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Undervaluing and Overexploiting the Brazilian Cerrado at Our Peril

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Undervaluing and Overexploiting

the Brazilian Cerrado

AT OUR PERIL

In a context of international scrutiny, important efforts are being made to preserve Brazil's tropical forests. Meanwhile, the destruction of its Cerrado biome advances with increasing leaps but little controversy. Yet the damaging changes threaten life-supporting natural resources and ecosystem services that are vital for the majority of Brazilians, as well as for the continued viability of agriculture. This ancient region of considerable geological and cultural significance encapsulates all of the major environmental challenges to sustainability, and begs new responses from science and society. Fresh policies are needed to promote and integrate the importance of this biome for the nation. These include implementing systematic monitoring systems and improving the management of established ones, minimizing new clearing. Degraded areas must be restored to comply with existing Brazilian environmental laws and international commitments related to climate change, biodiversity conservation, and sustainable development. Addressing the threats to this critically important yet neglected biome requires attention to structural governance problems, including improved education and involvement of stakeholders in key decision making about the region, as well as historically informed reexamination of the country's economic development path.



by Myanna Lahsen,
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The Cerrado: A Biome Subject to Conflicting Uses

Extending over 2 million square kilometers, Brazil's Cerrado savanna is the second largest integral biome in Latin America, equivalent to the combined area of England, France, Germany, Italy, and Spain. After visiting its major waterfall on the São Francisco River in the Serra da Canastra in the mid-nineteenth century, the French naturalist Auguste de Saint-Hilaire wrote with exaltation about the landscapes he encountered:

To give you an idea of how fascinating is the landscape there, the reader should imagine together nature at its loveliest: a sky of the purest blue, crowned mountains of rocks, a majestic waterfall, water a matchless clarity, the shimmering green of the leaves and finally the virgin forests, exhibiting all kinds of tropical vegetation. [translated by the authors]¹

After almost two centuries, this delightful description still applies to the few remaining preserved pieces of Brazil's Cerrado. It no longer captures the degraded state of about half this biome that originally covered nearly a quarter of Brazil. The Cerrado is poorly protected and has already lost about 50% of native vegetation cover. Deforestation and other land use changes intensified after the government began inducing human occupation into this interior region of Brazil and completed the new capital of Brasília in the 1960s. Pernicious alteration accelerated after the modernization of Brazil's agricultural sector, beginning in the 1980s. Agricultural technologies (like adapted plant genotypes and intensive soil management) enabled successful, government-stimulated expansion into the region, which is conducive to large-scale agriculture by virtue of its flat topography.²

It is primarily by means of deforestation here, not in the Amazon, that Brazil has become one of the world's leading producers and exporters of soybeans and cotton as well as beef, mostly from pastures planted with alien grass species.

The Cerrado recycles water to most of Brazil and also to some neighboring countries. Removing the native vegetation threatens this vital ecosystem service and fresh water provision, on which the Amazon region also depends.



Distribution of the main savanna region of Brazil's Cerrado.



Native vegetation in the Cerrado is sometimes, but not always, obviously lush, yet it is rich in biological diversity and key to the maintenance of climate and natural resources essential to human survival. Nevertheless, the 41% increase in the region's deforestation rate between 2010 and 2014 goes largely unnoticed, while the decline in deforestation rates in the Amazon during the same period is nationally and internationally celebrated.

The Cerrado has the largest area of farm and ranch land in Brazil, some 88 million hectares,³ 44% of its total area. In 2009–2010, 95% of its cotton, 54% of its

soybeans, 55% of its beef, and 41% of its milk were produced in the Cerrado.⁴

Cattle raising competes with crops near the large cities in the southern part

of the hotspot, while grain cultivation—predominantly soy for animal feed, plus corn and cotton—is expanding most rapidly in the relatively flat and more remote, pristine northern regions.⁵ These are now the country's most active agricultural frontier. A new territorial conception, MATOPIBA, gained its name from the first letters of the four states whose territory it subsumes: Maranhão, Tocantins, Piauí and Bahia. During 2005–2014, the cultivated crop area in MATOPIBA increased by 86%,⁶ in contrast to the national average of 29% during the same period.⁷ Land values of around 70% of the national average encourage large-scale mechanized agricultural production, encouraged also by the region's topography, superior road infrastructure, and proximity to the heavily populated southeastern regions of the country, compared to the Amazon.⁸

