

# DEVOURING THE RAINFOREST

By Terrence McCoy and Júlia Ledur

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The pattern is clear: First, the forest is razed.

Then the cattle are moved in.

If the Amazon is to die, it will be beef that kills it.

And America will be an accomplice.

Cattle ranching, responsible for the great majority of [deforestation in the Amazon](#), is pushing the forest to the edge of what scientists warn could be a vast and irreversible dieback that claims much of the biome. Despite agreement that change is necessary to avert disaster, despite attempts at reform, despite the resources of Brazil's federal government and powerful beef companies, the destruction continues.

*[How deforestation is pushing the Amazon toward a tipping point]*

But the ongoing failure to protect the world's largest rainforest from rapacious cattle ranching is no longer Brazil's alone, a Washington Post investigation shows. It is now shared by the United States — and the American consumer.

In the two years since Washington [lifted a moratorium](#) that was imposed on raw Brazilian beef over [food safety concerns](#), the United States has grown to become its second-biggest buyer. The country [bought more than 320 million pounds](#) of Brazilian beef last year — and is on pace to purchase [nearly twice as much](#) this year. The biggest supplier is the beef behemoth JBS, whose fleet of brands stock some of America's major retail chains and businesses: Kroger, Goya Foods, Albertsons (the parent company of Safeway, Jewel-Osco and Vons).

JBS, the world's largest beef producer, has repeatedly been accused by environmentalists of buying cattle raised on illegally deforested land. Greenpeace [first alleged](#) such ties in a 2009 report. In 2017, Brazil's environmental law enforcement agency, Ibama, fined the company what was then more than \$7.5 million, alleging that two of its Amazon meatpacking plants [had purchased nearly 50,000 such animals](#). In October, federal prosecutors focusing on deforestation [alleged](#) widespread “irregularities” in the company's direct supply chain from January 2018 to June 2019 in Pará state.

A truck with JBS signage drives near the company's beef production facility in Greeley, Colo., in June 2021. JBS is the world's largest beef producer. (Michael Ciaglo/Bloomberg News)

But in a forest where some beef producers still don't track cattle origins, and in a country where no law specifically prohibits the purchase of cattle from illegally

deforested land, JBS considers itself one of the good guys. It says it has prioritized the environment and blocked more than 14,000 cattle ranches that didn't comply with company standards. It has signed agreements with environmentalists and federal prosecutors promising not to purchase cattle from ranches that were illegally deforested. It publishes the names of the ranches from which it purchases cattle.

None of it has been enough.

By reviewing thousands of shipment and purchase logs, and analyzing satellite imagery of Amazon cattle ranches, The Post found that JBS has yet to disentangle itself from ties to illegal deforestation. The destruction is hidden at the base of a long and multistep supply chain that directly connects illegally deforested ranches — and ranchers accused of environmental infractions — to factories authorized by the U.S. government to export beef to the United States.

Between January 2018 and October 2020, records show, JBS factories with that authorization made at least 1,673 cattle purchases from 114 ranchers who at the time owned at least one property cited for illegal deforestation. Several ranchers from whom JBS bought cattle were notorious — alleged by authorities to be among the Amazon's most destructive actors. The supply chain, the examination found, was infected with dozens of ranches where land had been deforested illegally. Satellite imagery showed that several of the operations had cattle on land where grazing was prohibited at the time — in what environmental regulators called a violation of Brazilian law.

“Environmental control in the beef supply chain needs to be much more rigorous,” said Suely Araújo, who directed Ibama from 2016 to 2018. “Meatpackers need to stop complaining and actually control their supply networks. We've talked about cattle tracking for three decades but have never done it in a real way.”

President Biden has been outspoken about the need to conserve the Amazon, [a vital carbon sink](#) that scientists say must be preserved to avert catastrophic warming. But the U.S. agency that authorizes Brazil's meatpacking plants to export to the United States says it doesn't try to determine whether the operations cause environmental damage. Seven plants greenlighted by the U.S. Food Safety and Inspection Service are in the Amazon.

*[\[Climate Solutions: Are my hamburgers hurting the planet?\]](#)*

Brazil's Environment Ministry did not respond to requests for comment. The Agriculture Ministry blamed “historic land-use problems,” not the beef industry, for deforestation.

Senior officials at JBS say Brazil's cattle supply chain is one of the world's most complex, involving thousands of ranches spread over expansive territories, and is extremely difficult to monitor. Marcio Nappo, director of corporate sustainability at the beef giant, told The Post that the company has gone beyond what other companies have done to root out deforestation.

“JBS has been in the top five, top 10 companies in eliminating deforestation in its supply chain,” Nappo said. “...We can say with great confidence that we have already advanced enormously.”

