our collective success hinges on our ability to connect and align. By embracing robust partnerships and co-design we can achieve greater impact and build a more resilient and sustainable future. Let us move towards a shared commitment to collaboration. Together we can do it, but only if we come together and if we address SDG 10 along with SDGs 1 and 2: zero hunger, no malnutrition and reducing inequalities in the world.

I think with science we can, and we need to speak up a bit louder, to say the things we know and the things we don't know, to recognise them, but above all really working together as equals. It's learning: not one way, but both ways.

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Dr Ismahane Elouafi is the Executive Managing Director of CGIAR. She previously held the position of Chief Scientist at the Food and Agriculture Organization (FAO) of the United Nations. She was earlier the Director General at the International Center for Biosaline Agriculture (ICBA) based in the UAE. Dr Elouafi previously held senior scientific and leadership positions, including Senior Adviser to the Assistant

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KEYNOTE Q&A

Chair: Professor Wendy Umberger

Chief Executive Officer, ACIAR

Q. Peter Wynn, Charles University: Thank you very much for the excellent talk. You spoke about producing high quality foods in all these countries. Yet with climate change, we are going to increasingly have extremes of climate, like floods and drought, and so the distribution of high quality foods becomes important. Merely sending grains around the world controls energy and protein. But how about hidden hunger? And how can we get high quality foods in packages in drought- and flood-affected areas and war zones where people are starving? And so it becomes a distribution problem. How do we do that?

A. Ismahane Elouafi: That is a very good question. Definitely, I think we need first to diversify our agrifood system. The fact that we are using 125 species and only a few animal species and a few fish species is not good for the environment nor for the planet. Diversification is a must. If you go to a bank they will tell you to put your money in different portfolios. Same thing with food. We cannot have only a few countries producing, or only a few crops produced in different parts. I think we must have adaptation and be getting ready for the plus-2 degrees and plus-4. It is important to have diversification.

In relation to conflict zones, unfortunately, the number one problem causing extreme hunger is conflict, before climate change. That's what the World Food Programme says; that's what the data say. They are human-made issues, and the only way we can [solve hunger there] is to do more in the conflict and post-conflict zones. We have shied away from them, considering the issues mostly humanitarian. But we recognise now that in most of those zones it's not a matter of weeks, it's a matter of years. Hence, working in that particular area and working on a humanitarian–environment nexus is very important. Within the CGIAR we are developing our research portfolios for 25 to 30 years ahead, and the scientists came together and said we need to find solutions for those people as well, those that are in conflict or post-conflict zones so that we save lives.

It is something that we are debating and developing. What kinds of strategies, and who are the partners we need to work with? We had projects in Syria when the Syrian conflict happened, and the same case applies right now in Sudan and in many other parts of the world: Somalia, Democratic Republic of Congo, and so on. I think scientists need to jump in and find solutions to help those people.

Chair: It is really good that CGIAR continues work in conflict zones. We are proud that CGIAR remains committed to agricultural research and development in conflict zones.

Q. Shanice Van Haeften, The University of Queensland, and a Crawford Fund 'nextgen' scholar: Thanks for the opportunity to be here today. I guess we know what these problems are. What is your advice on the challenges of going in-country and trying to co-develop these partnerships and relationships to form meaningful projects that people on the ground want, when you often have funding bodies which have different priorities that may not directly align with what people on the ground might want or need?

A. Ismahane Elouafi: That's a very difficult question. Unfortunately, many of the organisations do not have the luxury of really doing what is needed, because the donors also have quite a lot of push towards their own priorities. I think that's a reality. And that's where I like very much the model here in Australia, with the levy. At least you have a levy, and then that may give you a pot of money that you could use somehow with some liberty to use it in the countries where you need to.

I am Moroccan originally. I moved to Canada in 2004, and my first year was with McGill University. I began in the lab of Diane Mather, who now is at The University of Adelaide, and I remember we were designing a project for the Canadian International Development Agency at that time, and we had a meeting with students. And the students told me they were going to go to Africa to help farmers. These were first year or second year, or even fourth year agriculture students. And I said, 'Really? You think you are going to go and help? Isn't it the other way around, that you are going there to learn, or at least to have a two-way exchange of information?'.

I think that is the bottom line. We need money that is independent from any agendas, and we need to tell the politicians that ODA has to be non-political; that there can be a levy, for example like GRDC and others, that is non-political.

There is also the relationship with the local people. When you go into a country, you have to recognise that they have been there for millions of years, so they know something. With those students (I was a professor at that time), I told them, 'It is about learning. It's not about going and showing African farmers how they are going to do it. Your professor might be helpful to the farmers in that way. But you, as a student, you are going to learn, and the learning needs to be in both directions.'

I think we come in with a presumption that we know it all. It seems to me that the best formula is to recognise the local knowledge, because the knowledge locally is the best because they know their environment better than anybody else. We might have the trends, but they have lived there for centuries. You combine the local knowledge with the new technology, the new analyses, so as to find better solutions for that particular environment or particular ecosystem.

Chair: The listening part of the engagement is very important. I might just make a comment, Ismahane, with regard to ODA funding. ODA funds are separate to levies. When Sir John Crawford and colleagues established ACIAR, they made it very clear that as part of our Act and as part of our mission we listen to our partners and their issues. 'Localisation' is the big key word right now – but ACIAR has been doing that from the beginning. We don't have strings attached other than keeping in line with the values of the Australian people, and I think that has really been why we have been able to have such strong partnerships over time, with that listening approach and considering the comparative advantages of our Australian agricultural innovation system.

We are lucky that the research and development corporations like the GRDC are able to sometimes co-contribute. It may not be well known that over 70%, maybe as high as 80%, of the varieties of wheat in Australia have come out of CIMMYT, through largely Australian funding that has gone into the R&D to produce those varieties. That is, varieties grown here came through that CGIAR system.

Q. Sud Kharel, DPIRD Western Australia, and a Crawford Fund 'nextgen' scholar: My question is around climate change. How do you get farmers in all those countries to change their behaviour, knowing what's going to happen in 2050? Also how do you tackle what's currently happening and help them with that, and also get them to be ready for what's happening in 2050, which might be shifting the farming systems?

A. Ismahane Elouafi: In the mountain areas of Morocco where I grew up, farmers never adopted any new varieties. They always refused them. They grew a mix of varieties anyhow, because they are not farming big lands, not thousands of hectares; they have really small plots. They didn't believe in the science, but they knew that the climate is changing: it has been going on for a while. One year you get more rain than others. So these farmers grow a mixture of grains, and hence if there is rain, this one will come up. If there isn't much rain, this

other one is going to come up. The coping capacity of farmers is huge! We need to understand that, and we need to work with it.

It seems to me that shifting of behaviour or coping with climate change is needed more in modern agriculture than with subsistence farmers. And in that sphere, you need to align all of them: data and science; science communication is very important. As scientists we tend to write papers that only other scientists can read. We need to speak up, and I think Next Gen should use the new media and the new communication tools to speak up and say what science is and what we find out.

You need to have the right policies, you need to have the right investment, and you need to have a plan. Things won't happen by themselves, and I think that's where national systems are very important, and national strategies.

Look at the UN Food Systems Summit (UNFSS) that happened in 2021. We were looking at the SDGs, and all the countries were providing their reports on Non-communicable Diseases and what have you, and the SDGs as well.

With reference to the Food Systems Summit in 2021, we said that we are off track completely for SDGs 1 and 2, and the only way to solve that is to have national pathways. So every country needs to define how they going to transform their agrifood system, and the only way to do it is to provide metrics. There are about 200 indexes that are published in *Nature* by a cohort of scientists that came together.

Last year we had the first one which we called UNFSS+2 that was reporting from countries at the national level. How they were going to transform their agrifood systems; and it was mostly by change of practices in adaptation to climate change.

What is lacking is incentives, right now.

I always say agriculture is maybe the hardest sector to be in, and I think Minister of Agriculture is one of the hardest jobs to have, because we are asking agriculture to produce food. We are asking agriculture to not emit anything. We are asking agriculture to not use enough resources. It is a sector that has a lot of pressures, and it is a sector where incentives are not well aligned with that strategy. We need to align the incentives. The best situation would be that the farmers are paid for the food they produce, and they are also paid for the ecosystem services that they provide.

But right now, the metrics and the standards are very, very off. Carbon credits started over 20 years ago, and they are not working, except in few markets. They are not improving the lives and livelihoods of small-scale producers because we are not able to monitor carbon sequestration; so the incentives are not aligned. If we really want to have a transition and transformation of the agrifood system, it has to be national. We have the standards and we have some targets that are regional or global, but it has to happen nationally. We need the policies and the regulations to be aligned.

And we need to incentivise farmers. If you don't incentivise farmers, they won't change. It is the only way to do it, and I don't think it is happening properly. Europe tried, partly, but it was mainly within Europe. There were a lot of mistakes there as well. Many countries are not yet aligning the policies, the incentives and the new strategies to transform their agrifood systems.

There is need for more science. As I said about nutrition, we know only 1%. We talk about the soil microbiome, but we know very little in human health, in livestock … there is a lot of knowledge that is not yet there; and we are not investing enough in science and innovation to reveal that, and in biology in general.

Chair: Thank you so much for some great points raised. This point about needing more funding into agriculture R&D is one that is very important. I think people may not realise that funding of agriculture R&D can help reduce the need for humanitarian aid, and reduce many of the conflicts around the globe, because people are in subsistence conditions or short on food or needing more income, which agriculture can contribute to.

Sometimes we forget to tell the good story about agricultural investment. Agriculture R&D can contribute to solving health issues. Funding is being taken from agriculture to other needs such as humanitarian aid and health, and many of those health issues are diet-related and agriculture could play a role in solving them. Climate is also related to health and humanitarian issues, and (as we say all the time) agriculture makes huge contributions to climate. So, I think the CGIAR has much important work to do. And as a behavioural economist (prior to becoming ACIAR CEO), I would encourage study to improve understanding of what incentives drive people and how they decide to adopt new practices and to change their behaviour. More investment is needed, including in social science, economics, and policy understanding.

I would like everyone to join me in thanking Ismahane for her presentation.

SESSION 2 OVERVIEW

Constructing effective high-quality research partnerships

Professor Hampus Eriksson

Senior Scientist, WorldFish;
Professor, Australian National Centre for Ocean Resources & Security (ANCORS),
University of Wollongong

ABSTRACT

Partnerships are viewed as a central part of the global food system transformation agenda. In recent years there has been a growing focus on research-for-development partnership models. The CGIAR framework for 'Quality of Research for Development' is helpful in organising ways to think about how research can be impactful. It organises four elements of research: Relevance, Scientific Credibility, Legitimacy and Effectiveness. Among research leaders, legitimacy and effectiveness have been found difficult to operationalise and this hinders adoption. In addition, a global assessment of agricultural research found that only about 2% of published agricultural and agronomic research has original and high-quality data for small-scale producers. Prioritisation of technical innovations, academic definitions of research excellence, unequal research collaborations, and funding constraints appear inhibiting to research application. My presentation emphasises research culture and how the perfect research-for-development strategy is of little use without research behaviours and attitudes to support it. I argue that legitimacy is a precursor to effectiveness. A shift in research approaches from research-for-development to research-*in*-development is one way to consider power over priorities and how research programming engages in partnerships.

The title of my presentation is the same as the session: 'Constructing effective high-quality research partnerships', but my talk focuses on what sits behind it, in terms of research principles, culture and approaches. First I will take you on a little bit of a journey to get there.

Figure 1 is a painting about the historical origins of island life in Malaita Province in Solomon Islands. It is painted by a local artist, named John Limaito'o and we quite often work with him for creating artwork around protected species, conservation and sustainability and food security. In this scene, women are coming ashore from the artificial islands in Langalanga Lagoon. They are bringing with them fish and other aquatic foods. On the other side, people are coming down from the bush. They are bringing roots and bush foods, and there is an old man with building materials. This is the heartbeat of the Malaitan food system. They exchange aquatic foods and products from the sea for products from the land. Figure 1 looks like a painting from a historical

Figure 1. Painting about goods exchange in Malaita Province, Solomon Islands.

past, long gone, but a lot of these practices continue to be foundational for food and nutrition security in these settings.

Figure 2. Takwa Market in North Malaita.

Figure 2 shows Takwa Market in North Malaita, and as you can see the market is very simple by some definitions. Food is often traded on the ground, but throughout Christianisation and colonisation and modernisation these practices have remained more or less the same, inferring that it is a pretty good way to think about food system resilience and food and nutrition security in these settings.

From the outside, these systems often get tangled into narratives about food system transformation, and that they require external intervention to be made more effective or efficient. An alternative way to look at it is that these are the building blocks of a more food-resilient future in the islands of the Pacific. It is true that there is fragility and that a lot of the species or foods that are being traded at these markets are experiencing threats, and that is clearly where research has a role to play.

But as a critical reflection: What kind of research are we doing? How do we make our research 'count'?

Making our research 'count'

For several years I followed a project called the Ceres2030 project, which had a number of elements to it. One element was that it sought to evaluate the utility of research in addressing the great challenge of ending hunger. Quoting from the editorial that was published in *Nature Plants* on 13 October 2020,

> A surprisingly consistent result was that only around 2% of published agricultural and agronomic research has original and high-quality data about solutions for small-scale producers.

My point here is not to say that 98% of research is meaningless. I am sure it is very meaningful and has utility in various aspects of these fields. But the finding does raise a couple of questions about the research that we are doing and how we do it.

Words like 'legitimacy', 'relevance' and 'effectiveness' are being mentioned at this conference; and according to the prospectus this conference aims to focus on these features. This is something we work quite a lot with in the CGIAR, and the CGIAR has a framework of quality of research for development (Figure 3).

It is a really complicated space, and certainly not a new space: think about the utility of discovery science and various aspects of applied sciences, how they fit in with our pursuit and aspirations to do good and to make a contribution to these grand challenges.

- Relevance is the ability of science to listen, and to adopt priorities of the systems that it is trying to study.
- Scientific credibility is what we are taught at universities: how to define research questions; develop methodologies to answer them; our ability to analyse, interpret and draw conclusions from those data.

Everyone in this room is more or less capable of doing that, I'm sure. But we are not taught about relevance so much, and we are certainly not taught about legitimacy and effectiveness.

- Legitimacy is the ethical and fair representation of the participants in the system under study, to make meaningful contribution to the definition of research and the design of research, and its intended use.
- Effectiveness is the potential of the research to make a contribution; to be adopted.

The documentation of the CGIAR highlights this. A survey in June 2020 showed that among science leaders in the CGIAR, 'elements of legitimacy and effectiveness were most challenging to mainstream' into planning, management and practice (Figure 3). That raises a few questions, particularly given our own mandate that we are trying to make research count and make a contribution.

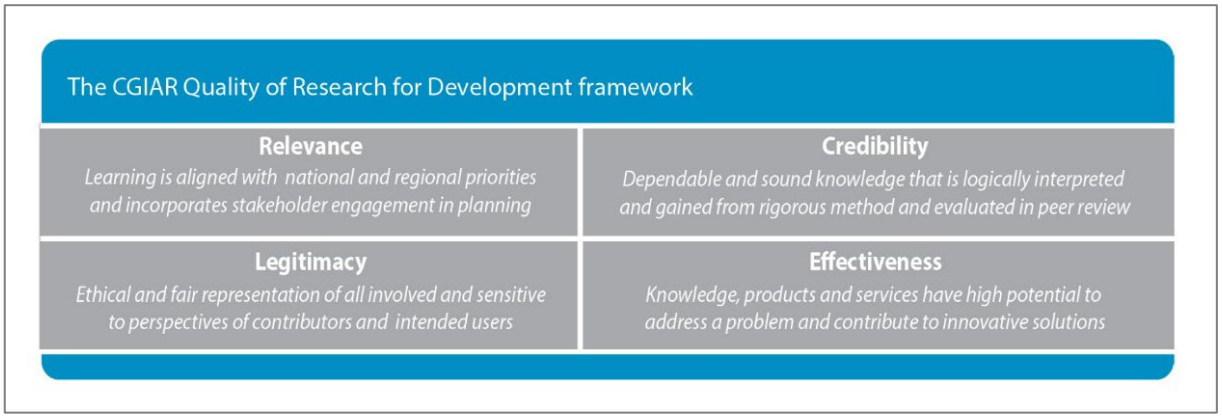

Figure 3. The CGIAR framework for recognising 'high-quality partnerships'.
Source: Independent Science for Development Council (ISDC) 2020.

I think a lot of our university qualifications, and the educational system in educating our next generation of scholars, do not really pay attention to the *point* of doing research – at least in our fields. This is something we thought a lot about. Several years ago, as we were going through a process of designing two new ACIAR projects for work together with the Ministry of Fisheries and Marine Resources in Solomon Islands, we wrote up quite a long journey of WorldFish in Solomon Islands (see Schwarz *et al*. 2021) – forty years next year – and we sought to discuss and use that experience as a way to think about these features: about legitimacy and effectiveness in particular.

We started working in Solomon Islands in 1985 under a hosting agreement with the national government. At that point, the ministry, today's ministry, was the Division of Fisheries under the Ministry of Agriculture, and it had about 20 staff members focused on coastal fisheries: areas that we are most engaged in. Fast forward to 2020 and there are now almost 60 staff members engaged in these areas of work; 80% of them have university qualifications and 100% of them have a diploma or above. The point is, the ministry is highly capable compared to the 1980s, and that means that WorldFish have to operate in a completely different way, and we have to think completely differently about the research that we do. The potential for research to be effective or impactful is possibly greater than ever. I think the Australian international development policy is well aware of that, and is recognising that there is a great need to develop approaches and practices to support those ambitions.

In the same paper, we sought to conceptualise some elements of thinking about the journey of partnership, and we used 'power over priorities' as a unifying concept. In Figure 4, these triangular-shaped bubbles are meant to represent (in blue) WorldFish's power over priorities, and (in green) the ministry's power over priorities. It is meant to represent that these days the ministry is not so much capacity-constrained as it is resource-constrained, and so we have to operate research programs and projects that seek to contribute to that resource.

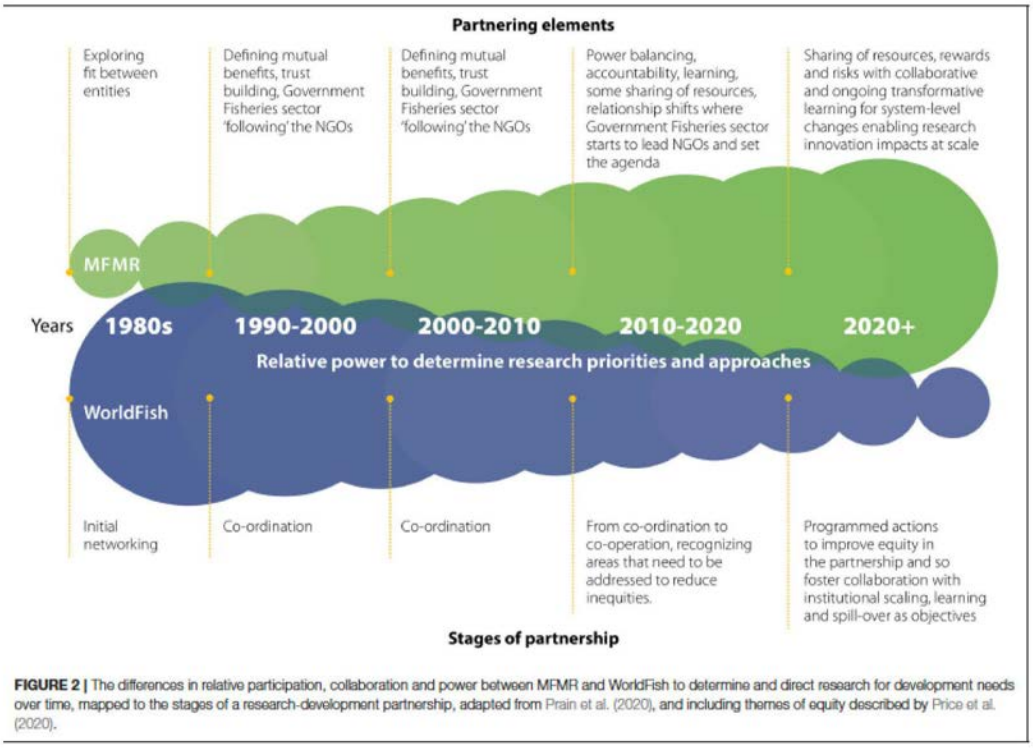

FIGURE 2 | The differences in relative participation, collaboration and power between MFMR and WorldFish to determine and direct research for development needs over time, mapped to the stages of a research-development partnership, adapted from Prain et al. (2020), and including themes of equity described by Price et al. (2020).

Figure 4. 'Power over priorities' illustration from Schwarz *et al*. 2021.

I would like also to make a point about the pursuit of organisational growth. The little blue bubble at the righthand end in Figure 4 is where WorldFish is today. In working for an international research organisation, the narrative is often about growing, with more money, more staff members. But an alternative way to think about it is 'being fit for purpose'. Our programs in Solomon Islands are quite small, and quite fit for purpose.

This also prompts some concepts, or ways to think, or approaches, where traditionally we talk a lot about research *for* development. It is a choice of words that we use in framing our work, such as in this conference, in the research that we do, and so on. But this way of thinking can also involve a shift in thinking about research *in* development and an integrated approach – to acknowledge that development is actually *not* separate from research (Figure 5). I don't think the intention with the 'research for development' vocabulary is to separate them, but by definition it somehow does. I think it has also given rise to a whole new body of work around knowledge transfer, knowledge translation, and all these things that are essentially a 'construct' from doing research for development.

An alternative way to think about it is to focus on investing research funding and resources *into* the development space, and creating those unique research opportunities that are not possible without that investment.

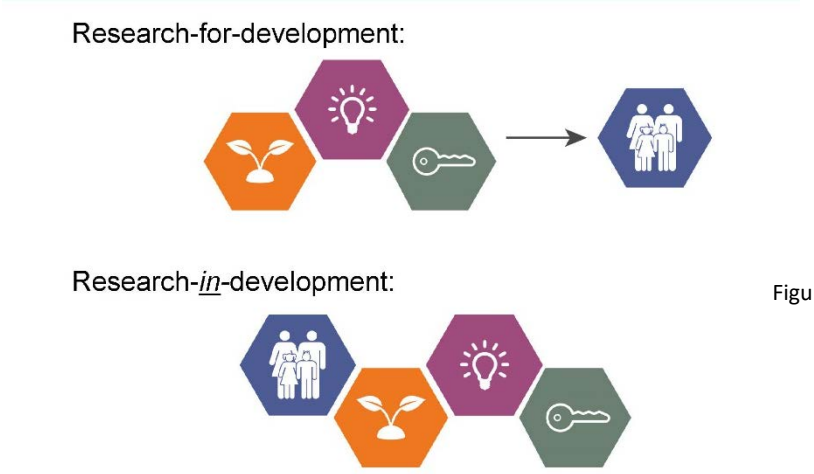

Figure 5. Research approaches.

Figure 6.

We operate a program across the Pacific based on ACIAR support. Across the network there is diversity. The point of Figure 6 is to say that it is very difficult to arrive at a conclusion about what is a good strategy, what is the strategy for engagement, national partnerships, national research and development models, and so on. Blueprinting a strategy, or a step-by-step process through which others can follow in similar footsteps, is impossible, because the single conclusion I can draw – from all these countries that we are operating with, and the multitude of partners that exist within them – is that all of them are at different stages of their own journeys in participating or understanding the role of research, their exposure to international research, their willingness to engage with international research.

For an ACIAR Project Leaders meeting for the fisheries program, I was asked to focus on 'the current strategies that you and your teams use to support the uptake and use of the knowledge you generate'. Again, this seems to be creating a position narrative: that first we do research and then we try to apply it somewhere or seek to have someone else apply it. I really struggled with this, because it is difficult to arrive at a blueprint or a strategy. We have documents that point our research pathways towards the national goal of the ministry and so

on, but they are just papers. A strategy is of little use unless there is a culture to support it. So my response was to deliver a cliché: 'culture eats strategy for breakfast'.

Over the years we have started talking more about research behaviours and attitudes, and ways to think about how we do research, than we do about the technical content and the scientific credibility of what we do. That has necessarily, for us, involved a transition away from evaluating ourselves based primarily on how many publications we have, and looking much more closely at how we engage in the conversations we are having with the right partners and whether we are listening to design research that meets demand.

Finally, speaking particularly to the Crawford Fund scholars, I encourage you to immerse yourselves in the 1980s and 1990s literature on Participatory Rural Appraisal and action research, because that school of thought contains principles around doing research that I think are highly relevant for ways to also think about partnerships and ways to engage.

Also, 'listen', 'have fun' and 'be nice to people' (Robert Chambers 1997). I think those are very good principles.

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Hampus Eriksson is a systems ecologist with 20 years' experience from transdisciplinary collaborations in the academic, fisheries and international development sectors in Africa, Asia and the Pacific. He holds a joint appointment as a Professor at the Australian National Centre for Ocean Resources and Security (ANCORS) at the University of Wollongong and as a Senior Scientist leading the WorldFish research program in Solomon Islands. In his WorldFish role he is also leading work in the CGIAR Initiative on Aquatic Foods, coordinating a growing program on island food systems. His research portfolio includes island food system assessment, and how to design and evaluate research for development initiatives in these systems. This is an applied research agenda that includes both theory and practice to nurture legitimate partnerships. Hampus is regularly sought by international organisations and research agencies, for advice and for leadership on incorporating such principles in partnership models and research design.

SESSION 2 CASE STUDY 1

Partnership through the Treaty Village Fruit Fly Trapping Program: Papua New Guinea and Australia

Ms Annastasia Kawi [1] and Mr Patrick Nai [2]

[1] Regional Agriculture Quarantine Officer – New Guinea Islands region, PNG National Agriculture and Quarantine Inspection Authority (NAQIA).
[2] Torres Strait Biosecurity Officer, Department of Agriculture, Fisheries and Forestry (DAFF).

ABSTRACT


The Treaty Village Fruit Fly Trapping Program (TVFFTP) was established in 2022 to understand the population dynamics of Oriental fruit fly (*Bactrocera dorsalis*) within the Treaty Villages of Papua New Guinea's (PNG) Western Province. This work complements, and is an extension to, the extensive fruit fly trapping and eradication program that was established in Australia's Torres Strait in the 1990s. Improving our understanding of Oriental fruit fly populations and movement throughout this region is mutually beneficial for both PNG and Australia. For PNG there is potential to minimise fruit fly impacts on agriculture and improve food security in regions that rely on subsistence farming. For Australia, prospects of reducing fruit fly incursions via the Torres Strait offer vast benefits for national biosecurity risk mitigation. The success of the TVFFTP is attributable to the collaboration between NAQIA (Papua New Guinea National Agriculture and Quarantine Inspection Authority), DAFF (Australian Department of Agriculture, Fisheries and Forestry), INLOC Operational Group, and the Treaty Village Ranger Network, and it is a testament to the genuine long-term partnership between our two countries. The social and cultural connection between the PNG Treaty Village Rangers and DAFF Torres Strait Biosecurity Officers is strong and is part of this project's successful partnership. This connection has strengthened biosecurity collaboration across the region and builds on the long-standing connectivity across our close borders.

We are giving a joint presentation about the Treaty Village Fruit Fly Trapping Program (TVFFTP) for Papua New Guinea (PNG) and Australia, including linkages to the National Exotic Fruit Fly Eradication Program in the Torres Strait. We will cover the purpose of the TVFFTP, the collaborators, the challenges, benefits, outcomes and the link between Treaty Villages and Torres Strait islands, and the future plans for the program.

Treaty Village Fruit Fly Trapping Program

Between DAFF and NAQIA we have more than 20 years of partnership in conducting combined plant and animal health surveillance, and one such collaboration is the Treaty Village Fruit Fly Trapping Program. The program commenced in 2022 to understand the population of Oriental fruit fly. The Treaty Villages are located at the southern border of PNG, just above the Torres Strait Islands (Figure 1).

The Oriental fruit fly is one of the world's worst horticultural pests, with more than 400 host plants, and it causes detrimental impact to food security in the community. The Treaty Villages rely on food gardens for their livelihood which are at risk of Oriental fruit flies. The Oriental fruit fly also impacts biosecurity outcomes for both countries.

Fruit fly trapping is undertaken in 14 Treaty Villages and Daru island. Two traps are set up in the 15 sites, cleared on a fortnightly basis during January to June because of the wet season, and on a monthly basis during July to December because of the dry season. This program is an extension of the established National Exotic Fruit Fly Eradication Program in the Torres Strait, outlined below.

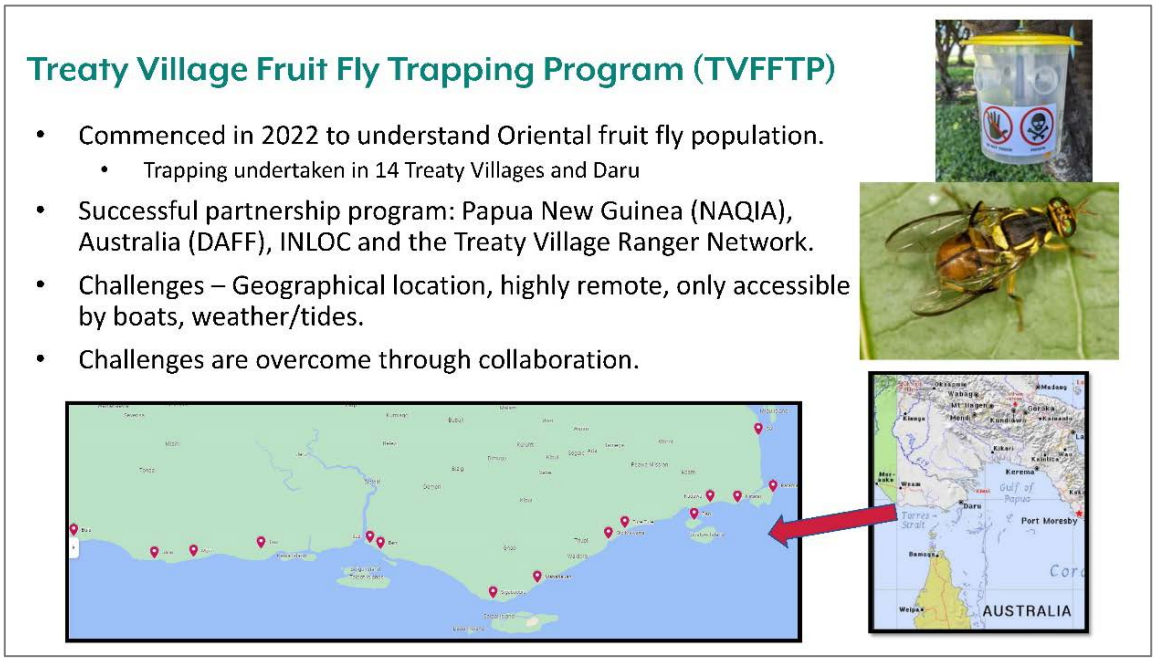

Figure 1. An adult Oriental fruit fly (6–8 mm long), and a trap;
and maps showing the Treaty Village locations along the south-west coastline of PNG.

The program is co-designed and co-delivered between NAQIA in PNG and DAFF in Australia, involving multiple partners in their respective roles and responsibilities. INLOC (a training and operational support group) and the Treaty Village Ranger Network conduct the operational support to collect and maintain fruit fly traps. Since 2022, more than 50 rangers have been trained on the field monitoring of fruit fly traps. Fruit fly traps are cleared by the rangers and the collections are sent by INLOC to entomologists in DAFF to undertake analysis and species identification.

The Treaty Villages are accessible only by boat, and access is dependent on the weather and the tides, but these challenges are being overcome through the strong partnership that has been developed.

