Remnant patches of Brazilian rain forest, the world's most biologically diverse habitat, edge land chainsawed, bulldozed, and scorched to make way for crops and cattle. Hard-to-remove trees may be left standing. At current clearing rates, and with climate change continuing, scientists predict that 40 percent of the Amazon will be destroyed and a further 20 percent degraded within two decades.

LAST OF THE AMAZON

BY SCOTT WALLACE • PHOTOGRAPHS BY ALEX WEBB

Manoki Indians displaced from their ancestral territory—a fate shared by many of Brazil's 170 indigenous Amazonian peoples—return to reclaim the land ritually and lament its degradation.

In the time it takes to read this article, an area of Brazil's rain forest larger than 200 football fields will have been destroyed.

The market forces of globalization are invading the Amazon, hastening the demise of the forest and thwarting its most committed stewards. In the past three decades, hundreds of people have died in land wars; countless others endure fear and uncertainty, their lives threatened by those who profit from the theft of timber and land. In this Wild West frontier of guns, chain saws, and bulldozers, government agents are often corrupt and ineffective—or ill-equipped and outmatched. Now, industrial-scale soybean producers are joining loggers and cattle ranchers in the land grab, speeding up destruction and further fragmenting the great Brazilian wilderness. *(Continued on page 49)*

Industrial-scale soybean farms such as this 100,000-acre operation in Nova Mutum in the state of Mato Grosso help make Brazil the world's second largest exporter of the legume. Highly mechanized, the farms employ only one person for every 400 acres.

A boy mourns activist Dorothy Stang at a gathering to mark the first anniversary of her murder. The 73-year-old nun, who dedicated her life to saving the forest and helping workers, was killed by hired gunmen in 2005 after trying to stop ranchers from clearing land. White crosses represent 772 victims of land wars in the state of Pará, and 48 red crosses symbolize local people now under death threats.

(Continued from page 43) During the past 40 years, close to 20 percent of the Amazon rain forest has been cut down—more than in all the previous 450 years since European colonization began. The percentage could well be far higher; the figure fails to account for selective logging, which causes significant damage but is less easily observable than clear-cuts. Scientists fear that an additional 20 percent of the trees will be lost over the next two decades. If that happens, the forest's ecology will begin to unravel. Intact, the Amazon produces half its own rainfall through the moisture it releases into the atmosphere. Eliminate enough of that rain through clearing, and the remaining trees dry out and die. When desiccation is worsened by global warming, severe droughts raise the specter of wildfires that could ravage the forest. Such a drought afflicted the Amazon in 2005, reducing river levels as much as 40 feet and stranding hundreds of communities. Meanwhile, because trees are being wantonly burned to create open land in the frontier states of Pará, Mato Grosso, Acre, and Rondônia, Brazil has become one of the world's largest emitters of greenhouse gases. The danger signs are undeniable.

All of it starts with a road. Except for a handful of federal and state highways—including the east-west Trans-Amazon Highway and the controversial BR-163, the "soy highway," which splits the heart of the Amazon along 1,100 miles from southern Mato Grosso north to Santarém in Pará—nearly every road in the Amazon is unauthorized. There are more than 105,000 miles of these roads, most made illegally by loggers to reach mahogany and other hardwoods for the lucrative export market.

In Brazil, the events set in motion by logging are almost always more destructive than the logging itself. Once the trees are extracted and the loggers have moved on, the roads serve as conduits for an explosive mix of squatters, speculators, ranchers, farmers, and, invariably, hired gunmen. The land sharks follow the roads deep into previously impenetrable forest, then destroy tracts to make it look as if they own them. Land thievery is committed through corruption, strong-arm tactics, and fraudulent titles and is so widespread that Brazilians have a name for it: *grilagem,* from the Portuguese word *grilo,* or cricket. *Grileiros,* the practitioners, have been known to age phony land titles in

Cowboys herd prime assets: Beef exports earn Brazil three billion dollars a year. With cattle numbers now topping 60 million, the demand for new pastureland drives much deforestation.

a drawer full of hungry crickets. When Brazil's agrarian reform agency, Instituto Nacional de Colonização e Reforma Agrária, reviewed Amazonian land ownership records over the past three years, it voided more than 62,000 claims that appeared to be fraudulent.

Guarantã do Norte, a city of 32,000 at the northern extremity of the paved section of BR-163, is the regional headquarters of Brazil's environmental protection agency, Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (IBAMA). With only a handful of inspectors to monitor thousands of square miles of territory, Márcio da Costa, the IBAMA chief, is overwhelmed. He works from a makeshift office behind the charred wreckage of the former headquarters, which was torched by an angry mob in 2004 after IBAMA agents and police broke a ring of timber traffickers, shutting down illegal sawmills and issuing millions of dollars in fines to loggers in the nearby town of Alta Floresta. The inquest into the arson failed to produce a single suspect.

