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ACIAR in Pakistan: 30 Years of Partnership in Research for Development

ACIAR TECHNICAL REPORTS 91

Research that works for developing countries and Australia

ACIAR in Pakistan: 30 Years of Partnership in Research for Development

Munawar Raza Kazmi, PhD
Australian Centre for International Agricultural Research

2017

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Cover: Women from two cultures sharing ICTs. (Photo: ACIAR)

Foreword

ACIAR 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 help 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, have 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.

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:

- Improvements in horticultural crop management and value-chain practices, particularly in high-value crops such as citrus, mango 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 (chickpea, lentil 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.

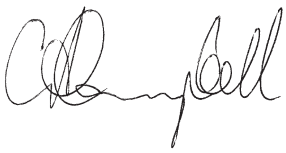
The ACIAR Commission for International Agricultural Research visited Pakistan in March 2016 to meet with key stakeholders and institutions; to learn more about ACIAR's activities 'on the ground'; and, to assess opportunities for future engagements in country. The Commission greatly appreciated the opportunity to engage with a broad cross-section of ACIAR partners and stakeholders, and for 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.

The people featured in this publication, many of them smallholder farmers, improved their livelihoods as a direct result of Australian scientists and agencies working with Pakistani partners, especially the Pakistan Agricultural Research Council (PARC).

ACIAR and Pakistan started working together in agricultural research in 1984. ACIAR works closely with the Government of Pakistan, other donors, 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.

ACIAR has been at the leading edge in Pakistan's dairy sector, providing a template for our engagement in agriculture. Recent projects focused on Pakistan's key fruit crops (mangoes and citrus), livestock (smallholder dairy), agricultural policy and agricultural water management. ACIAR also works to develop 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.

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.



Professor Andrew Campbell
Chief Executive Officer, ACIAR

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Dedication

This publication is dedicated to Dr Iftikhar Ahmad (1952–2016).

Dr Iftikhar Ahmad (1952–2016).

Dr Iftikhar Ahmad's visionary approach to Pakistan Agriculture and support for Australia-Pakistan agricultural linkages was greatly valued.

Dr Iftikhar achieved considerable academic qualifications: PhD (University College of North Wales, Bangor, 1982); MSc (University of Agriculture, Faisalabad, 1976); BSc (University of Agriculture, Faisalabad, 1973); FSc Agriculture, West Pakistan Agricultural University, Lyallpur, 1970).

Dr Iftikhar Ahmad was one of Pakistan's most accomplished and celebrated agricultural scientists; he received the 2006 Norman Borlaug Award for his work in crop protection that included designing national integrated pest management (IPM) programs for various cropping systems. These were implemented through high-impact and innovative channels such as farm-level research, Farmer Field Schools, Women Open Schools, and Children Ecology Clubs.

He 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.

Message from 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. 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 will continue to promote women's empowerment and target areas of key disadvantage 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.

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.

Margaret Adamson
High Commissioner to Pakistan

Background

History of ACIAR in Pakistan

Pakistan and ACIAR became partners in 1984, with projects spanning all regions of the country. Agricultural issues such as water availability and salinity, cereal productivity, and crop diversification and -management practices are being addressed through cooperative research. Similarities in water resource and salinity issues between Australia and Pakistan mean that agricultural scientists from the two countries are well-placed to help each other combat these challenges. ACIAR focuses on irrigation, drainage and salinity management in the major cropping systems, as well as working to enhance Pakistan's key fruit crops; mangoes and citrus. Australian horticultural expertise has informed the adoption of a whole-of-system approach by Pakistani smallholders to increase the productivity and competitiveness of their produce. ACIAR works closely with the Government of Pakistan, Department of Foreign Affairs and Trade and other donors, NGOs and the Pakistani private sector to provide research and development and technical capacity building and technical support.

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.

The Pakistan Ministry of Food Security and Research is the main implementing partner through its research arm, the Pakistan Agricultural Research Council, along with provincial agriculture departments. ACIAR consults with Pakistan Government agencies and other stakeholders to develop its priorities.

There are a range of agricultural issues requiring research in Pakistan, including cereal and legume productivity, and crop diversification and management practices. Natural resource management issues requiring research include surface and ground water availability and their effective management at farm and national level. There is increasing pressure on availability of surface and groundwater water resources for irrigation due to increasing agricultural intensification and competing demands for urban and industrial uses. For example, in Balochistan province

Miriam McCormack (ACIAR Graduate) consulting on weed types. (Photo: ACIAR)

and parts of Punjab province, groundwater aquifers are under stress, with falling water levels leading to significant economic impacts on 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.