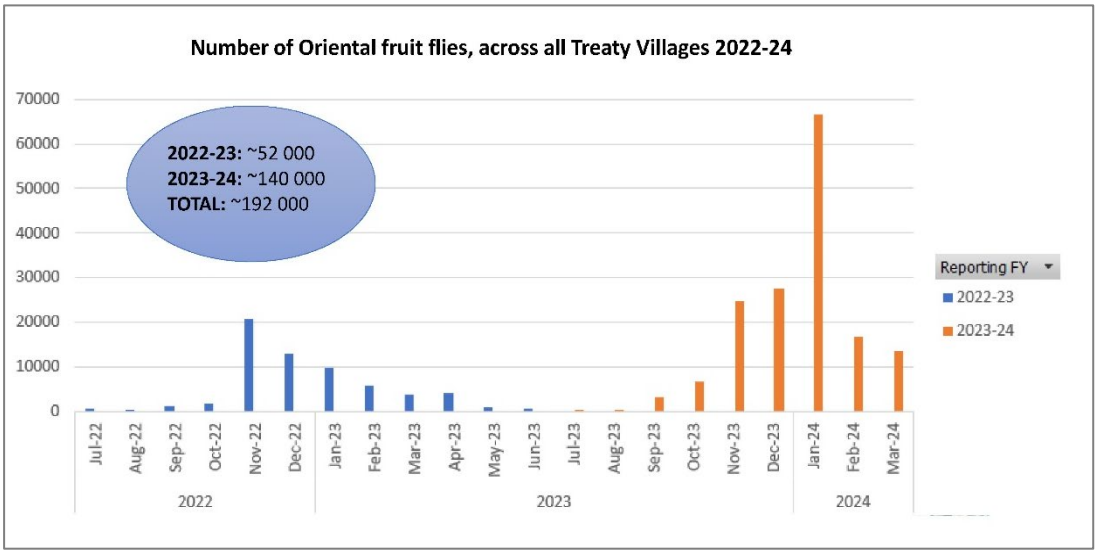

Figure 2. Outcomes of the Treaty Villages Fruit Fly Trapping Program.

The graph (Figure 2) indicates the number of Oriental fruit flies that have been collected in traps since 2022. There is a seasonal trend in fruit fly numbers, which coincides with the wet season when mango and other host species are fruiting in the area. We had a lot of flies trapped in the fruiting season for 2023–24 (Figure 2). We do not have a clear reason for that increase, and therefore we will continue trapping to find a way to manage these flies. The seasonal trend is not unique. A similar trend of fruit fly numbers is seen in the Torres Strait. Oriental fruit fly first spread to Torres Strait in 1993, soon after its incursion into Papua New Guinea.

Torres Strait Exotic Fruit Fly Eradication Program

There is also a National Exotic Fruit Fly eradication program undertaken in the Torres Strait. There are a series of over 100 permanent traps installed right across the islands and the northern peninsula area. These islands are numerous and isolated, and helicopters are required to have access to these locations (Figure 3).

We have two different types of trap: ME (metal eugenol) traps and Cue-lure traps. These have to be cleared on different days and flies are kept in separate sample boxes to avoid cross-contamination. Biosecurity officers from Thursday Island access these locations to collect fly samples, and then send the samples to entomologists in Cairns for analysis.

As already mentioned, the Torres Strait has a similar trend of flies caught in the traps, but the numbers are not as high. This is why there is a program in place to eradicate exotic fruit flies in the Torres Strait before they get to mainland Australia. Torres Strait is like a buffer zone (see the map in Figure 3). When a high number of exotic fruit flies are detected, the response program starts, under the direction of the scientists in Cairns.

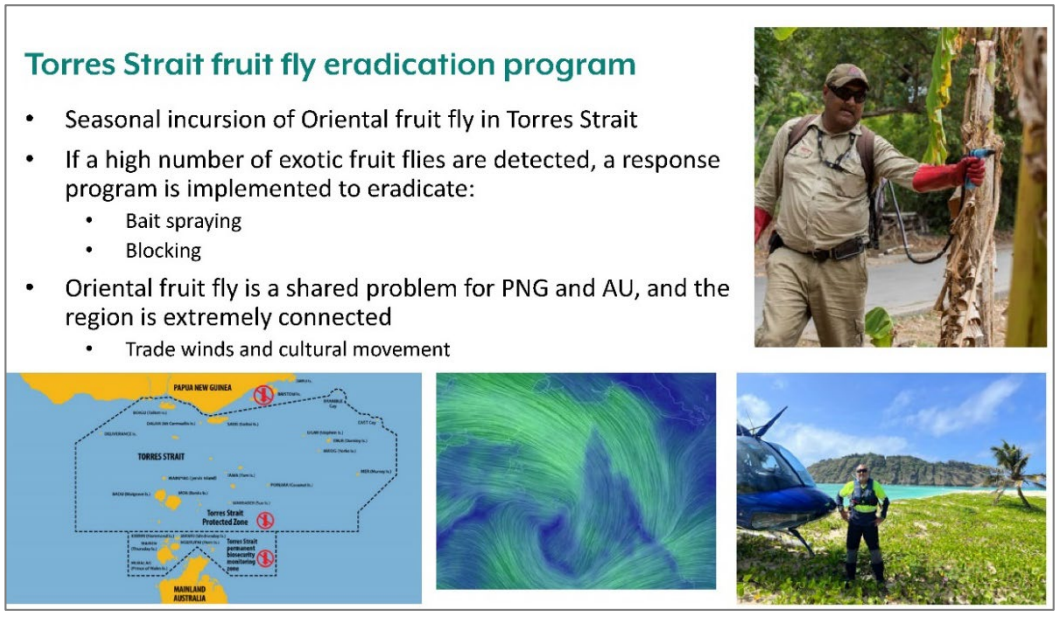

Figure 3.

- Response activities include bait spraying and bait blocking:
  Bait spraying is done by biosecurity officers on the island. This mixture of a lure, natural pesticide and water is sprayed on edible-fruit trees, on and under leaves or on the trunks of the trees, avoiding the fruit. This spray kills female flies. The task varies depending on the size of the island. It can take three hours or more to spray, occurring once a week for 12 weeks, or until no more flies are detected. It is better to spray in the morning when the flies are more active.
- Blocking is coordinated by Biosecurity Queensland. A pesticide block, which is nailed onto trees, kills male flies.

The region between PNG and Torres Strait is extremely connected, meaning the impact of exotic fruit fly is a shared problem that we need to manage together. The Torres Strait Treaty between PNG and the Torres Strait permits cultural movement of people between Torres Strait Protected Zone – the one in the middle in the map in Figure 3 – and the Treaty Villages of PNG. Travel must be for traditional purposes only, as there are strict conditions attached to the Torres Strait Treaty: for example, a wedding, church activities, funeral, bartering or trade. But there is still a strong connection here.

There are also trade winds (Figure 3) that blow across from PNG to the Torres Strait, which could be helping exotic fruit flies from PNG to jump to the Torres Strait during the monsoon season.

Cultural connections are important

As a result of my (Patrick's) experience in managing fruit fly in the Torres Strait, I was able to support the Treaty Village Rangers by attending training in PNG last November, to share my experience and knowledge with the rangers. I opened the training session with cultural acknowledgement, to acknowledge the traditional owners of the land, to reassure them, to 'Eso them' (thank them) from the team delivering the training, and to share connection between Torres Strait and the Treaty Villages. I also shared that 'This is a two-way street: we are here to learn as well. This is your place, your home, your culture. You have the local knowledge. We are not here to deliver to you, but to learn from you as well.'

We demonstrated the fruit fly management techniques that are undertaken in Torres Strait including spraying and blocking, between myself and our scientists in DAFF (Figure 4). There was also a demonstration of cultural management techniques, including banana leaf wrapping, from a representative from PNG villages. The Treaty Villages don't have shops nor resources, so this is the next best thing to protect their crops.

Figure 4.

This opportunity was very special to me, as my family bloodline goes back to PNG. I shared the Torres Strait Creole language to strengthen the connection, shared jokes and icebreakers. During this training, there was support from Treaty Village Rangers for trial of fruit fly management to be done within the Treaty Villages to help reduce the number of flies and the damage that they see on their crops.

Future plans for the TVFFTP

- The future plans for the Treaty Villages Fruit Fly Trapping Program include trials of fruit fly management techniques in the Treaty Villages, which will benefit the food security and biosecurity of Treaty Villages, PNG and Australia. The outcomes of this study can be applicable across PNG and other Pacific Island countries. Community engagement and support are key in these collaborations.

- Ongoing refresher training will be held for the Rangers; e.g. a session is scheduled for October 2024.
- We are also collaborating with AgriBio in a genomic study to understand if there are any genetic links between the Oriental fruit fly in the region.
- Social and cultural connections between Papua New Guinea Treaty Village Rangers and DAFF Torres Strait Biosecurity Officers are very strong, and are part of this project's successful partnership. Connections have strengthened biosecurity collaborations across the region, and they build on a long-term partnership across our close borders.

Figure 5. Treaty Village Rangers receiving their certificates after completion of the fruit fly training.

Annastasia is an entomologist with 28 years of experience working with fruit flies, from identification to understanding their biology, conducting host testing and damage assessment on commercial cultivated and wild fruits and establishing trapping as early warning systems for detection of exotic species. Additionally, she has conducted field management studies on fruit flies using integrated pest management techniques. She has been involved in five ACIAR-funded projects and Department of Agriculture and Livestock (DAL) entomology-related trials on fruit flies, Red Banded Mango Caterpillar, Mile a Minute weed, and weevil and viruses in sweet potatoes. Annastasia joined the National Agriculture Quarantine Inspection Authority (NAQIA) in 2014 as the Regional Plant Protection Officer overseeing plant health issues in the New Guinea Islands region based in Kokopo, East New Britain province. In 2018 she moved from the Technical Division (Plant Health) to Operations Division within NAQIA. In this role, as the Regional Agriculture Quarantine Officer for the New Guinea Islands region, Annastasia is responsible for the administrative management of regional operations program activities covering border control programs and management and administration of staff and resources. With her wealth of experience, she is fortunate to be part of the Treaty Village Fruit Fly Training Project and able to impart skills and knowledge to the biosecurity rangers. Community engagement is very important to conduct surveillances in very remote villages. Understanding their lifestyle and allowing community members to express their views in understanding fruit fly species and which species infests which common food crops is important for the rangers. Annastasia has a Graduate Diploma and a Masters Degree in Plant Protection from The University of Queensland Gatton campus.

Patrick Nai was born and raised on Thursday Island and his family background is from Yorke Island, situated in the Central Torres Strait and part of the Kulkalgal Region of the Central Islands. He commenced his role as a Biosecurity Officer for the Department of Agriculture and Water Resources in 2016, and was involved in a range of projects including plant health and animal health survey assistance and small vessel surveillance. Patrick is currently based at the Thursday Island Office working on Operations, Public Awareness and Scientific programs. His current role is Biosecurity Officer in the Operations Program. He is involved in activities associated with Avian Influenza and Asian Citrus Phylid Trapping. He is also involved in the annual animal and plant health surveys and the all-year-round Fruit Fly Activities.

SESSION 2 CASE STUDY 2

Creating strong channels of communication for agriculture policy research in Indonesia

Dr Wahida Maghraby

Agriculture Policy Analyst, Indonesian Center for Agriculture Socio Economics and Policy Studies, Ministry of Agriculture; and former Agricultural Attaché to the European Union

ABSTRACT

While agriculture is a key sector in Indonesia, agricultural research and development in Indonesia have had limited access to the national budget. From 2010 to 2020, research and development spending in the sector amounted to only 0.014% of the national GDP. The budget allocation was focused on increasing productivity and was biased towards the food crops sector. To make best use of this limited funding, a broad range of skills is required for building policy collaboration at different levels – community, regional, national and international. Central to this is communication and the building of networks. Without opportunities for capacity building and network building, the number of researchers with required skills and experience decreases over time. Advanced communication skills, strong networks with different stakeholders, and an open-minded attitude are considered key to the success of the research collaboration process, strengthening the partnership and increasing mutual benefit between partners. Indonesia needs investment in capacity building for early career researchers and policy analysts, to strengthen the translation from research into policy. A proven track record and history of successful collaborative research are strong factors that influence research partners and donors to open the door and provide an opportunity to develop high-quality policy research. Thus, it is important for research centres and policy units in Indonesia to expand their networks and be very creative in creating strong channels of communication with multi-stakeholder partners to develop high-quality policy research and increase impacts at community, regional and national levels, and increase international influence. This presentation provides examples of impacts with policy collaboration successes at the national and international level.

In this presentation I discuss creating strong channels of communication for agriculture policy research in Indonesia, and collaborative research and partnerships. Like other countries, Indonesia has been experiencing the spill-over of the global food crisis: trade distortion and effects caused by the COVID-19 pandemic which have not ended yet. Geopolitical tensions and their recent escalation contribute to high food prices. Last year's export ban for rice also had an impact in Indonesia and other countries, with high prices of staple foods, in particular rice. We are all experiencing the impacts of climate change that affect agricultural production.

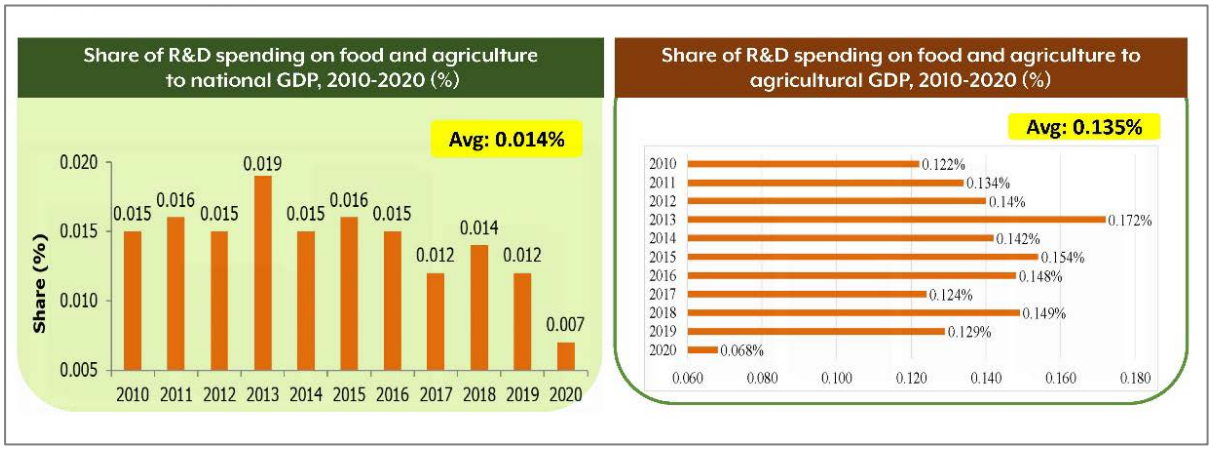

Figure 1.

Agriculture GDP grew positively during COVID-19, but the share from agriculture to the national GDP slightly decreased over the last decade. The numbers in Figure 1 show that the share of R&D spending on food and agriculture to national GDP and to agricultural GDP in 2010–2020 was very small.

As a solution, the budget allocation in 2015–2020 focused on the increase in productivity and was biased towards food crops (Figure 2), which is important and unavoidable because we are the fourth most populous country in the world. The capacity of the country to provide food security for the consumers, the people, is a strong message for every cabinet, every president in Indonesia.

The amounts and shares of R&D spending by thematic areas, 2015-2020

R&D Spending	Thematic Areas			
	Breeding	Cultivation	Post-harvest	Food Security
Food Crops:				
Thousand USD	5,396	1,705	448	906
Share (%)	35.81	11.31	2.97	6.01
Horticulture:				
Thousand USD	1,530	405	170	0
Share (%)	10.15	2.69	1.13	0
Estate Crops:				
Thousand USD	665	268	83	0
Share (%)	4.41	1.78	0.55	0
Livestock:				
Thousand USD	2,726	677	91	0
Share (%)	18.09	4.49	0.60	0
Total:				
Thousand USD	10,317	3,055	792	906
Share (%)	68.46	20.27	5.26	6.01

The amounts and shares of R&D spending by impact areas, 2015-2020

R&D Spending	Impact Areas			
	Productivity	Nutrition	Climate Resilience	Sustainability
Food Crops:				
Thousand USD	7,477	317	110	264
Share (%)	50.05	2.12	0.74	1.77
Horticulture:				
Thousand USD	1,724	144	160	131
Share (%)	11.54	0.96	1.07	0.88
Estate Crops:				
Thousand USD	924	45	0	38
Share (%)	6.18	0.30	0	0.25
Livestock:				
Thousand USD	3,084	140	87	295
Share (%)	20.64	0.94	0.58	1.97
Total:				
Thousand USD	13,209	646	357	728
Share (%)	88.41	4.32	2.39	4.87

Figure 2. Current major R&D initiatives and spending trends.

Developing and brokering collaborative research and policy formulation

To make the best use of this limited funding, a broad range of skills is required for building policy and global collaboration at the different levels: in this case, community, regional, national and international. Central to this, communication and building networks are very important.

Indonesia needs high quality research to support the cycle of policy formulation, starting from agenda setting, then policy formulation, dissemination, and the adoption process, as well as increasing the effectiveness of

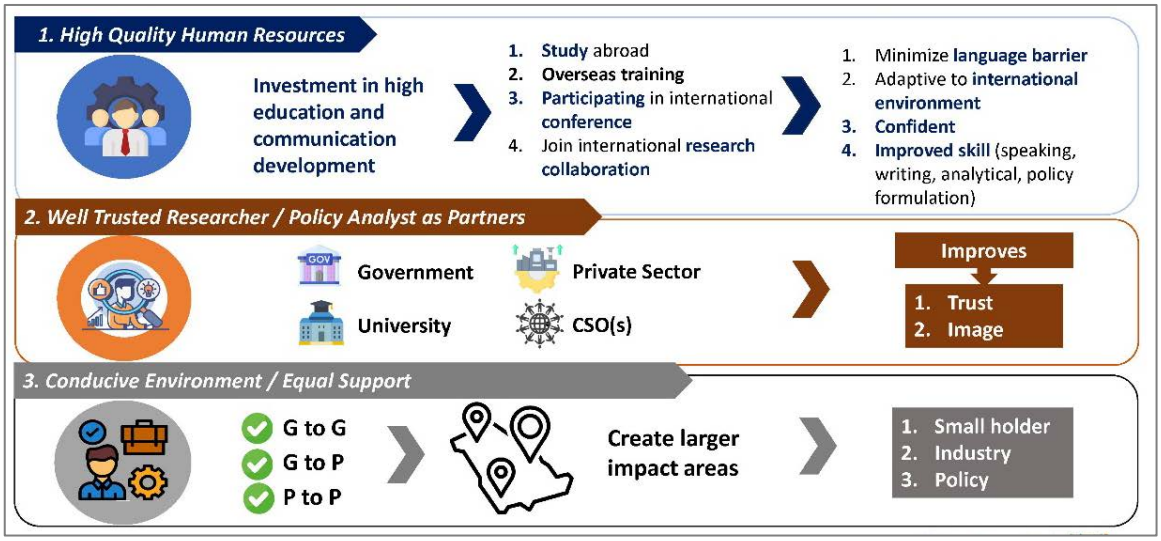

Figure 3.

policy implementation. I have learnt and experienced that these factors are very important to create a high quality research partnership.

Indonesia needs an investment in capacity building (Figure 3) for early career researchers and policy analysts to really strengthen the translation from research into policy. We need to become well trusted researchers and policy analysts to become research partners, between the government, private sector and university, as well as civil society organisations (CSOs). It will really improve the trust and image of Indonesians as partners. Also, we need a conducive environment that will support collaborative research and policy making: government to government, government to people, and people to people. I believe that this will create larger impact to, first, the farmers, the smallholders, who really get the benefit coming from this; second, to industries; and third, to policies.

Creating strong channels of communication

Advanced communication skills, strong networks with different stakeholders, and open-minded attitudes are considered the key to the success of the research collaboration process, strengthening the partnership and increasing mutual benefit between partners.

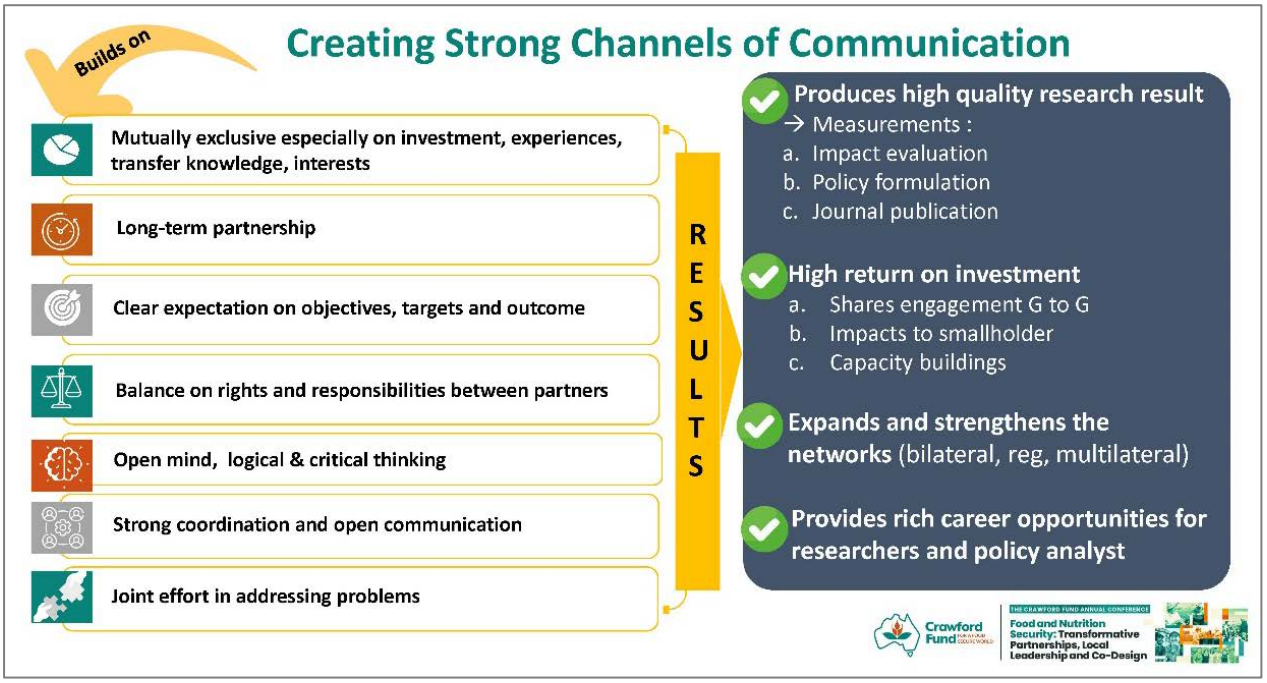

Figure 4.

The key to synergising the private sector is to create strong channels of communication (Figure 4) and then that builds on mutually exclusive interests, especially on investment, experiences and knowledge transfer. It builds on long-term partnership. And it is very important to have clear expectations on objectives, targets and outcomes, and a balance of rights and responsibilities between partners. It is very important for us to keep an open mind, with logical and critical thinking, strong coordination, open communication and a joint effort in addressing problems.

I believe with this we are able to produce high quality research, and high return on investment (Figure 4). We are going to able to expand and strengthen the network bilaterally, regionally and multi-laterally. And last but not least, the large amount of new material generated will provide rich career opportunities for researchers and policy analysts.

The new setting of agriculture research transformation

At the moment, and since 2019, Indonesia is the new setting for agriculture research transformations (Figure 5). These transformations create significant impact by translating research and innovation into knowledge, which is also adopted at farm level, and strengthens the role of policy units at the ministry level. Strong partnerships,

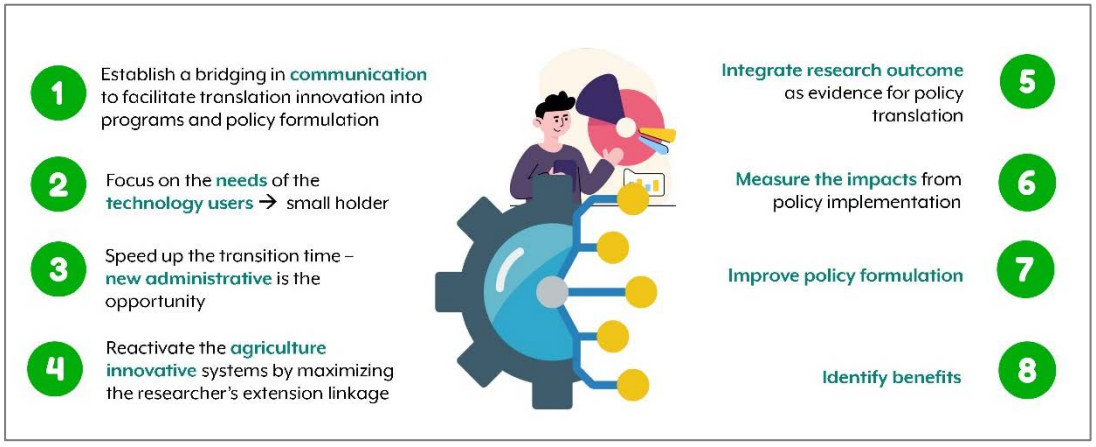

Figure 5.

integration and collaboration are key to accelerate the research link without creating any delay to policy formulation. These factors, I believe, are really important for us, and we need to work on them. Our first task is to really speed up the process. We need to focus on the needs. We need to shorten the transition time; new administration is the opportunity.

Impacts and benefits of ACIAR projects in Indonesia

Figures 6a,b,c,d are examples of impacts and benefits from various ACIAR projects in Indonesia, showing how strong communication channels play a role to connect multiple parties to perform these projects effectively. Indonesia and Australia share similar concerns in these sectors.

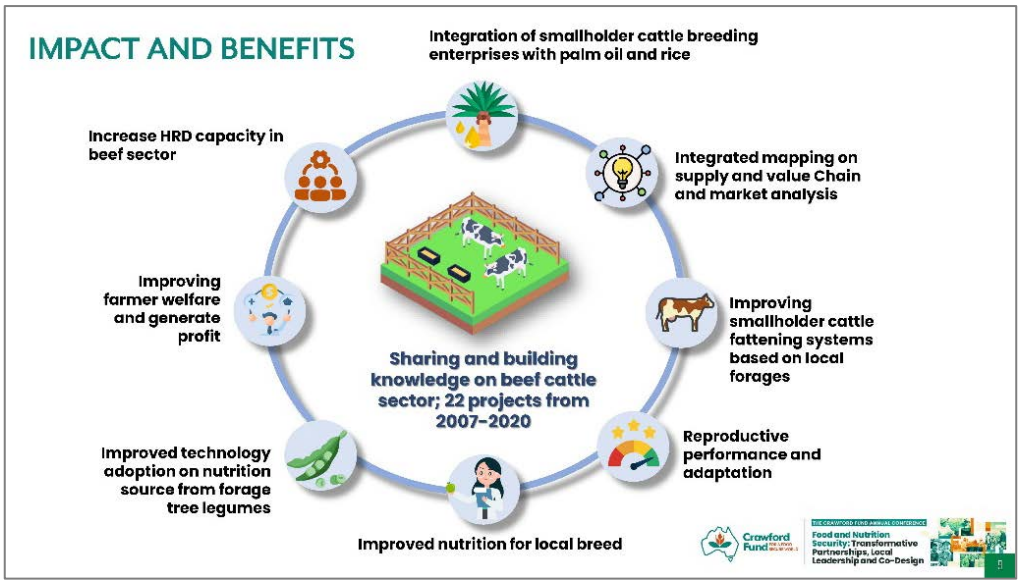

Figure 6a.

ACIAR has been supporting Indonesia in 22 projects from 2007 to 2020. Among impacts and benefits that were identified most fully was integrating market supply and demand. This first project (Figure 6a) improved smallholder cattle fattening systems based on local forages. The project was focused in the eastern part of Indonesia: East Nusa Tenggara and West Nusa Tenggara and some locations in Australia. It also helped farmers

improve reproductive performance and adaptation, and improve nutrition locally, while also improving farmer welfare and profit. Another benefit has been to increase the capacity in the beef sector where lots of researchers have become much stronger by participating in this project.

Figure 6b.

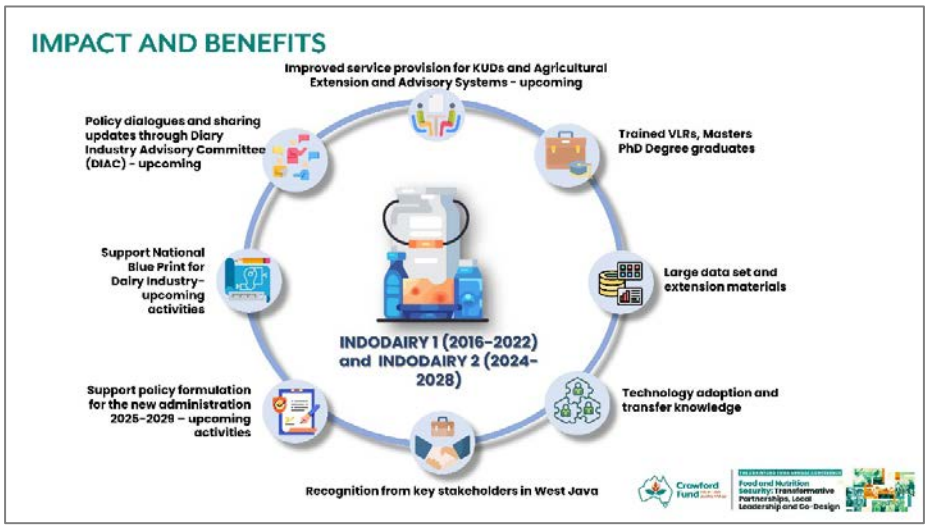

Figure 6c.

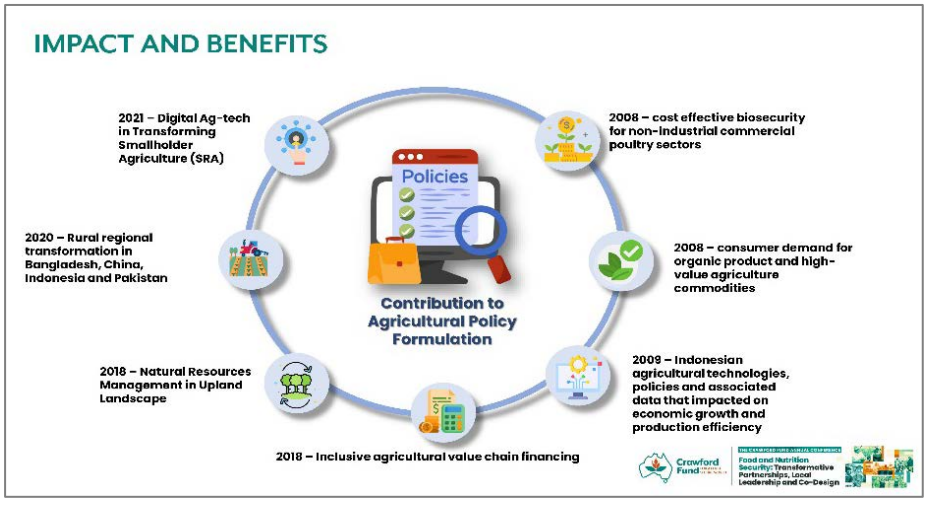

Figure 6d.

Another project that is a good example is the area-wide management (AWM) of pest fruit flies in mango-producing areas of Indonesia (Figure 6b), focused in the mango belt in the northern part of West Java, and on the Gedong Gincu variety in the east part of East Java. Fruit flies are one of the most serious horticultural pests globally. Through this project, it is very important for us to provide low-cost technology for smallholder farmers. This is what we need. Low-cost technology. It is also helping researchers mapping the supply chain. The project gives farmers the opportunity to access modern retail markets, by improving mango quality for domestic use and export. And it includes technology adoption, which is important for the farmers so they continue to use this technology. Ultimately, the project aims to prevent the spread of fruit flies in mango-producing areas in Indonesia.

The projects in Figure 6c are very timely because the next presidency will put very high importance on dairy production. There are two dairy projects: one ran from 2016 to 2022, and the other begins in 2024, led by David McGill. The first IndoDairy project trained Village Level Researchers (VLRs) which has been a very important outcome. We were also able to collect large datasets and extension materials. There is very good technology adoption and transfer of knowledge – very good outcomes of this project – and there is strong recognition from key stakeholders in West Java, which is where we conducted IndoDairy 1.