A sputtering air conditioner barely churned the soupy air as da Costa showed me a 2004 logging certificate, along with a carbon copy. The copy, signed by an export inspector 1,500 miles away in southern Brazil, listed thousands of cubic feet of wood nowhere to be found on the original document—all contraband. "Yesterday, we seized five trucks loaded with timber coming out of the same area," da Costa said.

In 2005, after gunmen hired by grileiros murdered Sister Dorothy Stang, an American-born nun and environmental activist, the Brazilian government accelerated a crackdown, suspending logging permits throughout the Amazon—most of which had been falsified to launder illegal timber. Federal police and IBAMA intensified their investigation into irregularities in the timber business. Waves of troops were dispatched to Mato Grosso and Pará. They seized truckload after truckload of contraband timber. Of the more than 300 people arrested, about 100 turned out to be IBAMA officials involved in a far-reaching conspiracy to sell millions of cubic feet of endangered hardwoods to the U.S., Europe, and Asia.

To reduce fraud, Brazil will soon introduce electronic logging certificates. Meanwhile, to aid in policing the sprawling Amazon hinterland, government agents are turning to satellite

Sawdust flies as a logger illegally fells a hardwood on a private ranch. "The Amazon is too big for police to shut down all illegal operations," says Enrico Bernard of Conservation International.

technology and remote sensing to alert them to the work of grileiros. Yet even when officials spot a *desmatamento,* or illegal clearing, they are usually hamstrung by a lack of manpower or equipment. And when the police do react, the resources they manage to scrape together can be modest.

Such was the experience of José Rosa, a rancher in the frontier town of Matupá, 20 miles south of Guarantã do Norte, who had discovered that grileiros were cutting trees on his property. It's not that Rosa objected to the idea of clearing land—he himself plans to plant 2,500 acres in the coming year—it's just that someone else was blatantly trying to steal his. Despite federal pledges for more resources to combat timber mafias and land sharks, the only help Rosa could round up was a tiny posse of two IBAMA agents and a local cop. Among them, they carried a single pistol and a pump-action shotgun—not much of an arsenal against heavily armed grileiros. To buy gasoline for their pickup truck, the IBAMA agents had to dig into their own pockets.

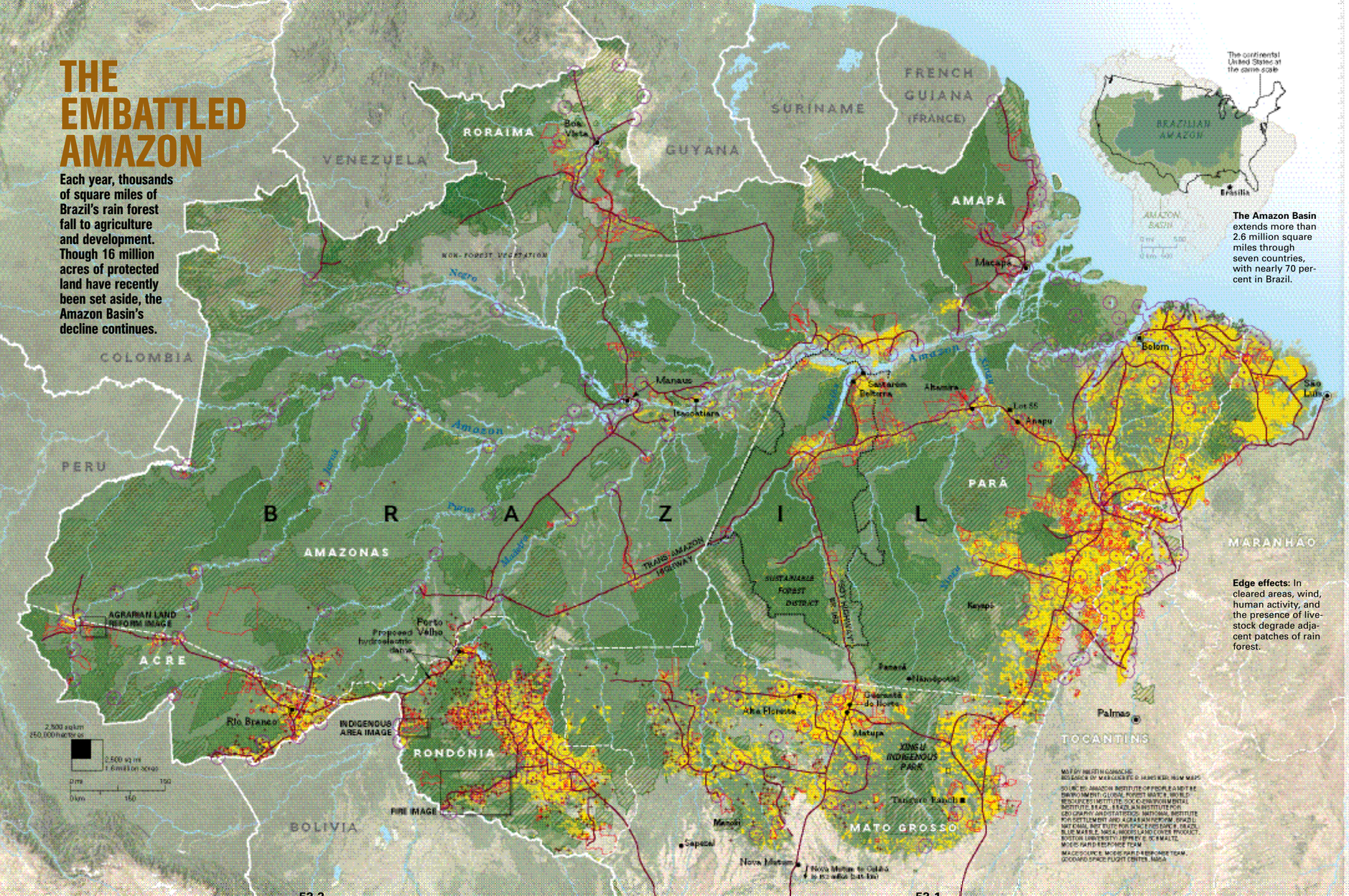
Evanoir Tibaldi, 42, the commander of this ad hoc detail, has spent 15 years working for IBAMA on the front lines in northern Mato Grosso. When I asked about the satellite imaging system that is supposed to give field agents the data they need to catch grileiros red-handed, Tibaldi replied, "We don't even have Internet in our office—it's a joke."