ACIAR links world-class research in Australia to its partners in Pakistan, helping to remove barriers to production and introduce technologies and innovation that boost productivity. Recent projects have focused on Pakistan's key fruit crops of mangoes and citrus, smallholder dairy livestock, agricultural policy and agricultural water management. ACIAR works closely with the Government of Pakistan, 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 Program (AVCCR) in Pakistan, aligns to the two phases of the earlier Australia–Pakistan Agriculture Sector Linkages Program (ASLP). AVCCR focuses on collaboration and research in selected agricultural value chains, and target the rural poor, especially women. AVCCR will continue to involve private-sector engagement in new and innovative partnerships and collaborations with private-sector projects will make a real difference to livelihoods by reducing poverty and help to achieve the outcomes of Government of Pakistan Vision 2025 related to agriculture.

Country priorities

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 ASLP program, have resulted in the identification of high-priority agriculture value chains are both valuable and feasible targets for further consideration for the AVCCR new program.

Food and water security are among the most pressing challenges for Pakistan, and are exacerbated by a growing population. Pakistan has placed food, water and energy security as key pillars of its future development in Pakistan Vision 2025. Australia has developed a portfolio of projects to help Pakistan meet these challenges.

Soil salinity has been on rise in Pakistan. In the past, ACIAR has worked on Pakistani salinity management projects, and it is again being highlighted as a potential area of collaboration. The ACIAR Country Office and the International Centre for Agricultural Research in Dryland Areas (ICARDA) conducted stakeholder consultations in 2016 and findings are being shared with relevant stakeholders.

Policy research is required to identify and support technical and social research and establish water institutions that will help ensure that water and related resources are appropriately managed. Irrigation water supply management is mainly at a provincial level in Pakistan, 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 attributable to PIM and irrigation management transfer often failing to materialise.

Key medium-term ACIAR research priorities:

- improving horticultural crop management and value-chain practices, particularly in high-value crops such as vegetables, mango and citrus
- improving dairy and beef production and marketing, including genetic aspects, animal nutrition, disease control, effective extension support and capacity building of researchers, also looking at small ruminants value chain
- assessing productivity issues and disease risk in wheat and smallholder diversification into other crops such as legumes (chickpea, lentil and peanuts)
- managing land and water resources along with exploring options for salinity related work for sustaining productive enterprises, input into policy development, including agriculture markets and water investigation of social policy and capacity constraints and issues in agriculture markets and water.

Current research program

ACIAR supports research to address the five Pakistani priorities:

Horticulture marketing and production systems

The horticulture sector in Pakistan is significant, both domestically and for export production. High-value horticultural crops, such as citrus, mangoes and vegetables, are an important source of farm income; however, crop management practices are often suboptimal and losses along the value chain are high. Under ASLP, significant progress was made on strengthening the value chains for mango and citrus, while more basic research explored the prospects for developing heat-tolerant varieties of vegetables. Based on these experiences, further work on strengthening selected horticultural value chains is planned under AVCCR. The choice of localities and crops to be included is based on the potential of various horticulture value chains to deliver broad-based livelihood benefits. A study is also being undertaken on regional mango markets and trade flows in Asia and the Pacific region, with a view to understanding the potential implications, constraints and opportunities for smallholders.

Dairy and beef production and marketing

Dairy is the largest livestock sector in Pakistan, with demand for milk and milk products growing at about 8% per annum. Pakistan is on milk and dairy products, which are sourced mostly from small farms with fewer than 10 animals. However, unit animal production is very low despite quite good genetic potential, due to poor nutrition and mismanagement, failure to control diseases and lack of proper marketing. This is compounded by a fragmented research effort and weak extension support services.

At the same time demand and prices for beef have been rising strongly opening opportunities for smallholder farmers. Traditionally, beef is a by-product of the dairy sector utilising male animals and old cows for meat. Thus, there are trade-offs between increasing milk production and growing cattle and buffaloes for meat on farms. A new project will take a whole-farm approach to improve farm profitability from dairy and beef cattle production and marketing. It will also engage with a range of partners to build capacity for more efficient and effective livestock extension.

