

# South Asia

Financial year	Regional expenditure	Percentage of total bilateral expenditure	Board target as percentage of expenditure
2006–07	\$4,370,781	12.6	<15%
2005–06	\$3,504,178	11.4	<15%
2004–05	\$3,787,994	13.5	<15%

ACIAR’s South Asia program operates in two groups of countries. The first, India, Pakistan and Bangladesh, where most population is centred, is emphasised in ACIAR programs. A small number of activities is under way in the second grouping comprising Nepal, Bhutan, Iraq and Afghanistan. For the region an expenditure target of not more than 15% of our overall annual bilateral research expenditure has been set.

	Page
<b>India</b>	<b>68</b>
<b>Pakistan</b>	<b>73</b>
<b>Bangladesh</b>	<b>76</b>
<b>Other countries</b>	<b>78</b>
Bhutan	78
Nepal	79
Afghanistan	80
Iraq	81



# India

Active projects in 2006–07	29
AOP budgeted expenditure in 2006–07	\$2,017,584
Actual expenditure in 2006–07	\$1,770,516
Expenditure in 2005–06	\$2,018,915
Expenditure in 2004–05	\$2,601,365

Dr Kuhu Chatterjee,  
Country Manager, India



Key performance indicators	Performance 2006–07
Significant involvement of farmers and farmer communities in planning and testing ACIAR project technologies in at least two projects	Farmers near Ludhiana started testing the Happy Seeder technology in collaboration with the machinery manufacturer and Punjab Agricultural University. In West Bengal, the NGO PRADAN is working with two communities to increase farm productivity at a small watershed scale.
Policy workshops and papers in trade and water management reaching key government planners	Water management workshops were held successfully in India and Australia involving senior Indian national and state government decision-makers.
Forward strategy for ACIAR involvement in the Indian livestock sector developed and communicated	In a consultation with stakeholders it was decided to discontinue investment in the livestock sector in India. The Livestock Strategy Paper was approved by the ACIAR Board of Management
Significant adoption by tanneries of salinity-reducing techniques for processing hides	Activities were interrupted due to a change in leadership at the Central Leather Institute. Adoptions of new strategies to manage salt effluent, including those assessed in the research, are being adopted due to regulatory intervention.
Production constraints in soybean–wheat systems of Madhya Pradesh identified and appropriate research strategies implemented	Key growth-limiting nutrients and other constraints such as waterlogging have been identified, and NGO partners tested integrated nutrient management techniques and ‘broad-based furrow’ system with farmer groups.
Preliminary catchment water balances in the Krishna Basin quantified and used to inform water policy decision-making at national and state levels	General water balances for the Krishna Basin have been compiled and communicated on a state scale to key stakeholders in Karnataka, Maharashtra and Andhra Pradesh.
Forty percent of new projects designed to have significant farmer or policymaker impacts within five years of completion	Only one new standard project was initiated in 2006–07 and this was rated as a medium time-to-impact project. A small research activity will achieve significant implementation of shrimp-farming best management practices within five years.

## Relationship to the AusAID South Asia strategy

The AusAID framework for assistance in South Asia over 2003–07 'seeks to maximise the effectiveness of programs reducing vulnerability and increasing the productivity of the poor' with an emphasis in the areas of 'health and sanitation, education and natural resource management'. It recognises that countries 'are at different stages of development, each with their own development priorities', for example, in Bangladesh there is a shift in focus from food aid assistance to food security.

The ACIAR program, while emphasising the agricultural sector, also has a strong emphasis on reducing vulnerability and increasing productivity of the poor. In India, there is an increased focus on boosting sustainable production in more marginal lands of the country, and in technical and policy interventions to support ongoing access to water. Policy reform is supported through collaboration on trade and natural resource management policy.

### Position

India, the world's largest democracy, faces huge problems in its rural sector even as the overall economy forges ahead. Indeed, the greatest numbers of poor and undernourished people in any country (approximately 250 million) are found in India, particularly in rural areas. At the same time India faces trade liberalisation and rapid diversification of diet towards high-value agriculture. Recent analyses by the International Food Policy Research Institute (IFPRI), however, confirm that investment in agricultural R&D has powerful impacts on agricultural growth and poverty reduction.

