

South Asia

Financial year	Regional expenditure	Percentage of total project expenditure	Commission target as percentage of expenditure
2007–08	6,199,724	14.5%	<15%
2006–07	5,933,376	15.1%	<15%
2005–06	5,285,715	15.0%	<15%

ACIAR’s South Asia program operates in two groups of countries. The first—India, Pakistan and Bangladesh—where most of the population is centred, is emphasized in ACIAR programs. A small number of activities are underway in the second grouping comprising Nepal, Bhutan, Iraq and Afghanistan. For the region as whole the expenditure target of not more than 15 per cent of our overall annual research expenditure has been set.

India	86
Pakistan	92
Bangladesh	96
Other countries	98
Afghanistan	98
Bhutan	99
Iraq	100



India

AOP budgeted expenditure in 2007–08	\$2,890,022
Actual expenditure in 2007–08	\$2,825,837
Expenditure in 2006–07	\$2,411,093
Expenditure in 2005–06	\$2,761,952

Dr Kuhu Chatterjee,
 ACIAR Country Manager,
 India



Expenditure includes both bilateral and multilateral projects

Key performance indicators	Performance 2007–08
An integrated cluster of linked projects designed and implemented around sustainable wheat farming systems in north-west India	It was agreed with the Indian Council for Agricultural Research to further focus around a program on using marker-assisted selection to enhance breeding of new wheat varieties, focusing on biotic (stem rust), abiotic (water logging, drought tolerance) and quality traits. The first two of six components have been implemented, another three are well advanced in design.
Improved soybean–wheat production systems being tested by farmers and propagated by NGOs in Madhya Pradesh	Nutrient management strategies for soybean–wheat cropping systems are being disseminated through a program established by farmers and supported by NGO staff. The trials confirmed the experimental results and provided a useful extension tool, establishing almost 100 sites. Adoption of these strategies, which involve an increased input of commercial fertiliser, will provide a clear confirmation of the approach, particularly in the current climate of rapid escalation of fertiliser prices.
Economic trade-offs of water allocation scenarios in the Krishna Basin quantified and communicated to water policy decision-making at national and state levels	Results using a framework to determine the value of different water uses were discussed during three stakeholder workshops in Andhra Pradesh, Karnataka and Maharashtra. Although the value of water for urban and industrial uses is substantially higher than for irrigation, feedback from water policy-makers is that social dimensions of water use may override purely economic evaluations.
A new collaborative program marker-assisted breeding in wheat developed	Successful program implementation has been followed by the addition of a bioinformatics component to extend impact.
40 per cent of new projects designed to have significant farmer or policymaker impacts within five years of completion.	All three new projects implemented in 2007–08 were designed as ‘short time to impact’ projects. In addition, three Small Research Activities were initiated, two of which have elements of early uptake.

Key performance indicators	Performance 2007–08
Demonstrated influence of policy research outcomes on trade and water policy decision-making processes	A project on trade liberalisation and domestic market reforms in Indian agriculture evaluated the impact of domestic market and international trade policy reform options on agricultural prices, production, incomes and consumption. Workshops used to disseminate policy recommendations to key stakeholders. Briefings of water policymakers conducted in three states on water allocation in the Krishna Basin and options to optimise state-wide water allocation.

Position

The emphasis of ACIAR's India program is on maintaining sustainable wheat-based cropping in the more favoured areas of north-western India, achieved through application of better genotypes, better management technologies, and increased linkage of farmers to markets. In the less favoured areas of India's rainfed Central Plateau, the emphasis is on broad-scale land and water resource management work, applying technical, economic and policy research approaches to increase water productivity. Both themes will be complemented by more general policy analysis work at the national level.

Achievements

Subprogram 1: Sustainability of wheat-based cropping systems in north-west India

As the scope of this subprogram is further tightened to focus primarily on marker-assisted breeding of wheat, a range of ongoing projects addressing the broader issues related to sustainability of wheat-based cropping have continued to progress very well.