Women's Discussion Group test milk types. (Photo: ACIAR)

Policy, capacity building and social sciences

A project aims to support the assessment and development of rural policy advice, legislation and codes of practice within Pakistan, through capacity training, technical exchanges of staff and R&D interventions aimed at specific policy issues. Most of the work will be conducted in Islamabad and the capitals of Sindh and Punjab provinces, in association with appropriate collaborating Pakistani agencies.

Research that aims to identify and support agriculture water reform pathways and establish water institutions in South Asia will help ensure that water and related resources are appropriately managed. A further project aims to attempt agricultural market reform in order to enhance growth, employment and productivity. The impact of farm characteristics on profitability in Pakistan is also being studied.

Cropping systems

Cereal productivity is lower than in equivalent environments elsewhere in South Asia, and there is also unrealised potential for smallholder diversification. A new project is supporting Pakistani participation in a regional program with India, Nepal and Ethiopia, addressing the threat of stripe (yellow) rust in wheat. Another project aims in expanding the production of legumes (chickpea, lentil and peanut) by understanding the barriers to improving the productivity and profitability of their cultivation and on-farm testing of agronomic innovations and improved varieties. This will help provide smaller holders with wider options for diversification. An expletory work on the possibility of introduction of new germplasm of old saltbush is also planned which will help in bringing the salinity affected soil under cultivation along with adding new fodder for ruminants.

Water

Australia is well placed to assist Pakistan in improving irrigation, drainage and salinity management in major cropping systems, and this is an important focus of the research program. In consideration of the research priorities of Pakistan and the ongoing DFAT-CSIRO Indus basin project related to whole of Indus basin surface and groundwater modelling, developed a portfolio of four complimentary projects. Two of these projects are related to groundwater management and use. Flowing from a previous groundwater modelling project there is a 14-month project to embed groundwater models and econometric modelling tools with Pakistani government and academic partners. Groundwater use is extensive in Pakistan, some areas being completely reliant on groundwater (Balochistan) and others (Punjab) using groundwater 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. A new project aims to research approaches for farmers/communities and managers/policy makers to manage both groundwater quantity and quality while enhancing agricultural productivity. This work will have strong engagement with communities to develop groundwater management options coupled with data collection and modelling to provide assessment of management options and feedback to the community on groundwater quantity (depth) and quality trends.

Water pump at work in the village. (Photo: ACIAR)

A key issue in irrigation in Pakistan is poor irrigation efficiency and associated impacts on productivity. This can be addressed by looking at how and when water is delivered to farms, as in the DFAT-CSIRO Indus basin project. A key component is how farmers manage water on their farms. To increase efficiency of water use and productivity, farmers need to improve their water management and agronomic practices. A new project will work with farmers to develop tools to improve skills, including testing various simple irrigation management tools for measuring soil moisture and soil nutrients and developing appropriate training methods that focus on co-learning. The aim is to encourage farmer-to-farmer-driven learning as a commercial service or facilitated by an extension service and NGOs.

Together, these projects form the Australian Water Program (AWP). The AWP consists of four projects in the fields of irrigation water management, irrigation efficiency, water productivity and food security. The program focuses on women and marginalised communities.

5-year country outcomes

- Improved smallholder profitability through integrated farm production and value-chain development with domestic and export market growth
- Strengthened institutional capacity building and training to support ongoing research interventions
- Research-based policy options that promote rural productivity and income growth to reduce poverty and malnutrition
- Improved surface and groundwater management for increased productivity , sustainability and livelihoods

Expected outputs of ongoing activities

- Increased knowledge and assessment of policies affecting Pakistani agriculture developed and documented for policy decision-makers
- Opportunities to improve livelihoods of smallholders and communities by strengthening selected horticulture market chains identified
- Wheat yellow rust resistance collaboration established
- Participatory analysis of the pulses situation in six districts completed and applied to design on farm trials
- A portfolio of projects in the water sector researching groundwater and surface water management, on-farm irrigation productivity and socio-economic outcomes for men, women and youth established
- Groundwater model of the Rechna Doab and associated econometric models embedded within the Punjab Irrigation Department
- Water policy research undertaken to assist with improving water management institutions in India and Pakistan
- Potential of new Australian Oldman saltbush varieties to fill ruminant feed gaps in arid and saline areas of Pakistan
- Enhancing smallholders performance through collaborative supply chain interventions for innovation practice change: A case study of the horticultural sector
- Smallholder goat value chains in Pakistan; challenges and research opportunities

Australia-Pakistan Agriculture Sector Linkages Program (ASLP)

The Australia-Pakistan Agriculture Sector Linkages Program (ASLP) was established in 2006 to improve livelihood systems for the rural poor in Pakistan and build links between the agricultural sectors of Australia and Pakistan.

