

# South Asia and Middle East

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## *ACIAR Regional Coordinator*



**South Asia:**  
Dr John Dixon  
Phone: 02 6217 0531  
dixon@aciar.gov.au



*Nasima, in Bangladesh, became the sole breadwinner for her family after she lost her husband in the Cyclone Sidr in November 2007. She continued her association with an ACIAR project to grow alternative crops in their fallow rice paddies and achieved one of the highest wheat yields in her district*

# India

Key statistics	
GDP per capita (US\$)	976
Population (millions)	1186.2
Funding	
Bilateral actual 2007–08	\$2.14m
Bilateral allocation 2008–09	\$2.35m
Bilateral budget 2009–10	\$2.68m
Bilateral + multilateral budget 2009–10	\$2.97m

**Country manager**  
 Dr Kuhu Chatterjee, ACIAR Regional  
 manager, South Asia



*Women of one of Amagan's Self-Help-Groups bidding farewell to an ACIAR project team*

## Key program managers

*Dr John Dixon, Cropping Systems and Economics*  
*Dr Paul Fox, Crop Improvement and Management*  
*Dr Simon Hearn, Agricultural Development Policy*  
*Dr Mirko Stauffacher, Land and Water Resources*

## Medium-term strategy

The emphasis of the India–Australia collaborative research partnerships in the main wheat-growing areas has shifted from maintaining the sustainability of wheat-based cropping systems to improving productivity, through development of new varieties resistant to major biotic and abiotic stresses. This is being achieved through the application of marker-assisted selection as a tool to achieve greater efficiencies in wheat breeding. This theme is being delivered through a joint program implemented in 2008 and co-funded by the Indian Council for Agricultural Research and the Australian Centre for International Agricultural Research (ACIAR). In the less favoured areas of India's rainfed central plateau, a second subprogram addresses broad scale land and water resource management. This is augmenting the earlier technical focus with complementary research on cropping systems, and institutional and policy issues related to water management. This subprogram applies technical, economic and policy research approaches to increase water productivity, and will have an increasing focus on climate issues, in particular adaptation to climate change. Project design which will emphasise strengthened integration will include greater involvement of farmers and NGOs, and engagement with policymakers, with a view to achieving quicker impact.

Policy analysis research at the national and state levels will complement both themes, with a shift from stand-alone policy projects to integration of policy components into projects of the main two themes. This will include research into domestic agricultural policy and trade-related reform options, and will consider in future cycles, plausible scenarios and futures for agriculture and food security.

## Key performance indicators (2009–10)

- linkages to international bioinformatics initiatives implemented as part of the joint Indo–Australian collaborative program on marker-assisted breeding in wheat
- introgression of genes conferring 'stay-green' characteristics into elite sorghum germplasm
- use of improved technologies for crop establishment and production in the rice–wheat and rice-based farming systems of north-western and eastern India
- activities addressing climate change management and climate adaptation integrated into the water productivity program in Andhra Pradesh
- enhanced understanding of policy and institutional arrangements, community-based water harvesting and impacts of watershed development on equity of water use in central India
- identified competition policy options to facilitate regulatory and market reform in the agricultural sector addressed through communication of analytical studies.

## Position

India faces very significant problems in its rural sector, even as the overall economy forges ahead. Indeed, the greatest number of poor and undernourished people in any country (approximately 300 million) is found in India, and most live in rural areas. At the same time India faces trade liberalisation and rapid diversification of diets towards high-value agricultural products.

ACIAR's collaborative program in India has evolved into a tightly focused suite of projects in three subprograms. These take into account national agricultural priorities and the key themes through which agricultural research in the two countries can achieve synergies. The Government of India is also encouraging donors to work with independent research organisations and non-government organisations (NGOs). Partnerships with NGOs will help increase emphasis on achieving practical farmer-level impacts, particularly in poorer regions. Involvement of independent policy institutions and their linkage to central and state government departments will also increase the likelihood of policy impacts.

India has a large and well-developed national agricultural research system. The Indian Council for Agricultural Research has several major programs, including the World Bank-funded National Agriculture Innovation Programme and the US–India Agriculture Knowledge Initiative, both of which share similar research priorities with the ACIAR program. ACIAR will maximise collaboration in areas of Australian expertise as well as in areas where both India and

Australia have strong common interests and potential for field-level and trade impacts in both countries. ACIAR will engage mainly with researchers in the main wheat growing states (Punjab, Haryana, Madhya Pradesh and Uttar Pradesh) and the Indian central plateau (Andhra Pradesh, with outreach to Karnataka, Maharashtra and West Bengal). Projects will help India manage scarce water and nutrient resources more efficiently, improve yield and quality of cereals and oilseeds, diversify production and raise farm incomes. Rainfed cropping systems in central and eastern India are prone to the effects of seasonal climate variability and, in the long term, impacts of climate change. India is one of four partner countries involved in ACIAR's climate change adaptation initiative designed for implementation during 2009–10.

A number of International Agricultural Research Centres (IARCs) are also active in India. The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), with headquarters in Hyderabad, has strong programs on peanut, sorghum, millet and chickpea, as well as crop–livestock systems (with the International Livestock Research Institute, ILRI) and soil management in the semi-arid tropics. The International Maize and Wheat Improvement Center (CIMMYT) and the International Rice Research Institute (IRRI) have significant regional activities in India, many connected with the rice–wheat eco-regional initiative. The International Water Management Institute (IWMI) has a joint program on policy issues, with an Indian research institute and other biophysical programs in India. ACIAR supports projects with these IARCs.

