

The man who defeated famine

As nominations open for the 2006 Rolex Awards for Enterprise, **Julian Cribb** profiles past laureate Gordon Sato's inspired coastal agriculture project which is giving new life to struggling Eritreans. Might it also have applications on Australia's coastlines and salt-soaked wasteland?

The sight of famine- and war-stricken Eritrean families unlocked painful memories in Gordon Sato. It recalled a time when he and his family were outcasts too, imprisoned behind barbed wire by their own country, along with thousands of fellow Americans of Japanese descent.

Today that memory of exclusion and adversity has given rise to one of the world's most remarkable aid programs, growing thriving plants where none grew before, building industries, work and new hope around them.

Sato, a 76-year-old retired molecular biologist, has declared a personal war on human suffering and landscape degradation – and set out equipped with little more than his own savings and a lifetime's knowledge of plants, to overcome them.

In the process he has pioneered a radical new technique for producing food – using seawater for irrigation, and emulating the natural processes of desert coastlines to grow plants.

An eminent American scientist with over 150 scientific publications to his name, Gordon Sato has spent the last 10 years – and A\$550 000 of his own money – establishing a multi-faceted agricultural programme in Eritrea around the cultivation of mangroves.

For his determined efforts to help Eritreans make positive use of their challenging environment, Sato received worldwide recognition when he was chosen as a Laureate of the Rolex Awards for Enterprise.

During World War II, the US government held Sato – a teenager at the time – in Manzanar, an internment camp in the Californian desert. Forty years later, towards the end of Eritrea's 30-year

struggle for independence, Sato recognised parallels between the way Ethiopia dealt with its Eritrean minority and the treatment meted out to his own family during the war.

Eager to help the Eritreans, and prompted by news reports of a new famine, Sato went to Eritrea and set up a small fish-farming operation in the north of the country, near the Eritrean navy's headquarters. This scheme, which he named Manzanar in memory of his family's wartime experience, provided wounded troops with a much-needed source of protein.

When he first arrived in Eritrea in 1985, Sato's initial reaction was 'outrage at the injustice of the situation. The Eritreans were being starved and massacred. Upon meeting the Eritrean leadership for the first time, I was impressed by their intelligence and highly principled commitment to freedom for Eritreans.'

From then on, Sato returned frequently to the small country on the Horn of Africa. On his retirement in 1992, he decided to devote six to eight months of every year, as well as his own life savings, to the project.

In less than a decade the Manzanar project has grown to the point where it will soon be providing fodder to raise livestock sufficient to feed up to 2000 people.

Eritreans are proud people, highly selec-

Gordon Sato's innovative Manzanar project harnesses two of the Eritrean coast's most abundant resources – intense sunlight and seawater – to grow mangrove plants used not only to feed animals, but also to provide a habitat for fish and shellfish. Could there be applications from Sato's work for coastal and salt-affected areas in Australia?





Rolex / Heine Pedersen

tive in the development projects they allow into their country and Gordon Sato admits spending almost as much time cultivating the authorities as he does his mangrove plantations. The Eritrean Ministry of Fisheries initially allowed him to use small plots of land for mangroves. Now, thanks to his diplomacy and commitment to the country, he has at his disposal large expanses of barren inter-tidal land along the Red Sea coast for the cultivation of mangroves and grasses.

Eritrea, which won independence from Ethiopia in 1993, is one of the world's most impoverished countries, with an annual per-capita income of only A\$280. The lands that lie along its 1000-kilometre coastline are especially poor. The harbour town of Massawa, where Sato runs the Manzanar project, is also one of the driest places on earth, receiving an annual rainfall of less than 20 millimetres.

Mangroves, which tolerate saltwater, grow along 15 per cent of Eritrea's coastline, forming a narrow fringe, normally no more than 100 metres wide. They grow particularly well in mersas, places along this arid coastline where seasonal rains collect for just a few days of the year and flow into the sea, carrying large amounts of sediment.

