



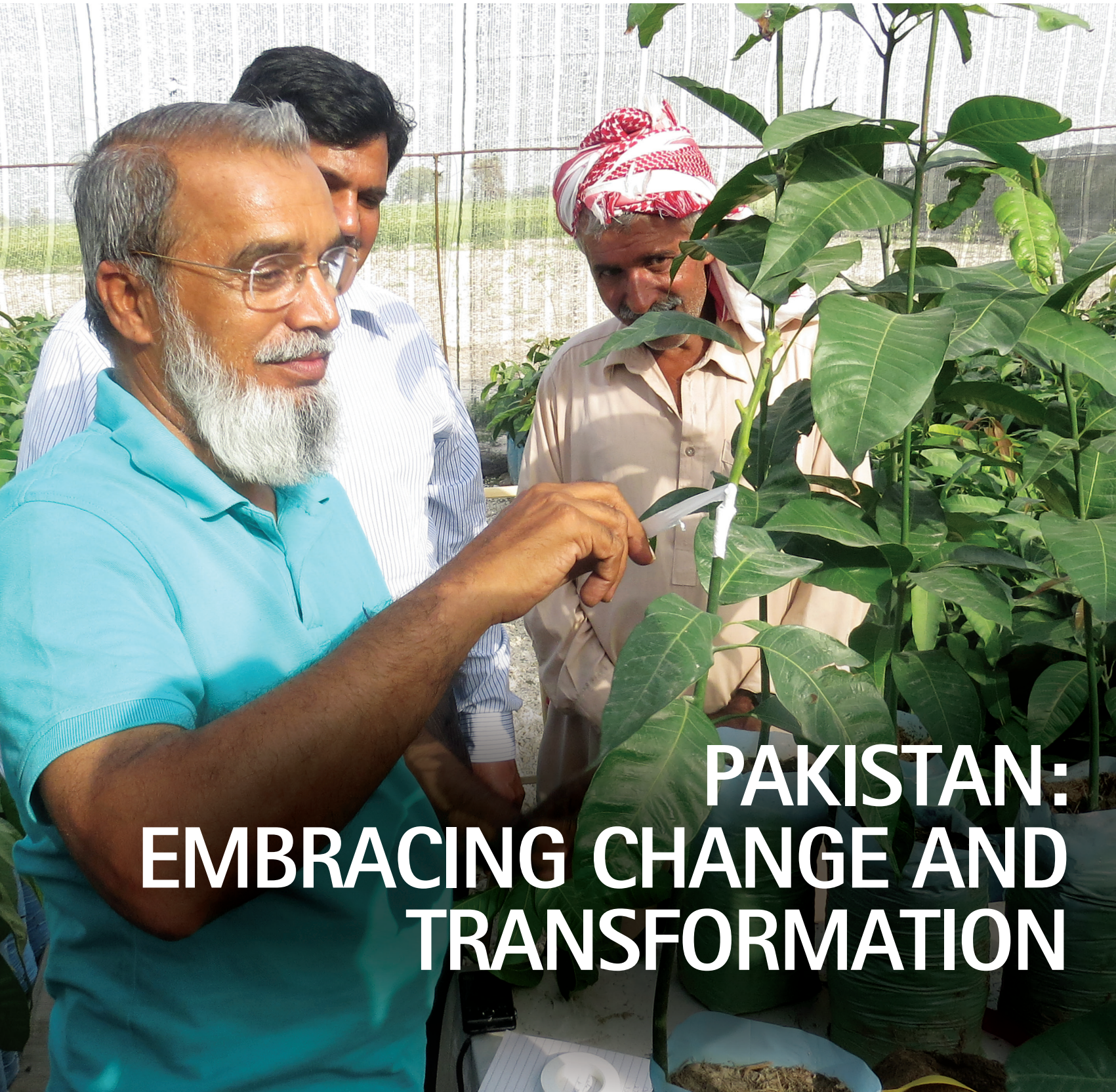
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# partners

IN RESEARCH FOR DEVELOPMENT



PAKISTAN:  
EMBRACING CHANGE AND  
TRANSFORMATION

# THE PAKISTAN DREAM



BY **NAELA CHOHAN**  
High Commissioner for Pakistan

**H**istorically, Pakistan has been known as the breadbasket of South Asia. Located at the crossroads of civilisations, it is endowed with diverse agro-ecological zones and a hardworking farming force that helps the country produce a variety of world-class agricultural products including mangoes, kinnows, cotton and basmati rice.

Agricultural land forms 34.4% of the country's total area and is very important for maintaining food security for the people of Pakistan. Agriculture contributes over 20% of the national GDP and involves about 43% of the total labour force.

The Government of Pakistan is making efforts to realise the 'Pakistan dream' and Vision 2025. Its main focus is on enhancing sustainable growth and creating employment through agricultural productivity, water resource management and development of industry.

Australia is well placed to assist Pakistan in achieving these goals, including improvement of irrigation, drainage and salinity management in major cropping systems.

It is a matter of great satisfaction that agricultural cooperation between Pakistan and Australia is very strong and well established. The Australia–Pakistan Agriculture Sector Linkages Program (ASLP) initially focused on the mango, citrus and dairy sectors. As the work progressed, there was an increasing focus on gaining benefits for smallholder and poor farmers and other disadvantaged groups. ACIAR has played a crucial role in linking world-class research in Australia to its partners in Pakistan, and in converting



Rice cultivation in Pakistan.

PHOTO: FATEH SHAMS WAMI

knowledge into programs that remove barriers to production and introduce technologies and innovation that boost productivity.

We deeply appreciate ACIAR's strategy for Pakistan, which is to work closely with the Pakistan Government, particularly with the Ministry for National Food Security and Research, its research arm Pakistan Agricultural Research Council (PARC), and the Pakistani private sector.

I understand that a new co-investment between ACIAR and the Australian Department of Foreign Affairs and Trade (DFAT)—the Agriculture Value Chain Collaborative Research Program (AVCCR)—is closely aligned with the previous two phases of the ASLP. AVCCR is intended to focus more strongly on collaboration and research in selected agricultural value chains that are important for Pakistan.

ACIAR is providing research, development and technical capacity building, technical support and carefully targeted interventions to underpin Pakistan's development programs through collaboration with PARC, which has played an important role.

Here I would like to pay tribute to Dr Iftikhar Ahmad, former Chairman of PARC, who we recently lost (*Inna Lillah hei wa Inna Allehey Rajioon*). May his soul rest in eternal peace. Dr Ahmad was a distinguished agricultural scientist who received the 2006 Norman Borlaug Award for his work in crop protection and designing National Integrated Pest Management (IPM) programs for various cropping systems, implemented through high-impact and innovative channels such as farm research, farmer

field schools, Women Open Schools and children's ecology classes. Dr Ahmad was dedicated to improving the agricultural sector in Pakistan and was committed to further strengthening mutually beneficial cooperation between PARC and ACIAR. He will always be remembered for his contributions.

The people featured in this publication, many of them smallholder farmers, realised their opportunity and improved their livelihoods as a direct result of the outstanding work of Australian scientists and agencies in cooperation with their Pakistani partners, especially PARC.

Achieving Pakistan's Vision 2025 and its sustainable development goals will be supplemented by replicating the success stories of smallholder farmers from all around the country, like the ones within the following pages. As is well known, poverty reduction, linking smallholders to markets, and gender equality are the main focus of the Government of Pakistan. Development programs that complement the Government's efforts are useful. We commend the support given by ACIAR, DFAT and AVCCR in achieving these objectives.

I am confident that our continued collaboration will open up more opportunities for many more Pakistani smallholder farmers to enable them to become more competitive, with further value-added processing and increased export. Cooperation with ACIAR will continue to make a significant contribution to increasing benefits for Pakistani smallholders and poor farmers as well as other disadvantaged groups, with greater involvement of women. ■

# THE WILL TO MAKE A DIFFERENCE



BY **MARGARET ADAMSON**

Australian High Commissioner to Pakistan

The Australian Government is committed to assisting Pakistan to build economic prosperity and stability for all its peoples. The Australian aid program is supporting sustainable, inclusive economic growth and poverty reduction in Pakistan, with a particular focus on the promotion of equal opportunity and protection from violence for women and girls.

One of the strategic objectives of Australia's development partnership with Pakistan is to accelerate sustainable growth and employment by supporting agricultural productivity and water resource management and industry. This objective aligns with, and facilitates, Pakistan's development policy, Vision 2025, which focuses on sustainable economic growth as a key driver for poverty reduction.

Vision 2025 also outlines Pakistan's commitment to creating a modern, efficient and diversified agriculture sector, including through improvements to food production and supply chains. Australia's aid investments are supporting this goal by improving agricultural productivity through better production techniques, agricultural inputs and technologies, agricultural policies, and improving agribusiness opportunities. Australia's support has led to Pakistan investing in complementary programs to enhance agricultural research and development.

Projects designed to build resilience and increase women's participation in decision making, promote private-sector partnerships and build the capacity of local smallholder farmers are key to achieving this objective. Australian aid

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## THE AUSTRALIAN AID PROGRAM IS SUPPORTING SUSTAINABLE, INCLUSIVE ECONOMIC GROWTH AND POVERTY REDUCTION IN PAKISTAN, WITH A PARTICULAR FOCUS ON THE PROMOTION OF EQUAL OPPORTUNITY AND PROTECTION FROM VIOLENCE FOR WOMEN AND GIRLS.

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will continue to promote women's empowerment and target areas of key disadvantage in Pakistan.

Australian assistance in the energy and water sectors, including technical exchanges, will be directed in support of a well-governed resources sector in Pakistan. Australia will also draw on its world-class expertise to help Pakistan enhance agricultural productivity and expand revenue streams for farmers, including through improved water management practices, adding value to raw agricultural products and improved access to markets. This will also boost Pakistan's food security and nutrition levels, and women's economic empowerment.

ACIAR is at the forefront of Australian-led collaboration between government, business and research bodies. ACIAR has been at the leading edge in Pakistan's dairy sector, providing a template for our engagement in agriculture.

ACIAR has had a program of research collaboration with Pakistan since 1984, with recent projects focused on Pakistan's key fruit crops (mangoes and citrus), livestock (smallholder dairy), agricultural policy and agricultural water management. ACIAR works closely with the Government of Pakistan, other donor partners, non-government organisations and the Pakistani private sector to provide research and development and technical capacity building.

Technical support and carefully targeted research and development interventions underpin successful development programs in Pakistan. The Ministry of National Food Security and Research has been the main implementing

partner for ACIAR through its research arm, the Pakistan Agricultural Research Council, along with provincial agriculture departments.

ACIAR has also been a leader, developing innovative ways to connect Australian and Pakistani universities including through institutional partnerships and technical exchanges designed to underpin research for development and contribute to building human resources capacity.

I am pleased to recommend this issue of *Partners* magazine to all those interested in the future of agricultural development in Pakistan. The stories told within the following pages are about real people who, with assistance from Australian research scientists, have broken through significant barriers to achieve sustainable economic success. They are stories of persistence and hope and they augur well for the future development of a modern, efficient, inclusive and diversified agriculture sector in Pakistan.

On a sadder note I was very sorry to hear of the passing of Dr Iftikhar Ahmad, one of Pakistan's most accomplished and celebrated agricultural scientists. His message lives on in his words in the pages of this magazine. ■



PHOTO: FASEEH SHAMS (WMI)

Women are playing an increasing role in agriculture in Pakistan.

# PAKISTAN: EMBRACING CHANGE AND TRANSFORMATION

**A**CIAR has supported a program of research collaboration with Pakistan since 1984, with recent projects focused on Pakistan's key fruit crops (mangoes and citrus), livestock (smallholder dairy), agricultural policy and agricultural water management. ACIAR works closely with the Government of Pakistan, the Department of Foreign Affairs and Trade (DFAT), other donor partners, non-government organisations (NGOs) and the Pakistani private sector to provide research and development (R&D) and technical capacity building.

Technical support and carefully targeted R&D interventions underpin development programs in Pakistan. The Ministry of National Food Security and Research has been the main implementing partner through its research arm, the Pakistan Agricultural Research Council, along with provincial agriculture departments.

A new co-investment between ACIAR and DFAT, the Agriculture Value Chain Collaborative Research (AVCCR) program in Pakistan, closely aligns to the previous two phases of the Australia–Pakistan Agriculture Sector Linkages Program (ASLP). AVCCR is intended to focus more strongly on collaboration and research in selected agricultural value chains.

The rural poor, particularly women, will significantly and equitably benefit from improvements in these strategic value chains. AVCCR will continue to involve private-sector engagement in new and innovative partnerships and collaborations that will make a real difference to livelihoods by reducing poverty and helping to achieve the outcomes of the Government of Pakistan's Vision 2025 related to agriculture.