### **The Amazon, Undone**

A series revealing how crime, corruption and greed are speeding the destruction of the world's largest rainforest. Terrence McCoy, who covers Brazil for The Washington Post, reported this story over 18 months.

#### **More in this series**

[We traveled deep into the Amazon to investigate deforestation. A grisly discovery awaited us.](#)

[How deforestation is pushing the Amazon toward a tipping point.](#)

The company has moved aggressively to stop purchases from operations that graze cattle on illegally deforested land, he said, using a “pioneering” monitoring system. He said the company plans to root out all deforestation in its supply chain by 2025 and has already succeeded in stopping purchases from ranches that have carried out illegal deforestation.

But the biggest problem in Brazil’s cattle industry today, and a key reason deforestation in the Amazon [has reached a 15-year high](#), isn’t the direct supplier. That hasn’t been the case in years. The biggest problem is the indirect suppliers — ranchers who know how to work the system, shuffling cattle from ranch to ranch to conceal their illegal origins and sell them off.

The game is called “cattle laundering.” The forest is full of players, swaggering ranchers who built their businesses from the embers of the forest. Today, one Amazon cowboy, Zaercio Fagundes Gouveia, says cattlemen like him have a new focus:

“The United States.”



Cattle in a holding pen on a ranch in São Félix do Xingu in Brazil's Pará state, (Jonne Roriz/Bloomberg News)



The life of an Amazonian steer typically amounts to climbing a ladder. At the bottom rung, where the system is least regulated and where most illegal deforestation occurs, are operations focused on breeding. Then the young animals are moved to properties that nurture them through adolescence. Next up are the fattening farms.

With each rung climbed, the system is more closely monitored and regulated, until the animal reaches the top of the ladder, the processing plant, where it is slaughtered and its meat butchered.

There was a time when nearly every stage of the process involved burning down forest, a cycle of fire and beef that transformed much of the Amazonian state of Mato Grosso — Portuguese for “thick forest” — into a checkerboard of cattle ranches. But a decade ago, leading beef producers signed a pair of agreements to clean up the industry.

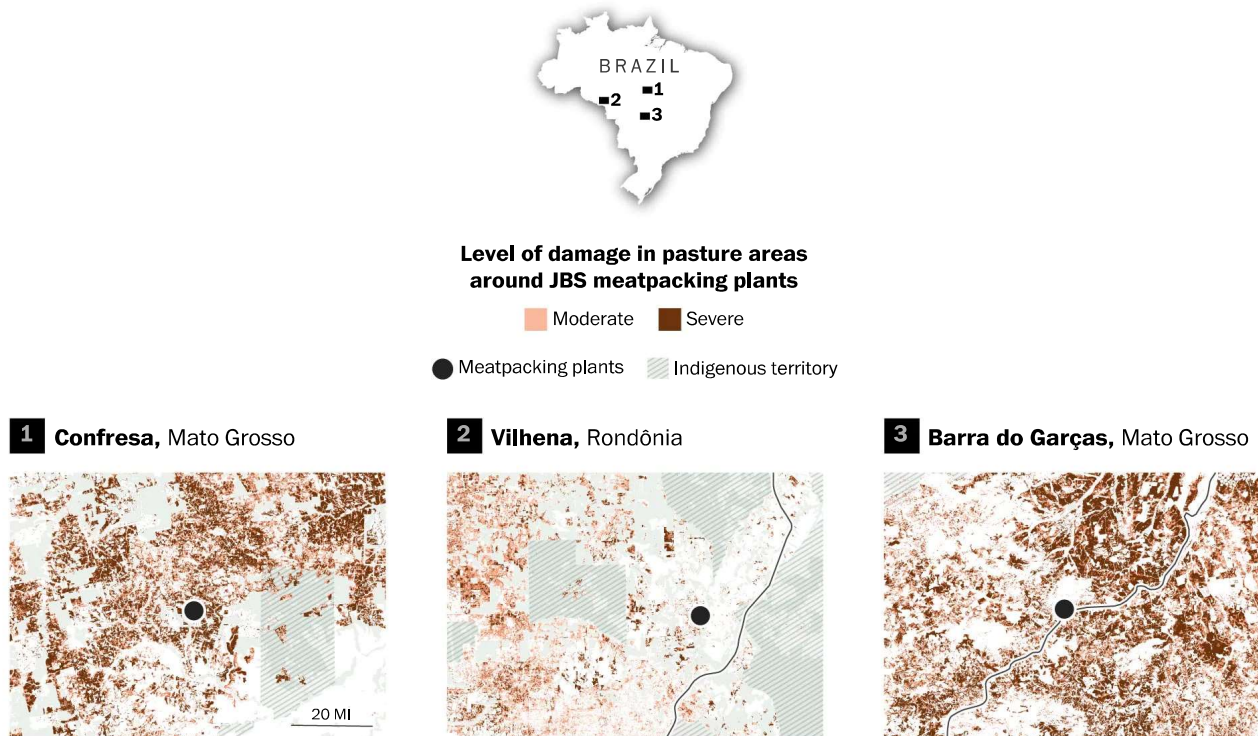
One was a [2009 accord](#) with Greenpeace that committed signatories to eliminating deforestation in their entire supply chains. The other was an agreement with federal prosecutors, in Brazil’s last real attempt to take on the powerful sector. Its most important signatory was JBS.

