North Asia

Financial year	Regional expenditure	Percentage of total bilateral expenditure	Board target as percentage of expenditure
2006–07	$2,876,548	8.3	<15%
2005–06	$3,857,431	12.5	<15%
2004–05	$4,233,310	15.1	<15%

ACIAR's program in North Asia concentrates on China. For the region an expenditure target of not more than 15% of our overall annual bilateral research expenditure has been set.

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China

Active projects in 2006–07	31
AOP budgeted expenditure in 2006–07	$3,225,574
Actual expenditure in 2006–07	$2,876,548
Expenditure in 2005–06	$3,733,227
Expenditure in 2004–05	$3,926,454

Ms Catriona Murray, ACIAR Country Manager, China

Key performance indicators	Performance 2006–07
Significant co-investment by Chinese partners in all new projects	All new Chinese projects incorporate Chinese funding and in-kind contributions.
Medium-term strategy for program in Tibet Autonomous Region developed and agreed between ACIAR and Chinese counterparts	Medium-term strategy for the Tibet Autonomous Region has been developed, which will focus on the development of the crop–forage–livestock systems in the valley regions.
Communication of results of analysis of technical barriers affecting trade communicated to Chinese policymakers	For a multilateral project addressing technical barriers affecting trade of China, the methodology and empirical applications have been presented to policymakers through published papers and international conferences.
Evidence of integration of biophysical and policy considerations in development of grassland management strategies	A framework was developed, including a feed balance analyser and a biophysical/economic analysis using data on quantity and quality of forage sources, enterprise budgets and linear programming, to identify the optimal combination of resources for alternative farm strategies. Field work detected further development of livestock markets and improving price signals for farmers.
Forty percent of new projects designed to have significant farmer or policymaker impacts within five years of completion	Only one new standard project commenced in 2006–07 and it was deemed likely to have impact in 5–10 years. Three small R&D activities commenced and two of these should have significant community impacts within 5 years.

Position

ACIAR has had a program with China since 1984. Major areas of research have included agricultural water management, selection of Australian trees suited to Chinese forestry, improvement and integrated pest management in brassica crops, studies of livestock production and diseases with a focus on sheep and wool, quality management in stored grains as well as broadacre crop and citrus improvement. Adoption of conservation tillage in some central western provinces has been recognised as part of the solution to improve crop management and reduce windblown dust in Beijing. In 1999, the focus of ACIAR's program shifted towards western China, in line with the need to raise farmers' incomes in this part of China and to better manage land and water resources.

In view of the significant human and financial resources available within the Chinese National Agricultural Research System and the strong mutual benefits to Australia, ACIAR requires that projects in China have significant sharing of costs by Chinese and Australian research providers. In many cases,

ACIAR will seek a funding commitment through case-by-case exchanges of letters at the stage of development of full project proposals. Only a small proportion of the highest priority projects can be supported. Projects chosen must:

- address the highest priority of Chinese partners
- address overall Australia–China development policy (to 'Further mutual interest by supporting China's balanced development policies and working together in the region'*)
- complement other schemes for China–Australia collaboration, including the AusAID Australia–China Environment Development program, to commence in 2006
- be in areas where the overwhelming driver is Australian technical comparative advantage
- complement rather than duplicate activities of other (larger) donors.

Within our stated priority areas, ACIAR will also fund small investments that foster collaborative linkages between activities that have been primarily funded from Australian and Chinese sources.

ACIAR projects form only one part of the China–Australia inter-governmental cooperation in agriculture and natural resource management. Some information on the other programs, several of which provide financial support for collaboration between Chinese and Australian agricultural researchers, follows. Most of these programs operate through annual calls for applications.

- Department of Agriculture, Fisheries and Forestry (DAFF) in Australia and the Chinese Ministry of Agriculture jointly administer the **Australia–China Agricultural Cooperation Agreement** (ACACA, www.affa.gov.au/acaca), which provides funding for agriculturally oriented exchange projects between Australia and China. Projects from researchers, businesses, industry associations and farmers that help develop trading relationships, enhance cooperation in a wide range of agricultural sectors, provide a forum for the exchange of scientific information and, especially, encourage commercial linkages are encouraged. The focus of the present program is on projects that demonstrate potential for commercial outcomes and provide clear flow-on benefits to industry. Over 175 projects have been completed since 1984.
- Australian Government Department of Education Science and Training (DEST), 'International Science Linkages program' (www.dest.gov.au/science/isl) includes competitive grants under the **Australia–China Special Fund for S&T Cooperation**, in which agriculture, biotechnology and environmental research form three of the priority areas. The Australian Government through DEST has also provided funding to support a new Australia–China Centre on Water Resources Research. The centre will increase research networks between Australian and Chinese scientists and promote multidisciplinary research collaboration into water resources in both countries. Finally, the first exchanges under the DEST-managed Australia–China Young Scientist Exchange Program will commence during 2006–07.
- In addition **DEST** supports international exchanges, targeted scientific and technological individual visits, missions and workshops to promote scientific and technological collaboration. These are managed by the Australian Academy of Science (www.science.org.au/internat/index.htm) and the Australian Academy of Technological Sciences and Engineering (www.atse.org.au).
- Food Standards Australia and New Zealand and the Chinese Ministry of Science and Technology recently entered into a Memorandum of Understanding on **Scientific and Technological Cooperation in Food Safety**.

