How can Brazil ensure that sustainable land use planning will meet conservation and agricultural demands by the year 2030?

By Jonathan Alfred Howes, University of York

Abstract

Currently, land used within Brazil is often mismanaged and does not adhere to current global environmental sustainability goals looking to be achieved by the year 2030. Issues proliferate from deforestation and agricultural burning, with a rapid loss of arable land and conservational issues for the Amazon rainforest as a result. To reduce these concerns, policies currently in place are critiqued for their necessity, and therefore sought to change as a result, based around alternatives and incentives for the Brazilian rural community. The alternative polices put forward suggest the implementation of a Reducing Emissions from Deforestation and Forest Degradation (REDD)+ policy after highlighting the positive instances of its implementation. Policies also suggest an appropriate land allocation for larger ownerships of land, due to incorrect laws based on private land. These policies should guide the direction for a sustainable land use future by 2030.

1. Introduction

Land regulation and a more efficient use of resources will ensure that conservation and agricultural demands are met by the year 2030 (Reydon, Fernandes and Telles, 2015). Brazil has a total land area covering 8.5 million square kilometres, land use covering the terrestrial forest biome, split across agriculture (31% of the land area) and forests/forestry (56% of the

land area).

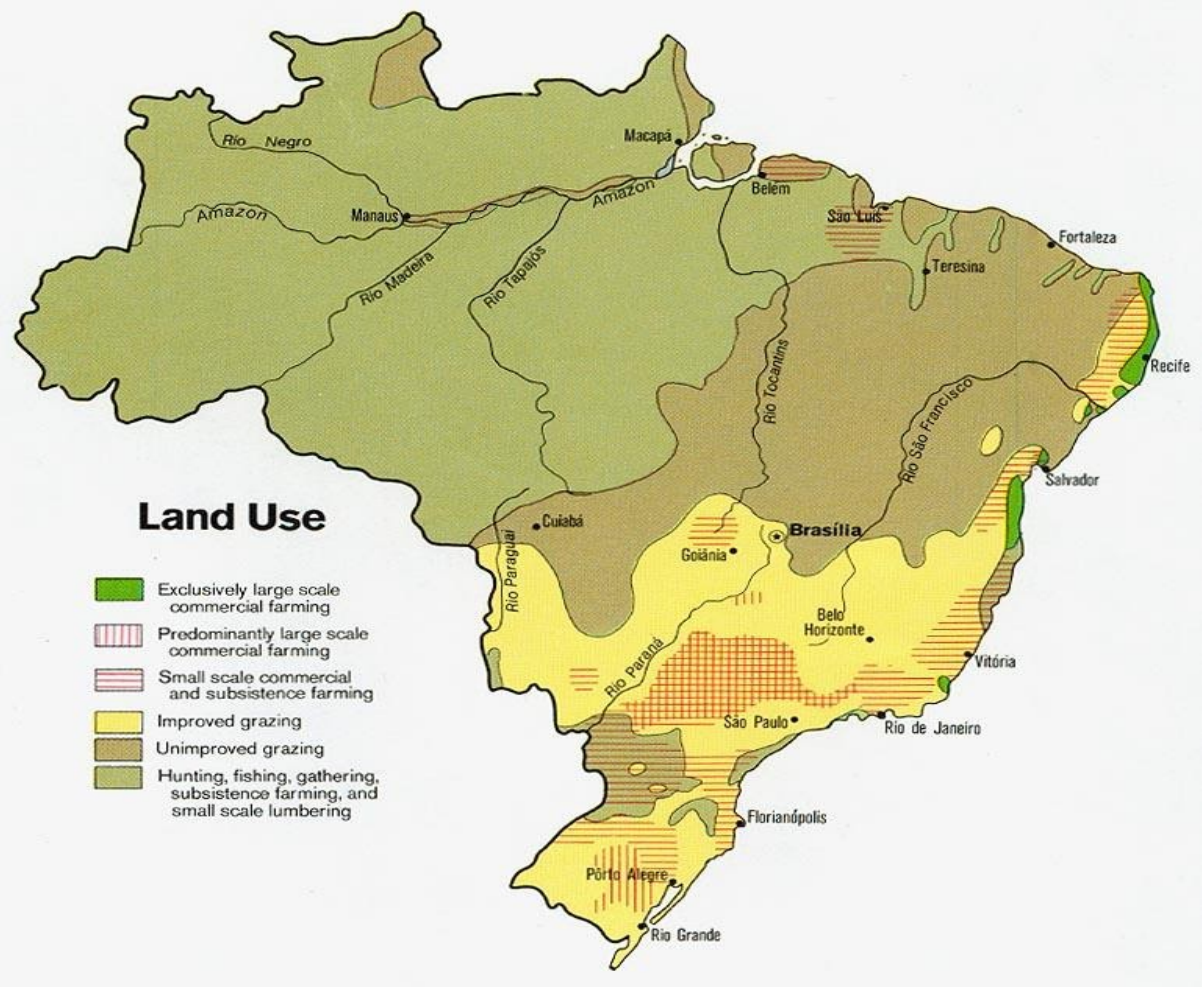

Figure 1. A map of land use types in Brazil (source: unidentified)

The purpose of this study is to make clear the issues with Brazilian land use, and to highlight the land use practices from Brazilian landowners. Once outlined, using policy knowledge and my own recommendations, I propose suggestions for policies to be implemented by the Brazilian government to achieve sustainable development goals by 2030.

1.1 Agriculture in Brazil

Brazil has access to areas of agricultural pasture, from the accessible land provided from the Brazilian rainforest (Chomitz and Thomas, 2001). The agricultural system implemented within Brazil has a worldwide recognition for its provisions, supplying the world with much needed food assets such as oranges and coffee grown mainly within the south and southeast of the country (Martinelli *et al.*, 2010).

The current agricultural system within Brazil involves 'row – crop' agriculture, intensifying the usage of crop growth areas to maximise yield per area of crop grown (Galford *et al.*, 2008; Martinelli *et al.*, 2010). Agricultural management in Brazil is completed under the 'Organisation for Economic Co-operation and Development' (OECD), working to provide