In the agreement, the producers promised to stop sourcing cattle from ranches that continued illegal deforestation. The effort would include stopping all cattle purchases from operations with environmental embargoes — citations that prohibit ranchers from grazing cattle on land that in most cases was illegally deforested.

But rather than cull deforestation from the industry, investigators say, the reforms pushed it further out of sight. Cattle are not tracked individually in Brazil, as they are in neighboring [Argentina](#) and in [Europe](#). All that ranchers with embargoed land have to do is ship their cattle to properties with clean environmental records. Once the animals reach a ranch that doesn’t have a history of deforestation, they are effectively born again — cleansed and ready to be sold to producers such as JBS for slaughter and shipment.

“This is cattle laundering,” said Raoni Rajão, an environmental scientist at the Federal University of Minas Gerais. “The scheme has become institutionalized.”

The Post, in a collaboration with the Dutch environmental research organization Aidenvironment, analyzed thousands of cattle purchase and shipment logs that provide a glimpse into this world. The analysis, which focused on three U.S.-authorized JBS plants located in areas of large-scale deforestation in the Amazon, did not seek to capture all ties to deforestation. It was based on Ibama embargoes, which, according to [a 2015 study](#), cover less than one-fifth of deforested areas.



The documents nonetheless expose loopholes and failings that investigators say bedevil the wider industry. They reveal what’s on the surface: JBS does direct business with ranchers who have extensive histories of deforestation; 3 percent of the plants’ cattle purchases between January 2018 and October 2020 were from ranchers who had been cited for deforestation by Ibama. They also reveal what’s beneath the surface, leading into the labyrinth of the indirect supply chain, where illegally deforested farms are hidden.

The documents draw a direct line. It begins at cattle ranches accused of illegal deforestation. It leads to ranches with no environmental infractions. It then travels to JBS slaughterhouses certified to export meat to the United States.

At the first step in the process, in the supply chains of two of the three JBS plants, The Post and Aidenvironment identified 71 ranches where Ibama had embargoed a section because of deforestation. (The Post was unable to obtain cattle shipment records for the third plant.)

The analysis found that those properties had shipped at least 7,912 head of cattle to clean ranches that directly supply JBS.

Finally, the examination revealed that those clean ranches made at least 263 sales of an unspecified number of cattle to JBS factories authorized to export to the United States.

Shuffling cattle from dirty ranches to clean ones isn't against the law: It's a workaround. What is against the law is using embargoed land to raise cattle — which Ibama inspectors say happens frequently. “The cattle produced there is commercialized normally,” said one Ibama agent in Mato Grosso, who like other government regulators spoke on the condition of anonymity to talk freely. “The state has lost its function. Society is acting however it wants, regardless of the law.”

At The Post's request, the geospatial company Maxar Technologies produced satellite imagery of five indirect JBS suppliers with embargoed land. The images showed that three of the ranches had cattle on land that was embargoed at the time.



One of them is Nova ranch, located in rural Santa Cruz do Xingu in the state of Mato Grosso. The town is home to about 2,700 people and 127,000 head of cattle.

One of the many ranches in the area cited for environmental infractions, Nova had nearly 3,000 acres of its land **embargoed** in 2016, prohibiting ranchers from grazing cattle there. But the ban didn't stop them.

Using close-up satellite images, The Post discovered cattle in multiple places on land embargoed at the time.

In this image from May 2021, five years after the embargo was imposed, cattle are seen grazing near a pond in an area that had been deforested.

Another image shows more cattle on the other side of an area embargoed at the time.

Livestock activity is also spotted close to a ranch in the middle of the restricted area.

Luiz Alfredo Abreu, attorney for Nova ranch owner Ricardo Eugênio Palmeira, said state authorities had given the rancher permission to use those areas. “He can sell cattle even to the president of the United States,” Abreu said. “This embargo is nothing.”

Ibama and state officials called that assertion inaccurate. “The embargo remains valid — so much so that the farmer was recently fined for disobeying it,” Ibama said in a statement. Local authorization does not override Ibama embargoes, state and federal officials said.

Palmeira is also a direct supplier to JBS. But his deforestation record is paltry compared with those of some ranchers with whom JBS has done direct business, The Post found.