Significant progress has taken place in the project to establish **zero-tillage in rice cropping in rice and wheat**. During 2007, researchers identified and developed suitable establishment systems for direct seeded rice as an alternative to the traditional

hand transplanting method. At field sites across the states of Haryana, Punjab and Bihar yield responses for coarse grain and basmati rice types were generally similar under comparative evaluations of direct seeding with the traditional hand-transplant system. Only at Kapurthala in the Punjab, which has a sodic soil, were rice yields significantly higher (44–85 per cent) under the traditional hand-transplant system. By contrast, rice established under zero tillage at Pusa in Bihar yielded significantly more grain (9–39 per cent) than the traditional hand-transplant system, and higher yields (8.3 t/ha) were obtained with zero-tillage



A local woman involved in the manual harvesting of wheat in Faizabad, Uttar Pradesh



Project team working on improving root traits and drought tolerance of wheat

machine-transplanted rice than with conventional puddled transplanted treatment (7.5 t/ha) at Kurukshetra research station, Haryana.

Waterlogging adversely affects 10–15 million ha of wheat each year, in soils ranging from the heavy clay alkaline/sodic soils of northern India to the acidic sandy duplex soils of Western Australia. There is evidence that every time wheat is irrigated in the heavy soils of India it becomes waterlogged. Scientists have investigated the **genetic diversity for waterlogging tolerance** in wheat, evaluated mechanisms of tolerance, and used this knowledge to develop new waterlogging-tolerant breeding lines for specific target environments. They have now established a genebank of these new lines, and the project is poised to capture the benefits of the work through the development of high-performing varieties.

A project focusing on **integrated manure nutrient management** seeks to overcome nutritional limitations in the soybean–wheat cropping system of the monsoonal environment in Madhya Pradesh. Scientists have tested an integrated nutrient management (INM) approach where the use of farm yard manures (FYM) is combined

with inorganic fertiliser, and demonstrated that substantial benefits can be gained from a smaller application of manure (5 t/ha) that permits farmers to treat a larger cropping area each year. Even so, there is insufficient manure available and an inorganic fertiliser regime termed balanced fertilisation (BF) seems necessary. In 2007–08 the project team evaluated INM and BF using a ‘Baby Trial’ strategy. In the Kharif (monsoon season) soybean crop, inorganic fertilisation produced yields 23 per cent greater than the farmer’s practice while the INM approach produced yields 46 per cent higher. During a farmers’ field day, farmers attributed the higher soybean yield under INM to better pod bearing relative to BF. Where farmers maintained effective control of weeds and pests the yields were even better, illustrating the beneficial impact of farm management on fertiliser practice.

Subprogram 2: Water management for enhanced livelihoods in 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

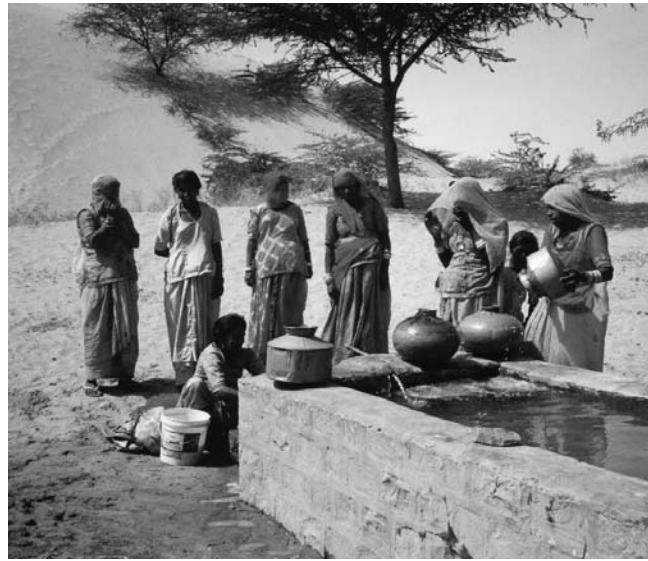
India. Water harvesting, as part of a broader watershed development agenda to increase water availability, is a key policy initiative of the Indian Government in these areas. At the same time, there is increasing competition for water as basins become fully allocated. Work in this subprogram is progressively being streamlined to a cluster of closely linked projects to enable a more holistic approach to water resource management.

Research has continued into **water availability and allocation issues** in India's Krishna Basin. This is an almost closed basin (i.e. all the water available is fully allocated to some purpose for a large part of the year) populated by some 73 million people, and the system is already severely short of water. During 2007–08 the team brought together much of the initial project thinking and activities into a set of models that explain the allocation of water in three sub-catchments within the basin. In April 2008 high-level officials from all three states visited Australia to gain an insight into the challenges and opportunities of aspects of water management in the Murray-Darling Basin, with a focus on how to cope with the problems of water scarcity. This tour provided a forum for exchanging ideas and initiated a process of harmonising the conflicting positions held by individual states and their policymakers in regard to the even more acutely water stressed Krishna Basin.

