

Superdirt Made Lost Amazon Cities Possible?

John Roach for [National Geographic](#), November 2008

ON TV *Lost Cities of the Amazon* airs Thursday, November 20, at 9 p.m. ET on National Geographic Channel.

Centuries-old European explorers' tales of lost Amazon cities have long been dismissed by scholars, in part because the region is too infertile to feed a sprawling civilization.

But new discoveries support the idea of an ancient Amazonian urban network—and ingeniously engineered soil may have made it all possible.

(See [Ancient Amazon Cities Found](#);

[Were Vast Urban Network](#) Aug. 28, 2008)

Now scientists are trying to recreate the recipe for the apparently human-made supersoil, which still covers up to 10 percent of the Amazon Basin. Key ingredients included of dirt, charcoal, pottery, human excrement and other waste.

If recreated, the engineered soil could feed the hungry and may even help fight global warming, experts suggest.

Before 1492

Scientists have long thought the river basin's tropical soils were too acidic to grow anything but the hardiest varieties of manioc, a potato-like staple.

But over the past several decades, researchers have discovered tracts of productive *terra preta*—"dark earth." The human-made soil's chocolaty color contrasts sharply with the region's natural yellowish soils.

Video Clip From Lost Cities of the Amazon Documentary

Research in the late 1980s was the first to show that charcoal made from slow burns of trees and woody waste is the key ingredient of *terra preta*.

With the increased level of agriculture made possible by *terra preta*, ancient Amazonians would have been able to live in one place for long periods of time, said geographer and anthropologist William Woods of the University of Kansas.

"As a result you get social stratification, hierarchy, intertwined settlement systems, very large scale," added Woods, who studies ancient Amazonian settlements.

"And then," he said, "1492 happens." The arrival of Europeans brought disease and warfare that obliterated the ancient Amazonian civilizations and sent the few survivors deep into the rain forest to live as hunter-gatherers.

"It completely changed their way of living," Woods said.

Magic Soil?

Today scientists are racing to tease apart the *terra-preta* recipe. The special soil has been touted as a way to restore more sustainable farming to the Amazon, feed the world's hungry, and combat global warming.

The *terra-preta* charcoal, called biochar, attracts certain fungi and microorganisms.

Those tiny life-forms allow the charcoal to absorb and retain nutrients that keep the soil fertile for hundreds of years, said Woods, whose team is among a few trying to identify the crucial microorganisms.

"The materials that go into the *terra preta* are just part of the story. The living member of it is much more," he said.



Fig. 1: Three Kuikuro Indians pose for documentary filmmakers in 2008 in Brazil's Xingu Indigenous Park, a remote Amazon Basin refuge for traditional cultures. The Kuikuro tribe is among the last to see British explorer Col. Percy Fawcett, who in 1925 led an ill-fated quest for a fabled lost Amazonian city. The idea the region hosted ancient cities is gaining ground in the 21st century, due to studies of ancient man-made soil, which may have provided food for such a civilization. Photo copyright Phil L

For one thing, the microorganisms break up the charcoal into smaller pieces, creating more surface area for nutrients to cling to, Woods said.

Anti-Global-Warming Weapon?

Soil scientist Johannes Lehmann of Cornell University is also racing to recreate *terra preta*.

The Amazonian dark soils, he said, are hundreds to thousands of years old, yet to this day they retain their nutrients and carbons, which are held mainly by the charcoal.

This suggests that adding biochar could help other regions of the world with acidic soils to increase agricultural yields.

Plus, Lehmann said, biochar

could help reduce the amount of greenhouse gas emissions released into the atmosphere from the burning of wild lands to create new farm fields. ([Learn how greenhouse gas emissions may worsen global warming.](#))

For example, specialized power plants could char agricultural wastes to generate electricity.

The process would "lock" much carbon that will otherwise escaped into the atmosphere in the biochar. The biochar could then be put underground, in a new form of *terra preta*, thereby sequestering the carbon for centuries, Lehmann suggests.

Current Amazonian farming relies heavily on slash-and-burn agriculture—razing forests, then burning all of what's left.

By reverting to the ancient slash-and-char method—burning slowly and then mixing the charcoal into the soil—Amazonian carbon dioxide emissions could be cut nearly in half, according to Woods, of the University of Kansas.

With slash-and-burn, he noted, 95 percent of the carbon stored in a tree is emitted to the atmosphere. Slash-and-char emits about 50 percent, he said.

"The rest is put in different forms of black carbon. Most are chemically inert for long periods of time—thousands of years."

In addition, the technique would allow many farmers to stay sedentary, Woods said.

Because the soil would apparently remain fertile for centuries, "they don't have to cut down the forest constantly and send it up into the atmosphere," he said.

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