In the upcoming project, IndoDairy 2, we would like the project to support policy formulation for the new administration of the new president in Indonesia; support a national blueprint for the dairy industry (Figure 6c); and try to create policy dialogues and share updates through the Dairy Industry Advisory Committee (DIAC). By the end of 2028, we would like to see improved service provision for KUDs (village level dairy cooperatives) and agriculture extension and advisory systems.

ACIAR also has helped Indonesia to support agricultural policy formulation. Figure 6d maps the ACIAR projects from 2008 until 2021. In 2008, the projects focused on cost effective biosecurity for non-industrial commercial poultry sectors; and on consumer demand for organic produce and high value commodities. In 2009, the focus was Indonesian technology policy and associated data that impacted economic growth and production efficiency. The 2018 project looked at inclusive agriculture value chain financing; and at 'Natural Resource Management in Upland Landscapes'. Then in 2020, rural regional transformation. This was a multi-national project, in Bangladesh, China, Pakistan and Indonesia. In 2021, the project was about digital ag-tech transforming smallholder agriculture. This project is something new that Indonesia really needs. These projects have been proved to help Indonesia in sharpening policy formulation.

These examples demonstrate a proven track record and history of how channels of communication play a significant role in following up and facilitating successful collaborative research. Thus, it is important for research centre and policy units in Indonesia to expand their networks and be very creative in creating strong channels of communication with multi-stakeholder partners to develop high quality policy research, and increase the impact at community, regional and national levels, and increase international influence.

Collaboration and partnership are the keys to gain mutually exclusive benefits and impacts for Australia and Indonesia.

Wahida is an agriculture policy analyst at the Indonesian Center for Agriculture Socio Economics and Policy Studies (ICASEPS), Ministry of Agriculture. As well as developing new collaborative projects, Wahida's focus is in developing, monitoring and improving agriculture policies as well as policy advocacy and dissemination. Wahida is involved in two new ACIAR projects and continues her role in participating in other collaborative agriculture policy works with different donors and ministries. Wahida has a PhD in Global Food Studies from The University of Adelaide. From 2016 to 2020, Wahida was assigned as the Agricultural Attaché to the European Union based at the Embassy of the Republic of Indonesia in Brussels, Belgium.

SESSION 2 CASE STUDY 3

How do we partner for impact? Communication, co-design and outscaling

Dr Uday Nidumolu

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ABSTRACT

Achieving widespread development benefits from science requires a deliberate focus on enhancing both the research and development aspects of R4D activities and 'planning for scaling out'. To build good partnerships, we need to invest in good partnerships, not just good science. Authentic partnerships, common language, and innovative communication are critical to bringing science and community together, fostering co-ownership, and ensuring impactful outcomes. In development science, and particularly within climate adaptation projects, the synergy between partnerships, communication, co-design, and outscaling is paramount. Agriculture in rainfed systems is risky, and climate-related challenges can be managed to some extent using science, technology and data. However, addressing climate risk is inherently complex and dynamic, so not only does it require contextual knowledge and robust adaptation science, but authentic and complementary partnerships are critical. Farming communities managing climate risk in rainfed farming systems require access to reliable, locally contextualised information enabling them to act, learn, and generate new knowledge and skills. Research for development (R4D) in smallholder farming must integrate both scientific and community-driven approaches. In a case study project in southern India, the convergence of science and community in the use of climate information has been facilitated by finding a common language and employing innovative communication methods. This approach has proved useful in bridging the gap between scientific research and community needs. In a case study in Bangladesh and West Bengal, the co-design, co-development, and co-ownership of crop choice models highlight the importance of investing in partnerships from the outset. A project for scaling water management research across three states in India has highlighted the importance of designing R4D activities that can be scaled. Improved understanding by researchers in how to engage with large development project partners has led to enhanced uptake of R&D solutions.

How we partner for impact is a huge topic. This presentation shares a few actual case study examples from India and Bangladesh. I focus only on those three topics: communication, co-design and outscaling. Co-design is one of the themes of this conference.

Adapting to climate change in Asia

The Indian case study in Figure 1 was an ACIAR-funded project across four countries, and the focus in the Indian part of the project was on managing climate risk. As we know, climate science is more complicated than other sciences because it is a science that is probabilistic in nature with in-built uncertainty, so that when you talk to a farmer about seasonal climate forecasts and you say there is a 40% chance of exceeding the median, it is very hard for them to grasp. It is hard for anyone to grasp in its completeness! Although climate science relies on data and information, communities rely on local contextual knowledge, so we need to translate climate science into something meaningful for them when we engage in research for development (RFID or R4D).

To do that requires very strong partnerships: authentic, complementary partnerships between many people – from climate modellers to people who can translate that model into something science-based yet understandable by the communities who need the information. It is a big ecosystem of partners, and the partnerships must be very strong for this sort of uncertain science to have some impact on-ground.

Figure 1 includes a paper of mine (available online) called 'Enhancing adaptive capacity to manage climate risk in agriculture through community-led climate information centres'. The key point is that this cannot be 'top-down' climate science. Although we understand climate science fairly well, farmers have been dealing with it in farming for many many years. We need to connect them, to link from the bottom up, to talk in the same sorts of words that our users use: not about equations and graphs because that doesn't really help.

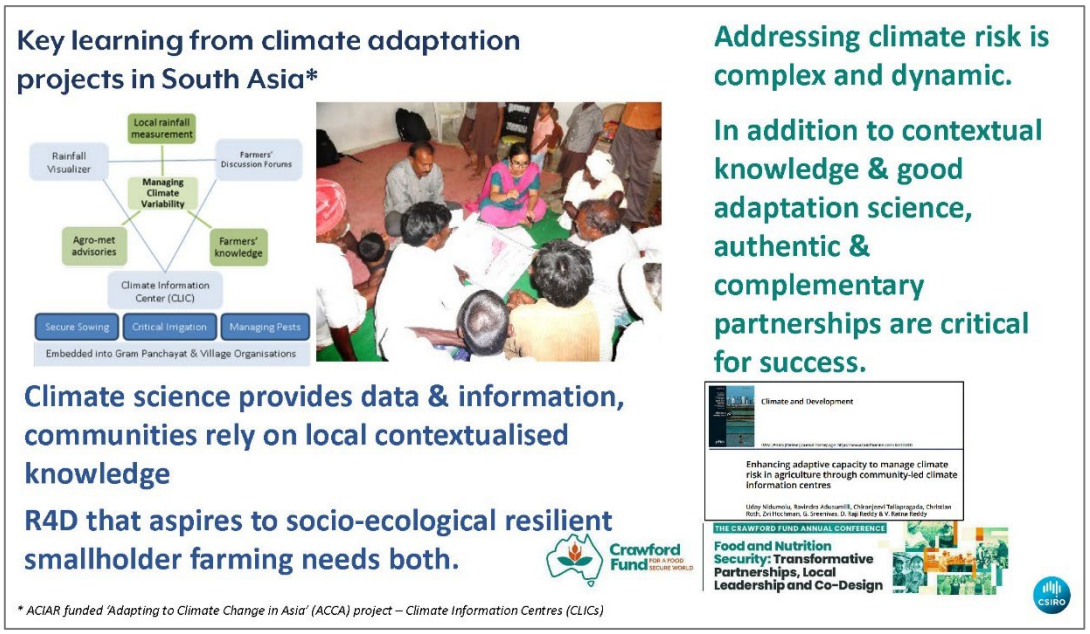

Figure 1.

One way we explored in this project to translate science is via theatre. Figure 2 is a still from a video of a little street play. We didn't plan this; it evolved organically. This street play translated our four years of research into a two-hour dance and song. It was fascinating for us because we didn't expect it. These performers learned all our key research findings in a week and they presented it in this format over a two-hour show! (As a scientist who can speak the local language, it is hard for me to get the farmers' attention to listen for more than ten minutes!)

Figure 2.

This is partnership in action: these performers are as important as the scientists because they are doing the big job of translating our science for the real people. In this photo the man is talking about sowing. Most people think a few millimetres of rain is enough to start sowing, but actually you need much more than that. This performer is saying 'Don't sow your seed at the first rain. Wait until there is enough soil moisture, and *then* you can sow the seeds.' Overall, the whole story took two hours. This group invested its effort into this R4D, and turned it into 200 shows, which meant our work got into 200 locations at no extra cost but in a very impactful manner.

My point in this is we need to find a common language between science and our target audience, and we need to find ways to translate our findings into action.

As researchers we should think about how to communicate our science, and for that we need very good partnerships. We believed in these guys; they believed in our science; we were equal partners. We never dismissed this as a little street show team. Instead, we said, 'You guys are much better than us in this way of communication, so why don't you do it?'.

Co-designing, co-developing and co-owning

What is co-designing? What is co-developing? Co-owning? I want to give you an example from Bangladesh and West Bengal. In traditional modelling there are three full steps. You collect data, build the model, and demonstrate it (Figure 3), and then you write your paper and report it. However, in this example, which is another ACIAR project (Socially Inclusive Agricultural Intensification (SAIGI)), I wanted it to involve the end-users from the start.

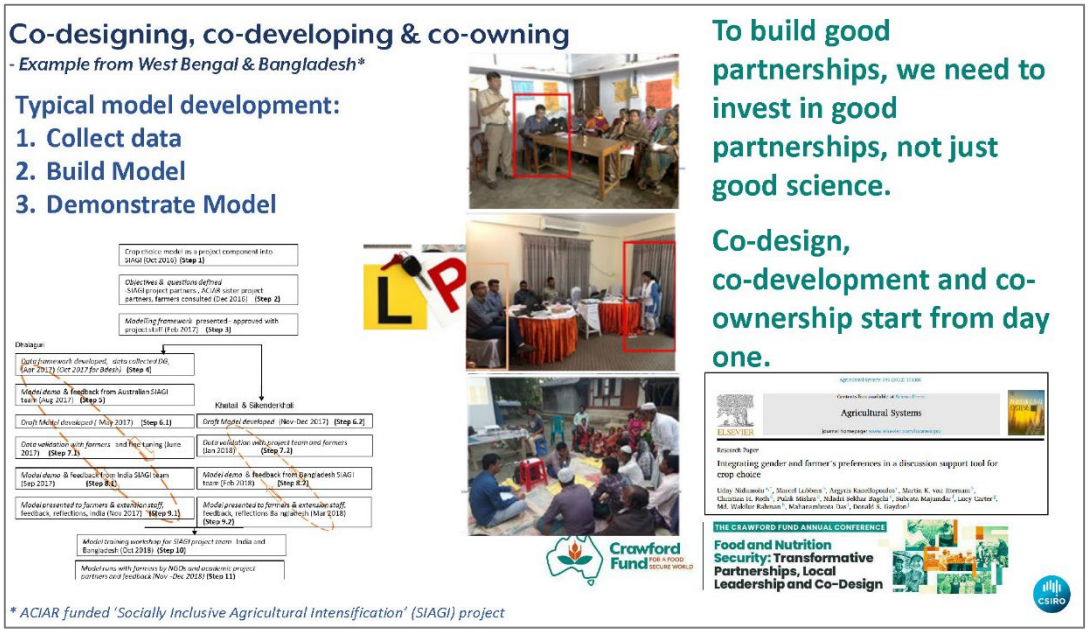

Figure 3.

It was not a three-step model, it was an 11-step model. We co-designed the model as a crop-choice model in the post-monsoon season, which meant farmers had a lot of choice between crops to plant. We asked 'What do you think? What do you plant?', etc. This was initially designed as a bioeconomic optimisation tool, which it still is, but it started as a tool where farmers would be part of the initial design. Somebody said gender is important, so we looked at how to include gender. The model took several iterations. For me as a scientist the easiest course of action would have been just to develop a three-step model. Instead, this model took a lot of effort, a lot of travelling in rural Bangladesh, eight hours on the rickety roads for example, and I did several trips just because I wanted to make sure it is inclusive. In the end, I feel satisfied that it has been done well.

The photos in Figure 3 show me running the model in a village in Bangladesh (top); one of the NGO partners running the model (middle); and the NGO partners running the model in the village without me present (bottom). That is, the ownership which was co-owned has now been transferred to them; they are running this on their own. (In Australian learner-driver terminology, they have passed their driving test and graduated from L plates to P plates.)

The point here is, this can be done if you put your mind to it and are prepared for the extra effort required, but it is worthwhile doing it. As it says in Figure 3, 'To build good partnerships, we need to invest in good partnerships, not just good science.' They do not happen by themselves, but they do happen when you put effort into it, just as in relationships and with friends.

Co-design, co-developing, co-ownership, they start from Day 1, in my opinion; they have to start from Day 1. It cannot be happening later. We published a paper, 'Integrating gender and farmer's preferences in a discussion support tool for crop choice', to share these ideas with other peers and show that these things can be done this way. I think that to include gender in a bioeconomic model was a new thing!

Scaling

The last case study is scaling. We talk about scaling a lot, but most research scientists are doing research (leftmost box in Figure 4) and are happy in that space. I think most of us in this room have ventured to the next box in Figure 4: that is, research for development. That is where, more or less, our boundaries are.

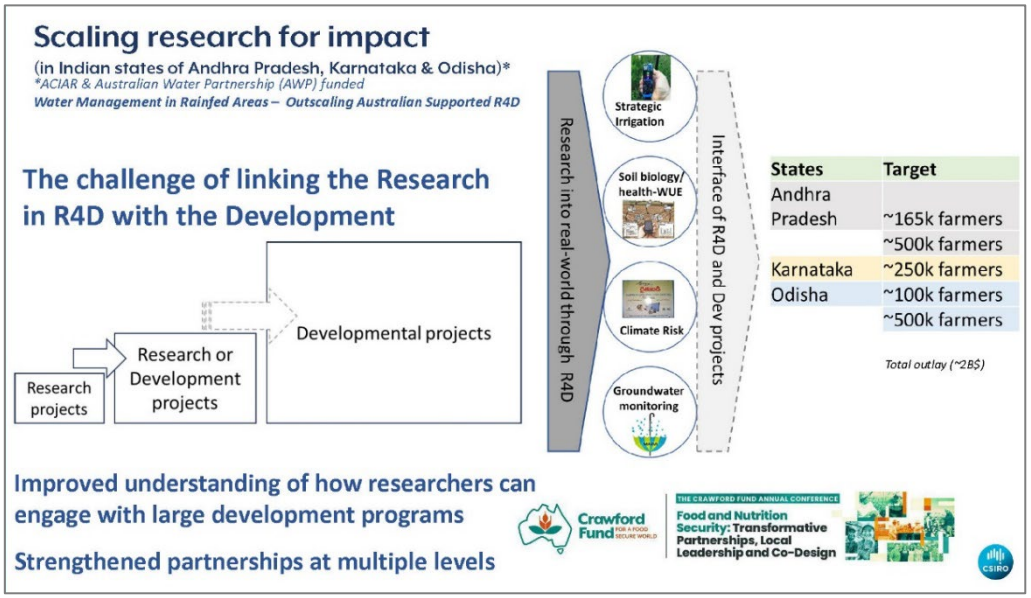

Figure 4.

In a new project, thanks to ACIAR and the Australian Water Partnership, scientists are discussing big development projects. It is not often done.

In this project, previous research has already produced four mature technologies: the Virtual Irrigation Academy strategic irrigation (devised by Richard Stirzaker); soil biology/soil health; climate risk (which I mentioned earlier); and groundwater monitoring. The methods for these four mature technologies were evolved in Australia and overseas, and they are largely Australian methods, techniques, tools. How do we scale them to reach the target farmers?

This involves five large projects in India trying to reach 1.5 million farmers (Figure 5), involving outlay of around $2 billion. We cannot scale them on our own, and so again partnerships come into play. We worked with them as an interface between science and the development projects. It was hard work because the research

language we speak is very different to the language spoken in the development space. We needed to understand how the projects will work, and they had to understand what research means. We had different country languages also, but in the process we learned how to do this well.

This project was successful, thanks to ACIAR for the confidence and partnerships at multiple levels. Now we are confident we can talk to the development projects staff. We can talk to the World Bank if you want to. It gave us confidence. Again, partnership is very important.

In summary, we need authentic complementary partnerships, common language, co-design, design for R4D.

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Uday Nidumolu is a Principal Research Scientist with CSIRO Agriculture and Food, and a research team leader for the Resilience and Adaptation area. He has over 25 years of professional experience and has strived to make a difference to the lives of farmers and smallholders. He has a strong interdisciplinary background and a systems approach to research for improved primary productivity and natural resource management outcomes. He has a Masters degree from University of Cambridge, UK, and a PhD from Wageningen University, the Netherlands, and has over 100 publications. He has led large project teams in multi-cultural, multi-institutional, multi-country and multi-disciplinary projects both in Australia and overseas. The focus of his work has been on achieving impact and scaling of research to maximise benefits to the key stakeholders. He has wide international experience in work, education, living and travel in India, UK, France, the Netherlands, Sri Lanka, Bangladesh and Australia.

SESSION 2 Q&A

Chair: Nicolas Gouletquer

Partnerships and Business Development Manager, Sustainability Program, CSIRO Agriculture & Food

Q. (female): Thank you very much. I would like to celebrate the inspiring presentations this morning, and I want to raise this theme for comment from the panel. We are in a transition. We've talked about inequality. We've talked about the way in which we do partnerships. We've talked about culture and its importance, the clarity in our language, the friendship and warmth we offer as we co-create. But we haven't talked about how much time and effort and cost it takes. I noticed in the last presentation it took between 2016 and 2018 to broker those relationships. I'm not sure how much the dancing cost, but I'm sure it had a cost. I think the second presentation talked about the back and forth, to understand whether the feedback was working and how the feedback could refine the approach. The first presentation talked about the respect for the science behind this. I'm keen to hear what is the proportion of time and investment in creating these types of approaches, not only for the initiation of projects, but to really understand how to scale and how to embed that learning?

Chair: Thank you very much. And also noting that sometimes the notion of time itself differs markedly from one country to another.

A. Uday Nidumolu: Time invested in partnerships. Yes. To me, that seems the most critical part of partnership, and especially in this space. If you are doing molecular lab work, that is a different story.

If you're wanting to translate your science to society, I would invest *any* amount of time just to make the partnerships stronger, because everything else will flow, because the objective is that this must be useful. For example, in this scaling project, I spent two years trying to convince ACIAR to fund me to do this, and now the fruits of that labour have paid off seriously well. You saw that song and dance: it was a one-week effort for us, but it had 200 shows.

We underestimate the investments in partnerships because it's like people: you have lifelong friends because you invested in them, right? This is exactly the same. I have had some of these partners for the last 20 years, so that makes it work efficiently. We have come to the point in the relationship where you can even disagree! In partnerships that's important. I don't think we should put a dollar figure on the partnership time. It cost money, of course, but if you are doing a $4 million project, and spend $15,000 on partnership, the partnership cost is nothing. That's my personal view.

A. Wahida Maghraby: Thank you very much. It's a very awesome question: how much time, effort and cost is required? I've been working in this area for more than 25 years. In my experience, I always treat the partner as my friend. I am always working from the heart, and I always find the most passionate people in building this partnership. And at the end of the day, you know, for us, Indonesia is a developing country, and thus developing networks is important for us. What we have to understand is: What is the most important outcome that we want from Indonesia's point of view? What is the mutual benefit for both countries (which in this case means Indonesia and the donors), and how this can make beneficial impact and improvement?

I know that measuring impact at the beginning is the hardest part, but you need to share and understand the narrative that we would like to generate from the partnership and common interest. As the first speaker in this session mentioned, you treat your partners as your friends. That has been the key for me. I have learned a lot from my colleagues about how to work with the younger researchers. It's opening my eyes and widening my ideas. It is important to involve the young generation (millennials and Gen Z). We can create room for collaboration and learning experiences across generations. At the end of the day, it is important for both partners to create collaboration opportunities, to develop a common interest and understanding, with open-minded attitudes, to increase the benefits and outcomes from the partnership.

Q. Neil Andrew, former Chair of the Crawford Fund: I am going to bring a very parochial and, I hope, practical approach to partnerships. I happen to have a property in the Riverland of South Australia. It has always been fruit-fly free. My question is to our Torres Strait islands and Papua New Guinea friends. My fruit-fly free property currently faces the reality of fruit fly in South Australia. Right now we are focusing on how to eliminate fruit fly in the Riverland of South Australia. I was fascinated by your practical approach in your region. In South Australia, there is a real effort to eliminate fruit fly by introducing sterile male fruit flies. The reason I raise that here is that the sterile males are effectively distributed by air, and it struck me that in the isolation that you face in those villages, in PNG particularly, and in the Torres Strait, there could be a lot of value in distributing sterile males simply by air. Don't ask me for a solution. You could ask Wendy Umberger and ACIAR about creating a transformative partnership, because that's what this question is supposed to be about.

A. Annastasia Kawi: I think the technique you mention, the sterile insect technique, is not really applicable in Papua New Guinea, within the small space of the Torres Strait and the Treaty Villages. Maybe in the future we can work on something. The Treaty Villages are subsistence farming, gardening. So, for them, something like bait spraying and blocking is more suitable at this stage.

Chair: Thank you everyone for your contributions to this session.

SESSION 3. TAILORING R&D TO DELIVER LOCAL ON-GROUND OUTCOMES

An overview of the Pacific Regional Research Collaborative Framework

Mr Mark Vurobaravu

Deputy Director, Department of Agriculture and Rural Development, Vanuatu

ABSTRACT

The 7th Pacific Heads of Agriculture and Forestry Services (PHOAFS) meeting highlighted the need for better research coordination and resource sharing to address development issues in Pacific Island countries and territories (PICTs). Funded by the Australian Centre for International Agriculture Research (ACIAR), consultations were held to develop a Regional Research Agenda (RRA) framework. The RRA vision is to identify common forestry and agriculture development challenges, establish Pacific research partnerships, and define research strategies. The RRA was presented and endorsed at the 8th PHOAFS meeting held in 2023. The RRA is broken down into three main components: Hearing Pacific Voices, Peer Review, and Partners in Research. The Pacific Community (SPC) as the secretariat is working closely with nominated Peer Reviewers from PICTs to test each component of the RRA. The testing has identified the need for platforms to hear Pacific Voices and ensure that research from the region is shared and documented. These initial findings have led the Peer Reviewers to recommend a biennial conference to bring together researchers, to share their work. Data access was also a challenge highlighted during the testing process. The Peer Reviewers are now working on a Regional Journal to support Pacific Island researchers to publish their work. The project team are currently testing the final component of the framework using the researchable priority of promoting climate resilient crops. The results from this will be shared with the PHOAFS in May 2025 at the Pacific Week of Agriculture and Forestry which will be held in Tonga.

I am speaking today on behalf of a group of peer reviewers who make up the team working to test the Pacific Regional Research Agenda. Our Peer Reviewers and the Secretariat of the Pacific Community (SPC) are working together to test our Pacific Regional Research Collaborative Framework, which I will refer to as the Regional Research Agenda (RRA) throughout this presentation. Through this opportunity to speak at this Crawford Fund conference it is our hope that we can find ways to better collaborate going forward, as we complete our testing process, and start to implement the RRA so as to achieve sustainability in our research work in the Pacific.

First, a bit of background on the original research agenda for the Pacific. The 7th Heads of Agriculture and Forestry Meeting in 2021 identified the need for better research, coordination and resource sharing across the Pacific Island Countries and Territories (PICTs) to address common research issues. With funding from the Australian Centre for International Agricultural Research (ACIAR), consultations were held virtually and face-to-face through workshops to come up with a framework for an RRA that could be tested. This framework was then endorsed at the 8th Heads of Agriculture and Forestry Meeting in March 2023, and SPC was tasked to work with member countries to test the framework. The testing process started in April 2023, with SPC as the Secretariat working closely with 17 nominated peer reviewers to test the RRA.

The vision of the RRA is that it identifies common forestry and agriculture development challenges in the Pacific region. It establishes research partnerships and defines strategies to overcome these challenges. The RRA brings decision making, leadership and planning into an inclusive Pacific process. Essentially, the RRA needed to be Pacific-designed, Pacific-owned, and a framework that could be implemented by the Pacific, where countries could bring complementary resources to the table to solve problems or address issues they have in common.

During the development of the regional framework (Figure 1), the following were the key components of the RRA: i) Hearing Pacific Voices; (ii) Peer Review; (iii) Partners in Research.

Figure 1. The Regional Research Agenda Framework. (*Source:* SPC 2022.)

Hearing Pacific Voices

This component looks at gathering the researchable priorities from member countries. It is an ongoing process and will involve SPC networks (Figure 2), national agriculture and forestry policies and plans, farmers and industry, civil society and research organisations. It is anticipated that these will also be collected and identified during panel discussions during regional meetings such as the Pacific Week of Agriculture and Forestry.

Peer Review

This part of the framework focuses on a system to set up the criteria to select the peer review group. That group is made up of leading researchers and experts nominated by the Pacific Heads of Agriculture and Forestry. The Peer Review Group will be key in driving and testing the RRA framework, as they will work with the Secretariat to sift through researchable priorities collected from the 'Hearing Pacific Voices' component.

Partners in Research

This part contains several key areas. First, once the researchable priorities are identified through the sieving process, the peer reviewers will set up a Regional Research Team made up of experts with expertise in the area highlighted as the researchable priority, which the RRA will be tested on.

Figure 2. Existing and active networks within the Land Resources Division of SPC.

Then, a stocktake of the resources required to address the researchable priority will be made, with contributions from countries that have the required resources such as infrastructure, technical expertise, etc., to address the problem. In this regard, any other resources required will be sought out by the Regional Research Team who can look for funding by putting together concept notes to access funding to implement research needed to solve the problem. Then results will be presented to the Heads and Ministers for endorsement in 2025.

To date, the 'Hearing Pacific Voices' and 'Peer Review' components of the RRA have been tested and the team is now working or moving to test the final component, which is 'Partners in Research'. The rest of this presentation, therefore, gives an overview of the lessons learned from the testing process, and opportunities for collaboration.

Testing

In testing the 'Hearing Pacific Voices', 12 regional research themes and 49 researchable priorities were identified across the Pacific, from PNG in the west to French Polynesia in the Far East.

While the review was extensive, the main lesson learned was that not all countries' voices were heard. Not all countries had national agriculture and forestry strategies, policies or plans in place. Other countries had strategies in place but consultations with the farmers, foresters and the private sector and other stakeholders may not have been thoroughly done. Therefore, it was important for a space to be created for more thorough consultations on the identified priorities so that voices from the different stakeholders within the agriculture and forestry sectors could be heard, to inform the researchable priorities of the PICTs.

Under the 'Peer Review' component, the first step was to establish the Peer Reviewers to lead the testing of the framework with support from the Secretariat. They went through the list of priorities and highlighted four main ones to focus on in the next steps of the process. In selecting a priority, one of the Peer Reviewers' considerations was the timeframe for trialling the research.

The theme 'Climate Resilient Crops' was identified as the most suitable priority to be used to test the 'Partners in Research' component of the framework. It was identified as a priority because partnerships could be

established quickly, and pilot activities could be tested in less than a year, in order to report results to the next Pacific Heads of Agriculture and Forestry Services Meeting in Tonga in 2025.

The trialling of the final component of the framework 'Partners in Research' has progressed. Five countries are part of the trials: Cook Islands, Fiji, Marshall Islands, Nauru and Tonga. A total of 69 publications were identified, and impacts to research, policy and communities, as well as research gaps, were identified. The key part of the research is to work as a region to fill knowledge gaps, with a significant focus on our farmers; specifically: What are the common challenges farmers face? How can we involve them in the research process? How can the resources of a regional public good such as the Centre for Pacific Crops and Trees (CePACT) be used efficiently and effectively to address these challenges? Who has used these resources? What has been planted? Can we learn from each other to identify resilient crops or varieties? How can we bridge the gaps between researchers, farmers, CePACT and governments?

This testing process is important as it will allow us to see how we work in partnership and collaborate as a region to carry out such research. Lessons from this regional research will also be presented in May 2025.

Opportunities for collaboration

The RRA needs to be driven by the Pacific, for the Pacific, and to meet research needs of the Pacific, and therefore to sustain opportunities for collaboration. One is to create a consistent platform to hear Pacific Voices. The Pacific Week of Agriculture and Forestry (PWAF) is suggested as the platform for an RRA side event where countries and stakeholders can be heard.

Also, there is potential for collaboration on a biennial conference to bring together Pacific Island researchers to share information and highlight the research and work that is being undertaken around the region, and to encourage equally important young scientists to be part of this process to foster collaboration in agriculture and forestry research.

Thirdly, the review highlighted the difficulty in accessing data and relevant literature from the Pacific. This was because a lot of the research carried out had not been published. Many researchers around the PICTs are more focused on the management aspects of their work and have little time to analyse and publish the findings. Therefore, a platform suggested by the Peer Reviewers is an annual 'writeshop' which will give researchers the support to analyse and write up their papers in preparation for the conference which is proposed as the side event of the PWAF.

The Peer Reviewers also highlighted that a regional journal was needed to support Pacific Island researchers to publish their data and research. The Peer Reviewers will trial the establishment of a Regional Research Journal to publish researchers' work, with papers from the conference feeding into the journal.

In summary, there is the opportunity for us to work together in these areas, particularly in supporting the sustainability of a biennial conference focusing on supporting our young researchers in the Pacific islands. We look forward to collaborating with you on how we can work together to support our Regional Research Agenda.

Mark Vurobaravu is the Deputy Director of the Department of Agriculture and Rural Development (DARD), Republic of Vanuatu. He currently holds a Bachelor of Agriculture degree from The University of the South Pacific, and a Master of Arts in Natural Science from the International Christian University in Tokyo, Japan. His area of expertise is in agriculture and climate change adaptation in island communities. He joined the Public Service in Vanuatu in 2008 as a Plant Protection Officer with the Department of Biosecurity, prior to joining DARD in 2012 as Principal Agriculture Officer responsible for agri-technical services. He was promoted to the position of Deputy Director in 2021. His 15 years' experience in the public service has also yielded strengths in leadership management, planning and public policy. Mr Vurobaravu is a current peer-reviewer representative of Vanuatu in the Pacific Regional Research Agenda for Agriculture and Forestry.

SESSION 3 CASE STUDY 1

Transformative partnerships for transforming the rice value chain for climate resilient and sustainable development of the Mekong Delta of Vietnam

Dr Tran Thu Ha

Team Leader, Low Emission & Inclusive Agriculture, SNV Vietnam

ABSTRACT

Rice cultivation has played a key role in Vietnam's development, providing livelihoods for millions of farmers and food security for the nation. The Mekong River Delta (MRD) is responsible for over half of Vietnam's rice production and 90% of its rice for export. Rice is responsible for almost 10% of Vietnam's greenhouse gas (GHG) emissions, and its negative environmental impacts include pollution and depletion of water resources, air pollution from burning residues, land subsidence and saline intrusion. These contribute to the extreme vulnerability of the region and its inhabitants to climate change. Without addressing the systemic challenges in a way that benefits farmers and the private sector, Vietnam will not meet its GHG reduction targets in rice production, and environmental degradation will undermine the long-term viability of rice-growing in the region. The Government of Australia is funding the 'Transforming the Rice Value Chain for Climate Resilient and Sustainable Development in the Mekong Delta' (TRVC) five-year program 2023–2027 that was co-designed by SNV Netherlands Development Organisation and the Ministry of Agriculture and Rural Development of Vietnam as well as provincial governments, private sector enterprises and agriculture researchers. The program leverages inter-discipline agronomic and eligible intervention research from both literature and on-the ground experience to support climate adaptation and mitigation. It does that by incentivising private sector companies in the rice value chain and smallholder farmers in the MRD to transition to low-carbon and climate-resilient agricultural practices. This paper documents the process of engaging the diverse stakeholders for the co-design and co-leadership of implementing the alignment of the high-level inter-government agenda between Australia and Vietnam. The agenda relates to the commitment to support sustainable socio-economic development, with a focus on climate change adaptation and mitigation, while addressing the emerging needs of rice grower communities and marketers in the context of adverse climate change phenomena in the Mekong Delta of Vietnam, with novel approaches to spur scalability and efficacy.