Rosa, in his grimy red sport shirt and battered hat, didn't look the part of wealthy *fazendeiro,* or plantation owner, with an 18,000-acre spread and 3,500 steers. Getting to his land required a two-hour drive east from town, down a dirt road and across flat plains and rolling hills, where blocks of forest still stood amid brilliant green fields of rice and soybeans. "The land here is perfect for soy," Rosa said.

On his property, we headed uphill through fenced-off pasture and entered the darkness of the forest along a two-rut road made by grileiros. We crossed a stream, so clear and inviting that we stopped for a drink. As I beheld the green cathedral that towered above us, I had the sense that we were day-tripping in a sacred place that should have taken weeks of arduous trekking to reach. An iridescent blue morpho butterfly lilted past, one of a million *(Continued on page 59)*

THE EMBATTLED AMAZON

Each year, thousands of square miles of Brazil's rain forest fall to agriculture and development. Though 16 million acres of protected land have recently been set aside, the Amazon Basin's decline continues.



The Amazon Basin extends more than 2.6 million square miles through seven countries, with nearly 70 percent in Brazil.

Edge effects: In cleared areas, wind, human activity, and the presence of livestock degrade adjacent patches of rain forest.

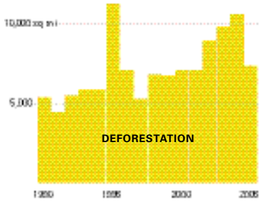
MAP BY MARTIN GAMACHE
RESEARCH BY MARGUERITE S. MUELLER, RUM MAPS

SOURCES: AMAZON INSTITUTE OF PEOPLE AND THE ENVIRONMENT; GLOBAL FOREST WATCH; WORLD RESOURCES INSTITUTE; SOCIO-ENVIRONMENTAL INSTITUTE, BRAZIL; BRAZILIAN INSTITUTE FOR GEOGRAPHY AND STATISTICS; NATIONAL INSTITUTE FOR SETTLEMENT AND AGRARIAN REFORM, BRAZIL; NATIONAL INSTITUTE FOR SPACE RESEARCH, BRAZIL; BLUE MARBLE, MODIS LAND AND COVER PRODUCT, BOSTON UNIVERSITY; JEFFREY E. SCHMALTZ, MODIS RAPID RESPONSE TEAM

IMAGE SOURCE: MODIS RAPID RESPONSE TEAM, GODDARD SPACE FLIGHT CENTER, NASA

EXPLOITING THE FOREST

Brazil holds about 30 percent of Earth's remaining tropical rain forest. The Amazon Basin produces roughly 20 percent of Earth's oxygen, creates much of its own rainfall, and harbors many unknown species. But the Amazon is under constant attack as settlement spreads and exploitation of its natural abundance continues. Between 2000 and 2005, Brazil lost more than 50,000 square miles of rain forest.