It began as a four-year program with a budget of A$6.6 million. Its goals were to transfer knowledge and expertise, contribute to poverty alleviation, and enhance the capacity of research, development and extension in Pakistan. After completion of the first phase, it was extended for a further five years (2010 – 2015) as an integral element of the Australia Pakistan Agriculture and Rural Development Strategy (APARDS). The initial focus of the program was on three industries, Mango, Dairy and Citrus, as major employers of rural labour, supplying key domestic and export markets.

ASLP had three components, Pro-Poor Value Chains, Agricultural Capability, and Enabling Agricultural Policy. The largest component is the work on Pro-Poor Value Chains, complemented by activities aimed at enhancing capabilities and policy underpinnings for productivity, marketing and pro-poor outcomes. While the program focused on the agricultural sector in Punjab and Sindh provinces, it also spilled over to Social Protection Assistance or Border Livelihoods Components of APARDS

ASLP had more than 27 active partners with a wide variety of roles. Partners included public sector institutions (government research and extension), universities and private commercial operations. Direct participants included around 1500 dairy farmers and more than 350 growers in horticultural industries.

Project Highlights

Dairy

In ASLP Phase I, the dairy project focused on improving the profitability of smallholder dairy farmers by introducing new extension approaches and materials. In Phase 2, the extension program was expanded with an emphasis on poor and marginalised producers.

Village children taste locally made icecream. (Photo: ACIAR)

Highlights

- Demonstrating a whole-family approach to extension (with no incentives) resulting in adoption rates of greater than 80% with 1500 registered farmers and flow-on impact to more than 3000 farming families.
- Demonstrating profitable calf rearing strategies using native dairy breeds, by reducing mortality rates and increasing live weight gain up to five-fold.
- Introducing improved fodder seed varieties providing opportunities to enhance profitability four-fold.
- Introducing entrepreneurial milk marketing strategies at village level.
- Training Pakistani and Australian students on key challenges relating to profitable smallholder farming enterprises, with outcomes incorporated into extension materials.

Partners

Pakistan: University of Animal and Veterinary Sciences, Lahore; Punjab Livestock and Dairy Development Department, Sindh. International: Livestock and Dairy Development Department, Charles Sturt University, Australia.

Citrus

Research and extension on citrus has been directed at improving orchard and management practices for Kinnow mandarins as a major crop for local and export markets. The project included introducing new germplasm, as well as a scoping study for marketing and export of Kinnow.

Highlights

- Improved citrus orchard management practices and evaluation of irrigation practices. Introduction of methods of tree pruning, fruit thinning, furrow irrigation and nutrition use, resulting in substantial increases in yields and quality in Kinnow production.
- Enhancement of research capacity and direct training of more than 5000 growers in citrus production.
- Release of seven new varieties to extend and expand the marketing period.
- Implementation of improved nursery practices, distribution of budwood and training of commercial nurserymen.
- Identification of value chain issues to be addressed for market development, including improving fruit quality to achieve higher market prices, reducing fruit wastage through improvement of harvesting and post-harvest practices, and developing knowledge and intelligence of markets.

Partners

Pakistan: National Agricultural Research Centre; Fruit and Vegetable Development Project; University of Agriculture, Faisalabad; Agriculture Research Institute, Peshawar; Horticulture Research Institute; Citrus Research Institute. International: New South Wales Department of Primary Industries, Australia.

Villagers discuss agricultural solutions. (Photo: ACIAR)

Mango

Two complementary projects in the ASLP program have been addressing production and marketing of mangoes. Together they have researched integrated crop management practices and sought improvements in the mango value chain. The first project has focused nursery best practice and improved management of established orchards to reduce the incidence of disease and reduce post- harvest losses. The second project has looked as integrating the whole value chain from farm to consumer.

Highlights

- Significantly increased yields and improved fruit quality by adopting canopy management and control of pests and diseases, providing higher returns to farmers.
- Identifying causes of Mango Sudden Death, leading to development and implementation of management protocols for this disease.
- Establishing commercial nurseries that apply best practice nursery management and grow grafted trees for sale in half the time, with significantly lower rates of transplant loss, compared to traditional nurseries.
- Developing a comprehensive best practice manual, from harvest to retail.
- Successful commercialisation of controlled atmosphere sea freight of mangoes from Pakistan to Europe and Britain and improved domestic marketing strategies involving smallholder growers.
- Developing village opportunities to produce and market value-added products that can increase household income by 50%.