Smallholders in watersheds of the East India Plateau stand to benefit **from water harvesting and better cropping systems.**



Villagers construct seepage pit to capture shallow ground water for irrigation



Women at the waterhole in Rajasthan

They have continued to participate fully and with increasing enthusiasm in the action learning cycle of planning, doing, observing and reflecting. A Village Core Committee has improved project implementation by shifting ownership and responsibility for trial site selection and management from the project team to the farmers. This large group of subsistence farmers has undertaken business-like planning of a research project, indicating development in their capacity to deal with complex issues and integrate them into village life. The high standard of management at trial sites and the reduced level of team support needed are indicators of the success of these moves.

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. Hence, ACIAR retains some projects aimed at assisting India with the implications of its transition from a highly regulated economy to a more open market economy.

An important study on **agricultural trade liberalisation and domestic market reform**

Marker-assisted selection promises more efficient wheat breeding

ACIAR and the Indian Council of Agricultural Research (ICAR) have engaged in collaborative research for 25 years. One of two main emphases in ACIAR's India program in recent years has been sustainable wheat-based cropping. Project work arising from this focus area takes place in north-western India, where researchers have sought improvements through better genotypes, improved management technologies and enhanced linkages of farmers to markets.

Now, after a review of priorities in 2007, ICAR and ACIAR have agreed to gather sustainable wheat cropping activities into a program based around the application of marker-assisted selection (MAS) to achieve greater efficiencies in wheat breeding. Efficient new wheat cultivars of better yield and quality are increasingly necessary in the global environment, particularly in India where population growth is leading to major stresses on natural resources. As such, the primary objectives of the collaborative multi-institutional network plan are: 1) to identify new markers that may be utilised to convey higher tolerance to abiotic stresses and additionally provide new or strengthened resistance to biotic stresses; and 2) to develop new wheat germplasm in shorter

time spans using MAS, thereby resulting in the rapid deployment of superior wheat varieties.

This new approach represents a paradigm shift in ICAR-ACIAR collaboration, away from a portfolio of projects to a more closely planned and integrated overarching program. It takes into account both Indian national agricultural priorities and the key themes for which synergies can be achieved by the two countries. The program structure also recognises the advanced research capabilities in both countries, and ensures sharing of program costs and benefits by the partner countries. A new ACIAR-commissioned project 'Molecular markers for faster wheat breeding' has a central and catalytic role in the program.

As a first step in defining the priorities for this new Indo-Australian Program a joint workshop was held in Delhi in October 2007 where participants determined the role of the Indo-Australian Program on Marker-assisted Wheat Breeding (IAP-MAWB). Given ACIAR's move towards funding projects with shorter time to impact, the IAP-MAWB will focus on MAS applications, trait testing and marker validation to form the core of a broader Indian wheat breeding program.

was completed, including a workshop for Indian researchers and decision-makers to consider the results in June 2008. Indian agriculture remains subject to a wide range of government regulatory impacts and market distortions. The project has broken new ground in assessing the impacts of current policy and institutional settings alongside domestic market and trade policy reform options. The project has provided Indian

policymakers, researchers and advisers with a review of the main institutional and regulatory interventions; a case study analysis of marketing system constraints and impacts in selected agricultural sectors; an evaluation of the economic impacts of domestic and trade policy reform options together with a set of policy recommendations to achieve more efficient markets. A key finding was that trade policy reform must



Transplanting rice

be complemented by 'behind the border' domestic reforms if government is to achieve their objectives of improved productivity, higher rural employment and incomes and enhanced food security. A follow-on project on **facilitating efficient agricultural markets** in partnership with the influential Indian National Centre for Applied Economic Research (NCAER) has been contracted in 2008. This research institute will further analyse domestic regulatory reform applications with guidance of policymakers in relation to the range of available competition policy mechanisms and their applications in particular circumstances. Australian experience and expertise in this matter and comparisons with other relevant developing countries will be used in the analysis.