### Box 7. Relationship of ACIAR activities to AusAID and other Australian Government programs in India

Australia's Development Cooperation Framework with South Asia for 2003–07 'sought to maximise the effectiveness of programs reducing vulnerability and increasing the productivity of the poor', with an emphasis on the areas of 'health and sanitation, education and natural resources management'. It recognised that countries 'are at different stages of development, each with their own development priorities', and the strategy should respond to humanitarian and emergency assistance needs as they arise'. A new framework for 2008–13 is currently under development.

A new five-year \$10 million Australia–India Public Sector Linkages Program (PSLP) was announced by AusAID in June 2008. The PSLP offers Australian federal, state and territory government agencies, as well as universities, competitive funding to develop linkages with public counterpart institutions in India. The Department of Innovation, Industry, Science and Research (DIISR) administers the Australia–India Strategic Research Fund (AISRF), which commenced in 2006–07 and will provide \$20 million over five years. This program supports collaborative research activities between Australia and India, with the Indian Government committed to providing matching funds. Competitive funding under the AISRF is available through the \$6 million Indo–Australian Science and Technology Fund (administered jointly with the Indian Department of Science and Technology) and the \$6 million Indo–Australian Biotechnology Fund (administered jointly with the Indian Department of Biotechnology). Priority areas under these two funds include agricultural research (transgenic crops), environment sciences (nutraceuticals and functional foods) and marine sciences (bioremediation). Coordination between DIISR and ACIAR ensures that agricultural research projects supported under the AISRF complement the ACIAR India program. Application details can be accessed at: <<https://grants.innovation.gov.au/AISRF/Pages/Home.aspx>>.

The Australian Department of Agriculture, Fisheries and Forestry (DAFF) has a growing interest in India. It has developed a strategy with a strong trade focus, reflecting the increasing importance of India in the World Trade Organization (WTO) and as a market for Australian agricultural commodities. ACIAR will collaborate to identify and undertake timely policy research and analysis designed to address opportunities for both agricultural trade and domestic policy reform in India.

## Research priorities

ACIAR has a program of consultation with India to establish priorities in research collaboration. The most recent review of priorities, held between July 2006 and May 2007, led to the emergence of several focal areas. These are outlined below.

### Subprogram 1: Application of marker-assisted selection as a tool in wheat breeding ('Indo–Australian program on marker assisted breeding for wheat')

- Application of rust and alternative genes to provide varieties with improved leaf, stripe and stem rust resistances
- Identification and application of suitable traits and markers for coping with abiotic stresses
- Identification and application of wheat quality traits.

### Subprogram 2: Water management and productivity for enhanced livelihoods in rainfed areas of the central plateau, with emphasis on Andhra Pradesh

- Implementation of sustainable water harvesting and watershed development
- Informing of water resource management and policymaking to optimise water productivity
- Improvement in water productivity of rainfed cropping and livestock systems
- Adaptation of farming systems to cope with climate change.

### Subprogram 3: Policy options for trade and market reform to underpin agribusiness development

- Adjustment to the challenges and opportunities of international trade
- Facilitation of private sector investment in agribusiness and marketing
- Safeguarding of smallholder livelihoods in the transition from a regulated to a market economy.

## Current project portfolio

(Possible new projects commencing in 2009–10 shown as 'proposed')

### Subprogram 1: Application of marker-assisted selection as a tool in wheat breeding

Wheat is the major crop of both India and Australia and is grown in similar environmental conditions in both countries. Although farm size is very different in the two countries, there are many similar production constraints. The north-west is India's major grain-growing area, and continued productivity is central to farmer livelihood and food security considerations. Until recently, the ACIAR focus in this program has been to underpin the

broader sustainability of wheat-based cropping. This has comprised a cluster of projects addressing a range of soil and water management and productivity issues involving improved nutrient management and zero-tillage. It has been complemented by a set of projects revolving around the development of improved wheat varieties that can cope with biophysical soil constraints such as waterlogging and soil sodicity/salinity.

Following a joint review of priorities in 2006–07, it was agreed to strengthen the focus on the application of marker-assisted selection as a tool to achieve greater efficiencies in wheat breeding. This new subprogram shares costs and benefits between the partner countries. It recognises advanced research capabilities in both countries, as well as the central and catalytic role of the active project 'Molecular marker technologies for faster wheat breeding' in the process.