The estimated average annual rate of deforestation in the Cerrado between 1994 and 2002 (18,000 km²) was over half the size of Belgium. While much higher in its MATOPIBA region, the current average annual rate of native vegetation cover loss is about 7000 km².⁹ This is higher than in the Amazon, which lost 4800 km² in 2014.¹⁰ While Federal Growth Acceleration Plans (PAC 2015) emphasize further agricultural development in the northern MATOPIBA region, a study by Brazil's federal agricultural research agency, Embrapa, found that 60% of pastures in the Cerrado are degraded due to faulty management.¹¹

The Brazilian government's choice of this biome as the main productive region is backed by the *ruralistas*, a strong political group in the two chambers of the Brazilian Congress organized by the agribusiness sector to represent its interests. Agribusiness produces about a quarter of the gross domestic product (GDP), a statistic frequently cited by the *ruralistas*.

Vital Functions of the Cerrado's Biodiversity

The Cerrado is classified as one of the global 35 “biodiversity hotspots”¹²

because of its exceptional concentrations of endemic biodiversity and high levels of damaging economic exploitation. The Cerrado's beauty and ecological significance are profoundly underappreciated, even among urban populations living in the biome.¹³ The 55% decline in deforestation rates in the Amazon in the period 2010–2014 is nationally and internationally recognized.¹⁰ However, the increases in losses of native vegetation in the Cerrado of 41% during the same period¹⁴ went largely unnoticed. Indirect land use changes are difficult to establish, but a number of studies infer translocation of deforestation from the Amazon to the Cerrado.^{8,15–17}

The propulsion of national agriculture in the Cerrado provokes potentially tragic outcomes for human well-being, biodiversity conservation, and sustainable development in Brazil. The many ecosystem services provided by the Cerrado's native vegetation include climate regulation and clean freshwater for most of Brazil, including the Amazon and neighboring countries. Aside from stabilizing the regional climate, the massive water circulation coursing through Cerrado's native vegetation forms many of the important river basins of Brazil and contributes to the underground Guarani aquifer system. The Cerrado provides water both to the wealthiest and to the poorest regions in Brazil. It supplies nearly 70% of the water that flows north to the Araguaia-Tocantins basin, south-southeast to the Paraná basin, and northeast to the São Francisco basin, feeding 8 of the 12 hydrographic regions of Brazil (Amazon, Tocantins-Araguaia, Western Northeast Atlantic, Parnaíba, São Francisco, East Atlantic, Paraná, Paraguay) and atmospheric or underground water to other regions and countries. This means that the stability and functioning of surrounding ecosystems in all these regions rely heavily on the biological integrity of the Cerrado. Because 80% of Brazil's electricity comes from hydroelectric power plants on rivers that have their sources in the Cerrado, conservation of the biome is also critical for the country's energy security.¹⁸



Deforestation to make way for soybean crop such as this one is putting the Cerrado increasingly at risk.



New agricultural technology developed since the 1980s opened the Cerrado to frontier expansion.

The Cerrado's native flora and fauna are highly adapted to the region's arid weather. It is often called an "inverted forest" because its old, deep and acid soils induce native vegetation to invest

in deep roots: Low shrubs and trees barely visible above the surface commit the major part (up to 75%) of their biomass—and carbon, as a consequence—underground, a means of both drawing

from and replenishing water deep underground. The exceptionally long and developed root systems perform the vital ecosystem service of channeling rain and other surface water back into deep soil reservoirs. Monocultures with shallow roots cannot perform the same ecosystem services of water care. The significant use of water for agricultural production (more than 80% of Brazil's water is used for agriculture) makes agriculture highly dependent on Cerrado ecosystem conservation. Cutting-edge technology-enabled science estimates that the Guarani aquifer has passed its sustainability tipping point, meaning that more water is being removed than is being replaced.¹⁹ Other features of land use conversion—such as the removal of a heterogeneous canopy—lead to other important changes in the exchange of energy and water between the vegetation and atmosphere.^{20,21}