ACIAR's priorities for Pakistan are based on formal and informal consultations with Pakistani Government agencies and other stakeholders, as well as the Australian Inclusive Economic Growth Investment Strategy (AEGIS). Further consultations in 2015, at the end of the ASLP, resulted in the identification of high-priority agriculture value chains that are both valuable and feasible targets for further consideration within the new AVCCR program (see story on page 30).

Australia is committed through its aid program to helping Pakistan meet these challenges and, as such, has developed a portfolio of projects. Key areas identified as ACIAR research priorities across the medium term include:



**ACIAR'S PROGRAM IN PAKISTAN IS OF STRATEGIC REGIONAL IMPORTANCE, WITH HIGH-QUALITY PROJECTS, ENTHUSIASTIC PARTNERS AND A STRONG GENDER ORIENTATION.**

ACIAR CEO Nick Austin

- improvements in horticultural crop management and value-chain practices, particularly in high-value crops such as citrus, mangoes and vegetables
- improvements to dairy and beef production and marketing, including genetic aspects, animal nutrition, disease control, effective extension support and capacity building of researchers
- assessment of productivity issues and disease risk in wheat, and smallholder diversification into other crops, such as legumes (chickpeas, lentils and peanuts)
- management of land and water resources to sustain productive enterprises
- input into policy development, including investigation of social policy, and capacity constraints and issues in agriculture markets and water management.

The ACIAR Commission for International Agricultural Research visited Pakistan in March this year to meet with key stakeholders and institutions, to learn more about ACIAR's activities 'on the ground', and to assess opportunities for future engagements in country. The Commission greatly appreciated the opportunity to engage with a broad cross-section of ACIAR partners and stakeholders, and the hospitality and friendship shown at every meeting. During discussions many opportunities for collaborative research emerged, with priority given to livestock, high-value fruit and vegetables, and water.

This issue of *Partners* magazine highlights some of the projects visited by the Commissioners and the extent to which Commissioners were impressed by the resilience and foresight of local researchers and farmers (see story on page 10). One featured story—where smallholder mango farmers adopted techniques to improve the quality of their produce and were collectively

marketing using innovative approaches such as smart phones, thereby bypassing costly and inefficient middlemen—particularly impressed Commissioners (see story on page 12).

The former Pakistan member of ACIAR's Policy Advisory Council, the late Dr Iftikhar Ahmad, describes the transformative nature of ASLP activities from Pakistan's perspective, highlighting how the partnership created a shift in conceptual frameworks given the input from Australian agricultural science. It is the focus on consultation and an integrated 'from farm to fork' approach that he credits most for the success of the ASLP projects (see story page 6).

Other stories demonstrate how ACIAR has worked to build its linkages with the horticulture (pages 12, 20 and 22), livestock and dairy sectors (pages 16 and 18) through strong people-to-people partnerships (page 24) under the ASLP.

Two ACIAR staff members—Pakistan country manager, Dr Munawar Kazmi, and Dr Ejaz Qureshi, research program manager, Agricultural Development Policy—are profiled in this edition (pages 15 and 19). Both men have an in-depth knowledge of Pakistan's agricultural research priorities and are an invaluable asset to ACIAR's knowledge base.

ACIAR's program in Pakistan is of strategic regional importance, with high-quality projects, enthusiastic partners and a strong gender orientation. ACIAR is committed to maintaining this partnership into the future. ■

**Dr Nick Austin**  
CEO of ACIAR



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IN RESEARCH FOR DEVELOPMENT

*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-sponsored research projects and puts 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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# SAAT SAMUNDAR PAR— ACROSS THE SEVEN SEAS

The late Dr Iftikhar Ahmad was one of Pakistan's leading agricultural scientists and pro-poor innovators. In this article he looked back at the challenges and achievements jointly shouldered through the Australia–Pakistan Agriculture Sector Linkages Program (ASLP)

## THE PASSING OF DR IFTIKHAR AHMAD



It has come as a great shock to his colleagues and friends to hear that, since writing this article, Dr Iftikhar Ahmad has passed away. He was among Pakistan's most accomplished and celebrated agricultural scientists. He received the 2006 Norman Borlaug Award for his work in crop protection that included developing disease-resistant wheat varieties and designing national integrated pest management (IPM) programs for various cropping systems, implemented through high-impact and innovative channels such as farm-level research, farmer field schools, Women Open Schools, and children's ecology clubs. He has held high-level positions at the Pakistan Agricultural Research Council (PARC), the National Agricultural Research Centre (NARC) and represented Pakistan on ACIAR's Policy Advisory Council. This article is published to honour his contributions to agricultural research collaboration between Pakistan and Australia. His friends and colleagues in Australia will miss him greatly.

## BY DR IFTIKHAR AHMAD

Former ACIAR Pakistan Policy Advisory Council member

It was in the deadly heat of Multan that I was asked to join a large group of professionals from across the rich alluvial plains of the Indus Valley to meet another set of professionals from across the seven seas, from a little-known mass of land to me, called Australia.

That was my first interaction with a scoping mission from ACIAR to Pakistan. The Australians sought to look at agriculture in Pakistan differently and join hands with us to seek solutions to complex problems affecting two main sectors—horticulture and dairy—walking and talking across the value chains, building linkages from policy to farm, from technical to social, and from heart to

heart, *Across the Seven Seas – Saat Samundar Par*. Since then, the partnership has been a journey of progressive and incremental attainment of goals, with outcomes that have far-reaching impacts in the chosen areas of collaboration.

## COMING TOGETHER

The Australia–Pakistan Agriculture Sector Linkages Program (ASLP) collaboration ran from 2006 to 2015 and focused on improving value-chain outcomes for the horticulture sector, especially the citrus and mango industries, and dairy smallholder producers in Pakistan.

At the heart of the program was robust science that allowed the testing of best practices. It brought in the experience of Australian agricultural industries while incorporating the local experience of Pakistani collaborators. It was an approach that developed pathways to practices at the field level that could bring success and generate a trust and confidence among the farming community, as well as the industrial partners, be it export value chains or native markets. The ASLP maintained a 'research for development focus', following in the footsteps of the Global Forum on Agricultural Research (GFAR), concentrating on impacts that result in improved livelihood, pro-poor growth, women's empowerment and youth engagement. It continuously adjusted itself to the priorities that Pakistani partners asked for, yet remained committed to the agreed agenda.

## PRO-POOR IMPACTS

Both citrus and mango are important in the Pakistan context because of their potential as export crops that could help spur pro-poor economic growth, since enhanced export and export earnings can contribute to overall development and, ultimately, to alleviating poverty in rural Pakistan.

Three projects were executed under this program, namely:

- the enhancement of citrus value chains'

production in Pakistan and Australia through improved orchard management practices

- integrated crop management practices to enhance value-chain outcomes for the mango industry in Pakistan and Australia
- ASLP Mango Value Chain Project.

These projects addressed issues from farm to table and involved stakeholders across the value chain, from policy maker to farmer.

They arrived at best practices that contributed to research and development of Pakistan's mango and citrus industries, playing a key role in helping to produce quality fruits and improve post-harvest management. Importantly, they also helped build Pakistan's confidence in its ability to raise the quality of citrus and mango value chains and contribute to the overall horticulture industry's development.

Some of these best practices—that were tested and used to develop research and development pathways suited to the specific needs of Pakistan—have allowed Pakistani mangoes to be exported to some of the toughest markets in terms of regulatory frameworks, such as the European Union and Australia.

In the case of dairy, a range of simple, integrated dairy technologies—combined with an innovative whole-of-village extension approach—have shown potential to significantly improve the productivity and health of smallholder dairy herds. With a range of modules—such as milk marketing, value adding, and village-based fodder seed production—the dairy program has provided unique pathways and learning processes that, once scaled out, are bound to transform the smallholder dairy sector in Pakistan.

## CONTINUOUS INNOVATION

As the ASLP moved from phase 1 to 2, it continuously looked at itself to improve and transform the processes and pathways available to the partnership. It was this introspection that led the way to the social and policy projects that

## MAP OF PAKISTAN



## PAKISTAN Key statistics\*

GDP per capita (US\$)  
1,275

Population (million)  
182.1

UN Human Development Index (of 187 countries)  
146

Proportion living on less than US\$1.25 per day  
1/5

Percentage of labour force employed by agriculture  
45%

Percentage of GDP contributed by agriculture  
21%

2013 WORLD BANK DATA FOR GDP AND POPULATION

examined the constraints that prevent knowledge and innovations from overcoming agriculture's local challenges.

In this way, the social project brought in youth and gender-inclusive perspectives, alongside ICT capacity, to interact with the commodity-based projects to overcome inertia and provide momentum to leap-frog to greater impacts. Also, in came the concept of integrated sites for research and development that help not only to go deep for impact, but also produce a fall-out effect in neighbouring, non-project areas, thereby providing new instruments for scaling out.

An interactive voice recording (IVR) system for farmers and extension workers, Farm-SMS, and YouthPhone (by youth for youth), combine to overcome the barriers of space and time.

Though the policy project was launched very late, it quickly developed an understanding of the policy constraints that bar the way.

## MOVING FORWARD

I can say with conviction that this immensely beneficial program of collaboration between Australian and Pakistani agricultural scientists—this journey together *Across the Seven Seas*, or *Saat Samundar Par*—is a journey of success and positive contribution. In the deadly heat of the Indus Valley, it represents many shades of social and cultural aspirations overshadowed by the clouds of globalisation and stresses augmented by anthropogenic interventions.

The journey continues, transforming conceptual frameworks regarding improvements to productivity, quality and marketing so as to link these gains to larger industrial development and economic growth. These gains can become game changers in the next phase, the Agriculture Value Chain Collaborative Research (AVCCR) program.

AVCCR is a co-investment of ACIAR and the Department of Foreign Affairs and Trade

that is aligned to Australia's new development strategy that focuses on human and private-sector development contributing to sustainable economic development and poverty reduction. At the same time, the AVCCR is aligned to Pakistan Vision 2025, which seeks to transform the country's economy, ensuring rapid growth of GDP using a seven-pillar strategic framework:

- people first
- inclusive growth
- good governance
- water, energy and food security
- private-sector engagement
- the knowledge economy
- regional connectivity.

Will this approach fulfil the dream inherent in the program's aspirations? Though one needs to be cautious, looking at the track record there is no call to exclude hope and conviction in the pursuance of these new goals. ■



Dr Greg Johnson

Right: ASLP Fodder Manager (Hafeez) working with a group of farmers and researchers to collect crop growth data to assess the benefits of the village-based seed enterprise to their farm production.

# HOW TO ENABLE AGRIBUSINESS-DRIVEN DEVELOPMENT

Australia and Pakistan have established strong linkages between their agricultural sectors that are improving livelihood systems for the rural poor

BY BRAD COLLIS

**F**ormer ACIAR Program Manager Dr Greg Johnson says he may have taken a backseat role for the successful Australia–Pakistan Agriculture Sector Linkages Program (ASLP), but that doesn't restrain his passion for what was, and continues to be, achieved.

Dr Johnson led the scoping missions for mango and citrus projects in phase 1 and was the implementation manager for phase 2 and its A\$13 million budget.

Phase 1 concentrated on lifting productivity and market development for Pakistan's mango, dairy and citrus producers, with the two-fold objective of economic development and poverty reduction. Phase 2 picked up on the progress made during the initial program, adding a social impacts overlay, an enabling policy project and a new-vegetable project.

The ASLP followed the approach for which ACIAR is renowned—its capacity to embrace a wide collaborative mix of research disciplines, including local and external specialists, and bring this combined effort to bear within the prevailing social, political and cultural setting.

"When people are working on an ACIAR project they go the extra mile and this leads to exciting scientific synergies for overcoming technical problems," Dr Johnson says.

"I always feel that being in an ACIAR project involves more of the person than just the scientist. It's not just straight-down-the-line R&D ... ACIAR projects take researchers outside their normal life. You often have to stop while you work things out, and this invariably creates space in which the best solutions to a problem become clearer. At least, that's my experience and observation."

Dr Johnson says that when the ASLP was proposed in 2005–06, the Pakistan Government had two specific areas of production that it wanted developed—mangoes and dairy, with citrus growing added before phase 1 commenced.

The mango projects began with some initial, fundamental production and handling issues to create a platform for the subsequent development of an enhanced value chain, in particular export-quality fruit and an export market.

The initial work involved:

- higher-quality planting material
- 'clean' mango nursery practice and good tree husbandry
- improved orchard management, including integrated strategies for disease and pest control
- strategies to address post-harvest disease
- extension and capacity building to improve the mango value chain and meet World Trade Organization requirements.