policies that benefit smaller farmers as well as commercial farmers both involved with land for farming (Meyer, 2010; OECD, 2019). Policies include the 'national program for strengthening of family farming' or the 'zero hunger program', both which seek to end hunger by strengthening credit given to family and local farmers, although, negating an environmental focus (Nassar and Ures, 2009).

1.2 Forestry in Brazil

Brazil occupies one of the largest expanses of tropical forest (e.g. Amazon rainforest and within the world (approximately 64% of tropical forest), creating large areas of timber potential for burning and wood working (Miccolis *et al.*, 2014). Brazilian rainforest is primarily deforested for livestock pastures, creating shelter and land for grazing, accounting for 91% of deforested land within the Amazon rainforest since 1970 (Steinfeld *et al.* 2006).

Land used by the timber industry within Brazil is a catalyst for the success in the country's financial stability, partnered with the FSC (Forest Stewardship Council) to ensure that forests are certified and used appropriately for timber production (Meyer, 2010). Legislation from 1965 called 'The Brazilian Forest Code' made it a legal requirement for landowners within the Brazilian amazon to keep 80% of their owned land as 'forest land', this was said to help deforestation of the Amazon by preserving most of the land as forest (Soares-Filho *et al.*, 2014; Machado, 2015).

2. Broader context

2.1 Mismanagement and Misallocation of Land

The environment within Brazil is compromised because of how the land is mismanaged, prioritising profitable gain over a sustainable management program (Assuncao and Chiavari, 2015). For example, agricultural land in Brazil is misallocated since relying heavily on natural resources, creating a land use model that is increasingly 'land intensive', requiring more land in space that is part of the Amazon rainforest (Assuncao and Chiavari, 2015). Access to land is primarily given to large agricultural companies (e.g. Bunge and Cargill), who have exploited the Brazilian forest code legislation to expand ownership of agricultural land, without keeping 80% of their owned land as forest land for the Amazon (Pacific Standard, 2016; Assuncao and Chiavari, 2015). The forest code legislation was poorly implemented by the Brazilian government in 1965, and deforestation continued illegally and unsustainably until the revision of this legislation in 2012 where land can be reallocated if it is being mismanaged sustainably (Soares-Filho *et al.*, 2014; Machado, 2015).