Following changes in 2003, and recent discussions in India, it is expected that ACIAR collaboration with the Indian Council of Agricultural Research (ICAR) and the Council of Scientific and Industrial Research (CSIR) on future projects will involve joint funding and focus on high-priority issues or strategic alliances of mutual interest. Funding is also available from the Australian Government

Department of Education, Science and Training Australia–India Strategic Research Fund to assist Australian researchers to increase their participation in leading-edge scientific research with Indian scientists, to raise the profile of Australian research, and to support the development of strategic alliances between Australian researchers and Indian researchers and industry.

The Government of India is also encouraging donors to work with independent research organisations (IROs) and NGOs, and ACIAR has taken up this challenge. This will help the goal of increased emphasis on achieving practical farmer-level impacts, particularly in poorer regions of India. The strategy of working in the central and north-western parts of the country will be maintained, given its closer match to Australian agro-ecological zones.

India was one of the first countries to become involved in collaborative projects commissioned by ACIAR. An earlier project on wheat rust control by identifying the various rust races and by the identification and deployment of resistance genes has helped to keep India free of major rust epidemics, with obvious benefits for poor farmers and consumers alike. A molasses-based nutrient block with medication to supplement diets and control internal parasites of straw-fed dairy animals has been developed. For stored commodities, improved means of managing resistance to the fumigant phosphine and of detecting persistent pesticide residues have been developed. Recent research has assisted in the widespread adoption of minimal tillage approaches in wheat seeding in the rice–wheat farming systems, with significant benefits arising from water and fuel saving, timelier sowing, and easier weed management.

India has a large and well-developed national agricultural research system, centred around ICAR, which has collaborated strongly in ACIAR projects. Additional linkages with other groups such as state agricultural universities,

CSIR, IROs and technical NGOs have facilitated technology development and the delivery of benefits. ACIAR engages mainly with researchers in the north-west and centre of India, with research projects presently underway to enable India to manage scarce water and nutrient resources more efficiently, improve yield and quality of cereals and oilseeds, and diversify production and raise farm incomes.

A number of IARCs are also active in India. The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) is headquartered in Hyderabad. It has strong programs on peanut, sorghum, millet and chickpea, crop–livestock systems (with the International Livestock Research Institute, ILRI) and on 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.

## Achievements

India needs to **improve the overall productivity of ruminants**, especially milk-producing cattle and buffalo. It can do so by more effective and efficient use of feedstuffs, including cereal straws and other waste by-products. Scientists working in a project to improve the efficiency of feed utilisation have developed technology for preparing feed supplements that comprise bypass proteins (which are not digested by bacteria in the rumen, but by enzymes further down the gut) and fats produced from by-products such as oilseed meals, groundnut and palm oil cakes/residues. In trials undertaken in cows and buffaloes in the states of Gujarat, Haryana, Orissa and Kerala, feeding 1 kg per day of bypass protein supplements, compared with 1 kg of untreated meal, increased milk yield, fat and protein content and lifted the incomes of village dairy farmers. The tangible economic benefits of these feeding trials has led to the design, construction and operation of a commercial plant capable of producing up to 50 tonnes per day of bypass protein feed supplement.

ACIAR has contributed to the development of no-till systems for wheat in India, and now



*Rice on raised beds at ICAR-POSCR experimental farm in India*

preliminary research suggests **no-till rice** can also be grown. This would substantially boost the benefits of no-till wheat, which are often subsumed by tillage and puddling in rice cultivation. A project is aiming to improve the productivity of direct-seeded rice through the application of improved weed and crop management technologies, and thus minimise the yield gap between wheat and rice. Trials are underway at several sites. Studies on sowing time of direct-seeded rice undertaken at the Experimental Farm of the Rajendra Agricultural University in Bihar revealed that long- and short-season varieties perform very differently in response to delayed planting time. In the long-season variety, grain yield declined significantly with delayed seeding, but short-season varieties performed better. Therefore, selection of appropriate varieties for direct-seeded rice appears to be pivotal to the success of the project.