"Then in phase 2, the mango value-chain activities were able to partner with a group of growers who wanted to direct-market and export," Dr Johnson says.

"With the backing of our Pakistani partners, we were able to provide the additional support of two Australian experts—Rowland Holmes from Queensland, an expert in packhouse operations, and Peter Johnston from Western Australia, an expert in marketing and handling.

"They succeeded in sea-freighting high-quality mangoes to Europe, and over the five years of this program built self-reliance and expertise among our collaborators and the participating farmers. They learned to problem-solve across a range of areas that are typical for anyone marketing or exporting fresh produce ... things like what to do if someone interferes with the container operating systems, or how to deal with an agent going out of business. The group learned how to overcome such hurdles."

The project also included the development of domestic-market innovations such as home delivery using an ordering app on smart phones.

Dr Johnson says the dairy project had a strong focus on extension: "Dairying was a comparatively simple project, ushering in changes that would improve milk production and quality among the typical smallholder farmers."





**"THEY SUCCEEDED IN SEA-FREIGHTING HIGH-QUALITY MANGOES TO EUROPE, AND OVER THE FIVE YEARS OF THIS PROGRAM BUILT SELF-RELIANCE AND EXPERTISE AMONG OUR COLLABORATORS AND THE PARTICIPATING FARMERS."**

– Dr Greg Johnson

"Examples of the work done include developing and demonstrating ways to optimise feed resources, and encouraging farmers to untether their animals and give them better access to feed and water.

"The dairy team developed fodder production calendars to establish a more reliable feed supply, and promoted better veterinary care which, while basic, has the potential to have a significant impact. A later focus was on more profitable approaches to calf rearing and selling."

Dr Johnson says the dairy project, in particular, ushered in some creative extension tools, such as staging short plays in which scenarios such as how best to treat a sick cow were acted out.

He says there tended to be a natural comic element because of the enthusiastic involvement of both villagers and extension personnel, but they proved to be a highly effective way to engage villagers with better herd and production practices.

Some of the extension messages were also introduced into schools so children could pick up on the knowledge, and he says children were often the family members who retained the knowledge best and sustained the changes.

In phase 1, the citrus project aimed to:

- improve orchard management
- introduce new germplasm with better heat-stress tolerance, enabling the season to be extended
- develop more effective irrigation systems
- enhance citrus value chains.

To consolidate the advances made in phase 1, phase 2 aimed to better understand social constraints to practice change, boost capacity building through training and look at what enabling policy settings were needed to maximise the benefits of the research outcomes.

"It was recognised that the project teams needed a better understanding of poverty in

Pakistan to ensure more benefits flowed to the poor," Dr Johnson says.

"The social component also fostered more cross-program collaboration. By having meetings that involved people from different projects we moved towards better collaboration and the ability to overlay the whole program with a social impact assessment.

"Added to this was the policy project to help ensure the right government policies were in place to sustain the developments."

In the social project, researchers undertook detailed socioeconomic surveys within villages. Men and women were interviewed separately to ascertain their different aspirations.

Dr Johnson says in some villages this led to the creation of community centres to provide neutral ground for men's and women's groups to meet separately to discuss their roles in the projects, and community matters generally.

The centres have also provided a new venue for young people to meet socially and for training as part of the capacity-building program.

Dr Johnson says his involvement in ASLP formally finished at the end of 2014, but he has continued to take a keen interest in the program and the life-changing concepts it has introduced to some of Pakistan's poorest rural communities. ■

# ENCOUNTERS THAT MATTER

When key stakeholders in the Australia–Pakistan agricultural sector partnership met on the ground in Pakistan, it was the smallholder farmers themselves who made a lasting impression



PHOTO: ACIAR

Pakistan smallholder farmers who raise cattle have a positive economic outlook.

**BY GIO BRAIDOTTI**

In March 2016, members of ACIAR's Commission for International Agricultural Research boarded a plane for Islamabad, Pakistan, opting to conduct their 34th annual meeting in the partner country. The Commission's role is to provide strategic advice to the Minister regarding the formulation of agricultural R&D programs and the funding of these programs.

Over the span of a week, the Commissioners—including their Chair, Don Heatley—not only attended high-level meetings with key stakeholders and institutions, but also visited ACIAR project sites on the ground.

A highlight for many Commissioners was the chance to meet directly with project beneficiaries—the smallholder farmers at the project sites—and to assess opportunities for future engagements between Australia and Pakistan.

Mr Heatley says he was personally impressed by the way projects are run and managed. This is high praise given his familiarity with farming systems and international agribusiness value chains acquired as a North Queensland cattle farmer who produces beef for highly specialised markets in Korea, Japan and the US.

"There is something special about being involved with an organisation that helps smallholder farmers to better themselves from working the land," Mr Heatley says.

"What's more, I believe a wealthy country like Australia has an obligation to be supportive of developing neighbours and to do it in the same spirit we use when fellow Australians find themselves in need."

He was especially struck by the opportunities presented to farmers in the Punjab by Pakistan's natural resources—the quality of the soil, the availability of water and the large areas of flat, arable and irrigable land. But he also noted that Pakistan is a country of diverse landscapes and that agricultural activity takes places in areas that present greater challenges.

Through the eyes of a true connoisseur of agricultural capital, however, it was the people that received the highest praise, particularly their affinity for the land and farming. "Yes, they are facing difficulties," Mr Heatley says. "But given the emerging political stability, there are real opportunities for agriculture to drive development gains."

From the smallholder farmers on the ground, he encountered a real appreciation for new possibilities, a willingness to take risks given new opportunities, along with an entrepreneurial flair to not just produce but also market their food in more profitable ways.

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**"UNDERPINNING ALL THE POSITIVES IS PAKISTAN'S YOUNG POPULATION. THEY ARE GROWING UP IN RURAL COMMUNITIES, THEY ARE INVOLVED IN AGRICULTURE, AND ACIAR IS SUPPORTING THE BROADENING OF THEIR HORIZONS AND DEVELOPMENT OF NEW OPPORTUNITIES."**

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– Don Heatley

"At the mango project sites, I saw switched-on producers who not only grasped the marketing principles of the value-chain projects, they sincerely want to do more direct marketing, they want to reach international markets," Mr Heatley says.

"They have grasped with both hands the support provided by ACIAR. While they may not end up wealthy, they see in these projects a pathway to better lives, with enough disposable income to, for instance, educate their children to a new level."

He found that wherever he travelled, his own background as a cattle producer made for instant connections with Pakistan's smallholder farmers. But as a cattleman, he was naturally fascinated by the fact livestock accounts for 54% of agricultural output in Pakistan.

Moreover, he was excited for smallholder farmers who raise cattle as the economic outlook for them is positive. Growth in demand for dairy and beef is accelerating even as the farmers' capacity to exploit market growth improves, given better herd management practices

acquired from the ACIAR dairy-sector projects.

"Underpinning all the positives is Pakistan's young population," Mr Heatley says. "They are growing up in rural communities, they are involved in agriculture, and ACIAR is supporting the broadening of their horizons and development of new opportunities."

It is the huge presence of agriculture in the overall economy that sees Mr Heatley excited for Pakistan's millennial generation. He knows the quality of life well-managed rural economies can offer and the importance of research-driven innovation to the success of farming enterprises.

"I feel fortunate to have met with Pakistani farmers," he says. "I found them astute, sensible and good operators, with the older generation proud to own land, to produce food and to support their families. They see themselves doing something worthwhile for the nation and they do it with minimal support. They want to move forward and do well. I am proud that Australia supports them as they move forward."

Besides the farmers themselves, Mr Heatley reserved particular praise for the skills of ACIAR's in-country managers—in this case, Dr Munawar Kazmi (see profile on page 15). "The skill of these managers is intriguing," Mr Heatley says. "In Pakistan, the portfolio is enormous, covering 190 million people, there are security issues, but the way they go about their job, and their knowledge of market economics, is truly impressive."

The clearest message to emerge from the meeting was that ACIAR has no intention of being a fly-by-night with regards to Pakistan. He sees the partnerships continuing, prospering and ultimately thriving in mutually beneficial ways.

"Pakistan is an important country in Asia and its people are its greatest resource," he says. "They are resilient and given an opportunity they will make the most of it."

As to ACIAR, while the organisation is not big enough to change the economic base of partner countries, what he saw on the ground reflects an organisation that is nimble, responsive, engaged, able to target projects that make a real difference, and with strong acceptance among the in-country stakeholders.

"From ACIAR's perspective in Pakistan, there is the potential to become involved in many more opportunities for economic development," Mr Heatley says. ■

**MORE INFORMATION:** Don Heatley, [byrnevalley@bigpond.com](mailto:byrnevalley@bigpond.com)

# MARKET MINDSET DELIVERS LASTING VALUE

A decade-long project to develop Pakistan mango value chains has equipped the country with a proven toolbox of skills and mindsets

## KEY POINTS

- A focus on delivering value to consumers has proven its ability to increase returns for mango industry stakeholders in Pakistan.
- ACIAR training and support have enabled new direct-marketing initiatives that are improving incomes for smallholders.

## BY TOM BICKNELL

The mango is known as ‘the king of fruits’ in Pakistan and, in line with its popularity, the country is estimated to be the sixth-largest global producer of the fruit by the UN’s Food and Agriculture Organization. But of all the mangoes grown in Pakistan, relatively few make it all the way to consumers.

“One of the early things we established is that for every hundred mangoes on the tree, roughly 30 reached the consumer. The waste in the system is just horrendous,” explains Professor Ray Collins, the project leader for ACIAR’s ‘Pakistan mango value chain improvement project’, part of the Australia–Pakistan Agriculture Sector Linkages Program (ASLP).

Improving that state of affairs was the key focus of the project, which began in 2006 and wrapped up at the end 2015.

The project took a systems approach to improving Pakistan’s mango supply chains in order to deliver better fruit to consumers, develop and improve markets, and build the capacity to turn the industry’s attention from supply to value. To achieve those goals, the road to success started in the market.

“We always worked from the market backwards,” Professor Collins says. The initial stages

of the project identified opportunities in markets such as China, the UK and Malaysia, and then determined what qualities a Pakistani mango would need to offer in each market for it to have a profitable presence there.

“Then you could go back to Pakistan and ask how the chain would need to perform—and what would need to be improved—in order to deliver that product with those attributes, at that price, in that particular market,” he says.

Back in Pakistan, many of the technical challenges behind improving quality and shelf life required significant work, but the project was able to leverage off best-practice strategies and technologies from other mango industries, such as Australia’s. Pakistan’s mango sector, however, had a unique logistical barrier to overcome before it could develop export markets successfully.

Pakistan has long exported mangoes to the UK, but a short shelf life meant the fruit needed to be airfreighted, resulting in a high landed price in the market. Combined with traditionally low quality, Pakistani mangoes were sold primarily to Pakistani expats through greengrocers and street markets, and were not able to access the huge but strict supermarket sector.

“To turn that around, for the first time we had controlled-atmosphere seafreight of Pakistan mangoes going to the UK, with literally world-class outcomes,” Professor Collins says. “Twenty-five to 28 days on the sea, and out-turns at the other end were as near to perfect as you can get with a biological product. They were exceptional results.”

The project’s controlled-atmosphere results had the potential to put Pakistan’s mango industry at the technological forefront of mango seafreight.

## CHANGING BUYERS’ PERCEPTIONS

The project’s technical achievements meant Pakistani mangoes were able to land in the UK and

meet the supermarkets’ high quality requirements. The new offering of ‘ASLP best practice’ mangoes were of better quality and lower landed cost than other Pakistani mangoes, and offered supermarkets a seven-day shelf life.

The challenge, however, was convincing the UK members of the value chain that those attributes, which went counter to decades of experience, were real. “There was quite a challenge to get wholesalers, distributors and retailers believing that Pakistani mangoes could be this good and would have this shelf life,” Professor Collins says.

“We had to personally go into the supermarkets in the UK, walking the mangoes through the system, showing people how to handle them, demonstrating to shoppers how good they were and letting supermarkets see how long they would last on a shelf.”

## CHANGING MARKETERS’ PERCEPTIONS IN PAKISTAN

With the export market potential established, the project turned to building the capacity of value-chain members in Pakistan in order to exploit local opportunities.

Convincing traditional middlemen to do business differently was one of the biggest challenges for the project, however, and one that is yet to be fully overcome as the project wraps up.

“The traditional middlemen were loath to be involved, because their business was transferring huge volumes of low-quality product as rapidly as possible at small margins,” Professor Collins says. “What we were proposing was higher quality, but slower and more expensive, and it just didn’t fit the way they did their business.”

