THE QUIET ACHIEVERS

Restoring the world's mangrove forests

Martin Atkin


Where the ocean meets the shore,
where salt water meets fresh,
mangroves stand with one foot
in the water, one foot on land.


“Love them or hate them, we all depend on mangroves and tidal wetlands. They have been the quiet achievers that have somehow adapted to fit among our everyday lives.”


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They live where the ocean meets the shore, where salt water meets fresh. They stand with one foot in the water, one foot on land. Washed twice a day by the tide, their roots lifting them high and proud above the waves, mangroves protect us from storms, suck up carbon from the atmosphere, provide a safe haven for endangered creatures and livelihoods for many millions of people.

Mangroves circle the globe like a blue-green mantle. Around 70 species covering more than 150,000 km2 in 118 countries fringe tropical and sub-tropical coastlines from Brazil to Australia, from Indonesia to Mozambique. The most common species - *Rhizophora mangle* (red mangrove) and *Avecennia germinans* (black mangrove) - thrive in the 'harsh space between the tides' where other plants would die, having evolved over countless millennia to cope with low oxygen and high salt levels. Their complex root systems extend like snorkels above the water and like anchors below, allowing them to both breathe and stabilise themselves.

Mangroves are one of our best allies in the fight against climate change - yet we are doing nowhere near enough to protect them. "Mangroves have enormous capacity for absorbing and retaining carbon dioxide and other greenhouse gases - and that's most critical in today's climate crisis," says Professor Benjamin Horton, Director of the Earth Observatory of Singapore and co-author of a recent report on the threats to the world's mangroves.

"Mangroves are an intriguing, intricate ecosystem that allows its trees to adapt to high temperature and salinity levels. But we could lose almost all mangroves by 2050 if the current carbon emissions trajectory is not lowered."

A world without mangroves is a world in serious trouble. Not only do they sequester huge amounts of carbon - around four times more than rainforests - but they provide natural protection against increasing frequent and more intense extreme weather events such as cyclones and storm surges. Their roots shelter huge biodiversity of fish, crustaceans and shellfish, upon which some 200 million people depend on for their food and livelihoods.

"Love them or hate them, we all depend on mangroves and tidal wetlands," says Professor Norman Duke of James Cook University in Australia. "They have been the quiet achievers that have somehow adapted to fit among our everyday lives. Facing the sea and bordering river and stream estuaries, these habitats offer essential services that will be sorely missed when they are further diminished."

The scale of destruction is alarming. The UN Environment Programme estimates that half the world's mangrove forests have been lost in the past 40 years. Urban development, deforestation, rising sea levels, industrial aquaculture and erosion have all taken their toll. Mangroves are highly adaptable, but even they are struggling to survive this onslaught.

Small wonder, that protecting and restoring mangroves is a top priority for the European Union's flagship climate change programme, the Global Climate Change Alliance (GCCA+). In Guyana, for example, a €4.17 million programme ran from 2009-2014 integrating awareness raising, research, restoration and community development. Now local women entrepreneurs make and sell mangrove honey, beeswax candles and other products whilst committing to protect the forests near their homes. As Agriculture Minister Robert Persaud noted, "The efforts to protect, restore and manage Guyana's mangroves forests efforts will continue long after the project has ended."

As part of a €47 million GCCA+ programme in Mozambique, nearly 230 hectares of mangrove were restored to protect the coastline from storms and erosion. When Cyclone Idai hit Mozambique in March 2019, more than a thousand people died - but it could have been far worse without the mangrove forests.

"Ultimately, it's our mangroves that saved us. They are our first line of defence. The day we don't have mangroves, I don't think our city will survive."

- Manuel de Araújo, Mayor of the coastal city of Quelimane, Mozambique.

In the Solomon Islands - one of the nations most vulnerable to rising sea levels - mangroves cover 65,000 hectares providing food, jobs and homes for thousands of people. Recognising their important role in disaster risk reduction, GCCA+ funded projects in five coastal communities including replanting and sustainable agro-forestry.

"Losing mangroves is the same as losing your livelihood," said farmer Dominic Odu. "If communities continue to cut and harvest mangroves at the current rate, soon there won't be any left. So we decided to replant - not only the edible mangroves, but the ones which are good for protection."

