

# Healing Wounds

AN AUSTRALIAN PERSPECTIVE

Research that rebuilds agriculture after conflicts and natural disasters



# INTERNATIONAL AGRICULTURAL RESEARCH

## A bit of background

**What is IAR?** Agricultural research designed to benefit developing countries (their farmers, their environment and their economies) and to foster mutual understanding can be defined as international agricultural research (IAR). Since the majority of people in less developed countries live in rural areas and are dependent on the land for food and employment, support for agricultural research is one of the most effective ways that Australia can assist in their development. Further information on international agricultural research and its benefits to Australia and to developing countries is available from the brochure at <http://www.crawfordfund.org/awareness/foodbrochure.pdf>

**What is the Crawford Fund?** Good news is worth sharing, and the Crawford Fund is dedicated to mobilising Australian support for international agricultural research. The Fund promotes the work of ACIAR and the CGIAR's Future Harvest Centres. This booklet is but one example of getting the word out on IAR. The fund also has a training program that fills a niche by offering practical, highly focused non-degree instruction to men and women engaged in agricultural research and management in developing countries. Some of that training program has been developed for countries after natural disasters and conflicts.

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**What is ACIAR?** The Australian Centre for International Agricultural Research (ACIAR) is an Australian Government statutory authority that operates as part of Australia's international development cooperation program within the portfolio of Foreign Affairs and Trade, with a mission to achieve more productive and sustainable agricultural systems for the benefit of developing countries and Australia. ACIAR commissions collaborative research between Australian and developing country researchers in areas where Australia has special research competence. It also administers Australia's contribution to the Consultative Group on International Agricultural Research.

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**What is CGIAR?** The Consultative Group on International Agricultural Research (CGIAR) is a strategic alliance of countries, international and regional organisations, and private foundations supporting 15 international agricultural research centres, which work with national agricultural research systems and civil society organisations including the private sector. The alliance mobilises agricultural science to reduce poverty, foster human well-being, promote agricultural growth and protect the environment. The CGIAR generates global public goods that are available to all.

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A Cambodian farmer contemplates a brighter future that will lift him from subsistence into enterprise creation.  
Photo: Brad Collins

# ACKNOWLEDGEMENT

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## ACRONYMS

AusAID Australian Agency for International Development  
ACIAR Australian Centre for International Agricultural Research  
CF The Crawford Fund  
CIAP Cambodian-IRRI-Australia Project  
CIDA Canadian International Development Agency  
CIFOR Centre for International Forestry Research  
CIAT International Centre for Tropical Agriculture  
CIMMYT International Maize and Wheat Improvement Centre  
CIP International Potato Centre  
CGIAR Consultative Group on International Agricultural Research  
DfID Department for International Development (UK)  
ESCWA Economic and Social Committee for West Asia of the United Nations  
FAO Food and Agriculture Organization (UN)  
GCDT Global Crop Diversity Trust  
GTZ German Agency for Technical Cooperation  
IARCs international agricultural research centres  
ICARDA International Centre for Agricultural Research in the Dry Areas  
ICRISAT International Crops Research Institute for the Semi-Arid Tropics  
IDRC International Development Research Centre (Canada)  
IFAD International Fund for Agricultural Development  
IFDC International Fertilizer Development Centre  
IPGRI International Plant Genetic Resources Institute  
IRRI International Rice Research Institute  
IWMI International Water Management Institute  
NGOs Non-Government Organisations  
RAMSI Regional Assistance Mission to Solomon Islands  
UN United Nations  
USAID United States Agency for International Development

# FOREWORD

Over the past three decades, international agricultural research centres (IARCs) under the aegis of the Consultative Group on International Agricultural Research (CGIAR) have carried out research and related activities to help poor farmers in developing countries feed, house and educate their families.

These CGIAR Centres began with a mission of helping developing countries turn agriculture into an engine of sustainable economic growth for the betterment of those caught in the cycle of poverty. They focused on scientific research-related activities in crop and animal production, forestry, fisheries, agricultural policy and environmental management, in order to achieve sustainable food security and enhance community development. But in more recent years they have also made major contributions to rebuilding agriculture after conflicts and natural disasters in around 50 developing countries across Africa, Asia, and Latin America. The map on the following page highlights those countries in which the CGIAR has been involved.

Australia has supported the work of the Centres, in both their general programs and in their response to emergencies. The bulk of the Australian Government contribution to the IARCs is channelled through the Australian Centre for International Agricultural Research (ACIAR), an Australian Government statutory authority that operates as part of Australia's international development cooperation program within the portfolio of Foreign Affairs and Trade. It contributes to the aid program objectives of advancing Australia's national interest through poverty reduction and sustainable development.

ACIAR has its own substantial portfolio of programs that involve Australian research institutions undertaking research and development activities with partner institutions in developing countries. But it directs around 20 per cent of its total government appropriation to the IARCs. Between one third and one half of that annual investment goes to project-specific funding, with the remainder allocated to core or unrestricted funding to support the maintenance of centres of research excellence that complement Australian expertise, and have a strong Asia-Pacific focus.

AusAID, the main agency responsible for delivering Australia's official development assistance, including its humanitarian, emergency and refugee programs, also has a strong rural development focus in specific areas.

Where conflicts and natural disasters have interrupted the CGIAR's mission, they have disrupted the long-term work of strengthening human and institutional capacities, establishing more productive cropping systems, and improving the sustainability of farming.

Nevertheless, when such disasters have occurred the CGIAR Centres have quickly reworked their strategy, partnering with donors, governments, emergency relief agencies, non-governmental organisations and others to ensure that emergency assistance made the best

possible use of available knowledge and technology. As soon as they could, the Centres moved on to help the affected countries rebuild their agriculture, while focusing also on human capacity and research infrastructure so critical to long-term recovery.