The Ecological Threat to the Cerrado

The Cerrado hosts almost 12,000 species of native plants, about 251 species of mammals, 267 species of reptiles, 209 species of amphibians, and a rich and diverse population of about 850 bird species, all distributed over a wide variety of habitats. Its aquatic environment is home to 1,300 species of fish, and recent estimates indicate that the Cerrado is the refuge of 13% of butterflies, 35% of bees, and 23% of the termites in the tropics.²²

At least 901 Cerrado species are threatened with extinction, including 266 species of fauna and 635 species of flora. Only the Atlantic Forest biome has more endangered species. Actual numbers are much higher but unknown, since discovery of new species in these endangered environments continues. Thus far, only a small part of the Cerrado flora species have been evaluated, and well under half of its 266 threatened fauna species have been identified and incorporated into the list of globally threatened species by the International Union for Conservation of Nature.⁵

The Cerrado has great social importance as well. Some 12.5 million people depend on its natural resources to survive and thrive. Traditional communities and small farmers are everywhere where the native vegetation remains, but suffer intense pressure from crop and cattle expansion.⁵ The Cerrado is inhabited by traditional peoples (indigenous, quilombolas, geraizeiros, sertanejos, vazanteiros) who over many generations have developed sustainable and mutually beneficial uses of the region's biodiversity and natural resources. Satellite-based evidence shows that native vegetation is better protected when conservation units are managed by local and traditional communities than by government park guards, who have a limited capacity to control illegal logging, poaching, and mining.²³ Rapid and extensive loss of native vegetation in the pristine regions causes an intense fragmentation, undermining important ecological functions. The vast territories dedicated to large-scale monoculture eliminate the ecological "corridors" that flora and fauna need to migrate and thus survive extinction.²⁴ The highly patchwork nature of both public and private conservation areas dislocates local peoples and separates them from the more extensive natural environments on which their livelihoods depend.⁵

Protected Areas in the Cerrado

Land tenure in tropical regions is a critical factor that determines both land use change and conservation strategies. Despite its biological importance and unlike the Amazon, the Cerrado is not a designated national heritage site, so only a small percentage of it is legally protected. Ownership is predominantly private in the Cerrado, underscoring the need to involve the private sector centrally in conservation efforts.

In Brazil, protected areas (PAs) created by federal, state, or municipal governments fit into 12 categories, forming two overall protected area (PA) groups: Integral Protection and Sustainable Use.

There are currently 285 protected areas in the Brazilian Cerrado, covering 8.3% of the region. Considering only the fraction covered by native vegetation, this proportion drops to 6.5%. Deforestation within PAs varies significantly with use, jurisdiction, and as the interaction between jurisdiction and expropriation. Despite being less numerous than state and municipal PAs, federal PAs are normally more efficient for biodiversity conservation, especially the strictly protected Integral Protection areas.²⁵ Deforestation is significantly lower in these areas compared to non-Integral Protection areas. Indigenous and other traditional community lands are not considered "conservation units" under the Sistema Nacional de Unidades de Conservação (SNUC), although they are part of the protected areas national program.

The Cerrado's protected area is below the 10% minimum stipulated by the Convention on Biological Diversity, of which Brazil is a signatory, and even further below the treaty's Aichi target of 17%, to which Brazil's government officially aspires. The estimated deficit is 4.5 million hectares.

To preserve the region's extensive ecosystem services besides biodiversity, it is crucial to increase the protection of the remaining Cerrado native vegetation through a combination of conservation and sustainable use and restoration programs. The 2012 Forest Code—the main instrument regulating land use in Brazil²⁶—requires that 5 million hectares of converted area be restored, 1.7 million of them in the form of permanent preservation areas for the conservation of water resources.¹⁵ This Forest Code only requires that rural landholdings in most of the Cerrado maintain Legal Reserves with native vegetation on 20% of their areas, and 35% in the transition area between the Cerrado and the Amazon. By contrast, Legal Reserves in the Amazon biome must at least cover 80%, allowing only 20% of private land to be deforested. With large areas still intact and Legal Reserves of only 20%, another 400,000 km² of pristine land is legally available for agricultural expansion in