Other projects

Excellent progress has been made in developing **aquaculture in degraded inland areas** in India and Australia. In India the project has focused on development of technology for hatchery and growout production of the giant freshwater prawn, *Macrobrachium rosenbergii*, in shallow watertable saline groundwater. Major achievements include identification of ionic imbalances of potassium, calcium

and magnesium in raw saline groundwater compared with seawater. The scientists have developed a cheap, efficient method to ameliorate these imbalances and make the saline groundwater suitable for *Macrobrachium* larval rearing, and now many thousands of post-larval juveniles are available to local and interstate commercial and research facilities. Following the success of the project the Indian institutions have recognised inland saline aquaculture as an important niche area of research and provided significant funding to advance the work.



Smallholder prawn ponds under cultivation in Andhra Pradesh

Pakistan

AOP budgeted expenditure in 2007–08	\$2,053,130
Actual expenditure in 2007–08	\$1,942,917
Expenditure in 2006–07	\$1,708,789
Expenditure in 2005–06	\$1,095,670

Dr Kuhu Chatterjee,
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Pakistan



Expenditure includes both bilateral and multilateral projects

Key performance indicators	Performance 2007–08
Significant exposure of Pakistan researchers and extensionists to modern methods of knowledge transfer and agricultural extension in dairy production	160 farmers from two areas of Punjab state engaged in three different extension approaches involving a range of providers (NGO, dairy cooperative, government extension agency). Pilot trials are being complemented by interactive workshops to introduce Australian extension expertise to scientists, academics and extension workers.
Bed planting and residue management systems using locally manufactured machinery achieving significant saving in irrigation water	The 'National Project to Stimulate Adoption of Permanent Raised Beds' has commenced the roll-out of permanent raised bed (PRB) technology. In 2008 at least 20 units of PRB machinery had been ordered by farmers, and three local companies are manufacturing PRB machinery based on ACIAR project designs. The introduction of 'Happy Seeder' technology in two regions of Punjab has led to more than 150 ha of wheat being planted using the new planters, with the area likely to double in the coming wheat season.
Mango supply chains mapped and opportunities to improve value generation identified for selected domestic and export markets	Domestic and export (UK, Dubai, China, Singapore) mango supply chains have been mapped and assessed and opportunities to improve value generation have been identified. These include lime-based de-sapping of fruit to control sap-burn, improved handling and packaging, changes in harvest maturity of fruit, storage conditions and grading. These improvements are currently being adopted by growers.
40 per cent of new projects designed to have components leading to significant farmer or policy impacts within five years of completion	Each of the two projects that commenced in 2007–08 has components likely to deliver short-term impacts. One will optimise canal and groundwater management to assist water-user associations in maximising crop production and managing salinisation. A second project on enhancing dairy extension systems will train extension providers in better delivery methods and supply more relevant material.

Position

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

Achievements

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.

Research under the ASLP has continued. A project to **optimise mango supply chains** for more profitable horticultural agri-enterprises has seen the introduction of simple techniques to increase the shelf life and the quality of mangoes through the practice of limewashing. Use of the process has positioned the Pakistan Horticulture Development and Export Board (PHDEB) to target the high-end European market. Initial batches of high quality, limewashed mangoes have achieved three-five-fold higher prices, and the Export Board is now poised to enter new export markets in Germany. This will help increase volume and value of mango exports from Pakistan.

Another breakthrough has been the discovery of the main agents causing the **Mango Sudden Decline Syndrome**. Prior to the ASLP, conflicting diagnostic protocols and



Dr. Saeed Shafqat and PhD student inspecting research on the role of bark beetle on mango sudden death syndrome

fragmented research gave an uncertain picture of causal agents, and development of effective disease control practices was impossible. Now the scientists have a basis for developing a range of recommendations, and this should lead to effective mango decline control measures within the life of the project.

In a project to **increase citrus production** in Pakistan and Australia through improved orchard management techniques, the researchers tried unsuccessfully to match climatic areas of interest in Pakistan with Australian citrus-growing areas, highlighting the need for additional crop phenology research in Pakistan. Budwood for 23 cultivars together with eight rootstocks have been sourced elsewhere and are now growing successfully at the University of Agriculture Faisalabad. In another component, efforts are underway to modify the flood irrigation system to an under-tree furrow irrigation system. Extension activities to lift skills in plant propagation and nursery production techniques have been boosted by an instructional DVD modified for Pakistan by the NSW Department of Primary Industries.

