

After 8000 years, the quest goes on

PROJECTS AIM TO IMPROVE CROPS IN PARTNER COUNTRIES

Despite the notion of crop improvement being a recent scientific advancement, the methods used have changed little since the first wheat crops were developed around 8000 years ago.

Most research into crop improvement still involves practices that were developed, whether through accident or design, by ancient farmers, essentially adapting crops to better suit local environments.

Developing countries plant a range of crops also grown in Australia, the difference being that in many developing countries the crops are not well adapted to local conditions. Crops grown in Australia are not native species, but the varieties chosen and grown have been adapted to the growing conditions on Australian farms through many years of research.

The same process is only beginning to gather genuine momentum in a number of developing countries, and is being supported by ACIAR research. Many food crops are grown outside their centres of origin, yielding at lower levels than would varieties more suited to local conditions.

Using the crop improvement research expertise of Australian scientists, ACIAR has undertaken, and continues to undertake, a range of projects to improve crops grown in partner countries – through more suitable varieties and by adapting those and other varieties to better suit local growing conditions.

On pages 4-11, *Partners* looks at some of these ACIAR projects.

Seeds of life cast a golden light

EAST TIMOR'S
POLITICAL FREEDOM
HAS OPENED THE
DOOR TO MODERN
AGRICULTURE
– IMPROVING
PRODUCTIVITY
TO FEED A NEW
NATION. **BRAD
COLLIS** REPORTS



The village women sit cross-legged, patiently shucking corn; production-line workers filling woven baskets with tumbling grain. Ordinarily there would be nothing to differentiate this moment from countless others in the cycle of life and work in the foothills outside Baucau, on East Timor's central north coast.

The crop has been harvested, the women, young and old, are doing what they have always done – yet the whole scene depicts a farming revolution. The grain, being prised off the cobs by a blur of callused thumbs, is yellow. Plus there is a lot more of it.

This new, high-yielding yellow maize is one of the more visible changes to an agricultural system that has effectively been unchanged in East Timor's rural areas for hundreds of years.

The freedom won from Indonesia in 1999 has opened the door to modern agriculture – something that is going to be crucial for food security and for the country's long-term aspiration to find an export crop.

The new yellow maize is being grown on a farm run by an Italian priest, Father Locatelli, who was a prominent figure during the two decades of resistance against Indonesian occupation. The farm, at Fatumaca, near Baucau, is attached to an agricultural high school run by the Silesian missionary order. It has proved the ideal site for crop trials being undertaken by a former CSIRO agriculturalist, Dr Brian Palmer. Already his yellow maize, provided by the International Maize and Wheat Improvement Centre (CIMMYT) in Mexico, is yielding up to six tonnes a hectare of 'corn' compared with the indigenous white maize's average of 1.5 tonnes.

If these high yields can be replicated across the country for staple crops like maize, it will free up land for more commercial ventures such as vanilla, soybean, peanuts and candle nut (for oil) and agroforestry.

While farmers are not suddenly clamouring for the new yellow variety, the fact that those around Fatumaca have been willing to give it a try, indicates some receptiveness to innovation.

Palmer, who has been volunteer project leader for the \$1.2 million ACIAR 'Seeds of Life – East Timor' project, argues that change will only succeed if it is adopted willingly: "Our new high-yielding maize is yellow. The traditional variety here is white. It's not up to me to tell them to change. What is up to me is to demonstrate the performance of the new crop and then leave the decision to them."

Palmer is sensitive to the dangers of introducing unsuitable agriculture: "This is a small country. It would be easy for something inappropriate to pass around quickly," he says. "I would not like to be the person responsible for introducing a



Laying the foundations: Dr Brian Palmer and a Fatumaca farmer inspect a crop of ground nuts.

Opposite page: An East Timorese farmer plants rice, hoping he'll get a harvest. Early relief efforts without the backing of agricultural research resulted in many farmers receiving unsuitable rice varieties to grow.

new crop variety or method that failed in the long-term because it wasn't properly tested."