* Source: China–Australia Country Program Strategy 2006–2010, AusAID, November 2005.

- The **Joint Declaration on Bilateral Cooperation on Climate Change** between the Australian Greenhouse Office (Department of Environment and Heritage, DEH) and the National Development and Reform Commission for China (www.deh.gov.au/minister/env/2003/mr24oct203.html) sets out cooperation in technology development and policy. During 2006, DEH will release the 'Australia–China Climate Change and Agriculture Research Prospectus' and fund several projects, of which at least one will be co-funding of a project managed by ACIAR.

From the Chinese side, the **State Bureau of Foreign Experts Affairs of China** is responsible for accrediting international educators in China and for identifying and negotiating training opportunities across the world that will be of benefit to China. The related China Association for International Exchange of Personnel (www.china.org.cn) is a government-sponsored institution also engaged in the international exchange of specialised technical and managerial personnel in several areas, including agriculture, science and technology.

Achievements

ACIAR projects in China are grouped under the following major themes:

- sustainable agriculture in north-western China
- improved agricultural productivity in Tibet Autonomous Region
- implications of Chinese trade developments for smallholders
- China linkages scheme.

China's western grasslands support the livelihoods of 40 million people, many from ethnic minorities. Income levels are amongst the lowest of any Chinese farmers. Grasslands are heavily degraded due to overgrazing, and have led to frequent dust storms, siltation of the Yellow River and declining biodiversity. A project aims to help **rehabilitate the grasslands** and improve smallholder incomes. Initially a model of the farming system is being developed, to evaluate technical and policy options to improve system sustainability. A Stage 1 model aims to create a realistic picture of what is occurring on the farms, while a Stage 2 model is designed to identify the optimal combination of resources for alternative farm strategies. Using this framework the project team is ranking the choices available for research and farm improvement. The Stage 1 and Stage 2 models are now considered robust, and have become teaching tools for Chinese colleagues. The team is now working on the Stage 3 model, looking at the sustainability of the farm

Relationship to the AusAID China strategy

AusAID's new China strategy for 2006–10 has the goal of furthering mutual national interest by supporting China's balanced development policies and working together in the region. It has the three strategic objectives of building capacity in selected sectors in China, in particular governance, environment and health; enhancing the Australia–China relationship by building institutional linkages; and working collaboratively to strengthen the region.

ACIAR's China program, while maintaining a focus on sustainable resource management in poorer western regions, reflects the strategic objective of building capacity in China, with a strong focus on capacity enhancement in technical and policy issues relating to the environment as it is either affected by agricultural production or in turn affects production sustainability. Governance and collaboration in the region are addressed by a second major emphasis on agricultural development policy issues, particularly relating to trade policy and environmental management. The basis of ACIAR's mode of operation in China is through the development of strong institutional linkages between Australian and Chinese government R&D and policy-making organisations, thus supporting the second strategic objective of the overall Australian aid program in China.

systems over a longer term, with emphasis on general relationships to estimate dust storm likelihoods and grassland stability in relation to the grazing pressure.

China and India are keen to **replace traditional rapeseed and mustard cultivars** with canola quality types (containing low levels of erucic acid and glucosinolate). They value Australia's canola quality *Brassica napus*, which is better adapted to their countries than varieties from Europe or Canada. But a number of key diseases and environmental stresses limit oilseed brassica production in India, China and Australia. A project seeking to develop *B. napus* (rapeseed) and *B. juncea* (Indian mustard) germplasm with improved canola quality, disease resistance (to *Sclerotinia*—white rust) and improved drought tolerance has screened germplasm to reveal some key characters that will be beneficial to the breeding of improved lines for each country. The project team has found white rust resistance in Australian and Chinese *B. juncea* lines, low erucic acid and low glucosinolate levels in Chinese and Australian *B. napus* and *B. juncea* lines, and drought tolerance in Australian *B. juncea* lines. A project designed to develop **varieties of lucerne** with high levels of tolerance to adverse factors such as salinity, acid/aluminium soils, waterlogging or drought now has produced advanced lines with aluminium resistance. Aluminium screening has continued through several generations, and each successive generation has shown increased tolerance over the previous generation. Further selections are continuing with the aim of releasing a cultivar in 2007. The evaluation of the material in pot experiments with acid soil has continued as well as field trials of the early acid-tolerant progeny. The acid/aluminium screening method has been adapted to screen both plants and rhizobia for nodulation at low pH. This is an important advance as acid-tolerant rhizobia are important for the success of lucerne in acid soils.

