

## SPECIAL REPORT

# Brazil goes to war against logging

It represents half of the world's rainforest and is home to one-third of Earth's species, yet the Amazon has one of the highest rates of deforestation. **Jeff Tollefson** looks at efforts to curb the problem.

**B**razilian President Luiz Inácio Lula da Silva (Lula) mounted a military-style crackdown on deforestation in the Amazon in January — just a month after the government proclaimed that deforestation rates had dropped 59% over the previous three years. The action was prompted by alarming new satellite data from the National Institute for Space Research (INPE) in São José dos Campos, indicating that clear-cutting is once again on the rise.

Brazilian police forces, hundreds strong, are blockading roads, conducting aerial surveys and inspecting agricultural and logging operations. And the nation has singled out about three dozen communities for inspections of land registrations as part of a broader effort to endorse legal development and punish illicit operations by confiscating the land.

The international community is watching closely. More than half of the Amazon lies within Brazil's borders, and the vast majority of deforestation there takes place in just three states — Mato Grosso, Para and Rondonia — on the southern and eastern parts of the rainforest. This area has one of the highest rates of deforestation in the world — deforestation accounts for upward of 20% of the world's greenhouse-gas emissions.

In many ways, Brazil is better equipped to deal with the problem than other rainforest nations. Scientists at the INPE have pioneered methods and technologies for tracking deforestation in the Amazon, giving the nation unparalleled ability to monitor its forests from space. "We do not have the atom bomb," says INPE director Gilberto Câmara. "Our space programme is based on the assumption that Brazil is an environmental power." To that end, Câmara says that Brazil is looking for partners to create a centre that would extend Brazil's model of satellite-based monitoring to other nations.

The country is now in a unique position to benefit from a global-warming treaty that rewards nations for avoiding deforestation, a goal that was outlined in December during a United Nations summit in Bali, Indonesia. "A lot

of countries are not yet ready for this. They don't yet have the data that would allow you to really start attaching firm numbers to what is happening on the ground," says Hans Verolme, director of global climate change for the conservation group the WWF in Washington DC. "Brazil is probably the exception to the rule."

Brazilian officials know this, just as they are acutely aware of the international community's interest in the Amazon, its biodiversity and, increasingly, the carbon it stores in plants and soils. Brazil is using its substantial influence to oppose the market-based approach to addressing deforestation that is endorsed by many other rainforest nations, opting instead for a more traditional programme involving government aid. In either case, nations would be required to set a baseline on deforestation rates. The market-based approach would involve selling credits for avoided deforestation into a carbon-trading market, but Brazil's proposal is that the funds should be distributed directly — and perhaps more quickly — to governments that succeed in reducing deforestation.

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It has the capability and commitment, Brazil says, but lacks the resources, to monitor and eventually halt deforestation before it becomes impossible to undo the damage (see 'Beyond redemption?').

Matthew Perl, who handles an Amazon conservation programme for the WWF in Washington DC, credits Lula's administration with going beyond a simple police raid — a tactic that has failed many times in the past — and actually conducting a legal review of land holdings. This might seem easy and obvious, but simple questions about land ownership, zoning and management facilitate illegal activities across the board — precisely because much of the public land has not been through any kind of formal planning process.

Perl offers some rough figures: 20% of the Amazon is in some sort of federal or state-protected area; 21% is administered as indigenous territories, occupied by a quarter of a million people; and 24% is nominally private, keeping in mind that many holdings may be illegal.



The future of the Amazon could lie in sustainable use of its forests.

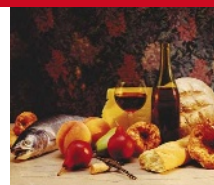
The remaining 35% — roughly 38.5 million hectares, an area larger than Germany — is in an 'open-access' category that has no formal zoning plan. Going through existing land registrations, as the government has proposed, is different from designating the remaining land. Tackling that would be difficult, as Brazil would need to address the most contentious questions regarding future development of the Amazon, and to a certain extent Brazil.

## Open claim

In the meantime, these open-access areas of virgin forest fall prey to squatters who claim title to the unregistered land. The logging follows in waves, starting with specialty hardwoods such as mahogany and teak and ending with construction-quality timber. Eventually the land is burned and cleared and grazed with cattle, or sown with soya beans. By this time, the squatters have moved deeper into the forest. By some estimates, this process has devoured some 18% of the Amazon.