In West Bengal, drying maize and rice is inefficient and unreliable, and more attention is needed to remove moisture and maintain quality during storage and transport. In an attempt to modernise the region's grain industries a project has been commissioned to **design and introduce drying systems** that reduce risk of loss of grain quality after harvest. The project team has constructed a two-stage drying system that comprises a fluid bed first stage for rapid removal of moisture down to around 17%, followed by a slower in-bin system to achieve safe storage levels of moisture content. Laboratory-scale units for both drying processes were constructed and tested for performance. Now a commercial prototype two-stage dryer, based on the laboratory-scale units, has been constructed by a local fabricator and installed in the Burdwan Government Seed Farm as a demonstration unit for drying paddy rice seed.

The East Indian plateau, covering three Indian states, receives high rainfall (in excess of 1,200 mm per year) but 80% of this falls

in the monsoon months between June and September. Despite the high rainfall, water shortages are a problem, with high runoff and little, if any, water harvesting practised. Cropping intensity is low, with only one crop per year, timed to maximise available water. A project is **introducing watershed management**, including water harvesting, and is testing new cropping and agronomic practices to improve livelihoods in this poor region of India. In the first step to develop a watershed development plan, PRADAN (an NGO) is undertaking socioeconomic 'mapping' to ascertain the resources available and list the constraints to development. PRADAN has also produced a 'resource map' of the Pogro watershed. A conceptual model for hydrology of small watersheds has been developed, and this could form the basis for modelling that will develop criteria for either assessing the suitability of small watersheds for development, or for the planning, design and installation of water-harvesting measures.

Culturing shrimp is a potentially lucrative industry in both Asia and Australia, but many Asian farmers have seen profits eroded by disease outbreaks. The pathogen of greatest concern is **white spot syndrome virus (WSSV)**. A clearer understanding is needed of WSSV transmission sources and routes, such as infected seed stock. Polymerase chain reaction (PCR) methods for screening are often limited, particularly on-farm, and a project is making PCR screening more effective. A major experimental component is a longitudinal study of shrimp ponds in the West Godavari District of Andhra Pradesh, India. The aim is to obtain information on the quality of PCR screening results available to farmers and to use molecular epidemiological analysis to trace the sources of disease outbreaks in ponds. Farmers participating in the study are members of 'aquaclubs' formed as part of an ongoing extension program of best management practices. Their farms were stocked with PCR-screened postlarvae (PLs) obtained from local hatcheries. When shrimp were PCR-tested the results indicated there

was a very high prevalence of WSSV infection in the study ponds, with a high proportion of moderate–severe infections. A small number of nursery ponds were pinpointed as the source of seed for a high proportion of disease outbreaks during grow-out, and they are highly likely the weak link in current disease-management practice.

**Agricultural knowledge, science and technology (AKST)** have played key roles in reducing poverty. When they produce outcomes such as the Green Revolution, the benefits can be widespread. But would similar outcomes, if produced today, result in similar benefits? And what would be the pathway for delivering them to the world's

poor? An ACIAR project involving The World Bank and IFPRI is attempting to answer these and related questions, in order to determine appropriate pathways for development and for disseminating information to promote agricultural advances. The project goal is to provide policymakers with options of alternative policies and investments for AKST. Using an expanded model proven in past research, a series of scenarios of future opportunities and alternative pathways for development is being described, with particular reference to India and China. Each scenario, presented with associated storylines, is being analysed prior to posting the results via the Internet for policy- and decision-makers.



*Women in Rajasthan collecting water from the village well*

# Pakistan

Active projects in 2006–07	9
AOP budgeted expenditure in 2006–07	\$2,007,239
Actual expenditure in 2006–07	\$1,658,786
Expenditure in 2005–06	\$1,045,668
Expenditure in 2004–05	\$506,033

Dr. Kuhu Chatterjee,  
ACIAR Country Manager,  
Pakistan



Key performance indicators	Performance 2006–07
Agriculture Sector Linkages Program (ASLP) components implemented that address Pakistan priorities and make optimal use of Australian technical expertise	Three projects in mango production, mango supply chain development and citrus production have been implemented. The design for a fourth project on increasing dairy extension effectiveness was completed and is due for implementation in 2007–08.
Government of Pakistan (GoP) funded program to disseminate bed-planting technology in other maize–wheat growing regions initiated	A five-year, \$11-million GoP program, aimed at establishing 1,000 farmer cluster groups based on the model trialled and using technology developed by ACIAR, was established.
Proof-of-concept of serial biological concentration of irrigation drainage water providing the basis for piloting in other districts of Punjab and Sindh provinces	While two pilot sites were successfully established, the original serial biological concentration concept did not work as well as anticipated.
Forty percent of new projects designed to have farmer or policy impacts within five years of completion	The supply chain development project is specifically designed to achieve early impacts. Projects on mango and citrus production are classified as medium-term impact projects, but have elements that lend themselves to rapid dissemination and uptake by farmers.