Transporting lucerne

The Hexi Corridor, a distinct valley in Gansu in north-western China, relies on snowmelt for much of its water. Recent reduction in snow fall has seen farmers and others turn to available surface water, which is lowering recharge and at the same time lowering the watertable. Local policymakers have implemented water restrictions, rationing allocations and increasing water and pumping costs. This is adding to the number of other pressures already faced—high input costs, low mechanisation and low incomes—particularly by smallholders. A project is encouraging **the adoption of permanent raised cropping beds** for wheat–maize rotations, including adapting existing tractors and improving agronomic and water management, to help alleviate many of these issues. The Gansu Agricultural Mechanisation Bureau (GAMB) has established the first of three demonstration sites to compare permanent raised beds, zero-till and conventional farming practices. A related project is underpinning the work by helping to develop criteria for **optimising bed design**, using analytical and numerical modelling of water and solute transport, designing placement strategies to maximise fertiliser usage and minimise leaching to groundwater; and determining the conditions most likely to lead to salinisation.

In the Tibet Autonomous Region the activities of small mammals, **particularly the plateau pika**, have degraded up to 15% of the region's valuable grassland ecosystems. Livestock numbers on the plateau have more than doubled in the past 50 years, but livestock carcass weight has declined in this time, suggesting that the system has been pushed so that animal productivity is declining. At the same time plateau pika numbers have increased, due to some factor in the system that has changed to their benefit. A project has sought the reasons for the increase, postulating either a change in pasture composition and/or structure or improved burrowing conditions due to increased erosion. Recommended control techniques for the pika include a reduction in livestock density to prevent the system degrading further and moving to the highly degraded 'black soil' state.

In a project aimed at **intensifying production of grain and fodder in central Tibet** farming systems, excellent progress has been made in developing baseline information on Tibetan agriculture. The project team conducted interviews in 45 different farming households across central Tibet's cropping zone, exploring demographics, farm resources, the components of cropping and livestock enterprises, and associated inputs and outputs. Attitudes to fodder production and system change were also assessed. These results have provided a more accurate picture of the typical Tibetan farm, which is assisting the project's ongoing research work and providing a foundation for future efforts in extension. In related work an Australian Youth Ambassador for Development has **described soils at key experimental sites**. Soil samples from farmers' fields across central Tibet were sent for nutrient analysis in Australia, revealing in initial assays that potassium and magnesium levels in Tibetan soils appear very low, and are a likely constraint to grain production.

A project that has studied the **implications of China internationalising its food economy** has also analysed how China joining the World Trade Organization (WTO) has affected the country's food policies. A general equilibrium model of the Chinese economy with regional dimensions (CERD) that included the eastern coastal, central and western regions described five agricultural subsectors. Findings consistently showed that the trade reforms China adopted in order to accede to the WTO will lead to substantial structural changes within the agricultural sector. In China, as in other rural-based countries, the main factors behind reductions

Inspecting a wheat crop in Tibet

in rural poverty will be the scope for rural households to earn off-farm income and for people to move from rural areas into industry and services in urban centres. Therefore, to a large extent, the success of the trade reforms will depend upon policies beyond agriculture.

These findings were reinforced by another project involving the International Food Policy Research Institute (IFPRI) in partnership with institutions in China. Together they have developed a **snapshot view of inequality** within and between rural villages in western China, based on a census-type household survey in three administrative villages and a sampling survey of 286 natural villages in the province of Guizhou. They found that, in contrast to coastal regions, **non-farm income** is distributed unevenly in this inland region and accounts for the largest share of overall income inequality. This finding has important implications for the future strategy in promoting development and poverty reduction in lagging regions. While overall economic development will be the main instrument to bring the majority out of poverty, a targeted approach will be increasingly crucial to help the development of these poor villages and households. It is imperative to understand why they are not participating in the growth process and how development strategies and various transfer programs would help them.