Partners

Pakistan: National Agricultural Research Centre; National Integrated Pest Management Programme; University of Agriculture, Faisalabad; Sindh Agricultural University; Pakistan Horticulture Development and Export Company; Punjab Fruit and Vegetable Development Project; Sindh Horticulture Research Institute, Mirpurkhas. International: University of Queensland, Australia; Queensland Department of Agriculture, Fisheries and Forestry, Australia; Western Australia Department of Agriculture and Food.

Summer Vegetables

During the second phase of ASLP, research began on solutions for heat stress in summer vegetables, tomato and okra, by identifying and characterising heat-tolerant varieties. Activities include evaluating performance of indigenous and exotic cultivars under heat stress conditions, and their potential profitability in commercial farming (assessing yield, quality, and seed production).

Highlights

- Identifying heat-tolerant cultivars for tomatoes and okra through trials in Punjab
- Applying strategies to identify genetic markers for tolerance to heat stress
- Training farmers in vegetable cultivation under changing and stressful climatic conditions.

Partners

Pakistan: University of Agriculture, Faisalabad. International: New South Wales Farmers Association, Australia; University of Sydney, Australia.

Social Economics

ASLP also works in social economics and policy. Social research includes participatory research and case-study approaches in the mango, citrus and dairy industries, to foster collaboration and strengthen pro-poor value chains. This has assisted ASLP to provide valuable input for design and implementation of the Australia-Pakistan Agricultural and Rural Development Strategy.

Highlights

- Preparing detailed baseline data from 750 households (1500 farmers and spouses) in 25 collaborating villages in the dairy, citrus and mango projects, and identifying and implementing opportunities for youth engagement.
- Validating holistic livelihood improvement for extension and community engagement in citrus, mango and dairy communities.
- Enhancing interaction between extension agents, field assistants, and farmers, and communicating timely advice and information to farmers by mobile phones in six focal villages.
- Establishing community service centres and female entrepreneurship centres as sites for skills training and enterprise development.

Partners

Pakistan: Pakistan Agricultural Research Council; Department of Rural Sociology, University of Agriculture, Faisalabad; National Agricultural Research Centre, Social Science Institute; Department of Agricultural Economics, Sindh Agriculture University; Planning Commission; OMSATS Institute of Information Technology; Department of Agriculture, Sindh; University of Agriculture; Department of Agriculture, Punjab; Department of Livestock and Dairy, Punjab. International: University of Canberra, Australia; Victoria University, Australia.

Enabling Policies to Assist Smallholders

This project complements social, technical and marketing research in ASLP, looking at policy options for benefiting smallholders in the Punjab and Sindh provinces of Pakistan. The project team is working with senior officials at both national and provincial levels, and with other Pakistani experts, to constraints facing smallholders in three industries (dairy, citrus and mango). They are defining and testing policies to address these constraints, to increase smallholder incomes, drawing on results from other Phase 2 projects.

Highlights

- Identifying six key constraints facing smallholders, through field work and extensive consultation with officials and experts (local and ASLP)
- Progressive development and testing of enabling policies in six areas (access to credit, extension services, market access, collaboration between producers, input quality and prices, and quality of seeds, plants and dairy animals)
- Ongoing work on the role of women, and how it can be enhanced through the policy process.

Partners

Pakistan Agricultural Research Council; Department of Agriculture, Sindh; Department of Agriculture, Punjab; Department of Livestock and Dairy, Punjab; COMSATS Institute of Information Technology; University of Agriculture Faisalabad. International: Victoria University, Australia. Pakistan: Planning Commission.

Eric Huttner (Research Program Manager Crop Improvement and Management) and project officers in consultation with villagers. (Photo: ACIAR)

ACIAR Commission Visit to Pakistan

ACIAR is governed by a Commission for International Agricultural Research, which advises the Australian Foreign Minister on agricultural research and development programs; program funding and related matters. Each year, the Commission meets in a partner country and in 2016, they met in Pakistan. The Commission talked with key national partners, visited field sites and explored opportunities for future projects, especially in the livestock, high-value fruit and vegetables, and water sectors. The Commissioners were impressed by the resilience and foresight of local researchers and farmers.