ACIAR has acted with flexibility and dedication to connect with IARC programs in countries where it has seen opportunities for Australian-supported agricultural research and development (R&D) to make a real difference to recovery. In the traumatic aftermath of the Asian tsunami in December 2004 Australians individually responded generously, and the Australian government has given high priority to assistance to restore agriculture and promote food security as part of its total package for the devastated regions.

Another example close to home is in Timor Leste (East Timor), where in 2000 ACIAR called on the resources of five CGIAR centres to help undertake the *Seeds of Life* project to boost the productivity of agriculture. More than 90 per cent of the population of this new nation is involved in farming. Now improved varieties have been identified to help farmers produce higher yields of staples such as cassava, maize, sweet potato, peanuts, and rice. Many scientists from Timor Leste have received training during the project, so this fledgling democracy now has a better chance of security in its food supplies.

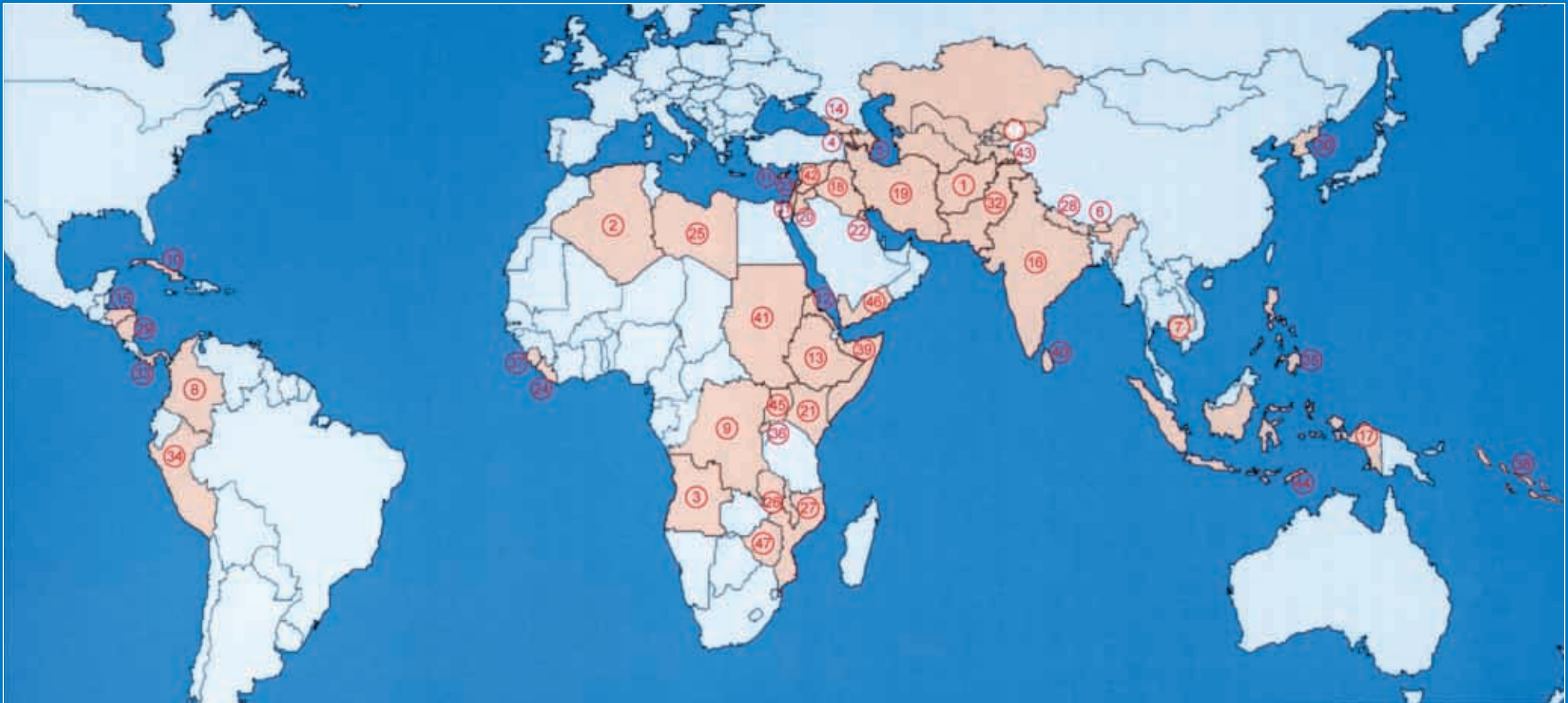
This booklet highlights the important roles of both the CGIAR centres and ACIAR in a range of these international efforts. It is intended to augment The Crawford Fund's role of making this important work better known in Australia.

The Crawford Fund is named in honour of Sir John Crawford—a remarkable Australian who contributed at the highest levels to the development of Australia and other countries. He was also a passionate supporter of international agricultural research for development. As such, he was one of the architects of ACIAR and first chair of ACIAR's Board. He was also a strong advocate for the development of the CGIAR and the first Chairman of the CGIAR's Technical Advisory Committee.

The recognition that the future of agricultural R&D relies on the quality of scientists, technologists and decision makers able to undertake and deliver on research, has spurred the Crawford Fund to offer short-term practical training that will teach and inspire men and women in developing countries to improve their farming, research and management. Some of these training opportunities have been provided to people from developing countries that have been affected by natural disasters and conflicts, including Timor Leste, Iraq, Cambodia and tsunami-affected regions.

We believe Australians can feel rightly proud of the effectiveness of our contributions to restoring agriculture and food security after conflicts and natural disasters, and of the high calibre of those leading the way.

