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# partners

IN RESEARCH FOR DEVELOPMENT

Reshaping  
agriculture for  
better nutrition

— PAGE 4

Getting to the  
root of the issue

— PAGE 10

Being prepared  
for the dry ...  
or wet

— PAGE 14



*Partners in Research for Development* is the flagship publication of the Australian Centre for International Agricultural Research (ACIAR). *Partners* presents articles that summarise results from ACIAR-brokered research projects and put ACIAR research initiatives into perspective. Technical enquiries will be passed on to the appropriate researchers for reply. Reprinting of articles, either whole or in part, is welcomed, provided that the source is acknowledged.

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## IN THIS ISSUE

- 1 From the CEO
  - 2 News
  - 3 Events November 2018 – May 2019
  - 4 Reshaping agriculture for better nutrition
  - 8 Nutrition's double burden—time to act
  - 10 Getting to the root of the issue
  - 14 Being prepared for the dry ... or wet
  - 18 Harvest of knowledge—sequencing the wheat genome
  - 20 Valuing livestock
  - 22 Water makes the world go around
  - 24 Small fish, big impact
  - 26 Linking nutrition and agriculture for better health
  - 28 Regional round up
- 

**Front cover:** Shantona Rani releases mola brood into her pond. Credit: Foto Agencies 2016

**Back cover:** Elephant head amaranth for sale at a market in Dhaka, Bangladesh. Credit: Salim Khandoker

## FROM THE CEO

### Professor Andrew Campbell

In this final issue of *Partners* for 2018, it is timely to reflect on some of the engaging and inspiring projects and events happening at ACIAR and in our region more broadly.

In August this year, I was privileged to see the transformative action communities are taking to mitigate soil losses in the Philippines, through the Australia-Philippines Landcare program. I have been involved with Landcare in various ways for over 30 years in Australia, and it was inspiring to see the Philippines Landcare success story.

ACIAR first became involved in the program in 1999, and the initial natural resource management focus has broadened to include all aspects of people's livelihoods. Today the program has grown to include over 8000 farmers and more than 60 research, government and non-government agencies across some 20 municipalities in the provinces of Mindanao and Visayas.

In August, the 2018 Crawford Fund Parliamentary Conference in Canberra focused on the relationship between agriculture and nutrition. This important topic is covered extensively in this issue, so I will not elaborate here, except to say that ACIAR was delighted to host a concurrent roundtable meeting of some key conference speakers to discuss how we can integrate the many activities occurring in this vital area better.

In early October, I attended the CGIAR Independent Science and Partnership Council (ISPC) Science Forum 2018 held in Stellenbosch, South Africa. The meeting focused on identifying synergies and trade-offs between the CGIAR System Level Objectives of Hunger, Poverty and



From left to right: Professor Margaret Gill, Dr Anna Okello, Professor Andrew Campbell, Dr Jessica Fanzo, Dr Alessandro Demaio and Mellissa Wood at ACIAR for the roundtable. Credit: Patrick Cape, ACIAR

Natural Resource Management, and relevant Sustainable Development Goals (SDGs). It was an excellent opportunity to interact with senior scientists and leaders from across the CGIAR, and to think about how we can pursue multiple objectives in our research more rigorously (and when we can't). The meeting was jointly hosted by the CGIAR and the African Research Council in historic ARC facilities on the outskirts of Stellenbosch.

Finally, we released our 2017–18 ACIAR annual report, which gives a comprehensive overview of the many facets of ACIAR's involvement in projects across the Indo-Pacific region, our key achievements during the financial year, and areas of focus for the future. Please download a copy at [www.aciar.gov.au](http://www.aciar.gov.au)

## NEWS

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### AgriFutures Rural Women's Award 2018

Krista Watkins, a banana grower, food waste innovator and co-founder of Natural Evolution Foods, from Walkamin, Queensland, is the 2018 winner of AgriFutures Australia's Rural Women's Award, presented in Canberra on 15 October.

It's estimated that food waste at the farm gate represents 10% of gross food production, valued at \$4 billion.

As a primary producer, Watkins said, it is difficult for any grower to see so much of their harvest thrown away either because there isn't a market for it, it is oversupplied or it doesn't meet consumers' perceptions of how fresh fruit and vegetables should look.

'Growers don't choose to waste produce ... Factors such as market supply, weather and consumer demand impact us ... Finding an alternate use through by-products helps to diversify the income stream and dramatically reduce the amount of leftover produce,' Watkins said.

Her next venture is research into developing by-products for the four most common sweetpotato varieties grown in Australia.

The Rural Women's Award acknowledges and supports the critical role women play in rural and regional businesses, industries and communities.

[www.agrifutures.com.au/news](http://www.agrifutures.com.au/news)

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### ACIAR's Indo-Pacific executive leadership program

In late January 2019, 25 John Allwright Fellows will take part in an ACIAR initiative, an executive leadership program run in partnership with the University of New England (UNE). Fellows will attend a 10-day intensive course at UNE's campus in Armidale, NSW, and undertake further study delivered online, returning to UNE for a final four-day intensive course.

The John Allwright Fellowships aim to build individual capacity, and in turn increase the research capacity of ACIAR's partner country institutions. This initiative will develop Fellows' management and leadership skills, equipping them to be future agricultural leaders.

Look out for more information on the program in the next issue of *Partners*.

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### Fall armyworm information-sharing session

On 18 September 2018, the International Centre for Insect Physiology and Ecology (*icipe*) held an information-sharing session for government representatives, researchers, international organisations and media on management of the fall armyworm in Africa.

Since its presence was first reported in Africa in 2016, the fall armyworm has spread at an alarming rate. Estimates from 12 African countries indicate that the pest is causing annual maize losses of between 8 and 21 million tonnes, leading to monetary losses of up to US\$6.1 billion, while affecting over 300 million Africans who, directly or indirectly, depend on the crop for food and wellbeing. The pest's impact is likely to be even higher when its damage on other crops is quantified. Recommendations from the discussions included the need for:

- transboundary collaboration in managing invasive insects, including the fall armyworm
- sustainable, integrated pest management of the fall armyworm, targeting each of its life stages
- development of communities of practice to gain a broader knowledge of the pest and devise management solutions
- partnerships to roll out strategies being developed through various initiatives, including those of *icipe*.

[www.icipe.org/news](http://www.icipe.org/news)

## EVENTS NOVEMBER 2018 – MAY 2019

- 
- STARTS**  
**08**  
**NOVEMBER**  
8.30PM (AEST)
- THE GOOD COOKS SIX-PART TELEVISION PROGRAM**  
SBS Food Network, Australia  
In this innovative new series on the SBS Food Network, six Australian chefs travel to remote parts of the world to learn how ACIAR is improving food security in the developing world, and to cook like the locals. [www.aciar.gov.au/goodcooks](http://www.aciar.gov.au/goodcooks)
- 
- 12-18**  
**NOVEMBER**
- APEC ECONOMIC LEADERS WEEK**  
Port Moresby, PNG  
Meeting of the Agricultural Technical Cooperation Working Group during APEC Economic Leaders Week. The working group aims to strengthen agriculture's contribution to the region's economic growth and social wellbeing.  
[www.apec2018png.org/](http://www.apec2018png.org/)
- 
- 18-23**  
**NOVEMBER**
- NATIONAL SOILS CONFERENCE**  
Canberra, Australia  
The conference will focus on how to achieve greater sustainability of soil resources. This requires learning from the past, reflecting on the present and developing concrete plans and goals for the future. Quality science and firsthand experiences from land management must underpin decision-making. [soilscienceconference.org.au/](http://soilscienceconference.org.au/)
- 
- 21**  
**NOVEMBER**
- NATIONAL AGRICULTURE DAY**  
Australia  
Australia will celebrate the remarkable contribution of Australian agriculture. This year we will support the theme of community through the hashtag #growforgood. [www.agday.org.au/](http://www.agday.org.au/)
- 
- 10-14**  
**DECEMBER**
- FISH PASSAGE CONFERENCE**  
Albury, Australia  
This conference will be highly relevant to those with an interest in advancements in fishways and riverine connectivity. It will also incorporate the first International Symposium on Hydropower and Fish Management.  
[fishpassage.umass.edu/](http://fishpassage.umass.edu/)
- 
- 19-20**  
**FEBRUARY**
- AUSTRALASIAN AID CONFERENCE**  
Canberra, Australia  
The Australasian Aid Conference, held in partnership with The Asia Foundation, brings together aid and international development policy researchers from across Australia, the Pacific, Asia and beyond.  
Registration is now open.  
[devpolicy.crawford.anu.edu.au/annual-australasian-aid-conference](http://devpolicy.crawford.anu.edu.au/annual-australasian-aid-conference)
- 
- 19-22**  
**MAY**
- 4TH WORLD CONGRESS OF AGROFORESTRY**  
Montpellier, France  
This conference will focus on bridging the science policy gap and progressing agroforestry science and practice.  
[agroforestry2019.cirad.fr/](http://agroforestry2019.cirad.fr/)
-