In this talk I share our local rice value chain development program that contributes to the green growth strategy of Vietnam. Vietnam is ranked in third place in the world as a rice exporter (Figure 1), with the Mekong Delta of Vietnam contributing about 90% of the total rice for export. White rice cultivation has multiple values and is a very important crop for Vietnam's economy. Rice production accounts for almost 50% of the total emissions from the agricultural sector of Vietnam. The Mekong Delta itself is undergoing major issues: water scarcity, associated pollution threats with dry intensive rice farming, and the adverse impacts of climate change. To address these high level and critical issues, we have been working in partnership with the government, the public and private sectors, climate change scientists and agriculture researchers to co-design the project named 'Transforming the Rice Value Chain for Climate Resilient and Sustainable Development in the Mekong Delta' of Vietnam.

Our first step in co-designing this project was to undertake a deliberate political and economic review of the priorities of the Government of Vietnam for the rice sector, as well as alignment with the international development policies of the Government of Australia. The co-design process took 12 months (Figure 2), from assessing the baselines and bottlenecks, to consulting and getting buy-in from the government and from private sector stakeholders and scientists. Finally, in March 2023, we submitted our full technical proposal. We secured the support and approval for funding from the Government of Australia. Soon after that, we reported the full design to the Ministry of Agriculture and had a face-to-face meeting to report it to our Minister in the Ministry

of Agriculture and Rural Development (MARD) of Vietnam, to be sure that the program is designed to target and contribute directly to Vietnam's latest rice development program: namely, 1 million hectares of high quality and low emission rice. The project is now in its implementation phase.

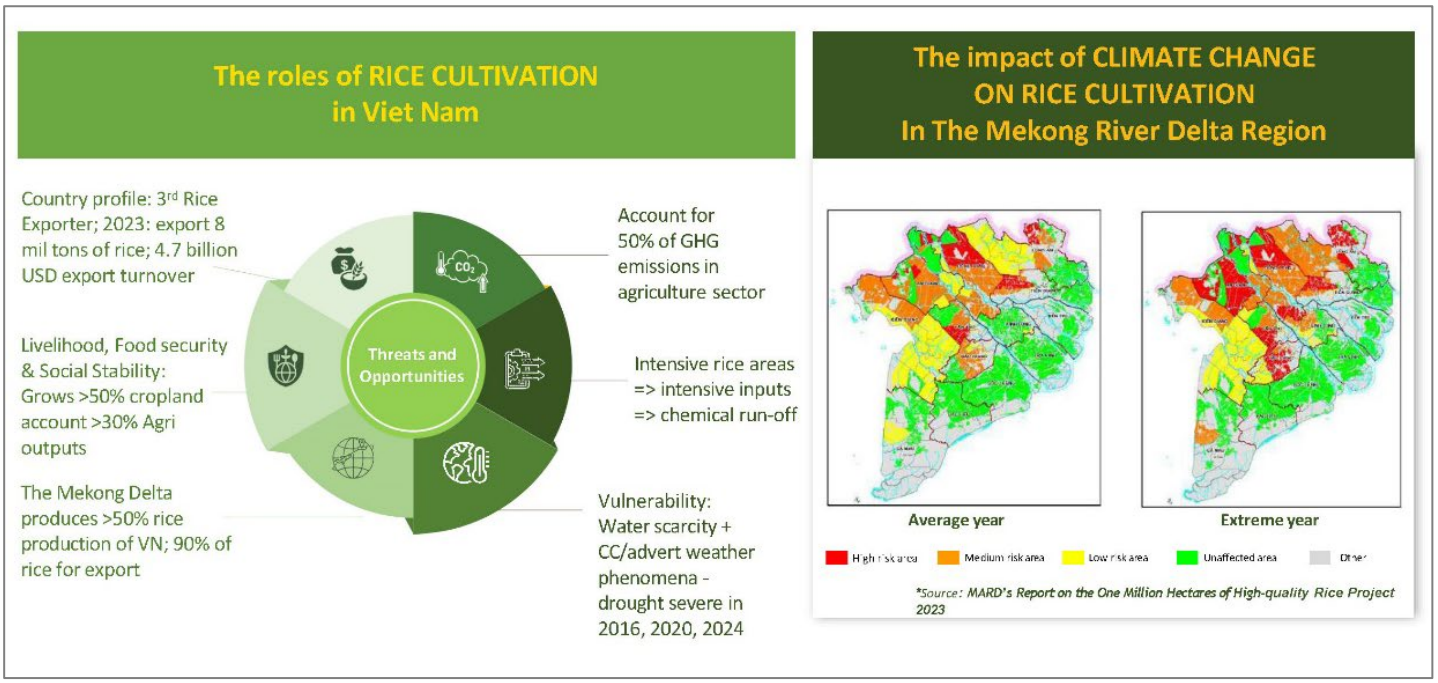

Figure 1. Overview of rice cultivation in Vietnam's Mekong Delta region.

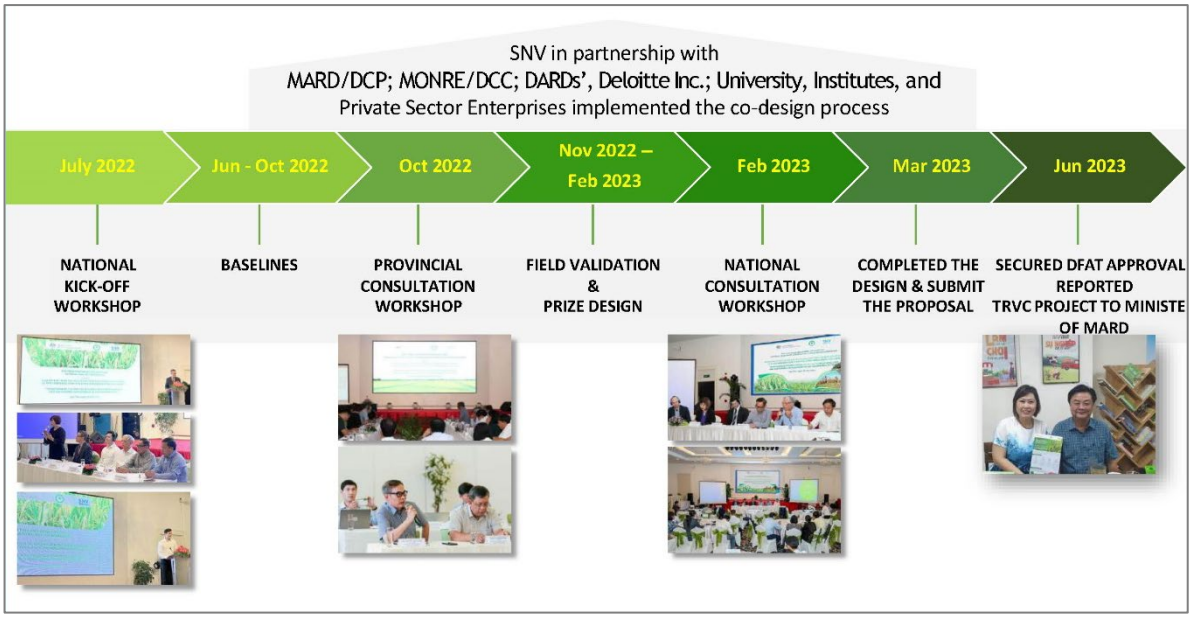

Figure 2. The multi-stakeholder co-design process for the TRVC project. (Green arrows show the design phase; the pale grey arrow is the implementation phase.)

The project targets the three most rice-intensive provinces in the upstream part of the Mekong Delta of Vietnam: namely Dong Thap, An Giang and Kien Giang. The project's primary goal is to support the profitability of rice smallholder farmers through reduction of input costs, and the premium from contract farming. The

reduced greenhouse gas emissions from rice cultivation is a co-benefit. The project also aims to support development of low-carbon rice branding for Vietnam, associated with the carbon credit that the project would help generate from low-emission rice cultivation at scale in the Mekong Delta. Also, the project aims to use robust data as the evidence-base for a policy dialogue to create the enabling environment for transitioning rice production to low emissions. The project is designed to be a four-year program of implementation over the six major rice cropping seasons – the summer and spring crops in the Mekong Delta (Figure 3). Right now, we are in Crop 1 one of the project implementation.

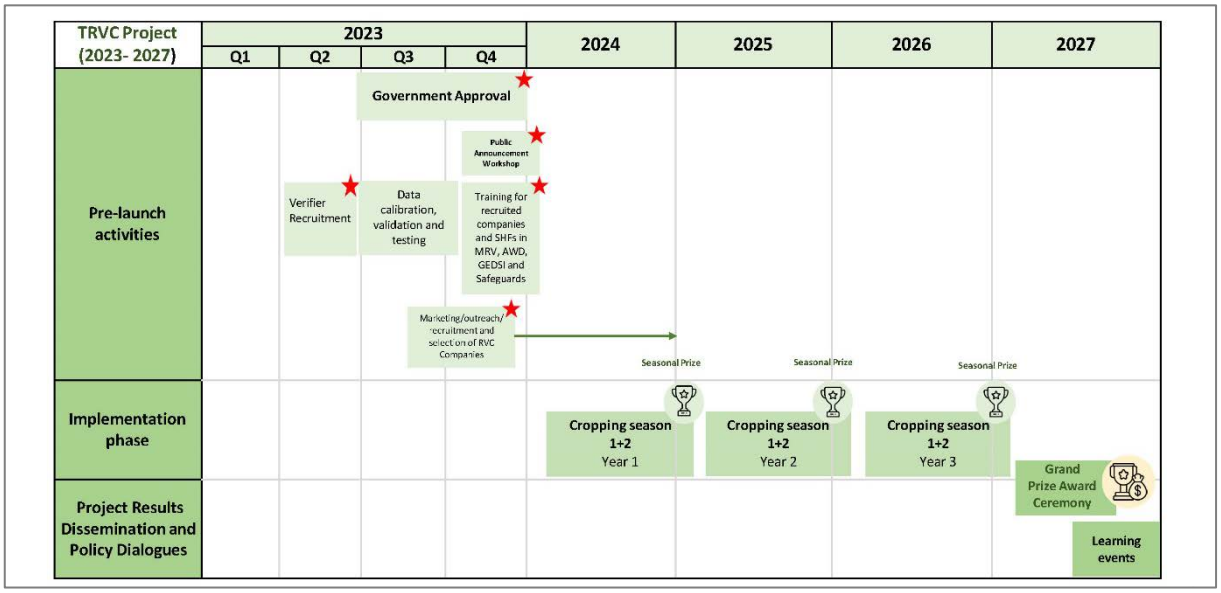

Figure 3. Timelines for TRVC project implementation in the Mekong Delta.

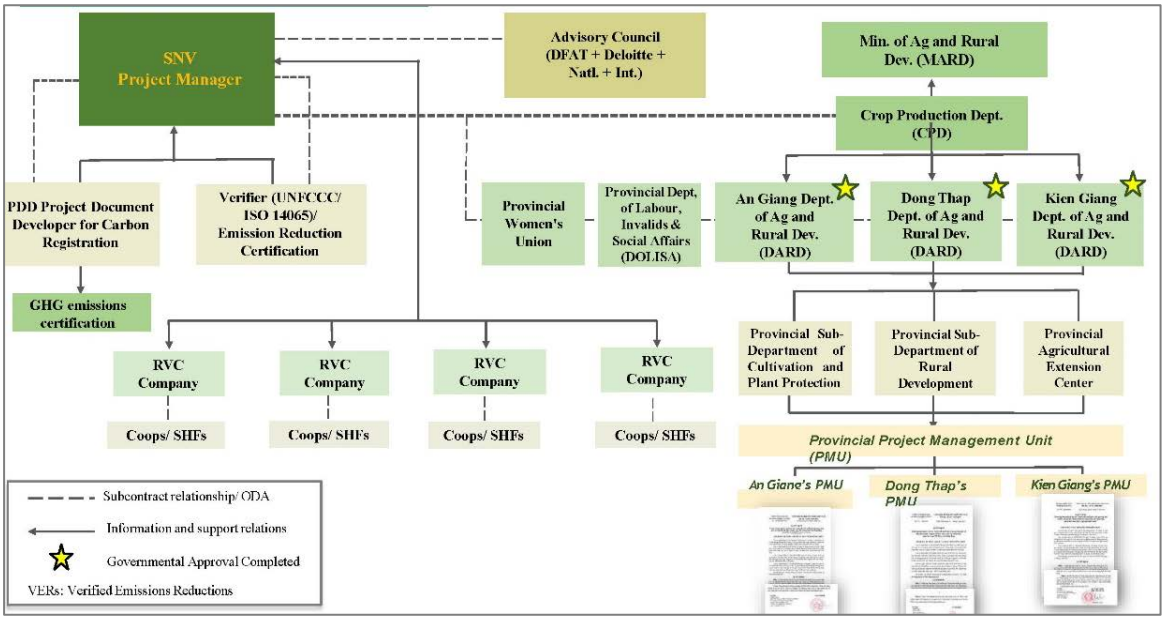

Figure 4. TRVC project governing structure.

The project also established the multi-stakeholder governance structures (Figure 4) that involve the government buy-in, the private sector, the independent verifiers and, very importantly, the Advisory Council.

The Advisory Council consists of scientists, policymakers of Vietnam, and a representative from DFAT (Australian Department of Foreign Affairs and Trade) to oversight the whole project implementation, for transparency, for being about the inclusions and social and environmental safeguards.

The project mobilised the buy-in for the prize-financing mechanism (Figure 5) meaning that the companies that are participating in the project make their own investments for scaling their low-carbon rice farming technologies. They work with smallholder farmers and co-ops to conduct these technology transfers and contract farming without any financial support from the project. At the end of the crop, they are only awarded the monetary prize incentive if they prove to us that they formulated an inclusive rice value chain, with greenhouse gases (GHGs) as the focus, and that the smallholder farmers enjoy at least a 30% profit margin.

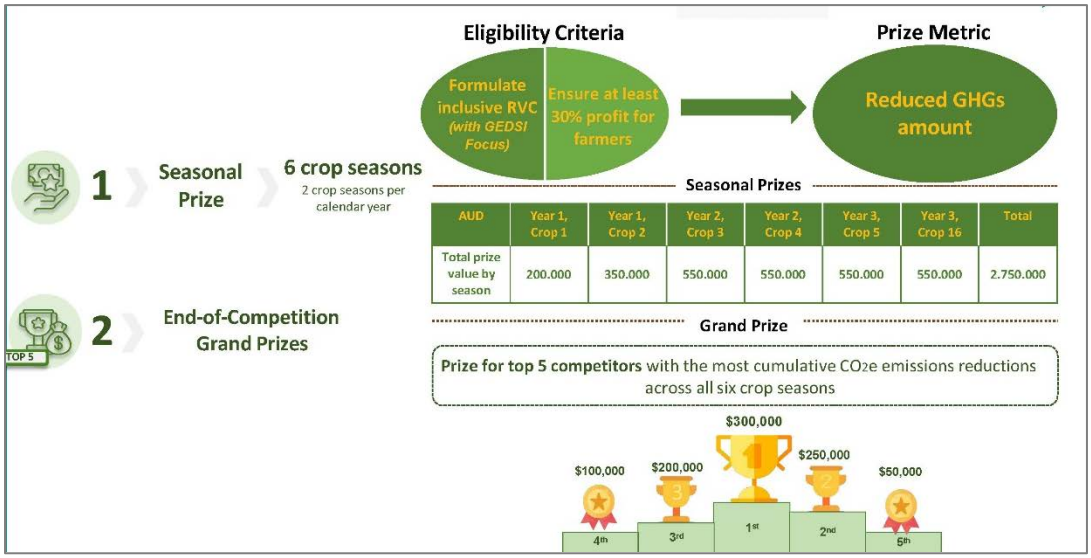

Figure 5. TRVC prize structure, 2024 – 2027.

The project also provides carbon credits as a non-monetary prize incentive to participating companies (Figure 6) to support their development of low-carbon rice branding and export to the niche market, and to prepare the companies' readiness to join the voluntary carbon market by 2027. That is when the legal framework of Vietnam will be ready to allow voluntary carbon transactions.

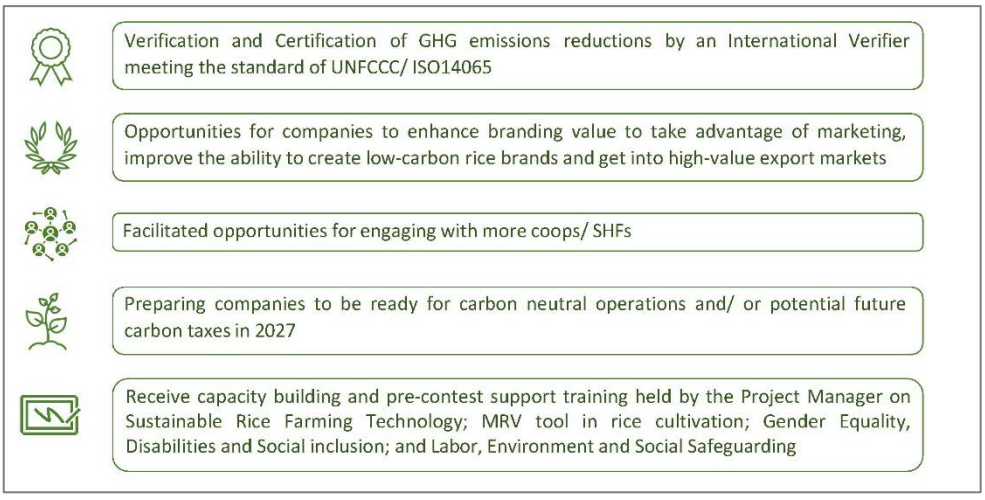

Figure 6. Non-monetary incentives for RVC enterprises participating in the TRVC project.

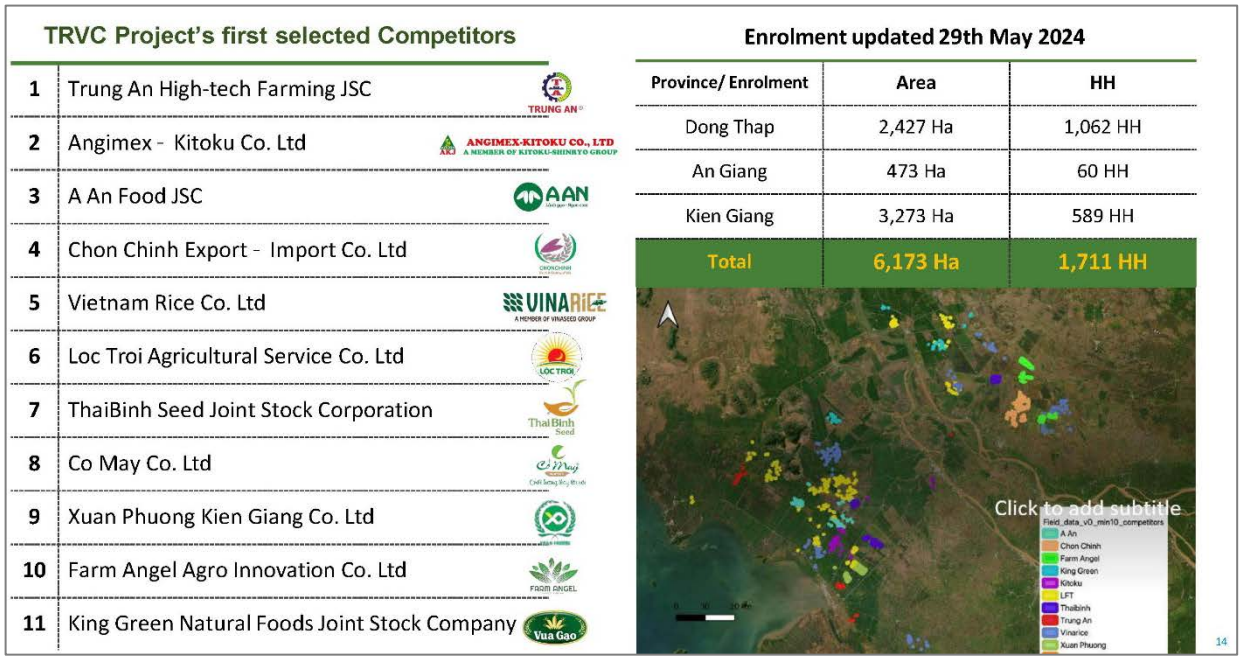

Figure 7. Milestones in the TRVC Project's implementation for February–May 2024.

The project deploys a sophisticated measurement, reporting and verification system (MRV for short). This is a process-based model link that uses satellite signals for monitoring agronomically as well as quantifying the emissions reduction from each paddy field. Eleven companies are participating in our project in Crop 1 (Figure 7), and already they have reached out to more than 6000 hectares and more than 1700 smallholder rice growers in the Mekong Delta. Technological Insights profiles revealed that climate-smart and nature-based solutions are being mobilised to design interventions to optimise economic efficacy and reduce GHG emissions. The most popular combination of interventions aims to reduce fertiliser application, to remove rice crop residues, to reduce the planting density, and to alternate wet–dry irrigation. From the areas of the first crop harvested, the profit outcome is looking very positive. So far, a rice price premium is being offered, via contract farming, to 100% of the farms participating in the project, and the profit margins have ranged from 46.8% to 60% for farmers in the three regions.

For more information about the project, visit https://trvc.vn/ .

Tran Thu Ha has established sound credentials in both professional career and academic background. She has been leading the innovative and pioneering work to drive the transformation in the agriculture sector towards sustainable, multi-values, climate-resilient and enabling policy framework through the inclusive value chain empowerment; unlock the investment and innovation from the private sector and mobilisation of state management power for policy changes. She successfully led the implementation of the very first pay-for-result and sophisticated initiative entitled 'AgResults Emission Reduction Challenge Project (AVERP)' in 2017–2021. With the impactful results and knowledge generated from AVERP, she led the design and implementation of a large-scale 'Transforming Rice Value Chain for Climate-resilient and Sustainable Development of the Mekong Delta of Vietnam – TRVC' for the period 2022–2027. Before joining SNV Vietnam in August 2016, Thu Ha held senior leadership positions in international organisations. Thu Ha obtained a Masters Degree of International Business Management with distinction from the Asian Institute of Technology (AIT, Bangkok, Thailand) and a Doctor of Agricultural Economics from Vietnam National University of Agriculture

SESSION 3 CASE STUDY 2

Learnings from Australian Indigenous projects

Ms Madonna Thomson

Aboriginal Biocultural Knowledge Holder and Practitioner

ABSTRACT

Indigenous food projects in Australia offer valuable insights into sustainable food systems. By revitalising traditional Aboriginal food practices and incorporating native plant-based foods, these projects address critical issues such as climate change, obesity, and undernutrition. They highlight the nutritional and health benefits of native foods, such as antidiabetic and antioxidant properties, while also promoting cultural identity and connection to the land. Environmentally, native foods demonstrate stress tolerance and ecosystem benefits. Economically, they provide income sources for remote communities and potential market opportunities. These projects underscore the importance of Indigenous knowledge and self-determination in creating sustainable and resilient food systems. Reference will be made to useful learnings for researchers working in less developed neighbouring countries.

I am here on behalf of the BushTukka & Botanical Indigenous Enterprise Co-operative (BBIEC). I'm a koori person of South East Queensland. This is the first time I have been to Canberra; the first time I have been to Parliament House. I walked in here and I thought about my upbringing and my grandfather's younger brother, the late Senator Neville Bonner. He was the first Aboriginal person elected to parliament. Being here made me think about the conversations that I had with him in my 20s as he tried to prepare me for a life of politics – and I realised I talk far too frankly to do it!

In this talk I give some context for the statements in Box 1; that is, around the role of Aboriginal people with Country, particularly native foods and plants in Australia, which is like the last frontier. It is also extremely important to us because it is through food and plants that we are intimately connected to Country. Our language is all around food, food processing and the utilisation of Australian native plants, from barks to mushrooms to lichens to leaves to seeds to fruits. The extent and the breadth of what we have in this nation is still not fully understood. Nor do we fully understand the role of Indigenous knowledge in terms of uses and applications of Australian native plants and their potential to be solutions to some of the changes that are happening across the world, because Australian native plants are perfectly adaptable to a very dry continent.

Box 1. Indigenous led & informed research – A Sustainable Benefit Model

Indigenous led & informed research allows for both the appreciation of Indigenous ecological knowledge and application, and its benefits to Indigenous Communities.

Indigenous knowledge about Australian native plants, their use and applications is vital to guiding where research can start and the potential benefits of new 'foods' in the food supply chain.

Research that is conducted in collaboration and consultation with Indigenous communities enables cultural continuity of practice & opportunity for social & financial benefits supporting current and future generations.

Australia is estimated, depending on which Google website you search, to have about 4500 to 6000 species; only 12 of those currently meet the world food standards, according to one or two 2019 websites. In terms of health and the impacts of development across the country, and the removal and impacts on native vegetation in South East Queensland, we have lost an enormous amount of native food species. In some areas of Yarra Country we had more than 35 species just for head colds.

Across the nation, in an Indigenous population of around 3.3% of the nation's population, we are seeing an increase in health-related issues and diseases. A lot of those can be directly attributed to our interactions with Country and the lack of diversity in terms of food, and the impacts from the poor quality food that is being brought into communities. Cattle and other impacts have affected water quality in some areas. There are high impacts on native grains and on animal species that communities rely on for subsistence-living. The poor water

quality in some remote communities of Australia directly affects the eyes. In about 2018 or 2019, 65,300 First Nations adults were reported as having diabetes and high sugar levels, on an age-standardised basis. They were 2.8 times more likely to report having diabetes or high sugar levels than non-Indigenous adults.

Three case studies

First, the Wattle Seed project at QAAFI at its Uniquely Australian Foods Research Centre at The University of Queensland. I want to acknowledge Professor Yasmina Sultanbawa, a wonderful human being to work with, who has worked extensively with Indigenous communities not only to develop research outcomes that have informed market demand, but also to create supply chains for Indigenous communities.

Second, the Kakadu Plum research that has come out of the university, and the work of Jessica Cartwright – a PhD researcher and accredited practising dietitian – around a healthy drink using the plum. The work in consultation with a community has identified what they required to help counteract some of the problems around chronic kidney disease.

Finally, the BushTukka & Botanicals Indigenous Enterprises Co-operative: how it has come about as an Indigenous-led solution to enable and support the sovereignty and the development of Indigenous businesses and communities.

Case study 1: Wattle seed

Australia has over 1000 different wattle species, across all states and territories. They are a very resilient and drought hardy legume: a solution for a changing climate perhaps. And they are beneficial for people and for Country. The seeds have been used by First Nations Australians for thousands of years, for uses ranging from weaning children off breast milk, to helping with the gut biome changes of elderly people, and transitioning away from red meats.

Table 1

Comparison of wattle seed flour (*Acacia coriacea*) with staple/conventional foods.

Food crop	Energy (kJ/ 100 g DW)	Protein (g/100 g DW)	Fat (g/100 g DW)	Carbohydrate (g/100g DW)	Dietary fiber (g/ 100 g DW)	Iron (mg/ 100g DW)
[a]*Acacia coriacea* (wattle seed flour)	1310	22.5	9.8	13.7	41.4	5.1
Triticum aestivum Wheat-flour whole grain	1448	15.1	2.7	71.0	10.6	3.9
Cicer arietinum L. Chickpeas dry	1581	20.5	6.0	63.0	12.2	4.3

[a] Wattle-seed whole-grain flour.

Figure 1. Comparison of wattle seed flour (*Acacia coriacea*) with staple/conventional flours (Sultanbawa and Sivakumar 2022).

We still don't fully understand all the potential benefits from wattles. But we do know that Indigenous knowledge has largely led and informed what is researched, because it would take a lot of money to research over a thousand wattle species. It is Indigenous knowledge that has helped and informed the targets of that research.

That research has included analyses and comparisons to foods in current use (e.g. Table 1 in Figure 1). The information is required not only to create demand but also to find seed that could become a food in Australia, and help create a supply chain.

I think we will find that the reason why we have such a shift in health in Indigenous communities is because of the introduction of a number of different food products, such as wheat, gluten and other things that our bodies are not entirely used to. My grandparents lived a subsistence lifestyle: for instance, they would hunt a possum. My mother's generation did less foraging, and my generation does barely any. That is not just because we cannot go foraging and hunting, but also because disease and other impacts have affected that wildlife, and

because a lot of our plants and animals no longer exist in our areas. They no longer run in my grandfather's country, west of Ipswich in the Lockyer Valley which is a big grain-growing food production centre.

That analysis and study, looking at the nutrient values, helps the whole community in understanding the composition of these foods as it is translated in western science. We know the benefits when we eat that food, and now the research centre has worked with those communities to translate that knowledge into a viable food product.

Figure 2. Wattle seed (*right*: seed of four wattle species) has a high protein and dietary fibre content, and is a very good source of minerals, particularly Mg, K and Fe. It has excellent flavour for savoury and dairy items and is used for caffeine-free coffee (Sultanbawa and Sivakumar 2022).
Above & below: Nutrient-enhanced bread rolls (Adiamo *et al*. 2021; Shelat *et al*. 2019).
Below right: Wild harvesting acacia seed.

Wild harvesting is largely the business that Indigenous communities do; not monoculture cropping. It's cultivation on their terms and their Country, and it is sustainable because it is better for their environment. It also allows them to transfer knowledge to the next generation so that we can continue to sustain our practices. In fact, harvesting country is about the continuity of cultural practice. That is how important it is for us, and we can also then transfer the knowledge not only about Country but also the animals, the topography, the geology and the language around how we use that, and the connection that we then have to our past. And the confidence that we gain from doing that is in becoming contributors to our future.

Case study 2: Kakadu Plum health drink

Kakadu Plum tree (*Terminalida ferdinandiana*) is endemic to northern Australia, as shown on the map (Figure 3). It is quite unique. I believe that Kakadu Plum (according to research that's been conducted) has highly contributed to the land management practices of those communities, and to the health of those trees as a result of that land management. The Indigenous community identified and informed the research into this fruit. Otherwise, no one else would have known about it.

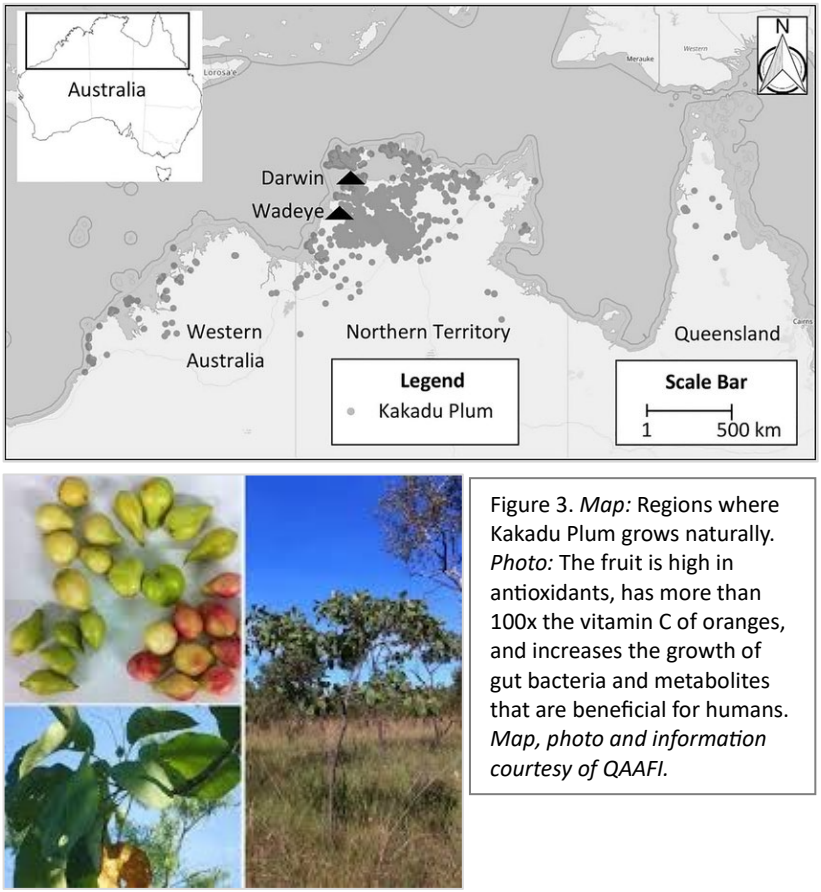

Figure 3. *Map:* Regions where Kakadu Plum grows naturally. *Photo:* The fruit is high in antioxidants, has more than 100x the vitamin C of oranges, and increases the growth of gut bacteria and metabolites that are beneficial for humans. *Map, photo and information courtesy of QAAFI.*

The Indigenous communities have eaten the fruit for thousands and thousands of years and tens and tens of generations, and continue to eat it, benefiting from its nutritional and therapeutic values. They are sharing with the world a fruit that contains the highest amount of vitamin C known at this time, and its applications – not just as a food but also applications across a number of different industries (Figure 4).