The Seeds of Life project, overseen by ACIAR research program manager Dr Colin Piggin, has changed from a humanitarian operation in 2000 to an agricultural extension program with the development of commercial crops as the ultimate goal. Its genesis was in the aftermath of the violent reprisals after the East Timorese voted for Independence in September 1999. Seed for the next harvest was either burned or stolen. ACIAR contacted the world's five leading crop research centres for suitable supplies and by December 2000 the first test crops were being sown.

The International Centre for Tropical Agriculture in Columbia (CIAT) provided soybean, mungbean, cowpea and cassava seed. Contributions also came from the International Potato Center (CIP) in Peru, the International Rice Research Institute (IRRI) in the Philippines, the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) in India, and CIMMYT in Mexico.

Brian Palmer was in the first wave of helpers to go to East Timor and has been there ever since: "I had spent 20 years as a research scientist. Now was a chance to put it to real use," he



Making change

happen: East Timorese women shucking corn, above, and right, a trader in a Dili produce market.



PROJECT:

CIM/2000/160 Seeds of Life – East Timor

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Footnote:

The Seeds of Life project was scheduled to run until 30 June 2004. A second phase is now being developed by the Ministry of Agriculture, Forestry and Fisheries, East Timor, in collaboration with current partners IRRI, CIMMYT, ICRISAT, CIP, CIAT, and Catholic Relief Services and potential new partners, the National University of East Timor and the crop extension group of the Northern Territory Department of Business, Industry and Rural Development. ACIAR and AusAID are discussing ways to link and jointly support promotion of better crop varieties identified in the Seeds of Life project.

► explains, trudging through sucking mud after the opening rains at Fatumaca.

Palmer is hoping his string of crop experiments around the country will become the basis for new, improved farming systems. He has been using the germplasm provided by the research centres to improve the crop selections for East Timor’s four main ‘agro-ecological’ zones.

“Once we feel we have lines that are well adapted to East Timor we then have to determine if they are acceptable to the farmers, as with the white corn/yellow corn example. Farmers are going to have to weigh up taste preference versus the food security that comes from the high-yielding yellow corn.”

Palmer is confident the higher yields will win-out and points out that in other crops, such as sweet potato, villagers already prefer the flavour and size of the new varieties.

Elsa Ximenes, a farmer from the Aileu district, says: “We are very happy with these new crops. They are much bigger than the old sweet potato. I can already tell they will sell well in the market”.

Brian Palmer says the key to farmers adopting new varieties and methods is what he calls ‘participatory planning’. “To me this means offering them technically sound options from which they can choose,” he says. “Some aid organisations simply want me to give farmers what they ask for. Well, until they’ve been exposed to a range of viable alternatives, that’s not giving them the options to move forward. And if the farmers who are recognised in an area as good farmers become involved, and adopt the new varieties and new technologies, then others will follow.”

Contrary to the pessimism that some observers have expressed about East Timor’s economic progress, Palmer is confident: “The progress we have already made and the willingness of the international agricultural

KEEPING THE WORLD'S SUGAR SWEET

► science community to be involved makes me pretty optimistic.”

Palmer says he wants to lay down a foundation on which East Timor's own young graduates can build – an ambition that has come a step closer with the restoration, also supported by ACIAR, of the University of East Timor's agriculture faculty.

There are four second-hand computers for 1200 students, squeezed into six lecture rooms: “We're still in the chalk and talk days,” says dean Flavian Soares. “But given that everything was destroyed, we're actually making good progress.”

The university's curriculum has an emphasis on practical skills and graduates are expected to return home to help develop their communities. Most of the faculty's senior students are in their mid-to-late twenties, their education broken by the destruction of the university after the independence vote. As teenagers many had belonged to the Falintil's clandestine courier network.

By the age of 15, aspiring agronomist Sipriano Martins had acquired the code name Saruntu, ‘fight like a crazy man’. Now, at 24, his ambition is to take new cultivation methods back to his coffee and vanilla-growing village.

Eusebio Gomes, 28, has already joined with other students to form their own non-government organisation to demonstrate new farming technologies – which can be as simple as planting in rows instead of casting seed randomly over the ground.