ISP/N/Peter Caton

The Cerrado, a global biodiversity hotspot, is the world's richest savanna in number of species, many of which are endemic.

the Cerrado. Although it is possible to convert up to 80% of rural properties in the Cerrado through legal deforestation, the law requires governmental authorization to convert native vegetation throughout the biome, including to deforest without exceeding the legally permitted percentage. In current practice, this process is not rigorous, but it provides a potential legal basis for enhancing conservation in the Cerrado, given the much-needed institutional incentive and support.

Optimistic analyses expound the virtues and potential of intensifying productivity on already cleared lands, such as through the federal “Low-Carbon Agriculture” (ABC) Plan.²⁷ It integrates use of technological improvements, including crops with longer roots. The reach of such programs is relatively weak, especially in the native

vegetation-rich northern areas further from urban centers where the agricultural frontier is rapidly progressing. This is partly because the expansion into the more remote and pristine areas is driven by land speculation rather than a search for sustainable income from agriculture.⁵ Conversion of land for cattle raising and agriculture in ever more remote areas is part of a larger process of land speculation.⁵

Institutionalizing the Cerrado’s Invisibility: Greenhouse Gas Emissions, Mitigation Goals, and Other Policies

According to official estimates, the combined greenhouse gas emissions

from the land-use and agriculture sectors make up around 60% of Brazil's total emissions. This is down from 80% in the 2010 national emissions inventory, but emissions from transportation and agriculture are both rising. Brazilians use more fossil fuels to run a growing fleet of cars and trucks, and Brazil has gained new prowess as an agriculture power.²⁸

The Cerrado is not subject to a continuous national program of satellite monitoring equivalent to the internationally acclaimed PRODES and DETER surveillance programs in the Amazon. The Deforestation Prevention and Control Plan in the Amazon (PPCDAM) involves integration and improvement of monitoring and federal control actions. This includes environmental regulation of farms, sustainable forest management and firefighting,

land use planning, biodiversity conservation, protection of water resources and sustainable use of natural resources, encouragement of sustainable economic activities, and maintenance of natural areas and recovery of degraded areas.

In 2010, the Brazilian government launched the PPCerrado modeled on the PPCDAm, but its implementation and efficacy, as well as the coordination between the different relevant public ministries and agencies, are weaker than those of the PPCDAm. Brazil suffers from a general lack of integrated federal land management, and

environmental policy is similarly fragmented.²⁹ Designated ministries document many environmental impacts, vulnerabilities, and risks, yet large-scale land-use decisions are made without their due consideration. For instance, the presentation of the 2015 development plans for MATOPIBA surveyed only regional natural resources and relevant socioeconomic factors, not negative environmental impacts of any sort.³⁰ Similarly, the ministry overseeing meat production estimates future output without consideration of the areas it will occupy.³¹ As a further hindrance,

portrayals of environmental concerns about Brazil's lost ecosystems as a foreign plot intended to harm Brazil's agricultural prowess and competitiveness in international markets are prominent in the cattle and agricultural sector³² and even apparent in some government reports.³³ Paradoxically, the same or allied forces aid foreign capital penetration and profiteering in Brazil that is of questionable benefit to the majority of Brazilians.^{2,34}

Despite the enormous technological advances in the production and quality of satellite images and in capacity to



access and interpret them, the Brazilian authorities make minor use of this technology to monitor land use change in the Cerrado. Yet doing so is critical for large-scale law enforcement now operating in the Amazon. Although the detection of vegetation change in the Cerrado is more difficult compared with the closed-canopy tropical rainforest transfer to clear-cut fields, research from local institutions have advanced monitoring of the region (e.g., www.lapig.ufg.br).

