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Understanding the Interconnected Threats to Global Sustainability: A Focus on Deforestation, Traditional Knowledge, and Biopiracy

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This paper examines the interconnected threats of climate change, deforestation, misappropriation of traditional knowledge (TK), and the detrimental phenomenon of biopiracy. It discusses the profound impacts of deforestation on climate change, with an illustrative case study centered on Brazil's Matopiba region. Additionally, it investigates the intricate relationship between TK, land grabbing, and biopiracy within indigenous and local communities.

Ce document examine les menaces interconnectées du changement climatique, de la déforestation, de l'appropriation illicite des savoirs traditionnels et du phénomène néfaste de la biopiraterie. Il analyse les impacts profonds de la déforestation sur le changement climatique, à l'aide d'une étude de cas illustrative centrée sur la région brésilienne de Matopiba au Brésil. En outre, il étudie la relation complexe entre les savoirs traditionnels, l'accaparement des terres et la biopiraterie au sein des communautés autochtones et locales.

Este documento examina las amenazas interconectadas del cambio climático, la deforestación, la apropiación indebida de los conocimientos tradicionales (CT) y el nocivo fenómeno de la biopiratería. Analiza las graves repercusiones de la deforestación en el cambio climático, con un estudio de caso ilustrativo centrado en la región brasileña de Matopiba. Además, investiga la intrincada relación entre los conocimientos tradicionales, el acaparamiento de tierras y la biopiratería en las comunidades indígenas y locales.

Introduction

Over the past decade, the greatest amount of deforestation has occurred in the humid tropics, with Africa experiencing the largest loss, followed by South America. According to the United Nations (UN) Food and Agriculture Organization (FAO), approximately 420 million hectares of forest were lost between 1990 and 2020 (FAO, 2022, p. xiii). Although the rate of deforestation has somewhat slowed down over the last years, it still reached 10 million hectares annually between 2015 and 2020 (Idem, 2022, p. xiii).

It is important to notice that the main driving force behind deforestation is the food system and the global demand for agricultural commodities.[1] The unsustainable land use, specifically that resulting from deforestation[2], greatly contributes to global greenhouse gas (GHG) emissions[3]. Net emissions from land change accounted for about 10 percent of total anthropogenic CO₂ emissions, between 2011 and 2020, while the terrestrial sink of forest accounted for about 29 percent of annual anthropogenic CO₂ emissions in 2011–2020 (FAO, 2022, p. 9).

In this scenario, it is important to analyze the connection between land grabbing, deforestation, food systems[4] and climate change, as well as the mitigation measures countries can implement. In order to do so, this paper will use the case study of Brazil's Matopiba region, with its current land grabbing and deforestation situation, the impacts on indigenous communities, as well as the mitigation measures that are being implemented, mostly the Low Carbon Agriculture Plan (ABC Plan) and the Responsible Commodities Facility (RCF) Cerrado Programme.

Over generations, indigenous and local communities have integrated traditional knowledge (TK) into their ways of life, guided by local laws, customs, and traditions, and this enduring knowledge has adapted and been transmitted through time (Correa, 2001). TK is essential in many ways, such as ensuring food security, advancing agricultural practices, and shaping medicinal treatments (Idem, 2001). However, these roles have been undermined by the appropriation of traditional knowledge and resources, which, as showed in Goyes & South (2016), has been facilitated by the preceding deprivation of communities, rendering them disempowered and marginalized due to the prior land usurpation.

Within this context, a cycle of "biopiracy" emerges, wherein the misappropriation of traditional knowledge and resources becomes intertwined with the seizure or theft of land, alongside alterations to agricultural methods and traditions. Therefore, the argument is that biopiracy and land-grabbing are intrinsically linked, where the misappropriation of TK and genetic resources thrives within previously disadvantaged and marginalized communities, both economically and within their spatial and cultural contexts (Goyes & South, 2016).

