Greener pastures: Can ancient eco-engineering help fix our degraded landscapes?

By Thomas Page, CNN

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Photos: Bunds: The case for low tech land restoration mounts up

Bunds are simple structures that have been used for thousands of years to keep a liquic out. In Kuku, southern Kenya, they have been used as a water management strategy to and regreen degraded land. Non-profit Justdiggit worked in collaboration with the Maa Wilderness Conservation Trust and the local Maasai community to restore arid, overgra: digging over 150,000 bunds.

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century. As a result of climate change droughts are becoming longer and more intense and severe flooding is getting worse. Land degradation due to human activity and extreme weather is increasing the spread of deserts, reducing biodiversity, making it harder for farmers to produce crops and increasing water scarcity.

The hunt for solutions is pressing, and growing evidence suggests there's a role to be played by the humble bund -- a simple structure that's been used by farmers for thousands of years.

Bunds are barriers designed either to keep a liquid in or keep a liquid out. They can be made of materials either natural or artificial, and pop up in many contexts -- for example, a wall surrounding a chemical storage facility in case of a leak, or a sloped embankment around a road or railway to control water flow.

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The most basic consist of mounded earth. In terms of geoengineering, they're about as low-tech as it comes, but when built strategically, their impact on the environment can be profound. Separate programs in as disparate climates as Tanzania and Northern Ireland are demonstrating bunding's regenerative power -- and the results could benefit both humans and nature.

Putting techniques in the hands of Tanzanian farmers

In Tanzania, a collaboration between non-profits Justdiggit and the LEAD Foundation is working with local communities to dig tens of thousands of bunds on arid land to harvest rainwater, as part of a massive regreening effort backed by the UN.

Angelina Tarimo, a coordinator at the LEAD Foundation, has been working with local communities in places such as Pembamoto, a village in the Dodoma region, where desertification is a growing threat.

"When you ask the elders what was happening in the past, they'll tell you that the rains were there; it was much greener than what we're seeing right now," she says. "You know completely that something went wrong somewhere."

Semi-circular shaped bunds trap water running off the ground and allow it to penetrate the earth. Grass seed sown inside the bunds grows, and over time greenery extends beyond the bund.

Agriculture has had a negative impact on land in Tanzania, Tarimo says, with farmers clearing trees and native plants in order to grow crops, or allowing grassland to become overgrazed. This damages the soil structure and makes it more prone to erosion. As the ground is drier, when rain falls it is more likely water will run off the surface instead of infiltrating the ground, washing away fertile soil and perpetuating a drying cycle.

In 2018, Justdiggit and the LEAD Foundation worked with the village to transform a barren 50-acre test site, digging a network of semi-circular bunds with a raised perimeter around a shallow trench, into which seeds were sown. The bunds, roughly five meters by two meters large, were laid in an overlapping fish scale pattern with their depression facing uphill to capture rainwater flowing off the land, slowing its movement and allowing it to penetrate the earth.

Bunds filled with water after rain. The water slowly penetrates the ground.

As part of the program, Pembamoto's community agreed to leave the land untouched for two years.

"They were really skeptical about seeing any sort of results, because they'd never seen any grass growing in the area for years," says Tarimo. But after two years, such was its success they decided to extend the fallow period. Not only did the grass seed grow, but other dormant seeds germinated, and small mammals returned. The greenery spread far beyond the perimeters of the bunds, blanketing the previously degraded landscape. "After three years, the grass was taller than me!" says Tarimo.

Bund regreening in Pembamoto, Tanzania.

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In August 2021, the community began to sustainably harvest grass for fodder and sold the surplus to neighboring villages, with the money going towards community development, says the LEAD coordinator.

Justdiggit has other projects in Central Tanzania, where it says hundreds of villages are working to restore over 750,000 acres through a variety of methods. Between sites in Tanzania and southern Kenya, over 200,000 bunds have been dug to date.

Justdiggit global director of communications Wessel van Eeden says getting regreening techniques into farmers' hands is vital.

Alongside its partners' outreach programs, which include roadshows, brochures and radio slots, Justdiggit has collaborated with other non-profits to create digital platform Greener.land, which details 20 geoengineering interventions to restore degraded areas.

"There are potentially 350 million smallholder farmers in sub-Saharan Africa," says van Eeden. "The techniques ... are super low tech, low investment, so they're scalable. All we need to do is to tell the right story to the right farmer through the right platform."

Restoring peatland in Northern Ireland

Cell bunding on a former tree plantation in Tullychurry, Northern Ireland.

Cell bunding -- creating an enclosed space with bunds -- has been used around the world for thousands of years to create watertight pockets of land ideal for growing crops such as rice. In recent years, trials have taken place to see if it can restore peatland in Northern Ireland.

As part of the €4.9 million ($4.9 million) Source To Tap project, Northern Ireland Water and its partners set out to establish if restoring peatland could be a sustainable, cost-effective method of improving drinking water quality.

Nearly 70% of drinking water in Northern Ireland and the Republic of Ireland comes from peatland, which acts as a natural filter, explains project manager Diane Foster. If the peatland is degraded, "that can cause challenges," she adds.

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available moisture for sphagnum moss, the essential building block for new peat. As a result, it can cause fluctuations in water color and cloudiness, Foster explains.

On land belonging to Forest Service Northern Ireland in Tullychurry, County Fermanagh, peatland had been used for a plantation of lodge pole pine. Trees were harvested on a trial site in 2019, and in late 2020 two diggers worked for 11 weeks to create 145 rectangular cell bunds on just over six hectares (15 acres).

The bunding method appeared to work "very, very quickly," says Foster, recalling some cells overflowing. A team from Ulster University collected water samples between February and December 2021. "We don't have masses of data," Foster admits, adding she would like to secure funding for future study. Results are expected to be published later this year.

"That area is now left to restore further," she adds. "We've put the mechanism in place to hopefully hold the water level up high ... We are seeing it's getting greener. We've seen sphagnum mosses come back."

Sphagnum moss, which rots down over time to become fresh peat.

While the trial was established with humans in mind, the benefits of restoring peatland are manifold. "It'd be supporting lots of different ecosystem services," says Foster, including "biodiversity, water supply, flood storage and especially carbon storage."

Northern Ireland Water is already implementing the technique elsewhere. At Lough Bradan, a lake that's a source of drinking water, between eight to 10 hectares (20-25 acres) of trees planted on peatland have been felled along the reservoir's western shore and cell bunding installed, creating a peat bog to slowly filter water flowing into the lake.

"(It's) really exciting to see it there in this drinking water catchment," says Foster. "It's going to take a bit of time for the sphagnum mosses and everything to colonize, but the process is now underway."

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