GORDON SATO – UNITED STATES

PROJECT HELP THE INHABITANTS OF ONE OF THE WORLD'S DRIEST REGIONS TO ESTABLISH AGRICULTURE BASED ON MANGROVES
PROJECT LOCATION ERITREA'S RED SEA COASTLINE

BIRTH 17 DECEMBER 1927, LOS ANGELES, CALIFORNIA, UNITED STATES
PROFESSION – CURRENT JOB CELLULAR AND MOLECULAR BIOLOGIST (RETIRED); ASSISTING ERITREA'S COASTAL COMMUNITIES TO ESTABLISH AN AGRICULTURAL ECONOMY
DEFINING MOMENT IN THE 1980s, GORDON SATO, AN AMERICAN OF JAPANESE ORIGIN, WAS DISTRESSED BY REPORTS OF ETHIOPIA'S TREATMENT OF ITS ERITREAN MINORITY. REMINDED OF HIS FAMILY'S INTERNMENT IN U.S. CAMPS IN THE 1940s, SATO DECIDED TO HELP THE ERITREANS.

DRIVEN BY A LONG-STANDING DESIRE FOR JUSTICE, AMERICAN BIOLOGIST GORDON SATO IS SPENDING HIS RETIREMENT HELPING SOME OF THE WORLD'S POOREST PEOPLE, IN ERITREA, TO HELP THEMSELVES. HIS INNOVATIVE MANZANAR PROJECT HARNESSES TWO OF THE ERITREAN COAST'S MOST ABUNDANT RESOURCES – INTENSE SUNLIGHT AND SEAWATER – TO GROW MANGROVE PLANTS THAT CAN BE USED NOT ONLY TO FEED ANIMALS, BUT ALSO TO PROVIDE A HABITAT FOR FISH AND SHELLFISH. HIS AIM IS TO HELP IMPOVERISHED, COASTAL COMMUNITIES IN THIS WAR-TORN COUNTRY TO DEVELOP A LOW-TECH, SUSTAINABLE AGRICULTURAL ECONOMY.

An eminent biologist and the author of more than 150 scientific publications, Gordon Sato has dedicated much of the past 10 years – and $400,000 of his own money – to establish a multi-faceted agricultural programme in Eritrea, with the cultivation of mangroves as the main activity.

For his determined efforts to help Eritreans make positive use of their challenging environment, Sato, an energetic and imaginative 74-year-old, has been selected as a Rolex Laureate. The reasons for Sato's commitment to Eritrea date back to the 1980s and even further. During the Second World War, the United States government held Sato, a teenager at the time, and his Japanese-American family in Manzanar, an internment camp in the Californian desert. Four decades later, during the last few years of Eritrea's 30-year struggle for independence, Sato recognised parallels between the way Ethiopia was dealing 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 famine affecting them, Sato went to Eritrea and set up a small, fish-farming operation in the north of the region, near the Eritrean navy's headquarters. This scheme, which Sato named Manzanar in memory of his family's war-time 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 Eritrea. On retiring in 1992, he chose to spend six to eight months of every year there. Since then the Manzanar project has become an impressive, non-profit initiative that could soon be providing fodder to raise animals to feed up to 2,000 people.

Eritreans are proud people, highly selective in the development projects they allow into their country. Sato admits spending almost as much time cultivating the Eritrean authorities as he

To grow mangroves where they have never grown before is the major retirement project of eminent biologist, Dr Gordon Sato. Mangroves grow on tidal flats, but need nitrogen, phosphorus and iron – freshwater elements not found in sufficient quantities in the sea. On the shores of Eritrea, in a region of scant rainfall, the Rolex Laureate devised a simple system to supply the missing ingredients. He is now teaching some of the world's poorest people to raise mangroves for animal fodder, firewood and as a habitat for fish and shellfish. When the tide recedes, Eritrean women will transplant mangroves from the nursery.

does his mangrove plantations. The Eritrean Ministry of Fisheries initially allowed him to use small plots of land for mangroves. Now, thanks to Sato's diplomacy and his commitment to the country, he has at his disposal expanses of barren inter-tidal land on 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 poorest countries, with an annual per-capita income of $200. The areas adjacent to its 1,000-kilometre coastline are particularly poor. The harbour town of Massawa, where Sato runs the Manzanar project, is one of the driest places on earth, receiving annual rainfall of less than two centimetres.

Mangroves, which tolerate salt water, 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.

While studying these areas, Sato and his co-workers – a team of young Eritrean biologists and agriculture graduates – made an interesting discovery that determined the direction of the Manzanar project. They realised that rainwater and the sediment it carries contain the elements nitrogen, phosphorus and iron, all of which are necessary for the growth of plants. These elements are also present in seawater, but in insufficient concentration.

After much experimentation, they devised a low-tech method of slowly releasing these elements directly into seawater – by burying small, plastic bags of fertiliser below the surface of the sand, next to young trees in tidal areas. This fertiliser contains two of the "missing" elements – nitrogen and phosphorus. The powder escapes very gradually through small holes pierced in one side of the bag. Iron, the third vital element, is provided by wire netting and pieces of metal, generally taken from the abandoned tanks, lorries and other military ephemera littering the coast around Massawa. This combination of elements enables mangroves to grow in otherwise barren inter-tidal areas.

The Manzanar project uses the native mangrove species *Avicennia marina*, which provides excellent fodder for livestock. The project team is also growing a second native mangrove species, *Rhizophora mucronata,* which was previously almost extinct in the region because of its popularity as construction lumber. This species is also used for firewood – very important in a country where 75 per cent of domestic energy requirements are met by burning wood. After determining that the successful growth of mangroves depends on proximity to a source of fertiliser, Sato and his team set about fertilising and cultivating areas above the maximum tidal level. They are now planting mangroves where they have never before grown, irrigating them with seawater pumped inland along a network of pipes.