One was José de Castro Aguiar Filho, who has been assessed more than \$11 million in environmental fines. He has been described by the [Intercept Brasil](#) as one of the “25 biggest destroyers of the Amazon.” (In audio messages to The

Post, the rancher called authorities who fined him “not very correct” and said he barely sells cattle now.)

Another supplier, Mário Quirino da Silveira, was [described by the federal government](#) in 2008 as one of the Amazon’s biggest deforesters. (Repeated attempts to contact Quirino da Silveira were unsuccessful.) Another was Vitor Elisio Poltronieri, [accused by environmental authorities](#) in 2009 of being one of Mato Grosso’s biggest deforesters. (Poltronieri didn’t respond to requests for comment.)

Two more direct suppliers, Aldo Pedreschi and his son Aldo Pedreschi Filho, [both named](#) two of Mato Grosso’s biggest deforesters, have been cumulatively assessed more than \$3.6 million in environmental fines. (Pedreschi died in 2020. Efforts to contact his son were not successful. A former family lawyer denied wrongdoing: “The family never committed any environmental crime!”)

Presented with The Post’s findings on its supply chain, including the names of the particularly notorious suppliers, JBS said it had severed ties with the men. The company acknowledged that its deforestation monitoring system targets ranches, not their owners, though many operate multiple properties — some sanctioned and some not — and can shuffle cattle between them.

Once the animals arrive at the JBS plants, the process leading to export to the United States can begin. Shipment records provided by Panjiva, the trade research unit of S&P Global Market Intelligence, show that JBS exports almost all of its U.S.-bound beef to its own American facilities.

But neither the U.S. government nor the American consumer knows where it goes from there. Once imported beef passes inspection, it can be stripped of all labels that identify it as foreign-sourced and be sold as if it were produced domestically. No federal agency tracks the domestic sale of imported beef. And retailers aren’t obligated to inform consumers of the raw beef’s country of origin. That [labeling requirement was repealed](#) with the passage of the 2016 omnibus spending bill.

To try to locate the beef, The Post asked 16 national grocery and restaurant chains whether they sell JBS beef from Brazil. Only Kroger and Albertsons said they did — but a very small amount. Goya Foods has imported nearly 2 million pounds of canned Brazilian beef since March 2020, trade records show. The company didn’t respond to requests for comment.

Kroger said it has a “no-deforestation commitment” and has “engaged the JBS team to further review the situation.”

JBS, citing “commercial restrictions,” declined to divulge its list of U.S. buyers. It did not respond to questions about whether it informs American retailers of the meat’s country of origin.

The beef of the Amazonian steer has finally reached the top rung of the ladder: the American consumer. But many of those buyers will have little idea it is Brazilian.





‘A LAND WITHOUT  
MEN FOR MEN  
WITHOUT LAND’

Cattle graze on land recently burned and deforested by ranchers near Novo Progresso in Pará state in August 2020. (Andre Penner/AP)

**H**ow cattle, the most common of animals, became central to the decimation of the world's most valuable forest is a story of intention, not coincidence. It begins in the mid-1960s, when Brazil was ruled by a military dictatorship. Worried that vast stretches of uncontrolled territory in the Amazon would invite foreign invasions, [generals set out to conquer](#) what had until then been unconquerable.

The mission: "Operation Amazon." The rallying call: "A land without men for men without land."

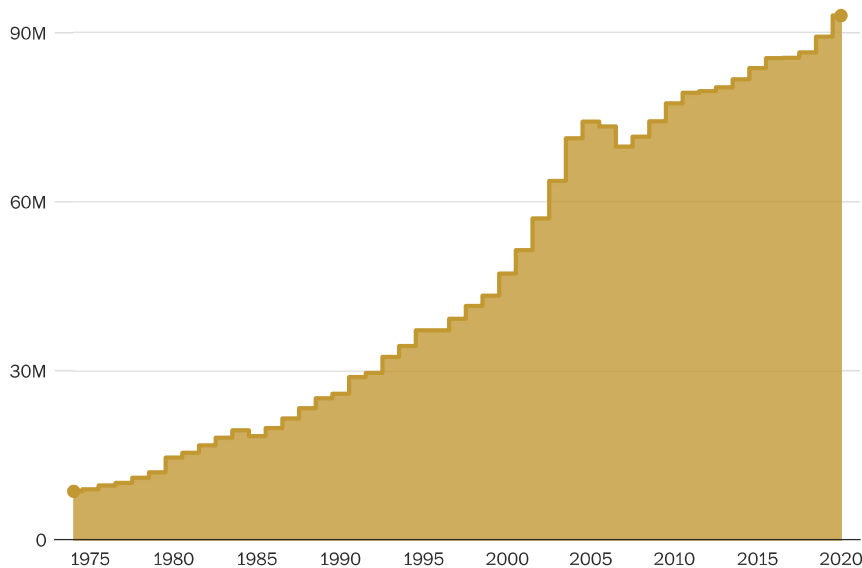
The tool of conquest: cattle.