## Rebuilding agriculture by CGIAR Centres in countries affected by conflicts and natural disasters



1. Afghanistan; 2. Algeria; 3. Angola; 4. Armenia; 5. Azerbaijan; 6. Bhutan; 7. Cambodia; 8. Colombia; 9. D.R. Congo; 10. Cuba; 11. Cyprus; 12. Eritrea; 13. Ethiopia; 14. Georgia; 15. Honduras; 16. India; 17. Indonesia; 18. Iraq; 19. Iran; 20. Jordan; 21. Kenya; 22. Kuwait; 23. Lebanon; 24. Liberia; 25. Libya; 26. Malawi; 27. Mozambique; 28. Nepal; 29. Nicaragua; 30. North Korea; 31. Palestine; 32. Pakistan; 33. Panama; 34. Peru; 35. Philippines; 36. Rwanda; 37. Sierra Leone; 38. Solomon Islands; 39. Somalia; 40. Sri Lanka; 41. Sudan; 42. Syria; 43. Tajikistan; 44. Timor Leste; 45. Uganda; 46. Yemen; 47. Zimbabwe

Note: In some countries marked on the map, the CGIAR Centres are involved only in specific areas that have suffered from conflict or natural disasters, and not the entire country. The objective of this map is only to show the locations where the CGIAR Centres have been involved in rebuilding agriculture. The authors or publishers hold no responsibility for the accuracy of political boundaries.

# RESTORING AGRICULTURE AFTER CONFLICTS AND NATURAL DISASTERS

Agriculture lies at the heart of the social and economic fabric of the world's developing countries. Most of the world's poor live in those countries and many are engaged in agriculture. When conflicts and natural disasters arise they not only take a heavy toll on human life but also cause serious damage to agriculture and the natural resources on which agriculture depends. The rural poor are among the most vulnerable to these events.

Research has shown that poverty and hunger breed despair and desperation. Without hope for a better future, illiterate youth are tempted into an alternative life of banditry, violence, and terrorism. Reducing poverty will reduce conflict and vulnerability to disease and natural disasters.

A recent study published by the CGIAR, called *Healing Wounds*, examined the role of agricultural research for development in underpinning emergency responses to disasters and post-conflict situations. The study described major Centre contributions to restoring food production systems after such events, and lessons learned in five key areas:

1. Alleviating hunger by rebuilding seed and food systems;
2. Safeguarding and restoring agro-biodiversity;
3. Rebuilding human and institutional capacities;
4. Reducing future vulnerability to these crises;
5. Making relief aid more effective and efficient.

Australia, through both AusAID and ACIAR, has been an active and a silent partner in some of the major relief and restoration initiatives undertaken by the Centres. This booklet highlights some examples of Australia's involvement.

# RESPONDING TO THE ASIAN TSUNAMI

The international agricultural research community responded rapidly as the extent of devastation caused by the Asian tsunami became apparent. The box below outlines the steps taken by the community to establish an effective program to rebuild agriculture, and the parts ACIAR and AusAID are playing.

## Rebuilding agriculture after the Asian tsunami

*In the traumatic aftermath of the Asian tsunami in December 2004 the scientists of the international and national agricultural research communities set about making a quiet and long-lasting contribution to rebuilding lives and livelihoods. The tsunami-devastated areas may not be the first place you would expect to find agricultural researchers, but they became involved in the relief and reconstruction efforts right from the start and are making important contributions to the mid- and long-term reconstruction efforts.*

*Member centres of the CGIAR and funding agencies such as ACIAR have used their extensive links and connections to local researchers and people in response to the devastation in the tsunami-affected region. Experience following previous disasters—due to nature or to conflict—has stood them in good stead. Indeed, knowledge such as risk mapping, soil rehabilitation, improved crop stocks and the effects on fish stocks, must be part of the rural rebuilding efforts if they are to succeed.*

*International centres with special interests in certain parts of the affected areas, or particular expertise to offer, have swung into action. IWMI, WorldFish, the Center for International Forestry Research (CIFOR) and WorldAgroforestry Center, all with sites located close to the affected areas, raised money for specific local recovery efforts and assisted their staff to search for missing family.*

*The IARCs together are developing long-term impact assessments and rehabilitation projects that embrace the entire landscape—from sea to upland forests—and are looking at the bigger picture for development using the sustainable livelihoods approach. This approach has already been adopted by the coordinated UN relief efforts in Indonesia and has been used successfully in past disaster recoveries such as the Orissa Cyclone. They won't just put these already poor communities back where they were but will start to address the fundamental issues of sustainable livelihoods.*

*Shortly after the tsunami several senior staff of ACIAR met with Indonesian agricultural and fisheries research leaders in Jakarta to assess how ACIAR and Indonesian research institutes could help. Training of scientists from Aceh, using Australian and Indonesian expertise and the intact facilities in other parts of Indonesia, was identified as a priority to help bolster local contributions to the long-term relief effort. Indonesia also sought help from Australia with the recovery of salt-damaged and sediment-covered soils and in fisheries assessments. Together with AusAID, ACIAR will give vital support to Australian long-term reconstruction efforts in Indonesia.*

*In addition to raising public awareness of these activities, the Crawford Fund is contributing to the relief effort in Aceh and northern Sumatra via its own training programs.*





# REBUILDING SEED AND FOOD SYSTEMS

## Cambodia

Cambodia is a rice-dependent country. So it was natural that the International Rice Research Institute (IRRI) took the lead in bringing CGIAR assistance to that country following the horrific Khmer Rouge genocide of 1971–79. The Cambodian-IRRI-Australia Project (CIAP) was made possible through special funding from AusAID from 1988 to 1995. As its work progressed, many additional partners joined in, notably World Vision, the German Agency for Technical Cooperation (GTZ), the Canadian International Development Agency (CIDA), Catholic Relief Services and Oxfam.

Agriculture had been devastated during the reign of the Khmer Rouge. Formerly one of Asia's leading rice exporters, Cambodia's production fell by 84 per cent during that time. The Khmer Rouge pursued a brutal and disastrous purging of foreign and educated influences. Most of the agricultural scientists were killed or fled the country.