Guyana, Mozambique and the Solomon Islands are among more than a dozen countries to benefit from GCCA+ mangrove restoration projects since 2007. The benefits are clear, says Professor Horton. "Projects and policies designed to use coastal ecosystems to reduce vulnerability can also achieve other societal, environmental, and economic goals. We have a chance to change the way we do things, to create a civilisation in which the environmental crisis and the climate emergency are addressed, a civilisation that does not exploit planet Earth for its own exclusive use, but lives in harmony with it."

Damaged mangroves on the south coast of Jamaica - a far cry from the gleaming white beaches and upmarket hotels which lure tourists to the island from all over the world.

JAMAICA - HELPING NATURE TO HELP ITSELF

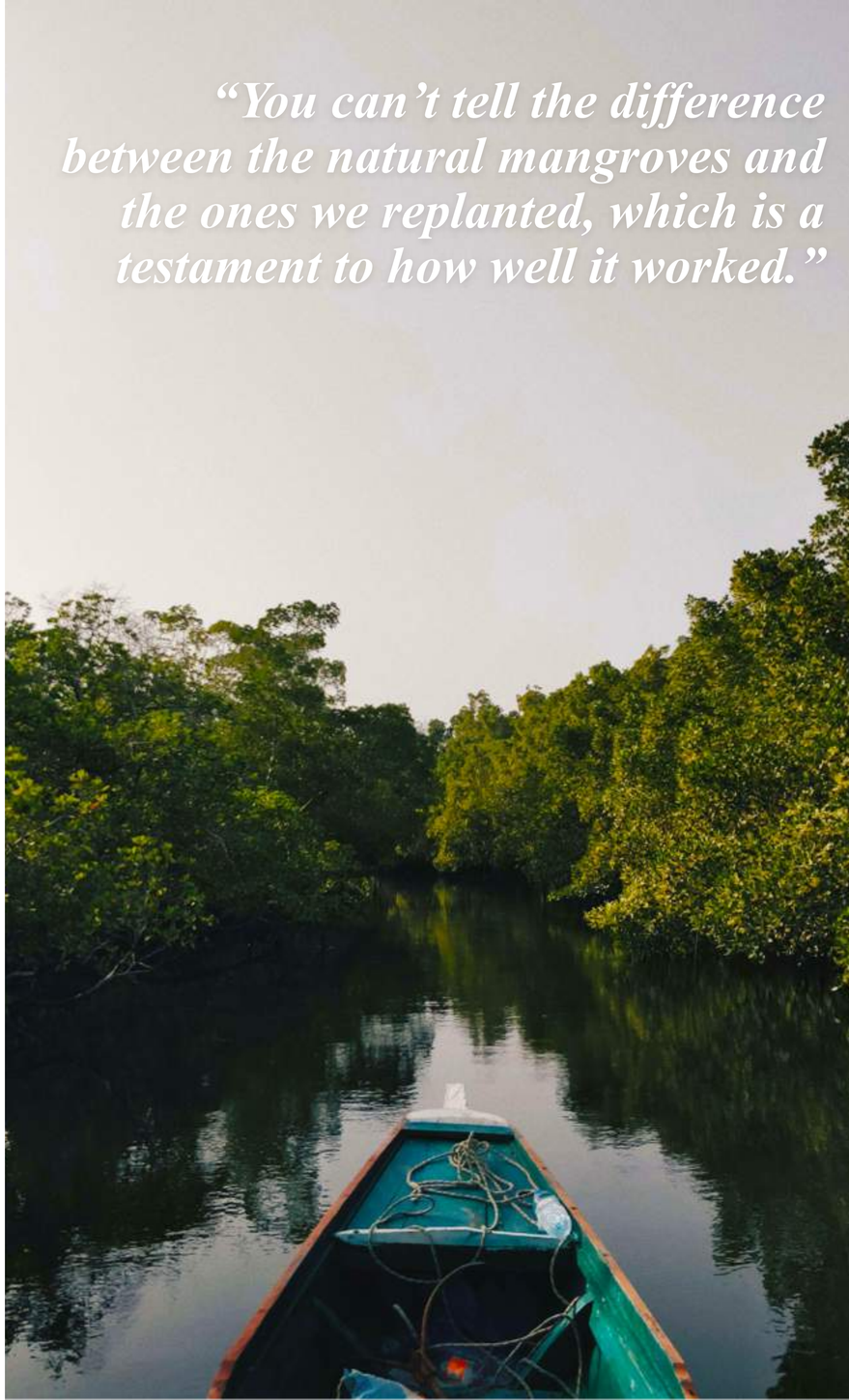
Portland Cottage on the south coast of Jamaica is a far cry from the gleaming white beaches and upmarket hotels which lure tourists to the island from all over the world. It's a mainly low-income community where people scratch a living from fishing or running mom-and-pop stores where you can buy anything from groceries to fishing tackle. High unemployment levels and poor infrastructure add to the feeling that this part of Jamaica, where the vast majority of households fall at or below the poverty line, has been left behind.