Studying these areas, Sato and his team of young Eritrean biologists and agriculture graduates made an interesting discovery: they realised that the rainwater and sediment carried contain nitrogen, phosphorus and iron, a shot of nutrition essential to plant growth. These elements are also present in seawater, but at levels too low to grow plants in areas not fed by the land.

After much experimentation they devised a low-tech method for slowly releasing the nitrogen and phosphorus directly into seawater – by burying small plastic bags of fertiliser below the surface of the sand, next to young trees in tidal areas. The nutrients trickle through small holes pierced in one side of the bag. And, in a scientific version of 'swords into ploughshares', iron, the third vital element, is provided by wire netting and pieces of metal, often salvaged from the abandoned tanks, trucks and other military impedimenta which litter the coast near Massawa.

They are now planting in areas where mangroves have never grown before, irrigating them with seawater pumped inland through a network of pipes.

Providing this combination of nutrients imitates the natural processes of the mersas, enabling mangroves to flourish in otherwise barren intertidal areas.

The team are using the native African mangrove, *Avicennia marina*, which provides excellent fodder for livestock.

They are also planting out a second native mangrove species, *Rhizophora mucronata*, which had become almost extinct in the region because of its value as building timber. This species is also used for firewood – very important in a country where three-quarters of household energy is supplied by burning wood.

After determining that the successful growth of mangroves depends on proximity to a source of nutrients, Sato and his team set about fertilising and cultivating areas above the high-tide line. They are now planting in areas where mangroves have never grown before, irrigating them



Rolex / Heine Pedersen

To ensure the success of the project, local Eritreans are being fully integrated into the agricultural cycle.

Profile

'The simple methods they have developed can be applied to coastal desert areas worldwide – so countries like Somalia need never suffer famine again,' Sato says.



Once mature, mangrove trees can be used as a principle source of fodder for cattle and sheep.



Sato's co-workers harvest mangroves at an inland nursery outside Massawa, one of the driest places on earth, receiving annual rainfall of less than two centimetres. Seawater is pumped in via buried tubes.



Sato's team has planted over 250 000 mangrove trees on the coast near the village of Hargigo, south of Massawa.

with seawater pumped inland through a network of pipes.

Animal feed trials showed that while goats can survive on a diet of *Avicennia marina* leaves alone, a varied diet is better for animal health. So they planted the grasses *Distichlis spicata* and *Spartina* – both can be irrigated with seawater and make excellent cattle fodder. They also plan to cultivate the desert saltbush *Atriplex* which is high in protein and can be used as fodder.

Robert Twilley, a professor of biology at the University of Louisiana, says that mangrove leaves provide a good food source for livestock in a desert environment. He adds that mangroves can be cultivated in Eritrea, 'as long as Sato can keep the saltwater input constant and allow large amounts of evaporation to overcome the salt balance'.

Sato is 'absolutely confident' that this can be done. 'Most of the planting is in the intertidal zone, which is awash with seawater,' he explains. And in the areas of cultivation further inland, the project's seawater irrigation system is working well.

In 2001, the Manzanar project grew

about 60 000 mangrove seedlings at various nurseries near Massawa, later successfully re-planting them near the coast. Since then, Sato has shown that mangrove seeds can be sown directly into the sand at coastal plantations.

The following year, the local Eritrean community planted another 250 000 mangroves, mostly at the village of Hargigo, 10 kilometres south of Massawa. Sato and the Eritrean biologists provided technical advice and training. The workers, mainly women, were paid for their labour during this time.

In 2003 the same workers became farmers, continuing to grow mangroves and harvesting them to feed livestock. Without a firm commitment by local people, the scheme will fail, so they are being fully integrated into the whole agricultural cycle. Total plantings exceeded 600 000 – and Gordon Sato was well on his way to his ultimate goal of three to five million trees within three years.

Gordon is using the US\$100 000 he received for the Rolex Award to expand the project and relieve the Eritrean Government of any need to support it.