2.2 Poverty and Forest burning

Poverty is rife within Brazil, creating land use issues from a rural sector when poorer families need to be self-sufficient when providing their own food (Guedes *et al*., 2011; Börner, Mendoza and Vosti, 2007). Often these families lack access to education, especially education based around sustainable farming practice and maintaining the Amazon rainforest, and when this is the case, often land space will be created through burning trees

in the little land that is available to these poorer rural communities (Börner, Mendoza and Vosti, 2007). Burning to create land within Brazil is common practice, creating a multitude of environmental issues within Brazil, including: increasing carbon release from trees into the atmosphere that facilitate climate change, loss of habitat and biodiversity in areas burned because the land becomes dry before it can regrow, and once uninhabited land is now being unsustainably used for agriculture in an attempt to create provisions on a local scale (Aldrich *et al.*, 2006).

2.3 Reducing deforestation

To make up for the loss of biodiversity and habitat within Brazil's segment of the Amazon rainforest, we would need to reallocate the land as well as making use of its ecosystem services sustainably without damaging the ecosystem as a result (Martinelli *et al.*, 2009). Gené and Aliadi, (2010) proposed a framework investigation into 'Reducing Emissions from Deforestation and Forest Degradation' (REDD) to determine what works in reducing deforestation. A REDD project would break down the management of deforestation into multiple levels and would help fund the areas that are severely affected as a result. Increasing the funding in areas that are hotspots for deforestation would encourage rural communities to adopt sustainable farming practices that were previously unaffordable. However, in Brazil one issue with implementing REDD is due to the communication on a local level, with rural communities lacking the education and understanding on the topic of deforestation (Gené and Aliadi, 2010). On the other hand, the Norwegian government launched a REDD scheme that was implemented within Tanzania- this was criticised for the way it wasted its own resources, and asserted a political dominance over the country the scheme is being implemented in (Mwakalobo *et al.*, 2011). Development efforts from Norway to try and encourage sustainable development in Tanzania, failed to address the rural communities and the poverty experienced in these local areas, trying to force a sustainable system that simply would be of no benefit to the Tanzanian communities, because they could not afford the resources being given to them (Mwakalobo *et al.*, 2011).

As a secondary measure, Nepstad *et al.* (2009) suggested a marketplace transition within Brazil, to exclude companies from supply markets if they are to supply from land that has been deforested unsustainably or illegally. I believe this restriction to be quite severe, and altering this by suggesting that there should be practical land use penalties, to make use of the land that has been illegally deforested e.g. land should be redirected towards supplying areas that are stricken with poverty in an effort to reduce rural efforts of agriculture adding to the degradation of the Amazon (Scherer, 2019). Amending 'the forest code' would also be beneficial in the reduction of deforestation, to state that land must be reserved as 80% and there should be fines associated with not doing so, and a closer monitoring system to determine who is abiding by these regulations (Soares-Filho *et al.*, 2014; Machado, 2015).

2.4 Land allocation

Allocating land has difficulties, due to most of the land ownership in Brazil being private, therefore there would need to be incentives towards prioritising environmental conservation when it comes to land use policy (Miccolis *et al*., 2014; Freitas, 2017). Policies

within Brazil implemented since the 1970's has driven for an economic focus, therefore neglecting the environment and allowing for private companies to take advantage of the current policy system in place. A land use policy assessment (LUPA) can be defined as an initiative that seeks to outline land use policies, and suggests improvements and redirections of land ownership and usage, dependant on factors that are going to increase efficiency of land use, and will provide the most economic benefits (Ding, 2003). A land use policy assessment can cover several different areas of policy assessment, making it difficult to find areas in which it has not been successful. The land use planning initiative discussed in British Columbia, Canada, identified the gaps in which a LUPA assessment can have. Limitations in land use policy assessment can include the areas directly impacted by the assessment and whether that will impact the livelihoods of the communities (Albert, Gunton and Day, 2003). Poorer communities can be directly impacted by a LUPA, as often they will not be able to implement the changes on the land that they own (Albert, Gunton and Day, 2003). Freitas (2017), determined that a 'land use policy assessment' (LUPA) in Brazil to will determine the downfalls of the current Brazilian land use policies, comparing the difference in public and private ownership of land and how improving the connection between these sectors will subsequently improve the quality and regulation over ecosystem services provided by native vegetation.