Portland Cottage is located in the Portland Bight Protected Area - Jamaica's largest protected area. The people here are used to tropical storms - a 2019 survey reported that nearly 90% of the residents had experienced flooding at some time. Eight people were killed and 500 families lost their homes when Hurricane Ivan ripped through in September 2004. The storm also devastated large swathes of the mangrove forests which fringe the Jamaican coastline - and along with them, the livelihoods of some 4,000 residents who rely on fishing.

"When Hurricane Ivan struck it washed sand and mud between the mangroves, blocking the channels. That meant the trees died back because they need to be constantly flushed with sea water," says Chalene Roye-Myrie, a marine biologist at the Jamaican National Environment and Planning Agency. "We had to dredge the channels before we could start replanting and restoration. We had to unblock the channels to allow the area to flush over time."

"The mangroves will not come back by themselves, they need help."

"You can't tell the difference between the natural mangroves and the ones we replanted, which is a testament to how well it worked."



Rebuilding homes, roads and other infrastructure took priority, and it wasn't until GCCA launched its €4.8 million programme in Jamaica in 2010 that work on restoring the mangroves really took off.

"It's the most successful mangrove restoration project we have ever done so far. You can't tell the difference between the natural mangroves and the ones we replanted, which is testament to how well it worked. The birds and the fish are coming back, it's been a tremendous success," says Chalene.

Mangroves are also helping to generate extra income for the locals in Portland Bight. A wetlands and wildlife discovery centre was built in 2015 to promote ecotourism and wildlife conservation.

Without mangroves, flooding to Jamaica's coastal zone could cause around US$169 million worth of damage every year. Factor in the protection of people and infrastructure during storms, and the value of mangroves works out at more than US$186 million per hectare. The GCCA project replanted a total of five hectares, representing a total protection value of nearly a billion dollars. By 2017, studies showed that half the area had at least one mangrove tree for every four square metres, and that the height of the trees had increased to more than three metres.

More than 30 locals either volunteered or were given paid jobs dredging, planting and maintaining the mangroves. "The community has been key to the success - we could not have done it without them," Chalene says. "You have to understand this is quite a low-income area, it's not one of the places with a lot of tourism, they depend on the mangroves. We wanted to be inclusive, for them to understand we were not just going to come in, replant the mangroves and leave again. They had to be involved for it to be sustainable in the long term. When the project ended they wanted to know when we were coming back, they wanted us to do more."

Replanting seedlings to cope with Portland Bight's unique conditions was a challenge. "This is an unusual area with high salinity, " says Chalene. "We collected seedlings from the surrounding healthy forests, and now you can't tell which is part is restored and which is the original forest. One of the main reasons why it has been so successful is that while other restoration projects tend to focus only on replanting, we set out to try and mimic the existing natural mangrove forests."

"We're trying to replicate as far as possible the existing natural mangroves, not just plant new ones. We wanted the mangroves to replant themselves without human intervention - that way they are much more sustainable in the long term."

Not everyone was convinced right away. "A lot of people were sceptical at first, they said it wouldn't work once we had left," says Chalene.

“But we have a very close relationship with the community and involved them in every aspect. For example, there were lots of goats which ate the mangrove seedlings, so we built a fence to keep them out. Eventually the fence got broken and the goats started invading again - until the local people chased them out and mended it to make sure the goats didn’t get back in and damage the mangrove seedlings.”

The Portland Cottage project was one of GCCA’s early successes - and although replanting finished seven years ago, Chalene says the legacy will last well into the future.

“I was so happy to see it work so well, to show the benefits of the mangroves. It’s been so successful, the Portland Bight project is now used as a guide for other mangrove restoration projects around the world, and we are now about to start another, much bigger project covering 1600 hectares of restoration. It’s been a fantastic success.”