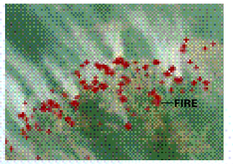


KEY

DEFORESTATION

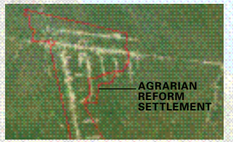
Deforested area: Clear-cutting for ranching and farming is the main destroyer of Brazil's rain forest. Undetected selective logging consumes additional forest. About a fifth of the Brazilian Amazon's 1.6 million square miles of natural cover has been stripped.

Fire: Red crosses (main map and inset at right) represent forest fires on one day, September 17, 2005. The number of fires nearly doubled early this decade. Half are accidental; the rest are set to clear land. The resulting release of carbon dioxide helps make Brazil a leading contributor of greenhouse gases.



Urban zones: Tens of thousands of square miles are classified urban in the Brazilian Amazon, where development and habitat destruction keep swallowing up wilderness. The region now contains 13.5 million people, 70 percent of whom live in or near cities.

Land reform: Since 1994, more than half a million poor, landless families have been granted property in agrarian reform settlements. Many of these settlers make quick money by illegally selling timber and land. Road networks creating fish-bone patterns through forest are the visible imprint of this activity (above).



Roads: Ecological destruction follows roads. Eighty percent of deforested land is within 30 miles of a road.

PROTECTION

Protected areas: Hundreds of state and federal parks and reserves cover 15 percent of the Brazilian Amazon. About half is strictly off-limits to any kind of development (though enforcement is lax), while sustainable production is allowed elsewhere.

Indigenous areas: About a quarter of the Brazilian Amazon is set aside as Indian land. Indigenous peoples' respect for ancestral grounds can preserve islands of pristine wilderness amid destruction (right).

Timber mills spew smoke across BR-163, Brazil's "soy highway," in Mato Grosso. Environmentalists fear that when the road is fully paved, assaults on the forests flanking its 1,100-mile length will intensify.

Golden cargo on the Madeira River, this boatload of soybeans belongs to Blairo Maggi, the "King of Soy." The world's largest producer, growing 350,000 acres of soybeans, Maggi is also the governor of Mato Grosso. He insists that concerns about Amazon deforestation are exaggerated.

(Continued from page 51) wonders still harbored by this primal forest. But for how much longer? Recalling the murky stew I'd seen in streams already overrun by farmland farther south, I figured it would be only months—not even a year—before these deep, mysterious shadows were exposed to scorching sunlight and the cool, clean water no longer fit to drink.

Bouncing along washed-out tire tracks overhung by low branches, we suddenly emerged onto a wider, newly graded road. "These aren't poor people doing this," Rosa said. "These are land grabbers. They have a lot of money. If they find me out here alone, they will kill me."

The invaders were brazen enough to have erected and locked a gate across the road. We proceeded on foot. Tibaldi signaled for silence as he pulled his Beretta 38 from his shoulder bag. A short way on, we came to a clearing and a ramshackle structure of lashed poles topped by an orange tarp large enough to shield a dozen men. Tibaldi reached under a table and pulled out a box filled with supplies: sugar, flour, coffee, utensils. "They've run from us," he said. All was silent, except for the yelping of a pair of toucans in the treetops. The day was growing long, rain clouds were building in the east, and no one wanted to be caught here with darkness falling.

Someone had evidently tipped off the grileiros. Rosa was furious. Next time he'd try to enlist the help of the federal police—men from outside the area. "It's the only way they won't know in advance," he hissed, eyeing the local cop. "But you can't say that here. To survive in Brazil, you have to shut your mouth and play dumb."

The Amazon land rush has its roots in the 1970s, when Brazil's military dictatorship pursued a policy of "*integrar para não entregar,*" meaning "occupy it or risk losing it." Destitute settlers followed the central axes of penetration, the Trans-Amazon and BR-163, into the jungle, escaping poverty in Brazil's overcrowded south and northeast. Many perished or gave up, but others survived and adapted to the harsh life, practicing slash-and-burn farming.

The poorest settlers were rarely given title to the land they worked, but the government awarded concessions to the well connected—blocks of up to 7,400 acres—to encourage logging, ranching, and other development. If grantees (usually

absentee landlords) failed to put the land to productive use within five years, they would forfeit the right to permanent ownership, and control was to revert to the federal government. Most grantees did nothing but still considered themselves the rightful owners. Meanwhile, landless squatters moved in from adjacent lots, working plots whose ownership the government failed to resolve. That has fueled a bloody showdown pitting the powerful absentee elites who raze forest for agribusiness against family farmers who clear small patches for crops but still depend on intact forest around them for survival.