CIM/2003/067 (multilateral)	Ensuring productivity and food security through sustainable control of yellow rust of wheat in Asia (CIMMYT)
CIM/2005/020	Molecular marker technologies for faster wheat breeding in India
CIM/2006/071	Root system traits to improve grain yield and drought resistance of wheat in Australia and India
CIM/2006/094	Enhancing farm profitability in north-western India and South Australia by improving grain quality of wheat
CIM/2006/177	Wheat improvement for waterlogging, salinity and element toxicities in Australia and India
CIM/2007/084	Molecular markers for broadening the genetic base of stem rust resistance genes effective against strain Ug99
CIM/2007/083 (proposed)	Applying molecular markers to breeding wheat with enhanced processing properties in India and Australia
CIM/1999/072	Oilseed <i>Brassica</i> improvement in China, India and Australia
CSE/2004/033	Zero-tillage rice establishment and crop weed dynamics in rice and wheat cropping systems in India and Australia
CSE/2006/124	Fine-tuning the Happy Seeder technology for adoption in north-western India
LWR/2002/032	Integrated manure nutrient management in soybean–wheat cropping systems on vertisols in Madhya Pradesh and Queensland

### Subprogram 2: Water management and productivity for enhanced livelihoods in the rainfed areas of the central plateau, with emphasis on Andhra Pradesh

Better water management is one of the highest priorities for improving livelihoods in the more marginal rainfed areas of central India. Water harvesting, as part of a broader watershed development agenda to increase water availability, is a key policy initiative of the Indian Government in these areas. While primarily designed to increase water productivity of

crop and livestock production systems at both farm and watershed levels, widespread implementation of watershed development harbours risks of unintended hydrologic and socio-economic impacts downstream, potentially risking some of the gains achieved in upstream areas.

Furthermore, water resources in rainfed areas are subject to some of the problems associated with common property, for example weak water institutions and the lack of clear water rights and entitlements. This poses a challenge to program design, as addressing the above issues requires a systems approach spanning both spatial and temporal scales and the integration of biophysical and socio-economic disciplines. Hence, this subprogram comprises a cluster of closely linked projects to enable a more holistic approach to water resource management.

Given similar water constraints and policy challenges in many parts of Australia, including the semi-arid tropics, there is significant expertise in Australia to address water research issues from policy to crop-water productivity.

CIM/2007/120 (multilateral)	Improving post-rainy sorghum varieties to meet the growing grain and fodder demand in India (ICRISAT)
FIS/2002/001	Developing aquaculture in degraded inland areas in India and Australia
FIS/2006/144	Strengthening regional mechanisms to maximise benefits to smallholder shrimp farmer groups adopting better management practices
LWR/2002/100	Water harvesting and better farming systems for benefit of small farmers in watersheds in the east India Plateau
LWR/2006/072	Impacts of watershed development on upstream and downstream hydrologic response and economic benefits

LWR/2006/158	Enhancing institutional performance in water resource development in Andhra Pradesh, India
LWR/2008/015	Developing options to mainstream climate adaptation into farming systems in Cambodia, Laos, Bangladesh and India
LWR/2007/113 (proposed)	Adaptation of water resource management to climate change in the Krishna Basin, India
LWR/2008/019 (proposed)	Building capacity of farming communities in Cambodia, Laos, Bangladesh and India to adapt to climate change

### Subprogram 3: Policy options for trade and market reform to underpin agribusiness development

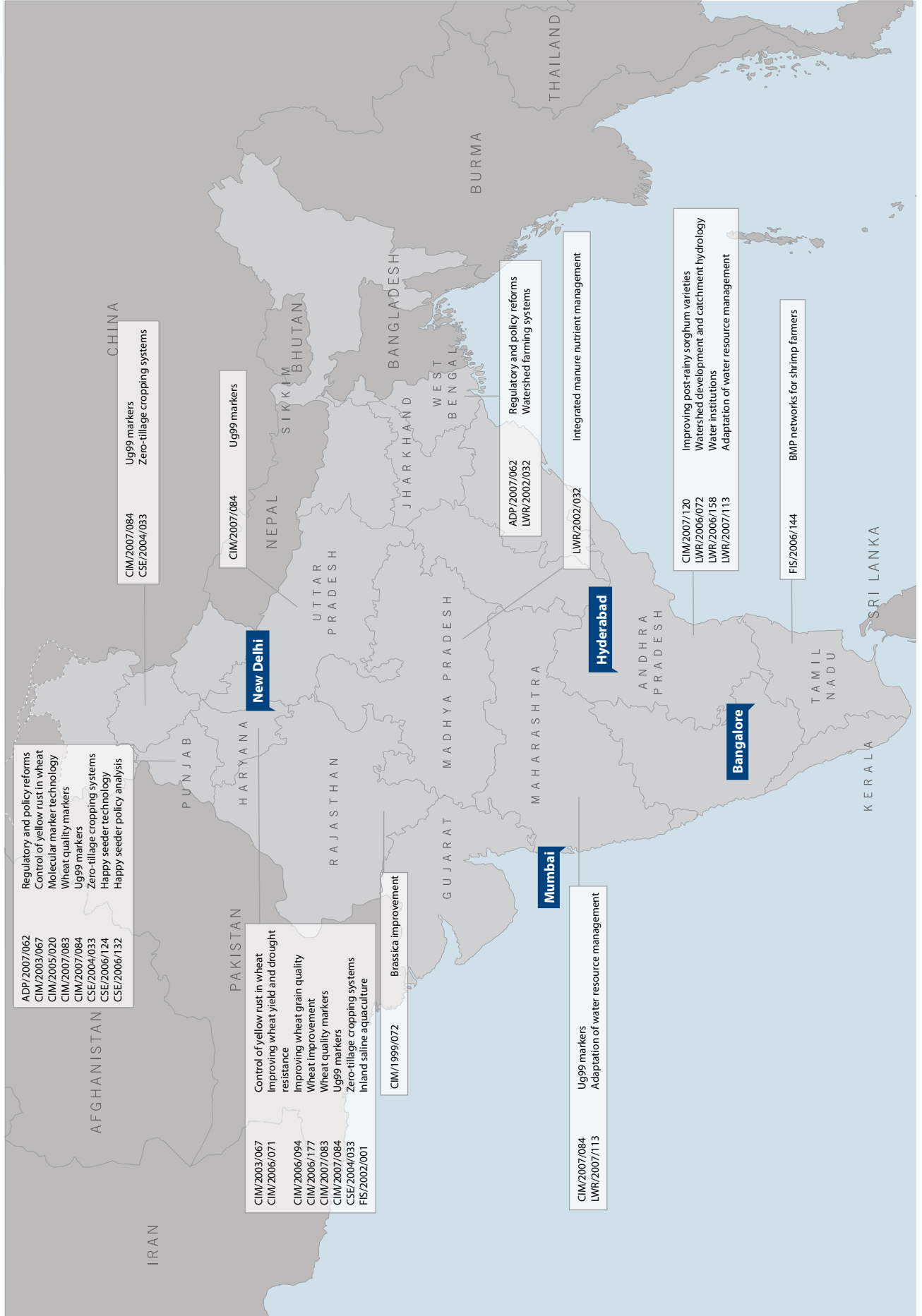
Creating the right policy environment for reform in the agricultural sector has the potential to deliver major impacts. Australia has significant expertise in policy analysis, particularly in assisting India with the implications of its transition from a highly regulated economy to a more open market economy. Large private retailers in India are poised to make large investments in the supply side to expand the already considerable agribusiness input supply sector, after having consolidated the retail sector. There is potential for enhanced Australian participation in the Indian food production chain through, for example, investment, collaboration and partnerships with Indian businesses, or export of Australian products and services. Possible benefits to Australia resulting from market reform include a capacity for India to engage in more open trade relations.