The bovine was seen as a crucial ally in taming — and then claiming — the wildest of terrain. A relatively small number of the animals can range across large expanses of land. Their grazing keeps the jungle from regenerating. And their meat provides both sustenance and income.

"The idea was conquest, to conquer and integrate the interior into the rest of the country," said Antoine Acker, a historian of the Amazon at the University of Zurich. "The cow was a powerful animal for that. It occupies a lot of land and is really cheap."

With investment benefits, tax breaks and a new web of [highways](#), Brazil persuaded local and foreign investors alike to bet on the seemingly paradoxical endeavor of cattle ranching in the rainforest. The goal of the dictatorship was to have at least 20 million head of cattle in the Amazon within a few decades. Brazil transitioned to democracy in 1985, but exceeded that benchmark for raising cattle by [1990](#) and has since [more than quadrupled](#) it.

### Number of cattle in the Amazon skyrocketed in the past four decades



People rich and poor rushed into the Amazon, burned chunks of forest, put down cattle and claimed the land by means both legal and illegal. In a vast region largely beyond government control, slave labor was pervasive, violent land disputes erupted and Indigenous communities were massacred. By the early 2000s, farmers were burning [enough forest](#) each year to cover New Jersey.

Lawmakers tried to curtail the destruction. Under the [forest code](#), farmers and companies were limited to burning only 20 percent of their properties. Knocking down more — or razing public and Indigenous lands — would make the deforestation illegal. But what was said in faraway Brasília was one thing. What happened in the Amazon was another.



In central Brazil's Mato Grosso state, where soy, maize and beans are widely produced, video from August 2020 shows illegal fires ablaze on farmlands. (AFPTV)

Ranchers continued to burn forest to widen their pastures. Land grabbers and squatters invaded and burned land to steal it. Environmental authorities struggled to patrol the vast territory: One of their primary law enforcement tools was the embargo. But the comparatively few citations that were issued had little effect. Few environmental fines are paid. Others are contested in the byzantine Brazilian appellate system in cases that drag on for years. The slaughterhouses had little incentive to stop buying cattle that came from illegally deforested land. And the ranchers had little incentive to stop selling it.

Incentive was exactly what federal prosecutor Daniel Azeredo hoped to provide. A native of southeastern Brazil — a wealthier, largely urban region where the Amazon feels as distant as a foreign country — he arrived in Pará state in 2007 and quickly realized conditions were unsustainable. Pressuring ranchers to stop burning forest wasn't working. His office was inundated with cases against them — all dead ends. He needed to exert pressure another way.

He assembled a list of ranches with embargoes to determine which meatpackers bought their cattle. Then he followed which grocery stores bought that meat. Then he started suing. He threatened Brazil's largest grocery stores, alleging that they hadn't ensured their meat was free of ties to deforestation. The fallout was immediate: Several grocery stores started to boycott the slaughterhouses linked to the destruction.

"It was decisive," said Beto Veríssimo, co-founder of the Amazon Institute of People and Environment. "It had impact."

In 2009, the largest slaughterhouses signed an agreement with Azeredo's office declaring that they would no longer source cattle from ranches that were being deforested illegally or had been cited with an embargo. The reforms contributed to one of the century's great environmental success stories. Deforestation in the Brazilian Amazon plummeted.

But even then, Azeredo couldn't shake the feeling that the gains wouldn't last. There were gaps in the reforms. It wouldn't be long before ranchers found them.