"What's happening today in Amazonia is a clash between two models of development," said Felicio Pontes, one of a new breed of government lawyers seeking to prosecute corruption, land fraud, and environmental crimes in the Amazon. We were standing in a mock cemetery of 820 crosses that symbolized the human cost of the land wars in Pará, on the first anniversary of the murder of Dorothy Stang. "The first model was implanted during the military dictatorship, based on timber extraction and cattle. It's predatory because it causes death, it's not renewable, and it devastates the forest." The alternative model, preached by Stang, is what Pontes calls social environmentalism. The first concentrates wealth, the second calls for its dispersion in small-scale agroforestry collectives.

Dorothy Stang, born and raised in Ohio, a sister of Notre Dame de Namur, was revered for her dedication to the ideal of family farmers who extract their sustenance in harmony with the forest. From her base in the frontier town of Anapu, she worked unceasingly to transform settlers along the Trans-Amazon Highway into environmentally conscious, cohesive, and combative communities, able to resist violent cliques of ranchers and speculators who would lay claim to the same land. Stang saw human rights and environmental conservation in the Amazon as inextricably intertwined. Though poor settlers themselves damage the forest, Stang believed they could learn to manage their land sustainably as a matter of self-preservation. "The death of the forest is the end of our lives," she told her followers.

Her last mission, to save a remote tract of jungle known as Lot 55, ended on the morning of February 12, 2005, when two gunmen confronted the petite 73-year-old nun on a secluded jungle path. A conversation ensued, overheard by a witness who later testified at the men's trial. Stang admonished them—the land was not theirs, they had no right to plant pasture grasses for livestock.

"So, you don't like to eat meat?" one of the assailants taunted.

"Not enough to destroy the forest for it," she replied.

"If this problem isn't resolved today, it's never going to be," the man snarled.

Stang saw him reach for his gun. She opened her Bible to Matthew and read from chapter five, *"Bem-aventurados os que têm fome e sede de justiça, pois serão satisfeitos*—Blessed are they who hunger and thirst for justice, for they shall be satisfied." As she turned to go, Rayfrán das Neves Sales leveled his revolver and squeezed the trigger.

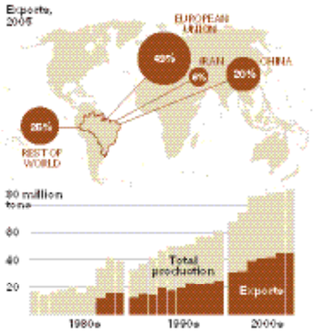
IN BRAZIL, THE EVENTS SET IN MOTION BY LOGGING ARE ALMOST ALWAYS MORE DESTRUCTIVE THAN THE LOGGING ITSELF.

Blairo Maggi, governor of the state of Mato Grosso, is seen by the environmental movement as the poster boy for predation. Maggi is "O Rei da Soja," King of Soy, the world's largest single producer. Maggi acquired a less flattering honorific when Greenpeace gave him its Golden Chain Saw award in 2005, Mato Grosso having led Brazil in Amazon deforestation for the third straight year, coinciding with his first three years in the governor's palace.

Besides growing soy, corn, and cotton on three gigantic ranches and several smaller ones—almost a million acres in all—Maggi extends credit to and buys soy from some 900 midsize growers. His company, the Maggi Group, built an entire city, Sapezal, in western Mato Grosso to service a single plantation. And rather than waiting for the federal government to pave BR-163 all the way to the Amazon River at Santarém for transshipment of soy overseas, the Maggi Group created an infrastructure of silos, tugs, and barges to store and transport it down the Madeira River to its own deepwater port at Itacoatiara.

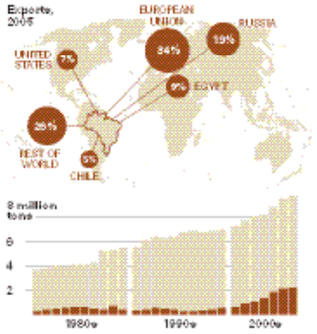
With reddish hair and a spreading paunch, the

WORLD DEMAND FOR BRAZIL'S PRODUCTS



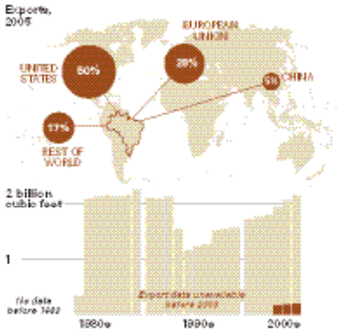
SOY

Soybean production in the Brazilian Amazon soared after heat-tolerant varieties were introduced in 1997. Brazil may soon lead the world in soybeans, surpassing the U.S.