Dairy farm visit by ACIAR Commissioners March 2016. (Photo: ACIAR)

A farming family. (Photo: ACIAR)

The Way Forward—Agriculture Value Chain Collaborative Research Program (AVCCR)

After the completion of ASLP, ACIAR conducted detailed consultation with local partners, key government stakeholders and likeminded donors. These strategic discussions led to the development of a new program: the Agriculture Value Chain Collaborative Research Program (AVCCR). The program is a co-investment between ACIAR and the Australian Department of Foreign Affairs and Trade (DFAT) and is closely aligned with the previous two phases of ASLP.

AVCCR focuses more strongly on collaboration and research in selected agricultural value chains that are important for Pakistan. The rural poor, particularly women, will benefit from improvements in these strategic value chains. AVCCR will continue to engage the private sector in new and innovative partnerships and that will make a real difference to livelihoods by reducing poverty and helping to achieve the agricultural outcomes of Pakistan's Vision 2025.

ASLP was a very significant initiative and has been thoroughly reviewed. The *Lessons Learned* paper provides clear guidance for refining this model as it applies to the new program, AVCCR. The new program will be delivered through two mechanisms:

First, a set of projects focused on agricultural value chains selected via a rigorous process summarised in the paper, *Reviewing the Priorities for Collaboration in Agricultural Research and Development*. Each project will have goals and objectives clearly aligned with the program.

Second, a program component designed to support and integrate activities towards the program goal and objectives, as follows:

Program Goal

That rural poor, particularly women, living in the Punjab and Sindh significantly and equitably benefit from improvements in strategic value chains

Objectives

Quality Research: Collaborative research identifies appropriate solutions to technical, social, economic or political constraints hindering strategic value chains.	**Smallholder Acceptability:** Smallholder farmers, both male and female, adopt improved value chain production, harvesting, handling and supply practices.	**Private Sector Acceptability:** Private sector entrepreneurs adopt improved value chain practices arising from research (including improved transport, packaging, value adding, processing and market access protocols).	**Sustainable Capacity:** Pakistan's research institutions can sustainably deliver integrated needs based and multi-disciplinary research in strategic value chains.

Australia Water Program for Pakistan

Food and water security are among the most pressing challenges for Pakistan. With energy security, they are key pillars of development for Pakistan's Vision 2025. Australia is working with Pakistan to meet these challenges.

Researchers in Pakistan and Australia are collaborating on several Australian aid projects targeting food and water security in Pakistan. The projects encompass field work to improve agricultural productivity, crop water use efficiency, and groundwater management including assessing water availability and efficient use of the Indus River Basin. Researchers are also assessing institutional design to improve irrigation water supply at provincial level.

Indus integrated water resource assessment and management

This project is part of the Indus Sustainable Development Investment Portfolio funded by the Australian Department of Foreign Affairs and Trade (DFAT). It runs until 2020 and uses Australian water management tools and technologies to improve Pakistan's understanding of current and future Indus water resources.

The project is developing a model for improved seasonal flows forecasting, a detailed water balance of the Indus basin and a salinity model analysis of changes in water flows due to rapid climate change. It is working on improving seasonal forecasting of water availability in the Indus Basin for better planning and informed decision making for water allocation.

It is also developing an Indus river system model to inform releases and distribution of water from dams, and diversions into irrigation canals. The economic impacts of improved water management will be assessed by linking biophysical changes with a national scale economic model.

The project includes detailed crop modelling in nine agro-climatic zones to inform crop production. Australia's Commonwealth Scientific and Industrial Research Organisation (CSIRO) is investigating water quality implications in the Ravi and Sutlej Rivers in partnership with World Wide Fund - Pakistan and Pakistan Council for Water Research in Water Resources (PCRWR).

Research is also being done on the volume of groundwater that might be sustainably used without damaging the resource base through over-extraction or inadvertent salinisation of aquifers. Given the high level of interaction between surface and groundwater resources, this will be linked to river modelling and seasonal flow forecasting.

Partners

Pakistan: Ministry of Water and Power; Ministry of Planning Development and Reform; Water and Power Development Authority; Indus River System Authority; Pakistan Commission for Indus Water; National Engineering Services; Pakistan Meteorology Department; University of Agriculture, Faisalabad; Sindh Agriculture University; World Wide Fund for Nature - Pakistan. International: CSIRO, Australia; ACIAR; World Bank International Finance Corporation; International Centre for Integrated Mountain Development; The Asia Foundation; Australian International Centre of Excellence in Water Resources Management and eWater.