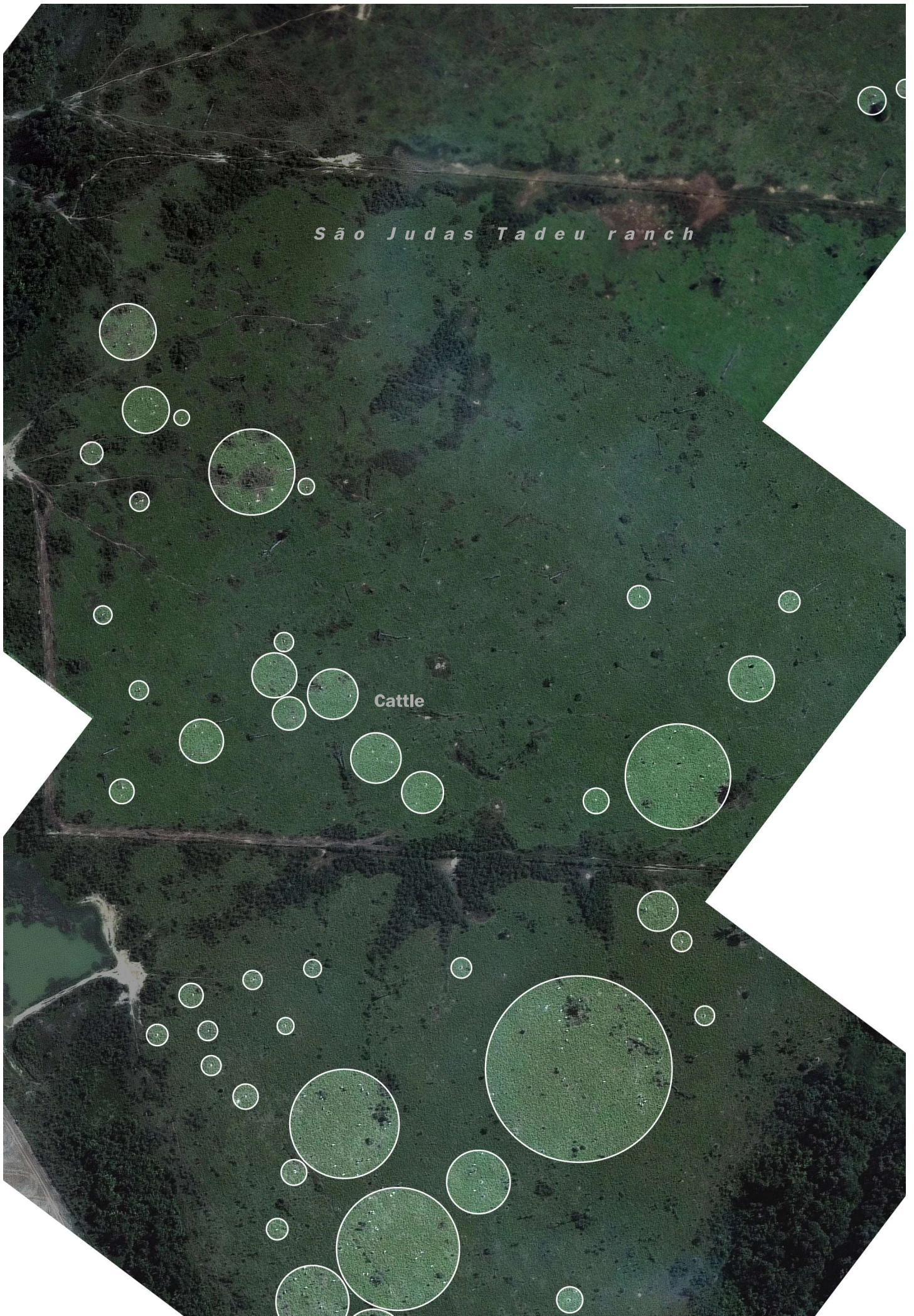


A JBS facility in Tucumã in Pará state, seen in October. (Jonne Roriz/Bloomberg via Getty Images)

**T**he São Judas Tadeu ranch sits at the cusp of the Amazon rainforest like a giant anchor, more than half the size of Manhattan. It has smoldered and burned for years. Thirty-six fires raged through the property in 2005 alone. An additional 13 in 2008. And seven more in 2013. In all, according to a fire analysis by University of Maryland geographer Louis Giglio, more than 100 fires have scorched the ranch since 2004.

Only one-fourth of the ranch still has remnants of native vegetation, property records show. Its history of fires suggests “forest clearing,” said Giglio, who studies global fire emissions. Embargoes have been issued for sections of the ranch, but satellite imagery produced by Maxar showed cattle on a swath where they were prohibited at the time.







The ranch is also an indirect supplier to a JBS plant authorized to export beef to the United States.

From January 2018 to January 2019, government cattle shipment records show, the São Judas Tadeu ranch transferred at least 3,173 head of cattle to the nearby, embargo-free São Sebastian ranch. In the months after the transfers, the clean ranch made at least 24 cattle sales to a JBS plant in northeastern Mato Grosso. The records show that both properties are owned by a single rancher.

Zaercio Fagundes Gouveia — short-cropped hair, gold bracelet, big aviators — is from the southeastern city of Ituiutaba. He arrived in Mato Grosso three decades ago, when his father joined the beef rush to become an Amazonian rancher. They knocked down a section of the forest — “permitted and cleanly legal at that time,” the son said — put down some cattle and built a ranch. Gouveia, then 19, never moved back home.

The region was forest and little else then — a blanket of green that would have been an environmentalist’s Eden. But to Gouveia, “it was awful, just terrible.” The closest telephone was more than 150 miles away on a dirt highway. There were few paved roads. Schools were out of the question. His daughter was home-schooled. To build what he has — an agribusiness with six ranches and 200 employees — and to help bring an economy to a region largely without one took sacrifice. More, he said, than most ranchers could handle.