ADP/2007/062	Facilitating agricultural sector reforms in India: an assessment of regulatory and competition policy requirements
CSE/2006/132	Policy instruments to address air pollution issues in agriculture – implications for Happy Seeder technology adoption in India



Women at the waterhole in Rajasthan

Active projects in India



# Pakistan

Key statistics	
GDP per capita (US\$)	996
Population (millions)	167.0
Funding	
Bilateral actual 2007–08	\$1.89m
Bilateral allocation 2008–09	\$2.09m
Bilateral budget 2009–10	\$1.00m
Bilateral + multilateral budget 2009–10	\$1.02m

## Key program managers

Mr Les Baxter, Horticulture  
 Dr Peter Horne, Livestock Production Systems  
 Dr Mirko Sjauffacher, Land and Water Resources

## Country manager

Dr Kuhu Chatterjee, ACIAR Regional manager,  
 South Asia



Farmers and scientists trialling raised bed cropping systems in Pakistan

## Medium-term strategy

ACIAR's long-term focus in Pakistan is on natural resource management issues such as efficient water use, salinity and drainage, and tillage options for irrigated cereal cropping. ACIAR has broadened the program of bilateral and multilateral projects in Pakistan to encompass the horticulture and dairy sectors. The broadened focus arises from the Australia–Pakistan Agriculture Sector Linkages Program (ASLP), which ACIAR is implementing on behalf of AusAID.

## The Australia–Pakistan Agriculture Sector Linkages Program (ASLP)

The main goals of the agriculture linkages component are to:

- transfer Australian knowledge and expertise to key sectors of Pakistan agribusiness to increase profitability and enhance export potential
- contribute to poverty alleviation of smallholder farmers through collaborative research and development
- enhance the capacity of the Pakistan research, development and extension systems to deliver targeted and practical research outputs to agribusiness and farmers.

It has been agreed to target the following priorities for technical support:

- increasing mango and citrus production, through diagnosis and control of diseases and orchard management, to increase productivity and reduce input costs

- enhancing the supply chain, including value-adding and marketing, for the mango and citrus industries
- increasing milk production from individual animals in the dairy sector.

To meet the ASLP goals and ensure it delivers early impacts, the program comprises initial short-term scoping studies and constraints analysis; information exchange and exposure to agroenterprises through visits to Australia; technical and scientific workshops; tailored training and capacity-building and research and development projects. The main anticipated outcome of the ASLP is to build stronger capacity in Pakistan to exploit agribusiness opportunities in the targeted sectors, with the dual purposes of underpinning the current high growth rates in the agricultural sector and contributing to poverty reduction. The current phase of the ASLP runs until March 2010. Following a review in early 2009, an extension of the program through to March 2014 has been recommended.

## Key performance indicators (2009–10)

- productivity gains in horticultural and dairy enterprises leading to higher farmer incomes in selected areas
- improved quality of mangoes achieving higher export volumes and revenues
- new generation resource conserving technologies and conservation tillage machinery increasingly adopted through the support of Pakistan Government programs.

## Position

Pakistan has been an ACIAR partner country since 1984. Increasing pressure on availability of water resources for

irrigation exists due to competing demands from urban and industrial uses. Soil and water salinity and drainage problems are placing additional pressure on irrigated agriculture. Given the similarity of some of its own water resource and salinity issues, Australia is well placed to assist Pakistan in addressing these issues. ACIAR's program continues to focus on irrigation, drainage and salinity management in the major cropping systems.