The feeling of the students was summed up by 24-year-old Aluiziu Assis, who is impatient to take his knowledge of animal disease and vaccines back to his home town, Manatuto: “We are optimistic for a very important reason,” he says. “We have already shown we can make change happen.” ■

The scientists knew the threats were out there – and now they know where. A three-year project funded by ACIAR has for the first time mapped the distribution of pests and diseases that threaten wild sugarcane growing in Papua New Guinea, parts of the Torres Strait, and the province of West Papua (Irian Jaya) in Indonesia.

Sugarcane originated from the New Guinea island, and a rich diversity of wild germplasm from the genus *Saccharum* grows there still. The germplasm is important for traditional purposes and for breeding new, improved varieties for sugar production in PNG, Indonesia, Australia and the rest of the world.

The destruction of forests through logging and reliance on artificial sweeteners are taking their toll, but pests and diseases pose the most serious threat to the germplasm's long-term survival. The spread of these scourges is also a risk for commercial sugar production in Australia, PNG and Indonesia.

Some serious pests and diseases occur in Australia and other parts of Indonesia, but not on the New Guinea island. Conversely, the island has its own host of dangers that could wreak havoc elsewhere. Scant knowledge about the distribution of the pests and diseases, however, made it difficult to determine the potential for spread, and to develop effective controls.

In an effort to fill in the blanks, Australian, PNG and Indonesian scientists collaborated in a project mapping diseases and pests across the region. The collaborating institutions were Ramu Sugar Ltd in PNG; the Indonesian Sugar Research Institute; BSES Ltd in Australia; and the Australian Quarantine and Inspection Service. The project ran from June 2000 until December 2003. It included surveys and studies on indigenous sugar species, their pests and diseases and resistance; training of professional staff from PNG and Indonesia in Australia; workshops for quarantine staff in PNG and the Torres Strait; workshops for laboratory and field staff in Indonesia; and study by graduate students in Australia.

The risk of exotic pests and diseases being introduced into the region is significant, with Indonesian plans to establish commercial sugarcane crops in West Papua using plants sourced from Java. Other quarantine risks have been identified and the project has highlighted these to the authorities in each country. Hybrid cultivars, sourced from commercial plantations, were found in some PNG household gardens, raising the risk of pests and

diseases spreading to disease-free areas.

The survey provided valuable insight into the nature of the threats. For example, *Eumetopina flavipes*, the insect vector for the debilitating Ramu stunt (a disease endemic in PNG), was found on most Torres Strait Islands and on the Australian mainland at Bamaga near the tip of Cape York. There was no sign of Ramu stunt, however, and the discovery of the planthopper in just a couple of gardens in Bamaga, coupled with its isolated occurrence in the Torres Strait, suggests it could be eradicated from the Australian mainland.

Ratoon stunting disease (RSD), a major global sugarcane disease, was not found during the PNG survey, but has since been identified on the commercial estate at Ramu Sugar, near Lae, PNG. The disease is a threat to wild germplasm, and further surveys to determine whether it has spread are a priority. Ramu Sugar plays an important socio-economic role in the Ramu Valley, which was an undeveloped area 25 years ago but is now home to 10,000 people with schools, roads and health services.

Disturbingly, the survey also discovered plants with sugarcane mosaic-like symptoms that did not test positive to diagnostic assays. The identity of the pathogens associated with this condition is unknown, and further research is essential.

The project successfully promoted community awareness of the importance of quarantine. Posters were distributed in English, Motu and Pidgin. Brochures in Bahasa Indonesian were distributed to communities during the Indonesian survey.

An external review of the project's progress and achievements was undertaken in the last six months of 2003. The review scientists said the project had achieved positive social, environmental, economic, capacity building, and scientific impacts. Following their recommendation, ACIAR has agreed to extend the project until December 2005. ■

PROJECT:

CIM/1996/140 Biological threats to *Saccharum* germplasm and sugar production in Papua New Guinea, Indonesia and Australia

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