The Amazon Protected Areas Programme (ARPA), a partnership between the WWF, the Brazilian government, the Global Environment Facility — an organization that funds projects in developing countries — and others, was designed to expand legal protection and ultimately administration of public lands in the Amazon. In many cases, says Gustavo Fonseca, who handles the programme for the

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But researchers are now probing the correlation between increased deforestation and rising commodity prices for crops such as soya beans, which have been linked to demand for corn-based ethanol in the United States. To analyse this relationship, experts need to know what type of land use will follow the current deforestation, and even that might not tell the whole story. There have been reports of soya-bean farmers acquiring land on the fringe of cattle country, thereby driving cattle ranchers farther into the forest.

Ruth DeFries of the University of Maryland in College Park says that soya-bean prices might have an effect but probably aren't the main driver. She was part of a team that used satellite imagery and ground validation to study the crop's impact in Mato Grosso, where soya-bean farming is common. The team found that in the period 2001–04, direct conversion from forest to cropland peaked at 23% of the annual deforestation in 2003.

If the international community is serious about tackling deforestation, it will probably need to use a hybrid approach: helping national governments such as Brazil to fund traditional policies for enforcement and monitoring and enabling communities to experiment with a market-based approach. The Brazilian state of Amazonas, where deforestation is less of a problem, is already talking about offering some kind of forestry credit on the international market.

Describing the shifting dynamic as a “tug-of-war on the agricultural frontier”, Fonseca says that agile market-based projects will be needed to ensure that communities can earn more while pursuing benign uses, such as the extraction of brazil nuts, essential oils and resins, than they would otherwise make by investing in soya beans or cattle. “I believe, at the end of the day, there will be a need for all of these systems,” he says. ■

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Global Environment Facility, a simple registration process has been sufficient to prevent deforestation. Some timber activities or mining operations might take place on the fringes, but nobody wants to invest time and money in a major agricultural operation only to have the government confiscate the land a few years later, he says. “It would be too big a risk.”

ARPA was established in 2002 and so far it has registered 14.5 million hectares under strict protections and another 9 million hectares under sustainable-use rules that allow for certain commercial activities such as fishing and rubber extraction and the collection of oils and seeds. Once these communities have a vested interest

— sometimes with some training — they can help to enforce their own protections.

This is the ultimate goal of those pushing to create markets for avoiding deforestation. If communities can make money without chopping down trees, they will be more inclined to protect the forest. Unfortunately, that hasn't always happened. As they accumulated a little wealth, some of the communities began investing in something more profitable: cattle. “Not good,” says Perl. “Not good at all.”

Many experts agree that cattle ranches, driven in part by booming exports, are responsible for most of Amazon deforestation, with some estimates as high as 80% of the total.

## Beyond redemption?

While policy-makers work on a way to reduce deforestation, scientists are scrambling to understand whether humans are pushing the forest towards a threshold beyond which it will become impossible to reverse course.

Some climate models suggest that droughts will become more frequent as the globe warms. Assuming that trends remain the same over the next two decades,

some 55% of the Amazon could be wiped out or degraded by logging, agriculture, fires and droughts, according to a study led by Daniel Nepstad at the Woods Hole Research Center in Massachusetts (D. C. Nepstad *et al. Phil. Trans. R. Soc. B*; doi:10.1098/rstb.2007.0036; 2008).

The Amazon has so many trees pumping water into the atmosphere that it generates its own weather, but this also makes it

fragile. As the forest shrinks, so too does its ability to provide for itself. Beyond a certain point, scientists say, the resultant loss of rainfall could mean that vast swaths of the southeastern Amazon become savannahs. And global warming itself might well come back to haunt Brazil even if deforestation issues are resolved. Many climate models project broad declines in rainfall, which could produce the same type of ‘savannization’.

Nepstad's study acknowledges that shifting agricultural trends and practices and protecting forested land could reduce deforestation. “In the long term, the avoidance of an Amazon forest dieback may depend on worldwide reductions of greenhouse-gas emissions that are large enough to prevent global temperatures from rising more than a degree or two,” the study concludes. **J.T.**