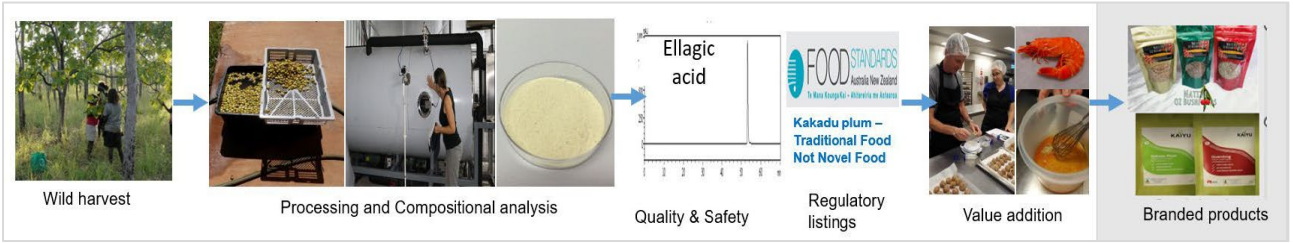

Figure 4. Research impact. Indigenous-led, owned and controlled Kakadu Plum value chain: a model of success that incorporates Indigenous participation in the agribusiness supply chain from wild harvesting to branded products, whilst supplying a range of national and international markets. *Credit: Uniquely Australian Foods Research Centre, QAAFI, UQ.*

We must learn how to ensure that the Indigenous people not only are a part of a valued food chain, but also – where Kakadu Plum has applications across other industries – that Indigenous people are able to reap some of the economic benefit of those applications as well (see Figure 4). Bear in mind that if it wasn't for the Indigenous knowledge, other people wouldn't know about it.

In fact, in Australia, Indigenous people have lost out on some of the biggest industries, such as Macadamia Nut (which in South East Queensland we call Bauple). Also, the Finger Lime, which also originates across South East Queensland and northern New South Wales, and the Lemon Scented Myrtle. None of the larger growers are Indigenous.

Jessica Cartwright at QAAFI worked with the Indigenous community to identify the reason they had chronic kidney disease (CKD), which was also attributed to high potassium and drinking a lot of soft drinks. Indigenous communities identified a need and a solution to that endemic health problem, being five times more likely to develop CKD and four times more likely to die from CKD than non-Indigenous communities.

They wanted a solution for the community. We needed something different, low in sugar with less potassium, that is not going to be harmful to our bodies. We can at least then train the next generation to become weaned off what they have become used to drinking.

In partnership with the community Jessica identified key ingredients. They did a lot of studies on that, and they produced a formula. One of the challenges, however, to the community, is how do you actually produce the end product when you don't have money? And because of the supply of native foods, when we produce an end product like a drink it is five or six times more in cost than a can of Coke. This is where BBIEC comes into play (see Box 2).

Case study 3: BBIEC, an Indigenous-led solution

In BBIEC we look at how to get investment to develop an end product. How do we then create an end product that will be purchasable by other states and territories where there is the disposable income, and then redirect that profit back to the community to enable that drink, that solution, that they came up, with to be accessible for them, if not at no cost, then at a significantly reduced cost?

I chair the Indigenous Enterprises Group that also works with the Uniquely Australian Foods Research Centre at QAAFI, and those Indigenous businesses and communities talked about the need to develop something that was sustainable. It was consistent with the way that we do business culturally. It respects the sovereignty of the family and the clans and their role in their Country and with their ingredients. But how do we address this massive gap around research and ensuring that there is more equitable access to the potential benefits of Indigenous knowledge and the changes that scientific research applies to that knowledge? – because, all of a sudden, we get out of the loop once its application is different.

Box 2. BBIEC BushTukka & Botanicals Indigenous Enterprises Cooperative (BBIEC) was formed to:

- Advocate (Indigenous Led Research Projects with Direct Community Benefits)
- Aggregate supply
- Increase visibility and awareness (AusTukka app and Native Foods Ledger)
- Contribute to & lead ethical research
- Educate (training for researchers and institutions)
- Support member growth and expansion (Product development & share models)
- Shared benefits (financially & direct reduced to 'no cost' products)
- cooperative chosen as is consistent with Indigenous principles: with cultural values, allows autonomy & supports small family and clan-based business models.

So we talked about the formation of a cooperative, because that model best fitted us culturally. It allows us to come together like we always have in terms of Indigenous governance, on our issues that matter the most to us. A cooperative respects that cultural form of governance and principally allows the families to do what they need to do as businesses, but come together in a form in which we can identify needs to enable some key gaps and challenges.

One challenge is that there is no funding to enable upscaling and expansion for communities to address the growing demand. $180,000 is a minimum for a freeze-drying unit, and then there are the skill sets and the

finances required to be able to assemble that, and people have to be trained in how to use that …. How do you cost it? It is a whole business model of its own. BBIEC can get access to that. We can have a look at what others are doing and share that information across businesses.

We can come together and look at what does ethical research look like. How do we prepare communities with the templates they need to be able to address the growing demand around research? What are the policies and principles they can have that they can say, 'Here, this is research principles and ethics on our terms'? Also, working with Yasmina the team in those communities identified a number of templates around prior informed consent: Indigenous cultural intellectual property.

What does benefit sharing really look like along the supply chain, so that we're not just marginalising a community again – to just being wild harvesters and growers to supply an ever-demanding market – but they are also not just producing food which is also very expensive? How can they also be shareholders, partners, collaborators in other industries and applications so that they can earn a return of income that will enable them to buy kidney dialysis machines, rather than big government agencies?

BBIEC is designed to not rely on government funding. BBIEC is designed to create income, because in creating income, we have the flexibility to shape our organisational structure so we can develop foundations and provide grants to our members and communities. So, if we are looking at working with a new product that our members and communities are happy with BBIEC taking on, that product, that key ingredient, could grow across a number of communities in Australia.

They don't have to be members of BBIEC. If a successful formula that is designed, co-designed, developed with research institutions and with proper investment, is then sold, we can take a percentage of that and make it available for funding and other grants to any one of those communities that that key native ingredient grows in, without having to be a member of BBIEC.

Conclusion

I have presented three examples: they are Indigenous led; they are Indigenous co-designed. We have a saying here: 'It's not about us, but by us'. We're tired of being researched. We need to be a part of the research and looking at how can we do it so that it is culturally informed and that it meets with engagement and outcomes that fit not only with community demands, but also allows researchers and research institutions to be confident in the programs that they are developing and co-designing with community (see Box 3). And it makes knowledge a social licence.

As someone said before me today, it's about kindness. It also means we are contributing to a better future to ensure that Australia doesn't lose the oldest continuing living culture in the world. We run the risk of having that happen because we are small remote communities of Australia now; we have to ensure our culture is protected because we don't want to be attributed with the tag of having destroyed it.

Box 3. Indigenous-led and informed research in Australian native foods:

- Identifies & develops nutrient rich and healthy foods.
- Enables economic prosperity through research-informed food products.
- Enables Indigenous participation & benefits along the value chain.
- Supports continuation of cultural practices & culturally informed land management & business models.
- Highlights the potential for new food ingredients that may address food security in a world of climate change realities.

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Madonna Thomson is a member of the Jagera People and is a grand-niece of the late Senator Neville Bonner. Madonna has worked with the Aboriginal Communities in South East Queensland with a particular focus on developing and sharing traditional knowledge about management of the State's natural resources and environment. Madonna is Chair of the QAAFI Indigenous Enterprises Group, Chair and co-founder of the BushTukka and Botanical Indigenous Enterprise Co-operative, Director of Nyanda Life Limited, and Director and Owner of Jagera Daran Pty Ltd. Madonna has worked extensively in native title, cultural heritage and natural resource management and has presented at numerous international, national and state conferences on these topics. Madonna is adept at the negotiation of Indigenous Land Use Agreements and Cultural Heritage Management Plans/Agreements. Madonna creates and builds corporate and governance models, facilitates organisational capacity building and advises on accountability and business management.

SESSION 3 CASE STUDY 3

Challenging dominant narratives on development approaches in the drylands

Mr Hussein Tadicha Wario

Director, Centre for Research & Development in Drylands, Marsabit, Kenya

ABSTRACT

The drylands of the horn of Africa, home to millions of mainly pastoralist communities, has remained on the margins of development; it has unacceptably low levels of development indicators and high poverty levels. This partly resulted from development narratives, which disregarded the potentials of the drylands, designating it an area not worthy of investment. Additionally, pastoral production system, the main livelihood system, was not recognised as viable but rather was branded as environmentally destructive and inherently vulnerable to the impacts of the changing climate. Consequently, the main theme of development in the region centered on diversification out of pastoralism. Recently, however, there is shift in the narrative with increased recognition of the pastoral production system as the most viable livelihood in the drylands and local communities' knowledge appreciated in the development sphere. There is also recognition that communities are not just passive victims of the impacts of the changing climate but are active first-line responders, where local actors working in networks make significant contribution to averting disasters. In this regard, the Center for Research and Development in Drylands (CRDD) with funding from the Australian Centre for International Agricultural Research (ACIAR) is implementing a research project, 'Exploring local constructs of "Resilience" in the face of chronic uncertainty in the Drylands'. It aims to create a deeper understanding of the role of local actors applying 'high reliability management' in order to influence the framing and practice of resilience in development projects. The expected outcome will be grounded, locally relevant perspectives on the opportunities for resilience building and climate adaptation.

The Centre for Research and Development in Drylands (CRDD) in Marsabit, northern Kenya, is a non-profit organisation initiated by scientists from the region. Our organisation specialises in people-centred research and development, and its vision is to be a centre of excellence for research, capacity development and advocacy that serves communities in the drylands. I will talk briefly about how narratives have shaped development in the drylands, and also reflect on what we are doing to contribute towards challenging this dominant narrative.

To start with, I provide a brief context, in terms of the livelihood system in the region and this development narrative that has influenced how projects are conceptualised and implemented in the region.

The communities in the drylands of the Horn of Africa are pastoralists, and they produce various livestock species on naturally occurring pastures, and this remains their main livelihood system. Livestock are also kept for various other uses which are social and cultural requirements. The narrative about this area does not recognise this important production system as a viable system, and the land upon which these pastoralists produce is often viewed as empty lands that are not being used and are ready for conversion. This results in rampant land losses.

This system also contributes quite significantly to the national and global economies, but because of how it is perceived it remains unappreciated, and therefore is not seen as worthy to invest in. Therefore it has been kept to the periphery by mainstream development policies, both at national and at regional levels.

Even in the current climate debate, with raging climate impacts, the production system is viewed as inherently vulnerable; that it needs to be saved. Hence, the focus of development is not mainly in terms of how to support this production system, but rather to see how it can be replaced by something else. This results in disconnects between how pastoralists perceive what they do, and how external entities perceive what pastoralists do.

For example, external interventions push pastoralists towards sedentarisation – having people settled – but the communities themselves use mobility (see Figure 1). They need to move because that is what the environment demands and that is how they produce. Another example is that external initiatives try to control the variability that is seen in the system and the environment, but pastoralists practise by embracing the variability and using it to produce.

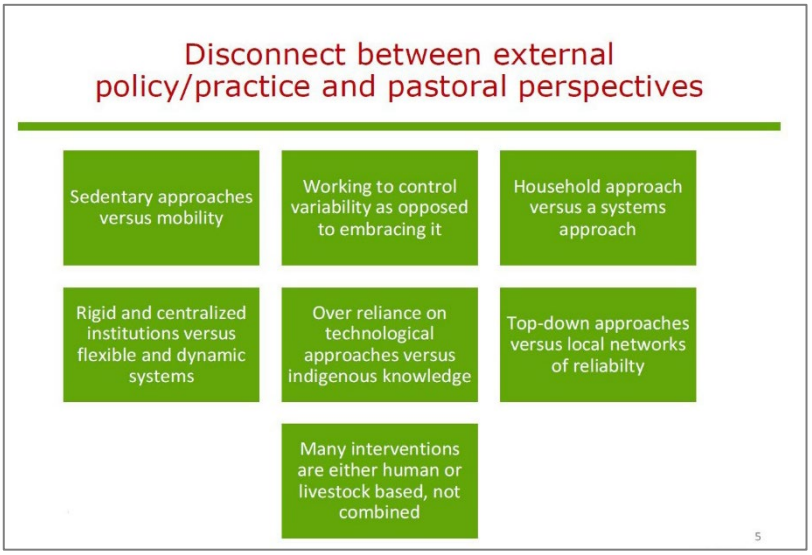

Figure 1. Influence of the dominant development narrative in drylands

- Pastoralism seen as vulnerable, requiring recurrent relief and diversification.
- Overlooks the reality and the potential of the drylands.
- Resulted in failed development interventions – more vulnerable communities.

Additionally, external entities promote rigid and centralised institutions, while pastoralist communities rely on flexible and dynamic systems (see Figure 1). As a result of these contradictions in how they are perceived, we see numerous failed development projects in this region, and the communities remain highly vulnerable to the crises that face them. Therefore, there is need to rethink our intervention.

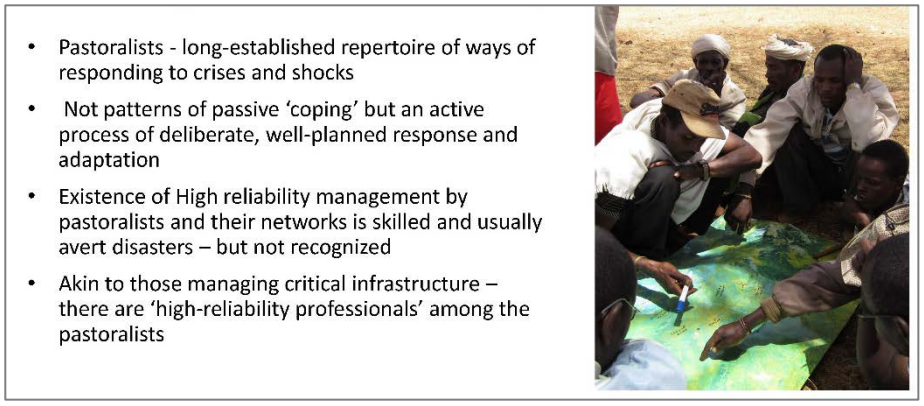

Figure 2. Rethinking interventions in the drylands.

It is important to acknowledge that despite this dominant narrative, there are changes in perceptions, and there is acknowledgement of how pastoralism has long-established repertoires of ways of responding to crises and shocks (Figure 2). Furthermore, there is recognition that these responses by local people are not passive

coping responses but an active process of deliberate, well-planned, adaptive responses. Among the pastoralist communities, there are individuals, groups, institutions acting in networks that undertake actions that usually avert disasters. These people are equivalent to what we call 'high reliability professionals', which needs to be recognised. In this system, the higher level professional is someone similar to those who manage critical infrastructure: for example, complex supply of electricity, where, of course, there are numerous actors in the background to ensure that the supply of electricity is not interrupted.

Taking this into consideration, and towards contributing towards challenging this dominant narrative, our centre, in partnership with ACIAR, is implementing a four-year research project, called 'Exploring Local Constructs of Resilience in the Face of Chronic Uncertainty in the Drylands (photo at left). This was conceived after observing that although the drylands in the Horn of Africa has received interventions aimed at building resilience, particularly with the frequent droughts, there have been minimal or no commensurate results in people being resilient to drought.

This project looks into identifying and exploring emerging alternative narratives towards resilience and climate adaptation in drought-affected areas in northern Kenya and southern Ethiopia. It aims to gather evidence of an alternative approach, embracing variability in the region and acknowledging the uncertainty that is there, rather than trying to manage or control these factors. Secondly, the project prioritises understanding of existing local practices and governance processes that exist outside external interventions.

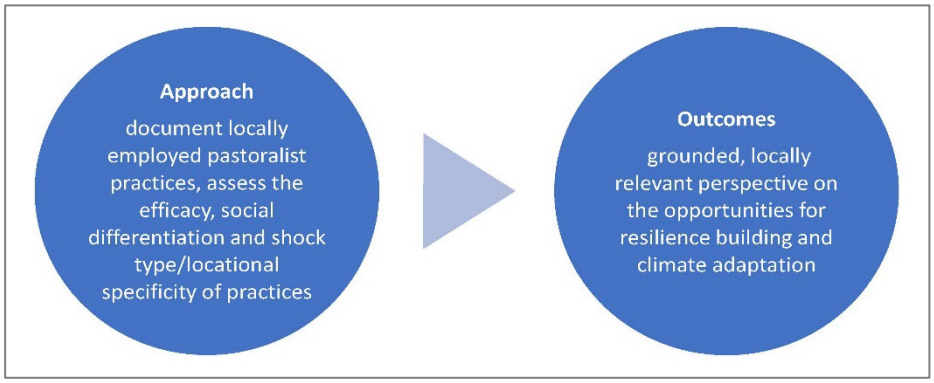

Figure 3. Our research approach: 'Resilience from Below'.

Our project approach is to document locally employed pastoralist practices (Figure 3), looking at the actors within the system who respond to different crises, the actions they undertake, and the networks in which they act. The project additionally assesses efficacy of the actions undertaken, how the actions are socially differentiated by differences of types and by specific localities. Further, it analyses how the actions and the networks of local actors correspond with the external interventions by governments and development partners. We will also look at how resilience is framed, and develop interventions. The expected outcome from this is a grounded, locally relevant perspective on opportunities for resilience building and climate adaptation, possibly proposing a new way of looking at resilience in the drylands.

Policy, of course, is central in determining the directions of development interventions; resilience building being one of them. So, our project is looking into policy disconnects that have affected how development interventions have been conceived, and how resilience from the perspective of the pastoralist can be infused into policy landscapes (Figure 4). Also, through continuous and collaborative efforts the project will look at how integration of pastoralists' resources, networks and assets can be deployed in resilience-building efforts. The project also plans to inform policies at county, national and regional levels, and also engage international initiatives: for example, the International Year for Rangelands and Pastoralism (IYRP), which is coming up.

Figure 4. Potential policy direction.

This project is one year old and we have recently started implementation.

In conclusion, definitely it is not easy to reverse the influence that has been created by these dominant narratives, and therefore it requires concerted effort – not short-term but rather long-term. Also, knowing our experiences and looking at the theme of this conference that looks at issues around partnerships, consultation and collaboration for co-designing and delivering high quality agricultural research, I see resonance with what we are doing. Also, as previous speakers have said, valuing communities – and particularly community knowledge – is central in what we are doing, in order to achieve a local on-ground outcome. And having locally embedded research institutions that understand the issues better, is really important.

We also appreciate the partnership that we have with ACIAR and look forward to achieving this locally grounded outcome. And we are pleased that in our work we also managed to host a student from the Crawford Fund in our project here who did a lot of our research work with us.

We are so pleased to be in this forum and engage in what it takes to work with local Indigenous communities to better their lives and their livelihoods.

Hussein Tadicha Wario has a Bachelor of Science degree from Jomo Kenyatta University of Agriculture and Technology, an MSc in Natural Resource Management and Sustainable Agriculture from the Norwegian University of Life Sciences and a PhD in Agricultural Sciences from the University of Kassel (Germany). He is currently Executive Director of the Centre for Research and Development in Drylands (CRDD), a non-profit research and development organisation created by scientists originating from northern Kenya and trained in trans-disciplinary and social-ecological research. His main areas of research interest are in the socio-ecological systems in the drylands of Africa. He currently leads implementation of a number of ongoing research projects that include enhancing women's agency in navigating changing food environments to improve child nutrition in African drylands, local constructs of resilience in the phase of chronic uncertainty, and increasing efficiency in rangeland-based livestock value chains through machine learning and digital technologies.

SESSION 3 Q&A

Chair: Mathew Fox

First Assistant Secretary, Climate Diplomacy and Development Finance Division, DFAT

Q. Matt Champness, Syntiro Agriculture: I do a bit of work for FAO and the World Bank on rice. Thank you to all the presenters today. My question is to Tran Thu Ha. I have looked into the VnSAT project, which was followed on by the One Million Hectares rice project. Obviously, rice is a big contributor worldwide to global methane emissions, and it is seen as an easy win to reduce our methane production if we can change our practices. There have been some good reports and scientific articles showing huge success from the VnSat project and the like, but when we go and talk to farmers, they talk about increasing production costs, stagnating yields and reduced productivity. That's what farmers are saying. There have been newspaper articles about that and the like, and I'm very interested to see in your project governance structure and the advisory council you list DFAT, Deloitte, and national and international organisations. I did not see farmers on the advisory council.

The last presenter, who spoke just now, said community knowledge and practices are essential in his region to achieve on-ground outcomes. So the practice change that needs to occur to reduce greenhouse gas emissions is for the smallholder farmers to change their practices.

Where are they in the co-design process? Where are farmers sitting in the governance structure? Where is their input? Because as a rice farmer, to reduce emissions they have to change their irrigation practices to intermittent irrigation, which is a significant increase in labour. They have to change their residue practices, which is a significant increase in cost and labour, in the hope that they might get a carbon credit, or they might win a prize through their cooperative. But day-to-day they need to increase the time spent farming.

Where's the benefit? They're telling us that they're not seeing any production increase or profitability.

A. Tran Thu Ha: Thank you for your question. It is very interesting. So far, in this bipartisan project we mobilised the roles of the private sector to be the lead on working, outreaching to smallholder farmers and their co-op for the technology transfer, the advocacy, the contract farming, to ensure that farmers at least secured 30% of the profit margin. So you see, the results showed that farmers got 48–60% profit margin and rice price premium was provided to smallholder farmers. With that, they brought in the win–win situation. The low carbon rice farming practices do not necessarily mean that farmers have to do more work to practise more intermittent dry events. It is the co-op's role to collaborate with both the farmer and the competitors to regulate their irrigation schemes: the farmers don't have to do it manually. There has been coherent collaboration from the ground – smallholder farmers co-op and private sector rice businesses – to implement this initiative at scale.

Your other question is why are farmers not sitting in the governance structure and SNV advisory council. The advisory council is a neutral party to facilitate, not a decision-making body. It facilitates SNV decisions in a participatory way. One of their roles is to reveal the price calculation report provided by the third party verifier, so the farmer is one of the direct beneficiaries. If the competitor gets the monetary prize, the farmer shares in that. That is the reason why the farmers should not be sitting within the advisory council, to avoid the conflict of interest.

Q. (female): A question to Madonna. Thank you so much for the presentation. I was really taken aback by the wattle seed data you showed: the high protein content, high fibre, low carbohydrate. So why didn't it take off? What is needed there? Aren't there already special programs for Indigenous species here? Maybe I can attract your attention to the new program called VACS – the Vision for Adapted Crops and Soils. I think such a crop would be quite interesting to look at for the Australian ecosystems.

A. Madonna Thomson: Being only 3.3% of the total population, an even smaller percentage of that would be involved in the wild harvesting. What we need to do is look at how we can prepare those Indigenous businesses

and communities so they can meet an increased demand. Because if we don't have a program to enable that infrastructure, others will fill that gap – and they are filling that gap very rapidly, which is a shame because then we become marginalised yet again in an area that is so intrinsically a part of us culturally. That is the next step that we are looking at with the team and with QAAFI and with BBIEC: how do we work with targeted communities to look at infrastructure, for wattle seed, and then the Kakadu Plum?

We have had to focus on those two because we have already missed the others – they have already got massive markets and massive growers. So, if we can at least get some support with developing a research project around how to get the infrastructure required for key communities and Indigenous businesses – to develop not only the business model for how to scale and be prepared for what that is going to mean, but also what infrastructure do they need to do that. There is already talk about international export of wattle seed, and Indigenous communities are not big players in that.

Chair: Well, this brings this session to a close. I just want to say thank you very much to Mark, to Madonna and to Hussein for sharing their rich knowledge and stories with us today that truly do embody the principles of partnership, participation, local leadership and co-design. Thank you very much, everybody.

SESSION 4 OVERVIEW

Re-thinking partnerships and capacity building to support transformational impacts of R&D

Mr Shaun Coffey

Chief Executive Officer, The Crawford Fund

ABSTRACT

To build capacity for addressing complex development challenges, organisations engaged in Agricultural Research for Development (AgR4D) continue to make substantial investments in governance networks. The final goal (SDG17) of the UN 2030 Agenda for Sustainable Development, for example, is dedicated to building collaborative networks, and advocates for 'multi-stakeholder partnerships that mobilize and share knowledge, expertise, technology and financial resources, to support the achievement of the Sustainable Development Goals'. This presentation will not attempt to consider the success, or otherwise, of the effectiveness of present approaches to deliver these outcomes. Rather it will look to the capacities needed to create effective partnerships and networks to deliver change in AgR4D, with *a particular focus on the role of the individual as an actor who can develop the relationships needed to operate more effectively across organisation, institutional and system boundaries.* Lasting transformational change results from the aggregation of smaller transactional activities driven by network members who explore and then exploit new ways of working.

For many of us, the professional that we expected to be when we started our careers is not the professional that we developed into, nor, in fact, that professional we needed to be. To the early career professionals here today, your challenge is not to learn how to fit into the system. Your task is to disrupt that system and continue to improve it and make it better. That is the starting point for this talk today.

I shall draw on some different approaches to knowledge and knowledge management, which come from the work originally by Gregory Bateson on the ecology of the mind, and his partner Margaret Mead and their daughters: the late Mary Bateson, and Nora Bateson who is working now in the field called 'warm data', which is like a meta-analysis of process. For those of us trained in genetics, particularly quantitative genetics, it's a little bit like pattern recognition in large data sets. Quoting Nora Bateson:

> Unlike "cold data," which refers to objective, quantifiable information, warm data captures the contextual, relational, and systemic elements that are often overlooked in traditional data analysis.

This paper aims to remind everyone that we are easily trapped in our own mindsets, and captive to our assumptions.

We all work with models: they are not reality

Many of us know Maslow's hierarchy of needs and have used it in our organisations. However, Maslow never had a hierarchy, and his original work did not report a linear relationship between the needs he identified – a cause and effect – from one to the next. Bridgman *et al*. (2019) report on the use of Maslow's theories since 1943 and this is an example of how we too often promote models as reality. In Maslow's hierarchy we have a model that is still used to design systems and organisations in a somewhat determinate way. That is, we apply the model, without necessarily understanding both its uses and its limits, or even what it is attempting to represent.

By returning to first principles, Maslow's hierarchy can be seen as a set of 'lenses' that could be used as a diagnostic tool in any situation to see what was working and what was not working.

With many of our models, the model becomes what we look for. However, just as a map is not the territory, models are guides and not reality. We have become very skilled at turning tools into prescriptions.

Models are guides for use in diagnostics and so on; and the lesson is that for a lot of what we do, *we always should be sceptical of received wisdom*. There is greater benefit in returning to first principles.

First principles thinking is an essential tool in understanding the complex problems that we face in research for development and in finding the creative possibilities we need. Returning to first principles enables us to see beyond conventional or received wisdom to understand a wider range of possibilities. If we understand the principles of the models we use as tools, we can decide if they work in our situation. Often, they don't and too often we try to force the context into what the model 'tells' us to expect.

First principles aim to break ideas into basic, undeniable truths. The benefits are several:

- avoiding assumptions, cognitive biases and inherited opinions.
- dissecting core ideas to focus on the essence of an argument or position.
- clarifying complex situations and building understanding so that we construct knowledge from the ground up, not from second-hand information.

Problems with partnerships: the place for capacity building

In preparing this paper, I quickly screened many research projects run with, and by, and in partnership with ACIAR and then looked at some other research entities such as universities and major foundations from all parts of the world. My key observation is that we tend to over-prescribe 'solutions', and underestimate execution barriers.

I wonder what would happen if we thought more in terms of projects contributing to system improvements rather than discrete solutions (see Armson 2011). We will need to leave that topic for another day.

In much of our project planning and operations, linkages to the big picture become detached. We regularly produce project plans in which we expect partnerships to deliver 'shared' goals, 'mutual' benefits and 'collaborative' effort.

But these partnerships under-perform for a few reasons:

1. Misaligned Objectives: Differences in goals and expectations can lead to conflicts and inefficiencies.
2. Cultural Differences: Diverse organisational cultures and practices can hinder collaboration.
3. Communication Barriers: Poor communication can result in misunderstandings and delays.
4. Resource Imbalances: Disparities in resources and capabilities can create power imbalances and dependency issues.
5. Trust Issues: Lack of trust can undermine cooperation and lead to conflicts.

This is evident in other papers in these proceedings where an often-asked question is: What happens when a developing country's objectives and a donor's objectives are different?

How much deliberate effort, discussion and accommodation goes into identifying what is 'shared', 'mutual' and 'collaborative'? Do we just assume these? I would suggest more effort is needed.

Taking a first principles approach draws us into another discussion. Are we getting the best outcomes as we try to agree goals? Can projects deliver in multiple contexts, simultaneously? Can we include objectives that are specific to one, or several, partners and not others, and live with that? Do we more explicitly acknowledge the barriers to performance and reflecting as process goals in projects? Or, as risks to manage? Can we more explicitly reflect that there are different expectations to be accommodated? What are the trade-offs for all participating groups and institutions?

Asking questions like these provides a richer path to address cultural differences, communication barriers, resource imbalances, and trust issues.

Transcontextual: not just transdisciplinary

Nora Bateson (2023) has introduced the concept of transcontextualisation into our thinking on complex issues. Capacity development is an area that would benefit from transcontextual consideration.

I note that ACIAR has made a recent decision to re-locate capacity development back into its research division. This is welcome. Capacity building should be a key outcome of research for development and will benefit from a more explicit recognition and evaluation in project deliverables and outcomes. This provides an opportunity to consider the research project in another context (capacity) simultaneously with other contexts (for example, productivity improvement).

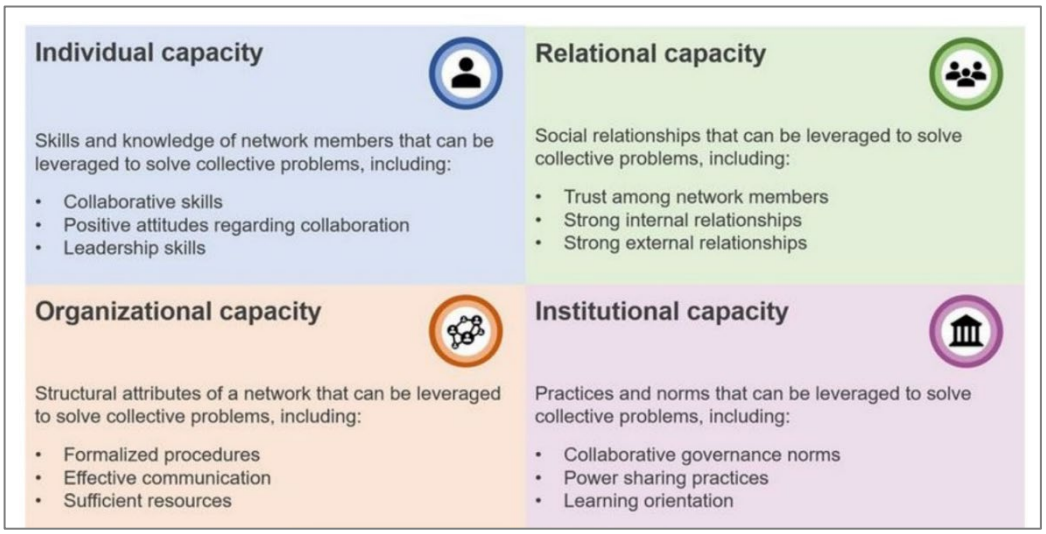

Figure 1. Contexts of collaborative governance capacity (adapted from Foster-Fishman *et al*. 2001). The sections are not discrete; they interact and overlap.