## Position

Pakistan has been an ACIAR partner country since 1984. In Pakistan, there is increasing pressure on availability of water resources for irrigation 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 Australia's water resource and salinity issues, Australia is very well placed technically to assist Pakistan in addressing the above issues. As a result, ACIAR's program continues to focus on

irrigation, drainage and salinity management in the major cropping systems. Some of the technologies developed comprise the introduction of salt-tolerant forage species from Australia to Pakistan and the use of eucalypts to assist in drainage of shallow water tables.

In addition, there is recognition that Australia also has skills in some of Pakistan's key horticultural crops, mainly citrus and mangoes, the two most important tree crops. Australia can provide expertise in a

'whole-of-systems' approach to increase the productivity and competitiveness of the mango and citrus industries, encompassing fruit-to-market strategies.

Pakistan is also one of the world's largest milk producers, slightly less than half of which is produced 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 the integration of forage production into farming systems to assist in improving milk production, a key to poverty reduction particularly for some of Pakistan's landless.

### **Achievements**

Under the auspices of the **Agriculture Sector Linkages Program (ASLP)**, the Pakistan program is focusing on two thematic priorities: horticulture and dairy. Water is also a cross-cutting theme, which underpins these priorities as well as linking the expanded Pakistan program to earlier ACIAR-funded research. The focus of the past year has been to complete the design of four R&D projects. New projects were developed for the mango and citrus sectors and in the dairy-production sector. A dairy knowledge fair was jointly organised with Austrade in Lahore in February 2007.

The sustainable development of the mango industry in both Pakistan and Australia has been hampered by a **shortage of high-quality fruit** for export. In addition to postharvest handling and storage, disease and pest losses, variable productivity due to orchard management issues, and market-access challenges constrain development of the mango industry. A project seeks to establish 'clean' mango nurseries so that high-quality planting material is made widely available to the Pakistan industry. The project is also developing improved tree husbandry and management options to produce sustainable yields and quality fruit; to develop improved detection and management

strategies for mango sudden death syndrome (MSDS) and other major diseases of mangoes; and to build research capacity in the mango industry.

Much of Pakistan's fruit and vegetable production, including mangoes, is not fully utilised, due to poor harvesting, handling and other postharvest practices. A project is addressing key constraints currently limiting the **efficiency, effectiveness and competitiveness of supply chains** for Pakistan mangoes. It aims to improve and maintain mango quality from harvest to consumption by identifying present market needs and likely future opportunities for Pakistan mangoes, through analysis of existing supply chains and the development of improved supply chain management systems and practices.

Pakistan has set an **annual export target for citrus** of 500,000 tonnes within the next 5 years, and \$300 million in export earnings by 2013, but some key constraints need to be addressed to achieve these ambitious targets. A new project has been developed after an ACIAR-supported scoping study outlined key constraints to a more productive citrus industry. Its principal aim is to improve mandarin and orange productivity in Pakistan (and Australia) through improved nursery production practices, demonstration of 'best practice' orchard management, and enhanced research, extension and production capacity of Pakistan citrus institutions and industry.

Severe epidemics of **plant diseases caused by geminiviruses** have emerged in recent years. Australia and Pakistan have collaborated to learn more about them and particularly their effect on cotton and tomato crops. The upsurge in the occurrence of geminiviruses is linked to the spread of their vector, the whitefly *Bemisia tabaci*. Epidemics in Pakistan during the 1990s were especially severe, with huge losses in cotton and related industries, while in northern Australia the prospect of large losses through

geminivirus of tomato is increasing. From field surveys and complementary work on virus characterisation the scientists have found that cotton leaf curl disease (CLCuD) in Pakistan can actually be caused by several different viruses. Virus disease complexes were also identified from leaf curl diseases of tomato, chilli, cucurbits, okra, papaya and the yellow vein disease of the weed *Ageratum conyzoides* (which acts as a reservoir of infection for cotton crops). In parallel with the cotton work, understanding of the tomato leaf curl disease and spread has been enhanced in Pakistan, AVRDC (The World Vegetable Centre) and Australia. The outcomes of this project will be used in plant-breeding programs aimed at producing geminivirus-resistant cultivars of cotton and tomatoes.