# Reshaping agriculture for better nutrition

**The relationship between agriculture and nutrition was the key theme of the 2018 Crawford Fund Conference held in Canberra on 13–14 August 2018.**

The good news is that globally, since 1969, we have halved the number of people going to bed hungry. The bad news is that we have a long way to go to solve the double burden of nutrition: two billion people worldwide are malnourished and lacking vital micronutrients such as iron and vitamin A, and 2.1 billion adults are overweight or obese. According to Devex (the media platform for the global development community, which produced a number of features from the conference), ‘An increasing number of countries face this double burden, where children are born into environments with limited food, leading to stunting, only to face obesity as adults as changing economic conditions and urbanisation lead to more food choices.’

There are, speakers told the conference, major challenges in global food supply. ‘Food is fuelling several of the major global challenges of our time,’ said Dr Alessandro Demaio, the conference opening keynote speaker and CEO of the EAT Foundation. ‘Current food systems fail one in two people worldwide, and poor diets are now the leading risk factor for disease, globally.’

‘Not one sector of global society—low-, middle- or high-income individuals—is consuming calcium, fruit, vegetables, nuts and seeds in the quantity needed for good health,’ Demaio explained, detailing the statistics. There is a strong imbalance in the food we are producing: 11% fewer vegetables than needed, 44% less

fruit and 68% less nuts and seeds. Tipping the balance the other way, Demaio said, is our production of 48% more fish, 54% more grains, and 468% more meat than is needed to support global nutrition.

The message conveyed throughout the conference was clear. To turn this around—to provide nutritious, micronutrient-rich foods for an increasing global population through sustainable agriculture—requires a concerted, cohesive and collaborative effort.

As Professor Andrew Campbell, CEO of ACIAR argued, ‘Too often I think we’ve conceived of a multidisciplinary team as having an agronomist and an economist ... (but) we now need to think about how agriculture works with public health, with sectors we’re not used to working with. We need an integrated approach to face the challenges of the convergence of food, nutrition, water and health ... amplified by climate change,’ he said.

To support this integration, Demaio and the EAT Foundation are working with the world’s leading independent general medical journal, *The Lancet*, on the ‘EAT–Lancet Commission on Healthy Diets from Sustainable Food Systems’. Their goal is to set ‘scientific targets defining healthy diets and sustainable food systems [which in turn] can help link agriculture, health sciences and sectors to better practice and policy’. The Commission’s report will be released in late 2018.



Bean power Tanzania. Uyole 03 is an improved variety helping farmers improve their lives and empowering women.  
Credit: Georgina Smith CIAT

Speakers said while agriculture may have answered the food quantity challenge successfully, it now needs to focus on food quality to ensure global nutrition needs are met. With current progress, the United Nations' Sustainable Development Goal 2: 'End hunger, achieve food security and improved nutrition and promote sustainable agriculture' would be unlikely to be met by the 2025 target date.

Several speakers highlighted the complexity surrounding food quality, acknowledging the multilayered cultural, agricultural, political and geographical factors that affect food quality and

## KEY POINTS

- 1 To solve the double burden of nutrition requires a concerted multidisciplinary global collaboration.
- 2 Agriculture should focus now on food quality to meet global nutrition needs.



An African mothers' group learns about the nutritional benefits of orange-fleshed sweetpotato. Credit: S. Quinn/CIP



nutrition. One theme was a call for more food diversity. This included the need to reassert the value of traditional and indigenous foods and recognise the important role they can play in improving global nutrition.

Dr Marco Wopereis, Director General of the World Vegetable Center (WorldVeg), for example, compared the nutritional value of traditional vegetables such as amaranth and moringa leaves with common cabbage. Amaranth and moringa outperformed cabbage on every measure. Moringa is especially rich in vitamin E, iron and folates and has a very high antioxidant activity score. However, Wopereis told the conference that unfortunately these traditional vegetables represent only 5% of the 60,000 accessions to the world's largest collection of vegetable germplasm held in WorldVeg's genebank.

Philmah Seta-Waken, an agronomist working with the National Agricultural Research Institute (and an ACIAR John Dillon Fellow), reinforced

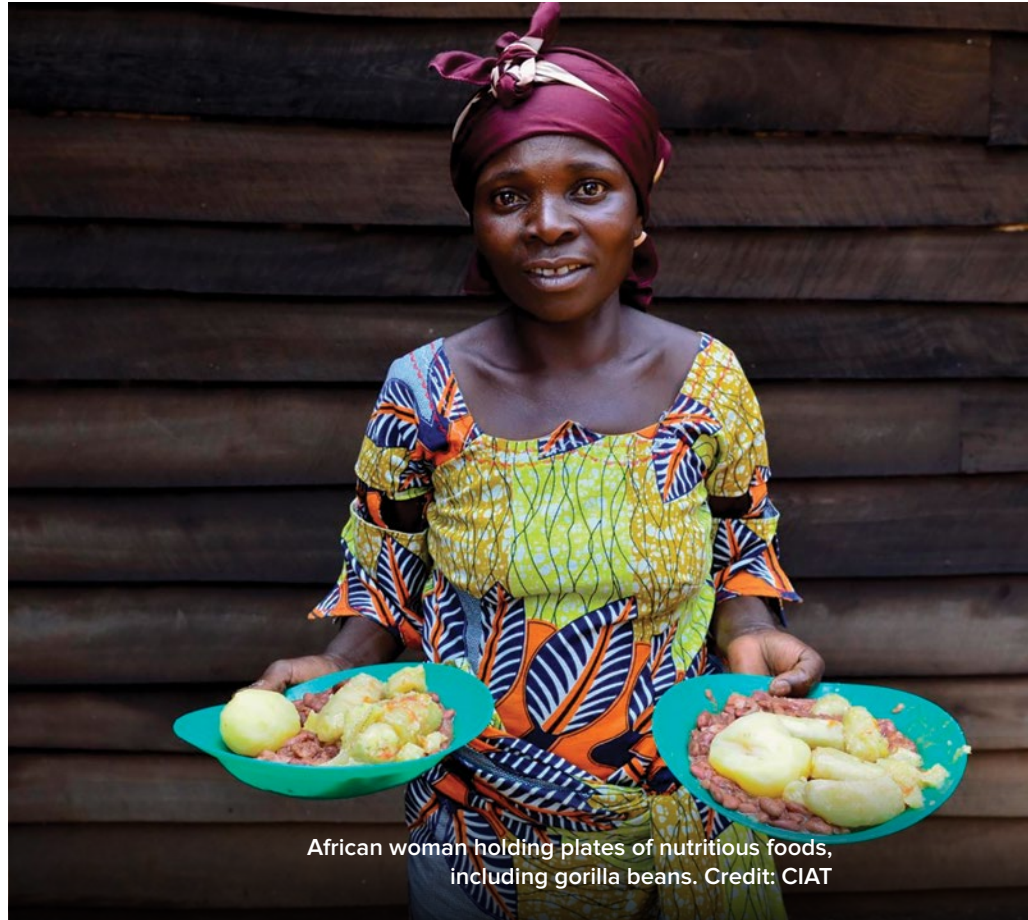
the importance of traditional vegetables in Papua New Guinea. Not only are vegetables such as amaranth, pit pit and slippery cabbage more nutritious, she said, 'but they are generally better suited to the local climate, and require less fertiliser and insect and disease controls, than more globally popular vegetables'. Moringa, for example, which is native to India but grown widely in tropical and subtropical areas, is a fast-growing, drought-resistant tree, which also appears to be relatively disease-resistant.