Great personal courage was required of the project leader Dr Harry Nesbitt and his team. The box below highlights the magnitude of the challenge.

### An Australian leads the way

*Not even a grenade thrown into the project office, shots fired at his house, or a bounty placed on his life by the Khmer Rouge deterred Harry Nesbitt from his vision of lifting rice production in Cambodia from subsistence to sustenance to surplus. This was the foundation from which CIAP could aim for a more diversified agriculture that would assist the country's economic and social recovery.*

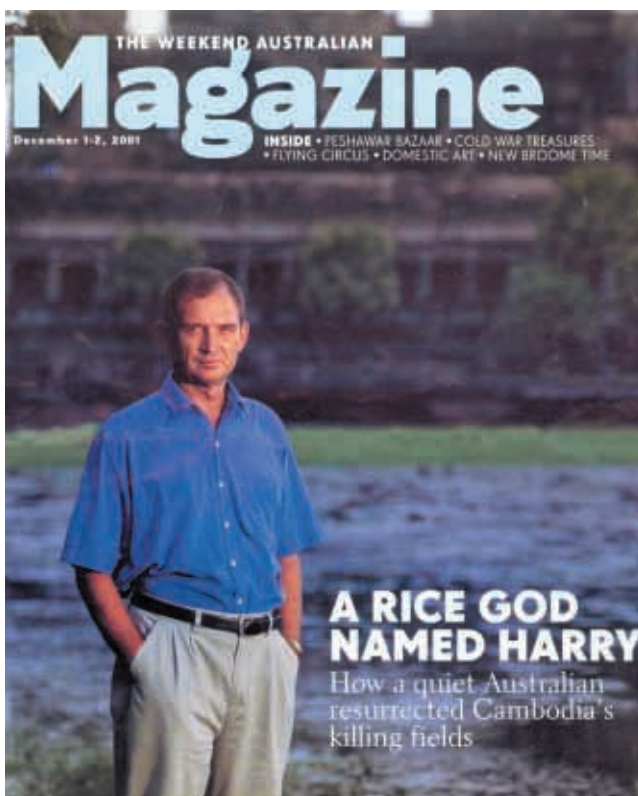
*Harry and his CIAP team obtained traditional Cambodian rice varieties from IRRI's gene bank and began growing them for testing, along with launching a training program. They introduced new rice varieties such as early-maturing IR66, providing*

*a quick food crop and leaving time for a second harvest the same season. To achieve the potential of new varieties, the team needed to introduce Cambodians (who were used to low-input rainfed agriculture) to more intensive methods employing fertilizer, water control, and integrated pest management. Postharvest grain handling issues also received attention.*

*Harry's (and CIAP's) work was greatly appreciated by the Cambodians. At farmer field schools the mention of Australia or CIAP would often trigger spontaneous applause. Writer Brad Collis, in a story appearing in *The Weekend Australian*, dubbed Harry*

*'The Rice God' for his extraordinary achievement, which saw Harry awarded a Member of the Order of Australia in 2003.*

*CIAP made a major contribution to relieving intense human suffering. It was instrumental in transforming Cambodia from a rice deficit country, reflected in widespread hunger and starvation, into a surplus producer by 1995. The dollar value of net benefits over both the terms of the CIAP project (1987–2001) and projected to the year 2020 was estimated as US\$1.3 billion (in 2001 dollars), delivering an impressive average annual internal rate of return of 32 per cent on donors' investment. In a remarkably short time the country has moved from hunger, to hope, to relative prosperity.*



*History records wars and warriors, but rarely the achievements of those sent to rebuild a country after conflict. In the mud of Cambodia's killing fields Dr Harry Nesbitt, an Australian scientist, helped to feed a nation. Photo: Brad Collis, *The Weekend Australian Magazine*, December 1–2 2001.*

### Cambodia cont...

More recently ACIAR has linked with AusAID in Cambodia to provide a comprehensive program of research, extension, industry development and capacity-building initiatives. Some of the research involves adaptation of ACIAR-supported research on rodent management in Southeast Asia to the specific needs of Cambodian farming systems. Other initiatives include projects to diversify crops, promote aquaculture and control animal diseases. Among an array of activities in the pipeline are projects focusing on small-scale family poultry farming in rural and peri-urban communities and on improvement of vegetable production and postharvest management systems.

The Crawford Fund's training efforts in Cambodia have included topics such as agroforestry, soil and water management, and construction and use of reduced tillage equipment.

## Rwanda

Perhaps one of the best-known examples of the CGIAR's engagement in rebuilding a country shattered by war has been the case of Rwanda after the genocide and civil war of 1994–96. The Rwanda nightmare was a brutal example of the new type of post-Cold War 'stagnation' conflict. Poverty, political unrest and economic stagnation fuelled hopelessness and ethnic hatred.

AusAID was a significant contributor to the *Seeds of Hope* project to rebuild Rwanda. The CGIAR Centres helped Rwanda in four major ways:

1. Helping relief agencies find good quality seed of the right varieties that farmers and communities were asking for, avoiding the past pitfall of indiscriminate supplies of seed not well adapted to the target zone;
2. Studying changes in seed diversity and household seed security in the immediate aftermath of the genocide, to understand if and how precious biodiversity might have been damaged;
3. Multiplying seed of a wide range of indigenous Rwandan crop varieties outside the country, so as to be prepared to restore it on a major scale in case of total loss (fortunately, this worst-case scenario did not materialize, but those seeds did prove valuable in rebuilding Rwanda's research capacity); and
4. Helping rebuild human capacities, training scientists to replace many who had been killed or forced to flee.