[1] "The term 'commodity' is commonly used in reference to basic agricultural products that are either in their original form or have undergone only primary processing. Examples include cereals, coffee beans, sugar, palm oil, eggs, milk, fruits, vegetables, beef, cotton and rubber. A related characteristic is that the production methods, postharvest treatments and/or primary processing to which they have been subjected, have not imparted any distinguishing characteristics or attributes. (...) Agricultural commodities are generic, undifferentiated products that, since they have no other distinguishing and marketable characteristics, compete with one another on the basis of price." (Crawford, 2006, p. 142)

[2] Deforestation is defined as "the direct human-induced conversion of forested land to non-forested land (with less than 10% crown cover)". (Karousakis and Corfee-Morlot, 2007)

[3] According to the Kyoto Protocol, there are six greenhouse gases (GHGs) produced by human activities: carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulfur hexafluoride. (UNFCCC, 1997)

[4] "The term "food systems" refers to all the elements and activities related to producing and consuming food, and their effects, including economic, health, and environmental outcomes." (OECD, 2023). Available at <https://www.oecd.org/food-systems/>.

As a means to organize the discussion, this paper is divided into four sections. The first section offers a background on (i) climate change and deforestation, followed by a section with a background on (ii) traditional knowledge and the importance of land and a section on (iii) land grabbing and biopiracy. After the explanation on these three important issues, we then move to illustrate these processes with the case study of (iv) Brazil's Matopiba region.

Climate change and deforestation

According to the 2023 Climate Change Synthesis Report (SYR) of the Intergovernmental Panel of Climate Change (IPCC) Sixth Assessment Report (AR6), the global surface temperature reached 1.1°C above 1850-1900 in 2011-2020 (p. 4). This is unequivocally tied to the increase in gas emissions, energy consumption, land use and patterns of production across the globe. The human-caused climate change affects the ecosystem and people in every region, but it disproportionately affects vulnerable populations who have contributed least to the current state of climate change (p. 5).

Land use and deforestation are responsible for the most greenhouse gas emissions out of every other aspect of human life (Benton *et al.*, 2021). This is due to the intensified agricultural pattern of production, where the degradation of soil and ecosystems is related to intensive food production practices in order to keep up with the local and global demand. The consequences are numerous, given that climate change affects biodiversity by reducing the resilience of ecosystems and changing habitat suitability and the continuing destruction of ecosystems and habitats pose a threat to our capacity to sustain human populations (Idem, 2021).

On a positive note, the 2023 Climate Change Synthesis Report showed that changes in land use with the implementation of measures such as ecosystem restoration, reforestation, and afforestation represent the largest share of economic mitigation potential, with reduced deforestation in tropical regions offering the highest total mitigation potential (p. 29).

Traditional knowledge and the importance of land

According to Correa (2001), traditional knowledge encompasses a variety of information and purposes that originated in ancient times, yet continues to evolve and be refined in modern contexts. This knowledge exists in both documented and undocumented forms and can hold economic significance based on its present or potential applications. The Convention on Biological Diversity, the Rio Forest Principles, and Agenda 21 recognized the significance of traditional knowledge and offered directions to the global community on how to integrate it into diverse endeavors (UNCED, 1992).

The United Nations Declaration on the Rights of Peasants and Other People Working in Rural Areas (UNDROP) states that:

States shall take appropriate measures to promote and protect the traditional knowledge, innovation and practices of peasants and other people working in rural areas, including traditional agrarian, pastoral, forestry, fisheries, livestock and agroecological systems relevant to the conservation and sustainable use of biological diversity. (UNDROP, Article 20.2, p. 14)

In order to protect TK it is necessary to protect the land of the respective communities. States have the primary responsibility to take measures to preserve the land of peasants and other people working in rural areas in the absence of which their TK will disappear. It is also important to mention other international resolutions that address land rights and human rights. Thus, the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) recognizes the need to respect and promote the “inherent rights of indigenous peoples which derive from their political, economic and social structures and from their cultures, spiritual traditions, histories and philosophies, especially their rights to their lands, territories and resources” (UNGA, 2007, p. 2). The Commission on Human Rights’ Resolution: 2004/28 on Prohibition of forced evictions reaffirms that “every woman, man and child has the right to a secure place to live in peace and dignity, which includes the right not to be evicted unlawfully, arbitrarily or on a discriminatory basis from their home, land or community” (OHCHR, 2004, p. 1).

Land grabbing and biopiracy

Land grabbing is a well-established phenomenon which has its roots in the dramatic revaluation of land ownership that took place in recent years due to the convergence of global crises in food, energy, finance, and the environment. There are various mechanisms through which land grabbing occurs, ranging from straightforward private-private purchases and public-private leases for biofuel production to acquisition of large parcels of land for conservation arrangement, with variegated initial outcomes (Hall, 2011; Wolford, 2010).