In addition, there is recognition that Australia has skills for working with some of Pakistan's key horticultural crops, especially citrus and mangoes, the two most important tree crops. Australian expertise can provide a whole-of-system approach to increase the productivity and competitiveness of the mango and citrus industries, encompassing all steps from fruiting to market. Pakistan is also one of the world's largest milk producers, with slightly less than half of that production from dairy cattle. Unit animal production is very low although genetic potential is quite good. Major opportunities exist for applying Australian expertise in animal nutrition and integrating forage production into farming systems to assist in improving milk production. This work is a key to poverty reduction, particularly for some of Pakistan's landless people. The geographic focus in ACIAR's Pakistan program, including work carried out under the support of the ASLP, is on Punjab, Sindh and North-West Frontier provinces.

### Research priorities

The most recent formal consultations were held in November 2008 during the review of the ASLP. All new projects in Pakistan will include significant components of capacity building in participatory research and extension methodologies.

Indicative priorities are grouped under the following themes:

#### Subprogram 1: Developing more productive and competitive mango and citrus production and marketing systems

- Diagnosis and control of diseases, especially dieback in mango
- Orchard management to increase productivity and reduce input costs
- Optimisation of supply chains to increase value-adding and marketing opportunities

- Support of linkages between farmers and the private agribusiness sector
- Analysis of policies underpinning development of the horticultural sector.

#### Subprogram 2: Improving livelihoods of dairy farmers

- Increase in unit productivity of dairy cattle through improved nutrition
- Support of linkages between farmers and the private agribusiness sector
- Analysis of policies underpinning development of the dairy sector.

#### Subprogram 3: Management of land and water resources to sustain productive enterprises

- Introduction of strategies to optimise the value of limited and variable-quality irrigation water
- Technology selection to improve productivity of saline land and water resources
- Use of resource-conserving technologies for irrigated horticultural and cereal-based farming systems.

### Current project portfolio

*(Possible new projects commencing in 2009–10 shown as 'proposed')*

#### Subprogram 1: Developing more productive and competitive mango and citrus production and marketing systems

The horticulture sector in Pakistan is significant both domestically and for export production. A problem common to both mango and citrus is major losses due to poor harvesting practices, packing and transportation. With production, key issues are inadequate orchard and irrigation/drainage management, and major diseases. Australia has strengths in mangoes and citrus that span the production system and supply chain, in particular the use of a systems approach and integration of end users in the planning, execution and evaluation of the research. These are unique attributes that could be employed in Pakistan, and promise significant opportunities for impacts on productivity and more efficient supply chain systems. The ASLP will aim to capitalise on this by linking the Australian and Pakistan research teams with the agribusiness sector and introducing participatory activities with farmers.

### Box 8. Relationship to the Australian Development Cooperation Framework for Pakistan

A new Development Cooperation Framework for Pakistan is under development during 2009–10. In line with an increased focus on helping the Government of Pakistan get back on track to achieve the Millennium Development Goals, priority sectors for Australian support are primary education, basic health, natural resources management and poverty reduction in provinces bordering Afghanistan and North-West Frontier province. The ACIAR program, while concentrating on the agricultural sector, includes a strong emphasis on reducing vulnerability and increasing productivity of the poor. The Pakistan program also addresses increased productivity in selected agricultural sectors as well as management of the natural resources base.

HORT/2005/153	Development of integrated crop management practices to increase sustainable yield and quality of mangoes in Pakistan and Australia
HORT/2005/157	Optimising supply chains for more profitable horticultural agro-enterprises in Pakistan and Australia
HORT/2005/160	Increasing citrus productivity in Pakistan through improved orchard management techniques and more efficient use of inputs

### Subprogram 2: Improving livelihoods of dairy farmers

Dairy is the largest livestock sector in Pakistan, with demand for milk and milk products growing at about 8% per annum. Despite good genetic potential among animals, production is low due to poor nutrition, mismanagement, failure to control diseases, and lack of proper marketing of this highly perishable commodity. This is compounded by a fragmented research effort and weak extension support services. The ASLP will support Government of Pakistan initiatives to stimulate the dairy sector. The program will integrate activities and concentrate on mechanisms to increase individual animal production, principally through nutrition. It will have a strong systems focus and an emphasis on capacity building in extension strategies. The issues likely to be considered in this approach include social, economic and biophysical analysis of farming systems, development of seasonal feeding options, the introduction and evaluation of forages, and feed conservation strategies.

LPS/2005/132	Improving dairy production in Pakistan through improved extension systems
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### Subprogram 3: Management of land and water resources to sustain productive enterprises

Irrigated land supplies more than 90% of agricultural production in Pakistan. The main canal system and its

secondary level canals are managed at a provincial level by central irrigation agencies. A recently introduced reform process is designed to shift the management of irrigation at local (tertiary) levels to water user associations. The aim is to address some of the multiple problems of irrigation systems such as inequitable water distribution, high conveyance losses, low delivery efficiency, waterlogging and salinisation.