Residue burning is widespread in rice–wheat systems of Pakistan, causing serious air pollution and loss of nutrients. In response to this problem, the Farm Machinery Institute

(FMI) of the Pakistan Agricultural Research Council (PARC) in Islamabad recently designed and built a prototype machine (the 'FMI Seeder') for **direct seeding wheat into rice residues**, in a single operation based on a similar machine developed in another ACIAR project in the Punjab. However, while the problem has almost been solved mechanically, there are a number of agronomic issues to be resolved to achieve good establishment and crop performance. A project is evaluating and refining the technology for a range of stubble, soil and seasonal conditions, and developing guidelines for achieving good establishment, efficient use of nitrogen fertiliser and high yields in rice–wheat and alternative systems. The project is making progress in further developing the machinery and establishing operational guidelines for the novel seeder, in preparation for its commercialisation and widespread distribution.



The ASLP mango project team undertaking a grower field consultation in Pakistan

# Bangladesh

Active projects in 2006–07	7
AOP budgeted expenditure in 2006–07	\$405,500
Actual expenditure in 2006–07	\$413,045
Expenditure in 2005–06	\$371,464
Expenditure in 2004–05	\$243,712

Dr. Kuhu Chatterjee,  
ACIAR Country Manager,  
Bangladesh



Key performance indicators	Performance 2006–07
Technical and economic feasibility of wheat production examined in southern Bangladesh, and options for further research and development determined	The study confirmed the long-term financial and technical feasibility of growing wheat as a rabi-season crop on residual moisture. ACIAR commissioned a project to underpin the further expansion of wheat into rice-fallow systems, with strong participation of NGOs.
Integrated legume research program designed and initiated	A project aimed at expanding production of rabi-season chickpeas and lentils was initiated in the north-west of Bangladesh.

## Position

Bangladesh has been a partner country since the mid 1990s. ACIAR's program is small, given Australia's relatively 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 cropping system) and potential for increased inclusion of a legume component in cropping systems. One project addresses diseases of these legumes.

A completed project on management of Hilsa fisheries led to a series of management recommendations that will require difficult decisions to be made by the Government if the fishery is not to risk collapse.

Most recently a project analysing the fate of arsenic from groundwater has produced useful information that has contributed to a larger initiative on the arsenic problem in Bangladesh.

## Achievements

Current collaboration is mainly in the production and management of grain crops. Botrytis grey mould (BGM), considered **the most important foliar disease of chickpeas** in Bangladesh, has caused a substantial decline in chickpea production over the past decade. A project has screened a wide range of chickpea germplasm (including closely related wild species) for resistance to BGM under field conditions in Bangladesh and Nepal to provide a sound basis for genetic enhancement of host-plant resistance to BGM. Field screening to identify chickpea lines with resistance to BGM took place in Bangladesh over four seasons. There were clear differences in reaction to BGM, as measured on a 1 to 9 rating scale at each location in all seasons. A series of on-farm trials was conducted in Bangladesh to evaluate various components of disease and crop management under farmers' conditions and merge them with the evolving integrated crop management (ICM) package for chickpea. Using the results gathered in the 2002–03 season, the project has assembled ICM packages, incorporating

best-bet technologies for BGM management along with other optimum agronomic packages, and these have been tested in farmer-managed operational scale plots and compared with adjacent plots where prevailing farmers' practice was followed. The trials found yield increases in five districts due to ICM were around 20–50%.

In the past, lands in southern Bangladesh were considered **too risky for rice–wheat rotations** because of the hot, short-season rabi (dry-season) environment and, in some districts, the saline soil profile and limited water resources. Only recently have these southern lands been reconsidered for rabi-season production of crops such as wheat, maize and mungbean, using supplementary irrigation from limited surface water stored over from the wet kharif season. ACIAR

funded a scoping study to assess the long-term technical and economic feasibility of rabi wheat production. The study provided justification for continued R&D investment in rabi-season crops on currently fallow lands in southern Bangladesh. Specifically, the study noted that water resources of southern Bangladesh needed to be characterised to determine their potential availability for irrigation, their distribution, and the types of water bodies and their quality. Salinity levels have the potential to affect wheat production, and tolerance of current and improved varieties to salinity needs further investigation. More work is also needed to adapt agronomic practices, especially the timing and amounts of fertiliser and irrigation, in order to increase ecological sustainability, profitability and yield.