There is no cartographic database of rural land ownership in the region, a necessary basis for identification of

the boundaries between public and private lands and for monitoring whether individual farms are preserving the mandatory 35% or 20% of native vegetation. If successfully completed, the Rural Register (*Cadastro Ambiental Rural*) mandated by the 2012 Forest Code could greatly strengthen the monitoring process.³

The 2009 Brazilian Policy for Climate Change transformed into a national law Brazil's voluntary 2009 commitment under the UNFCCC to reduce greenhouse gas emissions between 36.1% and 38.9% of projected emissions by 2020

compared to 2005 levels. To meet this target, the law aims for an 80% reduction of annual deforestation rates in the Amazon by 2020 relative to the average for the years 1996–2005, and 40% reduction of annual deforestation rates in the Cerrado biome compared to the average rate between 1999 and 2008.

Total projected emissions for the year 2020 is a result of the multiplication, in successive stages, of the projected rate of deforestation in the Cerrado averaged for two periods: 1994–2002 and 2003–2008. With exorbitant average annual deforestation rates at 18,000



Juxtaposition of the natural landscape of the Cerrado (left), with an open pasture (center), and a developed soybean plantation (right) in the Cerrado area in Mato Grosso, Brazil.

Stock/josemoraes

km² and 14,100 km² during those periods, the Brazilian Policy for Climate Change established that an “acceptable” annual rate of deforestation in the Cerrado would be a loss of about 9400 km²! (Eighteen thousand square kilometers, the estimated average annual rate of deforestation in the Cerrado during 1994–2002, is equivalent to more than half the territory size of Belgium, and 14,100 km² is only a little less than half of Belgium.) This high rate corresponds to an annual loss of 1% of the Cerrado’s native areas remaining in 2009. However, when the Brazilian Policy for Climate Change was launched, the rate of deforestation in the Cerrado was already about 6500 km². The target for the Cerrado had thus already been reached, indicating that a more ambitious target was required for the policy to have impact.

Brazil’s Intended Nationally Determined Contributions (iNDC) text submitted in the context of the Paris Agreement expressed an intention to increase the national emission reduction target to 43% by 2030 and achieve zero illegal deforestation in the Amazon. But it did not even mention deforestation in the Cerrado, much less propose its reductions for the region, despite the urgings of national scientists that it do so.

The reforestation intention specified in the iNDC (12 million hectares by 2030) seems to only be feasible with the use of nonnative, rapidly growing species associated with developed forestry technologies. However, even using rapidly growing species, it does not seem feasible to meet that goal without a currently nonexistent objective set of measures to ensure compliance. Here again, the Cerrado is not given adequate attention. The land conversion is not evenly distributed throughout the Cerrado. This means that conservation and mitigation strategies should give special consideration to protection of vegetation remnant in the northern part and focus ecological restoration efforts in the more occupied, less pristine southern portion. Reforestation which replaces some of the nonforest ecosystems in the Cerrado with other species for the sake of carbon sequestration might

result in loss of biodiversity and ecosystem functioning.³⁵

It is important to recognize that carbon and climate change are only part of the problem. Pollution caused by mineral fertilizers and negative health impacts also result from heavy use of pesticides, a major source of complaint and problems.^{5,36} The world’s top user, Brazil applies around one-fifth of pesticides used globally, including extremely toxic and controversial pesticides forbidden elsewhere. Some of these are still legal in Brazil; others are forbidden but used illegally in a context of lax public oversight.³⁷

Economic Necessity? Who Benefits?

Brazilians are emphatically told that livestock and agriculture are essential to the national economy, since they contribute a quarter of the GDP. During President Lula da Silva’s two successive presidencies, the share of primary products in exports rose from 48.5% in 2003 to 60.9% in 2009.³⁸ Continued emphasis on agricultural exports to propel the country’s development is a dangerous and potentially tragic gamble, given the environmental consequences. The emphasis on the agricultural sector’s contribution to the GDP hides some important facts about the distribution of associated benefits and costs, and critiques of the extractivist model more generally.

The beef and grain boom in Brazil is part of the “re-primarization” of Latin America’s economy, a reflection of a new distorted global economic system referred to as the “Commodities Consensus.”³⁹ This extractivist economic model intensifies monoculture, over-exploitation of natural resources, and destruction of biodiversity in natural-resource-rich countries, a continuity of the colonial model also sustained under the more finance-centered Washington Consensus.