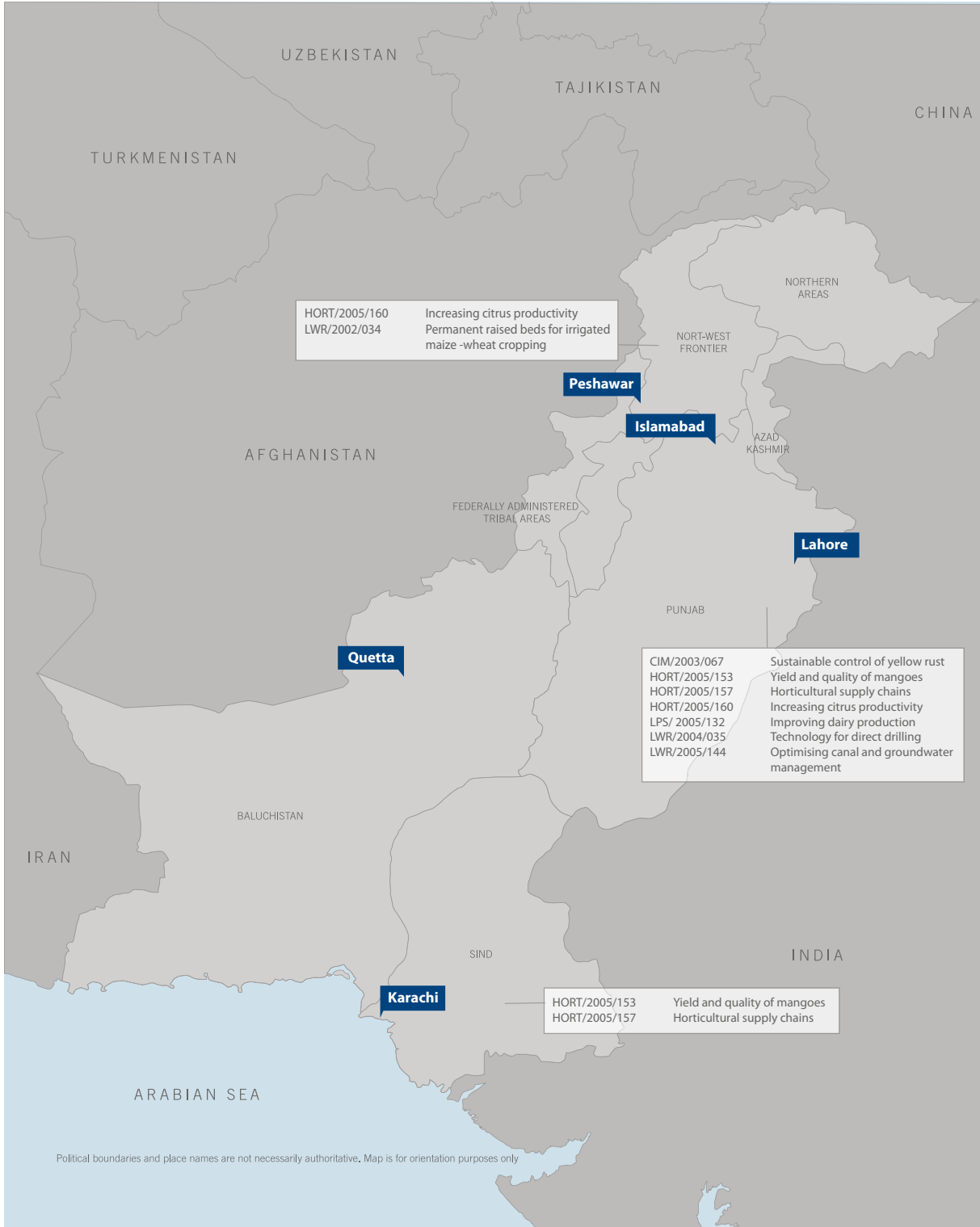
Increasing competition for water by non-agricultural users will put additional strain on the systems, and there are uncertainties about future water supply as a result of climate change. Australia, facing similar problems with its irrigation systems, has developed strong irrigation and water resources research expertise. In the future the cluster of projects in this subprogram is expected to have substantial linkages with the horticulture and dairy sectors, while improving the overall performance of the irrigation sector in Pakistan. There will also be ongoing support to promote raised-beds technology as a promising on-farm technique to reduce irrigation water usage.

CIM/2003/067 (multilateral)	Ensuring productivity and food security through sustainable control of yellow rust in wheat in Asia (CIMMYT)
LWR/2002/034	Refinement and adoption of permanent raised-bed technology for the irrigated maize-wheat cropping system in Pakistan
LWR/2004/035	Technology for direct drilling into rice and other heavy stubbles in Pakistan and Australia
LWR/2005/144	Optimising canal and groundwater management to assist water user associations in maximising crop productivity and managing salinisation in Pakistan and Australia
LWR/2007/079 (proposed)	Promotion of conservation agriculture using permanent raised beds in irrigated cropping systems in Pakistan and Australia



*Pakistani and Australian citrus growers share their knowledge and expertise as part of the ASLP*

## Active projects in Pakistan



# Bangladesh

Key statistics	
GDP per capita (US\$)	428
Population (millions)	161.3
Funding	
Bilateral actual 2007–08	\$0.51m
Bilateral allocation 2008–09	\$0.49m
Bilateral budget 2009–10	\$1.02m
Bilateral + multilateral budget 2009–10	\$1.53m



Zero till wheat trials

## Medium-term strategy

ACIAR's strategy in Bangladesh is to focus on agronomic and biotic constraints to the production of broadacre grain crops, either through bilateral projects or projects led by IARCs. These projects link to existing programs such as the Consultative Group on International Agricultural Research-coordinated Rice–Wheat Consortium and the International Rice Research Institute (IRRI)–International Maize and Wheat Improvement Center (CIMMYT-Mexico) Alliance for Intensive Production Systems in Asia. While in the past the emphasis has been on 'Rabi' or winter season crops such as pulses, wheat and maize, the focus will shift increasingly to taking a farming systems approach to underpin broader food security issues. This will be achieved by expanding the work on rice-based farming systems and by broadening the scope of the program in Bangladesh to include a greater focus on food security and climate change adaptation.