The power of 'smart aid' was evident in this project. Rather than blanketing the country with non-adapted seed—a practice frequently employed in the haste of emergency relief initiatives—the Centres built on a decade of prior experience there to quickly draw together complementary partners and identify seed sources appropriate to specific localities and needs. As a result, aid was precisely targeted. The right seed got to the neediest people, quickly—and equally important, local agro-biodiversity and seed enterprises were not pushed aside.

## Solomon Islands

Solomon Islands has been deeply troubled by ethnic conflict in recent years. The people of Guadalcanal province resented settlers from one of the other major provinces, the island of Malaita, who they saw as taking land and jobs from them. When fighting broke out in 1998 on Guadalcanal, about 20,000 people had to flee their homes and return to Malaita.

Thanks to the intervention of the Regional Assistance Mission to Solomon Islands (RAMSI), spearheaded by Australia and New Zealand, peace, hope and business confidence are returning to Solomon Islands. The challenge now is to create new livelihoods throughout the country, otherwise the civil unrest and insurgency may re-ignite. Through support from ACIAR and others the WorldFish Centre has been developing small-scale aquatic enterprises that can help the coastal poor lift themselves out of poverty.



Pearl farming is a promising new livelihood option in Solomon Islands. Photo: Mike McCoy

Farming black pearls is the second most important source of foreign exchange in French Polynesia (a US\$200 million per annum industry) and Cook Islands. Over the past nine years, WorldFish has transferred the technology for catching and growing the blacklip pearl oyster from Polynesia to Solomon Islands. WorldFish has also operated a demonstration pearl farm to show that high quality black pearls can be produced in Solomon Islands at costs far lower than elsewhere in the region. The establishment of just one major pearl farm in the Western Province of Solomon Islands is expected to provide at least 100 households with annual incomes of US\$2000.

The tropical marine aquarium trade is a US\$300 million per annum industry providing income for thousands of coastal dwellers across Asia, the Pacific and the Caribbean. Most of the colourful fish and invertebrate species are collected from coral reefs. Environmental groups are lobbying consumers to only buy fish from suppliers that use responsible practices

or who culture fish rather than collect them from reefs. WorldFish has worked with the Department of Fisheries and Marine Resources in Solomon Islands to find remunerative yet sustainable options to help the islanders benefit from their coral reef biodiversity. They have developed sustainable methods for the farming of giant clams and corals, and for the capture and culture of the postlarval stage of valuable aquarium fish and crustaceans for the aquarium trade. These methods provide farmers with more options and solidify their position at the high-value end of the international aquarium market, where consumers are willing to pay for environmentally responsible products. As villagers come to see the economic value of their biodiversity, they will be more motivated to protect and sustain it.

WorldFish is also working with local communities to add value to wild harvests of sea cucumbers, and to alert them to the dangers of overfishing. During the ethnic tension, when distribution networks for cocoa and copra were dismantled, collection of sea cucumbers, a commodity that can fetch a wholesale price of more than US\$70 per kilo, was the only source of income for many coastal communities.

However, sea cucumbers are easy to harvest and stocks have been overexploited. Also, in their desperation for cash, villagers do not always process sea cucumbers in ways that maximise their value. WorldFish is helping communities identify other livelihood options to allow stocks of sea cucumbers to recover to more productive levels; developing sustainable harvest practices such as catch limits; and training villagers in better processing methods so that they obtain higher prices.

ACIAR has given ongoing support to the work of WorldFish, and current projects on pearl oysters, sea cucumbers and sustainable aquaculture reflect this. Other ACIAR-funded research targets management of migratory tuna stocks, support for regional plant genetic resources development, and domestication and commercialisation of crops from indigenous trees and shrubs.

## Timor Leste

In the struggle for independence in Timor Leste (East Timor) many lives were lost and crop seeds were stolen or burned, creating an imminent food crisis. Finally, after a United Nations (UN) Transitional Administration was installed to bring calm, a newly independent Democratic Republic of Timor Leste was internationally recognised in May 2002.

The devastated country needed help. Since more than 90 per cent of the population was involved in farming, a major priority was to rebuild agriculture and establish food security. Numerous agencies rushed assistance to the country in the form of seeds, but crop scientists found

that much of the seed and plant material provided was not well adapted to the country.

Through ACIAR, Australia called on five CGIAR Centres to help—CIAT for cassava and beans, CIMMYT for maize, CIP for sweet potato, ICRISAT for peanuts and IRRI for rice.

ACIAR then designed and supported the *Seeds of Life* (SOL) Project, launched in the year 2000 during the UN Transitional Administration period. SOL formed a close partnership with the new nation's Ministry of Agriculture, Fisheries and Forestry and helped train its new staff. It also partnered closely with some non-government organisations (NGOs)—Catholic Relief Services, World Vision International and Australian Volunteers International.

The Memorandum of Understanding that established the partnership was the first such agreement signed by the new government, and the new president of the country, Xanana



ACIAR's aid is helping to build a better future for these children in newly independent Timor Leste. Photo: ACIAR

Gusmao, was an enthusiastic participant at the inaugural planning meeting—demonstrating the priority the new country placed on getting its agriculture moving again.

An initial scoping mission found a wide range of soil types and rainfall patterns across the country. The mission concluded that an appropriately wide range of germplasm should be assembled for testing with the participation of farmers on their own lands. Farmers typically tried one to three varieties of a crop using their own management resources. This helped them identify the best materials to be multiplied at the village level for further use, and allowed neighbouring farmers to observe as well. Their feedback helped national authorities identify the best varieties for formal release.

The project team also advised the government on setting up a central seed multiplication farm to accelerate seed production. Improved varieties were impressive in the trials, especially when combined with better management techniques. Cassava lines from CIAT yielded almost twice as much as the local varieties, while CIMMYT maize



The seeds of life team meets for its inaugural planning meeting in Timor Leste. Photo: ICRISAT

### Timor Leste cont...

outpaced the local types by 50 per cent and were less prone to falling over (lodging). Groundnut (peanut) is the most important food legume in Timor Leste, and varieties provided by ICRISAT proved far more productive than the local varieties in tests across four diverse locations.