'Smart Food—food that is good for you, the planet and the farmer—can have a major impact on the mega-global issues of malnutrition, poverty and environmental degradation,' Joanna Kane-Potaka told the conference. Kane-Potaka is Assistant Director General of the International Crop Research Institute for the Semi-Arid Tropics (ICRISAT) and Executive Director of the Smart Food initiative. The Smart Food initiative encourages the uptake of cereals such as sorghum and millet because of their nutritional,





Sorghum at Sawla market in Ghana's Northern Region. Credit: Neil Palmer CIAT



African woman holding plates of nutritious foods, including gorilla beans. Credit: CIAT

environmental and agricultural benefits. Smart Food would like to see the current global staples of wheat, rice and maize—the ‘big three’—become the ‘big five’, supplemented by traditional grains such as sorghum and millet.

Millets and sorghum have considerable health benefits. Finger millet, for example, has three times more calcium than milk; pearl, little and barnyard millet have 2–4 times more iron than meat; and all millets and sorghum are gluten-free with a low glycaemic index. Millet and sorghum are also generally hardier crops. ICRISAT says that pearl millet, which represents 50% of millet grown globally, ‘is the world’s hardiest warm-season crop’, growing in some of the least fertile soils in West and Central Africa.

While grains and vegetables are important, Dr Anna Okello, ACIAR’s Research Program Manager for Livestock Systems, reminded the conference of the importance of livestock to human health and nutrition. She said, ‘Livestock provided 14% of total calories and 33% of protein

globally,’ as well as being an important source of micronutrients such as vitamins A and B, calcium, iron and zinc. ‘Livestock also brings indirect health and nutrition benefits.’

ACIAR also took the opportunity of the nutrition and agriculture expertise present at the conference to hold a roundtable to workshop ways for better including nutrition in the ACIAR agenda.

#### FURTHER CONFERENCE COVERAGE IN THIS ISSUE

Dr Jessica Fanzo: The nutrition context (pages 8–9)

Dr Alex Johnson: Biofortification of grain staples (pages 10–13)

Dr Anna Okello: Livestock in human health and nutrition (pages 20–21)

Dr Jessica Bogard: Aquaculture in Bangladesh (pages 24–25)

# Nutrition's double burden—time to act

**Dr Jessica Fanzo's presentation at the Crawford Fund Conference gave context to the discussion about the double burden of nutrition.**

Dr Jessica Fanzo has taken a year's leave of absence from her position as Bloomberg Distinguished Associate Professor at Johns Hopkins University to serve as the Senior Programme Officer for Nutrition and Food Systems at the UN Food and Agriculture Organization (FAO). She is also the co-chair of the *Global Nutrition Report*. Her research and program experience in sub-Saharan Africa, South and East Asia have led her to take a systems approach across sectors to improve nutrition and diet.

It was time to act, she told the conference. 'While some indicators of global health are improving, nutrition overall is not.' She presented compelling statistics that highlighted the insidious and pervasive double burden of nutrition, saying that while 'undernutrition is decreasing, [progress] is way too slow. Obesity is rising, rapidly.'

- Twenty-two per cent, or 150 million of the world's children under the age of five are chronically undernourished or stunted.
- Fifty million children are wasted or acutely malnourished, with a high risk of dying.
- On the other hand, 38 million children, and over two billion adults are overweight or obese. That number is rising across the world, from low- to high-income countries.
- The diet-related incidence of non-communicable diseases such as diabetes, cardiovascular diseases and some cancers is also on the rise.

Dr Fanzo concluded her presentation by posing the question: 'What do we do to address this

massive burden, and who should do it?' She said there was nothing new about needing the efforts of many sectors and many disciplines to help eradicate the burden, but what was required was a new global approach to development—the shared effort required across the 17 Sustainable Development Goals.

She said we should 'see development across the goals as part of an *integrated whole* and that each goal is essential for what we, as global citizens, would agree is a better, more equitable world. It is not just about what other sectors can do for us in the nutrition community to deliver our goals, but what we can do for them in delivering their goals.'

After the conference, *Partners* also spoke to Dr Fanzo at her FAO office in Rome, where she elaborated on some of the conference themes. *Partners* asked her whether, in the face of these figures, she remained hopeful.





Dr Jessica Fanzo speaking at the ACIAR roundtable. Credit: Patrick Cape, ACIAR

## KEY POINTS

- 1 Undernutrition is improving, but far too slowly, and obesity is rising rapidly worldwide, regardless of income levels.
- 2 To lift this double burden requires an integrated global approach, focusing on the 17 Sustainable Development Goals.

‘I’m optimistic,’ she says. ‘The food environment is incredibly difficult to navigate, but there’s a tsunami of things happening in response to the obesity epidemic.’ These include government actions such as a tax on soda drinks and the reformulation of foods. ‘There are a lot of solutions which need to be scaled up and financed,’ she explains. ‘The food and beverage industry is being held accountable, but we need to increase investment in nutrition ... especially innovative investments from the private sector.’

As a further cause for optimism, she points to the leadership in keeping nutrition on the international development agenda shown by global figures such as the UN Secretary-General and heads of the World Bank and the FAO. She also takes heart from Imran Khan’s inaugural speech as prime minister of Pakistan in August 2018. Khan referred to stunting as one of the urgent challenges facing his nation. ‘We are unfortunately one of the countries that suffer from the highest incidences of stunting in children. We are talking about 45% of this nation’s children. They are not getting proper nutrition. They are not developing properly.’

## MORE INFORMATION

The 2018 Global Nutrition Report is due out in November. [globalnutritionreport.org](http://globalnutritionreport.org)



Education program for Fijian women on good nutrition to counter the risk of non-communicable diseases such as diabetes. Credit: Juanita Mooney

# Getting to the root of the issue

**Following his presentation at the Crawford Fund Conference, *Partners* talked to Dr Alex Johnson of the University of Melbourne's plant nutrition laboratory about how biofortification of grains can help reduce global 'hidden hunger'.**

By his own admission, Dr Alex Johnson has had one great advantage in his life: he always knew what he wanted to do.

'I just always wanted to grow plants, study plants and eat plants,' he says. 'I grew up in Washington, DC, and I remember my mum had a little tiny garden. From the moment I could walk I would be out there planting: watermelon, beans, corn. I was fascinated that you could grow your own food in your own backyard.'

At university he considered medicine. 'But as soon as I had my first class in plant biology I was hooked.' An undergraduate degree in biology led him to Virginia Tech and an MSc in plant tissue culture—an essential skill for any ambitious plant biologist. 'Then I told my supervisor I really wanted to do my PhD on genetically modified potatoes. I've always been interested in working with and improving the staple crops that people eat.'

Johnson's green odyssey has led him to the University of Melbourne, via the universities of Cambridge and Adelaide. In his plant nutrition laboratory at the university, he leads a team of researchers specialising in biofortification of rice and wheat.

'Biofortification is breeding plants to have more vitamins and minerals,' Johnson says, pointing out that it is a new direction in the long history of breeding food crops.

'Through most of human history, we've been breeding crops to be high-yielding and really good sources of carbohydrate. That's enabled us to feed billions of people. Biofortification is a step further. We still want to have lots of carbohydrate in food crops, but in addition we want to start enriching them with the most important micronutrients for the human diet.'

In 2011, his plant nutrition laboratory created a genetically modified rice that had significantly more iron and zinc than ordinary rice.

Why rice? As Johnson and his colleagues wrote in their paper on the discovery, 'Rice is the primary source of food for billions of people in developing countries, yet the commonly consumed polished grain contains insufficient levels of the key micronutrients—iron, zinc and vitamin A—to meet daily dietary requirements.'

'Millions of people around the world suffer from deficiencies in these micronutrients,' he says.

'Iron deficiency is the most common nutritional deficiency in the world. It affects 30% of the population—more than two billion people—and causes anaemia, which leaves people weakened and tired. Zinc deficiency causes stunting and learning difficulties in children. It affects about two billion people. Provitamin A deficiency, which affects about 150 million people, or six times the population of Australia, causes blindness and increased susceptibility to infections.' Because of their negative impact



Golden Rice grain compared to white rice in greenhouse of Golden Rice plants.  
Credit: International Rice Research Institute

on people in childhood and youth, these deficiencies have been estimated to cost 63 million life years annually.