Helping nature along, Sato designed small cylinders to protect the tender mangrove seedlings and perforated fertiliser bags to feed them. Villagers in Hargigo cut sheets of wire to make the cylinders. As they rust, they provide iron for growth, as do metallic remnants of war buried in the sand. Women fill white plastic bags with sand and fertiliser, then prick tiny holes to release the nutrients slowly. The bags will be placed near the seedlings on the flats.

Ready to graduate from the mangrove nursery, seedlings are dug and put into pots for trucking to the coastal plantations. To create the inland nursery, Sato built a system of pipes to pump seawater to the site. Now he believes that it is possible to plant mangrove seeds directly in the coastal sand and save the time and cost of transporting the young seedlings. Between January and October 2002, Sato oversaw the planting of 200,000 trees, mostly in this region south of Massawa.

And while Sato and his co-workers have conducted experiments that prove goats can survive on a diet comprised solely of *Avicennia marina* leaves, a varied diet is better for the health of most animals. To address this, they have 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 salt bush *Atriplex* which is high in protein and can be used as fodder.

Robert Twilley, a professor of biology at the University of Louisiana, agrees that mangrove leaves provide a good food source for livestock in a desert environment. He maintains 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 inter-tidal 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," he adds.

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. In the 10 months to October 2002, Sato and the Eritreans he works with planted about 200,000 mangroves, most of them at the village of Hargigo, 10 km south of Massawa. Sato and the Eritrean biologists provided technical advice and training. The workers, most of them women, were paid for their labour during this time.

In 2003 the same workers will become 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.

The Rolex Award will help take Sato closer to his long-term goal of relieving the Eritrean government of its financial support of the Manzanar project, which currently stands at between $20,000 and $50,000 a year. In addition, it will give a positive image of Eritrea. Sato 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 feeding centre for animals on a five-hectare mangrove plantation near Massawa, so people can see the simple effectiveness of this technology for themselves.

The residents of Hargigo are already reacting favourably to the project. Concerned at first that villagers would not like the mangrove forests being fenced off, Sato admits to being pleasantly surprised at their reaction. "They love it," he explains, "because periodically Rashaida nomads come through with huge herds of camels, goats and sheep that eat everything in their path."

The fences now protect the mangroves from such risks. Sato maintains that the Manzanar project has had a profound effect on the thinking of his young Eritrean colleagues who, he says, show great promise of becoming future leaders of their country. “The simple methods they have developed,” he says, “can be applied to desert areas worldwide – so countries such as Somalia need never suffer famine again.” He also points out that Manzanar serves two major purposes, “contributing to economic development and to environmental enhancement”.

The originality of the Manzanar project stems from Gordon Sato’s simple, but effective scientific methods, themselves born out of a lifetime of confronting – and systematically overcoming – all manner of difficulties. “I just keep going,” he says, “I am unusually persistent.” In addition to constantly refining his ideas, Sato’s creativity has proved to be “an extremely valuable quality when working in a poor country”, says distinguished biochemist Bruce Ames, from the University of California, Berkelely. Ames has known Sato since they were both graduate students at the California Institute of Technology, and has visited him in Eritrea.
Jesse Roth, a professor of medicine at Johns Hopkins University, in Baltimore, points out that seawater, at first an obstacle, became the solution for the Manzanar project. Such ingenuity, he adds, “is typical of Sato’s thinking”.

With help from a protective cage and a bag of fertiliser, a young mangrove is on the way to maturity. This cylinder, now clogged with seaweed, proved too small for its task, crowding the plant. Bigger cages will soon be used. The cages are eventually removed and placed near the plant so that iron will continue to leach into the sand. Sato’s approach to problems is simple, yet innovative. His motivation springs from a deep desire to help the world’s minorities. Success, for him, will mean a profitable enterprise for Eritreans, managed by Eritreans.

“Introducing low-technology agricultural methods to help the poor and arid country of Eritrea holds hope for other developing coastal countries with similar climates. Collaboration with young, Eritrean biologists and training of the local population should promise long-term success for Sato’s project.”

DR LAILA EL-HAMAMSY

“The impact of Sato’s project is several-fold. Beneficiaries in Eritrea will learn new techniques and improve their quality of life. At the same time, Sato stands as a role model for scientists to show that one can, and should, apply laboratory-based knowledge in a much wider world. Lastly, here is proof that you do not have to be ‘bright young things’ to have an ingenious and workable idea.”

BARONESS SUSAN GREENFIELD

“The clarity of Sato’s vision, his determination to explore new ways of growing mangroves in unfamiliar territory, his resourcefulness and ingenuity in marshalling his knowledge and experience, accumulated over a lifetime, all demonstrate an unquenchable spirit of enterprise.”

MR LIU THAI KER

“It is impressive that a renowned American biologist is working in his retirement to help the people of Eritrea. His low-tech agricultural methods present a concrete approach with immediate results. The project’s success will be enhanced by his devotion to improving the quality of life of the local people, by his collaboration with young local biologists whom he has trained and by the support of government ministries.”

PROFESSOR CHIE NAKANE

“SATO STANDS AS A ROLE MODEL FOR SCIENTISTS TO SHOW THAT ONE CAN, AND SHOULD, APPLY LABORATORY-BASED KNOWLEDGE IN A MUCH WIDER WORLD… HERE IS PROOF THAT YOU DO NOT HAVE TO BE ‘BRIGHT YOUNG THINGS’ TO HAVE AN INGENIOUS AND WORKABLE IDEA.”