The work of Foster-Fishman *et al*. (2001) shows that capacity building operates in four contexts (or levels) at any one time (Figure 1). The individual, relationship, organisation and institutional contexts are not discrete, although we often consider them in isolation. Not only do they interact and always overlap; any time we operate in one context we are impacting at all other levels.

Whilst a full discussion of each of these contexts is not possible today, we can ask what weak signals (warm data) we receive in each. My quick scan of research for development papers, reports and evaluation could be summed up thus:

> Participants often reflect that the major benefit to them from partnership activities was *learning new ways to work*.

These new ways of working, however, are rarely reported, nor identified for inclusion in future work. They are captured as casual observations, not as the outcomes that they clearly are. At best we comment on the *capacity building of individuals*, only. Perhaps this is because we assume that capacity building is something that sits outside the project, not a legitimate or valued inclusion.

One key opportunity we have for improving the research for development system is to incorporate the four contexts of capacity building into our core research programs. We passively acknowledge the need for capacity development, albeit almost always in a single context – the individual.

Another observation (warm data) I have made is that reports are more frequently indicating that we know that we need to be doing more to train individuals to understand how to work in these new systems. At the same time, the reports resign themselves to accept that there will never be enough resources to invest on capacity development. We do need to be more proactive in this situation.

A collaborative governance framework, reflecting the contexts in Figure 1, with ethical and fair representation of all involved and sensitive to the perspectives of contributors and intended users, would have the objectives of:

1. enabling faster adoption of changes in practices, and adoption of new or improved processes and products.
2. enhancing the credibility and acceptance of research findings among all stakeholders.
3. encouraging researchers to adopt good practices that contribute to both.

Transformation, myths and leadership

Bridgman and Cummings (2021) have an interesting chapter titled: Heroic Leaders and the Glorification of Change. There is a vast mythology about change (transformation) and innovation. Everyone thinks change and innovation are hard, perhaps because we let the issue of scale cloud our understanding at first principles level.

Take innovation, for example: innovation at its heart is about putting an idea into action (Dodgson *et al.* 2005). The first principle here is easy: innovation = idea + action. Nothing to be feared; except we tend to say that because large-scale innovation can be difficult to manage (Dodgson *et al.* 2008) then all innovation is difficult. But assumptions take hold, and we fear innovation, effectively ignoring the fact that we innovate every day.

This has impacts in the leadership and management domain too. For large-scale innovation or change it is often posited that 'we need transformational leadership'. But does this reflect how the leadership of change works in practice?

A model of change used by Clear (2018) tracks the impact of a 1% improvement made each day over a year, to achieve a net 37 times improvement (Figure 2). It's a model: we know it doesn't work in practice. It is useful, however, in providing a lens on how much change (including the transformational type) is an aggregation of marginal gains. Work by various authors (see, for example, Snowden 2016, Ladkin 2020, and Haslam *et al*. 2020) suggests that leadership is transactional – it occurs in the space between a leader and a follower – and happens 'one nudge at a time'.

Leadership is an improvisational practice of influencing others in a manner that enhances their contribution to the realisation of group goals. It is a process of influence. It takes place in groups in a particular context at a particular time. The group focus in the definition is not widespread in the leadership literature, yet it appears pivotal to effective leading, and relevant to research teams.

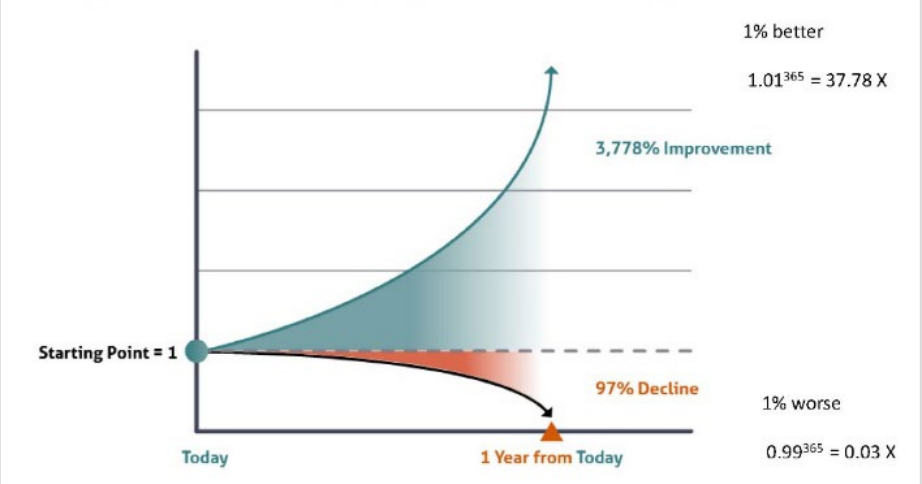

Figure 2. Progress = The Aggregation of Marginal Gains (see Clear 2018).

Haslam *et al.* (2020) contend that the identity that we find in our membership of groups (families, tribes, clubs, teams, projects, programs, organisations, corporations, etc.) is foundational to effective leadership, and emphasise again that leadership is a process of influencing others in a manner that enhances their contribution to the realisation of group goals.

They propose four rules of effective leadership:

1. leaders need to be seen as one of us – use 'we' and 'us', not 'I' or 'me'.
2. leaders need to be in-group champions – they must be seen to act in the collective interest.
3. leaders need to be skilled entrepreneurs of identity – their skill lies in representing their ideas as the embodiment of who/where we are and what/where we want to be.
4. leaders need to be embedders of identity – not only telling us who we are but also shaping a world in which our sense of who we are can be made to matter.

This resonates with me for many reasons, but particularly because I have witnessed many situations where organisations and businesses have failed because leaders are out of step with the values and desires of group members. Effective leaders can articulate the aspirations and purposes of groups members and describe a reality that makes sense, inspires action and creates followers. Haslam *et al.* (2020) call this a sharing of social identity. Effective leaders 'succeed by standing for the group rather than standing apart from it'. They are 'one of us'.

Following this line of thinking, each of the four capacity contexts identified in Figure 1 needs a champion in the team (it can be the same person) if effective change is to be achieved. This certainly warrants more empirical examination in research for development.

Ask better questions; set better goals; get better outcomes

We can ask better questions if we are to set better goals in our projects:

- Rather than asking 'What type of leadership do we want? (Transformational leadership? Adaptive leadership? Agile leadership? Values-based leadership?)', ask 'What do we want our leadership to do?'.
- Rather than wondering 'Why aren't there more women in senior management?', ask 'Why is gender so important to leadership?'.
- Rather than saying 'We will teach you project management', challenge participants to 'Demonstrate to us how you will use the project management skills you have learned so far, in your next step'.

At the individual level, reflective practices need developing to better analyse past experiences to learn and improve. For a researcher in agricultural development, this might mean evaluating a project's outcomes: what worked, what didn't, and how future efforts could be refined. It's like looking in a mirror and asking, 'What did I learn here?'. This process boosts self-awareness and helps refine methodologies. This leads to adaptive changes.

Significant change, however, requires a different path. Using a *reflexive practice* approach provides a tool that doesn't stop at analysing actions and results; it also examines the researcher's own values, assumptions and biases. It requires better, or at least different, questions.

Reflexivity asks questions like: 'How did my perspective shape my decisions? Did my worldview influence how I approached this community or interpreted the data?'. It's about understanding the lens you bring to your work, and questioning how it impacts both process and outcomes.

We can ask 'Why is the addition of reflexive practice more effective than reflection on its own?'.

Reflection focuses on learning from experience, but reflexivity invites you to interrogate the beliefs and contexts underlying your work. For a researcher, this means considering not just project success, but also how

personal and cultural biases may have influenced their understanding of the community, the framing of research questions, or even the design of interventions.

For instance, imagine a researcher implementing a sustainable agriculture project.

- Reflection might highlight that a particular training session didn't resonate with farmers.
- Reflexivity goes further. It would lead the researcher to ask whether the training materials reflected the farmers' lived realities or if the project prioritised technical solutions over local knowledge systems.
- Reflexive practice reveals blind spots and creates space for more inclusive, contextually sensitive approaches.

In research for development, reflexivity transforms the practice from a technical exercise to a collaborative, context-aware process. It challenges assumptions, deepens engagement with stakeholders, and ensures that the researcher's work aligns more closely with the realities of those it seeks to serve.

Reflexivity doesn't just refine methods: it reshapes the way we understand and enact development.

Wicked problems: system improvements or situation solutions?

As with Maslow's hierarchy, in the contemporary world we use the term 'wicked problems' freely. The paper that introduced the concept (Rittel and Webber 1973) is very narrow in its application. At first principles level, a wicked problem is one where the problem we are dealing with is not going to be solved by the projects that we are running. The problem space continues to evolve as we work in the solution space. Project outcomes can contribute to system improvements, but rarely solve a problem (see Armson 2011 for a useful discussion).

Hampus Eriksson addresses this in this conference proceedings (Eriksson 2025), when he says, 'First we do research and then we try to apply it somewhere'. Reality dictates that most of the problems we are dealing with are not going to be solved by the projects that we are running. Often by the time we start to get information from our projects, the problem space has shifted, and our planning assumptions need adjustment.

If we are to address the major global issues, we need to make progress in the solution space faster than the problem space evolves.

- When I started in my career in agriculture over 50 years ago, population growth was the key driver in the food security domain. It appears that in the second half of this century we will be approaching net zero population. That has shifted the problem.
- Ageing populations may be the major problem now, except in sub-Saharan Africa. In Europe, for example, ageing populations raise concerns about where the workforce needed to support domestic economies will come from. So, the shift there has been into fields like population flows and migration, and away from food production and supply.
- That, however, does not mean we have 'solved' the world food problem. More problems have emerged and taken centre stage, notably in food quality and nutrition. More recently, as we see elsewhere in these proceedings, the problems have also shifted to equity and diversity. We may just be keeping ahead of the curve in these domains, although that is not clear (and it can be disrupted – as we experienced with COVID-19).
- And in climate change the problem space is probably still racing ahead of the solution space.

We need to think about different ways that we can do all of these; and that, again, requires new and different questions. Big topics for another day.

Re-thinking partnerships

Rather than being prescriptive, I suggest we take a reflexive approach to our practice, and:

- always consider the information in 'first principles' senses, as opposed to thinking 'Oh, that is something I can adapt and use', without considering whether it is necessarily right for what we want.

- understand that models are *tools* rather than prescriptions, and that:
  - we can ask better questions.
  - we need to be open to emergent data and under-reported signals and outcomes.
  - we must fine-tune our capacity to observe.
- recognise that we are all leaders, and we can embrace the situation we are in, and we can change it. We need to consider how we can disrupt ourselves as leaders. What can I do differently?

Change occurs one transaction at a time.

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An agronomist and geneticist by training, Shaun Coffey has developed broad interests across science and technology through key leadership roles, including as Foundation Chief of the CSIRO Division of Livestock Industries (2002–2006) and Chief Executive Officer of Industrial Research Ltd, the New Zealand Crown entity, during 2006–2013. Mr Coffey serves on the Board of the Future Fuels Cooperative Research Centre, and as a Director of the Board of the Grains Research and Development Corporation. He is the Chief Executive Officer of The Crawford Fund, as well as the Fund's Director of Capacity Building.

SESSION 4 CASE STUDY 1

Genuine partnerships for transformational agricultural research and development

Adjunct Associate Professor Seeseei Molimau-Samasoni

Researcher, Scientific Research Organisation of Samoa

ABSTRACT

Samoa has had years of investment from donor countries and partners, though it can be difficult to grasp the impact of some of these initiatives particularly in the agriculture space. Agricultural production in Samoa continues to decrease, dependence on imported food increases, and the contribution of the agricultural sector to exports remains inconsistent. For the donor dollar to have real impact, the research and development initiatives need to be developed through genuine partnerships so that they focus on the real needs on the ground; and for such efforts to be sustainable, capacity building needs to be incorporated in these approaches. This talk will focus on the importance of cultural awareness, supporting local champions of change, and recommending a way forward for capacity building for agricultural researchers from Samoa and the Pacific.

This presentation outlines our experiential learning from not just one project but across several projects in which we have been fortunate to be partners, and our experience and some strategies that have worked well for us on how we can build genuine partnerships for transformational agricultural research for development. I'll present to you some of the current, perhaps not ideal, realities of how research is conducted in the Pacific; then make some recommendations on how we can move forward, and finish with some concluding thoughts.

We heard earlier today about the sombre statistics of food insecurity in the Pacific. We are highly reliant on imported foods. There is a declining rate of food production at the local level coupled with climate change and shifting labour availability. The scene is not optimistic, and it is compounded by the nature of how we do research in the Pacific.

A lot of the time, the research projects that come into the Pacific have a research agenda focused on academic learning, academic knowledge-finding. The research priorities of the Pacific are often secondary. Pacific partners are often seen as service providers, as sources of information and data, and are not genuine partners in the project. In cases where we do identify local champions, we fail to recognise, sometimes, the fine line that our local champions tread. Further, we in the Pacific have a declining interest in engaging in agricultural research as a career pathway.

Below are some strategies that have worked well in some of our projects, and there are some strategies that perhaps could be considered in moving forward.

Essential strategies: 1. Improve cultural and social awareness by project partners

The first strategy is to look at *improving our project partners' cultural and social awareness* when they come into the Pacific. It is acknowledged that each Pacific Island country has its own unique culture, but at the core of many of our Pacific Island cultures are our:

1. value of family,
2. love and respect for each other,
3. service to our community, and
4. religion is very important, particularly for our Polynesian Pacific Island countries and territories.

Food is synonymous with culture, and food features in a lot of our cultural events.
However, health is very low in our list of priorities.

Therefore, it is important for projects that come to the Pacific intending to address food insecurity to first understand the social and cultural barriers that are creating the gaps that we are hoping research will address.

We would also like to advocate for our project partners to *beware of perpetuating colonialism and of 'forcing' Western standards onto the Pacific*. It is imperative that we identify first if the Western standard is addressing an actual issue in the Pacific, before bringing in Western solutions (which may or may not work). And despite the best intentions of people, even those who have worked in the Pacific for a long time, there is still a risk of arriving with privileged mindsets.

We think that reflecting on this is important, so that we do not reinforce colonial practices and continue to cause harm.

Essential strategies: 2. Work with local champions; use local co-leadership

The second strategy that I would like to put forward is *working with local champions and local co-leadership*. Here is a quote from a book that some of our partners use before they come into the Pacific: 'Genuine participation/partnership means bringing Pacific scientists and Pacific communities in at the start of the research process'.

Local champions need to be genuine members of the project leadership team, not just a token local representative to 'tick a box', but someone who will actually be involved in the strategic discussions and decision-making of the project as it progresses.

Local champions work particularly well when you are trying to engage with local government ministries and local NGOs. Sometimes there can be a bit of animosity from local government ministries towards researchers coming in from other countries, and then having that local champion on the team is very important: they can use their local network and reputation to help the project. However, I want to stress that there is also a reputational risk to the local champion, particularly when these collaborations don't go very well.

The local communities will require the local champions on your project team to translate and to rally their support and their engagement. We have also found that some communities respond well to seeing our Australian and our New Zealand and other foreign partners with them in the field. That is a bonus.

However, when we have built genuine partnerships and we have supported our local champions, the champions are at a real risk of being seen as 'tall poppies' and then being undermined or disregarded by their community. So, where we build friendships with our local partners, we strongly encourage our project partners coming in from Australia or New Zealand to be supportive of our local champions as well, when they navigate these negative impacts of building collaborations.

Revamping capacity building.

When overseas researchers come into the Pacific, a lot of the local researchers that you will work with will be graduates with bachelor degrees, and like new graduates everywhere they will require a lot of mentoring, coaching and training to start them thinking more critically about the research that they're doing and are asked to be a part of, to move them away from just 'doing as they are told'. We do recognise that this requires commitment from the project partners as well as from our local researchers.

Agricultural research is not considered a career pathway by our top tier students. Our local universities offer agriculture degrees, and if our top students want to undertake agricultural degrees, they will have to study at these local universities, which means they cannot travel out of Samoa to study. I suggest to our donors that you consider sponsoring exceptional students who are interested in agricultural research to study in Australia or New Zealand, where they can get that wider solid foundation of learning about agricultural technologies, strategies and new knowledge; then encourage them to consider PhD or Masters research projects on topics relevant to, and valuable to, the Pacific. Then when they come back to the Pacific, they would be able to use this knowledge and these skill sets.

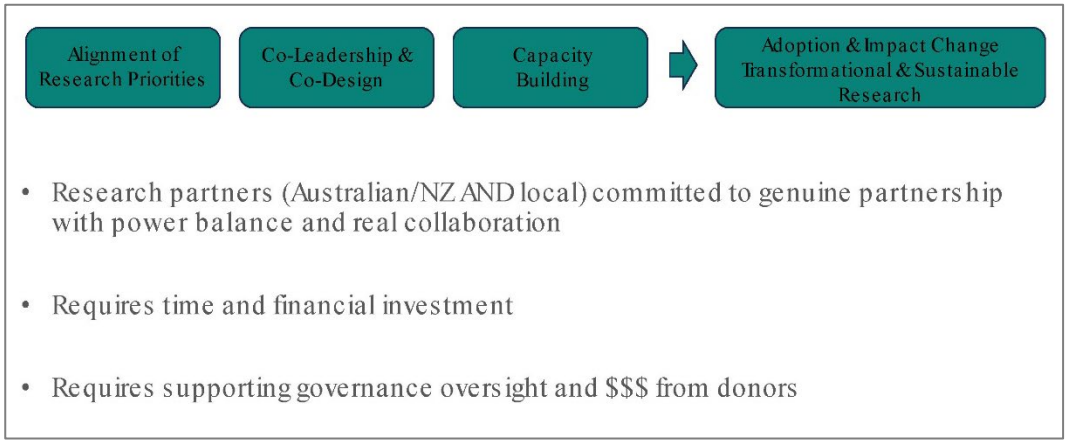
Summary

When you have an alignment of research priorities, along with co-leadership and co-design, and you incorporate capacity building in your research projects, this is a fantastic starting point to achieving adoption and impact change in your research project, and transformational and sustainable research in the Pacific.

We recognise that research partners, both Australian and from New Zealand and the Pacific, need to be committed to genuine partnership with an equal balance of power and real collaboration.

We do understand that it takes time, effort and financial investment.

Thank you to ACIAR, DFAT and the Crawford Fund for supporting us financially, because this is needed.



Dr Seeseei Molimau-Samasoni is a researcher at the Scientific Research Organisation of Samoa (SROS), where she has worked since 2009, and an Adjunct Associate Professor at the University of the Sunshine Coast Australian Centre for Pacific Islands Research. Although formally trained in molecular bioscience and chemical genetics, Seeseei has spent most of her time in recent years leading and managing projects in agricultural R4D in Samoa with close partnerships across the Pacific, Australia and New Zealand. Seeseei is the first Pacific Project Leader to lead an ACIAR project in the Pacific, when SROS became the first Pacific national organisation to be a commissioned organisation for an ACIAR project. In her management of this project, Seeseei encourages the Pacific partners to be the driving forces in leadership decision making for the project. Seeseei also advocates for capacity building initiatives that will lay a strong foundation for a new class of agricultural researchers in the Pacific.

SESSION 4 CASE STUDY 2

Capacity building for transformative change in the water sector

Dr Muhammad Azeem Ali Shah

International Researcher – Water Governance Institutions,
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ABSTRACT

This talk covers the success factors in the delivery and achievement of impact in the International Water Management Institute's large water project funded by USAID in Pakistan. More specifically, it tries to differentiate between institutional capacity building and individual capacity building. The presentation focuses on capacity building initiatives at different levels with a multitude of stakeholders to bring transformative change in the water sector. It also covers the challenge of improved water governance which is often confused with water management.

This talk is about capacity building for transformative change in the water sector. I present a case study of a large governance-related project, which is being carried out in Pakistan and Afghanistan. The talk will provide a flavour of how you can show tangible outputs in the governance domain, which is very hard. Often there is criticism that you cannot see tangible outcomes, but based on our experiences in the last six years (approximately) working on this, we have something to show.

We started by building a governance model, looking at how we were going to approach this issue. Then we followed a system change approach. Then we identified the key role of stakeholders and the kind of capacity building that was needed. And then we began our interventions.

When we look at the whole package of how we have dealt with this issue, you can see we have brought about a real transformative change.

Understanding water governance

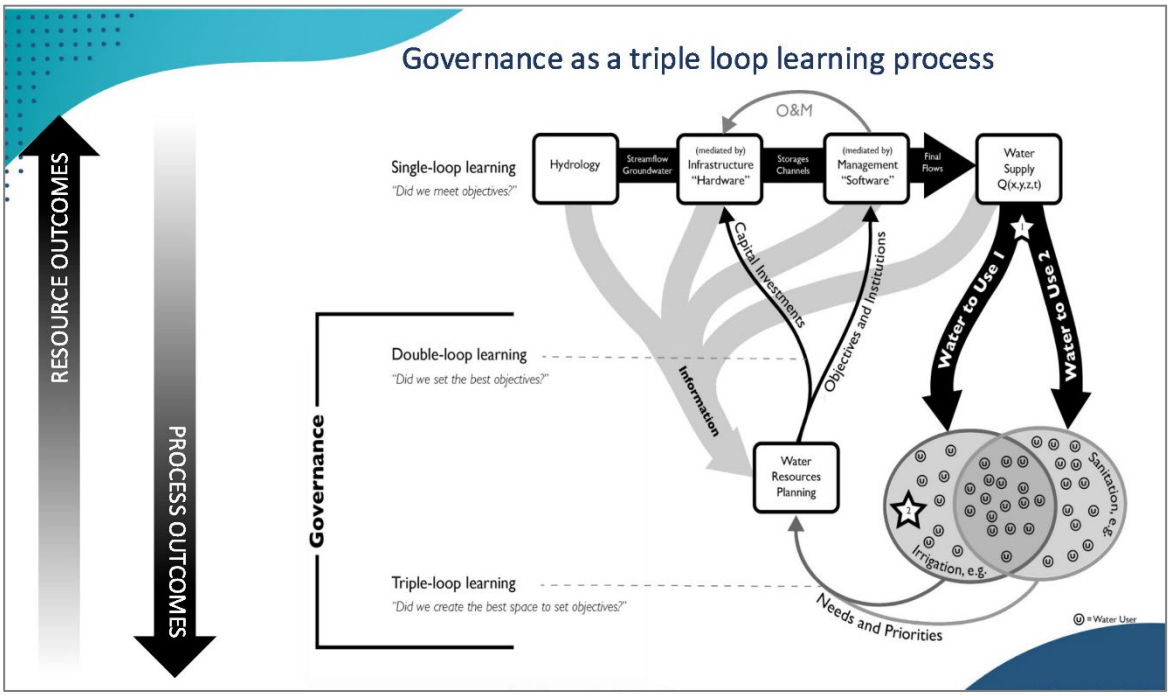

Figure 1. (Quoting Bell *et al*. 2022): 'Conceptual model for the construction of some water supply *Q(x,y,z,t)*. Spaces for improved governance are marked with dashed lines... Key governance challenges (stars) for a realised water supply are (a) allocation across different uses, and (b) allocation across users within a particular use.'

When we started this work, the challenge was that people were using management and governance synonymously. We tried to clarify Pakistan's water governance issues and how these might be improved. (Bell *et al*. 2022). In Figure 1, the first loop is about the management of water resources. You have a hydrological system; you have some infrastructure mediated by some management tools; and you supply water to the users; and water governance controls how you set the objectives to run the system.

The real issue, where stakeholders or influential players get involved, is at the third loop, where we ask: Did we create the best space to set objectives? Did we invite the right stakeholders to set the objectives of the water infrastructure system? The idea was that management is about the resource outcomes, and governance is about the process outcomes. You need a process where you have a clear idea of what you want to achieve.

The other issue is scale (Figure 2). This irrigation system in Pakistan, in this [Indus River] basin, is very large and complex. Often what we are trying to achieve at a certain level is not very clear. Are we trying to work at the administrative level, or at the hydrological level, or in a command area, or perhaps at the district level, or at problemshed level (Mollinga 2020)? These are various scales that we are working with. But we were very clear that we were supposed to deliver under administrative provincial boundaries, and at the transboundary level with Afghanistan.

That was the clarity with which we approached our objectives,

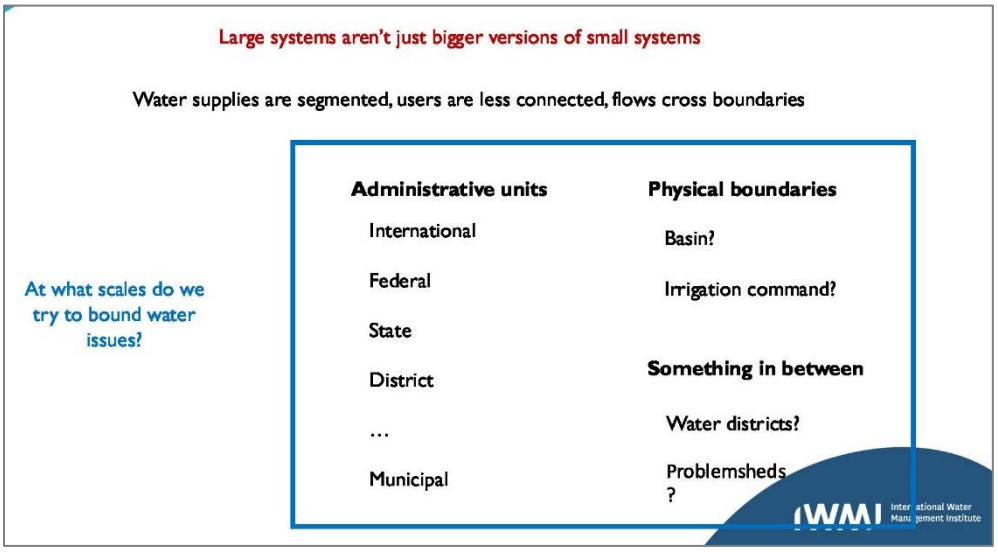

Figure 2. Scaling up water governance.

System change approach in the water sector

The system change approach that we followed was to begin by trying to raise awareness about the issue that we were trying to solve through our interventions. We involved government, private sector, and other types of stakeholders in sessions to empower them by raising their awareness, and then we started focusing on building their capacity, both at the institutional and the organisational levels. Finally, over time, we built linkages (Figure 3).

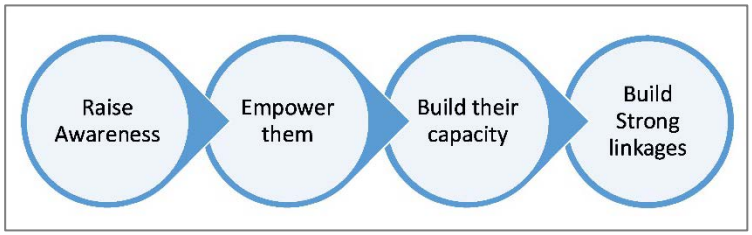

Figure 3. System Change approach in water governance.

For capacity building, which is the focus of this talk, the first question is: what kind of capacity are we trying to build: on the individual level or the institutional level (Figure 4)? We were very clear that we had to build the capacity of both. At the institutional level, since it's a governance-type activity, people have to work with tools, techniques, laws, policies, and their implementation frameworks for implementation and modernisation of their systems, which are pretty broad in the irrigation infrastructure in Pakistan. At the individual level we held many training sessions: technical, managerial, induction and refreshers.

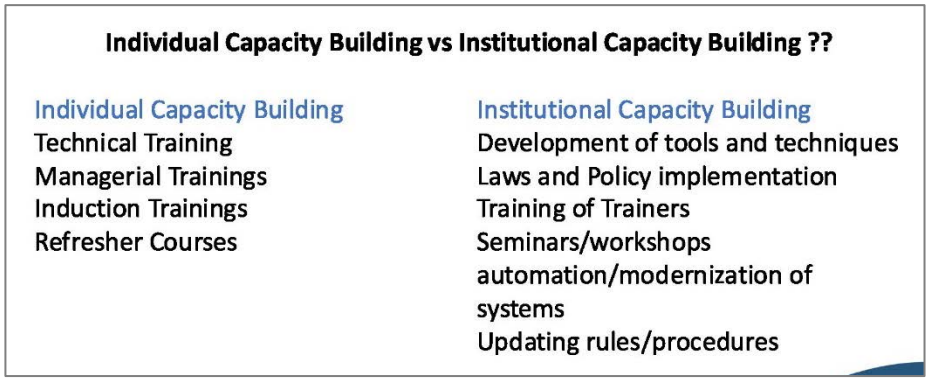

Figure 4. Capacity building – of whom?

Identification of stakeholders and types of capacity building

Next, we started mapping all the stakeholders. If you are to improve water governance in a large area where you have multiple rivers, the main custodians are the public sector organisations and allied entities. Also, the private sector (for-profit and not-for-profit organisations) and the farmers who were the basic custodians whom we wanted to influence. Also, academia was involved, to provide education to their graduates (Figure 5). We created a lot of networks. The righthand side of Figure 5 shows the kinds of interventions we set up with all of them at different levels.

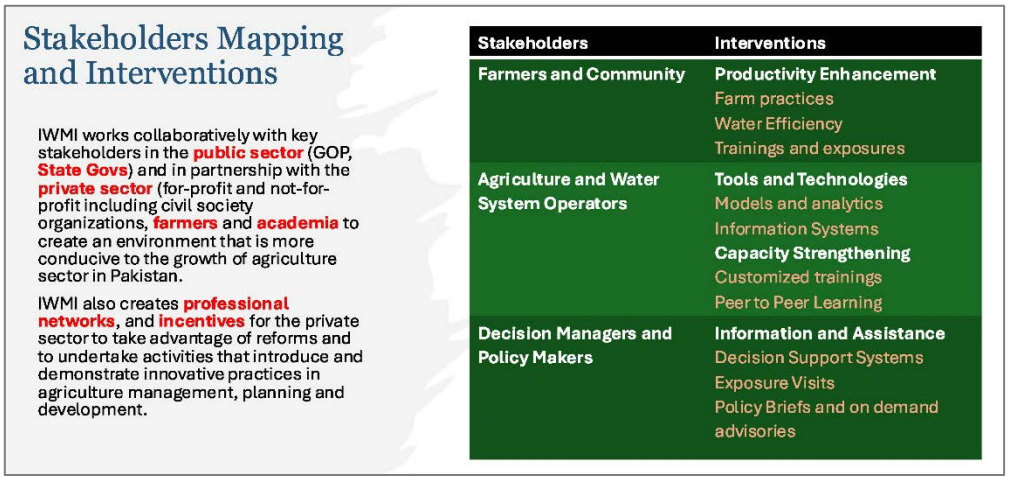

Figure 5.

Capacity building interventions at different levels

For individual capacity building, our first focus was the farmers. To give you some background, this is a new greenfield area of around 77,000 hectares being developed since the Gomal Zam Dam was built in 2011. We introduced micro drip irrigation kits and tunnel farming type structures (Figure 6). Then, looking at the value chains, we saw there were issues with silage, so silage-making techniques were introduced for the first time, as were surface irrigation techniques and a focus on organic farming through bio-fertiliser wells. We made these technical interventions with the farming community directly, and we engaged some associations, but they were

not very effective at the very start. We also ran awareness campaigns around the larger issues of climate change shocks, building their capacity to deal with those (Figure 7).

Figure 6.

Figure 7.

Figure 8.

For technical training, we approached all the stakeholders – public sector, private sector, universities – and started running training workshops with them on modelling aspects and gender mainstreaming activities (Figure 8). At the decision makers level (Figure 9), the executive management training programs were about leadership, procurement processes, value chains. They were delivered in partnership with a major Pakistani private sector university (LUMS – Lahore University of Management Sciences).