Therefore, implementing a similar system towards land allocation will serve a beneficial purpose in determining how the land is used, and what can be done to provide the most beneficial solution to land allocation. If we can assess the land area, and determine how the land will be used, we can provide a connection between rural community land conservation, with a monetary capital provided from a larger corporation e.g. agricultural intensification systems are implemented as part of a LUPA, implementing a crop system that favours intense agriculture in the area already available, opposed to creating more space for agriculture through deforestation (Barretto *et al.*, 2013). There is a technological incentive for families, which provides jobs and income to support rural agriculture by supplying them with agricultural technologies like soil and water sensors, to improve rural farming, and increase support for sustainable agriculture within Brazil (Barretto *et al.*, 2013).

2.5 Sustainable management schemes (For poverty reduction and land preservation)

To create a sustainable scheme for reducing poverty whilst preserving the environment would need to slightly re-imagine the 'national program for strengthening of family farming' (NPSFF), to create an environmental focus whilst retaining the credits being given to the family's involved with the scheme (Nassar and Ures, 2009). Flexor and Grisa (2016), used the framework for the NPSFF, and determined that we would need to re-interpret the role of how family farming can benefit Brazil, discovering that dependence on these policies is going to be the only way these families are going to provide, and how the multidimensional issue of poverty is going to be difficult when deciding the rules on how this policy is carried out.

I believe incentives should be given towards families in need of financial support, to take part in agricultural projects that are going to be sustainable by educating and increasing awareness of unsustainable farming. This would work together with the REDD assessment

to reduce deforestation, implementing land intensification, and incentivising the use of land that is already publicly owned, to require more intense agricultural practice (Nepstad *et al.*, 2013)

3. Policy Recommendation(s)

To change the land use system within Brazil, I propose these final changes to ensure that the land can be changed to meet sustainability goals in 2030.

3.1 Table of Policy recommendations

Problem	Proposed policy	Working Example of Policy
Deforestation from rural deforestation and burning, timber clearance and tree removal from large companies.	Action plan that seeks to break down the issue of deforestation into manageable goals that Brazil can achieve over a 10-year period, working towards a sustainable land use future in 2030 (Toni, 2011).We would need to focus implementing a REDD+ framework, much like the one adopted in Ecuador (2009).	– The Ecuador REDD project was able to identify where deforestation was occurring, and how financial incentives could reduce Deforestation (Loaiza, Nehren, and Gerold, 2015).- The Ecuador REDD project successfully engaged with communities of different ethnic groups to design subsistence-based production schemes that would also decrease deforestation (Loaiza, Nehren, and Gerold, 2015)
Disparity in land allocation to the Brazilian people and privately owned land is being mismanaged.	I propose a Land Use Policy Assessment that is carried out before a company is purchasing new land, to determine what the land is going to be used for, and how it is going to be used (Gallardo and Bond, 2011; OECD, 2019).	– Land use policy assessments are adopted regularly by the EU, to make land that is unused (Brownfield land) into green spaces for public use to reduce harmful effects of urban expansion (Doick *et al.*, 2009)- Land ownership under EU proposals against brown spaces suggest that the land is given back to public ownership if the land is not being managed

	correctly under private ownership (Doick *et al.,*2009)

4. Conclusions

To conclude, sustainable land usage within brazil would need to include appropriate land ownership and the reduction of deforestation to meet sustainable development goals in 2030. Deforestation would need to be broken down into manageable goals over 10-year periods, and to give credits to landowners adopting a REDD+ framework (Toni, 2011). Land ownership needs to be assessed against the forestry code to reduce unlawful land expansion and burning (Gallardo and Bond, 2011; OECD, 2019).

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