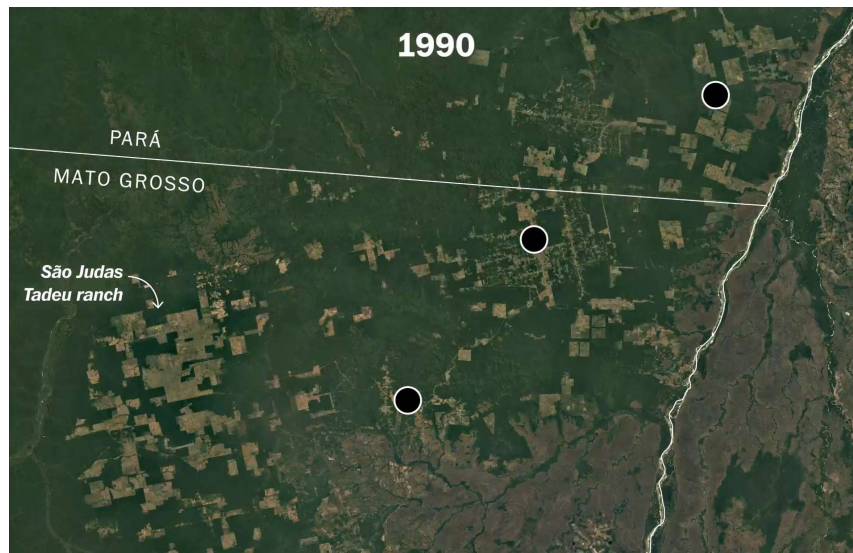
And now: “It’s wonderful.”

Much of the forest is gone. The terrain is latticed with a network of roads and dotted with cattle ranches, churches, towns — all powered by beef. The region developed and prospered, he said, by the grace of settlers like him and a market poised to continue its growth.



● Current locations of JBS meatpacking plants





Global beef consumption, a traditional marker of development, is projected to continue to rise over the next decade. The United States is the largest market: It is home to 4 percent of the world's population but eats about [20 percent of its beef](#).

Gouveia said he's here to provide it. There's just one obstacle in his way.

"The environmentalists," he said. "I have so many environmental problems. So many. It's not easy."

Authorities have cited Gouveia eight times since 2008 for environmental infractions. At the time of his sales to JBS, he stood accused of knocking down at least 5.4 square miles of forest and had been assessed nearly \$3 million, a sum researchers say puts him among the most-fined ranchers in the Amazon.

Gouveia blames the infractions on fires started by others and on environmental regulators who were incompetent and inexperienced. He denies wrongdoing. One large embargo was recently dismissed, and he is appealing at least one fine. The accusations, he said, once wouldn't have impacted his supply chain much. Ranchers could continue sending cattle directly to the meat plants. But with this "extremely serious and unjust environmental pressure on top of us," he said, ranchers had to find a workaround.

"A different system," he called it.

Gouveia continued to raise cattle at São Judas Tadeu — but not, he said, within prohibited areas, which had accounted for more than one-third of the ranch. From São Judas Tadeu, he said, he would ship the cattle to another of his operations to fatten them. Then they'd be sold off to slaughter.

When told The Post had obtained satellite imagery that showed cattle on land embargoed as of May 2021, he shrugged.

"Well, generally, I tell them not to put cows there," Gouveia said.

Workers stand outside the JBS beef-processing facility in Greeley, Colo., in April 2020. (Michael Ciaglo/Bloomberg News)

JBS cut ties with Gouveia's Amazonian ranches after it was informed of The Post's findings — a decision Gouveia bitterly mourned. “You hurt me with this report,” he said. “I talked to you with an open heart.”

He still had reason to be optimistic. The agricultural industry, which [managed to grow](#) during the coronavirus pandemic, now accounts for 8 percent of Brazil's gross domestic product. The lifting of the U.S. moratorium on raw Brazilian beef two years ago has opened up a massive new market. And President Jair Bolsonaro is in power.

“We're now the most important industry in Brazil, aren't we?” Gouveia said.



A boat carrying trucks loaded with cattle passes through the meeting point of the Xingu and Fresco rivers in São Félix do Xingu, (Jonne Roriz/Bloomberg News)

**T**he problem is not without a solution. The maze of the cattle supply-chain system has a key. But Brazil has failed to seize it.

Every time cattle are moved in the country, a shipment log called a “Guide of Animal Transport” is created. The purpose of the document is sanitary: to help prevent the spread of infectious diseases and ensure proper cattle vaccinations. But those records, current and former government officials say, can be used to create a cattle-tracking tool and illuminate even the murkiest sections of the supply chain.

Researchers have done it. But not the federal government.

