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**HEADLINE:** In Niger, Trees and Crops Turn Back the Desert

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**DATELINE:** GUIDAN BAKOYE, Niger

**BODY:**

In this dust-choked region, long seen as an increasingly barren wasteland decaying into desert, millions of trees are flourishing, thanks in part to poor farmers whose simple methods cost little or nothing at all.

Better conservation and improved rainfall have led to at least 7.4 million newly tree-covered acres in Niger, researchers have found, achieved largely without relying on the large-scale planting of trees or other expensive methods often advocated by African politicians and aid groups for halting desertification, the process by which soil loses its fertility.

Recent studies of vegetation patterns, based on detailed satellite images and on-the-ground inventories of trees, have found that Niger, a place of persistent hunger and deprivation, has recently added millions of new trees and is now far greener than it was 30 years ago.

These gains, moreover, have come at a time when the population of Niger has exploded, confounding the conventional wisdom that population growth leads to the loss of trees and accelerates land degradation, scientists studying Niger say.

The vegetation is densest, researchers have found, in some of the most densely populated regions of the country.

"The general picture of the Sahel is much less bleak than we tend to assume," said Chris P. Rejj, a soil conservationist who has been working in the region for more than 30 years and helped lead a study published last summer on Niger's vegetation patterns. "Niger was for us an enormous surprise."

About 20 years ago, farmers like Ibrahim Danjimo realized something terrible was happening to their fields.

"We look around, all the trees were far from the village," said Mr. Danjimo, a farmer in his 40s who has been working the rocky, sandy soil of this tiny village since he was a child. "Suddenly, the trees were all gone."

Fierce winds were carrying off the topsoil of their once-productive land. Sand dunes threatened to swallow huts. Wells ran dry. Across the Sahel, a semiarid belt that spans Africa just below the Sahara and is home to some of the poorest people on earth, a cataclysm was unfolding.

Severe drought in the 1970s and '80s, coupled with a population explosion and destructive farming and livestock practices, was denuding vast swaths of land. The desert seemed determined to swallow everything. So Mr. Danjimo and other farmers in Guidan Bakoye took a small but radical step. No longer would they clear the saplings from their fields before planting, as they had for generations. Instead they would protect and nurture them, carefully plowing around them when sowing millet, sorghum, peanuts and beans.

Today, the success in growing new trees suggests that the harm to much of the Sahel may not have been permanent, but a temporary loss of fertility. The evidence, scientists say, demonstrates how relatively small changes in human behavior can transform the regional ecology, restoring its biodiversity and productivity.

In Niger's case, farmers began protecting trees just as rainfall levels began to rise again after the droughts in the 1970s and '80s.

Another change was the way trees were regarded by law. From colonial times, all trees in Niger had been regarded as the property of the state, which gave farmers little incentive to protect them. Trees were chopped for firewood or construction without regard to the environmental costs. Government foresters were supposed to make sure the trees were properly managed, but there were not enough of them to police a country nearly twice the size of Texas.

But over time, farmers began to regard the trees in their fields as their property, and in recent years the government has recognized the benefits of that outlook by allowing individuals to own trees. Farmers make money from the trees by selling branches, pods, fruit and bark. Because those sales are more lucrative over time than simply chopping down the tree for firewood, the farmers preserve them.

The greening began in the mid-1980s, Dr. Reij said, "and every time we went back to Niger, the scale increased."

"The density is so spectacular," he said.

Mahamane Larwanou, a forestry expert at the University of Niamey in Niger's capital, said the regrowth of trees had transformed rural life in Niger.

"The benefits are so many it is really astonishing," Dr. Larwanou said. "The farmers can sell the branches for money. They can feed the pods as fodder to their animals. They can sell or eat the leaves. They can sell and eat the fruits. Trees are so valuable to farmers, so they protect them."

They also have extraordinary ecological benefits. Their roots fix the soil in place, preventing it from being carried off with the fierce Sahelian winds and preserving arable land. The roots also help hold water in the ground, rather than letting it run off across rocky, barren fields into gullies where it floods villages and destroys crops.

One tree in particular, the *Faidherbia albida*, known locally as the gao tree, is particularly essential. It is a nitrogen-fixing tree, which helps fertilize the soil.

Its leaves fall off during the rainy season, which means it does not compete with crops for water, sun or nutrients during the growing period. The leaves themselves become organic fertilizer when they fall.

"This tree is perfectly adapted for farming in the Sahel," said Dr. Larwanou. "Yet it had all but disappeared from the region."

That is because for generations local farmers had simply cleared their fields of all vegetation, including trees, before sowing neat rows of sorghum, millet, peanuts and beans. When a field became less productive, the farmer would move on to another.

Wresting subsistence for 13 million people from Niger's fragile ecology is something akin to a puzzle. Less than 12 percent of its land can be cultivated, and much of that is densely populated. Yet 90 percent of Niger's people live off agriculture, cultivating a semiarid strip along the southern edge of the country.