*“It’s not just about selling honey.
It’s also about contributing something
to nature by pollinating the mangroves.
And that’s the difference.”*

TREES, BEES AND PEOPLE - THE VIRTUOUS CIRCLE OF SURINAME

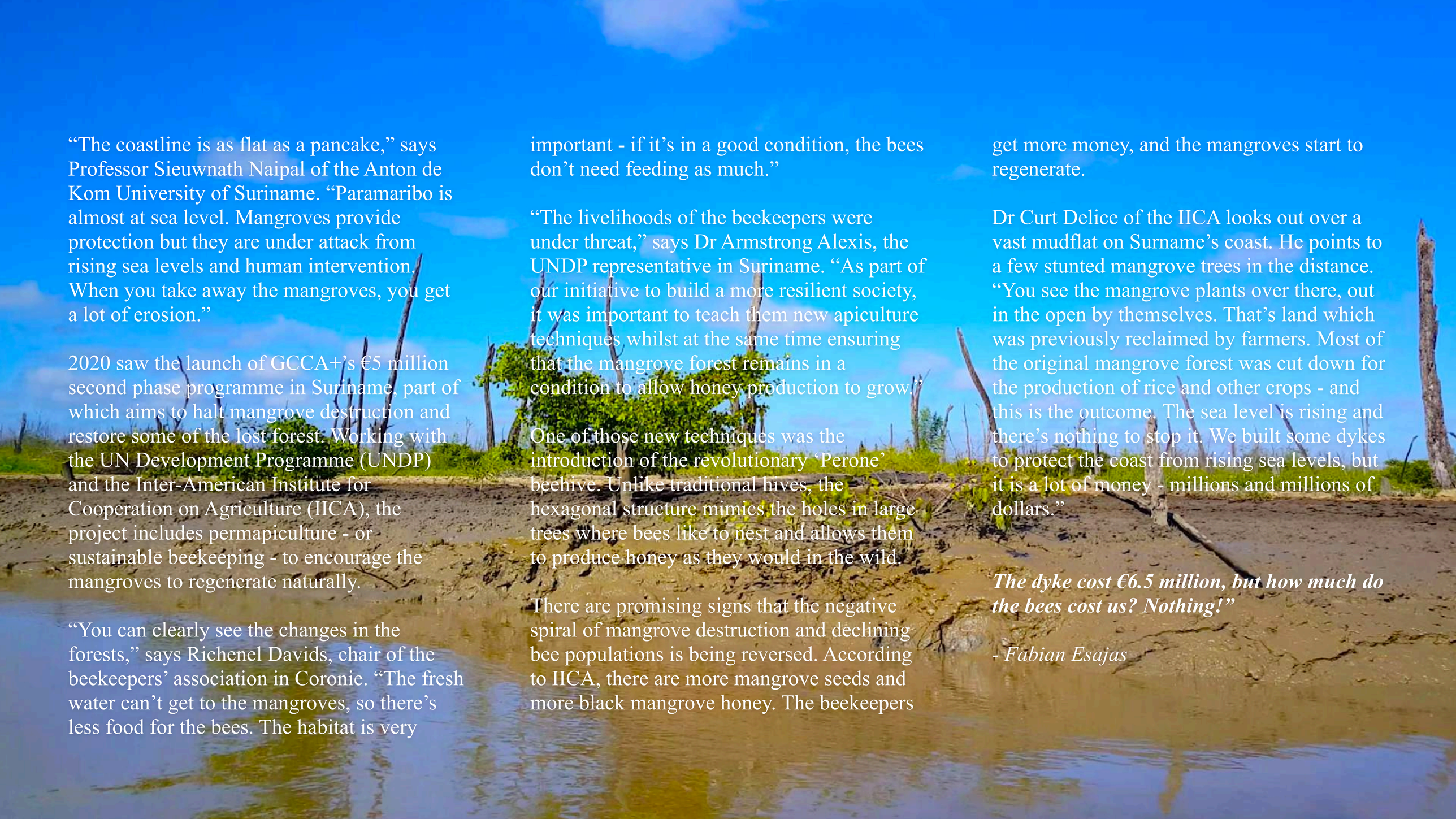
Beekeeper Fabian Esajas is enjoying the sweet taste of success. His honey, beeswax and medicinal ingredients are fast gaining attention among health and fashion-conscious consumers all over the world. But Fabian's bees aren't just making money - they're helping restore Suriname's mangrove trees.