Subprogram 2: Improving livelihoods of dairy farmers

Dairy is the largest livestock sector in Pakistan, with demand for milk and milk products

Upswing of activity as ASLP gains momentum

Since 2005 ACIAR has managed the **Australia–Pakistan Agriculture Sector Linkages Program (ASLP)**. The main goals of the program are to transfer Australian knowledge and expertise to key sectors of Pakistan agribusiness to increase profitability and enhance export potential; to contribute to poverty alleviation of smallholder farmers through collaborative research and development; and to enhance the capacity of the Pakistan research, development and extension system to deliver targeted and practical research outputs to agribusiness and farmers.

The program is based around two thematic priorities—horticulture and dairy. ACIAR's core program complements the ASLP through a broader focus on land and water resources, encompassing community-driven water allocation and drainage management as well as irrigated cereal production.



Prior to the ASLP, the level of ACIAR exchange with Pakistan was restricted to a project-by-project base. But the ASLP has led to a routine engagement between ACIAR and the Planning Commission, the Federal Ministry of Food, Agriculture and Livestock, the Pakistan Agriculture Research Council and the Punjab and Sindh Departments of Agriculture. Such liaison is enabling a far broader exchange of expertise between Pakistan and Australia, extending beyond the ASLP's immediate emphasis on horticulture and dairy to issues of water management and disease threats (e.g. avian influenza, Ug99 wheat stem rust). It is also underpinning the broader capacity-building support by helping Australian universities to link with partner universities in Pakistan and by helping to place Pakistan-funded postgraduates in Australia.

All four R&D projects implemented under the ASLP are now fully operational and, in some cases, early results indicate that project activities are exceeding expectations. Although significant impact of R&D activities is normally observed toward the completion of projects and beyond, there have already been a number of encouraging outcomes, as demonstrated by the examples given in the adjacent report.

growing at about eight per cent 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.

Much of the technology required to boost efficiency of the **Pakistani dairy industry** is available but not readily disseminated nor adopted by the farming community. A project, also part of the ASLP, is seeking to demonstrate the economic and social benefits of improved extension services to smallholder dairy farmers and to capture, enhance and disseminate knowledge relevant



ACIAR is working with dairy producers as part of the ASLP to improve animal nutrition and disease control to increase milk production and meet the rising demand for dairy products within the domestic market

to smallholder dairy systems. Already there is evidence of enhanced linkages in Pakistan across the research-extension-farmer continuum. As a result farmers are now receiving unambiguous extension messages, research programs are far less fragmented and, most importantly, a farmer demand-driven research mindset has been instilled in Pakistan. A major facet of the work is a survey to identify the key limiting elements for production on small farms in two disparate regions of Punjab. The data being collected cover all aspects of the farm operation including production, feeding, reproduction, animal health and, where possible, farm budgets over a two-year period.

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

ACIAR's program in Pakistan has had a longstanding focus on improving the management of land and water resources, given the similarities with Australia. In attempts to reduce the incidence of residue burning in rice-wheat systems of Pakistan, the Farm Machinery Institute (FMI) in Islamabad has designed and built a prototype machine (the 'FMI Seeder') for **managing rice stubble and**

direct seeding in a single operation. The seeder, which is based on a similar machine developed in another ACIAR project in the Indian Punjab, is now undergoing assessment for performance under a range of stubble, soil and seasonal conditions. On the basis of last year's test results researchers have made two main modifications to the Mark-III model of FMI Combo Seeder. In a further development, the 'FMI Rocket Seeder', has been developed for a lighter and more vigorous straw cutting. A simple straw spreading kit, seen as a prerequisite for the adoption of the seeding technique, was also developed for all common models of combine harvesters.



A Farm Machinery Institute drill in heavy rice stubble, Lahore

Bangladesh

AOP budgeted expenditure in 2007–08	\$553,303
Actual expenditure in 2007–08	\$533,866
Expenditure in 2006–07	\$481,224
Expenditure in 2005–06	\$538,454

Dr Kuhu Chatterjee,
ACIAR Country Manager,
Bangladesh



Expenditure includes both bilateral and multilateral projects

Key performance indicators	Performance 2007–08
Extent of water resources available for supplementary irrigation to facilitate expansion of rabi cropping in southern Bangladesh determined	Preliminary estimates at smaller scale (300 ha) have been completed, indicating that the amount of surface water stored in ponds would be sufficient to irrigate a third of the cropped area. The above analysis will be extended to a larger area once data on shallow groundwater tables have been sourced.
Improved crop establishment techniques for legume planting in north-western Bangladesh designed and tested	Several low-cost planters suitable for small two-wheel tractors developed and tested across sites with different crop and soil conditions. The planters greatly increased the time windows of legume planting and achieving equal or higher yields.