Farmers here practice mostly rain-fed agriculture with few tools and no machinery, making survival precarious even in so-called normal times. But when the rains and harvest fall short, hunger returns with a particular vengeance, as it did in 2005 during the nation's worst food crisis in a generation.

Making matters worse, Niger's population has doubled in the last 20 years. Each woman bears about seven children, giving the country one of the highest growth rates in the world.

The regrowth of trees increases the income of rural farmers, cushioning the boom and bust cycle of farming and herding.

Ibrahim Idy, a farmer in Dahirou, a village in the Zinder region, has 20 baobab trees in his fields. Selling the leaves and fruit brings him about \$300 a year in additional income. He has used that money to buy a motorized pump to draw water from his well to irrigate his cabbage and lettuce fields. His neighbors, who have fewer baobabs, use their children to draw water and dig and direct the mud channels that send water coursing to the beds. While their children work the fields, Mr. Idy's children attend school.

In some regions, swaths of land that had fallen out of use are being reclaimed, using labor-intensive but inexpensive techniques.

In the village of Koloma Baba, in the Tahoua region just south of the desert's edge, a group of widows have reclaimed fields once thought forever barren. The women dig small pits in plots of land as hard as asphalt. They place a shovelful of manure in the pits, then wait for rain. The pits help the water and manure stay in the soil and regenerate its fertility, said Dr. Larwanou. Over time, with careful tending, the land can regain its ability to produce crops. In this manner, more than 600,000 acres of land have been reclaimed, according to researchers.

Still, Koloma Baba also demonstrates the limits of this fragile ecosystem, where disaster is always one missed rainfall away. Most able-bodied young men migrate to Nigeria and beyond in search of work, supporting their families with remittances. The women struggle to eke a modest crop from their fields.

"I produce enough to eat, but nothing more," said Hadijatou Moussa, a widow in Koloma Baba.

The women have managed to grow trees on their fields as well, but have not seen much profit from them. People come and chop their branches without permission, and a village committee that is supposed to enforce the rights of farmers to their trees does not take action against poachers.

Such problems raise the question of whether the success of some of Niger's farmers can be replicated on a larger scale, across the Sahel. While Niger's experience of greening on a vast scale is unique, scientists say, smaller tracts of land have been revived in other countries.

"It really requires the effort of the whole community," said Dr. Larwanou. "If farmers don't take action themselves and the community doesn't support it, farmer-managed regeneration cannot work."

Moussa Bara, the chief of Dansaga, a village in the Ague region of Niger, where the regeneration has been a huge success, said the village has benefited enormously from the regrowth of trees. He said not a single child died of malnutrition in the hunger crisis that gripped Niger in 2005, largely because of extra income from selling firewood. Still, he said, the village has too many mouths to feed.

"We are many and the land is small," he explained, bouncing on his lap a little boy named Ibrahim, the youngest of his 17 children by his three wives.

Climate change is another looming threat. Kerry H. Cook, a professor of atmospheric science at Cornell University, said that improved rains in the Sahel are most likely a result of natural climate variability from decade to decade, and that while the trend is positive, the rains have not entirely recovered to what they were in the 1950s.

The Sahel, like other parts of Africa, has experienced big swings in rainfall in recent years. Severe droughts in eastern and southern Africa have led to serious hunger crises in the past five years, and a drop in precipitation in Niger in 2005 contributed to the food crisis here that year.

Dr. Cook's long-term projections, based on a variety of climate models, point to longer and more frequent dry periods in the Sahel, caused by rising temperatures in the Gulf of Guinea.

"This is the place in the world that just stands out for having vulnerability for drought," she said.

Still, more trees mean that Niger's people are in a better position to withstand whatever changes the climate might bring. "This is something the farmers control, and something they do for themselves," said Dr. Larwanou. "It demonstrates that with a little effort and foresight, you can reduce poverty in the Sahel. It is not impossible or hopeless, and does not have to cost a lot of money. It can be done."

**URL:** <http://www.nytimes.com>

**GRAPHIC:** Photos: A market in Droum is bountiful, thanks to increased crop yields, largely because newly planted trees have helped retain the soil and water.

In Tahoua, where women have regenerated once-barren fields by digging manure pits, women mill their grain by pounding it with wooden pestles. (Photographs by Michael Kamber for The New York Times) (pg. 6)

In Ague, Niger, where replanting trees helped alleviate the effects of a famine, young men and boys operate a foot pump to draw water for irrigation. (Photo by Michael Kamber for The New York Times) (pg. 1) Chart/Map: "A Green Revolution" Better rains combined with farmers planting trees have led to mass reforestation across parts of southern Niger. Below, aerial photographs of the village of Galma taken 30 years apart show an increase both in the size of the village and in the number of trees, visible

as small black dots. Map of Africa highlighting Niger. (The New York Times  
aerial photographs by Institut Geographique National du Niger [1975] and Gray Tappan) (Source by  
Gray Tappan, SAIC, USGS Center for EROS) (pg. 6)

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