Two forestry projects are using the same plantations to undertake parallel research. They are both focused on **growing trees and processing timber** to provide a higher quality product for use in construction joinery and furniture in China (and also Vietnam). Poor yields result from growth stresses released upon sawing that cause distortion and splitting in logs, so eucalypts in many developing countries are mainly used for fuelwood, pulp and poles. One line of research is focusing on genetic and silvicultural controls to reduce losses. So far this project has initiated a wood-quality analysis along with an assessment of growth and form at an established spacing and fertiliser trial of cloned trees at Dongmen Forestry Farm. The initial analysis has enabled the research team to identify trees for further wood-quality assessment. Additional support from a Chinese pulp and paper company has extended the project to evaluate the **impact of silviculture on pulp wood production and quality** as well as the original focus on solid wood.

The other project is trialling **sawing and recovery strategies** to get the best from logs, with a particular focus on economic viability. Early in the project five scientists from China and Vietnam attended a training session at the Timber Training Centre in Creswick, Victoria, to gain more skills in

Plantation of eucalypts

eucalypt timber sawing and wood drying, and to learn processing research procedures. While in Australia they visited the University of Melbourne's Centre for Advanced Wood Processing and the CRC-Wood Innovations and were introduced to the microwave pre-treatment technology in solid wood processing. They also visited industrial sites in Victoria and New South Wales and intensively managed eucalypt farm forests in southern and northern Victoria.

ACIAR supports ongoing and new research and capacity-building activities at CIMMYT, ICARDA and PBIC–Sydney University to ensure productivity and food security through **sustainable control of wheat yellow rust** in Asia. The researchers have made significant progress in incorporating durable yellow rust resistance into several cultivars, but they found some cultivars deemed highly resistant in Mexico were either susceptible or just moderately resistant in China. They therefore devised a shuttle-breeding strategy whereby early generations were grown in Mexico then subsequent generations were grown in China, to speed up the breeding as well as select under high yellow rust pressure in China. This strategy resulted in more lines that were resistant and better adapted to the Chengdu environment. Moreover it developed local capacity to continue the work into the future.

ACIAR has invested heavily in the development of integrated crop management (ICM) systems for **growing brassica vegetables with minimal pesticide** application, using environmentally friendly methods. A recent project has developed world-class decision-support tools (electronic-based and paper-based) for China and Australia for improving the implementation of ICM systems in brassica crops at the farm level. It has built on existing research and extension activities in China and Australia (many of them developed with ACIAR funding). The Chinese toolkit comprises: 1) the Decision-support and Training Multimedia System for Integrated Crop Management in Brassica Vegetables, which is primarily for extension officers; 2) the paper-based Field Guide to Integrated Management of Crucifer Pests, Diseases and Disorders, designed for farmers. The Chinese toolkit is now in commercial production, and so far 8,000 copies of the field guide have been sold and distributed to farmers.

Peri-urban vegetable production is helping to **increase the availability and diversity of fresh vegetables** in the urban centres. But spoilage of vegetables remains a problem, with unacceptable levels of pesticide use and high postharvest losses from fungal and bacterial pathogens. Inadequate washing, grading and packing facilities contribute to the spoilage, as does limited options for disposing of wash-water and waste. Detection and monitoring of risk factors is possible, using polymerase chain reaction (PCR) technologies that apply to both vegetables and wash-water. A project has used PCR technology to test different washing and handling procedures, and also obtained basic information on the level of contaminating organisms on three vegetable types in the supply chain. The scientists also evaluated the influence of irrigation water on yield, rot susceptibility and quality, and investigated

Marketable produce has been increased through reduced vegetable spoilage in China

how poor plant nutrition lowered resistance of vegetables to postharvest disease and physiological deterioration. The project team has developed recommendations on washing of vegetables and developed a PCR test for rapidly detecting the presence of the bacteria *Enterococcus faecalis*.

The **FILTER (filtration and irrigated cropping for land treatment and effluent reuse) technique** was developed by CSIRO for Australia to overcome some of the problems in land treatment of wastewater. The system was successfully tested on clay soils, treating primary or secondary sewage, and the extracted water and nutrients used for intensive annual crop-growing. However, FILTER needed performance-testing on non-clay soils and with different wastewaters, and this has been achieved through an ACIAR project. Results of trials in both Griffith, Australia and Wuqing, China, confirmed that when the FILTER system is installed at sites featuring soil with a high capacity for phosphorus uptake, with a stable soil structure to maintain hydraulic flows and appropriate groundwater conditions, it can reduce pollutants markedly and make the drainage water suitable for reuse (other than for human consumption).

A small R&D activity is supporting collaboration between Australian and Chinese rice breeders in the development of **cold tolerance in rice** varieties for both countries. This is a very high priority issue for both Australia and China. In addition, Australia is transferring new molecular marker technologies to help China boost its cold-tolerant activities. Cold-tolerant varieties will help reduce the substantial yield losses suffered in cold years in both countries, and they have another advantage of needing significantly less water in cold conditions.

Water is a major threat to the world's food security and ACIAR is working to improve water use in rural China