Enhancing irrigation skills of farmers

A key issue in irrigation in Pakistan is poor efficiency and associated impacts on productivity. To increase efficient water use and productivity, farmers must improve their water management and agronomic practices. The ACIAR project *Enhancing Irrigation Skills of Farmers in Balochistan, Sindh and Punjab Provinces of Pakistan* is being led by University of Canberra and CSIRO, with Pakistan partners. The project works with farmers to develop tools to improve their skills. This includes testing various simple irrigation management tools for measuring

soil moisture and soil nutrients and developing appropriate training methods that focus on a co-learning approach. The aim is to encourage farmer-to-farmer learning as a commercial service or through an extension service and NGOs.

Partners

Pakistan: Pakistan Council for Water Research in Water Resources; National Agricultural Research Centre; Society of Facilitator and Trainers. International: University of Canberra, Australia; CSIRO, Australia.

Integrated management groundwater resource

Groundwater use is extensive in Pakistan, with some areas completely reliant on groundwater (Balochistan) and others using it with surface water to increase cropping intensity (Punjab). In Sindh, large areas are affected by waterlogging that could be reduced by greater use of groundwater. The ACIAR project *Improving management of groundwater resources in Pakistan to sustain farmer livelihoods and economic development* addresses these issues. Experts from Charles Sturt University are leading the project with Pakistani partners.

The project is identifying approaches for farmers/communities and managers/policy makers to manage groundwater quantity and quality while enhancing agricultural productivity. The teams work with communities to develop groundwater management options. Data collection and modelling will assess management options and provide feedback to the community on groundwater quantity and quality trends.

Partners

Pakistan: Pakistan Council for Water Research in Water Resources; University of Agriculture Faisalabad; PMAS – Arid Agriculture University; Sindh Agriculture University; Mehran University of Engineering and Technology; NED – University of Engineering and Technology; Balochistan University of Information Technology Engineering and Management Sciences; Punjab Irrigation Department; Sindh Irrigation Department; Water and Power Development Authority. International: Charles Sturt University, Australia; International Center for Agriculture Research in Dryland Areas.

Centralised vs decentralised irrigation

Irrigation water supply management is mainly undertaken by provincial irrigation and drainage authorities. These authorities follow a relatively simple policy agenda that centres on improving water management by devolving decisions to farmers. This participatory irrigation management (PIM) approach has yielded mixed results, with productivity gains often failing to materialise. The ACIAR project *Centralised versus decentralised water management: Matching institutions to achieve more productive irrigation in India and Pakistan* addresses these issues. The project will develop policy-relevant guidelines or rules-of-thumb that predict the relative efficiency of participatory irrigation management versus centralised control.

Partners

Pakistan: Pakistan Agriculture Research Council, Applied Economics Research Centre – University of Karachi; Mehran University of Engineering and Technology; University of Agriculture Faisalabad; Pakistan Institute of Development Economics, Punjab Irrigation and Drainage Authority; Sindh Irrigation and Drainage Authority. International: University of South Australia.

Australian Agriculture Alumni Network (Aus-AAN) Pakistan

Australia has become a preferred destination for Pakistanis seeking education abroad, with the number of Pakistani students enrolled in Australia's universities and educational institutions rising from 11,000 in 2012 to 15,000 in 2016.

ACIAR's Pakistan office is developing a network of Pakistani alumni from Australian educational institutions with specialisation in agriculture, water and livestock and dairy studies. Australian universities and state research institutes lead ACIAR's research activities in-country and want to engage with former students trained in Australian institutes.

The alumni network will connect Australian alumni in Pakistan with shared research and development interests in the fields of agriculture, water, livestock and dairy development and policy development sectors. It will facilitate exchange of research ideas and opportunities to collaborate in Pakistan and abroad, and assist alumni to keep up-to-date with developments in their sectors.

Commission Chair Don Heatley, Commissioners Lucinda Corrigan and Professor Tony Gregson with with Pakistani students. (Photo: ACIAR)

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.

ACIAR's mission

To achieve more-productive and sustainable agricultural systems, for the benefit of developing countries and Australia, through international agricultural research partnerships.

For more information, visit www.aciar.gov.au

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