Instead, the project had success connecting with local entrepreneurs who were able to substitute for traditional wholesalers and distributors, and who saw promise in an approach



PHOTO: RICHARD MARKHAM

aimed at generating higher returns by delivering better quality to consumers.

In every city studied, the project's research in domestic markets identified willingness among consumers to pay better prices for better-quality mangoes, and disappointment that the traditional system failed to meet these needs. Entrepreneurs demonstrated how this demand could be profitably met.

### BRINGING IT BACK TO THE SMALLHOLDER

Under the project's overarching objective of generating higher returns using a market-led, consumer-focused approach, there was a central goal to ensure a more equitable share of returns went back to growers.

In the traditional supply-chain structure in Pakistan's mango industry, smallholders are price takers with limited ability to improve their returns. Part of the ASLP project, therefore, was to work with smallholders to engage them in directly meeting the needs of consumers.

The project worked with a group of growers in a village near Multan in Punjab, who had received training in on-farm best practice as part of the ASLP program, enabling them to produce high-quality 'ASLP best practice' mangoes and market

them direct to consumers. With support from the project with packaging, marketing material and overcoming technical challenges, the group of six smallholders has been able to set up a direct-to-consumer value chain over the last two years.

The smallholder group used three different marketing channels. In 2015, about one-third of the group's 30.7 tonnes of production was sold through a market stall that the smallholders set up and ran themselves in Multan, despite opposition from traditional sellers who ran competing stalls.

A further third was sold through a home-delivery system, where consumers placed an order over the phone and the smallholders delivered the fruit by motorbike. The final third of the smallholder group's fruit was sold through Facebook ordering and payments made over the phone, delivering orders by bus throughout Pakistan.

The results spoke for themselves, according to Professor Collins. "They ran out of fruit in 28 days. The net result to them if you compare like-for-like with those same mangoes sold through the traditional system was that their incomes after all costs were 77% higher. Don't let anybody say smallholders can't do it—with the right attitude and a focus on the consumer, they most certainly can." ■

Clockwise from left: Mango pickle makers; mangoes ready for delivery; selling mangoes in market.

PHOTO: RAY COLLINS



PHOTO: RAY COLLINS



## EMPOWERING WOMEN

Mango pickles are a popular food in Pakistan, but are primarily made by several large national companies. Market research undertaken by the project identified an opportunity for mango pickles that could be made by hand.

In partnership with Sindh Agriculture University, the project trained and supported women in two rural villages to produce and market pickles using fallen, immature mangoes—locally called baby mangoes—that would otherwise be wasted.

The two village-based groups of women produced one tonne of pickles each in 2015, which were marketed directly to shops and consumers by village men. Over the two-month season, pickle sales increased household incomes by roughly half.

With the training and equipment provided by ACIAR, the future of the pickle enterprise looks good following the end of the project. "I feel quite strongly that this initiative has a life after the project," Professor Collins says.

**ACIAR PROJECT:** HORT/2010/001 'Pakistan mango value chain improvement'

**MORE INFORMATION:** Ray Collins, The University of Queensland, ray.collins@uq.edu.au



Improved nursery management techniques are helping to eliminate pest and disease problems of mango production.

Munawar Kazmi, ASLP coordinator and now ACIAR country manager in Pakistan. "By the end of the project, some 40,000 of these trees were being produced each year. A manual on nursery practices, jointly produced with the citrus project, has been widely used in an extensive effort to train nursery operators and farmers."

When it came to improving existing mango orchards, the project team focused their efforts on 'canopy management'—pruning to achieve an open structure of highly productive branches—and on more efficient irrigation. Irrigation in response to the need of the trees reduces the amount of water needed by 40% and avoids salt build-up and waterlogging. Farmers using the ASLP 'best practices' were able to increase the yield of their trees by at least 60%.

The researchers were able to diagnose the fungi causing mango sudden death and mango malformation disease in Pakistan (*Ceratocystis fimbriata* and *Fusarium mangiferae*, respectively). They developed a treatment for the former that involved injecting fungicide directly into the trunks of the trees. Tree losses were reduced by this practice from 10% a year to virtually nil, and in some cases whole orchards were saved.

Perhaps the project's most important legacy will be a new generation of well-trained researchers, extension officers and farmers. The project supported eight researchers to obtain doctorates and 19 to obtain masters degrees. More than 100 farmer training events were held, reaching over 6,000 farmers, and the training effort is being continued by various partner organisations.

Under the project, researchers from universities and government organisations became accustomed to working together to conduct problem-solving research with farmers. With these new skills and ways of working together, Pakistan's researchers will be well placed to solve new problems as they arise and to support the further development of the country's mango industry. ■

**ACIAR PROJECT:** HORT/2010/006 'Integrated crop management practices to enhance value chain outcomes for the mango industry in Pakistan and Australia'

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## BREAKING THE MANGO DISEASE CYCLE

Professionally managed nurseries provide a foundation for better mango production

BY DR RICHARD MARKHAM

**M**ango trees, like people, need a good start in life and continuing care as they grow up, to enable them to reach their full potential and have a long and productive life.

The 'mango production project', part of the Australia–Pakistan Agriculture Sector Linkages Program (ASLP) portfolio, looked systematically at the pests and diseases that were adversely affecting the productivity of mango trees in Pakistan and the quality of the fruit coming to market.

The researchers concluded that many of the problems started in the nursery and were compounded by neglectful or inappropriate management of most orchards.

Traditionally, mango seeds are planted in dense seedbeds in the soil, under the parent trees, where they become infected with fungal diseases such as those implicated in mango sudden death and mango malformation disease by the trees above.

A high proportion of the seedlings die from these diseases or from root damage when they are dug up and transplanted to their final position in a new orchard.

A concerted research and training effort by the project team resulted in the establishment of well-managed, dedicated mango nurseries. Initially, six commercial nurseries and six nurseries in various research organisations were established. Mango seeds were carefully selected, planted in polythene pots, in well-drained, soil-less growing media (formulated from locally available materials such as sugarcane waste and coconut peat), grafted with defined, market-preferred varieties, and carefully raised with adequate water and fertiliser.

Almost all the trees survived subsequent field planting—with a strong root system undamaged by the planting process—and quickly started to bear good-quality fruit.

"Farmers love these strong, healthy trees and are ready to pay a good price for them," says Dr

PHOTO: IAN BALLY

# A FLAIR FOR THE BIG PICTURE



Dr Munawar Razi Kazmi

BY GIO BRAIDOTTI

**A**CIAR's country manager for Pakistan is Dr Munawar Raza Kazmi, a researcher who formerly headed mango production research at Pakistan's Agricultural Research Centre (PARC). In 2005, Dr Kazmi was invited to a workshop exploring the possibility of Australian support for Pakistan's mango industry through the Australia—Pakistan Agriculture Sector Linkages Program (ASLP).

"My relationship with ACIAR started with the invitation to lead the local team for the ASLP mango project," Dr Kazmi says. The role quickly grew, however, first to ASLP program officer, then ASLP operations manager and now to country manager based at the Australian High Commission in Islamabad.

In his latest role, Dr Kazmi not only facilitates agricultural R&D collaborations between Australia and Pakistan, but is involved in myriad other activities essential to the longstanding partnership.

For example, he contributes to the design and implementation of new projects, participates in strategic processes about emerging local needs, and also monitors issues that may affect ACIAR's activities in Pakistan. Then there are his tasks of briefing research managers and senior management, as well as contributing to communication with stakeholders.

"The journey from researcher to research manager and then country manager has been interesting and I like the experience of working with an international agency," Dr Kazmi says. "There is a strategic vision intrinsic to ACIAR's work in Pakistan. My role is not to get lost in the details of individual projects but to have oversight of the overarching strategic goals."

Looking back over the years of partnership between Pakistan and Australia, Dr Kazmi believes it has highlighted the importance of the value-chain approach (see, for example, the story on page 12).

"The projects span from the farm to the fork," he says. "It is a whole-system approach that improves productivity relative to marketing opportunities, encompassing social factors, such as employment opportunities, with a special focus on women and youth."

"What that means is that while the money spent by ACIAR is smaller in comparison to many other donors in Pakistan, the level of impact is far better."

Dr Kazmi attributes the ability to act so broadly to the linkages ACIAR forges between, and among, all the important stakeholders, with local needs and settings respected, while exploring new ideas and avenues for research.

"There are a number of benefits to Pakistan from its relationship with ACIAR," he adds. "The project-development process can be a learning opportunity for Pakistan researchers, as the process is very different from other donors. Additionally, ACIAR's ASLP investment acted as a precursor for further investment from other donors, such as the Government of Pakistan."

He estimates that since its launch in 2006, ASLP triggered public-sector investment in the form of complementary projects amounting to Rp 17,750 million (equivalent to A\$178 million in 2016 figures). These are projects that directly support the objectives of ASLP.

Of all the innovations he has seen emerge from the partnership, however, Dr Kazmi especially values people's willingness to now talk about issues that were once never considered. He cites the example of fodder for dairy animals, which he says everybody knew in principle to be important for milk productivity, but no one took seriously.

"Post-harvest losses, value-chain approach, disease-free nurseries—now all these things are known even to farmers," he says. ■

## ABOUT DR KAZMI

Dr Kazmi completed a master's degree at the University of Agriculture Faisalabad and a PhD in plant pathology at Quaid-e-Azam University Islamabad. He specialised in mango disease and farmer training. Over 15 years as a research scientist he published more than 40 peer-reviewed science articles. Additionally, he is a trained facilitator and has worked extensively on the farmer field school approach, collaborating with various national organisations and also with international agencies in Vietnam, Bangladesh and Kyrgyzstan.

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# FORAGING FOR NEW OPPORTUNITIES IN THE DAIRY SECTOR

Growth in demand for products from dairy livestock is making Pakistani smallholder farmers essential to national aspirations to raise productivity and reduce rural poverty

## KEY POINTS

- Farm-practice innovation in Pakistan's dairy sector is creating multiple new avenues to increased income.
- Preceding the changes to on-farm practices was innovation to the content and delivery of extension messages.

## BY GIO BRAIDOTTI

**A**n 'innovation hub' embedded within Pakistan's agricultural extension system has helped improve incomes among the many smallholder farmers in the Punjab and Sindh regions that contribute to Pakistan's economically important dairy industry.

As the world's fourth-largest milk producer, dairy is the biggest livestock sector in Pakistan, valued at Rp 360 billion annually (equivalent to A\$8 billion in 2016 figures). Remarkably, farmers with up to 10 animals each make up about 90% of the dairy population.

While total milk production has increased about 5% a year for the past 15 years, demand is anticipated to more than treble by 2020, requiring a faster boost in production.

Since 2006—when ACIAR launched its first dairy-sector project—growth in demand for milk has been exploited as an opportunity to reduce

rural poverty by helping smallholder farmers to improve productivity. The ultimate aim is to translate those gains into greater household income and accelerated rural development.

From the start, ACIAR team members made use of the fact Pakistan has an established extension service for dairy farmers that incorporates village-based veterinary officers.

The capacity of this system was further boosted through linkages with Australian researchers and research infrastructure provided through a Pakistan-based extension innovation hub.

The hub aids in the ability to identify on-farm production and marketing constraints, detect omissions in extension services, trial new solutions and develop suitable training material for not only farmers but also extension field officers and the schools that teach the children of farming households. The hub also makes it possible to form connections with the right academics when research is needed to solve production problems or assist with emerging opportunities.

Innovations emanating from the hub have been instrumental in achieving higher adoption rates of key production innovations based around fodder, nutrition and animal welfare. The result has been healthier herds that are linked to increased milk production of 1 to 2 litres per animal a day, which is especially impressive given that the

average production level for subsistence farmers is at most 3 litres of milk per animal a day.

Central to the hub's establishment was a team based at Charles Sturt University, headed by now-retired Professor Peter Wynn and the project's Pakistani project leader, Dr Hassan Warriach from the University of Veterinary and Animal Sciences.

The project is currently led by Dr David McGill, who in 2007 travelled to Pakistan in the role of project manager. Dr McGill established a base for the project in Lahore, where he lived for nearly three years, creating the relationships with Pakistani partners that are thriving to this day.

"We stepped into a system where field officers had discussion groups established, but these were for men only and we noticed two things," Dr McGill says. "The first was that adoption rates were not as high as they could be. The second was that the excluded household members were actually playing important roles rearing and looking after dairy herds."

A novel way was found to solve issues around gender exclusion. Crucial to these efforts were the young Pakistani interns and students who travelled to the farms with a male colleague, gained the confidence of households, and





PHOTOS: DAVID MCGILL



Above: Interns from the University of Veterinary and Animal Sciences (UVAS), Nimra and Shireen (foreground), and Irfan (UVAS Masters student) working on a calf-rearing trial to determine the most profitable feeding strategies for male calves.