Figure 9.

The interesting part was at the institutional level. The national water policy of Pakistan was passed for the first time in 2018, and the provinces were grappling with implementing the various clauses in the policy. Working in KP province, we automated the whole flow measurement system in the main canals, to deliver on the policy. They had been lacking that institutional capacity. KP was the first province to have that system. With their support and continuous engagement (to deal with issues), finally we have launched that system (Figure 10).

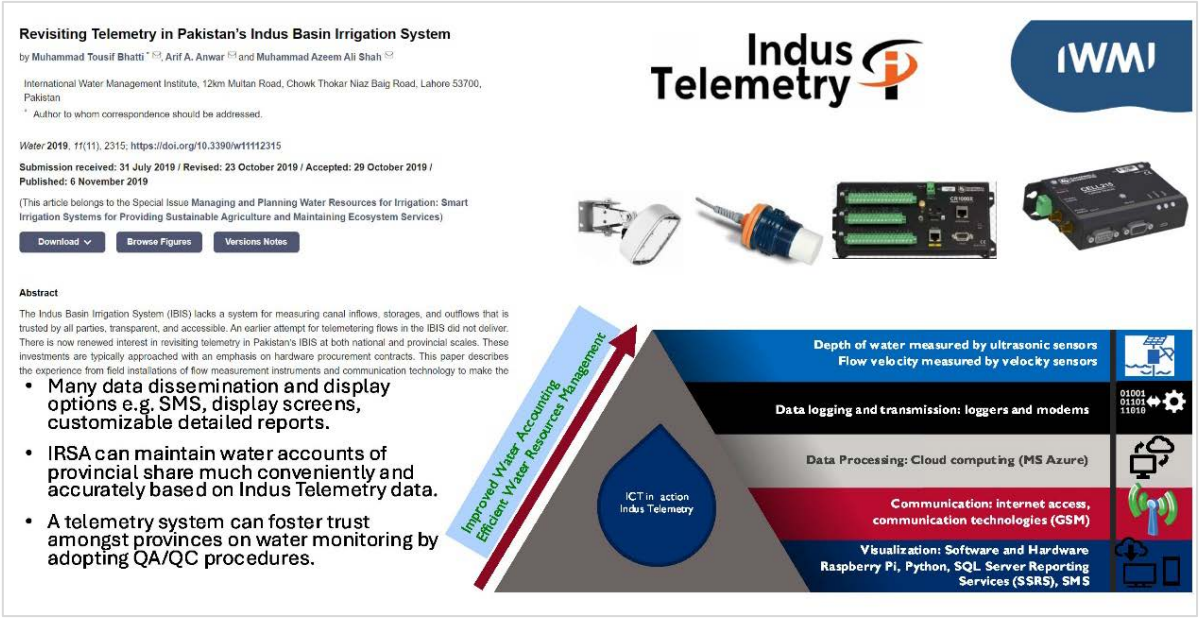

Figure 10. See Bhatti *et al*. 2019.

Other data interventions

Their weather forecasting system had been relying on obsolete data. During the project we installed around six weather stations for monitoring the weather.

One of the major institutional interventions was to digitise the water allocation system, which is called 'Warabandi' in the vernacular. This was the first time a whole system of information had been implemented about the water distribution in the command area of the Gomal Zam Irrigation System, including acquiring flow data from the small distributaries and canals. We developed all these systems in collaboration with the partners, and we delivered them and they are now in use.

So that is how you can make a change in the way processes are being carried out, and how you can influence governance.

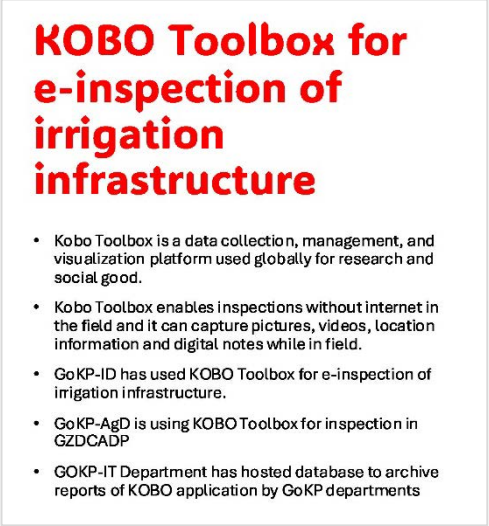

Figure 11.

Finally, also at the institutional level, we introduced e-inspections for maintenance and repair works, using the KOBO Toolbox of open-data type tools (Figure 11). Every year now, institutions issue a letter before the maintenance and repair season saying that staff have to use the KOBO Toolbox. That way, institutions can monitor that their staff are actually going into the field, taking pictures, recording videos and making audio notes. There is transparency, which is a key aspect of improving governance.

Then we realised that KP province was a bit lacking as compared to the Punjab province for instance. So, we brought professionals from KP to Punjab to learn from their peers in the equivalent departments. Learning from their peers and discussing how they are carrying out their business has been a great success. They identified champions in the respective departments and the collaboration has delivered good outcomes.

We have engaged with universities. The Vocational Training Institute was engaged to train their faculty on design of drip irrigation systems and make it part of its curriculum. We also developed a complete course on the impact of climate change with the University of Peshawar in KP province, and now they are launching a diploma program (see Figure 12). As researchers I think it is our responsibility to bring these contemporary issues to people's attention.

Figure 12.

There was good support for the implementation of the KP Water Act 2020. There had been a series of water Acts being rolled out in Pakistan in each province, and they were not very clear what to do next. Our Organizational structure strategy document is helping to operationalize all these tools and techniques they need in order to implement the Act (see Figure 13). These were developed to strengthen what they want to achieve. Advisory services are very important, and we send them directly to the farmers as well as to the departments.

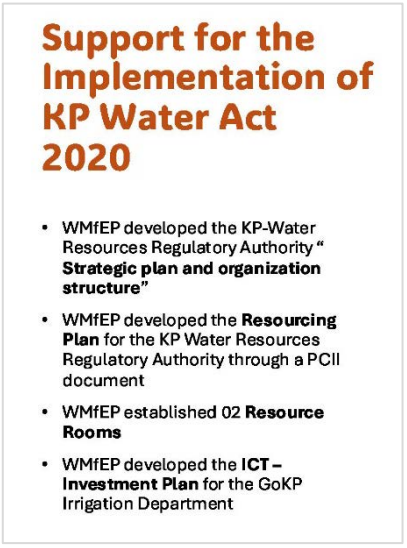

Figure 13.

Collaboration with Afghanistan

The last component was with Afghanistan. Pakistan has a formal arrangement with India for exchanging waters of the Indus Basin's six rivers. However, there is no similar mechanism with Afghanistan. Therefore, we first checked with the Ministry of Water Resources to find out if they had the right information to engage with Afghanistan on this matter. There was nothing. So we developed a complete book on the three main rivers that Pakistan shares with Afghanistan (Shah *et al*. 2023), and it was launched during the course of the project. It provides the baseline data (biophysical and social) needed for meaningful engagement between the two countries. We also carried out exposure visits with people from the relevant ministries to areas like Central Asia, South Africa, to let them see how those countries are dealing with the issues of transboundary water resources management. Figure 14 shows part of a website that we will soon launch – a knowledge platform – that gives all the necessary information on the rivers between Afghanistan and Pakistan.

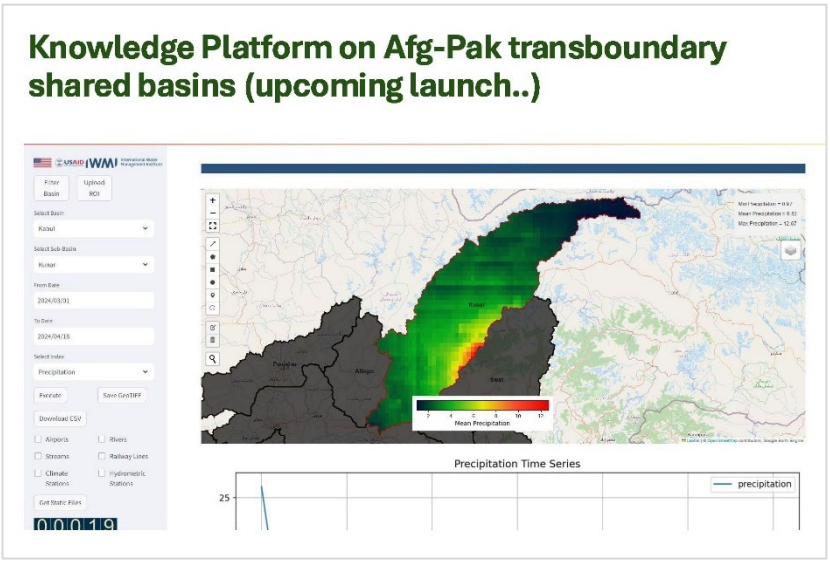

Figure 14.

In summary, I have given you some practical examples of how, with a package of initiatives, you can influence governance. It entails all these kinds of efforts.

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Dr Shah is a water governance professional with over 19 years of experience in conducting applied research for development projects in the South and Central Asian regions. Based in Lahore, Pakistan, Dr Shah's research focuses on the water security issues at transboundary/national levels, climate smart agricultural interventions to improve water productivity and food security, automation systems for flow measurement and solar based irrigation systems for agricultural resilience. Dr Shah is currently Chief of Party for a large USAID Project with IWMI implemented in Pakistan/Afghanistan and Country Project Lead for a regional South Asian project on Solar Irrigation for Agricultural Resilience funded by SDC. Dr Shah is also IWMI Team Lead for Central Asia and MENA regions and Project Steering Committee Member for "PEER2PEER International Convergence Research Networks in Transboundary Water Security" funded by NSF. Apart from this current portfolio of projects, Dr Shah has successfully implemented multiple projects funded by USAID, World Bank, FCDO, ADB and other donors. Dr Shah has more than 20 research publications in reputed international journals to his name. He is also the Lead Editor of the book *Afghanistan-Pakistan Shared Waters: State of the Basins*. Dr Shah holds a PhD in Management (Water Governance) from the Lahore University of Management Sciences, Pakistan. He has presented his research and participated as guest speaker/panellist in more than 20 countries in the world.

SESSION 4 CASE STUDY 3

Early career researchers working effectively together

Ms Jessica Fearnley-Pattison

Facilitator, RAID Network, Crawford Fund;
Australia Volunteer Program; and Vietnam National University of Agriculture Project

ABSTRACT

The RAID/VNUA early career research and mentoring program represents a significant collaboration between the Researchers in Agriculture for International Development (RAID) Network and the Vietnam National University of Agriculture (VNUA), with the support of the Crawford Fund and the Australian Volunteers Program. This program aims to enhance research capacity and foster international collaboration through a structured mentor partnership model. This paper outlines the attitudes, skills and capabilities needed by early career researchers to effectively work with researchers in developing countries and deliver high impact research. It discusses how the project team have been working through a co-design and co-leadership process when working remotely, as well as the challenges this can sometimes present. It also outlines some preliminary outcomes that indicate a positive impact on the participants' research capabilities and professional networks, and thoughts on how others can learn from the project's outcomes over the past 4 years.

This talk is about a program that has been going since 2020. At the moment we are calling it Early to Mid-Career Australian and Vietnamese Research Program. I will tell you about some of the developments we have had over the few years with this program, and some of the challenges that we have experienced. They have given new skills and attributes to our program participants and also to the group that has been working together to create this program.

In its current phase, the program has three specific partners: RAID Network; the Australian Volunteers Program; and the Vietnam National University of Agriculture (VNUA).

- RAID (Researchers in Agriculture for International Development) is a program of the Crawford Fund and funded by ACIAR. Our core motivations are to *connect* early to mid-career researchers, and *engage* our members, and to provide *support* for agricultural career development.
- The Australian Volunteers Program is an Australian Government-funded initiative that supports global volunteering. It supports partner organisations across the Pacific, Asia and Africa to achieve locally led change and the realisation of the Sustainable Development Goals. The Australian Volunteers Program is involved because it is supporting our participants to work in-country, and it provides funding for our program as well.
- Our in-country partner is Vietnam National University of Agriculture, which is an agriculture-focused university located in Hanoi, Vietnam. We have been working with the Agricultural Economics faculty to build our program.

This partnership has demonstrated the program's commitment to building a long-term agreement with early career researchers in Australia and early career researchers in Vietnam.

The program has had many iterations since it was begun in 2020 (Figure 1) during COVID-19 by David McGill and team at The University of Melbourne. It started as a five-week online workshop for early career researchers, and we engaged in basic research skills: developing research questions; survey analysis; design of research programs; and presenting our research.

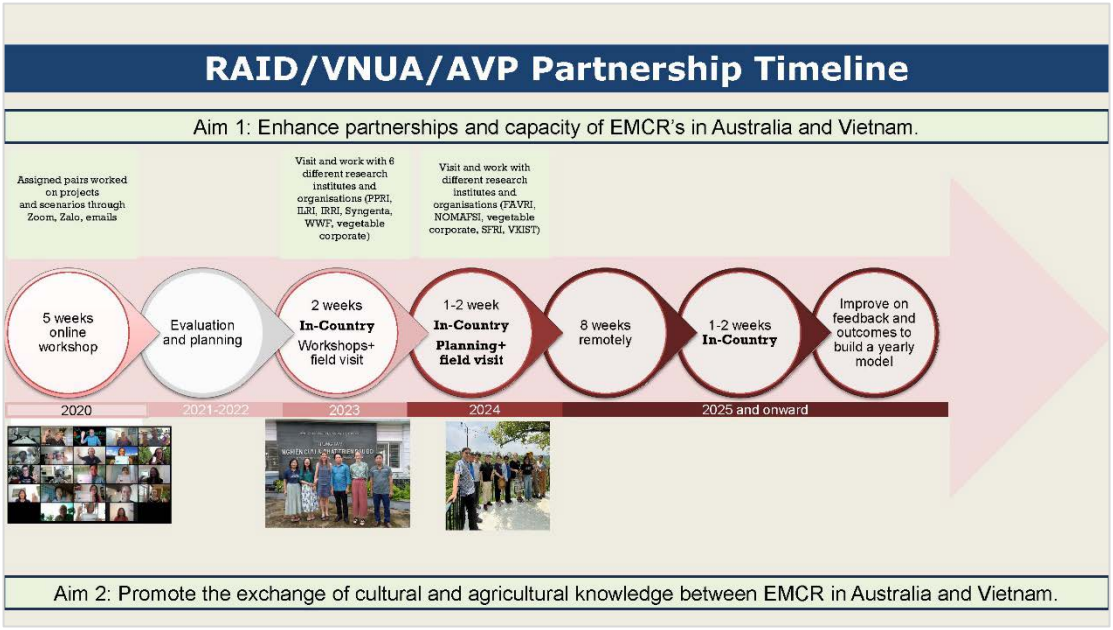

Figure 1.

I was a participant in that program, and that program significantly advanced my research skills and gave me the opportunity to have good interactions within the international agriculture arena. I developed a very good relationship with Phuong, one of my partners in Vietnam. The main objective of this was to develop both sides, Australian and Vietnamese, and to work together to develop our research skills. That was very successful.

We went into an evaluation and planning phase through 2021 and 2022 as the world opened up after COVID-19, and that gave RAID a way to develop the program further and see if we wanted to continue the collaboration.

Then in 2023 we had two weeks in-country with the cohort from 2020, and we were able to meet our Vietnamese partners in person and work again on some research skills. We were also able to see some Vietnamese agriculture and start to think more about the challenges that are experienced in Vietnam agriculture, and how these might relate to challenges in Australian agriculture. It was partnership, working together again, and identifying where we might be able to put our future research focus. That was, again, a great success.

A lot of the participants from that exercise decided to become program leaders. Three Vietnamese participants from 2020 came onto the leadership committee with Megan Williams, myself and the RAID team. We decided to plan again, assess what we had learnt, and design a program that would be sustainable year after year into the future. That was because, while it is good to go into a country and be fascinated by their agriculture, we needed to consider what that would lead to. How could this make progress? And as a volunteer organisation, how could we ensure that if I leave or Megan leaves the organisation, we can still carry this on. In essence, we were working with VNUA to create a sustainable program.

This year, we have just completed a five-day planning session in Vietnam with VNUA. We decided on an outline of what they would like to see and how to support their early career researchers, and then how we in Australia might implement some of the skills here as well.

Now, we have just decided, for the future we will have another remote component as part of that program with Vietnamese students as well as Australian students working together, two weeks in-country again, and then year on year it will just continue to improve.

Some of the outcomes from this program.

In 2020, 12 Vietnamese and Australian early to mid-career student researchers (EMCRs) successfully completed the online research skills workshop. As I mentioned, this came at a critical time for a lot of the participants in that program. Many of them have since pursued PhDs, Masters degrees, or research fellowship jobs. That is an excellent outcome from that workshop.

In 2022, Me Vang, one of the Vietnamese students, completed a three-month internship in Australia, which was funded by the Crawford Fund. It was two members of the group, Megan and Anh Pham, who organised bringing Me Vang to Australia to see Australian agriculture and develop his English skills. That has enabled him to take on a Masters program in Korea this year!

Then in 2023, Australian program participants visited Vietnam to work on research modules with Vietnamese students.

This year, 2024, previous participants from the 2020 and 2023 cohorts are working together to create a yearly program, learning from previous outcomes and partnering with other universities. There is extensive evaluation and planning with Vietnamese partners to develop content for the next program. That those participants are now carrying this program forward is an excellent outcome.

Challenges in setting the directions for 2025

Challenges help develop skills. One of the main points that we have been discussing with the team at VNUA is how to have a clear understanding of the candidates who can apply to join this program (Figure 2). Sometimes the content is too basic for PhD students to participate.

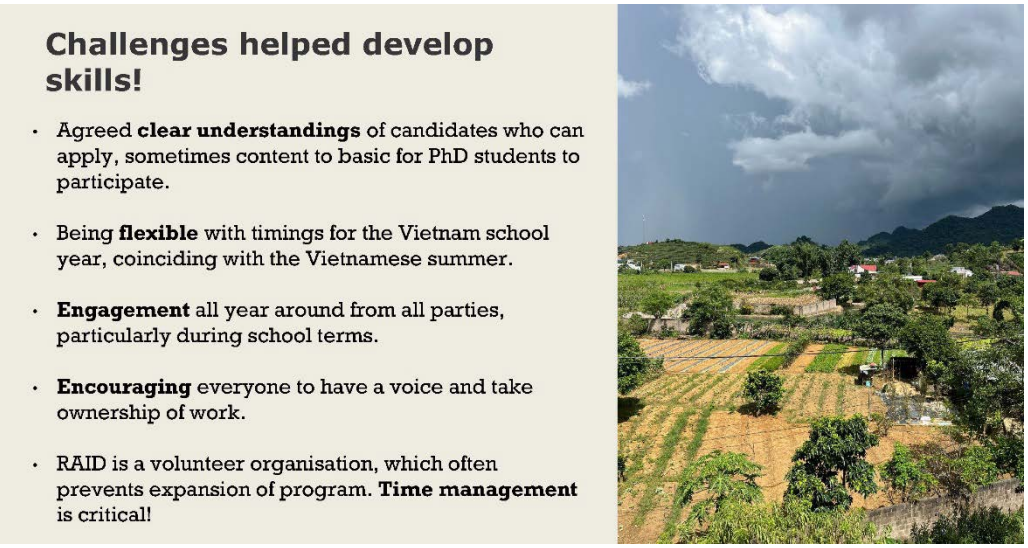

Figure 2.

In 2020, the program was run at entry level, all about designing research. VNUA have decided that they would like to move forward now, and focus on particular research skills. This coming year, 2025, we believe we will be focusing on writing and on reading papers: that is, looking at journal articles, and structuring journal articles, and making sure you use the right format, and know where to send your article, and referencing. In other words, as VNUA's aims and needs are changing, we are trying to develop the program to meet those as well.

Another aspect we have been discussing is how to be flexible in the timing of the program, so it accommodates the Vietnam school year and coincides with the Vietnamese summer. We want to make sure our time in-country with our partners is at a time convenient for them as well.

Staff of VNUA are extremely busy throughout the year, so the time when we run the in-country component needs to be when they are on school holidays. But this creates more challenges: namely, being in the field when it is 37 degrees and 90% humidity – which coincides with the wet season (the photo in Figure 2 was taken as a storm was rolling in).

Managing engagement all year round from all parties, particularly during the school terms, is also a bit of a challenge. However, we aim to find out how staff of VNUA like to work: just with emails at night?; or by Zoom?; or by Zalo? And what about the Australian counterparts? In our volunteer organisation, RAID, we all have full-time jobs, so finding time when we can develop content is also a bit difficult, as is encouraging everyone to have a voice and take ownership of the work. However, we have discussed this with VNUA now, and we have agreed on certain components that we are all developing. And each meeting we work through a list of actions. Everyone is delivering their work, but also everyone's having a voice on how we are constructing the program. Time management is obviously critical.

The cohort from 2022.

Contact us to take part next year

The program is a good way to enhance early research skills, both here and in Vietnam, and to celebrate successes as well at the end of the program. It will be running again next year, and we are just finalising the last details. To participate, please contact us:

Jessica Fearnley-Pattison, RAID Vice President, raid.vp@crawfordfund.org.au
Megan Williams, RAID VNUA Program Lead, meganwilliams@live.com.au

Jessica Fearnley-Pattison is the Vice President of the Researchers in Agriculture for International Development (RAID) Network. After completing a Bachelor of Rural Science, she received a Crawford Fund student award for her research in Cambodia, where she looked at adaptation of horticulture crops in different provinces. Jess now works as Development Officer for Temperate Fruits at the NSW Department of Primary Industries. Her work at NSW DPI is focused on research and extension working directly with industry and farmers to improve production sustainably in the apple and cherry industries. To complement her work, Jess is currently studying for a PhD in carbon sequestration in perennial orchards to help horticultural growers mitigate and adapt to a changing climate. Jess currently is facilitating the Vietnam National Agricultural University collaboration with RAID which connects early to mid-career researchers in Australia and Vietnam to improve research and communication skills, and foster international working relationships.

SESSION 4 Q&A

Chair: Jo Grainger

Acting First Assistant Secretary, Trade and International Division,
Australian Dept of Agriculture Fisheries and Forestry (DAFF)

Q. Chair: A question to all the panel. What do you think is the way, as a co-leadership model, to look at institutional partnerships and capacity building?

A. Seeseei Molimau-Samasoni: A lot of the genuine partnership and co-leadership that we try to build in the Pacific involves talanoa – inclusive dialogue – and it also involves encouraging our partners to share. After many years of having project partners coming in and just telling us what to do, added to our culture of respect, we find it very difficult to contradict or to go against what our project partners propose. Something that we have found worked very well was participatory and interactive workshops when we are trying to design a project together with co-design and co-leadership. We have also been fortunate enough to work with partners who have been open to the idea of shifting their research agenda in proposed projects. When they have brought in a project that we have not been able to design together, we have sat down and discussed with them what the *project* wanted to achieve and what the *realities* were on the ground, and worked together with them through a participatory, interactive and talanoa session on what we *both* wanted to achieve through the project. That ensured that the work that we were doing in the project addressed the objectives set for the research funding, and also addressed *our* research priorities to answer our research challenges.

A. Shaun Coffey: I would add to that. In a practical operational sense, quite often it is as simple as giving people in the room 'permission' to do things or to speak up or to give voice to their ideas. We often create the participatory frameworks and sessions, but then when we observe that people aren't participating we try to make interventions that, in fact, don't reflect the local culture or the local norms. So, just giving people the opportunity to voice their thoughts, and creating a safe environment in which they can do that, is good. We have had that experience directly, in a particular workshop where Dr Samasoni stopped everyone by voicing some major concerns – and many of us in the room with Western tradition and non-Pacific tradition suddenly saw things in a new way! It's about giving people 'permission' to speak up.

Q. Tom Swan, University of Sydney: My question is along those lines. I was very interested to hear Seeseei talk about local champions, and I would like some advice about how you find and foster the local champions, given that you said that at times it can be a risk for them to be acting and serving on our projects.

A. Seeseei Molimau-Samasoni: It can be a challenge at times, but when you do – sometimes once in a blue moon – identify a really fantastic local champion, I think it is very important to build that relationship with them; to have friendship, open friendship, that is comfortable enough for them to start letting you know when they are at risk as a result of the collaboration, as a result of the capacity building that they are receiving as part of the co-leadership and by being a local champion on the project. It may just be that they need someone to talk to, or mentoring in terms of how to navigate being the tall poppy that is about to be 'chopped off'. I think you need to develop that relationship and that friendship to support the person, and be able to discuss possible options for how they can survive.

Q. Beris Gwynne, Incitare International: With a session on rethinking partnerships and capacity building to support transformational impacts of R&D, I want to congratulate all the speakers who have spoken on the need for us to resist applied or assumed wisdom; to question the worldviews and paradigms that have built up over the last 50 or 60 years and have colonised words like 'partnering', 'outcome' and even 'capacity building'.

My interests at the moment are in the impact-investing space. I am based in Geneva in Switzerland. What I find is, first, that the extraordinary expertise that ACIAR brings to the table, and that Australia brings more broadly, is typically not at all visible at those impact-investing conferences.

I would like to invite the panellists, as well as the organisers of this extraordinary event, to consider that, at a future meeting, there might be a conversation about partnering and capacity building to engage with the private sector – and not just the companies with money for corporate social responsibility (CSR) but in the impact-investing space. That's where real transformation will take place. So any comments that you have, that might help me to get better traction in Geneva, would be appreciated.

Chair: Anyone who is offering impact-investment dollars is very welcome at this conference, I think.

Q. Peter Wynn, Charles Sturt University: Dr Shah, I noticed in all your photographs that there are almost no women involved with the measurement of irrigation, and conferences, and field work. Is this a challenge for you? Because women obviously are very much in charge of the food supply for the family.

A. Azeem Ali Shah: The reality is we have a lot of male dominance, particularly in the irrigated agriculture sector here in Pakistan, and especially in the government and public sector organisations. We have to take a direct approach and specify that you have to involve female representatives from your departments. That is the strategy we have been pursuing. But at the household level, at the farmer level, there have been separate interventions for the females and for the males, because cultural barriers are involved and the females do not like to be with male counterparts. It may not have been clear in the presentation but we have a lot of interventions with farmers – female as well as male. But when it comes to the private sector and government departments, we make sure that the invitations include proper representation of the females, which is a maximum of 20% or 25% in their workforce.

Q. Mikayla Hyland-Wood, from ACIAR and the RAID Network: A question for Seeseei about balancing international capacity development opportunities for those exceptional Pacific students while also avoiding contributing to the brain drain to Australia, New Zealand and other funding countries. What advice do you have for funders interested in developing Pacific capacity, in agricultural research or related disciplines, that aligns with Pacific values?

A. Seeseei Molimau-Samasoni: We probably can't stop people from moving away, in terms of the brain drain. (I have stayed behind out of loyalty and out of love for country.) In terms of supporting capacity-building initiatives for our exceptional students, I've heard a lot about the New Colombo Plan. A lot of scholars are talking about how eye-opening and enlightening the experience was. I think if our agricultural researchers or budding students had the same level of exposure, where they can visit another country and see what potential is out there – that they could then bring back to the Pacific Islands to help build our capacity and improve our food security – that could also be transformational. Often, our agricultural researchers stay in the Pacific, and their careers can be limited when they don't have that level of exposure that perhaps the New Colombo Plan is offering Australian students.

Q. (male): There are Australian farmers who use labour from the Pacific to harvest their crops. That can't be very good income for families on the various islands in the Pacific. Are there negative effects of this very extensive industry?

A. Seeseei Molimau-Samasoni: That is so, and we hear a lot about it from our private sector business. It is starting to affect our education and our nursing and our healthcare systems, where teachers, policemen, and nurses are leaving the Samoan workforce, or the Pacific workforce in general, because it is more financially rewarding to travel to New Zealand and Australia to work on a seasonal scheme, where in six months they will make more money than they normally would over two or three years working in the Pacific. That leads not only to a shortage in those industries and sectors, but it also negatively impacts our ability to produce our own food when there is less labour available to work the land. Often, the people who leave on the Seasonal Worker scheme are the able-bodied youth whom we really need to start producing food locally. It's very difficult to try and hold people back when they know that it is beneficial for their families, because many of these seasonal workers come back and they buy new cars for their parents and they build houses for their parents. Meanwhile,

there will be people who have worked in the Pacific for more than ten years and are still trying to pay off their car loan. It's a difficult space to navigate.

Chair: Yes, and the farm workers from the Pacific are incredibly valued by the agriculture sector here. Yet we need to look after them better when they are here.

This has been a fascinating conversation, giving us a lot of thinking to do.
Thank you very much to all our speakers.

SESSION 5 PANEL DISCUSSION

Achieving transformational outcomes

Dr Ismahane Elouafi[1], Ms Karen Mapusua[2], Dr Line Gordon[3], Professor Wendy Umberger[4]
Moderator: The Hon John Anderson AC FTSE[5]

[1] Executive Managing Director, CGIAR; [2] Director, Land Resources Division, The Pacific Community; [3] Director, Stockholm Resilience Centre, Stockholm University; [4] Chief Executive Officer, ACIAR;
[5] Chair, The Crawford Fund

Hon John Anderson, Dr Ismahane Elouafi, Ms Karen Mapusua, Dr Line Gordon and Professor Wendy Umberger during the panel discussion.

Hon John Anderson: Welcome to our four panellists. To get the ball rolling, I am posing the question: Are we using appropriate language to set the scene for engaging people in the climate challenge?

Steve Koonin was President Obama's right-hand man on climate; and in London last year when he was asked, 'What is the first thing we need to do about climate?', I heard him say: 'Stop the catastrophizing'. I think he meant that, for young people particularly, every event now seems to be labelled a 'crisis'. It's mental health or it's the cost of living or it's geopolitical realities, or it's the economy or it's climate.

As one of our scholars said to me over lunch today, we run towards a challenge to have a go at it, but we run away from a crisis or catastrophe. I'd be interested in the panel's views on how we engage people in a way that doesn't simply frighten them off. There are stories in newspapers and the like of young men saying they have just had a vasectomy because the world is so frightening they don't want to bring children into it. How do we get the right tone?

Dr Line Gordon: I can try to kick off. I think this is a big challenge in terms of how we speak about climate change, and I personally feel quite torn. On the one hand, I agree with you: it's a risk that people run away from a crisis. On the other hand, it *is* a crisis. Look at what happened during the pandemic, which was a real crisis perceived as a crisis. It made the world come together and collaborate to solve it, turning that crisis into the challenge of: How can we solve this?

Also, sometimes I am almost worried that if we tone down the language we will also reduce that capacity of coming together. I do agree that we also need to have a more imaginatively positive view of where we are going

– from potentially going from this crisis situation into one that is more positive. I talked a bit about that in the Sir John Crawford Address.

How can we create a more positive Anthropocene? We need to combine that feeling of crisis with a positive imagination. That would be my perspective.

Ms Karen Mapusua: Yeah, it is a crisis. It's an existential crisis for some of us. It's not something that we can play around with or water down or just say: 'It's a challenge. We should do something about it.' It is the end of the world for some of us. I think the word 'emergency' is appropriate, because we respond to an emergency. We don't run away from it; we respond to it; and that's what we need to do. We need to respond strongly and clearly and with very firm intent.

I agree that knowing what our response is, and then envisioning a positive future, is also critical, because there is strong evidence that the climate emergency has mental health impacts on some people, where it is existential.

We need to be able to give people hope as well and look for something in a future … look for those positive outcomes from the world we have today.

Hon John Anderson: Can I challenge you a little bit? Essentially the same physicist who was Obama's adviser says that the climate change science is clear; the modelling is not. But you have just asserted that there is a crisis coming. How serious is it? As I understand it, the IPCC does not predict the end of humanity as we know it. You have just asserted that you think it *is* an existential crisis.