Micronutrient deficiencies have an economic impact on entire societies, Johnson says. 'They trap people in poverty, and people enter the workforce tired or stunted or fatigued, a long way short of their potential. Think of how unproductive you are when you're sick at work and multiply that by millions.'

The collective term for micronutrient deficiencies is hidden hunger. 'When I was growing up, the focus was on people starving for calories. Hidden hunger is starving for micronutrients, and it can happen whether you are getting too few calories or too many,' Johnson says.

## KEY POINTS

- 1 Increasing iron and zinc levels in grain staples such as rice and wheat through biofortification can alleviate micronutrient deficiencies.
- 2 In Bangladesh, approximately half of children and 70% of women are iron-deficient.

Fortification of foodstuffs with micronutrients during production is a longstanding and effective practice, but limited. ‘You have to keep adding the micronutrient every single time you produce a batch of the foodstuff. Biofortification is simpler, and you only have to produce the biofortified crop once.’

And biofortification means the depleted food staples that create hidden hunger can also be the most effective way to abolish it. ‘Because so many people eat rice, all you have to do is make small changes to have a really huge impact on hundreds of millions of people,’ Johnson says.

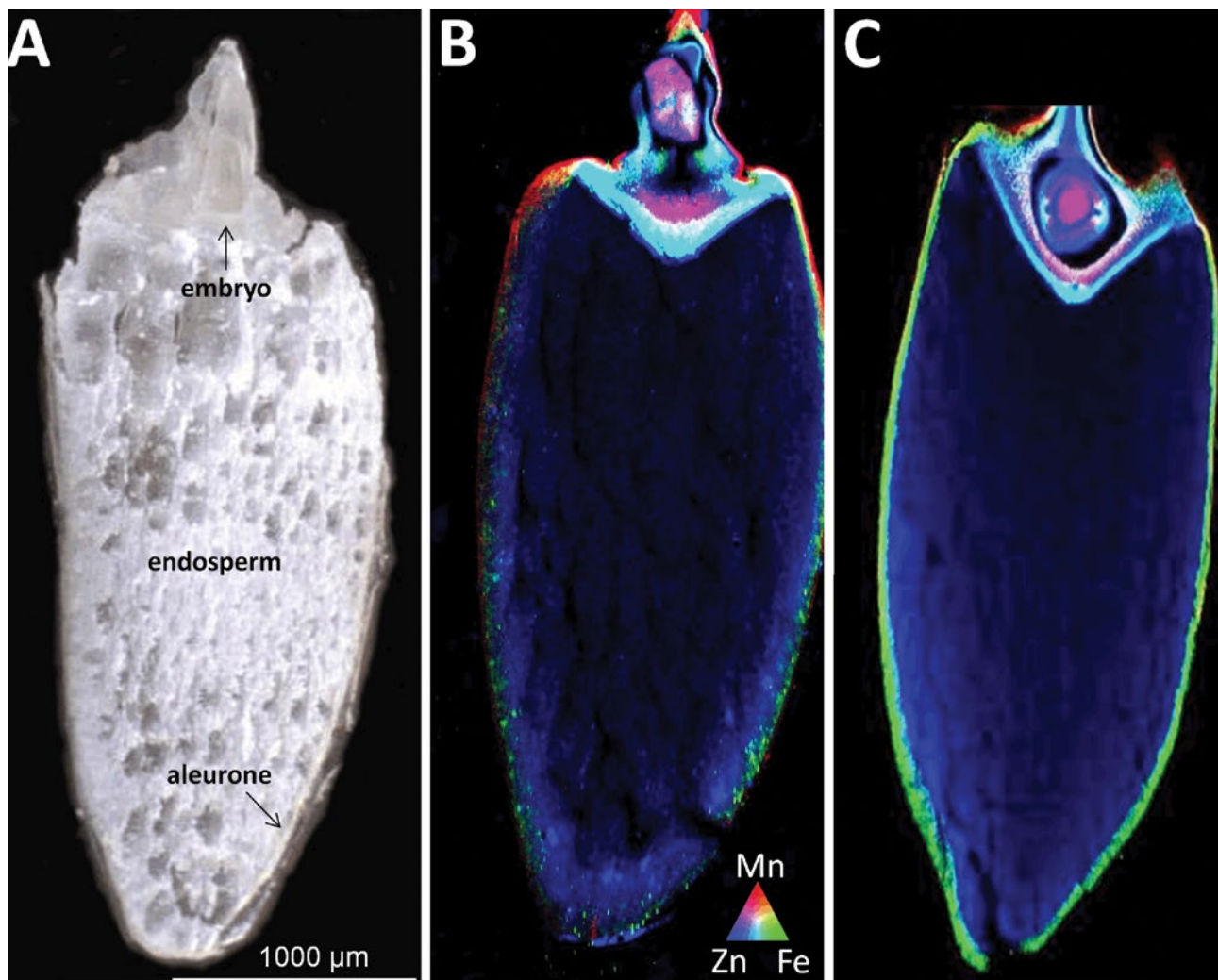
While it is true that iron and zinc deficiencies can be partially addressed by eating more leafy vegetables, Johnson does not see this as a

complete solution. For one thing, the burden of raising these often-seasonal crops falls on rural populations who are already suffering from hidden hunger. These vegetables can also be more expensive to buy.

Johnson’s aim is to see iron and zinc biofortified rice planted in Bangladesh, where almost 80% of cultivated land is dedicated to rice, but approximately half of children and 70% of women are iron-deficient.

There are two other compelling reasons for biofortification: population and climate change.

‘The world is headed towards at least 9.3 billion people by 2050. That’s not far away,’ Johnson says.



X-ray fluorescence microscopy (XFM) images of iron and zinc distribution in rice grain. Dr Alex Johnson, adapted from Kyriacou et al. 2014: *Journal of Cereal Science* 59

‘We have to work on all aspects of food production: making more food, distributing it more efficiently, but also focusing on the quality of what we produce. Since the first Green Revolution began in the 1960s, our capacity to breed new crops has really improved. We have so many wonderful tools. We have classical genetic engineering, and new tools such as gene editing. We need to use them all to grow more food as well as more nutritious food.’

Climate change includes the global effect of atmospheric change.

‘As CO<sub>2</sub> increases in the atmosphere, that has huge impacts on terrestrial plants,’ Johnson says. ‘CO<sub>2</sub> is their food, so they get bigger and you see increases in yield. This is particularly true for crops that use what we call C<sub>3</sub> photosynthesis, like wheat and rice. But there are other things happening. Protein decreases in C<sub>3</sub> grains, and iron and zinc decreases too, by about 10%. You might get increased yield but the grain quality suffers.’

The burden of keeping a world of 9.3 billion fed and healthy could easily seem insurmountable. Progress is incremental. The plant nutrition laboratory recently discovered that wheat has 21 copies of the nicotianamine synthase gene that was originally modified to increase iron and zinc in rice.

‘It does sometimes seem like a mega challenge,’ Johnson says. ‘But I like to work on big challenges.’

## THE CHALLENGES

Biofortifying staple grains to alleviate global micronutrient deficiencies may present a great challenge for researchers, but this is by no means the only hurdle to be overcome. There is also the added complexity of uptake of these biofortified grains by both producers and consumers, as Dr Eric Huttner, ACIAR’s Research Program Manager for Crops, explains.

For producers, a grain variety with higher levels of vital micronutrients such as zinc and iron also

has to have other appealing characteristics, such as higher yields and disease resistance. ‘Unfortunately, the [higher micronutrient] trait is invisible, and farmers have not been rewarded for sowing it,’ Huttner says.

However, he cites a project ACIAR is funding in Bangladesh that could make biofortified wheat more attractive to farmers. A consortium under the International Maize and Wheat Improvement Center (CIMMYT) is working on a wheat-blast resistant strain to fight the fungal disease which devastated key wheat districts of south-western Bangladesh in early 2016. A possible bonus of this research is that one strain of wheat that shows signs of resistance also appears to have elevated zinc levels.

Another concern is uptake by consumers. Traits like increased iron and zinc are invisible, so what is needed, Huttner says, is a national-level approach to marketing nutrition. A good example is the biofortified rice flagship: golden rice, which has elevated levels of provitamin A. The rich golden colour of the polished grain makes this rice very obviously different to white, unfortified polished rice.