Left: ASLP dairy area adviser, Dr Sobia Majeed (right), working with a group of farmers in Sindh on milk value addition.

established discussion groups for women.

Included are women such as Sobia Majeed, Zahra Batool, Shumaila Arif, Khadija Javed, Zunaira Akram and Nabila Murtaza who worked with female farmers in Sindh and Punjab provinces.

Dr McGill describes the gains these women achieved as “incredible”, demonstrating the kind of initiative, intelligence and panache that saw many offered scholarships from around the world to continue their studies. Included is Zahra Batool who recently started a PhD in Melbourne.

“The women who worked on the ground were instrumental in achieving impressive husbandry and milk production gains,” Dr McGill says. “Additionally, women were identified at each site to take on an organising role—the go-to person for that village who plays an analogous (but unpaid) role for the women groups to the one provided to the men by the village-based veterinary officers.”

The benefits are not restricted to the Punjab and Sindh provinces since the innovation hub developed training sessions for extension officers from other provinces. Dr McGill says these workshops—which included theory, practicals, farm visits and debate—were based on farmers’ needs relative to the time of season.

The extension messages centred on three core principles—nutrition (especially fodder), health

**“THE WOMEN WHO WORKED ON THE GROUND WERE INSTRUMENTAL IN ACHIEVING IMPRESSIVE HUSBANDRY AND MILK PRODUCTION GAINS. ADDITIONALLY, WOMEN WERE IDENTIFIED AT EACH SITE TO TAKE ON AN ORGANISING ROLE—THE GO-TO PERSON FOR THAT VILLAGE.”**

– Dr David McGill

and animal management—based on a central message: what is good for the animal is good for milk production.

“Part of what we did was to acquire a feel for what people knew and what recommendations we needed to promote,” Dr McGill says. “In turn, that required understanding the farm system.”

An example was the observation that dairy herds often co-exist with cropping systems.

As a result the practice of relying on wheat, sugarcane, maize or rice straw by-product to feed cattle was widespread but created shortfalls of fodder, especially between seasons.

“People didn’t see dairy nutrition as important, as it is perceived that cash crops earn the larger income,” Dr McGill says. “We recommended staggered sowing of fodder that can be harvested every other week. This, however, was not popular with farmers, as fodder seed was scarce and of poor quality.”

In response, the innovation hub explored the possibility of establishing village-based fodder seed businesses. Included were fodder trials to compare seed quality from imported sources, established Pakistani suppliers, and the Fodder Research Institute (which breeds improved varieties). These were undertaken by Shoab Tufail in the form of a PhD project in which he excelled at drawing farmers into the research activities.

The results were clear-cut and made widely available: the improved varieties from the Fodder Research Institute performed the best, producing up to three times as much forage with the potential to double the amount of seed produced.

“We found that if farmers ran a forage seed business they can make money—up to four times the value of a cash crop,” says Dr McGill, referring to research results from Mr Shoab’s PhD project. →

from page 17

A pilot program has given villages around Okara support to trial seed enterprises, achieving impressive uptake rates (up to 50%). In support of these enterprises, different groups of farmers have participated in research to explore the value to their enterprises of various forage species, such as berseem (Egyptian clover).

Income-earning opportunities based on improved nutrition are just one example of how improved animal management can be profitable. An extension module was developed to promote cow comfort as a means to raised productivity.

Additional gains were made possible by simple measures, such as untethering animals, building fences and allowing them to roam within small enclosures where animals have free access to water and feed, shade in summer and warmth in winter.

Work is now under way to develop an app-based decision-support tool on animal health. The idea is for farmers to record some simple measures about their animals on their phones. That data can then be compared to a database to determine the best inputs and actions to improve the animals' ability to produce milk.

Additional income-earning opportunities for farmers have also been identified in the form of an emerging market based on increased demand for beef from an urban middle class.

"If the animals are treated well, then the same extension message will work for beef production," says Dr McGill, who is continuing his involvement in the international sector from his new base at the University of Melbourne. "We can even tailor the message to adapt nutrition regimes suited to marketing male cattle for beef."

All the extension messages are being packaged to develop resources suitable for all the key stakeholders: field officers, both male and female farmers, and children, including classroom activities.

"We now have extension modules that work and a sense of the research questions we need to ask," Dr McGill says. "I am now keen to explore which Pakistani organisations are in a position to take on the roles the innovation hub would play in the next phase without support from Australia." ■

**MORE INFORMATION:** Dr David McGill, david.mcgill@unimelb.edu.au

**MULTIMEDIA:** Along with a group of other early-career researchers working on similar projects, Dr McGill has helped to establish the RAID (Researchers in Agriculture for International Development) network: www.raidaustralia.net

## BEES AND THE DAIRY INDUSTRY

BY SHOAIB TUFAIL

School of Animal and Veterinary Sciences, Charles Sturt University

The majority of Pakistan's nine million smallholder dairy farmers are subsistence farmers, with fewer than five animals on 2 to 3 hectares of land. Livestock productivity is generally low. In recent years, dairy farmers became aware of the need to produce quality green forage to feed their milking herd. As a result the demand for seed has increased dramatically, yet the formal seed-supply system in Pakistan is able to supply only about 10–20% of farmers' needs.

To overcome shortages, the Pakistani Government invests more than Rp 300 million (A\$40 million) on berseem clover (*Trifolium alexandrinum* L.) seed imports each year. Berseem clover accounts for more than half of Pakistan's annual green fodder needs, particularly over the winter and spring months.

A project led by Charles Sturt University (CSU), in partnership with ACIAR and the Pakistan Government, is providing important support for the development of a vibrant alternative to the formal seed-supply system for smallholder farmers. This project uses a participatory approach that engages farmers and their communities in the establishment of village-based forage seed enterprises (VBFSEs).

VBFSEs are enabling farmers operating at the margin of profitability to diversify their practices, bypass high-cost multinational seed companies, and produce high-quality berseem clover and seed products on site. The approach also gives farmers ownership and control over the supply of the forage seed that is so important to their financial sustainability.

Through the project, farmers learned the art of varietal selection, seed production and the importance of bees for pollination, while researchers investigated the impact of introducing honey bees at the smallholder farm level to maximise berseem seed production.

Pollination plays a vital role in berseem seed-setting and honey bees are the principal agents, accounting for 88% of total insect visitors. Globally, honey bee populations are declining due to the widespread use of neonicotinoid pesticides. In Pakistan, neonicotinoid pesticide is used extensively both in the form of spray and as a seed coating over a range of crops including wheat, rice, cotton and orchards to protect against sap-feeding insects such as aphids. These toxic insecticides



are decimating honey bee populations to the point where, in some cases, effective cross-pollination of crops is not possible.

The impacts are visible on berseem clover yields. Research found that by carefully selecting seed, farmers could produce up to 13 tonnes of forage dry matter and 420kg of quality seed from one hectare of land. Remarkably, the research also found that the introduction of bees in a netting system increased the seed yield of berseem clover by 113% when compared with conventional open pollination.

Clearly there is a major shortage of bees naturally present in the field trial environment. As a result of bee pollination, income generated from seed production alone was Rp 112,635 (A\$1500) per hectare. The most productive and viable strategy for berseem VBFSEs is achieved by combining the use of an improved research station variety (Agaitti berseem-2002) and honey bees (2 to 3 hives/ha) for maximum returns per unit area.

As a result of the project, five VBFSEs have been successfully developed in the Kasur and Okara districts of Punjab. They produced a total of 870kg of quality berseem seed that is sufficient to plant 40 hectares of land in a single season. The new seed entrepreneurs generated an income of up to Rp 420,000 (A\$5600) per hectare both from fodder and seed, which is three to four times higher than farmers could earn from any other cash crop grown in the region.

The project and its outcomes have exposed farmers to the value of participatory agricultural research and have opened farmers' eyes to the commercial opportunities that can support sustainability and lead to positive change. ■

### ACIAR PROJECT

**LPS/2010/007:** 'Strengthening dairy value chains in Pakistan through improved farm management and more effective extension services'

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Dr Ejaz Qureshi

## THE ECONOMIC IMPORTANCE OF AGRICULTURE

BY GIO BRAIDOTTI

**D**r Ejaz Qureshi's journey from a small farming village in Pakistan, where as a child he helped tend wheat and maize crops, to his current role as ACIAR's research program manager for Agriculture Development Policy was mediated by education, he says. His subject of choice was agricultural economics and the journey culminated in a PhD from the University of Queensland.

The subject choice is interesting, seeming to respect his farming family's heritage while allowing a strongly analytical intelligence to bring an arsenal of methodologies, including sophisticated mathematical models, to bear on the challenges farmers face on the road to sustainable prosperity.

"Agricultural economics lets you make the best use of limited resources—such as water, land, labour, capital or public investment—so these resources can be allocated to maximise productivity, efficiency, and long-term sustainability," he explains.

It is a skill set applicable to a remarkably broad set of problems, from optimising on-farm management through to framing the most beneficial national policies and on, ultimately, to global food security.

"By understanding inefficiencies across whole value chains and estimating the associated costs, economists can identify ways to remove barriers and create pathways to improved outcomes," Dr Qureshi says.

Following the completion of his studies, Dr Qureshi subsequently held research positions at the University of Queensland, James Cook University and the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES), but

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**"A KEY COMPONENT OF MY PROGRAM IS UNDERSTANDING HOW POLICIES CAN INFLUENCE ADOPTION OF OUTCOMES FROM TECHNICAL RESEARCH AND HELP FURTHER DEVELOPMENT GOALS."**

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– Dr Ejaz Qureshi

found the research environment most productive at the Commonwealth Scientific and Industrial Research Organisation (CSIRO). There, his skills as a senior economist and policy analyst were predominantly applied to the complex, multi-faceted challenges related to water scarcity and best-practice water management in Australia, including urban water economic modelling.

Dr Qureshi has published close to 100 scientific papers including journal articles, book chapters, technical reports, conference papers and policy briefs. His high-profile research work was recognised with several CSIRO awards, including the Land and Water Chief's High Impact Studies Award and the Strategic Excellence Look Out Award (2007). He also received the Social and Economic Science Program Award in 2012 and was offered the Julius Career Award in 2013.

The segue to ACIAR came in 2013, motivated by a growing desire to assist developing countries where agriculture is frequently the single most important engine for greater economic growth, prosperity and development.

His responsibilities currently cut across 10 developing countries, including Pakistan, and take two forms.

He operates stand-alone projects, such as the highly praised and influential 'Farmers' capabilities, productivity and profitability' project, which recently identified the key factors that determine whether a farming operation is successful or not in Pakistan's horticulture sector (see story on page 26).

Additionally, his program's blend of economic and policy analysis is applied throughout ACIAR's more commodity and resource-based programs, including land and water resources, agribusiness, forestry and livestock production systems.

"A key component of my program is understanding how policies can influence adoption of outcomes from technical research and help further development goals," he says. "This is important because institutional and policy settings can have a strong influence on productivity and sustainability in both developing countries and Australia."

From his visits to Pakistan and meetings with officials and relevant stakeholders, Dr Qureshi says the researchers, policy makers and resource managers are enthusiastic about ACIAR projects and they see value in the partnership.

"Agriculture is very important to developing countries," he says. "By addressing all the related issues that affect farming productivity we can help increase the prosperity of a country and its stability, ensuring people get enough food and nutrients, and have the opportunity to generate income and acquire purchasing power." ■

**MORE INFORMATION:**

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# CITRUS DELIGHT

PHOTO: DR TAHIR KHURSHID

Nurserywomen from Pakistan learn 'chip budding' technique at Thanathon Orchard, Fang, Thailand.

## Mandarin and orange producers in Pakistan discover their orchards can yield 50% higher incomes by adopting new production and marketing strategies

### KEY POINTS

- Greater variety choice, improved orchard management techniques and more efficient use of inputs are helping to increase citrus production in Pakistan.
- Greater quality, in addition to greater productivity, also has the potential to raise citrus producers' incomes.
- The same ACIAR project also demonstrated project impacts can be delivered in ways that empower women.

### BY DR TAHIR KHURSHID

NSW Department of Primary Industries, Australia

Pakistan is an important global producer of citrus, particularly of high-yielding, hybrid mandarins called Kinnow. This production base was prioritised within the Australia–Pakistan Agriculture Sector Linkages Program (ASLP)

for additional input from agricultural research. As a result, ACIAR funded the NSW Department of Primary Industries and Pakistani research institutes to work with Pakistani citrus producers.