Rolox / Heine Pedersen



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Women are employed to plant mangrove saplings in the intertidal zone, and to clean the planted areas of seaweed.



Rolox / Heine Pedersen

Fertiliser containing nitrogen and phosphorous is put into small plastic bags which will last three years.



Rolox / Heine Pedersen

Sato's Manzanar project has grown to the point where it will soon be providing fodder to raise livestock sufficient to feed up to 2000 people.

Today he is confident that local people will willingly participate, once they understand the technology behind the Manzanar project and its potential impact. 'They are fishermen and shepherds,' he says, 'and know the value of trees.' He is planning to set up a feedlot for animals on a five-hectare mangrove plantation near to Massawa, so



Rolox / Heine Pedersen

Protective fencing keeps the newly planted trees safe from huge herds of livestock of passing Rashaida nomads.

Profile

The originality of the Manzanar project stems from Gordon Sato's simple, but effective scientific methods, themselves borne out of a lifetime of confronting – and systematically overcoming – all manner of difficulties.

people can see the simple effectiveness of this technology for themselves.

Sato believes that the Manzanar project has had a profound effect on the thinking of his young African colleagues. 'The simple methods they have developed can be applied to coastal desert areas world-wide – so countries like Somalia need never suffer famine again,' he says.

'Manzanar serves two main purposes – it contributes to economic development and also to environmental enhancement.'

The originality of the Manzanar project stems from Gordon Sato's simple, but effective scientific methods, themselves borne out of a lifetime of confronting – and systematically overcoming – all manner of difficulties.

'I just keep going,' he admits, 'I am unusually persistent.'

More information:

Full details of the Awards are available from: www.rolexawards.com



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Who is our greatest environmentalist?



Two species of mangrove native to Eritrea are being planted. Total plantings exceed 600 000 – the ultimate goal is three to five million trees within three years.

Ecos calls for candidates for Australia's first ever Rolex Award for Enterprise

Nominate your most admired achiever for a Rolex Award.

Gordon Sato has accomplished an outstanding achievement for humanity, the environment and agriculture – but many Australians have also achieved equally remarkable things in their own country and round the world.

The Rolex Awards for Enterprise are among the world's best-known environmental accolades, bringing not only international recognition but also renewed support for a cherished project. Anyone can apply for them.

Several eminent Australians have been involved in the Awards, either as judges or applicants. They include entomologist George Bornemissza, underwater filmmaker Krov Menuhin, and Professor of Botany Adrienne Clarke, OAM.

The next cycle of the Rolex Awards for Enterprise opened in June 2004, and Ecos invites readers to

suggest Australians who have made exceptional achievements for the environment and related spheres of human endeavour.

These can be in any of the following areas: the Environment, Exploration and Discovery, Cultural Heritage, Technology and Innovation, and Science and Medicine. Candidates can be of any age and come from any background.

The five laureates and five associate laureates will be selected based on:

- Spirit of enterprise – a project carried out with determination, tenacity and boldness, usually against challenging odds
- Feasibility – a project that is likely to succeed
- Originality – an innovative project that breaks new ground
- Impact – the project that has a positive impact on the community

The director of Rolex Australia Pty Ltd, Mr Richard de Leyser, said that nominations for the 2006 Rolex

Awards for Enterprise represented a tremendous opportunity for Australians who were making a great contribution in the environment and related fields to receive international recognition for their work.

'Australians are among the world leaders when it comes to the environment, and one of the most important aims of the Rolex Awards is to acknowledge outstanding and ongoing achievement in this field of endeavour. We encourage anyone who knows an Australian who is making a remarkable contribution to nominate them for a Rolex Award.'

If you know someone you consider worthy of international recognition through this program, please send details to:

The Editor, Ecos Magazine
email: ecos@csiro.au

While Ecos cannot apply on behalf of candidates, we look forward to encouraging them to apply, and to supporting them in the magazine.

How to apply:

www.rolexawards.com/how-to-apply/index.html