BEEF

The world's largest exporter of beef since 2004, Brazil now supplies nearly every country, including emerging markets such as Algeria, Romania, and Egypt.



TIMBER

Demand for Brazilian hardwoods in Europe, the U.S., and Asia has been growing in recent years. Most timber from the Amazon Basin is taken illegally and stays in Brazil.

SOURCE: ECONOMIC RESEARCH SERVICE, USDA

Corner store hangouts are a common sight in the dirt-road neighborhoods around frontier cities such as Altamira in Pará. In the 1990s, after the government offered new agricultural subsidies, powerful elites drove squatters off rural land. Many settled on urban fringes.

Federal police in Pará drill a hole for explosives, preparing to blow up one of many illegal landing strips used by absentee ranchers and farmers to inspect their holdings.

Agents from IBAMA, Brazil's understaffed environmental protection agency, join a local police officer (with shotgun, at center) for a raid on *grileiros,* land grabbers, illegally clearing forest.

50-year-old Maggi retains a boyish air that belies his reputation as a foe of the forest. His tough, can-do image has made him intensely popular in his home state and a rising star on the national scene; he does not discount a run for the presidency. Maggi is of Italian descent, having inherited land—and his business acumen—from his father, André, who once sold seed to farmers in the southern state of Paraná, then worked his way north, opening the agricultural frontier of Mato Grosso and founding an agribusiness empire.

Blairo Maggi's fortunes have paralleled Brazil's accelerating deforestation and emergence as a global agricultural powerhouse. The country is the world leader in beef exports and second only to the U.S. in soybeans. "The only place left for serious expansion of soy is Brazil," says Oswaldo de Carvalho, a biologist with the Amazon Environmental Research Institute (IPAM). That means more trees will fall in Pará and Mato Grosso.

To Maggi, deforestation is an overblown issue, a "phobia" that plagues people who can't grasp the enormity of the Amazon. "All of Europe could fit inside the Amazon," he says, "and we'd still have room for two Englands."

What does he think of Dorothy Stang's vision of small growers carrying out sustainable projects in harmony with the land? "*Totalmente errado*—Completely wrong," Maggi says, adding that without heavy subsidies, such projects run counter to the march of history and are doomed to failure. "All business tends toward concentration. Unit prices fall, and you need huge volumes to survive."

Not all environmentalists see Maggi in unqualified negative light. "He has seen the wisdom of doing things right on private property as he tries to position Mato Grosso as a world economic superpower," says Dan Nepstad of the Woods Hole Research Center in Massachusetts. The center, together with IPAM, its Brazilian counterpart, is conducting research at Maggi's 202,000-acre Tanguro Ranch, located in the headwaters of the Xingu River. One of their experiments involves assessing the ability of mulch made from microbe-rich rain forest leaf litter to regenerate soil depleted by years of monoculture and ranching. With prodding from Nepstad and others, Maggi supports proposals to certify soy grown by internationally accepted environmental and social standards—standards yet to be written. Maggi has already imposed conditions on his growers: no illegally cleared land, no slave labor, no spraying of agrotoxins within 500 meters of a stream. "There is potential for a win-win situation," says Nepstad, who believes that three-way partnerships among NGOs, the government, and the private sector offer the best hope for stopping rampant clearing.

"We're very responsible environmentally and socially," Maggi said, as we began a tour of Tanguro. "Everything we're doing is aboveboard and within the law." He pointed proudly to the ranch's gleaming cafeteria and the spotlessness of the grounds. "Look around," he said, "you won't find a single scrap of plastic here." Motioning to a barnlike structure that stored herbicides and pesticides, he said, "We keep all our agrotoxins properly ventilated until use."

In a steady rain, our vehicle fishtailing in the mud, we approached a denuded gully straddling a narrow stream; a closer look revealed hundreds of saplings. "When we bought this property," Maggi said, "this riverbank was totally stripped. Now we're regenerating the area."

We continued on a service road, straight as a ruler, along the edge of a mile-long field of yellow-green soy. On one side, row after row of calf-high bushes presented a perfect scene of modern mechanized agriculture. A casual observer might have marveled at the bright green luster of the plants, unaware of the toxic mix required to achieve that sheen. Soybeans need large amounts of acid-neutralizing lime, as well as fertilizers, pesticides, and herbicides. From scientists to native villagers, nearly everyone but Maggi spoke to me with alarm about toxins seeping into the watershed. Indian communities such as the Enawenê-Nawê in Mato Grosso complain of poisoned water and dying fish.