Besides mining and oil, extractivist activities in Brazil include agricultural and biofuels production, all contributing to large-scale destruction of

biodiversity and increased land dispossession in favor of the concentration of landownership and profits, facilitated by state-sponsored transportation and energy infrastructure. This also consolidates export circuits that have little or no connection to local chains of production, leading to local and regional social fragmentation and characteristically volatile prices.³⁸ Small farmers provide about 70% of the food consumed in Brazil and produce it by planting on only 30% of national agricultural land.² “Partnerships” between the peasantry and capitalist agricultural production chains ensure their continued existence, but in conditions that largely deny them the ability to add value to their products.

Mineral, agricultural, and other primary products constitute more than half of Brazil’s total exports nowadays, but it was not always thus. Brazil has undergone a reversion, evaluated by academic analysts as a “great leap backward,” which threatens its medium- and long-term socioeconomic stability and development.^{30,38-41} Before the recent commodities emphasis that began to dominate starting in the 1990s, the larger part of export revenue came from manufactured goods, more lucrative than primary and semimanufactured goods combined. But its agriculture sector grew along with commodity prices on international markets, making Brazil one of the world’s leading exporters of agricultural commodities. This pressured emphasis on the production of primary commodities at the expense of manufacturing goods and services has resulted in a loss of capacity and volume compared to other developing countries, especially China, and in heightened vulnerability to price volatility. Importantly, manufacturing exports, and particularly high-tech exports, are essential to sustainable, equitable development.⁴⁰

Capital-intensive, extractive megaprojects are pervasively promoted with the fallacious argument that they create employment, when such projects invariably replace labor with technology. The more capital intensive an activity is, the larger is the profit going to capital.^{23,38} In line with this, highly mechanized

large-scale agriculture in Brazil employs relatively few people³¹ and concentrates income in Brazil, which already has one of the most unequal land and income distributions in the world. The 2006 national census revealed that 75% of all agricultural land area is in the hands of large-scale commodity producers, who own only 10% of farmland titles. Ownership of the remaining 25% of farmland is shared among 90% of rural property owners.¹⁷ According to 2012 data, 1.5% of rural land owners occupy 52.6% of all agricultural lands.²

In the MATOPIBA region, 94% of the rural establishments in the region are poor, most of them very poor (80% of total). Currently, less than one half of a percent of these establishments generates 60% of gross income in the region, earning more than 200 times the minimum wage.³⁰ According to the 2006 Agricultural Census, 69% of all rural properties in the Cerrado are still owned by small farmers, who occupy only 9% (some 180,000 km²) of the total area. The Cerrado has the highest average size of rural properties in Brazil, and concentration of land ownership is currently intensifying, a key characteristic of the extractivist economic model. Smallholder farmers lacking proof of formal ownership are being displaced by the spread of large-scale soy and sugarcane farms. After land is converted to mechanized soy production, rural employment opportunities diminish, pushing the poor either to illegally occupy and convert new areas to farmland or to migrate to urban slums. These pressures not only contribute to food insecurity and deforestation, but also concentrate the poor in urban centers where they cannot grow food or easily find employment, thus heightening dependence on government social spending.^{17,42} Inadequate access to land by the poor and insecure land tenure also generate violence, human rights abuses, and exploitation of rural workers in conditions of servitude.

A study by TRUCOST identified cattle raising and soy as especially high-risk sectors in Brazil due to their ecosystem dependencies, which translate into

financial risks. The study considered 45 business sectors in an effort to enable Brazilian financial institutions to understand the relevance and magnitude of natural capital risks to which they are exposed through their funding and investments. It concluded that beef cattle ranching was the most environmentally onerous of all 45 sectors studied, dwarfing even other very-high-impact sectors such as soybean and cotton farming. It calculated that beef production causes public losses that are 20 times higher than the financial gain, which is privately enjoyed.⁴³

This massive socioeconomic and environmental hammering induced by the extractivist economic model generates widespread conflict linked to disputes over land and access to common goods.³⁸ The model generates a spiral of criminalization of resistance throughout Latin America and violation of human rights. Forces strongly opposed to protected areas and indigenous peoples' rights have increasing power in Brazil's Congress and in some ministries, as well as in state and local governments.^{32,44,45}