*A locally manufactured power-tiller, zero-till drill*

## Other countries

Active projects in 2006–07	9
AOP budgeted expenditure in 2006–07	\$492,928
Actual expenditure in 2006–07	\$528,434
Expenditure in 2005–06	\$68,131
Expenditure in 2004–05	\$436,885

Key performance indicators	Performance 2006–07
At least five Iraqi scientists receive in-depth training in integrated pest management (IPM)	Five Iraqi scientists were trained by CSIRO and Queensland Department of Primary Industries and Fisheries for 5 months of intensive IPM.
CIMMYT wheat lines identified with improved yield and/or disease resistance to local lines in field trials in Afghanistan	Eighty-two promising bread-wheat lines were advanced, based on both yield and disease resistance as evaluated in multi-site yield trials.

### Bhutan

#### Position

ACIAR's small program with Bhutan began in 1998. Because of Australia's relatively low comparative advantage, the program has remained small. Earlier ACIAR research to develop Newcastle disease 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 protection and pest and disease management is under design.

#### Achievements

A new project aimed at improving mandarin production in Bhutan and Australia

through the implementation of on-farm best management practices commenced in April 2007, as part of the Bhutanese Government initiative to substantially increase the country's production of citrus (mainly mandarin). This project seeks to lift overall productivity of Bhutan's citrus on a sustainable basis and to improve the quality and yield of its present mandarin cultivar.

A short-term scoping study commenced in May 2007. Its main purpose is to make recommendations to the Royal Government of Bhutan on possible actions for improved land and water management practices, specifically in relation to surface water and watershed protection, water harvesting, improved cropping/farming practices and improved water-use efficiency.



*Bhutanese women on the way to the village market*

## Nepal

### Position

Almost 85% of Nepal's population of 24 million are rural and the majority of these are involved in agriculture. ACIAR formerly had a small program of projects in Nepal, with an emphasis on the lowland Terai, which has more in common with Australian agricultural production environments than upland areas. The discipline focus for collaboration has emphasised crop production and management, and some aspects of animal health. ACIAR-funded research has made progress in the fields of crop and livestock health and productivity and land management. Benefits to date include the development of a specific vaccine that has effectively targeted the two strains of virulent footrot existing in Nepalese sheep and goats; the introduction of new varieties of lentils resistant to disease and drought; and the identification of factors in wheat sterility (low temperature and boron limitations).

However, ACIAR is no longer developing any new projects with Nepal.

### Achievements

Scientists have continued investigation of fungal wilt and Stemphyllium (a damaging leaf and stem disease) in lentil, seeking to identify tolerant lines for use as genotypes for direct release or as parents in breeding programs in Nepal and Australia. They have also investigated the efficacy of seed priming for improving seedling establishment, vigour and yield in lentil post-rice ('paira') cropping systems in Nepal. The technology is being extended to farmers through on-farm demonstrations and seed increase of promising genotypes. The project has advanced the development of new Lathyrus germplasm with low toxin to make it more suitable as food for humans and livestock in Nepalese conditions, giving new impetus for inclusion of this crop in farming systems there.



*Animals on the Nepalese terraces provide fertiliser*

## Afghanistan

### Position

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

ACIAR's multilateral projects in Afghanistan provide short-to-medium-term support to wheat and maize production, wheat being by far the most important crop and maize the third most important. The objective of the project is being achieved principally through provision of seed of suitable cultivars via import, establishment of on-farm participatory testing of imported germplasm for the identification of better-adapted improved cultivars, and local multiplication and distribution of improved cultivars. Particular attention will be paid to improved yellow rust resistance in wheat and to promoting improved crop management along with improved cultivars of both wheat and maize. The capacity of local NGOs, state scientists and farmers will benefit. The project is co-funded by AusAID, managed by ACIAR and executed by CIMMYT.