Position

ACIAR’s strategy in Bangladesh is to focus on agronomic and biotic constraints to the production of broadacre grain crops, especially the ‘Rabi’ or winter season crops, such as chickpeas, lentils, wheat and maize.



A local and Australian scientist discuss the benefits of conservation tillage for cereal production

This is done either through bilateral projects or projects led by the International Agricultural Research Centres that link to existing programs such as the Rice–Maize Alliance between the International Rice Research Institute and the International Maize and Wheat Improvement Center.

Achievements

North-western Bangladesh, the poorest region of the country with regular food shortages and dietary imbalances, grows few pulse crops such as chickpea, lentil, mungbean and black gram. A project is conducting a program to **increase the production of chickpea and lentils** in this region. In the second year of the project the sharp rise in prices of internationally traded grains, fertilisers and fuel has highlighted the opportunities and threats for pulses in Bangladesh. Pulses remain highly profitable, but the rising price of maize, wheat and Boro rice has reinforced the view that project



Scientists and farmers involved in the development of conservation farming techniques (power tillers) discuss the current limitations of existing machinery

research should specifically target those areas with limited or no irrigation so that the Rabi (dry) season pulses, chickpea and lentil, are not grown in direct competition with cereals. Two seasons evaluating both chickpea and lentil have shown that reasonable yields can be obtained provided the recommended integrated crop management package is followed. Molybdenum and *Rhizobium* were also needed, but additional responses to lime suggest that in northern districts other soil acidity constraints exist. A sub-sector analysis under way for lentil and chickpea in north-west Bangladesh will identify the key bottlenecks for expansion of chickpea and lentil production and provide a framework for their further promotion.

Farmers in southern Bangladesh currently depend primarily on one wet-season rice crop per year to provide income for their families, meaning that around 800,000 hectares lie uncultivated during the Rabi season. This is primarily because irrigation resources are limited, but other constraints also add to the perception that the area is too risky for wheat in a rice–wheat rotation. A project building on earlier research funded by ACIAR and FAO aims to address the **constraints of water and unsuitable**

management practices, thereby improving the livelihoods of these farmers by making their fallow lands productive during the post-rice Rabi season. The excellent wheat yields achieved in successful project-sponsored farmer trials during the 2007–08 season, combined with current high demand and record prices for wheat grain in local markets, have created exactly the right ingredients to encourage further Rabi cropping in southern Bangladesh.



Traditional ploughing in Bangladesh villages

Other South Asia countries and the Middle East

AOP budgeted expenditure in 2007–08	\$515,717
Actual expenditure in 2007–08	\$897,104
Expenditure in 2006–07	\$1,332,270
Expenditure in 2005–06	\$889,638

Expenditure includes both bilateral and multilateral projects

Key performance indicators	Performance 2007–08
New project activities initiated in Bhutan supporting the key agricultural export product, citrus	In project HORT/2005/142 new activities including establishment of best practice trials sites and training of local researchers and growers in plant propagation and other production techniques in both Bhutan and Australia have been initiated.
Best bet varieties of a range of suitable crops and technologies identified and being tested in dryland farming areas of northern Iraq	Successful germplasm testing has been complemented by significant impacts with zero tillage options in farming communities.
Dissemination of promising wheat and maize varieties and further training of Afghan scientists and NGOs	From wheat and maize introductions, three wheats have been released. In-service training was provided for 25 Afghani scientists at International Maize and Wheat Improvement Center (CIMMYT). All but one of these remain with their sponsoring institutions.

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 project in Afghanistan provides support to wheat and maize production.



Achievements

During 2004–07 CIMMYT, through its country office in Kabul, implemented a joint AusAID–ACIAR-funded project with the overall aim of achieving a **sustained increase in wheat and maize production and productivity** in Afghanistan through research, training and technical interactions. The project operated and delivered outcomes in an environment that continues to present logistical and security challenges. In particular, the project successfully developed networks with a number of organisations operating in Afghanistan and leveraged considerable extra resources to help fulfil the aims of this important project.