Ms Karen Mapusua: Yes, it is. If you live on a small island that is at sea level, it is an existential crisis. It might not appear that way for everyone, but for some it does. And while the modelling is uncertain, that is part of the risk. We know that the models … well, we have already broken the boundaries; we don't know what's going to happen. Will we flip into an ice age? Will we continue to heat the planet? Those things are unknown and that makes it difficult to respond. But I don't think that we can lessen the risk that is around that.

Dr Ismahane Elouafi: I agree with both of you, but I think for the agriculture sector it could be an opportunity. And it *is* an opportunity, because when we think about it, what can sequester carbon? It is only plants, soils and oceans. It's not electric cars that absorb the carbon!

We are giving away money to renewable energy, and particularly electric cars, saying that, if we give subsidies, we are paying somebody to stop a potential emission. Whereas for agriculture, if we are well organised, if we can monitor all the carbon sequestration that is happening right now, and if we use different practices to increase sustainability and increase that sequestration, it could be a winner! But we are not doing that, because we don't have the data and because, more importantly, we are not well organised internationally. I think that is the flipside story – that we need really to put forward agriculture as part of the solution.

However, we need to understand it; we need to monitor it; and we need to use the right incentives. Right now, farmers are not really incentivised, particularly small-scale farmers, because (as I mentioned earlier) the carbon didn't really benefit them at all because the monetarising methods we have right now carry a big question on the standards *per se* and the monitoring. And there is also the cost. We are not simplifying it in such a way that we create a market of credit and conservation, of diversification, of biodiversity, through agricultural systems.

It is doable, but we need to get it right. Hence, I think it's very important that we see this as another area where we need *more* partnership and *more* collaboration.

Professor Wendy Umberger: I agree with what my colleagues have said. My comments are related to Ismahane's, but from a different point of view, in the sense that there is an opportunity to communicate the need for more investment in agriculture R&D, because climate change and climate issues and the crisis, they are creating food security issues that mean we need to be more productive. We cannot just talk about the positive things that agriculture can do with respect to sequestration. Demand for meat and protein in emerging

economies is increasing, but meat does contribute to emissions. We must drive innovation and increase funding for agriculture R&D so that we can innovate, increase productivity, find how to bring in new crops and crop varieties that are climate resilient, good for soil, that are more sustainable, that keep us from having to extend our land use. Su McCluskey, who is the Special Representative for Australian Agriculture, speaks passionately about the benefits of investing in agriculture; that agriculture has so much to contribute in this debate, and not just from a carbon sequestration point.

Speaking as a behavioural scientist, not just the ACIAR CEO, we try to think about what drives people to change their behaviour or attitudes. We want people to understand that we need to invest, that we need to pay attention. However, some people will only change their behaviour and wake up when they see what is threatening them, and that it is a threat to their livelihood. Also, some people *like* to respond to a crisis. Yes, it might not excite some people, but some other people want to help and want to contribute. It might get *them* excited.

I think, yes, we do need to talk about opportunities. I don't disagree with you; but using the word 'crisis' is not so bad because some people will get excited by it. It might drive some people to get involved to help do something good; because a lot of us get into things because we want to try to do something good in our lives.

Hon John Anderson: Let me then say, as a farmer, and having talked to a farmer from Australia and one from Pakistan, in the context of what you've just said, we are confronted with a blunt reality. Global consumption of oil, coal and gas is still rising very quickly. It is as simple as that. So, what should an Australian farmer or a Pakistani farmer do on the ground to argue for mitigation? Let's get on with it. Let's try and reduce, or go for adaptation, because nothing we do in Australia is going to make any difference (the former Chief Scientist made that point in this place). What do we argue for? For mitigation? Or do we say: This is coming anyway: we need help in the area of research, to adapt and somehow make the most of it.?

Professor Wendy Umberger: Absolutely both.

Dr Ismahane Elouafi: Maybe I can champion that. I think we have exhausted discussion around mitigation, but that doesn't mean we don't need it. But we haven't discussed enough about adaptation. I think what we need now is mitigation with co-benefits of adaptation as well. It isn't either/or. It's both of them.

But the reality is that we have invested a lot in mitigation – although some of the commitments never made it – but we haven't invested in adaptation, even where it's a reality. And I go back to what you said: all the scenarios are very bad; the +2, +4, +6, all the scenarios are bad, and that's where the crisis would resonate with me as well.

We need to invest more in adaptation, because even +2 needs a huge adaptation. I tell people that maize in +2 degrees in Africa would not flower. If there is no flower, there is no production. It is as simple as that; and most plants, let alone animals, are very sensitive at the flowering stage, which is the mating stage that gives you production. So it's very serious.

We talk about +1 as if it is nothing; it is as if today we have 30 and tomorrow it is 31.
No! +1 is huge. +2, +4, +6 – that is a burning planet. It's *very* serious. In my thinking, adaptation, particularly for the Global South, is very important, and it has been neglected for so long. If you ask me where to invest more now, it has to be into adaptation with co-benefits of mitigation or vice versa.

Dr Line Gordon: Yeah, I also want to emphasise that need for both adaptation and mitigation. It's not that we can now focus on adaptation because we have done enough with mitigation. We must continue with mitigation.

If you want to be a successful farmer in the future, you need to be part of that argument also, because the more we hit the planet, the more vulnerable you are going to become.

Of course we need mitigation. And I completely agree that we have had too little focus on adaptation. It is not either/or. We need them both at the same time.

Ms Karen Mapusua: Often many of the agricultural technologies that are supporting adaptation are also mitigators. I think it is a bit of a false dichotomy in a lot of cases.

Hon John Anderson: The Crawford Fund is an organisation that has been committed for a very long time to what I call the noble objective of feeding people, lifting them out of poverty, giving them decent lifespans, the opportunity to ensure that their children get a better start. Until the last couple of years, we've been making remarkable progress.

We know, from research that is quite clear on this, that younger people right across the West in particular are now less inclined to support humanitarian causes than they are environmental causes. It raises an interesting question: When we have to choose between trade-offs, should our objective be saving the planet, or saving humanity?

At the back of my mind is the comment made, brilliantly, by somebody in England the other day, that one of the worst things you could do for the environment, and indeed for climate, is to force people back into poverty.

So where should our first emphasis be? Lifting people out of poverty (because we know that with increasing living standards people are then in a position to care more about the environment)? Or should it be saving Gaia, so to speak?

Dr Line Gordon: This is a false dichotomy, I feel. As I tried to show in the Sir John Crawford Address, I basically don't care about the *planet*. The planet will survive. Without humanity on the planet, it could be rich in many different ways. I don't worry so much about that. What I worry about is humanity and the capacity to have a good life on this planet, and that is why we need to care about the environment. We need to care about the way that the environment can support human well-being and support agriculture. Also, we see that some of the poorest communities on the planet Earth are the most vulnerable to climate change and environmental degradation and so on. So, we need to combine these objectives, now and in the future.

Hon John Anderson: Any further comment? Can I say, it might be a false dichotomy but it's a real one.
A friend of mine recently came across a paper written by a youngish person in one of the big financial houses saying that climate change is so urgent that we need to become realistic: there are too many of us, and we will have to jettison people. It's called 'lifeboat ethics', and it had its origins in the Club of Rome in the 1960s. There are too many of us; we need to do the brutal thing and throw a few people 'overboard'. I don't know whether you would rather be thrown overboard, or be the person who decides somebody else should be. But lifeboat ethics is back.

It may be a false dichotomy but, as someone who has been involved in public life for a long time, can I tell you this is an important debate we need to have. I'm not disagreeing with you, but it *is* real. A lot of young people have been convinced. There are almost religious overtones in this attitude that the earth must be saved at all costs. And I would suggest that we if do it at all costs without regard for humanity, we will do immense damage to both.

Dr Ismahane Elouafi: I agree with you, John. I think it's a real debate, and you are very brave to bring it up. It's humanity at its worst and I think it began during the COVID-19 period: if 'I' am a rich person, would I care about humanity, or would I care about the environment that can affect 'me'? So you find that you choose to support the environment because the environment affects 'me', whereas humanity, people in poverty, that wouldn't affect 'me'.

I think it's a real issue that we have to face and that we have to discuss. That is why in my talk earlier I spoke about SDG 10 and reducing inequalities. Inequalities are getting worse, and getting worse to the point where we now have poverty in high income countries, which was not something we talked about a few years ago.
I think it's a real issue. Do we want to be one population on this planet and support each other? Or do we want to put a 'wall' between the south and the north and leave the Global South to deal with their problems and the rich countries to deal with their own, like we did during COVID-19, when so many countries locked up?

In many countries there was a debate about access to vaccine. There was a debate about equality and access to knowledge and innovation. There was a debate about the IP. Can we, should we, reduce the multiplication of vaccine in certain places, or should we not? It's a global issue, so – no IP and let everybody produce it.

I think really your question, John, is very deep, and it addresses maybe our lack of humanity, or the humanity values that are becoming different with time, and getting, I would say, less human with time, as well.

Hon John Anderson: I am not being particularly brave, because this is an audience of people who are concerned for humanity. I know that, and we are doing our best, and that's great. Many of us in the West hold 'luxury beliefs', because we can afford to. We are not worrying about where the next meal comes from for our children, and so forth; and that does colour our perspectives, I suspect. And that leads into the next question.

I was really interested in what Dr Seeseei Molimau-Samasoni said in her presentation. Samoans are such a lovely warm people that I can believe that they prefer to have a good party with the family than worry about what they are eating. It's very concerning to me that in Australia's neighbourhood there are still those issues where we need to step up and help look after this region's people.

Seeseei, you made that fascinating comment about cultural colonialism. We need to be careful to be sensitive to local cultures, and they vary hugely. There is a temptation, from countries like Australia I think, to impose our values, sometimes almost with the veiled threat that if you want our help you need to adopt some of our approaches.

Wendy, how do we do good things in ways that are genuinely, appropriately, culturally sensitive? And how important is that, in your view? I am starting with you, Wendy, because you spearhead Australia's efforts in this regard, and I know that you are very alert to these matters. What are your views?

Professor Wendy Umberger: It has been part of the conversations and the talks that we have had today: this partnership discussion, and 'partnership' as in 'sitting down and listening'. This is ACIAR's mantra or ethos. We don't always do it right, but when we talk to our country partners about what Australia can do to assist, if it's wanted, we actually listen and ask: 'Okay, then how can our innovation system contribute? What is our comparative advantage?' (because we are talking about research and capacity development); or, 'How can we leverage multilateral institutions like the CGIAR? How can we most effectively help address the issue?'.

One of the questions this conference has aimed to address is: what does Australia do well, and not so well, in the partnership space? I think that is very relevant. We want to be good partners, but sometimes we have some very colonial or old-school thinking about what we have, versus what our partner countries have. One of the speakers today made the comment that 'Capacity exists; resources do not'. I think that is a very important point. I am proud that in ACIAR, and in my former life as an academic, we have tried hard to build capacity, through scholarship programs, and through Master Classes which the Crawford Fund does very well. So now there is significant capacity in most of the places where we work in our Indo-Pacific region and throughout Africa. The researchers are well trained, there is so much talent; but they are lacking resources. How can we try to leverage more funds into helping our partner countries in the right area where they need it?

Maybe there is still something in our innovation system that we can do? I do believe there is. We are getting asked to help in climate issues, in policy and all these areas. So how can we work together? It requires really sitting down together, listening and respecting each other.

Wahida Maghraby, who spoke this morning, knows how to make partnerships work. During my early time in Australia the best lessons I had about development and partnerships came from working with Wahida. She completed her PhD with us, and our whole team learned from her. We learned how to truly listen, ask questions and learn how we could help.

Australia's strength is in what we've built in relationships every time we go into a country, with our alumni – who are not just scholarship alumni, but also alumni that have worked on research projects, Master Classes and

similar – and *friendship*. Wahida mentioned friendship in her talk and other speakers have also talked about it today. Friendship is that deep connection that we get when we work together in countries, and that is what we do well when we listen and have genuine respect. Respect is the big thing, and we try to listen to the issues of other countries.

Hon John Anderson: One last question from me, and it goes back to the frustration that a farmer might feel on the matter of mitigation versus adaptation. As you say, we need to work on both. However, the blunt reality is that Australia has no impact on what is being done by bigger, more powerful nations that are less committed to this issue. That is a real problem. We must face reality. Demand for fossil fuels is rising very strongly, and if we accept the science on that – that it is causing problems – that means those problems are not shrinking.

That, I think, is at the heart of a lot of the despair. What hope is there, realistically, of influencing the countries that are intent on lifting their people out of poverty by providing abundant cheap energy?

I know this has been rehashed many times, but give us some hope on that front, if you can.

Dr Line Gordon: I think in the European Union changes are advancing very rapidly, with new carbon markets and trends of rapidly falling use of fossil fuels and rapid adoption of renewables. In China, there is super rapid adoption of renewables, …

Hon John Anderson: How many new coal-fired power stations is China building?

Dr Line Gordon: Yeah, but as soon as renewables' prices start falling, that trend is going to shift. We see that is also starting to happen globally. So I think there is definitely hope.

Ms Karen Mapusua: I think we need to use the processes that exist, flawed as they are, the UNFCCC processes. We have to keep hammering away at that. And we must also look at other things that we can do. The private sector is incredibly powerful here. We need to be able to find ways to make it worthwhile for people to make the transition, and part of that is understanding the impact if they don't. I think that is critical, in this conversation. We can't give up. And although Australia might be a relatively small player, there's a lot of room for improvement, so I think that we all also have to keep working at home.

Dr Ismahane Elouafi: From my perspective, the only way out for us is to develop the Global South. Let us look at this from the perspective of food, for example, because food uses a lot of energy as well. Right now, the same productivity in Europe, for example, or in North America or Australia, you get about 10% of that in Africa. But if we go to Africa with the right technology, with the right investment – I agree with you, Hampus Eriksson, there is need for resources as well – you could increase productivity easily by six, by seven, eight, nine, ten times, and then you need to produce less in the north.

So this solution, for everybody, is the development of the Global South.

But how can you develop in the Global South when farmers have no access to carbon credits, no access to mechanisation, no access to road transport and to storage? We all need to invest in the Global South so that they produce the food that they need, and this ought to be part and parcel of the global economy.

And for energy, if we help energy in the Global South to be partly renewable – accepting that some won't be renewable – it is going to bring the cost down.

So, I think the opportunities are really general but we don't understand them because the multinational companies see it from *their* perspectives as companies. If there are companies in the South, maybe they're going to be much more local and they would see it positively.

I didn't have time to talk about this in my address, but there is an interesting study from IFPRI that shows what we call Total Productivity Factors, which are the output minus the input. Looking at 1990 to 2020, there is a huge difference between high-income countries and low-income countries. In the high-income countries, we are producing more with less, despite all our problems, including in Australia. There is more production and it is

because of innovation. Looking at the low-income countries, they are producing more, but doing it by clearing new land and by using more inputs. So, what we need to do is to make it possible for low-income countries to produce more with less. And we cannot do that without innovation and without investment.

The important point is this: developing the Global South is a solution for humanity, not only for the Global South.

Hon John Anderson: I think it's fair to say that that's where we in Australia, headed up by ACIAR, can truly maximise our contribution.

Professor Wendy Umberger: I want to add to that point, Ismahane. Yes, we are producing more with less. There was the Green Revolution and since then we have gained significant knowledge about how to produce more without having negative impacts on the environment, or not as bad impacts, not destroying the soil or worsening biodiversity loss. We have that knowledge now, and we are learning more. So as we work, and try to get funding, I think we should make sure that we are doing more with less in *sustainable* (for lack of a better word) ways, as well.

Ms Karen Mapusua: I think it is also important in this conversation not to undervalue what is already being done in the Global South. Also, touching back onto the conversation around being culturally appropriate, and capacity building, and what that means in that context, there are a lot of solutions that already exist in the Global South. There is a lot of traditional knowledge and traditional practice, a lot of adapted traditional knowledge and practice that can be built on and shared and learned from.

I think that it is important that, as ACIAR and others go and work with partners in the Pacific and other regions, there's recognition that those knowledges are equal, and equally valuable, and to make sure that we are not using a lens that produces outcomes expected from an Australian perspective but that might be very different from a community perspective.

The vision of success has to come from the communities, and not from the external partners.

Hon John Anderson: To what extent can each of you see a pathway for the business of feeding people, paddock to plate – that is, agriculture through to the last mile, the grocery mile – to achieve net zero in the business of feeding people by 2050, as a sector?

Dr Line Gordon: Well, I think there are four different things that need to be happening. We need to look at our diets, and we need to look at what makes a healthy diet, and have that as our centre, and start from there. It will require dietary shifts in many places around the world. The second need is a big investment in agricultural innovation, so that we close these gaps in many places around the world, and produce more food with less impact – and that will require substantial innovation and resources into agriculture. The third need is to cut food loss and waste: if we are throwing away 30% of what we have used today, halving that is very important. And fourth, moving into more circular practices, and we need to do that while we also protect and maintain our ecosystems. Those are the four key areas.

Dr Ismahane Elouafi: I completely agree with that. Diversification, I think, is very much needed, and the other point I want to talk about is global trade. I think there are huge inefficiencies in the way trade is organised right now. The World Trade Organization says that many commodities cross the border twice. They are produced in one place, go somewhere, get processed, come back, and maybe go across again. So we need to look at efficiency. And now we have data. I don't know why we use traceability for diseases, but we don't use it for trade. I normally eat as locally as I can because I believe that we all need to eat what the ecosystem allows us to produce. We can get some things from other places, but we can't have strawberries (for example) all year

round. We are getting too spoilt, and the trade is very inefficient, and it is emitting a lot. As a matter of fact, we know that certain multinationals are emitting much more than countries!

I think it's important to really look at data and use data to understand our trade movements and try to make sense of them. Diversification of food, and better understanding of nutrigenomics – maybe this way we can be healthy with what we eat, not what we would *like* to eat. In short, I think we need diversification, trade (to some extent), and increasing productivity in places where there is a huge yield gap.

Ms Karen Mapusua: I live in a place that is a net importer of food. Every Pacific Island is. So one of the biggest changes we need to make, assuming we will continue to import at least some food – and I think that is a realistic assumption – is sustainable transport. We need to cut emissions of the transport that brings our food in. Production and consumption is one thing. How the food actually gets to us is a significant emitter.

Hon John Anderson: As a former transport minister, I must say I think that is absolutely loaded with challenges. We are effectively now seeing the airline industry acknowledge that the challenges they face are almost insurmountable. It raises the question, how seriously should we stop and think about our carbon footprint when we jump onto an aeroplane? They're making it quite plain that there is no pathway that can be identified for that sector. I think these things are enormous challenges. Forgive me for playing devil's advocate, but I think for some of these matters, we need to put ourselves on the spot. We need to understand how people might be questioning, and thinking: 'Well, how do I fit into this?'.

Reference

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SESSION 5 Q&A

Chair: Hon John Anderson AC FTSE

Q. Tony Fischer AM: A number of points cropped up during the conversation.

The greenhouse gas intensity per kilo of food, which is the criteria we should be using, is actually less in modern well managed agriculture than in any other form of agriculture. That is true. That's factual. The problem with modern agriculture, and with all high yielding agriculture, is its dependence on nitrogen. If we can produce ammonia, green ammonia, we will substantially reduce the greenhouse gas intensity of food production. Nitrous oxide is a part of it, and there is scope to breed biological nitrification inhibition into our crop plants. That is starting and we should be investing much more in that. That would, from current experiments, reduce substantially the nitrous oxide from the root zones of crops. There is also possibly scope to breed for reduced methane production by rice, but that is far more theoretical at this stage.

We shouldn't forget that the CO2 increase ameliorates – quite substantially – the effects of temperature increase in C3 crops. I've just analysed 60 years' data from northwest Mexico. The temperature increase is cancelled by the CO2 increase on yield in that environment. Admittedly, the temperature increase on that coastal environment is a little bit less than elsewhere.

Breeding for high temperature adaptation has scope, a lot of scope. But we must remember that the temperature that a crop sees depends very much on the water supply the crop gets. You can grow very good wheat in Sudan if you irrigate it. It runs along at about 6 to 8 degrees below the air temperature because of transpirational cooling. So it's not very efficient in terms of water-use efficiency. You have to be pretty careful about breeding for high temperature: is it with, or without, lack of water? They are very different situations.

I totally agree with Ismahane in particular. Let's fix up sub-Saharan Africa. The yield gaps are massive. We know what to do, but it's very different to change institutions and policies and governance in those places.

Finally, the dilemma. What we do in Australia has no influence on the global balance of any of these things. But why shouldn't we be setting an example? If we are wanting to be able to speak in global fora, we should have our own 'house' in order.

Chair: Thanks, Tony.

Q. Tony York, Commissioner with ACIAR: I have enjoyed this couple of days that I have been here, but I just note the gender of the guests we have on the panel, and the lack of conversation with reference to the male and the female views of nurture, nature and science, and how we might solve problems and globally, noting that ACIAR as part of its extension and research program has a strong emphasis on empowering women. So I am inviting the panel to comment on whether you think we have gone far enough in empowering women in all aspects of global politics and decision making?

A. Ms Karen Mapusua: Okay, I'll be brave on that one. The short answer: No, because it's not the same all over the world. Having four women sit on a panel doesn't mean that the balance of power has changed in the decision-making echelons of any of our countries. But I also think this is one of the things where gender is very cultured, and it looks different in different places, and predicting what gender equality in Australia looks like on other communities is also not helpful.

A. Professor Wendy Umberger: I agree with everything Karen said, and I think we also have a lot of work to do to understand the different gender roles in the different places that we work in. I think there's research on gender that needs to be done, and inclusivity; not just gender. I am a big believer in equity, and that means understanding what we each can contribute, and making sure that it's equal. You don't want anyone to be marginalised, right? But I think there's a lot of research still to be done to understand and, as Karen said, to not impose our values on other places.

A. Dr Ismahane Elouafi: To add to what Karen and Wendy said, I think we need at least another century of positive discrimination to women, to get us a role; and I think we need that because it has been going on for a long time, and many things are more made for men and decided by men. As Karen said, having a woman here doesn't mean that we have succeeded. I think we have to be intentional about gender, particularly, and social inclusion. We have to set KPIs. We have to shoot for the moon until we achieve having the same opportunities across the globe.

A. Dr Line Gordon: I am happy with those answers.

Chair: Thank you, four wonderful and amazing ladies, for allowing me to cross-examine you, and to act a little as an agent provocateur to try and draw some of these issues out. You've been magnificent. Let us all thank you in the normal way.

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Dr Ismahane Elouafi is the Executive Managing Director of CGIAR. She previously held the position of Chief Scientist at the Food and Agriculture Organization (FAO) of the United Nations. She was earlier the Director General at the International Center for Biosaline Agriculture (ICBA) based in the UAE. Dr Elouafi previously held senior scientific and leadership positions, including Senior Adviser to the Assistant Deputy Minister, Agriculture and Agri-Food Canada Research Branch; the National Manager of Plant Research Section; and Director of Research Management and Partnerships Division at the Canadian Food Inspection Agency. She worked as a scientist with several international research organisations and has been a member of various strategy expert panels and advisory groups, including the Global Commission on Adaptation and HarvestPlus. She was a board member of the International Food Policy Research Institute (IFPRI) and the Centre for Agriculture and Bioscience International (CABI). Dr Elouafi was also a member of the Scientific Group for the 2021 UN Food Systems.

Karen Mapusua is Director of the Land Resources Division of the Pacific Community which provides technical and scientific support to the Pacific Island countries & territories on all aspects of agriculture and forestry. She has worked in rural development in the Pacific region for close to 26 years including co-founding the Pacific Organic & Ethical Trade Community (POETCom), leading in implementing the Pacific Organic Standard and Guarantee Scheme, building tools to support organic policy development, and establishing alternative forms of certification that empower farmers. Karen has driven the development of the Pacific Community Flagship on Food Systems for improved health, nutrition and resilience outcomes and has actively promoted economic empowerment of women through agricultural value chains. Karen is President of IFOAM-Organics International, the global umbrella body for the organic agriculture movement, and previously served on the Board of Directors of Fairtrade Australia New Zealand. She is a national of Samoa and Australia.

Line Gordon has over 20 years of experience leading interdisciplinary teams in Sustainability Science. Her leadership focuses on investing in a collaborative, trust-based and creative working culture that enables us to achieve impact, while ensuring that scientific integrity underpins all our work. Line Gordon's research focuses on water and food systems as key entry points to build Biosphere resilience and improve governance of social-ecological systems, livelihoods, and public health. Her research is problem-oriented, interdisciplinary, and highly collaborative. She often leads and contributes to collaborations that bridge disciplines and technical skills to advance scientific frontiers. Gordon's current research focuses primarily on the role of food system transformation for public and planetary health. This work includes leading the Just transformation working group of the EAT-Lancet 2.0 Commission, developing national Swedish food systems scenarios in the Mistra Food Futures programme, and working on gastronomic landscapes. She has previously done research on livelihood resilience and ecosystem services in sub-Saharan Africa (Burkina Faso, Tanzania, South Africa, Senegal, and Ghana), and on the critical roles of 'invisible water flows' across local to global scales, in particular highlighting how global land use change, and evaporation and precipitation interact. Line Gordon has an undergraduate degree in biology and a PhD (in 2003) in Natural Resources Management, Department of Systems Ecology, Stockholm University. She was a postdoctoral fellow at the International Water Management Institute (IWMI) in Colombo, Sri Lanka. She has also been a visiting researcher at University of Kwa-Zulu Natal, South Africa, CIRAD in France, McGill University in Canada, and STIAS – the Stellenbosch Institute for Advanced Study, in Stellenbosch, South Africa. She was appointed the Curt Bergfors Professor in Sustainability Science with a focus on food systems in 2021. Line Gordon serves on many different boards and advisory boards.

Professor Wendy Umberger is the CEO of ACIAR. Previously, she was the President of Australia's Policy Advisory Council (for International Agricultural Research and Development) and an Honorary Professorial Fellow in the School of Agriculture and Food at The University of Melbourne. She is an expert in agricultural economics and development and food policy. She has worked on food system issues across the Indo-Pacific region and led interdisciplinary value chain research projects in Asia, Australia, North America, the Pacific Islands and South Africa. Her research has explored opportunities for agricultural smallholder households in producing high value (horticulture, dairy, beef) food products and adopting new technology to gain access to modern food value chains. From 2013 to 2022 she was the Foundation Executive Director at the Centre for Global Food and Resources at The University of Adelaide and a Professor in the School of Economics and Public Policy. She served on the Board of Trustees of the International Crops Research Institute for Semi-Arid Tropics (ICRISAT) from 2015 to 2021. She is also an Independent Director of Grain Producers South Australia (GPSA), a Director of the International Association of Agricultural Economists, a board member of Food Bank SA, an Honorary Fellow of Food Standards Australia New Zealand, and a Distinguished Fellow of the Australasian Agricultural and Resource Economics Society. Wendy has a B.S. in Animal Science (1996) and M.S. in Economics (1998) from South Dakota State University and PhD in Agricultural Economics (2001) from the University of Nebraska-Lincoln.

Hon John Anderson AC has been a long-serving member of the Board of the Crawford Fund and has been Chair of the Board since 2017. He was appointed Companion of the Order of Australia (AC) in the Queen's Birthday 2022 Honours List for eminent service to rural and regional development, to leadership in international agricultural research and food security, to social commentary, and through contributions to not-for-profit organisations. John Anderson is the former Deputy Prime Minister and Leader of the National Party of Australia (1999–2005); Minister for Primary Industries and Energy (1996–1998); Minister for Transport and Regional Development (1998–2005); served on Expenditure Review (Budget) Committee, National Security Committee and Standing Environment Committee while in Cabinet. He was the member for Gwydir, New South Wales, from 1989 to his retirement in 2005. John has returned to farming, and is also active in the not-for-profit sector.

CONFERENCE SUMMARY

Summing up and the way forward

Dr Wendy Craik AM

Board member, The Crawford Fund

The message that came out of the conference, particularly the individual talks today, is very clear. I think the message is very well encapsulated in Uday Nidumolu's talk on his project in southern India on climate adaptation, where the locals had such a degree of ownership of the research findings that they made it into a street dance! I think that is quite extraordinary. And they didn't just dance it once, they danced it 200 times! I think that is absolutely amazing, and it shows how effective that partnership was.

We are facing a world where climate change, food security, loss of biodiversity, health challenges are threatening and are presenting all sorts of interlinked challenges to us. Today it was pointed out that there won't be a single technical solution, given the nature of the problems that we're facing. We need systems solutions, and we need local and regional approaches, and we need not just one solution but a diversity of solutions. And we need transformational solutions.

I think everyone would agree we have had a series of absolutely excellent talks, last night and today, illustrating the issues that we are facing. And we have heard a number of versions of the message that has come through, and it's all about partnerships and focusing first on the partnership: making sure that the researcher has a really good relationship with the people they are working with.

Quoting what people have said:

- The researchers' role is to listen, to have fun, and to be nice to people.
- A research project should be assessed against relevance, legitimacy, credibility, effectiveness, all those things, before it is started.
- Research should invest in the partnerships from day one.
- Put the locals at the centre of what you're doing.
- The things that need to be considered are co-design of the projects, communication, collaboration, inclusivity – gender and disability for example – and also local policy people.
- Think about scaling right from the beginning of the project, rather than leaving it till the end of the project.
- Question your accepted wisdom. You should embrace local constructs of relevance: for example, how local farmers operate in drylands (described as 'resilience from below').

We heard also about partnership approaches to capacity development, and I think that is another important part of research projects. People gave some very interesting talks about that today.

One of the fundamental questions was: Partnerships are all very well, but what about the time, the cost and the effort that you have to put into them, to make them work?

I think it is like a friendship. You cannot expect it to work immediately. It does take time. It does cost money. It certainly takes effort. But I think if you want transformational change it is really worth making those large

investments, because we know – and we know by default from the talks today – that everybody, based on the partnerships that they had – regarded the success as worth the time, cost and effort. I did not hear a single person say 'This cost us too much' (in whatever way) 'when we got a transformational result'.

In summary, I would say that solving these global challenges does require multifaceted transformational projects. And we really need to start investing right from the very beginning with the partners that we are going to work with, if we are going to achieve those transformational changes.

Dr Craik has over 30 years' experience in senior roles in public policy. She has been a Commissioner of the Productivity Commission, Chief Executive of the Murray-Darling Basin Authority, Executive Director of the National Farmers Federation, and Executive Officer of the Great Barrier Reef Marine Park Authority. She has been on a range of boards including as President of the National Competition Council, Chair of the Climate Change Authority, the Australian Fisheries Management Authority, NSW Marine Estate Management Authority and the Australian Rural Leadership Foundation. Board member roles include the Reserve Bank, Australian Institute of Marine Science, Australian Farm Institute and Dairy Australia. She was Deputy Chancellor of the University of South Australia. She is currently Chair of the OneBasin CRC, and a board member of the Crawford Fund, the Ocean Earth Foundation, the Australian Infrastructure Financing Facility of the Pacific and Chair of the Advisory Board of the Royal Australian Mint. Wendy was appointed a Member of the Order of Australia (AM) in 2007 for service to the natural resource sector of the economy, particularly in the areas of fisheries, marine ecology and management of water reform, and contributions to policies affecting rural and regional Australia.

CONFERENCE PARTICIPANTS 2024, in person and online

*indicates Crawford Fund conference scholars for 2024.
Some acronyms are expanded on the last page.

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Some acronyms used in this Proceedings

ACIAR	Australian Centre for International Agricultural Research
ANU	Australian National University
CABI	Centre for Agriculture and Bioscience International
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CIAT	The International Center for Tropical Agriculture
DAFF	Australian Government Dept of Agriculture, Fisheries and Forestry
DFAT	Australian Government Dept of Foreign Affairs and Trade
DPIRD	Department of Primary Industries and Regional Development
GRDC	Grains Research and Development Corporation
IFPRI	International Food Policy Research Institute
IPCC	Intergovernmental Panel on Climate Change
IRRI	International Rice Research Institute
NSW	New South Wales
QAAFI	The Queensland Alliance for Agriculture and Food Innovation
RAID	Researchers in Agriculture for International Development
SDG	Sustainable Development Goal
UNFCCC	United Nations Framework Convention on Climate Change

Crawford Fund FOR A FOOD SECURE WORLD

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