At Bacau (a lowland site), farmers were stunned to see the sweet potato supplied by CIP yielding six times as much as local varieties. They and Timorese leader Xanana Gusmao took note, because it was previously believed that sweet potato wouldn't grow well there. In Aileu, a mountain town, the farmers carried away most of the sweet potato cuttings. Rather than being perturbed, project staff saw that as a compliment. Orange-fleshed sweet potato varieties that could help alleviate vitamin A deficiency—a significant problem on the island, especially for children—will also be introduced.

Drought severely damaged crops in early 2003, and Timor Leste's Minister of Agriculture wrote to ICRISAT asking for help in reviving sorghum culture, a crop that is well suited to dry conditions and is currently found mainly in the north around Liquiga.

ACIAR also currently funds support for the rehabilitation of the Agriculture Faculty of the National University of East Timor (described further on under Rebuilding human and institutional capacities), adoption of improved cassava production and biological control of two major weeds affecting the country's crop and livestock production. Some of these initiatives will be longer-term, as will ACIAR's commitment to the second stage of the Seeds of Life project.

The Crawford Fund has undertaken a number of training programs in East Timor including areas related to biological control of tropical weeds, fisheries management, upland soil management, raised bed cropping technologies, cattle and dairy management, and development of a Landcare movement.

## Afghanistan

After years of armed conflict and drought, Afghanistan is struggling to get back on its feet. Afghanistan once produced enough to feed its people and even exported some surplus. A long period of war and four consecutive years of drought all but halted agricultural production. Productivity declined sharply and food became scarce.

Getting agriculture back on its feet is not easy, given the virtual collapse of supporting institutions, the neglect of human resource development and the scarcity of inputs. The country's entire agricultural production system was disrupted; local seed and crop improvement

programs did not function; research stations were extensively damaged, equipment was looted and staff members had left the country or did not have the financial means to carry out research and development activities.

Wheat is the most important crop in Afghanistan, covering 80–85 per cent of the farmland or about 4–8 million hectares annually. It is the main staple cereal in the diet. In late 2001 and early 2002, there was worldwide concern about the possibility of starvation in Afghanistan. Just three months prior to the 2002 planting season the CGIAR launched the Future Harvest Consortium, involving nine centres supported by the United States Agency for International Development (USAID) and Canada's International Development Research Centre (IDRC). Fast action was needed, but fortunately the Consortium had a deep base of experience to draw on. CIMMYT and the International Centre for Agricultural Research in the Dry Areas (ICARDA), for example, had been evaluating wheat germplasm there with national partners for years.

By early April 2002, ICARDA had procured 3500 tonnes of CIMMYT/ICARDA wheat varieties in Pakistan. The United Nations World Food Programme transported the seed to NGOs and village shurahs (community groups) for distribution to farmers. The seed reached an estimated 70,000 farm families.

The International Fertilizer Development Centre (IFDC) later supplemented the seed with fertilizer distributions through a voucher system. To avoid creating dependency, no inputs were provided free of charge; farmers paid for the seed with wheat grain from their harvest.

For the autumn 2003 planting, the Consortium arranged the production and delivery of more than 5000 tonnes of wheat seed. All of this seed was produced locally by leading farmers following a rigorous program to ensure quality, including field inspections, the removal of off-type plants, post-harvest treatment against disease, and proper packaging. The seed reached more than 90,000 farmers in 11 provinces. This high quality, disease-resistant wheat seed produced at least 100,000 tonnes of food in 2003.



The Australian Government through AusAID and ACIAR helped CIMMYT's efforts. A project called *Seeds of Strength* is delivering locally adapted wheat and maize seed that can be sown right away. As a condition of receiving the seed, the farmers are asked to give a portion of the grain they produce to neighbours who did not have access to the seed in the first year of distribution. On-farm participatory testing of the imported seed is identifying the best cultivars, allowing for their local multiplication and distribution. Particular attention has been paid to yellow rust resistance in wheat and to promoting improved agronomy along with improved cultivars.

## A code of conduct for seed support

*The crisis in Afghanistan has attracted considerable aid interest, and many international and national organisations and donor agencies are assisting in the rebuilding of the country's agricultural sector. Genuine as these efforts are, such activities come with risks such as the import and distribution of inappropriate varieties, or seeds that carry new diseases, pests, and weeds. To reduce these risks, ICARDA organised a meeting of IARC partners in May 2002 to develop a Code of Conduct for all those involved in seed production and distribution in Afghanistan. The Code is being finalised with support from FAO and is expected to form the basis for a larger national seed policy and regulatory framework for the country.*

## Iraq

Iraq is a very different case from Afghanistan. It has long had a well-trained cadre of agricultural scientists, many with PhD degrees from Europe and the USA. ICARDA trained over 350 Iraqis since collaboration began in the late 1970s. With the chaos of war and the disruption of institutions, this capacity has been scattered and immobilised.

A three-year project due to start in April 2005, funded by AusAID and managed by ACIAR in partnership with ICARDA and the Iraqi Ministry of Agriculture, plans to introduce and promote improved varieties of wheat and barley, plus pulse and forage legumes among farmers in the dryland cropping regions of northern Iraq. The project will identify, develop and promote improved agricultural systems suited to dryland farming in the country. It will also develop the capacity of Iraqi scientists to identify and evaluate potentially valuable germplasm and better crop/soil management technologies, and promote their adoption by farmers.

With support from the Economic and Social Committee for West Asia of the United Nations (ESCWA), ICARDA has created a database of the expertise of Iraqi nationals around the world. Iraqi nationals can register to help research and development agencies find them for consultancies and full-time positions in Iraq.