The project took a broad, whole-orchard and value-chain approach to identify the key issues affecting the income-earning potential of orchards. Our key achievements relate to the introduction of varieties and rootstock that extend the harvest season, the introduction of more efficient furrow irrigation systems, the trialling of quality payment systems, capacity building through engagement with training activities and greater inclusion of women.

### IN THE ORCHARD

Our biggest achievement was the introduction of new citrus varieties that create opportunities for citrus producers to earn more by increasing production in a novel way—by extending the harvest season. Rather than distributing this

material using existing flawed pathways, the project introduced the capacity to produce clean nursery trees.

This involved constructing clean screenhouses infrastructure and then demonstrating the benefit of this approach to nurserymen/women and growers. While the technology was taught to our project partners, it has since spread to the commercial nursery sector. They have now multiplied the budwood, thereby making the new varieties available to the growers.

The commercial nurserymen have now constructed three commercial screenhouses in Punjab and Khyber Pakhtunkhwa (KP) provinces.

In the orchards themselves, yield and quality were important targets of project activities. Particularly striking was the impact from the adoption of improved irrigation systems. Pakistan normally uses flood irrigation systems where there is no control of water and significant waste of water. Over-irrigation can create quality problems



**THE PROJECT ENGAGED HEAVILY IN CAPACITY BUILDING, BRINGING 54 PAKISTANIS TO AUSTRALIA FOR TRAINING, INCLUDING SCIENTISTS, GROWERS, PACKERS, WOMEN AND POSTGRADUATE STUDENTS**

A group of women from Pakistan look at the fruit trellis system at the Royal Project in Chiang Mai.

In November 2014, three progressive nurserywomen were selected from this group to participate in training held in Thailand at the Maejo University and at the commercial Thanathon Orchard nursery in the Fang district of Chiang Mai.

On their return from Thailand, we monitored the training of the women very closely. On the basis of their interest and dedication to help rural nurserywomen, two women—Samina Naz and Iffat Kalsoom—were selected for advanced training in nursery management in Australia, held in April 2015.

Since their return to Pakistan, these skilled nurserywomen have trained other women in their region and have increased their profit margins by budding trees in the sanctuary of their own household and producing high-quality citrus trees. The women were able to make an extra profit of 100 rupees for each high-quality tree.

The women trained through this project are now industry leaders, implementing changes to their own businesses and helping to train other women in their region. They have also found their voices, gained through increased confidence and experience, and have told ACIAR—including its CEO and Commission when they recently travelled to Pakistan—that they want to be included in the next program. They want to apply their knowledge and techniques nationally in the nursery industry, focusing on women. They are also interested in learning more about marketing.

More broadly, the project engaged heavily in capacity building, bringing 54 Pakistanis to Australia for training, including scientists, growers, packers, women and postgraduate students. The project also resulted in 10 Pakistanis receiving postgraduate degrees (masters or PhD) and invitations to attend and present at international conferences. We have produced 36 videos about the project and nine training packages. ■

## ACIAR PROJECT

**ACIAR PROJECT:** HORT/2010/002: 'The enhancement of citrus value-chain production in Pakistan and Australia through improved orchard management practices'

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**MEDIA LINKS:** Pakistan Women's Empowerment in citrus nursery production, [youtube.com/watch?v=3AV\\_iBgtaUo](https://youtube.com/watch?v=3AV_iBgtaUo)



PHOTO: TAUSEEF TAHIR

Australian review team inspecting a screenhouse and Australian citrus varieties.

which can cause root diseases. Since the Pakistani growers are poor and cannot adopt pressurised irrigation systems, such as sprinklers, we helped them to convert the orchards to furrow irrigation systems.

Furrow irrigation systems involve diverting water into trenches that run the length of an orchard, under the tree canopy. It is an easy system to adopt and research demonstrated it not only saves water—an important outcome given the effort Pakistan is putting into improving water-management practices—but also increases both quality and yield of the trees.

The Flood Rehabilitation Project in KP province adopted these project outcomes, giving away a range of fruit trees, including citrus, peaches and apricots, to growers willing to adopt the new irrigation system. Meanwhile, improved citrus quality gave us the opportunity to trial a quality payment system. These trials involved four growers (two each in Punjab and KP provinces) establishing orchard blocks where all good management practices were applied. We then asked the growers to directly market the fruit rather than selling through wholesalers.

The growers found they were able to increase income from the high-quality fruit by 50%. Now they are applying the same techniques to other blocks, with the growers reporting a high-quality crop in 2016, which they have directly marketed.

## EMPOWERING WOMEN

For cultural, safety or logistical reasons, women in Pakistan do not work in citrus orchards or packing sheds. This excludes half the population from a major and growing sector of the economy. The assistance provided through ACIAR, however, should in principle also benefit women, so the project responded when we identified an opportunity for women in the citrus industry to acquire new skills and business opportunities.

The opportunity came about when we noticed that in their backyards, women are actively budding trees in informal nurseries, with the material then sold by male members of the household. We recognised the value of this work and provided additional training to propagate and maintain healthy, high-quality citrus nursery trees for supply to local industry.

Central to our thinking was the precedent established by a non-government organisation (NGO) run by women called Pakistani Hoslamand Khawateen Network (PHKN), which translates to 'Pakistan courageous women network'. It is based in Haripur, in the Hazara District of KP province. Members of this NGO have experience running a nursery business that involved propagating trees in members' backyards.

In October 2013, seven Pakistani nurserywomen participated in the nursery training program held at the National Agricultural Research Centre (NARC) in Islamabad where they were also provided with nursery equipment—including budding knives and budding tape—to use their new skills in their backyard businesses.

# MITIGATING THE EFFECTS OF EXTREME HEAT

Heat-tolerant tomatoes and okra germplasm have the potential to extend the production season for smallholder farmers in Pakistan

## KEY POINTS

- Vegetables grown in Pakistan provide dietary variety and a source of income, but the heat of summer curtails the production season.
- An ACIAR project has screened genetic resources from around the world, identifying traits for heat tolerance that can now be incorporated into local breeding programs.

BY GIO BRAIDOTTI

When the temperature climbs above 40 °C in Pakistan—as it regularly does in summer—the tomato and okra plants grown by smallholder farmers stop producing fruit due to heat stress. As local sources of these popular vegetables dry up, demand continues unabated across the country. That demand is currently met by imports.

Pakistani smallholder farmers understand all too well that heat brings an abrupt end to their lucrative vegetable production season. Due to a

lack of available—or affordable—storage facilities, farmers are obliged to bring their tomatoes and okra to market as soon as it ripens. However, a recently concluded research project brings hope that one day they will have varieties that will allow them to produce and sell even when the thermometer rises.

The project was launched in response to dialogue about research priorities between the Pakistani Government and ACIAR. The project made it possible for the world's genetic resources of tomato and okra, brought from as far afield as Taiwan and the USA, to be screened in search of plants with elevated heat tolerance.

Led by Dr Tariq Chattha of the Plant Breeding Institute at the University of Sydney, the project team at the University of Agriculture in Faisalabad identified candidates with promising signs of heat tolerance. These were subsequently tested more rigorously in the field in Pakistan's Punjab province and in glasshouses in Australia. Both countries are set to benefit from the research effort.

Dr Chattha says the Pakistani field trial results

are so promising that the best-performing material has already been handed over to plant breeders at the Vegetable Research Institute for possible inclusion in their programs, and stored at the gene bank of the National Agricultural Research Institute.

"We tested the material at multiple sites in Punjab and we also planted at different times to ensure our trials experienced as much seasonal and environmental variation as possible," Dr Chattha says.

"We saw lots of differences in performance, but for both tomatoes and okra, enhanced heat tolerance translated into plants that kept fruiting after extreme heat events. That means this germplasm promises something very important to growers: it could extend their growing season."

Smallholder farmers hosting some of the trials were able to see for themselves how the new materials performed.

"We visited the farms that hosted trials and they saw the same thing the researchers did—these plants produced more not because

Okra lines from the ACIAR project are evaluated alongside breeders' materials at the Ayub Agricultural Research Institute, Faisalabad.

Women undertake the meticulous work of controlled pollination involved in preparing hybrid tomato seeds.

Cultivars of tomato and okra with enhanced heat tolerance are handed over by Professor Iqrar Ahmad Khan (left) to Dr Sadar Uddin Siddiqui (holding the seeds) of the National Agricultural Research Centre, Islamabad, for storage at the National Genebank.



PHOTO: RICHARD MARKHAM



PHOTO: ACIAR

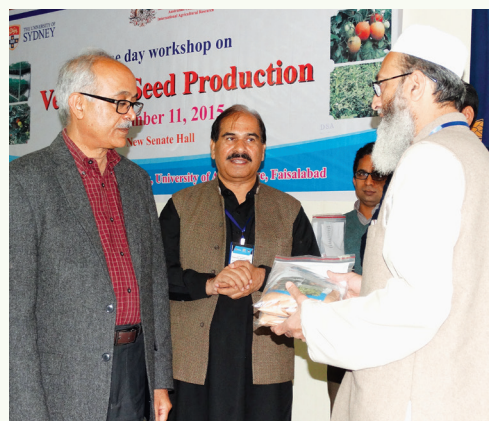


PHOTO: THE UNIVERSITY OF AGRICULTURE, FAISALABAD, PAKISTAN

THE TRIALS REVEALED ONE PARTICULARLY IMPRESSIVE TOMATO LINE THAT COULD KEEP FRUITING DESPITE HEAT STRESS AT ALL FOUR TESTING SITES, MAKING IT ESPECIALLY VERSATILE FOR GROWERS.

PHOTO: THE UNIVERSITY OF AGRICULTURE, FAISALABAD, PAKISTAN



Dr Tariq Chattha (third from the front) on a visit to a vegetable farm in Okara, Pakistan.

of a higher yield potential but because of consistent production over a prolonged season,” Dr Chattha says.

The trials revealed one particularly impressive tomato line that kept fruiting despite heat stress at all four testing sites. The results for okra were more variable, with different lines performing better at different sites.

The Pakistani research partners at the Vegetable Research Institute and the University of Agriculture in Faisalabad now have further work to do if the heat tolerance is to be incorporated into commercial varieties that can be distributed to farmers—and they will have to make some hard decisions on strategy.

For instance, all the tomato lines currently showing good levels of heat tolerance have small fruits, very different from the large-fruited hybrids currently preferred in the Pakistan market. In other countries, consumers have come to value small ‘cherry’ tomatoes to include in salads, and processing industries have been developed that use varieties with relatively small fruit and appropriate flavour characteristics. In Pakistan, breeders will have to decide whether to develop varieties for these new—and as

yet undeveloped—markets or embark on the lengthy process of bringing heat tolerance into conventional hybrids.

Dr Chattha says that, whatever route they decide to take, ACIAR’s relationship with Pakistan is committed to the long term. With vegetables a high priority, the researchers believe incentives exist to further broaden and diversify smallholder farmers’ earning opportunities in this sector.

Dr Chattha wants to look beyond the development of new varieties to the economic opportunities that improved varieties might create. Included is the option to use extra income earned from vegetable sales to invest in better production systems. Dr Chattha is particularly excited by cost-effective options to improve yield and quality through ‘protected cropping’ structures, combined with drip irrigation and soil-less composts.

He also sees opportunities arising from the popularity of hybrid varieties among Pakistani farmers, since demand for hybrid seed is currently met through imports.

“There are opportunities to develop a hybrid-seed supply chain locally,” Dr Chattha explains. “In the process, we want women from the farming households to become involved since they already

make the crosses between plants and store seed extremely well. The development of a local seed sector not only creates more options for women, it also generates a new revenue stream.”

Viable candidates for such an expanded strategy include tomatoes, onions and chilli.

Finally, he sees opportunities for Pakistan’s public research and private agribusiness sectors to start building relationships so that they can mount public-private partnerships that achieve more by working together than they currently do separately.

“Australia already has successful examples of this mixed public-private approach,” Dr Chattha says. “For example, the Plant Breeding Institute works closely with a private horticultural company, Abundant Produce. That means the germplasm identified in this ACIAR project is already being included in a commercial breeding program in Australia, so that farmers will benefit quickly from this research.” ■

**ACIAR PROJECT:** HORT/2012/002: ‘Heat stress alleviation in summer vegetables—enhancing the use of genetic diversity in central Punjab, Pakistan’  
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# TOGETHER WE ARE STRONGER

Research-for-development projects may seek economic impacts to the lives of subsistence farmers, but the implementation and adoption of research outcomes are fundamentally social phenomena

## KEY POINTS

- Focal villages have been established in Pakistan where farmers work with social researchers to maximise impacts from commodity-based agricultural research projects.
- The model further benefitted from establishing Community Service Centres (CSCs) as meeting places for training and other development activities.
- The model has proven so effective it has been adopted by other aid providers.