Maggi does not perceive any ill effects from soybean cultivation. "It's environmentally beneficial," he said, looking me straight in the eye. "The land here is very poor. If you don't take the right corrective measures, you couldn't produce anything. It's not true that soy degrades the soil. On the contrary, it puts into the soil what naturally isn't there. Afterward, you can grow anything you want." Researchers agree that proper management of soy fields can increase soil productivity. But in reality, no one knows for sure how long the thin, highly acidic

When the paving of BR-163 is complete, land speculators may pressure 300 surviving Panará Indians in their village of Nãnsêpotiti. Once scattered in nine settlements in southern Pará, the Panará were decimated by diseases in the 1970s, when the road was built.

Amazon soils can be propped up, raising the possibility of an eventual two-headed catastrophe: environmental and economic.

On the other side of the service road, a line of magnificent 100-foot-high trees draped in lianas—the very core of an ancient primeval forest—was starkly revealed in cross section. Such vistas of geometric fields carved from virgin jungle have become commonplace in Pará and Mato Grosso as the soy frontier advances. While many of the incursions are illegal, many are not. Farmers are entitled to clear up to 20 percent of their land, as long as they maintain the other 80 percent as a so-called legal reserve. If the vegetation on their land is "transitional"—somewhere between rain forest and savanna—they're allowed to clear 50 percent. But laws are only as good as the will to enforce them. "Satellite imagery shows that in many frontier zones there is nearly zero compliance," says Stephan Schwartzman of Environmental Defense, a U.S.-based NGO. "People have to believe breaking the law has consequences."

It appears that landowners are starting to believe it. In the crackdown since Stang's murder, farmers who have cleared more forest than their legal limit have been looking for ways to legitimize their holdings. Sympathetic to their situation, Governor Maggi is allowing them to buy up tracts of non-contiguous forest to comply with the legal reserve statute. He promises stiff fines for violators, but he enforces the law reluctantly. "Brazilian producers are the only ones in the world who are obliged to maintain a reserve," Maggi said. "There should be a royalty for leaving those areas intact—they need to be compensated in some way."

Brazilians are not the only people profiting from soybeans. Along the 500-mile paved stretch of BR-163 between Cuiabá and Guarantã do Norte, there are no fewer than five John Deere dealerships. And at harvest time, fleets of the trademark green-and-yellow combines rumble across the fields flanking the highway, pouring rivers of golden soy into open-bed trucks bound for shiny new silos belonging to ADM, Bunge, and Cargill—all American multinationals.

Because BR-163 is not yet paved to the Amazon River, most of Mato Grosso's soy still leaves the state in diesel-belching convoys that must ply 1,200 treacherous miles to Brazil's congested southern ports. In 2003, when the government announced plans to lay asphalt on the last 650 miles of BR-163 from Guarantã do Norte to Santarém, a frenzied land grab ensued. The scale of devastation forced officials to suspend the paving until they could formulate a forest-management strategy for the region. That plan was unveiled in February 2006, one year after the death of Sister Dorothy Stang, when President Luiz Inácio Lula da Silva announced the protection of 16 million acres of rain forest on the western flank of BR-163 between Guarantã and Santarém. (This is nowhere near Lot 55, the patch of forest Stang died defending, where grileiros are still felling trees.) Within the protected area, companies deemed environmentally responsible will be given limited logging concessions, but no clear-cuts or settlements will be allowed.

The new district adds to an expanded mosaic of parks, reserves, and conservation units that, together with indigenous territories, forms the bulwark of defense against the expansion of the frontier in the central Amazon. These measures may be paying off. Deforestation rates fell more than 30 percent in 2005, and preliminary numbers for 2006 are also down. Indian lands in the Xingu watershed are proving an especially effective barrier. There, militant Kayapó and Panará warriors armed with clubs and shotguns patrol their borders using satellite images furnished by international NGOs to pinpoint illegal clearing. As Stephan Schwartzman puts it: "Where Indian land begins is where deforestation ends."

But Brazil's measures to protect the Amazon must be weighed against its other ambitions. These include plans to build seven dams on the environmentally sensitive Xingu and Madeira Rivers, as well as roads, power lines, oil and gas pipelines, and large-scale mining and industrial projects. The dams will power aluminum smelters, and shipping channels will facilitate river transport of exports to Chinese markets. The dams will also flood millions of acres of forest, releasing methane and other greenhouse gases, destroying biodiversity, and forcing indigenous communities to flee ancestral lands.

As indigenous people intuitively grasp, the benefits the Amazon provides are of incalculable worth: Water cycling (the forest produces not only half its own rainfall but much of the rain south of the Amazon and east of the Andes), carbon sequestering (by holding and absorbing carbon dioxide, the forest mitigates global warming and cleanses the atmosphere), and maintenance of an unmatched panoply of life. But the marketplace has yet to assign value to the forest: It's far more profitable to cut it down for grazing and farming than to leave it standing. "Tropical deforestation is a classic example of market failure," Schwartzman says. Oddly enough, Maggi would probably agree with Schwartzman's solution: "It's urgent to find mechanisms to compensate forest peoples, and their governments, for the ecosystem services their forests provide."