Australia is committed to helping Iraq lift its agricultural performance and productivity. In late 2004, the Crawford Fund sponsored an important visit to Australia by six senior Iraqi scientists from the Ministry of Agriculture. ACIAR and its partners discussed with them potential areas for agricultural research and training. There are now two projects in the pipeline, one dedicated to introducing better crop germplasm and management for improved production of wheat, barley and pulse and forage legumes, the other to building integrated pest management capacity in Iraq, initially concentrating on control of jasmine whitefly in the citrus/date horticulture system of central Iraq.



# SAFEGUARDING AND RESTORING AGRO-BIODIVERSITY

The CGIAR Healing Wounds study found that smallholders had surprisingly resilient local seed systems. When conflicts were brief as in Rwanda, those systems bounced back quickly, because seed supplies on-farm had not been destroyed or exposed to long periods of decay in storage. On the other hand, intense and/or extended conflicts such as the Khmer Rouge period in Cambodia and the conflict in Afghanistan did degrade agro-biodiversity significantly.

In contrast, formal seed systems were more vulnerable to disruption because they depended on centralised infrastructure, institutions and human resources—



assets that were often damaged by forces of nature, or came under direct attack during conflicts. These systems are critical for future agricultural growth, so this vulnerability requires special attention.

The CGIAR's regional and international networks of expertise and gene banks proved to be a priceless resource of knowledge and materials to restore agro-biodiversity and re-establish seed and food production systems. Recognising the crucial significance of these and other gene banks, the United Nations Food and Agriculture Organization and the CGIAR Centres in 2003–04 established the Global Crop Diversity Trust (GCDT) as an element of the funding strategy for the International Treaty on Plant Genetic Resources for Food and Agriculture. The trust will provide a permanent source of endowment funds to underpin the secure storage of the genetic diversity of the world's main food crops. Australia, through AusAID and the Grains Research and Development Corporation, provides more support to the GCDT than any other country. This vital safety net deserves continuing support.

Rwandan farmers' amazing bean biodiversity. Photo: CIAT

## REBUILDING HUMAN AND INSTITUTIONAL CAPACITIES

Restoring the capacity of national institutions to conduct agricultural research is vital for sustainable recovery. This has been a traditional strength of the CGIAR Centres, and they have applied it vigorously in all the crisis situations described. Sometimes it meant building a national system from the ground up, as in Cambodia and Timor Leste. In both these countries AusAID and ACIAR have made important contributions.

For instance, the violence that followed the 1999 referendum in Timor Leste led to the destruction of the agricultural facilities at Timor's university, including those at the Hera Experimental Station. Many staff returned to Indonesia and elsewhere. Courses and teaching were totally disrupted. ACIAR funded a project to rehabilitate the agriculture faculty, focusing on rebuilding agricultural research and teaching capacity within the university, as a prerequisite for any subsequent collaborative research projects with ACIAR.

The project was a cooperative venture, with several Australian universities providing resource people and training, Curtin University providing overall leadership and Northern Territory University (now Charles Darwin University) having a key role in regular interaction, training and logistics.

Now the rehabilitated facilities at the Hera site are of a high standard. An enormous amount of collaborative work went into the development of the

new curriculum and unit guides. Many of the Australian collaborators assisted with this task, often at little cost to ACIAR. Unit guides or workbooks were developed for many technical subjects. Demand for student places in agriculture is high and staff members have large class sizes and teaching loads. Approximately 95 per cent of the 2004 graduating class are now employed, at least on a part-time basis.

In Cambodia, the CIAP project worked closely with NGOs, who took responsibility for many outreach functions until national researchers killed by the Khmer Rouge could be replaced and trained. Today the work goes on through the AusAID-funded Cambodian Agricultural Research and Development Institute (CARDI) Assistance Program.

Restarting the small-scale private sector is also crucial, especially input supplies and markets. In Nicaragua and Honduras, *Seeds of Hope II* fostered the emergence of small-scale private seed enterprises. Similarly, tree nursery micro-enterprises have been fostered in locations as diverse as Rwanda, Palestine and Afghanistan. Sustainable small-scale livelihoods such as aquafarming of black pearl, giant clam, sea cucumber and coral, and ornamental fish and crustacean cultivation, being encouraged by WorldFish in the Solomon Islands, can alleviate the poverty that fuels ethnic conflict.

# REDUCING FUTURE VULNERABILITY TO CONFLICTS AND DISASTERS

It is human nature to think of disasters and conflicts as unique events, hoping they will never happen again; but the unfortunate reality is that they will—as illustrated by the case studies in this booklet. How can the CGIAR Centres help aid agencies prepare for the inevitable?

A vast swath across the Indo-Gangetic Plain of highly-populated South Asia depends on rice and wheat grown in rotation for its food supply. This area includes the troubled border area between India and Pakistan, where continuing low-level conflict has spread fear and insecurity. Nepal and Bangladesh have also endured their share of conflicts and disasters.

This zone had become a showcase for improved agricultural production, thanks to the new wheat and rice technologies introduced during the Green Revolution of the 1970s and 1980s. But in 1990, studies by IRRI and CIMMYT revealed some worrisome findings. Yields were levelling off or even beginning to decline, suggesting deterioration in the natural resource base under such intensive cropping. What was the cause, and how could it be fixed?

Several CGIAR Centres (ICRISAT, IWMI, and CIP, led by CIMMYT and IRRI) teamed up with these national partners to form the Rice-Wheat Consortium in 1994. Their work was made possible through support from the Asian Development Bank, the government of The Netherlands, the government of Japan, the Department for International Development (DfID—U.K.), the International Fund for Agricultural Development (IFAD), USAID and ACIAR.