BY ADJUNCT PROFESSOR JOHN SPRIGGS AND ADJUNCT PROFESSOR BARBARA CHAMBERS

University of Canberra, Australia

**H**ow do you improve livelihoods for the rural poor in Pakistan? From our perspective, you first need to understand the circumstances surrounding their marginalisation, especially of women. Second, work with them in their context to design strategies for sustainable value-chain development. Thirdly, explore opportunities for collaboration across the commodity-based projects working in the horticulture and dairy sectors, so that both the poor and non-poor can have 'win-win' outcomes that are empowering and lead to improved livelihoods.

The Social Research Project (SRP) was initiated in the second phase of the Australia–Pakistan Agriculture Sector Linkages Program (ASLP2) to facilitate a collaborative approach to improving the livelihood systems for the rural poor in Pakistan. That includes collaboration with local stakeholders in Pakistan as well as the various ASLP2 value-chain projects.

The SRP team was led by the University of Canberra and was composed of the authors as chief investigators alongside Rob Fitzgerald and

Sandra Heaney-Mustafa (from the University of Canberra), Dr M. Azeem Khan, Sajida Taj, and Nadeem Akmal (National Agricultural Research Centre), Dr Tehmina Mangan (Sindh Agricultural University), and Dr Izhar Ahmad Khan (University of Agriculture Faisalabad).

Together we cooperated with the researchers from the commodity-based teams working in mango, dairy and citrus sectors, and community leaders in rural villages.

## THE RIGHT METHOD

For Pakistan we applied a participatory action research method developed by the authors in 2011. It began with an extensive stage of information gathering involving a baseline survey of 750 low-income households, a capacity inventory, focus groups and case study.

Included were initial meetings with all the ASLP2 commodity-based projects to learn of their activities and to build relationships. This was followed by a collaborative planning workshop in Canberra in April 2012 that involved Australian and Pakistani members across all the projects of ASLP2.

The most important idea to emerge was the need to develop sites for integrated research and development that involve all the various commodity-based projects. This resulted in the establishment of focal villages and village clusters that maximise opportunities for collaboration across projects and also enable engagement with the target beneficiary groups.

The SRP team then worked with the four commodity-based projects in 2012–13 to identify six focal villages. Included were two villages in the districts where the dairy, mango and citrus projects were operating.

The villages were instrumental in providing information, including capacity audits, in staging village-level planning workshops to determine R&D priorities, and developing strategies for



PHOTO: RICHARD BRETELL

As part of a youth camp aimed at exposing young people in Pakistan to a variety of agricultural techniques, women visit a bio-remediation plant at NARC, Islamabad.

implementing changes in consultation with the commodity-based teams. Additionally, the villages were assisted to develop ICT capabilities.

## THE IMPACTS

To assess the value of the SRP, results from an end-of-project survey of 90 households from the first three focal villages (where activities have been ongoing for sufficient time to assess impacts) were compared with results from the same households in the baseline survey. What we found suggests impacts have been extensive and positive.

The participatory action research model was found to be strongly demand-responsive. It met the needs of male heads of households well (achieving a score of 2.66 on a scale of three) but also of females (2.74). Being demand-responsive is the best way to ensure program innovations are sustainable beyond the end of the program.

The approach also worked to bring together the commodity-based projects at the focal villages, making it possible for research across sectors to integrate their findings. There was also agreement on the development of Community Service Centres (CSCs) as meeting places for





**WE FOUND WOMEN HAD A MUCH MORE POSITIVE ATTITUDE TO COLLABORATION WITH OTHER HOUSEHOLDS THAN MEN. HENCE, A STRATEGY OF INVOLVING WOMEN MAY BE A KEY TO SUCCESS FOR COLLABORATIVE DEVELOPMENT INITIATIVES.**

training and other development activities.

We kept records on the use of the CSCs for the first eight months of 2015 and found that during this time they generated nearly 560 workshop activity hours across 185 unique workshop activity sessions for 3,269 villagers.

These CSC activities were able to address 363 factors related to learning across three categories: attitudes (83), skills (111) and knowledge (167). What that means is that in less than one year, CSCs have proven to be a rich and productive social initiative.

Another key objective of the project was to engage the poor and marginalised so they too can benefit more from ASLP2. Two groups of people of particular concern are women and youth. With regards to inclusion, the CSCs played a particularly important role as a segregated, safe place for women to meet and learn.

A strong result from the endline survey was that women became more confident and empowered as a result of the SRP. Compared with the baseline data, women were significantly more involved in household decision-making, had increased use and ownership of mobile phones, and showed a greater willingness to work

collaboratively with other women in the village.

For example, male access and use of mobile phones was high (about 90%) both at the start and the end of the SRP. However, female access increased greatly over the project duration, rising from about 40% to the same level as males by the end of the project. Access to and use of computers by both males and females was quite low at the start of the project (28% for males and 17% for females) but increased more than two-fold over the duration of the project (to 57% and 45% respectively).

Male heads of households were much more likely than at the start of the project to rate employment opportunities for women as an important household concern. This is an important outcome since the male head of household plays a dominant role in household decision-making and has an important voice in whether—and what type of—training can be undertaken by the women. The endline survey indicated a significant change in their attitude in this regard. In addition, a Youth Camp was organised to expose young people to new technologies and economic initiatives that create opportunities for

rural employment rather than drifting to the cities for work.

One other significant result related to attitudes towards collaboration among different households. Such collaborations are important in many development initiatives, such as joint marketing of outputs, joint purchase of inputs, joint purchase of community assets, or organising a village social event. We found women had a much more positive attitude to collaboration with other households than men. Hence, a strategy of involving women may be a key to success for collaborative development initiatives.

Given the many positive outcomes, work in some focal villages is continuing with the new ACIAR program in Pakistan and we understand the approach we have undertaken in the focal villages is being replicated by another (USAID) project in other villages. ■

**ACIAR PROJECT:** ASEM/2010/003: 'Social research to foster effective collaboration and strengthen pro-poor value chains'

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# THE EVIDENCE THAT POINTS THE WAY FORWARD

Dr John Steen helps farmers identify the key constraints on farm profitability.

## All the good will in the world will fail at eliminating poverty if aid is poorly targeted. Being strategic is key, but in research-for-development work, even strategy requires innovation

### KEY POINTS

- ACIAR has invested in developing tools to identify the key factors that determine success for smallholder farmers.
- The new method was trialled in Pakistan's horticulture sector and the results have generated widespread interest.

### BY GIO BRAIDOTTI

In just over a year, a small ACIAR pilot project achieved something altogether new in Pakistan that has important implications for development work globally.

The project managed to both adapt and apply the analytical methods used in business research for use in development work. In the process, the researchers demonstrated that it is possible to rigorously identify the interventions and investments most likely to impact on smallholder farmers' profitability.

The project ran during 2015, when 40 ACIAR-funded surveyors used motorbikes to visit 850 smallholder farms in the horticulture sector. In Australia, the information they gathered became grist for the powerful analytical methods of 'econometrics'. That means information about the farms' profitability was subjected to rigorous statistical analysis and mathematical modelling.

For people combatting rural poverty, the analysis produced something uniquely valuable and enabling. It identified the factors that most influence whether farming operations prosper, or trap their households in hardship and poverty. It brings clarity as to the nature of additional assistance needed to improve the earning potential of smallholder farmers.

The project was an initiative of ACIAR's in-house agricultural economist, Dr Ejaz Qureshi, research program manager for agriculture development policy (see profile on page 19). It was led by Dr John Steen and Dr Shabbir Ahmad from the Australian Institute of Business and Economics at the University of Queensland, whose research program collaborates with universities globally in support of small business enterprises.

"Globally, there are lots of aid dollars but very little in the way of rigorous, evidence-based analysis to understand how best to deliver assistance," Dr Steen says. "ACIAR understands this and the need to target its investments strategically."

Working alongside Dr Steen at the University of Queensland is the Pakistan-born mathematician and economist Dr Shabbir Ahmad. Besides his expertise in econometrics, Dr Ahmad's extensive connections within Pakistani universities, government departments and aid agencies were especially crucial to the project's success, including organising the herculean survey process.

"It was a huge task," Dr Steen says. "We believe this is the most detailed survey of horticulture in Pakistan. When I say this is a breakthrough project, I am not overstating the matter."

While the data is still being mined and recommendations formulated, the preliminary analysis has produced important findings. It confirmed there are many variables at work affecting farming performance. Nonetheless, there are also overarching factors that have disproportionate influence.

For the Punjab smallholder farmers, three key drivers of profitability were identified.

The first key factor relates to the capacity to adopt new technology. In the context of farming, 'technology' can refer to better-quality seed, improved crop varieties, water use-efficient irrigation systems, or simple crop protection structures, such as tunnel farming. This is the domain of ACIAR's commodity, extension and social science-based projects.

The second factor relates to diversification, with the more diverse farming operations tending to fare better economically. This is a subject often encountered by ACIAR in its whole-farming system and market-access projects.

The third factor, however, relates to farmers' ability to access credit at reasonable interest rates. Currently, few Pakistani farmers have access to standard bank loans or microfinance and if they do, face punitive interest rates of up to 46%.

While the findings have been presented at Pakistan's National Agricultural Research Centre, they have also generated widespread interest in Pakistan beyond researchers.

"Horticulture in Pakistan has strong export potential, and with it, the ability to grow farmers' revenue streams," Dr Steen explains. "Anything that can help realise that potential is especially welcome in Pakistan."

Dr Steen has spoken with representatives of the Punjab Government and Australia's High Commissioner to Pakistan, Margaret Adamson, especially on the role of women in horticulture

farms. Dr Ahmad's analysis found that in terms of labour productivity, women are more productive but they are paid less. A short briefing on diversification was given to Pakistan's Prime Minister who is considering a national agricultural policy.

The value of cross-sector discussions, however, are particularly stark in the case of the non-governmental organisation the Akhuwat Foundation, which is exceptionally positioned to act on the third factor—farmers' lack of access to low-interest credit.

Dr Steen explains that Akhuwat is a Pakistani initiative that for more than a decade has turned conventional microfinancing wisdom on its head. The worldwide consensus has favoured lending to the poor through for-profit microfinance institutions. Instead, Akhuwat drew on the Islamic principle that a society can prosper together if the 'haves' help the 'have-nots'. As such, donations from corporations and the salaried class are lent at zero interest to the poor to set up or expand their businesses.

In the decade to 2013, the Akhuwat Foundation disbursed over Rp 3.3 billion to 231,335 families in about 105 cities and towns throughout Pakistan. The recovery rate on that money was 99.83%, a figure that tends to baffle microfinance experts.

"Akhuwat are interested in the findings from this project and they want to work with us on different models of providing credit to smallholder farmers," says Dr Steen, who is keen to continue the project.

The key issue moving forward into the next phase is to use the findings to develop suitably targeted solutions. He believes that the issue of scale is likely to be important and may underscore the three key drivers of productivity, especially since farms are getting smaller as they are passed down through families.

"We have to work out how to help farmers realise the benefits of scale, such as through collaborative farming and marketing, more suitable forms of credit, value adding, and responding better to customer demand," he says. ■

**ACIAR RESEARCH PROJECT:** ADP/2015/004: 'Farmers' capabilities, productivity and profitability: A case study of smallholders in selected agro zones in Pakistan'

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Traditional hand pumps are common in rural Pakistan.

PHOTO: FASEEH SHAMS/ IWMI

# NO FOOD WITHOUT WATER

Food security is among the most pressing challenges for Pakistan, making the management of water resources an essential factor in development programs

## KEY POINTS

- Agriculture currently accounts for about 95% of Pakistan's water consumption.
- With demand for water growing, a series of research projects are addressing water-management challenges, from on-farm through to the national scale.

### BY DR EVAN CHRISTEN

ACIAR research program manager, land and water resources, and **DR MUNAWAR KAZMI**, country manager, Pakistan

**P**overty is a major obstacle to Pakistan's overall national aspirations and continues to be an endemic problem in rural areas, where it occurs at almost double the rate of urban areas. Improvements in agriculture and

increased trade have, therefore, been earmarked as essential to fostering inclusive economic growth and job creation in Pakistan.

As the availability of water is fundamental to agricultural productivity, managing this natural resource well requires research that encompasses surface and groundwater availability, improvements to agricultural productivity, crop water-use efficiency, and better management at all scales, from the provincial to the Indus River Basin.

Across Pakistan, there is increasing pressure on surface water and groundwater resources for irrigation due to increasing agricultural intensification and competing demands from urban and industrial uses.

For example, in Balochistan Province—the 'fruit basket' of Pakistan—and parts of Punjab Province, groundwater aquifers are under stress with falling

water levels leading to significant economic impacts upon the poor.