"Climate change is happening. Sea levels are rising. The impacts on the mangroves must not be underestimated," says Fabian. "The beekeepers in the coastal areas earn a living from the mangroves, so we have to protect and restore them."

Fabian is part of a natural virtuous circle of trees, bees and people. "The bees are attracted to the mangrove flowers," he explains. "They pollinate the flowers, producing more seeds which grow into mangrove trees - and we get mangrove honey. Bees make a huge contribution to maintaining our mangrove forests. Give the bees what they need, and nature gives back.

"It's a win-win situation - the bees pollinate the crops, the farmers don't need to take land from the sea, I sell my honey - everyone benefits! If we work together we can make the world understand that Suriname honey is really good. Other people are not going to do it for us, we have to do it for ourselves."

Situated on the northeast coast of South America, Suriname is highly vulnerable to climate change. Battered by rising sea levels, hurricanes and storm surges, the country's coastline has retreated in some places by up to 600 metres in just ten years. The mangrove forests which help to stabilise the shore have been steadily destroyed for agricultural land, artificial fish ponds and urban development. In some areas, such as Weg naar Zee (literally, "road to the sea") near the capital Paramaribo, around a quarter of the mangrove forests have been lost since 1980.



“The coastline is as flat as a pancake,” says Professor Sieuwnath Naipal of the Anton de Kom University of Suriname. “Paramaribo is almost at sea level. Mangroves provide protection but they are under attack from rising sea levels and human intervention. When you take away the mangroves, you get a lot of erosion.”

2020 saw the launch of GCCA+’s €5 million second phase programme in Suriname, part of which aims to halt mangrove destruction and restore some of the lost forest. Working with the UN Development Programme (UNDP) and the Inter-American Institute for Cooperation on Agriculture (IICA), the project includes permapiculture - or sustainable beekeeping - to encourage the mangroves to regenerate naturally.

“You can clearly see the changes in the forests,” says Richenel Davids, chair of the beekeepers’ association in Coronie. “The fresh water can’t get to the mangroves, so there’s less food for the bees. The habitat is very important - if it’s in a good condition, the bees don’t need feeding as much.”

“The livelihoods of the beekeepers were under threat,” says Dr Armstrong Alexis, the UNDP representative in Suriname. “As part of our initiative to build a more resilient society, it was important to teach them new apiculture techniques whilst at the same time ensuring that the mangrove forest remains in a condition to allow honey production to grow.”

One of those new techniques was the introduction of the revolutionary ‘Perone’ beehive. Unlike traditional hives, the hexagonal structure mimics the holes in large trees where bees like to nest and allows them to produce honey as they would in the wild.

There are promising signs that the negative spiral of mangrove destruction and declining bee populations is being reversed. According to IICA, there are more mangrove seeds and more black mangrove honey. The beekeepers get more money, and the mangroves start to regenerate.