Lastly, there’s the question of genetic modification, which is often used to create biofortified crops such as golden rice and high iron and zinc rice. Genetic modification has been a vexed topic for some environmental and health activists. However, as Nobel Laureate Sir Richard Roberts said in June 2018, ‘Examples of the benefits of the new GM technology for citizens of the developing world include golden rice and halting both banana wilt and the fall armyworm’. Not only is there scientific support for biofortified crops such as golden rice, but the governments of Australia, Canada, New Zealand and USA have approved it as safe for consumption and registrations have been applied for in the Philippines and Bangladesh.

### MORE INFORMATION:

For a copy of Dr Alex Johnson’s presentation see [www.crawfordfund.org/events](http://www.crawfordfund.org/events)  
[www.alexjohnsonlab.com](http://www.alexjohnsonlab.com)

# Being prepared for the dry ... or wet

**Australia and its PNG partners are working on the final stages of review and approval for further research to help PNG farmers better prepare to meet climate variability.**

Farmers have always had to deal with the vagaries of climate. But farmers in many countries are now contending with much more variable and seemingly less predictable weather patterns, along with more extreme climatic events such as droughts and floods. Some traditionally high rainfall regions, such as the highlands of Papua New Guinea, are experiencing droughts that farming systems are struggling to cope with.

Papua New Guinea (PNG) suffered the effects of an El Niño-induced drought in 2015 and 2016. Drought and widespread water shortages, combined with unseasonal frosts in the highlands, led to failure of the sweetpotato crop, severely disrupted household food production and caused widespread hunger.

Eighty per cent of PNG's population depends on rain-fed farming and more than three-quarters of food consumed is locally grown. Understandably, PNG's National Agricultural Research Institute (NARI) is interested in being better able to predict and manage droughts in regions such as the Central Highlands, where farming systems are now having to contend with unprecedented low rainfall.

NARI is a key partner for ACIAR in PNG. In 2017, in response to a request for assistance, ACIAR convened a meeting of 20 Australian scientists working at the forefront of applied research into weather prediction and climate change to meet

with NARI Director General, Dr Sergei Bang. 'We know another drought will come,' says Dr Jayne Curnow, ACIAR's Research Program Manager for Social Sciences, 'so it was an opportunity for us to put our heads together, and consider ways PNG could be better prepared in the future.'

Following that meeting, Dr Steven Crimp, a research fellow at the Australian National University's Climate Change Institute, initiated a scoping study supported by ACIAR.

Firstly, Crimp and his colleagues were interested in what he describes as 'the knowledge landscape, how farmers share information about crop production and climate: within the village itself, with other communities, and between the community and government'. Was there any difference, for example, between the information men need to respond to climate variability and the information women need? The team surveyed farmers in a number of locations in the highlands to identify the information needed to be able to respond to, and prepare for, climate variability.

The second focus of the initial research was climate data. Crimp says, 'We knew one of the limiting factors in responding [to climate emergencies] was climate information'. PNG once had approximately 48 weather stations, but over time this number has declined dramatically. 'There are 12 weather stations currently operating across PNG with a reasonable length





Weather station, PNG. Credit: Dr Steven Crimp ANU

of record, (you need at least 15 years of data before you can use that data reliably),’ Crimp says. Using the data from those 12, they were able to develop statistical approaches to better understand temperature and rainfall trends, and in turn develop climate information interpolated across PNG, despite the challenges created by PNG’s ‘massive topography’.

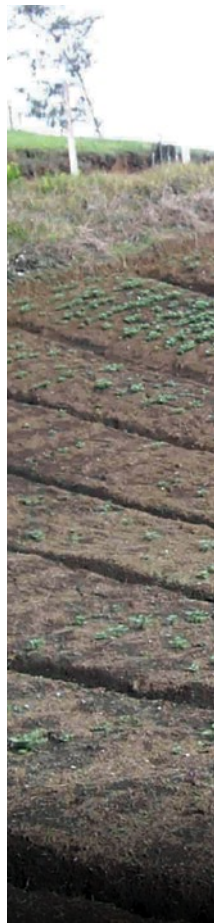
Crimp says the final part of the research focused on the question: ‘Can we look at expert knowledge and work out strategies for responding to climate variability? We discussed with local experts the types

### KEY POINTS

- 1 Australia and PNG are working together to help PNG be better prepared for climate variability.
- 2 Local experts and scientists will test simple land management strategies in a series of field trials.



Highlands children with one of the weather stations. Credit: Dr Steven Crimp ANU



of farming practices they could consider adopting to mitigate drought or wet years. This information was collated from a number of historical field trials and local knowledge and presented as possible management strategies that local farmers could follow. We sat down with these experts and came up with a number of hypothetical scenarios. What should you do at various elevations in a drought? What if it was particularly wet? Or a business-as-usual year?' The experts then devised some simple techniques and technologies to manage these scenarios.

Dr Jayne Curnow says the 'expert knowledge' refers to 'two equally valid sources of knowledge: the deep local ecological knowledge and scientific evidence-based knowledge, brought together for a better result'.

In dry conditions, for example, one strategy could be to have different planting times and/

or companion cropping, such as pairing a relatively drought-hardy crop like cassava with sweetpotato. Mulching and creating furrows could also improve moisture retention. In a particularly wet year, simple strategies include raising plant beds to avoid waterlogging, ploughing to reduce run-off and the loss of topsoil, and farming to conserve ground cover.

The initial research also looked at weather forecasting on a macro level, to identify scientific products that PNG's weather service could use more effectively. NARI's initial request was for assistance with seasonal forecasting accuracy. Weather forecasting is not an exact science, especially in a country like PNG, which faces twin challenges of data availability and varied topography. PNG has climates ranging from coastal areas, such as that around the city of Lae with an extraordinary annual rainfall of around 4300 mm, to the Eastern Highlands capital,



Soil management to mitigate climate variability.  
Credit: Dr Steven Crimp ANU



The team from the National Agricultural Research Institute.  
Credit: Dr Steven Crimp ANU

Goroka, which is 1600 m above sea level and has an annual rainfall of 1840 mm.

With funding from the Department of Foreign Affairs and Trade, Australia's Bureau of Meteorology (BOM) is working with the PNG weather service on a range of initiatives. These include training programs and operationalising the BOM's forecasting system, Seasonal Climate Outlooks in Pacific Countries (SCOPIC), for PNG. (SCOPIC is described by the BOM as 'an accessible, stand-alone seasonal climate prediction software system, which uses a statistical method to determine forecast probabilities, based on historical data').

Australia and its PNG partners are now working together on the final stages of review and approval for further research. Work will be done to determine if the simple management strategies identified above are

more effective than current practices under a range of seasonal conditions. Both women and men will be engaged in field trials to ensure that the strategies are practical and fit their farming styles and needs. To help with the issue of insufficient weather stations and data, and to mitigate patchy connectivity, local communication providers will be approached to co-locate weather stations with their towers. Finally, collaboration with the multiple tiers of government in PNG will ensure that, when the project finishes, there will be continuity and drought preparedness will be part of their day-to-day operations. Crimp says this will include 'regular interaction with the Provincial Forum on Disaster Risk Management, which makes resourcing decisions at a provincial level'.

It is hoped that the next phase of this research will be underway by the end of 2018.

# Harvest of knowledge— sequencing the wheat genome

**After 13 years of research, a consortium of scientists from 64 countries has sequenced the complex wheat genome, promising to allow more rapid crop improvement.**

For thousands of years, human beings have relied on a grass of the genus *Triticum*, better known as wheat. This reliance is characterised by cycles of breeding, planting, growing, harvesting, processing and eating. The nature of those cycles will be affected by the 16 August 2018 announcement of the sequencing of the wheat genome.

It was a massive cooperative effort. The International Wheat Genome Sequencing Consortium, made up of 2100 members from 610 organisations in 64 countries, worked on the project for 13 years. The *Science* magazine article announcing the research had 200 authors from 73 research institutions in 20 countries. The wheat genome turned out to be more than five times as large as the human genome, containing more than 85% repetitive DNA. The human genome is diploid, meaning we have two sets of chromosomes (one from each parent). In contrast, wheat is hexaploid, with six copies of each chromosome. The research article described the location of 107,891 genes and 4.7 million molecular markers, and provided sequence information between the genes and markers.

Professor Rudi Appels of the University of Melbourne and Murdoch University was part of the consortium. He says examining the wheat genome sequence was like looking inside the engine of wheat.