## Key performance indicators (2009–10)

- broadening of the Bangladesh program to include a suite of new linked activities aimed at increasing production of rice-based cropping systems, including climate adaptation work to safeguard future food security
- increased adoption of winter (Rabi) season cropping using residual soil moisture or supplementary irrigation in traditional rice-fallow regions.

## Position

Bangladesh has been a partner country since the mid 1990s. ACIAR's program is comparatively small in view of Australia's limited comparative advantage to deal with Bangladesh's rice-dominated agricultural problems.

Projects have focused on constraints to broadacre crop production (especially the rice–wheat system) and the potential for increased inclusion of a legume component in cropping systems. This past focus will broaden with the emergence of rice–maize as an increasingly important

## Key program managers

*Dr John Dixon, Cropping Systems and Economics*

*Dr Paul Fox, Crop Improvement and Management*

*Dr Mirko Stauffacher, Land and Water Resources*

## Country manager

*Dr Kubu Chatterjee,*

*ACIAR Regional manager, South Asia*

cropping system. However, it is recognised that the national focus on rice can compromise nutrition and, as such, work on improved pulse productivity and availability will continue.

With re-emerging concerns about Bangladesh's ability to maintain food security in the light of its high vulnerability to the impacts of climate change, the emphasis will shift to increasing the productivity of rice as the main staple. Low-lying areas and rainfed cropping systems in Bangladesh are particularly impacted by the effects of seasonal climate variability and impacts of climate change. Consequently, Bangladesh will be one of four partner countries involved in ACIAR's climate change adaptation initiative designed for implementation during 2009.

## Research priorities

Priorities for collaboration are developed through meetings of ACIAR research program managers and other senior staff with managers and scientists at agricultural R&D institutions and government bodies in Bangladesh. Current collaboration is mainly in the production and management of grain crops. In the medium term ACIAR will consider projects in the area of agronomic and biotic constraints to the production of broadacre grain crops, and will consult more extensively with Bangladesh partners during 2009–10 on priorities for climate change adaptation research with impact at the farm level.

## Current project portfolio

*(Possible new projects commencing in 2009–10 shown as 'proposed')*

CIM/2003/067 (multilateral)	Ensuring productivity and food security through sustainable control of yellow rust of wheat in Asia (CIMMYT)
CIM/2007/122 (multilateral)	Sustainable intensification of rice–maize production systems in Bangladesh (IRRI)
LWR/2005/001	Addressing constraints to pulses in cereal-based cropping systems, with particular reference to poverty alleviation in north-western Bangladesh
LWR/2005/146	Expanding the area for Rabi-season cropping in southern Bangladesh
LWR/2008/015	Developing options to mainstream climate adaptation into farming systems in Cambodia, Laos, Bangladesh and India
LWR/2008/019 (proposed)	Building capacity of farming communities in Cambodia, Laos, Bangladesh and India to adapt to climate change

## Other South Asian and Middle East countries: Bhutan, Afghanistan and Iraq

Key statistics			
GDP per capita (US\$)		Population (millions)	
Bhutan	1,982	Bhutan	0.7
Afghanistan	345	Afghanistan	28.2
Iraq	2,404	Iraq	29.5
Funding			
Bilateral actual 2007–08		\$0.21m	
Bilateral allocation 2008–09		\$0.20m	
Bilateral budget 2009–10		\$0.17m	
Bilateral + multilateral budget 2009–10		\$3.40m	

### Medium-term strategy and priorities

ACIAR is managing one large project in Iraq, co-funded by AusAID. It is anticipated that support will be limited to this project in the medium-term as Iraq passes through a critical period of consolidation, with recent improvements in its security environment. Activity in Iraq and Afghanistan will continue through collaboration with CGIAR centres. CIMMYT and ICRISAT are leading the activities in Afghanistan, while the International Centre for Agricultural Research in the Dry Areas (ICARDA) is the key partner in the ACIAR-supported project in Iraq. In Afghanistan and Iraq there are complex operating environments resulting from poor security and political uncertainty that limits access by Australian scientists and hinders donor capacity for long-term planning.

In Bhutan there is one major active project, and any additional projects would need to be initiated and strongly endorsed at an early stage by the Bhutan Government and closely fit Australia's skills and expertise.

Priorities are developed through visits by research program managers and other senior staff meeting with leading agricultural R&D institutions and government bodies. Efforts are also made to collaborate and coordinate with other implementing partners, including government, NGOs, grower and industry groups, and donor organisations.

### Key performance indicators (2009–10)

- control measures for fruit fly and psyllid insect vector of citrus greening disease tested under commercial orchard conditions in Bhutan
- new maize varieties arising from ACIAR-managed research available to Afghani farmers
- conservation cropping practices demonstrated to farmer groups in northern Iraq.