“Does Brazil have the capacity to do this? It does,” said Izabella Mônica Vieira Teixeira, Brazil’s environment minister from 2010 to 2016. “What it lacks is the political will.”

In late 2018, environmental regulators, supermarket chains and beef producers [gathered](#) in Brasília to develop a system that would incorporate the cattle shipment logs into a tracking tool. Then Bolsonaro, who’d spent the presidential campaign criticizing environmental regulations, was sworn in. Participants in the discussions say the effort soon fizzled.

“We had the money,” said a senior government official who spoke on the condition of anonymity to offer a candid assessment. “But people believed there was no way to continue. Things had changed politically.”

The government has since made tracking cattle more difficult. In mid-2019, months into Bolsonaro’s tenure, federal and some state governments sharply restricted access to the records. Documents that were once available to download on Agriculture Ministry websites — albeit painstakingly, one by one — are now even harder to obtain. Even meat producers complain, not without reason, that they’re criticized for not tracking cattle when the government has deprived them of the tools to do it.

“The federal government doesn’t make this data available to third parties,” Brazil’s Agriculture Ministry told The Post in a statement, because it includes

confidential information. "It's essential for the maintenance of the animal health system. Therefore, there is no reason for it to be released for demands that don't involve the health of animals."



Illegal fires burn during the dry season on farmlands at the border of a rainforest reserve in Mato Grosso state in central Brazil in August 2020. (AFPTV)

In that restriction, environmentalists see the contours of what has become a political Rubik's Cube. Bolsonaro, under international pressure to save the Amazon, has committed to ending illegal deforestation by 2030 and making Brazil carbon-neutral by 2050. But few think those goals can be reached without curbing rapacious cattle ranching. And even fewer think Bolsonaro, who sees those who practice it as a crucial base of support, will do it.

"Brazil is a green power," Bolsonaro declared during November's international climate summit in Glasgow, Scotland. "We are part of the solution. Not the problem."

Days later, the federal agency charged with monitoring deforestation released its annual report. Deforestation had reached a 15-year high. The Amazon's losses for the year could nearly cover the state of Connecticut.

A few weeks after that, one more report was released, this one by the national association of Brazilian meat producers. The year 2021 was another banner one for beef. Brazil, which [shipped out](#) over 2 million tons, was once again dominant in the global export market: the reigning king of beef.

*Heloisa Traiano, Gabriela Sá Pessoa and Reinaldo Chaves contributed to this report.*

**MORE ON THE AMAZON RAINFOREST**

**HAND-CURATED**

An Indigenous TikTok user in the Amazon posted a video of herself eating beetle larva. Now she has 6



The world has pledged to stop deforestation before. But trees are still disappearing at an 'untenable rate.'



Brazil's Amazon hit by worst deforestation since 2006  
Nov. 19, 2021



million  
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**Sources:** Data on deforestation (from 1988 through 2020), forests and water bodies, Indigenous territories and official Amazon borders are from Brazil's National Institute for Space Research (INPE). Pasture areas and levels of damage, as well as the location of meatpacking plants, are from the [Atlas das Pastagens](#), a digital atlas of Brazilian pastures. Pasture areas are as of 2019. Biomass data is from [NASA's ORNL DAAC at Oak Ridge National Laboratory](#). Data on the number of cattle in the Amazon is from the Brazilian Institute of Geography and Statistics, [Municipal Livestock Survey](#). Satellite images are from Maxar Technologies.

#### Methodology

##### Cattle purchase and shipment logs

The Post identified three JBS slaughterhouses located in what Brazil defines as the Legal Amazon — a region of nine states that fall within the Amazon basin — that are authorized to export to the United States. The Post obtained the purchase logs of the processing plants through the beef producer's traceability database, which included identifying information for ranchers who sold to the company. The Post then referenced the names against an Ibama database of federal embargoes. In collaboration with Aidenvironment, an analysis of the indirect supply chain of two of the slaughterhouses was carried out using Guide of Animal Transport (GTA) cattle shipment records in Mato Grosso state. Those records were also referenced against an Ibama database of federal embargoes.

##### Pasture-quality data

Developed by the Image Processing and Geoprocessing Laboratory of the Federal University of Goiás (Lapig/UFG), the Atlas das Pastagens maps pasture areas in Brazil and their quality. Researchers developed a machine-learning model to analyze nearly 300,000 satellite images from Landsat 5 and Landsat 8. They detected, quantified and classified damage in pasture areas in Brazil from 2010 to 2018. They also conducted field research on pasture areas to create an archive of samples that helped refine the data collected by the two satellites.

Degradation is quantified using the Normalized Difference Vegetation Index, in which a value of 1.0 correlates with dense, live, green vegetation. Values between 0.4 and 0.6 correlate with moderate damage; values of 0.4 below correlate with severe damage. The accuracy rate of the model is 92 percent.

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