The Consortium is finding ways to help farmers implement more sustainable practices. One approach is known as 'precision farming'—applying inputs only where they are needed, rather than blanketing entire fields with high rates of inputs. A simple leaf colour chart is helping farmers determine whether they need to add nitrogen fertilizer, and at what rate. A study found that 175 farmers in India's Haryana State were cutting their fertilizer rates by up to 20%. Controlled-release and deeply-placed fertilizers have increased nutrient efficiency by another 30 per cent. Reducing rates of input usage also saves big money—a significant motivation for farmers to change.

Other land-saving topics under study include salt and water balances, the cultivation of rice on raised beds, weed management in rice-wheat systems, crop diversification (including potatoes), and the introduction of legume crops into rice-wheat systems. Efforts to improve water use are also paying off. In some cases, water savings of up to 40 per cent have been observed. Techniques such as cultivating rice on raised beds are contributing to these savings.

The drama that provided the impetus for the very creation of the CGIAR—the race to prevent massive famine in Asia in the 1970s, which succeeded brilliantly through the new crop varieties and management practices known as the Green Revolution—is a striking example of how preventive investments in research can pay off spectacularly.

## MAKING RELIEF AID MORE EFFECTIVE AND EFFICIENT

The knowledge and expertise contributed by CGIAR Centres has helped aid agencies increase their effectiveness in crisis situations. This knowledge-based 'smart aid' gets the job done better, more quickly and more efficiently.

The power of smart aid was evident in the *Seeds of Hope* project in Rwanda. Rather than blanketing the country with non-adapted seed—a practice employed all too frequently in the haste of emergency relief initiatives—the Centres built on a decade of prior experience there to quickly draw together complementary partners and identify seed sources appropriate to specific localities and needs. As a result, aid was precisely targeted. The right seed got to the neediest people, quickly—and equally important, local agro-biodiversity and seed enterprises were not pushed aside.

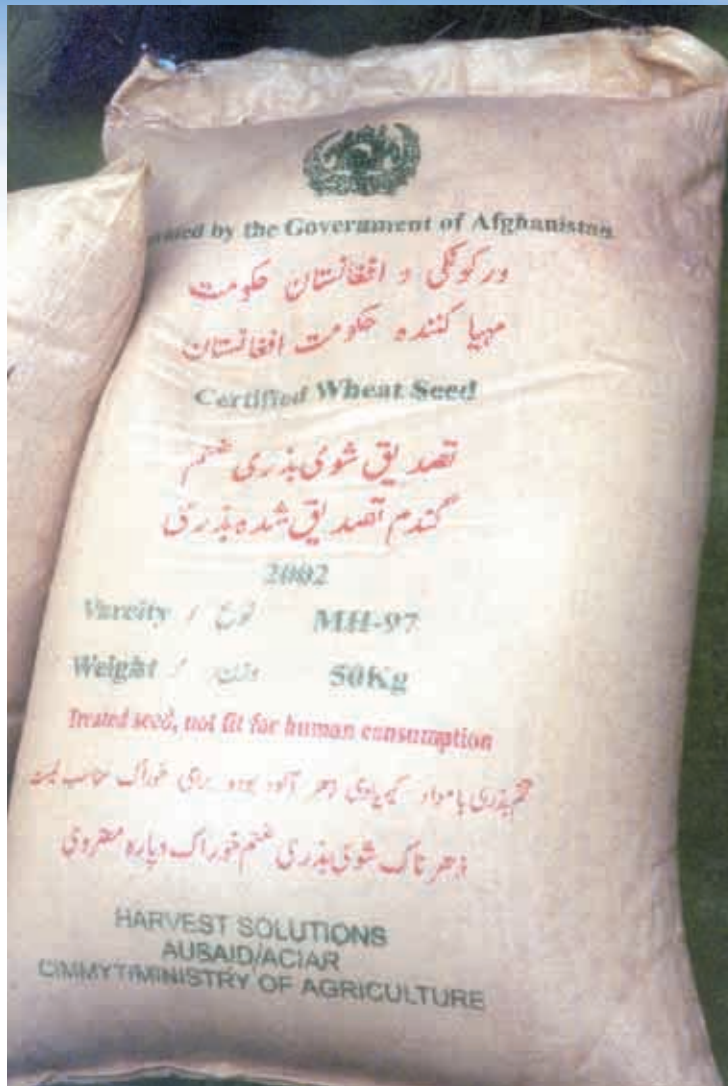
The CGIAR study concluded that indiscriminate seed giveaways undermine local seed enterprises. Partnerships with aid providers proved a better way, providing aid in the form of vouchers that poor farmers could use to buy seed from local suppliers of their choice. Supporting local institutions and social networks builds local resilience and food security.

When embarking on major rebuilding efforts, the Centres' diagnostic and analytical capabilities contribute significantly to steer aid in the right direction. The Future Harvest Consortium in Afghanistan, for example, conducted an in-depth needs assessment that reached every province of the country, talking to thousands of farmers. The information fed into priority-setting deliberations by a wide range of assistance entities, including Afghanistan's own Ministry of Agriculture and Livestock, USAID, US universities, NGOs, FAO and private sector organisations. The AusAID-ACIAR sponsored CIMMYT project is a positive outcome of these deliberations.

## RETURNS ON INVESTMENTS

The CGIAR's knowledge-based approach, referred to as 'smart aid', makes relief assistance more efficient, effective and targeted. It helps aid agencies to achieve more relief per dollar, reach the truly poor and avoid counterproductive outcomes such as the undermining of local mechanisms of resilience. The CIAP effort to rebuild Cambodia's rice economy, for example, generated an

internal rate of return of 32 per cent per annum on the humanitarian investment, worth US\$1.3 billion. The entire CGIAR System's three-decade (1971–2001) cost of US\$7.1 billion was vastly exceeded by an estimated \$65 billion in benefits related to the prevention of food insecurity crises. Clearly, research for development pays big dividends!



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