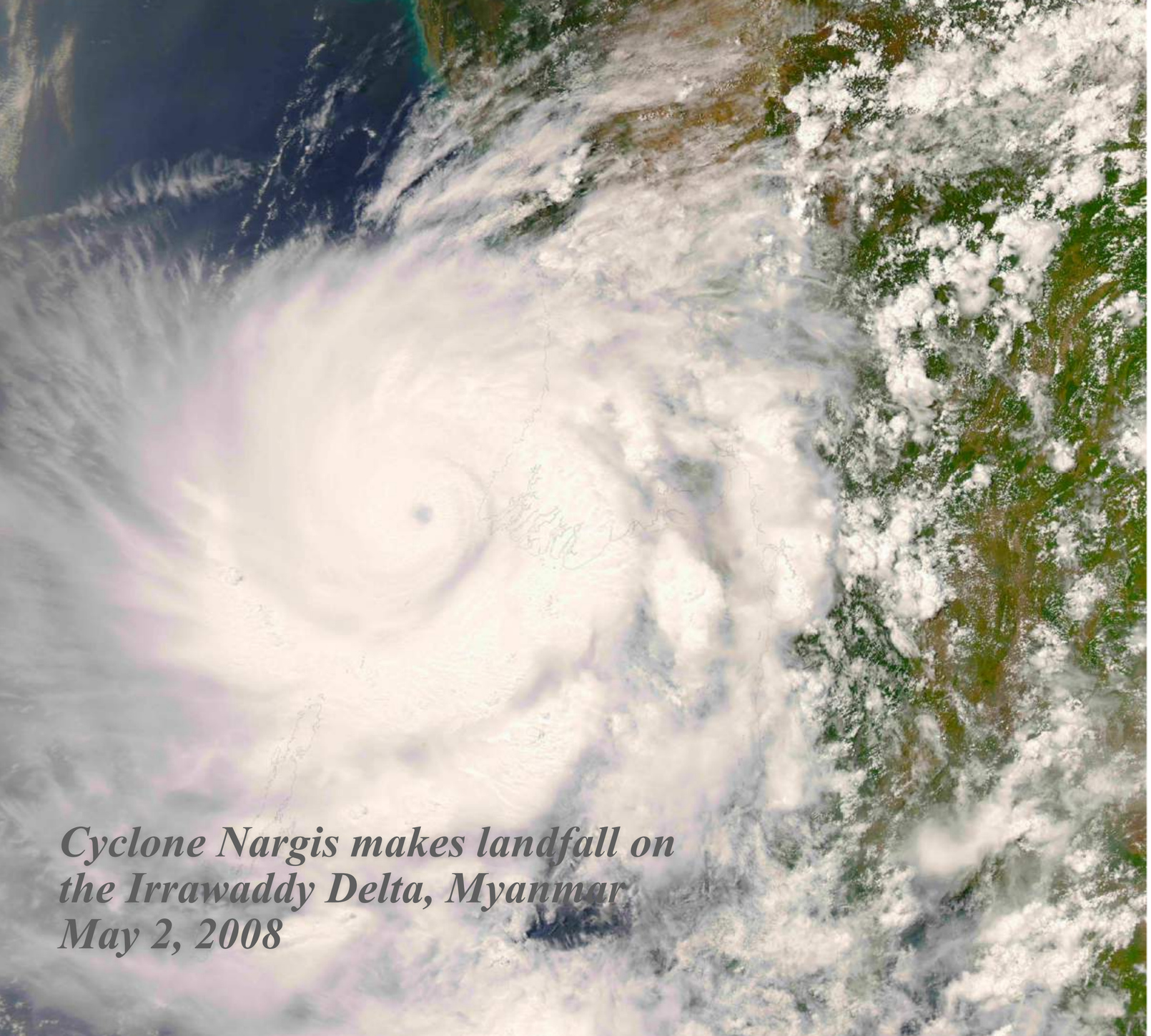
Dr Curt Delice of the IICA looks out over a vast mudflat on Surname’s coast. He points to a few stunted mangrove trees in the distance. “You see the mangrove plants over there, out in the open by themselves. That’s land which was previously reclaimed by farmers. Most of the original mangrove forest was cut down for the production of rice and other crops - and this is the outcome. The sea level is rising and there’s nothing to stop it. We built some dykes to protect the coast from rising sea levels, but it is a lot of money - millions and millions of dollars.”

The dyke cost €6.5 million, but how much do the bees cost us? Nothing!”

- Fabian Esajas

“The mangrove and the bees are inseparable,” says Richenel. “The bees take care of the rehabilitation of the mangroves and in return they get nectar which turns into honey. What’s good for the mangroves is also good for local jobs. In the 1980s, there were only about eight or nine beekeepers, but now there are between 35 and 40. For a long time we worked as individuals, but now we’ve started to collaborate. When you work together, you learn more. People think beekeeping is easy, but it’s not. You need a lot of knowledge and experience.”

“When we sell honey, we’re not just selling a product,” says Fabian. “We’re telling the story that the bees benefit the whole coastal area. As a beekeeper, it’s not just about making and selling honey. It’s also about contributing something to nature by pollinating the mangroves. And that’s the difference.”



Cyclone Nargis makes landfall on the Irrawaddy Delta, Myanmar May 2, 2008

SHELTER FROM THE STORM - REPLANTING MANGROVES IN MYANMAR

When Cyclone Nargis swept across Myanmar in 2008, Labutta township in the heart of the Irrawaddy delta bore the brunt. More than 80,000 people were killed in this one district alone, while damage across the whole country topped US$12 billion. Winds of more than 200 km per hour pushed a wall of water up to 40 km inland, across shrimp farms and rice paddies where protective mangrove forests used to stand.