But these catastrophic trends are also opening up new public agendas and politics to expand rights and seek to reduce poverty through the prioritization of human well-being over purely economic measures.^{38,46}

Conclusions

The Brazilian economist Celso Furtado warned that development was a myth used to focus on "abstract objectives such as investment, exports and growth" and transmit the "simply unrealisable" idea that "the poor may one day enjoy the same lifestyles as those who are rich today"—an idea used to mobilize and convince peoples of the periphery to "accept enormous sacrifices, to legitimize the destruction of ancient cultures, [and] to explain and make people understand the need to destroy the environment, and to justify forms of dependence that reinforce the predatory nature of the system of production."⁴⁷ Eduardo Gudynas⁴¹ comments that this

myth is still maintained and contributes to the formidable problem of reconciling development and long-term prospects for human survival and well-being into the twenty-first century.

Overshadowed by the Amazon forest and largely privately owned, the Cerrado's destruction is especially difficult to halt, so it proceeds without significant pushback both domestically and internationally. Despite its vital economic importance for the country (and beyond), it is not formally recognized as a national heritage. Thus, it is legally poorly protected, and huge areas of lands are still legally open to exploration. The government avoids giving environmental attention to the region and institutes laws and law enforcement structures that are weak, ignoring scientific understanding of the many benefits of its biodiversity and ecosystem functioning, not least its provision of natural resources such as water, a basic human need.

Laws for foreign ownership were loosened under the Fernando Henrique Cardoso government in the late 1990s. But Brazilian entities were still a necessity, at a minimum as a front for foreign capital. President Lula da Silva's government adopted and intensified the new prioritization of commodities production but instated restrictions on foreign land ownership in 2010, fearful that foreign countries could take control of large segments of arable land in Brazil.^{2,39} The Brazilian government is now preparing for the imminent extension of foreigners' rights to purchase land in Brazil,⁴⁸ approaching it as an engine by which to boost the country's economy.³⁴ This change is expected to cause "an avalanche" of investments in the country, especially in the Cerrado, where the highest profits are earned from buying land with native vegetation and converting it into lands for commercial use, especially grain production. The government is also said to be negotiating with large corporations such as Nestle and Coca-Cola to privatize water from the Guarani aquifer.^{49,50}

To preserve the region and thereby also strengthen both water and food

security, new clearing must be limited, protected areas should be expanded, and management in already established protected areas should be strengthened. This will require systematic monitoring systems, as those in place for the Amazon should be implemented, and degraded areas should be restored, in compliance with the country's environmental laws, and local and traditional communities should be empowered and brought in as central participants in the definition of policies for the region. National governments would need to become more independent from large special interests to support transitions to a postextractive economy by means of public policy strong enough to provoke economic and ecological reforms, initially through a tax reform for greater revenue collection (higher taxes for extractive projects or a supertax for particularly high profits), followed by a moratorium on new large-scale industrial practices that have high natural capital costs and few broadly shared benefits.³⁸

All this will require definition of alternatives to development that make it possible to consider the link between social and environmental concerns in a new way. It will require new institutions better able to consider the common good into the future. This will have to include changing long-standing cultural conceptions by delinking notions of "a better life" from current patterns of consumption and overcoming the "developmental illusion so deeply rooted in the Latin American political imaginary" according to which the region's role as a nature exporter offers a viable pathway toward positive political, social, and economic transformations and constitutes its "inexorable destiny."³⁸ Like all human societies, Latin America needs to identify minimum requirements for a decent living and to seek to satisfy these needs without social hurt and ecosystem destruction. As Maristella Svampa observes,³⁸ this requires a new, decolonized consciousness that can become a political force for change, including conceptions of social needs that do not translate into new forms of slavery and self-destruction.

The Cerrado is a metaphor for non-sustainability that is under the radar. The role of sustainability science is not only constant vigilance and diagnoses of biogeophysical conditions. It must also work to shed critical light on development pathways widely accepted as success stories when these, in fact, are obstacles to the goals of furthering human well-being and environmental sustainability.

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