Poor irrigation management practices, combined with poor drainage and soil management, have resulted in significant increases in waterlogging and salinity in Sindh province and also parts of the Punjab.

Presently, researchers in Pakistan and Australia are collaborating on several Australian-funded projects on food and water security in Pakistan.

These projects sit well with Pakistan's own aspirations as outlined in Pakistan Vision 2025, which places food, water and energy security as key pillars of future development.

This collaborative program of complementary work is designed to match field-scale crop and water management with basin-scale water availability and delivery. This is a 'Team Australia'

approach, with the aid section of the Department of Foreign Affairs and Trade (DFAT) funding some aspects and ACIAR funding others.

### INTEGRATED RIVER SYSTEM MODELLING

One project already under way aims to improve seasonal forecasting of water availability in the Indus Basin. The project is part of the South Asian Sustainable Development Investment Portfolio, which is funded by DFAT and has ACIAR, the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and others as partners.

This project relies on developing modelling capability in support of more efficient water allocations and more effective use of constrained water resources across agriculture, hydropower and the environment. A model-based strategy has a strong track record allocating water in Australia's Murray-Darling Basin.

With a 12-year overarching strategy, outputs include improved seasonal forecasting of water availability in the Indus Basin.

Pakistan hydrologists also receive support managing river operations, such as releases and distribution of water from dams, and diversions into irrigation canals. These are all pathways to more efficient and effective use of the limited water, including how and when water is delivered to farms.

The gains possible on the back of more efficient water management include greater and more equitable food production and economic development. Economic modelling at the national scale will also make it possible to assess the impacts of these coordinated, improved water-management efforts.

This project further includes research into detailed crop modelling in nine agro-climatic zones to better inform the understanding of crop production within the larger-scale model.

Then there are teams looking at water-quality implications in the Ravi and Sutlej rivers in partnership with World Wildlife Fund–Pakistan (WWF–Pakistan) and Pakistan Council of Research in Water Resources (PCRWR).

To complement the work in surface-water resources undertaken in 2015, a planned second phase of the project, from July 2016, will develop a greater understanding of groundwater resources. This includes understanding the volume of groundwater that might be sustainably used without damaging the resource base through over-extraction or inadvertent salinisation of the aquifers.

Given the high level of interaction between surface and groundwater resources, this work will be linked to the river modelling and seasonal flow forecasting, to further support farm productivity.

The project is a partnership between the Ministry of Water and Power, Ministry of Planning

## THE GAINS POSSIBLE ON THE BACK OF MORE EFFICIENT WATER MANAGEMENT INCLUDE GREATER AND MORE EQUITABLE FOOD PRODUCTION AND ECONOMIC DEVELOPMENT.

Development and Reform, Water and Power Development Authority, Indus River System Authority, Pakistan Commission for Indus Water, National Engineering Services Pakistan, Pakistan Meteorology Department, University of Agriculture Faisalabad, Sindh Agriculture University, WWF–Pakistan, PCRWR, Pakistan Strategy Support Program–International Food Policy Research Institute in Pakistan, and CSIRO, ICE WaRM and eWater in Australia.

### ACIAR WATER PROJECTS IN PAKISTAN

In consideration of the research priorities of Pakistan and the ongoing DFAT–CSIRO integrated rivers program, ACIAR has additionally developed a program of three complementary projects related to on-farm irrigation efficiency, groundwater management and an irrigation institutions project.

To increase farm productivity, improvements are needed to farmers' water management and agronomic practices. These needs are being addressed through the ACIAR project 'Enhancing irrigation skills of farmers in Balochistan, Sindh and Punjab provinces of Pakistan', due to start in July 2016.

This project entails developing an irrigation farmer field school approach that allows farmers to 'learn by doing' while using simple irrigation management tools for measuring soil moisture and soil nutrients. The hope is that these tools will be tested by farmers, further adapted and, eventually, supply chains set up in Pakistan. These will feed into the development of appropriate training methods that focus on a co-learning approach so farmer-to-farmer-driven learning can occur, either as a commercial service or facilitated by an extension service and non-governmental organisations (NGOs).

As to groundwater, it is used extensively in Pakistan. Some areas (Balochistan) are completely reliant on groundwater, while others (Punjab) use it in conjunction with surface water to increase cropping intensity. In Sindh, large areas are affected by waterlogging that could potentially be reduced by greater use of groundwater than occurs at present.

The ACIAR project 'Improving management of groundwater resources in Pakistan to sustain farmer livelihoods and economic development' will start in July 2017. It will seek ways for farmers and their communities, along with managers and policy makers, to manage both groundwater quantity and quality while enhancing agricultural productivity.

Such a project to develop groundwater management options will involve strong engagement with communities, since testing needs to be coupled with data collection and modelling to assess what works best. Only then can feedback be provided to the community on groundwater quantity (depth) and quality trends.

In Pakistan, irrigation water-supply management is mainly at a provincial level, undertaken by provincial Irrigation and Drainage Authorities.

These authorities—as in many other parts of the world—are following a relatively simple policy agenda that centres on improving water management by devolving decisions to farmers. Often known as Participatory Irrigation Management (PIM), this approach has yielded mixed results, with productivity gains often failing to materialise.

The ACIAR project 'Efficient participatory irrigation institutions to support productive and sustainable agriculture in south Asia' started in January 2016 and aims to derive policy-relevant guidelines or rules of thumb that predict the relative efficiency of PIM versus centralised control.

In conclusion, ACIAR together with DFAT are strategically funding projects in the water sector in recognition of the importance placed upon this sector by the Government of Pakistan. Unsustainable water-management practices are rapidly felt in the more marginal landscapes and among those with tighter profit margins, so an integrated strategic approach presents new possibilities for sustainable poverty alleviation in Pakistan. ■

### ACIAR PROJECTS

**LWR/2015/011:** 'Handover and training of surface-groundwater and econometric models to end users in Pakistan'

**LWR/2015/036:** 'Improving groundwater management to enhance agriculture and farming livelihoods in Pakistan'

**LWR/2014/074:** 'Efficient participatory irrigation institutions to support productive and sustainable agriculture in south Asia'

**ADP/2014/045:** 'Modernising water management institutions in India and Pakistan'

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# FARMING THE ECONOMIC GROWTH OF THE FUTURE

A new Australian investment is getting under way in Pakistan that brings together the findings, impacts and aspirations garnered over a decade of cross-sector, multi-disciplinary and collaborative research-for-development partnerships

## KEY POINTS

- Inclusive economic growth is a priority in the new round of collaborative research between Australia and Pakistan—the Agriculture Value Chain Collaborative Research (AVCCR) program.
- The new program is shaping agriculture to become a leading engine to lift the population out of poverty.

BY DR RICHARD BRETTELL

ASLP implementation manager

With the majority of Pakistan's population living in rural areas—and almost half of Pakistan's labour force employed in agriculture—great opportunities for poverty alleviation arise from innovation in rural industries and natural resource management.

Australia and Pakistan have sought out opportunities for mutual benefits through investment in agricultural production systems and supply chains during the life of the now-completed Australia–Pakistan Agriculture Sector Linkages Program (ASLP), launched in 2006.

ASLP targeted priority areas in agricultural industries already important to Pakistan's economy, such as the dairy and horticulture sectors. It had more than 27 partners in the public, academic and private sectors working on three synergistic components that focused on pro-poor value chains, agricultural capability, and enabling agricultural policy.

It was a program that delivered positive impacts, including how to better help Pakistani smallholder farmers alleviate poverty.

Now, those learnings are being integrated into a new strategy called the Agriculture Value

Chain Collaborative Research (AVCCR) program, created by ASLP, which draws heavily on the relationships between the Pakistani and Australian Governments, scientists, and farmers.

In common with its predecessor, AVCCR is a program geared towards development in the livestock, agriculture and horticulture sectors, but it is setting out on a new track, with increased emphasis on promoting social equity and empowerment of women.

The AVCCR Program has been planned to run for five years from 1 October 2015 until 30 September 2020, with total Australian funding of \$10.5 million. Of that, \$9 million is from the Department of Foreign Affairs and Trade (DFAT) and \$1.5 million from ACIAR.

The AVCCR program is concentrated on the Sindh and Punjab provinces. These adjoining provinces were selected as having the largest populations of poor and food-insecure rural households. In addition, they have the public and academic capacity to collaborate in research programs, as well as a level of security that allows effective participation of both Pakistani and Australian research personnel.

The overall goal of AVCCR is that rural poor, particularly women, living in the Punjab and Sindh significantly and equitably benefit from

improvements in strategic value chains. This goal is to be achieved through four objectives:

- quality research
- acceptability for smallholder adoption
- acceptability for private-sector engagement
- institutional capacity for R&D or 'sustainable capacity'

Extensive consultation was undertaken in the design of the program to identify value chains where new knowledge can assist in stimulating inclusive growth and alleviating poverty. That included two team missions that visited Islamabad, Faisalabad, Lahore and Karachi in 2015 and were led by ACIAR with representation from DFAT.

The mission teams met with potential stakeholders including federal and provincial government ministers and departmental secretaries, the Pakistan Agricultural Research Council, private-sector groups, university research bodies, donors, and representatives of the agricultural value-chain programs of other donors.

Twenty-two agriculture value chains were identified for potential investment, assessed and ranked against agreed criteria.

The prioritised list was then presented to stakeholders to assess their confidence in the rankings, to identify gaps, and to discuss specific value-chain characteristics. Based on these discussions, the design team selected the following six value chains for further consideration:

- goat meat
- onion
- potato



The AVCCR program aims to improve agricultural strategic value chains.

PHOTO: ACIAR

- red chilli
- dairy (including meat from dairy animals)
- tomato.

Projects are now being developed to address 'researchable issues' among these value chains. Further work is being undertaken to identify opportunities to promote inclusive economic growth, link large numbers of rural poor to markets, and empower women engaged in the chains.

An additional project is being initiated by ACIAR on increasing legume production and profitability in cropping systems in Pakistan, after this was identified as an area that would complement the work being conducted in the AVCCR program.

The duration of each research project will be flexible (generally three to four years), but timed to finish within the overall five-year framework of the AVCCR program.

AVCCR will be delivered through ACIAR's country office in Pakistan with the support of a part-time Australia-based AVCCR coordinator to manage the day-to-day activity of the program, and to monitor the progress of each of the research collaborations. This role will be overseen by Dr Peter Horne, ACIAR's general manager for country programs. ■

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**MEDIA LINKS:** <http://en.dailyakistan.com.pk/business/australia-to-invest-13-million-to-support-pakistans-small-farmers-876/>



Mr Andrew Campbell

## WELCOME

On 6 May 2016 the Foreign Minister announced the appointment of Mr Andrew Campbell as incoming CEO of ACIAR. Andrew was chosen after a comprehensive search and selection process, led by the Secretary of the Department of Foreign Affairs and Trade, supported by the Chair of ACIAR's Commission and President of ACIAR's Policy Advisory Council. He will commence his five-year term as CEO on 31 July 2016.

**For more information, read the Foreign Minister's media release here: [http://foreignminister.gov.au/releases/Pages/2016/jb\\_mr\\_160506a.aspx](http://foreignminister.gov.au/releases/Pages/2016/jb_mr_160506a.aspx).**

## FAREWELL

Dr Nick Austin has been at the helm of ACIAR for the past seven years and completes his appointment as CEO with great distinction. ACIAR staff have been privileged to work with him during his term in office. We commend him for his dedication to service, to ACIAR in particular, and to agricultural research for development in general.

He has been at the forefront of Australia's effort to place international agricultural research as a centrepiece of the broader Australian aid program. During his term he continued to build Australia's reputation globally as a leader in addressing the challenges of developing country agriculture systems through international research partnerships.

Nick has led ACIAR through a time of significant change, which has seen Australia's efforts in international agriculture research become a central pillar of the broader aid program and highly valued by the broader international agricultural research community, including the CGIAR.

Nick will remain involved in international agricultural research, having been appointed the interim executive director of the CGIAR, based in Montpellier, France. We wish Nick well in his upcoming endeavours.



## ACIAR'S VISION

ACIAR looks to a world where poverty has been reduced and the livelihoods of many improved through more productive and sustainable agriculture emerging from collaborative international research.

The Australian Centre for International Agricultural Research (ACIAR) operates as part of Australia's international development cooperation program, with a mission 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. It also administers Australia's contribution to the International Agricultural Research Centres.



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Back cover:  
Value-adding ACIAR agribusiness projects  
in Pakistan's dairy sector have pleasant  
spillover effects for the farmers' children,  
seen here recruited to taste-test ice cream.

Front cover:  
Grafting at MAK Nursery  
PHOTOS: ACIAR