New research reveals how Brazil produced more food while saving its rainforests

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As the world turns its attention to Brazil with the opening of the World Cup this month, many people around the globe know the country's soccer fame, but few realize that it is the world's leader in reducing carbon emissions. A new study published in *Science* magazine provides the first in-depth analysis of how Brazil reached this global-leader status and managed to increase its agriculture production at the same time.

"Brazil is known as a leading favorite to win the World Cup, but they also lead the world in mitigating climate change," says the study's lead author, Daniel Nepstad who heads the Earth Innovation Institute and is a lead author of the recent IPCC report.

Since 2004, farmers and ranchers in Brazil have spared over 86,000 square kilometers of rainforests, close to 14.3 million soccer fields, from clear-cutting. Saving these forests amounts to a 70% decline in deforestation and 3.2 billion tons of CO2 kept out of the atmosphere. The decline in deforestation in 2013 alone represented a 1.5% reduction in global emissions for that year.

In this new study, a group of 17 scientists and economists from the US and South America set out to understand what drove this change. They found that a combination of bold public policies, market rejection of deforesting farmers, and an increase in protected areas curbed clear-cutting, while still allowing the country's soy and beef production to grow.

"There is an urge to find a silver bullet hiding in all the different deforestation efforts. But the truth is that the government can't claim this win alone, nor can Greenpeace or responsible companies. It's the mixture of interventions that worked," says co-author Toby McGrath.

Brazil's success points to the potential for tropical nations to produce more food without destroying forests, but the authors warn that these wins may be short-lived without more positive incentives for farmers on the ground.

"These gains are globally significant, but fragile," explains Nepstad. "We're bumping up against the limits of what can be achieved through punitive measures. As global demand for soy and beef begins to grow again, we will need a new approach to keep deforestation low in the Amazon. Through a one billion dollar pledge from Norway, Brazil has an important first step towards the creation of positive incentives for farmers who forgo forest clearing."

From 1999-2004, pressure on Amazon rainforests increased dramatically as commodity markets drove large-scale expansion of farming for soy, allowing local economies to prosper. Forests were cut down at alarming rates, with swaths the size of Vermont cut down each year from 2002 to 2004. Though the government's forest code policy required farmers to keep 80% of their land as native forest, these rules were unrealistic and went largely unenforced, so compliance was low.

"The forest code had little credibility before 2004, partly because the rules of the code were changed abruptly," says Claudia Stickler, a co-author of the study. "It was like trying to stop a tsunami with a sand castle."

From 2005 to 2007, the profitability of soy plummeted, creating an opening for new policy, finance, and supply chain incentives to motivate

change. Due initially to public pressure led by Greenpeace, it became riskier for businesses to be associated with deforestation. After intense negotiations, most buyers of Amazon soybeans united in support of an Amazon agreement to purchase only the soy grown on land that had been cleared before 2006, pushing farmers to use existing farms more productively. In 2008, the Government went a step further, launching a creative scheme through which the farmers of entire counties were cut off from agricultural credit if those counties had high deforestation rates. Meanwhile, the government was rapidly expanding the area of the Amazon that was formally designated as nature reserves and indigenous territories, including new protected areas in the agricultural expansion zones.

Clear cutting of rainforests dropped by 70% below its ten-year average in just eight years.

However, the longevity of these results relies on the continued will of political leaders and risk profiles of national and international corporations. Both will be tested as demand for soy and beef grows and local communities struggle economically. Clear-cutting of mature forests is already on the rise again: it increased by 28% in 2013 and is expected to rise again this year.

"Farmers are frustrated. They are tired of top-down approaches and big UN declarations, and they aren't seeing price premiums from certifications," says Nepstad. "We've made great strides, but to lock them in we need to start integrating positive incentives too. We have to help farmers get on the right path."

To expand positive incentives, the authors call for a "territorial approach" that would set goals for reducing deforestation at a regional scale. Farmers in regions that meet these goals would be rewarded with preferred access to finance and buyers. This approach has worked to

change other farming and ranching practices, such as safety measures to prevent foot and mouth disease. It aligns positive action with economic gain and encourages enforcement by peers within the region, rather than relying on national level policies that are difficult and expensive to monitor and enforce.

While international beef and soy buyers could play a role in rewarding positive efforts, some of the largest companies have left the region because of purchasing commitments that have zero tolerance for any level of deforestation. An infusion of $1B from Norway has started to provide positive incentives, but these efforts are not yet operating at a scale big enough to change the system.

"We think that large buyers of soy and beef, local farmers, conservation groups and political leaders can come together to design a coordinated approach that works for the long haul," says McGrath. "The long-term survival of the Amazon forests depends on it."

This change is important not just for Brazil, but for the rest of the world as well: the greatest potential for agricultural expansion is found in Brazil and other tropical countries, and tropical forest loss accounts for 15% of global carbon dioxide emissions. In addition, other studies show that the loss of these ecosystems may affect everything from rainfall in Iowa to the survival of thousands of plants and animals in the rainforest.

"The great global challenge is to grow more food, for more people, on smaller areas of land, while we end and reverse the loss of tropical forests," explains Nepstad. "Brazil has shown the world that it can be done."

Co-author Ane Alencar of the Amazon Environmental Research Institute (IPAM) adds, "Now we must show that the dramatic decrease in deforestation that we have achieved can be made permanent—that it

really is possible to keep 80% of the forest standing for future generations."

More information: "Slowing Amazon deforestation through public policy and interventions in beef and soy supply chains," by D. Nepstad et al. *Science*, 2014. www.sciencemag.org/lookup/doi/ … 1126/science.1248525

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