"If you look at the path of the storm that hit Myanmar, it hit exactly where it was going to do the most damage, and it's doing the most damage because much of the protective vegetation was cleared," said Jeff NcNeely, chief scientist for the International Union for Conservation of Nature (IUCN), shortly after the cyclone struck.

Villages surrounded by mangroves reported more survivors than those without, and many people said they saved themselves from the storm surge by sheltering in mangrove trees until help arrived. Some reported being swept along by the water for several kilometres until they were able to grab hold of a tree.

Not surprisingly, replanting and restoring the delta's mangroves became an urgent priority. Funded by €4 million from the EU, GCCA+, UN-Habitat and UN Environment Programme jointly set up the Myanmar Climate Change Alliance (MCCA) programme in 2013. Labutta was chosen for a pilot project, including mangrove restoration, aimed at creating resilience through ecosystem-based adaptation.

"Mangroves are the most important thing in Labutta," says Shashank Mishra, Disaster Risk Reduction Programme Manager for UN-Habitat in Myanmar. "People rely on them for their livelihoods, as well as for protection. There's already been a sixty percent reduction of the mangroves in that area through unsustainable deforestation and land use."

"We consulted heavily with local people. There is a very low level of awareness about climate change and the impacts of cutting down the forests. It was very much a participatory discussion with village leaders, to understand their problems, and how much they understand. We want them to become ambassadors for protecting their local environment."

As part of the pilot project, four hectares of mangroves have been replanted by the community. "It was very important to involve them," says Shashank. "After all, these communities are directly or indirectly responsible for the deforestation. But they have little alternative, because they rely heavily on wood for fuel and energy, and there's a lack of alternative energy sources."

Unfortunately, despite GCCA+ and other initiatives in Myanmar, recent data suggests the country continues to lose mangroves at an alarming rate - four times higher than the global average. “Myanmar is currently a global hotspot of mangrove deforestation, primarily due to conversion to rice agriculture,” says Daniel Friess, Associate Professor at the National University of Singapore. “The rest of south east Asia has seen a reduction in mangrove loss in recent decades, but mangroves are still threatened in many countries across the region.”

That’s bad news for the people of the Irrawaddy delta.

“We were born here so we want to survive. Now we realise the importance of trees and mangroves and not cutting them down for firewood.”

- Ohn Myint, farmer and chairman of the mangrove committee in Thin Gar Lay

“If we don’t get enough fish for our family we have to borrow money. We can’t afford rice or other products. They have become more expensive after the flooding.”

- Zaw Min, fisherwoman


“Mangroves are vital for this area because they are nutrition for all life.”

Haïdar el Ali - a man on a mission

RESTORING SENEGAL'S MANGROVES, ONE TREE AT A TIME

Take a trip through the Casamance river delta in southern Senegal, and the chances are that you'll come across a man up to his knees in muddy water, planting mangrove trees.

Haïdar el Ali - businessman, politician and environmental campaigner - takes just a few seconds to pick a mangrove seedling from his bag, reach down into the water and poke it into the mud, before moving on to the next one. "Here we have a young leaf. You take it and plant the lower third in the mud. After that you take one step, two steps, and plant another one." He gestures to the thousands of young mangroves stretching as far as the eye can see. "All of this has been planted by hand, like this."

Haïdar is a man on a mission. As a former Minister of Ecology and Minister of Fisheries in the Senegalese government, he witnessed at first hand the devastation of one of Africa's biggest and most important mangrove forests. Now, he's dedicating his life to saving it.

"Towards the end of the last century a lot of roads were built through the delta which blocked the natural flow of the water," says Haïdar. "Back then there were no environmental impact studies, people just cut down the mangroves and no-one replanted them. The fishermen had to go further and further out to sea to catch fewer and fewer fish. The salt water destroyed the rice fields - if the mangroves are healthy, they regulate the salinity of the water, and the fields are fertile. So we started replanting."

More than 53,000 hectares of mangroves disappeared in Senegal between 1980 and 2005. So far, Haïdar, together with volunteers from hundreds of local villages in Casamance, have replanted an astonishing 152 million mangroves covering around 15,000 hectares. It's one of the biggest mangrove replanting programmes in the world.