### Achievements

Despite the logistical difficulties and the difficult security situation in some parts of Afghanistan, the project 'Wheat and maize productivity improvement in Afghanistan' has progressed successfully. In collaboration with researchers in the Agricultural Research Institute of Afghanistan (ARIA), 126 promising wheat and maize varieties have been identified, six of which are potential candidates for official release nationally. Promising varieties, as well as appropriate crop-management practices, are being demonstrated on-farm in collaboration with a strong network of NGOs and government partners.

There is strong anecdotal evidence that the varieties introduced by the project are being adopted. This is particularly evident in Alingar district in the Laghman province, where the project works in collaboration with farmers and the Norwegian Project Office, and where a double cropping of improved wheat and maize varieties introduced by the project is potentially beneficial to the farmers. Such a combination improves the productivity of wheat-based cropping systems and provides farmers with a viable option to replace poppy production. Finally, the project has made



*Inspecting crops in Afghanistan*

good progress towards developing a strong core team of well-trained national scientists working in the public, private and NGO sectors.

Afghanistan is also involved in the ACIAR-supported activities at CIMMYT, ICARDA and PBIC–Sydney University to ensure productivity and food security through sustainable control of wheat yellow rust in Asia.

## Iraq Position

The high levels of input subsidies, guaranteed commodity prices and free food distribution have distorted agricultural markets in Iraq and have provided no incentive for innovation by farmers. In addition, scientists have had limited access to international developments in the agricultural sector for over two decades. In concert with other investments by AusAID, the ACIAR projects are intended to assist the Iraqi Government in its quest to modernise agricultural markets and production systems.

The projects have been shaped by the relevance of Australian expertise to Iraqi conditions and by the constraint of limited access to Iraq by Australian scientists. One project will focus 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, coupled with the adaptation of improved management practices, including tillage, fertiliser and weed control. Significant yield improvements are anticipated, given that current yields of these crops are only about one-third that under similar conditions in developed countries. In the second project Australian scientists will initially assist Iraqi senior scientists to develop a National Strategy Plan for the control of jasmine whitefly affecting citrus production in central Iraq, and follow this with training in Australia of junior scientists in integrated pest management practices to enable them to implement that plan upon return to Iraq. The

projects are co-funded by AusAID and ACIAR, managed by ACIAR and executed by ICARDA and Australian research organisations.

## Achievements

The **jasmine whitefly project** has concluded. As recorded in last year's annual report, a strategic plan for the management of jasmine whitefly and also the dubas bug in the date palm/citrus complex of central Iraq has been submitted to the Iraqi Government and formally accepted. How to act on the plan will require considerable further discussion, planning and development. Five Iraqi scientists have spent time in Australia, three located with the Queensland Department of Primary Industries and Fisheries to work on active integrated pest management projects, while a further two were located at CSIRO Entomology in Brisbane working as part of the silverleaf whitefly biocontrol program.

Another project has sought to develop better crop **germplasm and management** for improved production of wheat, barley, and pulse and forage legumes in Iraq. Despite many difficulties, the project has gone remarkably well, facilitated by the enthusiasm, flexibility and dedication of Iraqi collaborators, the proximity of ICARDA in Syria, and the interest and support of ICARDA and Australian scientists. An agreed work plan for the demonstration program has been carried out as planned at 13 locations in the four main agroclimatic zones. However, heavy rain,



*Jasmine whitefly*

security concerns, land disputes and transport shortages have reduced from 80 down to 30 the planned research trials evaluating better adapted lines/varieties.

On-farm demonstrations of improved varieties were conducted as planned in the following types of location: three high-rainfall areas; four medium-rainfall areas; three low-rainfall areas; three with supplementary irrigation. Best-bet technologies and new lines/varieties were tested and demonstrated with farmers in a participatory manner at these sites.

In project-linked research at ICARDA, a range of lines/varieties of oats, peas, canola and other oilseeds from Australian collaborators was introduced and tested for adaptation and use in Iraq. Some varieties grew and seeded very well. The trial was inspected and discussed with several groups of visiting Iraqi scientists, and seed from material of interest in Iraq and ICARDA was collected for broader testing.

The project has re-established international linkages amongst Iraqi, ICARDA and Australian scientists. Twenty-six Iraqi scientists have participated in six ICARDA training courses, and there were several visits by others to discuss and plan project activities. Australian collaborators have presented four seminars of relevance to Iraq, covering advances in cereal and legume improvement, crop management and crop–livestock interactions in Australia.