The estimates of the quantity of lands involved ranges from 45 mln hectares (World Bank, 2010) to 227 mln hectares (Oxfam, 2012), although they are not always precise and up to date. Land grabs today are deeply shaped by past practices and historical legacies and exhibit continuities from the past but also diverge in significant ways, and are riddled with contradictions and tensions (Margulis, McKeon & Borras Jr., 2013). Land grabbing is facilitated by ever more extensive and rapid flows of capital, goods, and people across borders and these flows occur through axes of power that are far more polycentric than the North-South divide tradition.

In 2010, one of the most ambitious studies on land grabs was published by the World Bank, which was the object of several controversies. This report shows that land grabs have taken place largely in places where buyers could exploit corrupt or indebted governments with little ability to regulate the transaction or prevent buyers from targeting the poorest rural communities, expelling people with non-traditional land title from their land. Once land grabbing happens, it perpetuates a cycle of disempowerment and marginalization, entrenching communities in a state of vulnerability against the dispossession of their land and knowledge. Consequently, these communities become reliant on externally imposed farming methodologies and costly biotechnological interventions that lack legal alternatives (Goyes & South, 2016).

In this context, it is important to address biopiracy. Biopiracy refers to the phenomenon in which TK and genetic resources are forcibly acquired without the consent of the knowledge holders or the countries where such resources reside (Correa, 2001). It is also valid to mention how biopiracy is going through a process of change from “micro-biopiracy - stealing ‘seed by seed’ - to macro-biopiracy - managing the theft of ownership of ‘all seeds at once’” (Goyes & South, 2016, p. 562). This process makes it clear how intertwined biopiracy and land grabbing are.

Brazil's Matopiba region: a case study

The Matopiba was institutionalized during the Dilma Rousseff government, with Decree No. 8,477 of 6 May 2015. The region is an acronym for the Brazilian states of Maranhão, Tocantins, Piauí and Bahia and comprises the Cerrado^[5] biome. The Matopiba accounts for approximately 10% of the Brazilian production of grains and fibers, mainly soy, corn and cotton (Paes, 2021), and counts with 324 thousand agricultural establishments, 46 conservation units, 35 indigenous lands, 36 quilombolas lands and 1053 land reform settlements (Idem, 2021).

It is also known that almost a quarter of the Cerrado's soybean area is in the Matopiba region, and 61% of this agricultural expansion happened over native vegetation between 2007 and 2014 (Marengo *et al.*, 2022, p. 6). Thus, the region, possessing a significant amount of natural habitat, stands as one of the most imperiled areas within the Cerrado due to the pressure for extensive agricultural expansion (Polizel *et al.*, 2021). Because of this unsustainable land use for agribusiness expansion the Matopiba has been suffering from changes to a drier and warmer climate (Idem, 2022, p. 4). Between 2007 and 2020, the region suffered from severe to exceptional drought in more than 25% of its area (Idem, 2022, p. 5).

These climate change impacts in the region (i) affect the local population, especially the most vulnerable communities, given that the Matopiba region has a low and medium Municipal Human Development Index (HDI) in most municipalities, and a low and medium Social Vulnerability Index (IVS), therefore, there is a problem of misery and chronic poverty of the local population (Paes, 2021); and (ii) compromise food security and the suitability of the area due to water deficit conditions (Marengo *et al.*, 2022). Conflicts over land are also an issue to be addressed in the Matopiba region. Looking at the Caderno de Conflitos no Campo 2020 released by the Comissão Pastoral da Terra (CPT), we see that the state of Maranhão accounts for 203 occurrences, in Tocantins there were 55, Piauí recorded 18 cases and in Bahia there were 127 conflicts in 2020. In total, the four states of Matopiba account for a total of 403 conflicts over land registered by the CPT in 2020. According to the publication, between 2019 and 2020 there was a 25.08% increase in conflicts over land in Brazil.

It is possible to identify four processes taking place in the Matopiba region in regards to these conflicts, according to Santos (2017). First of all there is an excluding modernization and a worsening of the vicious circle of urban poverty. Secondly, there are the issues for traditional people and peasants in the region, who suffer from loss/expulsion of their lands. Thirdly, there is the destruction of the environment, mainly the Cerrado biome. Lastly, the author points out the uneven urbanization and social segregation in the Matopiba.