For Cargill, a Minnesota-based food conglomerate, the greatest urgency lies in getting soybeans to market as cheaply as possible. Anticipating the eventual completion of BR-163, Cargill opened a warehouse and deepwater port in Santarém in 2003. Until it can transport soy there by road, Cargill, like Maggi, has been moving much of it by barge via the Madeira River. "We've exported close to two million tons," Douglas Odoni, the plant's operation manager, told me with pride. We stood on a catwalk above the Cypriot-flagged freighter *Evdoxos* as a giant nozzle disgorged soybeans into the vessel's belly at the rate of 1,350 tons an hour. Within two weeks, the *Evdoxos* would dock in Amsterdam and unload 52,000 tons of Brazilian soybeans at a crush plant that makes oil and animal feed. "They buy only from us," Odoni yelled above the din of the machinery.

"THESE ARE LAND GRABBERS. THEY HAVE A LOT OF MONEY. IF THEY FIND ME OUT HERE ALONE, THEY WILL KILL ME."

—JOSÉ ROSA, RANCHER

Cargill's operations in the Amazon have been controversial from the start. Federal prosecutors are suing the company over its alleged failure to provide an adequate environmental impact study of the port. Cargill's installation of a soybean washer and dryer has infuriated forest defenders, whose protests have repeatedly closed down the plant. To avoid spoilage, soybeans must be cleaned before they're transported, and for farmers around Santarém, it was only after the arrival of the washer and dryer that they had a buyer for soy and an incentive to grow it. Deforestation in the area has soared. "Maybe it's true that if Cargill weren't here, they wouldn't plant soy," Odoni conceded. But "if they couldn't sell soybeans to us, there would be no taxes and revenues for the local community."

Last summer, Cargill and Brazil's other big soy traders agreed to a two-year moratorium on buying soy grown on newly deforested land in the Amazon. The agreement is sending a signal to soy producers that the environmental impact of their operations is increasingly important in the world marketplace.

For many in the community of Belterra, an hour's drive south of Santarém, the moratorium comes too late. As the head of the Rural Workers Union local, Auricelia Núnes, 33, represents some 5,000 farming families. These people, she said, had been coaxing a decent

living from their small plots, when, in the late 1990s, outsiders from southern Brazil began buying up property for a pittance. "There are many small farmers who don't know the value of money," Núnes said. "They thought the money would last, but it doesn't." Now they languish in Santarém's growing slums.

Those who refused to sell found themselves encircled by an encroaching wasteland, as whining chain saws and raging fires consumed the trees right up to the edge of their land. Their yards were overrun with vipers, bees, and rodents escaping the apocalypse, and when tractors began spraying the cleared fields, toxic clouds of pesticides drifted into their homes. "Their health was in jeopardy," Núnes said. "Many started getting sick. Their animals started dying."

Núnes and her husband, Everaldo Pimentel, still live as traditional family farmers, growing corn, squash, and beans and raising livestock on their 70-acre plot. But Pimentel wanted to show me another place, 15 minutes away by car. We followed yet another dirt road past miles of soy before turning onto a narrower track that traced the edge of a freshly plowed field—the driveway to the farmhouse his grandfather had built in the shade of a large mango tree. This, Pimentel said, was where he had grown up. Four years ago, his father sold the farm to a stranger. Workmen immediately cut down every tree. "In 30 seconds," he said, "they can cause more devastation than a small farmer who's been on the land for 30 years."

Pimentel couldn't have cared less that we were trespassing—there were no hired guns to be seen. He pointed to a cracked slab of concrete in the ground, overgrown with weeds and vines. "The house was here." A dozen giant mango trees lay on the ground, toppled by chain saws and left to decay under the blistering sun. "We never would have sold it if we knew what this guy was going to do," Pimentel said. He hoisted himself onto the stump of an old mango. "My grandfather planted this one a hundred years ago," he said, looking out across a desolate, empty field. Pimentel buried his face in his hands and began to weep. "It was beautiful here," he said. "You should have seen it." □

Disappearing Forests Join our online discussion and share your thoughts on the global impact of the diminishing Amazon rain forest at **ngm.com/0701**.

Ten-year-old Jeremias Silva lives with his parents and two brothers in an isolated government settlement in Mato Grosso. His father, a farmer, sells illegal timber to make ends meet. "I hope for better days," Jeremias says. "Here in the forest it's not so good."