### Bhutan

Because of Bhutan's relative lack of capacity to effect significant change across many agricultural sectors at once, the program will remain small and very tightly focused. Earlier ACIAR research to develop Newcastle disease

### Key program managers

Mr Les Baxter, Horticulture  
Dr Paul Fox, Crop Improvement and Management  
Dr Mirko Stauffacher, Land and Water Resources

### Country manager

Dr Kuhu Chatterjee,  
ACIAR Regional manager, South Asia (for Bhutan)



Oxen threshing wheat in Tajikistan

vaccine for village chickens was extended and adapted for the situation in Bhutan with the help of AusAID funding, and projects were initiated on the management of fruit flies and on footrot management in ruminants. A major initiative on improvement of citrus production (Bhutan's largest horticultural export industry) and pest and disease management is being implemented, and a smaller study on water and land management was carried out in 2008.

### Afghanistan

Two decades of war coupled with a recent severe drought have devastated Afghanistan's food production capabilities and depleted critical seed stocks, leaving the nation heavily dependent on food aid from international donors.

ACIAR's collaboration with Afghanistan, which started in 2002, provides support to wheat and maize production. Wheat is by far the most important crop, while maize is the third most important. Activities have aimed principally to import seed from suitable cultivars, establish on-farm participatory testing of imported germplasm for the identification of better adapted improved cultivars, and undertake local multiplication and distribution of selected cultivars. Particular attention is being paid to capacity-building, improving rust resistance in wheat, with specific attention to the new stem race variant designated Ug99, and promoting improved crop management, along with provision of improved cultivars of both wheat and maize. The gains made with cereal-based systems will be extended

through a capacity-building initiative to assist Afghani counterparts to design and implement community-based watershed programs, and provide on-the-job training, external training courses and MSc programs.

ACIAR is exploring future program options with the Ministry of Agriculture, Irrigation and Livestock, CGIAR partners and AusAID around capacity building in watershed management. Community-based watershed development provides an entry point for transfer of many improved agricultural technologies and for cropping diversification. This watershed focus will also strengthen on-farm engagement through the current project (CIM/2007/065) for cereals, further legume research linked to cereal-based systems, conservation agriculture, weed control, water-use efficiency of cropping systems, and higher value crops for sale to enhance farmers' livelihoods. ACIAR's project partners will work with in-country organisations who have established programs in agricultural extension and community development.

### Iraq

Iraqi scientists have had limited access to international developments in the agricultural sector for over two decades. Consistent with other support provided by the Australian Government, the ACIAR-managed, AusAID-funded projects are intended to facilitate the development of modern and sustainable agricultural production and marketing systems in Iraq.

In Iraq, pressures to abandon cereal-fallow rotations exacerbated soil degradation and nutrient depletion to the extent that established cropping systems are in serious decline. The introduction of sustainable tillage will play a key role in restoring these systems and spillover benefits are also expected beyond Iraq. The project has been shaped by the relevance of Australian expertise to Iraqi conditions, but constrained by the inaccessibility of Iraq by Australian scientists. It focuses on the enhancement of barley, wheat and grain legume production under dryland conditions in northern Iraq through the introduction and evaluation of appropriate modern varieties; and on the adaptation of improved management practices, including tillage, fertiliser and weed control techniques. Achieving sustainable increase in domestic production is now a national imperative. Significant yield improvements are anticipated, given that current yields of these crops are only about one-third of those under similar conditions in developed countries.

Iraq's agricultural sector represents a vital component of its economy as it is the largest employer (25% of the labour force) and the second largest industry after oil (contribution to GDP). The 2 million-hectare central-southern irrigated zone that produces vegetables and fruit as well as cereals is under increased pressure from salinity. According to the FAO, it is estimated that approximately 75% of this region is moderately saline and another 25% has levels of salinity that prevent farming. Ineffective and poorly maintained irrigation infrastructure, compounded by increasing levels of salinity of the irrigation water from both the Euphrates

and Tigris rivers due to changed water regimes, has led to the current situation. ACIAR's proposed project focuses on understanding salinisation processes, water management and the use of moderately saline soil for agricultural production. The project is funded by AusAID and managed by ACIAR, and executed by ICARDA and Australian research organisations.

### Program emphases in these countries are:

#### Subprogram 1: Field crop germplasm improvement and utilisation

CIM/2003/067 (multilateral)	Ensuring productivity and food security through sustainable control of yellow rust of wheat in Asia (India, Pakistan, Afghanistan, China) (CIMMYT)
CIM/2004/004 (multilateral)	Plant genetic resource conservation, documentation and utilisation in Central Asia and the Caucasus (ICARDA)
CIM/2004/024 (multilateral)	Better crop germplasm and management for improved production of wheat, barley, and pulse and forage legumes in Iraq (ICARDA)
CIM/2007/065 (multilateral)	Sustainable wheat and maize production in Afghanistan (CIMMYT)
CIM/2008/047 (multilateral, proposed)	Cropping system diversification, capacity building and rural livelihoods in Afghanistan (ICRISAT)

#### Subprogram 2: Sustainable water resources management

LWR/2009/034 (proposed)	Sustainable irrigation in southern Iraq
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#### Subprogram 3: Horticulture, including pest and disease management

HORT/2005/142	Improving mandarin production in Bhutan and Australia through the implementation of on-farm best management practices
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ICARDA-based Dr Ken Street collects seeds in Armenia as part of an ACIAR-funded germplasm project in the Caucasus and central Asia