GCCA+ has been active in Senegal since 2011, committing a total of €9 million in two phases to develop and implement an integrated coastal management zone (ICZM) to tackle Senegal's alarming rate of coastal erosion - up to two metres a year in places. The programme includes replanting mangroves not only in Casamance, but further north in Saint Louis, where entire communities have become climate refugees.

"Mangrove trees can live for up to 600 years," says Ameth Segne Diagne, whose former village is now submerged under the waves. "Their roots spread wide into the ground, which enables them to cope with the weather and the salt water. They help sweeten the underground water. Mangroves are vital for this area because they are nutrition for all life."

"So far we have planted at least 276 hectares of casuarina trees and 260 hectares of mangroves in the Petite Côte, Saint-Louis and Casamance areas, as well has hard infrastructure such as breakwaters, groynes and dykes made from rocks," says Dior Sidibé, ICZM Project Manager.

"Beach reconstruction and reforestation are very important. A healthy mangrove ecosystem plays a vital role in the conservation and regeneration of biodiversity, it helps stop salt water from spreading inland. It stabilises the coastline and slows down coastal erosion. Coastal erosion is a natural phenomena, but it is made worse by human action."

It's not just on the ground that the success can be measured. According to satellite-based analysis by NASA, Senegal's mangroves have experienced significant regeneration and expansion since 2000, with scientists measuring a 48 km2 new mangroves and 148 km2 regenerated over 16 years.

“For decades, there has been so much negative news about losing mangroves that it is easy to forget that these are plants that are almost perfectly designed to trap sediment and colonise empty mudflats,” says NASA scientist Dr Lola Fatoyinbo. “The regeneration of mangrove ecosystems is something we are actually seeing in several parts of the world now.”

As the tide starts to rise in Casamance, Haïdar swims around the mature mangrove forest, delighting in its rich ecosystem.

“Here we can see crabs, oysters and shells which are the starting point of the ecosystem, of the marine life in the mangrove roots. The women harvest the oysters, the crabs feed the little fish, the little fish become big fish which will be caught - and that’s the life of the mangroves. The mangroves attracts rain and the mud captures methane CO2. There is nothing better when it comes to regulating climate change.”

“THE FUTURE OF THE MANGROVES IS IN OUR HANDS”

GCCA+ projects across the world have already restored, replanted and protected thousands of hectares of mangroves as part of integrated climate resilience programmes funded by the EU to the tune of many millions of euros. From women entrepreneurs in Guyana to the Belize ‘Marvellous Mangroves’ schools campaign, from Resiliencia Costera in Cuba to Bangladesh’s ‘greenbelt’ coastal afforestation programme, EU-funded projects are protecting and enhancing the lives of millions of people.

It’s clear much more needs to be done - some 35% of the world’s mangroves were lost between 1980 and 2000. The global annual rate of loss continues at around 2.1% - although it is higher in the Americas at 3.6%. Deforestation rates have declined in the past decade - and some countries such as Suriname have seen a modest increase in mangrove cover - but the overall outlook is gloomy. However, wholesale replanting is not always the answer. A recent IUCN report claims that mass planting - such as the world record setting programme in the Philippines - can do more harm than good. As IUCN notes, “Restoring a mangrove is a complex process that needs to be founded on the principles of ecosystem management. Often, fast-paced and large-scale ‘restoration events’ are not necessarily scientifically robust in terms of which mangrove species should be restored, and where.”

The Portland Cottage success shows that sustainable mangrove restoration is often about letting natural regrowth take its course. Other common mistakes include planting the wrong species in the wrong place, and failing to consult and involve the local community “beyond paid labour and photo opportunities.”

It’s this last point which GCCA+ is at pains to get right. From Portland Cottage to Weg naar Zee, from Casamance to Laputta, EU funded mangrove restoration schemes are designed to ensure local communities not only have their say and contribute their knowledge and experience, but actually take ownership of the project.

In the Solomon Islands for example, through a programme partly funded by the EU, indigenous landowners have voluntarily given up their rights to logging mangroves in exchange for the opportunity to create and sell rainforest carbon offsets from their coastal rainforests.

The future of the world’s mangroves hangs in the balance. “I could not be more serious when I say the future of humanity will depend on whether we can live sustainably, and the survival of our mangroves is a key test,” says Professor Horton.

“The future of the mangroves is in our hands. Sustainability is one of those rare issues, because of its magnitude, because of its scope, that if we don’t get it right, we may not be able to reverse, we may not be able adapt sufficiently.”

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