An Afghan farmer in his maize crop

The Afghanistan Ministry of Agriculture, Irrigation and Livestock is committed to rebuilding agriculture in Afghanistan and has developed an **Agriculture Master Plan** which places a strong emphasis on cropping and capacity-building. In line with that Plan, a new project is focusing on the introduction and screening of new wheat lines with a particular emphasis on resistance to yellow rust and stem rust (including Ug99). It is also supporting the release of new high-yielding varieties and the production and dissemination of quality breeder seed. It especially seeks to gain more knowledge of agro-ecological wheat production zones in Afghanistan in order to better target the new varieties so that they meet the needs of farmers and consumers in these different zones.

Bhutan

Position

ACIAR's small program with Bhutan began in 1998. Because of Bhutan's relative lack of capacity to effect significant change across many agricultural sectors at once, the program remains small and very tightly focused. 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. The current program emphasis is on improvement of citrus production (Bhutan's largest horticultural export industry), the implementation of pest and disease management, and a smaller study on water and land management.

Achievements

A study to find opportunities **to improve land and water management** in Bhutan has focused on Eastern Bhutan where poverty levels are greatest. Bhutan places high priority on protection of natural resources and, while concerns had been expressed in the country about soil and water management issues related to agriculture, few had been investigated. A study identified land slips as a major contributor to river sedimentation, increased by anthropogenic factors such as inappropriate road construction. A less important contributor was poor maintenance of the canal system used for irrigation water reticulation. There was little evidence that arable 'dryland' agriculture contributed to serious gully or sheet erosion, despite the high rainfall, steep slopes and traditional tillage practices. Nevertheless, land was at risk of erosion between the first and second crops in the wet season, and there was a need for research and extension to develop and promote soil-conserving tillage practices.

A project to **improve mandarin production in Bhutan and Australia** through the implementation of on-farm best management practices was launched in June 2007. Four demonstration orchards have been established. Basic improvements such as basin formation to allow for application of water and inorganic fertilisers and the clearing of vegetation under trees were the first activities undertaken. Soil and leaf samples were collected and analysed and a basic fertiliser program started in February 2008. Selected trees at each of the sites have been pruned to varying degrees to assess the timing of operations and tree response in Bhutan. Three Bhutanese project members have visited Australia for formal training in soil and irrigation management, citrus nutrition and citrus canopy management. They have undertaken practical instruction in pruning, budding, grafting and topworking of citrus. Visits to two commercial citrus nurseries provided them with an insight into nursery production practices in



Nursery establishment of new rootstock varieties to improve mandarin production in Bhutan

Australia. They also visited a commercial citrus packing company and juicing plant to look at postharvest operations and facilities.

Iraq

Position

The high levels of input subsidies, guaranteed commodity prices and free food distribution have distorted agricultural markets in Iraq and have provided little incentive for innovation by farmers. In addition, scientists have had limited access to international developments in the agricultural sector for over two decades. ACIAR is managing one project in Iraq, co-funded by AusAID. The project is intended to assist the Iraqi Government in its quest to modernise agricultural markets and production systems. It is anticipated that support will be limited to this project in the short- to medium-term as Iraq passes through a critical period of development.

Achievements

Iraqi farmers are moving from a heavily subsidised to a commercially-oriented agriculture. A project sought to introduce **better crop germplasm and management for improved production of wheat, barley**

and pulse and forage legumes while reintroducing Iraqi scientists and farmers to international level research and production technologies. It focused on cereal production in the northern low rainfall zone where 70 per cent of cereals are produced.

The approach adopted was to draw on expertise in Iraq, ICARDA (Syria), Australia and elsewhere to design some 'best-bet' production systems combining crops, cultivars and tillage practices. The decision was sound and the 'best-bet' practices were well chosen. Demonstrations of cropping systems have now been maintained for three years at several locations in three rainfall zones and have given the project the impetus it requires for early impact.

The significant success of the project to date has been the introduction of zero tillage as a soil and crop management option for Iraq. This management system is well suited to low rainfall areas where it offers at least equivalent yields but at smaller production cost than conventional tillage, while improving soil quality and protecting it from wind and water erosion. The economic advantages have special attraction to Iraqi farmers faced with greatly increased fuel costs now that they no longer receive a heavy subsidy for their agriculture.