[5] The Cerrado is "the world's most biodiverse savanna, home to 5% of the planet's animals and plants. It's also critical for supplying clean water and sequestering carbon, the process of storing vast amounts of carbon in the soil to act as a buffer against climate change." (WWF, 2023) Available at <https://www.worldwildlife.org/places/cerrado>.

One key point here is that the situation in the Matopiba makes the living of peasants and traditional communities unsustainable. Borrowing from the Sustainable Livelihoods Approach (Serrat, 2017) we see that these communities in Matopiba lose access to natural capital: "land and produce, water and aquatic resources, trees and forest products, wildlife, wild foods and fibers, biodiversity, environmental services" (Serrat, 2017, p. 23). Amidst this loss of natural capital and social capital in the Matopiba, the people from the small communities cannot make a living anymore in their environments, so two scenarios take place. The first is people who "migrate to the cities, where they live in slums in the outskirts of mid-sized and large cities, working in precarious jobs" (FIAN *et al.*, 2018, p. 45). The second scenario is that the communities that stay have to live under extremely precarious conditions (Idem, 2018, p. 45).

In this problematic context, it is important to discuss mitigation measures. According to Strassburg *et al.* (2014), Brazil's current agricultural lands are capable of supporting production levels that are projected to meet future demands, encompassing both domestic consumption and exports, for meat, crops, wood, and biofuels until the year 2040, without the need to convert additional natural habitats. To balance agricultural expansion with environmental concerns, enhancing the productivity of existing pasturelands has been proposed as a viable solution. It is also known that the livestock sector in Brazil offers the greatest potential for mitigation, as it is responsible for approximately half of all Brazilian greenhouse gas emissions (Bustamante *et al.*, 2012).

There are some measures that are being taken in order to decrease deforestation, preserve the Cerrado and guarantee a sustainable agricultural production in Matopiba. One of these measures is the Low Carbon Agriculture Plan (ABC Plan). As shown by Suela, Nazareth & da Cunha (2021), the ABC Plan in Matopiba presents a dual advantage by offering a means to both prevent new deforestation and promote agricultural productivity in the region. Furthermore, according to data from the Ministério da Agricultura Pecuária e Abastecimento - MAPA (2018), the adoption of mitigation measures outlined in the ABC Plan has already led to notable expansions in agricultural areas and increased productivity. Remarkably, this implementation has also resulted in a reduction of greenhouse gas (GHG) emissions (Suela, Nazareth & da Cunha, 2021) thereby contributing significantly to Brazil's voluntary commitments as proposed in the United Nations Framework Convention on Climate Change (UNFCCC) Conference of the Parties (COP) 15 and 21.

Another initiative is the Responsible Commodities Facility (RCF) Cerrado Programme, which focuses on providing financial incentives (low interest credit lines for crop finance) for soy production in already cleared and degraded lands, with the goal to discourage the continued expansion of agricultural activities into the Brazilian Cerrado. According to the initiative's annual report 2022-2023 (RCF, 2022), none of the areas underwent changes in their native vegetation, resulting in the lack of greenhouse gas emissions connected to land conversion within the farms under consideration. Moreover, the monitoring detected no use of prohibited pesticides, no violations of labor laws, and no breaches of environmental regulations on these farms since they joined the RCF program.

Finally, it is relevant to note that, as shown by Trigueiro, Nabout & Tessarolo (2020) in their research on deforestation in the Cerrado, to reduce it in an effective way public policies should focus both at the national level and biome levels as well as at the regional spatial level. It is also worth noting that President Lula da Silva, during a speech at the opening of the New Global Financing Pact - a forum organized by the French government in Paris on June 23, 2023 - urged world leaders to unite and fight against global inequality, suggesting the reform of international organizations to enhance global governance (Brasil, 2023).

Final Considerations

There are interconnected challenges posed by climate change, land grabbing, deforestation, traditional knowledge (TK), and the harmful practice of biopiracy. The serious effects of deforestation on climate change are exemplified by the case study from Brazil's Matopiba region as an illustration. The mitigation measures applied in Brazil, such as the Low Carbon Agriculture Plan (ABC Plan) and the Responsible Commodities Facility (RCF) Cerrado Programme have led to an increase in productivity and a reduction of greenhouse gas (GHG) emissions, with a sustainable agricultural production. Public policies to address climate change, deforestation and land grabbing should focus on the national level (biome levels) and coordinated at the regional and the global level to ensure coherence and more equality in today's global governance.

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