‘What we see is beautifully put together to allow for variation and adaptation to different

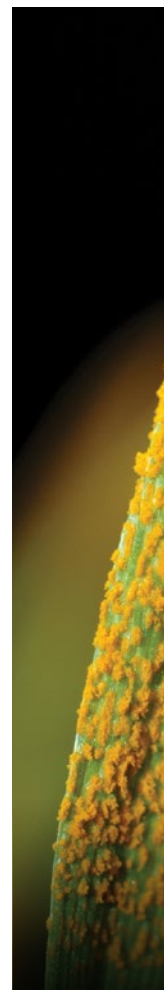
environments through selection, as well as sufficient stability to maintain basic structures for survival under various climatic conditions,’ he says.

Wheat is the world’s most cultivated crop. It is grown from the arctic to the equator, and from sea level to the highest plateaus. It is the staple food of more than a third of the world’s people, and is the world’s largest single food source, accounting for almost 20% of the calories and protein consumed by humans worldwide.

The wheat genome is important because we are going to need more wheat, much more. To feed the projected world population of over 9.3 billion by 2050, wheat productivity needs to increase by 60%, or 1.6% each year, says the consortium. As biodiversity, water and nutrients are all finite resources, the majority of this increase will have to be achieved through crop and trait improvement on land currently cultivated, rather than committing new land to cultivation.

## KEY POINTS

- 1 The wheat genome is more than five times as large as the human genome.
- 2 Wheat genome sequencing promises more rapid crop improvement.





Rust-affected wheat seedlings.  
Credit: CSIRO Science Image



Head of bread wheat: *Triticum aestivum*  
Credit: Dinesh Valke

Wheat's genetic complexity has made it a hard crop to improve by conventional breeding. Yields increased during the Green Revolution of the 1960s, but progress has slowed since then because its complex genome makes it difficult to isolate and reproduce desirable traits. This is about to change. The consortium expects a high-quality reference genome sequence for wheat will lead to more rapid crop improvement, with benefits similar to those that were seen in maize and rice after their reference genome sequences were produced. There are potential improvements in yield, grain quality, resistance to fungal diseases and tolerance to abiotic stresses such as salt and drought.

Using genome editing, it is already possible to cut out or insert sections of DNA using an enzyme. With the wheat genome sequenced, the task now will be to identify DNA sequences which cause desirable traits and use gene editing to add these traits to new wheat varieties. It should be possible, for example, to put several disease-resistance genes into one plant. Wheat varieties could be engineered to be more resistant and tolerant of the dry and hot conditions predicted to become more frequent and severe as a result of climate change.

One particular characteristic of wheat makes it suitable for rapid dissemination and adoption of genetic improvement. Wheat is self-pollinating, so farmers are able to save grain for seed. In the past, this has tended to limit commercial research and innovation in improved varieties, but the upside is an improved crop can be brought about with a one-off planting of improved seed. Once the seeds of an improved variety have been distributed, farmers can multiply the seeds as they wish without relying on commercial seed companies for their seed supply, (although seed quality from commercial sources is usually higher and often worth the cost).

The wheat genome may be sequenced, but the consortium's mission continues. Among its priorities are developing public, user-friendly, integrated databases and tools for genome users, and a wheat pan-genome that represents the breadth of the world's wheat diversity.

| MORE INFORMATION: [www.wheatgenome.org/](http://www.wheatgenome.org/)

# Valuing livestock

**Dr Anna Okello, ACIAR's Livestock Program Manager, puts the case for a greater recognition of the role livestock plays in human health and nutrition.**

Much of the focus at the Crawford Fund Conference was on the role of vegetables and grains in human health, which were presented as more sustainable nutrition sources than meat. However, as Dr Okello told the conference, we should not forget the critical role livestock has played in human development over the millennia—physically, socially and immunologically. The term 'livestock' includes beef and dairy cattle, buffalo, sheep, goats, pigs and poultry.

According to 2016 FAO figures, 14% of our calories and 33% of our protein comes from livestock. 'Importantly, too, for balanced nutrition, livestock is also a good source of

## KEY POINTS

- 1** Livestock plays a vital role in human health and nutrition, providing 33% of our protein, and a large number of micronutrients.
- 2** People in low- and middle-income countries on average consume a lot less meat than those in high-income countries.



ILRI's cloned Boran bull, 'Tumaini' ('Hope' in Swahili). Credit: ILRI

micronutrients such as vitamins A, B2 (riboflavin) and B12, and calcium, iron and zinc,' Okello said.

Then there are the many indirect contributions livestock makes to health and nutrition, especially in low- and middle-income countries. 'Livestock has a multiplier effect,' Okello said. For many smallholders, particularly those in sub-Saharan Africa, livestock such as cattle and buffalo are living tractors, helping to boost crop production by working the soil and fertilising it with their manure. Livestock such as pigs and cattle also have a role in ceremonial and social functions across Africa and Asia. 'It's not just consumption—they are much more than meat and milk for these people—they are part of the cultural fabric, and bring social status,' Okello said.

For these livestock owners, cattle are assets to be cashed in to pay school fees or hospital bills, or used as dowries when children marry. Okello told ABC Radio's Northern Territory Country Hour that the West's growing anti-livestock



Hardiyanto, a cattle farmer in Lombok, Indonesia, washes his cattle in a small creek. He is participating in an ACIAR-funded/University of Queensland project to improve cattle fattening systems based on forage tree legume diets. Credit: Conor Ashleigh

rhetoric did not take these cultural, social and economic factors into account. 'Talking about Western meat consumption of 100 kg per head is not equivalent to people in sub-Saharan Africa who eat less than 10% of that,' she said.

She quoted Dr Jimmy Smith, the Director General of the International Livestock Research Institute and former head of the World Bank's global livestock portfolio, who was unequivocal: 'There is no moral equivalence between those who make poor choices of food (consuming too much food and excess fat and sugar), and those who have no choice.'

What is needed, Okello said, is recognition of the complexity of the livestock issue. The livestock sub-sector can constitute up to 40% of agricultural gross domestic product in developing countries; and in East Africa, for example, it represents up to 80% of rural assets. Rather than simplistic calls for less meat consumption, what is needed is balance, including ongoing support for research into

ways to improve production. Being more efficient by getting better weights from fewer animals with the same resources will help livestock production be more sustainable, she said, reinforcing comments made by Dr Smith during his 2017 Australian visit.

'What will help raise livestock productivity by smallholder farmers and herders in low-income countries, while also reducing greenhouse gas emissions and other environmental harms, are today's many scientific advances in such fields as livestock genetics, breeding, feeding and nutrition. Many of these come from Australia, which shares much of the sub-humid and semi-arid agroecologies of the developing nations of the world,' Smith said.

MORE INFORMATION: 2018 Crawford Fund Conference [www.crawfordfund.org](http://www.crawfordfund.org); International Livestock Research Institute [www.ilri.org](http://www.ilri.org)

# Water makes the world go around

**Partners looks at one of a series of innovative ACIAR collaborations that are leveraging technology to drive agricultural development.**

Water, not bread, is arguably the staff of life. In an Australian–African collaboration, scientists are helping to ensure this precious commodity is used efficiently. A project combining CSIRO expertise and ACIAR project management and funding, the Virtual Irrigation Academy (VIA) brings together new irrigation monitoring tools with an online communication and learning system. The tools have been developed by Australian scientists, led by Dr Richard Stirzaker, CSIRO Agriculture and Food, who has an enduring interest in using such technology to create a social movement around water and food. ‘Soil physics is boring to most, but turning water into food for the vulnerable on earth is not,’ Stirzaker says.

The VIA involves two main irrigation monitoring tools: the Chameleon Soil Water Sensor and the FullStop Wetting Front Detector.

The Chameleon consists of a series of relatively cheap and easy-to-understand sensors, which are embedded into the soil at various levels (15, 30, 45 and 60 cm) to show where the plant’s roots are actively taking up water. A Chameleon reader displays lights that turn from blue to green or red to show the soil’s water status.

Armed with this information, smallholders can manage crops more efficiently, by timing when to irrigate to avoid water stress, and working out how much water the soil needs. The Chameleon also helps smallholders avoid

waterlogging by determining when the soil profile may be susceptible to fertiliser leaching, capitalising on rainfall.

The FullStop acts as a simple soil leaching detector, monitoring salt and nitrate levels in the soil. It captures a soil water sample from the root zone and indicates how much fertiliser is there with colour-changing paper strips. If farmers use both the Chameleon and FullStop, they know what’s going on underground.

The Chameleon sensors are ID-chipped and the reader is wi-fi enabled, which allows data to be shared. The farmers see the data first through the coloured lights, but the information is also sent to the cloud via mobile phones so that extension workers and researchers

## KEY POINTS

- 1 The Virtual Irrigation Academy is an Australian–African collaboration, combining ACIAR project management and funding with CSIRO expertise.
- 2 The Virtual Irrigation Academy uses new irrigation monitoring tools and an online communication and learning system.







Smallholder maize farmers and VIA members in the field in Malawi with the Chameleon Soil Water Sensor. Credit: Dr Richard Stirzaker

can learn from these farmers' experiences. A growing number of people and organisations have made their data public on the VIA site ([via.farm/our-community/](http://via.farm/our-community/)).

The VIA project was launched in 2015 and will run until 2019. In Africa, the project is being undertaken in Malawi and Tanzania. The Association for Strengthening Agricultural Research in Eastern and Central Africa coordinates and provides technical support in both countries.

Delegates at the first East Africa Digital Farmers Conference and Exhibition held in May 2018 in Nairobi, Kenya, were very positive about the use of these water and nutrient smart technologies to promote efficient and cost-effective irrigation. According to conference reports:

- The combined technology has reduced water usage by 50% in pilot schemes in Malawi and Tanzania by extending the intervals between irrigation. Instead of irrigating four to five times a month, smallholders are now irrigating only once or twice a month.
- The land under irrigation has increased by 83% in some of the pilot schemes.
- Less frequent irrigation means smallholders have more time to devote to grazing livestock, cultivating other crops and, for some women, building off-farm businesses to generate more family income.

Several hundred Chameleon and FullStop arrays are already in operation across southern Africa, and the project team are working with irrigation departments in Malawi, Mozambique and Zimbabwe to roll out the sensors to monitor water use in government irrigation schemes.

ACIAR PROJECT: LWR/2014/085:  
A Virtual Irrigation Academy to improve Water Productivity in Malawi, Tanzania and South Africa.

MORE INFORMATION: The Virtual Irrigation Academy ([via.farm](http://via.farm))



The Chameleon display indicating the moisture levels at depths of 20, 40 and 60 cm. Credit: Dr Richard Stirzaker

# Small fish, big impact

**Dr Jessica Bogard and Dr Shamia Chowdhury presented on the impact of a WorldFish aquaculture project in Bangladesh at the Crawford Fund Conference.**

Thirty-six per cent of Bangladeshi children are chronically stunted and consume poor-quality diets with insufficient quantities of vitamin A, iron, zinc and other nutrients. A WorldFish project, Aquaculture for Income and Nutrition, aims to help turn that around. Dr Jessica Bogard, Nutritional Systems Scientist with the CSIRO and Dr Shamia Chowdhury, Nutrition Specialist with WorldFish, told the conference that, alongside rice, fish is a central element in the Bangladeshi diet.

However, fish is often beyond the reach of poor Bangladeshis, who eat it infrequently and in relatively small quantities. The project therefore focused on aquaculture, including small indigenous species along with large fish. This offered the dual benefit of income generation from selling large fish and increasing availability of nutrient-rich small fish for household consumption.

While capture fisheries, chiefly men's work, have stagnated in Bangladesh over the past 10 years, aquaculture has seen rapid growth. 'In 1984, aquaculture production in Bangladesh was around 0.1 million tonnes; by 2014, that had grown to nearly 2 million tonnes,' the pair told the conference. This growth now makes Bangladesh the world's fifth-largest producer of aquaculture products.

Bogard and Chowdhury said the project addressed the issue of the nutritional quality of aquaculture species, rather than the previous focus on producing quantity. Nutritional value varies greatly across fish species. While species may have similar protein levels, they vary greatly

in their micronutrient levels. 'In general, non-farmed species (particularly small indigenous fish) were more nutritious than commonly farmed species,' they said. The project focused on farming small indigenous fish species such as mola, which is packed with micronutrients.

The project also promoted the role of women in aquaculture: they are often the ones who manage and clean the ponds, farm and catch the small fish, and importantly, do the cooking. In parallel, the program also fostered the growing of vegetables, such as the vitamin A-rich orange sweetpotato, around the banks of the ponds to encourage dietary diversity and supplement the micronutrients in the small indigenous fish.

The project included nutrition education for all household members, focusing on essential nutrition and hygiene. Cooking demonstrations were particularly effective in communicating simple strategies for improving the nutritional quality of complementary foods for infants and young children.

The project saw large increases in nutrient-rich small fish production, Bogard and Chowdhury told the conference. 'There was a 3.5-fold increase in total fish production in household ponds,' they said, 'with an even larger increase in nutritional yields'.

The dietary quality and diversity of families in the program improved markedly. They had a ready supply of the nutrient-rich mola, as well as the tubers and leaves of the sweetpotato and other vegetables grown on the pond banks.





Bangladeshi woman harvesting mola with a gill net.  
Credit: AWM Anisuzzaman WorldFish

## KEY POINTS

- 1 Over one-third of Bangladeshi children are chronically stunted and consume poor-quality diets.
- 2 A WorldFish aquaculture project farming micronutrient-rich small indigenous fish aims to improve children's nutrition and provide an income for their families.

Families that adopted the small fish polyculture system consumed fish more regularly and in greater quantities than those adopting the large fish only system. Families in the program ate 72% of the small fish they farmed and sold the remainder. Selling the excess fish and vegetables at the market, and making and selling the gill nets used to catch the small fish, generated extra income for the family. Many families reported they spent this extra income on education for their children.

The project adopted a whole-of-family approach, engaging both women and men in decision-making and sharing the workload. Women were empowered through their roles as promoters of the nutrition-sensitive production system in the community, reporting a sense of pride and a greater role in family decision-making.

This integrated approach to aquaculture demonstrated numerous benefits for nutrition, gender equity, income and livelihoods in Bangladesh.

**MORE INFORMATION:** *Aquaculture for income and nutrition: Final report*, WorldFish, [www.worldfishcenter.org](http://www.worldfishcenter.org).

# Linking nutrition and agriculture for better health

*Partners* profiles two young researchers, Lydia O’Meara and Jessica Bogard, who are driven by the desire to use their nutrition expertise in developing countries.

## LYDIA O’MEARA

Lydia O’Meara says her upbringing in outback Queensland gave her ‘a unique appreciation of agriculture, and the nutritional challenges facing rural people’. Fresh vegetables, for example, were anything but by the time they reached the sheep station where she spent her childhood, a 13-hour road trip due west from Brisbane. After moving to the Atherton Tablelands, she studied a Bachelor of Medical Science by distance education from Central Queensland University (CQU) while working at the local hospital.

O’Meara says she was always interested in international aid, having ‘done voluntary work as a teenager in Cambodia’. She jumped at the chance to be involved in a protected vegetable cropping project ACIAR is funding in Fiji, led by CQU’s Professor Phil Brown. The project is examining the factors that affect the ability of farming families to access and eat diverse foods.

One in three Fijians, or 31% of the population, has diabetes, compared to just over five per cent of the Australian population. According to the World Health Ranking, Fiji has the highest rate of diabetes-related deaths in the world. O’Meara’s role in the project was to collect nutritional data, which she says was quite an eye-opener.

‘We did some 24-hour food recall work—a typical breakfast could consist of white rice with coconut cream, and tea with four teaspoons

of sugar. In the Pacific, there’s an emphasis on eating carbs,’ she says, ‘and protein is only eaten on special days, such as Sundays.’

She is now writing up the data reports, and will ‘perhaps pursue a PhD next year’ but will remain focused on contributing her nutritional expertise as part of a multidisciplinary team.

‘Food security is not just about ensuring people have enough food to eat. It’s also about ensuring they have access to an affordable, diverse diet, which includes a colourful variety of fruits and vegetables to improve their health. It will be exciting to see where this goes in the next 20 years and hopefully we can all work together to make a difference.’

ACIAR PROJECT: Integrating protected cropping systems into high value vegetable value chains in the Pacific and Australia (HORT/2014/080)

### KEY POINTS

- 1 Dr Jessica Bogard and Lydia O’Meara are young Australian nutritional researchers.
- 2 They bring their nutrition and human health expertise to assist in the challenges facing agriculture, such as food security.





Lydia O'Meara and young Fijian boy compare nutritious meals. Credit: Juanita Mooney



Dr Jessica Bogard volunteering in Bangladesh. Credit: Dr Jessica Bogard

## DR JESSICA BOGARD

Originally trained as a clinical dietitian, Dr Jessica Bogard was looking for something different to her hospital role of one-on-one patient counselling. When the opportunity to work as a volunteer for 12 months with WorldFish in Bangladesh arose, she seized the chance.

As a city dweller, born and bred, this project was her first foray into agriculture. 'It was really interesting work,' Bogard says, 'bringing together agricultural research and nutrition. I extended my stay in Bangladesh, and then came back and wrote up the project as a PhD, which I finished last year.' (For more detail on the project, see pages 24–25 of this issue of *Partners*.)

She remained at WorldFish until early this year, when she joined the Commonwealth Scientific

and Industrial Research Organisation (CSIRO) as a nutrition systems scientist in their agriculture and food unit. 'My work at the CSIRO is quite broad,' Bogard says. 'I sit with the global food and nutrition security group under the agriculture and global change program. It's an interesting area, because there is a lot of momentum globally on the importance of linking food systems to nutrition and health.'

Her role is to be the nutrition voice in a multidisciplinary team that includes agricultural scientists, environmental scientists, and data and modelling experts—all working to find solutions to the big challenges facing agriculture, such as climate change and food security. 'I try to influence research so that nutrition and human health are part of the discussion.'

| MORE INFORMATION: [www.worldfishcenter.org](http://www.worldfishcenter.org)

## REGIONAL ROUND UP

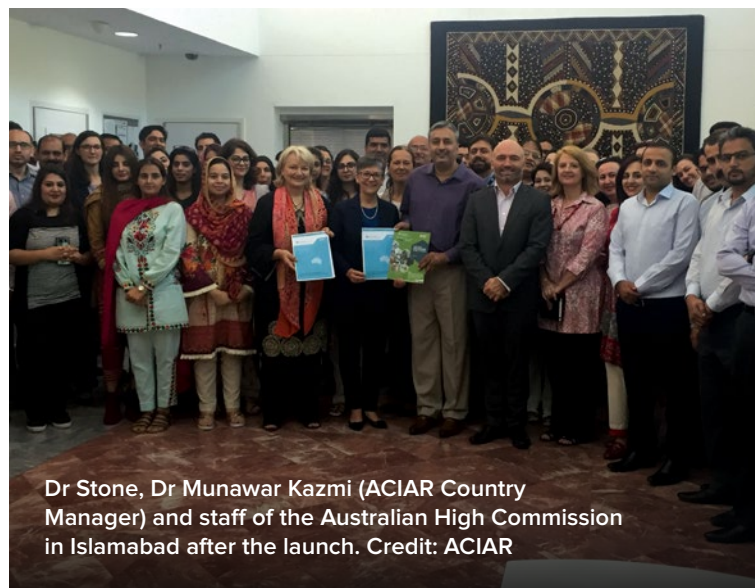
# Gender inclusion on the agenda for ACIAR Pakistan

A new strategy focusing on advancing gender equality and empowering women was launched by the Australian Ambassador for Women and Girls, Dr Sharman Stone, on 18 September 2018 at a ceremony at the Australian High Commission in Islamabad.

Advancing gender equality and empowering women are key priorities for Australian development assistance, as they are fundamental to economic growth and sustainable development. Pakistan is primarily an agriculture-based economy. While women play a major role in the agriculture sector, they often occupy subordinate positions when it comes to decision-making and having direct access to revenue.

Through its engagement in Pakistan, ACIAR has been helping local researchers to devise research strategies that both foster economic development and have a primary focus on gender inclusion. Gender inclusion studies in biophysical research is a major change—in the past, such studies would have been undertaken separately by gender specialists. This strategy is designed to facilitate this change.

The strategy focuses on mainstreaming gender in all aspects of ACIAR's program. This means assessing and addressing gender roles at all times and in all places—not only on farm and along the value chain, but also in project teams and partner organisations. In turn, this requires



Dr Stone, Dr Munawar Kazmi (ACIAR Country Manager) and staff of the Australian High Commission in Islamabad after the launch. Credit: ACIAR

equipping team members with the necessary skills and awareness. Importantly, it includes a continuous learning cycle. This recognises the complexity of gender dynamics and the multiple factors that govern this in different families and communities.

This strategy complements ACIAR's Gender Equity Policy and Strategy 2017–2022, and post-gender policy, providing a pathway for ACIAR to deliver its high-level gender objectives within its activities in Pakistan.

Regional roundup is a new section for *Partners*, designed to highlight major activities in ACIAR's country offices. Thank you to Dr Munawar Kazmi, ACIAR Country Manager, Pakistan, for this first contribution. *Partners* welcomes contributions: please email [partners@aciar.gov.au](mailto:partners@aciar.gov.au) with 'Attention: *Partners*' managing editor' as the subject.

## THE GOOD COOKS

AIRS 8 NOVEMBER 2018  
ON SBS FOOD NETWORK

A new television series on Australia's SBS Food Network demonstrates how ACIAR is improving food security in the developing world. *The Good Cooks* features six Australian chefs who travel to remote parts of the world to learn to cook like the locals.

Dan Churchill learns how to cook the rice paddy snake in Vietnam's Mekong Delta. Sarah Todd serves an earth-cooked Fijian feast. Rebecca Sullivan makes beef rendang in a remote Indonesian village. In the Philippines, Luke Hines cooks grouper to perfection. Mark Olive prepares chicken the Tanzanian way under a giant boab tree. In Mozambique, Paul West is sweet on cassava with balsam apple.

*The Good Cooks* is a unique TV recipe. With its satisfying blend of cooking, travel and infotainment, it tells the story of how ACIAR is making a difference in the developing world.



A copy of the series' cookbook, *The Good Cooks' Journey*, has been included in this issue of *Partners* for our Australian subscribers. You can also download it free of charge at [www.aciar.gov.au/goodcooks](http://www.aciar.gov.au/goodcooks)

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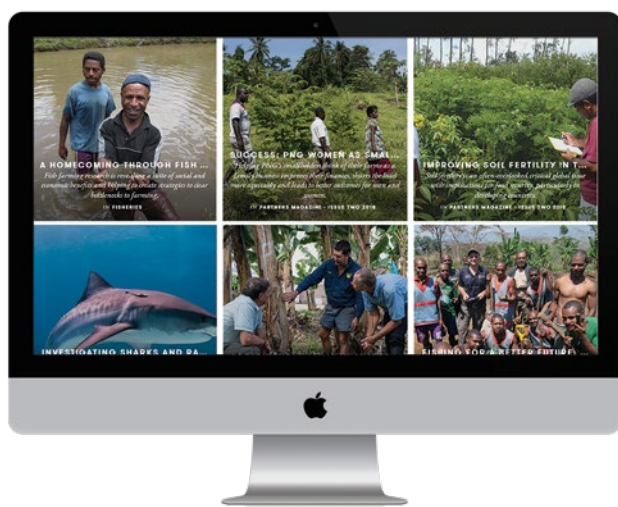
## REACHING OUT—ACIAR'S BLOG TURNS ONE

To keep more people up to date with the wonderful work being done in the field by ACIAR's commissioned organisations, ACIAR's Outreach Branch publishes a blog, recently renamed *reachout*.

Established in October 2017 and attracting over 200,000 readers in its first year, *reachout* tells the story of ACIAR and the projects it funds through words, video and photographs.

As well as publishing articles appearing in the popular *Partners* magazine, *reachout* covers news and project updates from ACIAR's 10 research programs. All articles are also promoted through ACIAR's social media channels.

Visit and subscribe for free at [reachout.aciar.gov.au](http://reachout.aciar.gov.au)





The Australian Centre for International Agricultural Research (ACIAR) is part of Australia's international development cooperation program. Its mission is to achieve more productive and sustainable agricultural systems for the benefit of developing countries and Australia. ACIAR commissions collaborative research between Australian and developing-country researchers in areas where Australia has special research competence. ACIAR also administers Australia's contribution to the international agricultural research centres.



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