Ambio. 2012 Mar; 41(3): 309–314.
Published online 2011 Oct 18. doi: 10.1007/s13280-011-0196-7
PMCID: PMC3357851
PMID: 22535430

Brazilian Amazon: A Significant Five Year Drop in Deforestation Rates but Figures are on the Rise Again

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Introduction

Brazilian officials have recently announced that, after a five year lull, deforestation rates are again on the rise in the Legal Amazon (INPE 2011). While this may come as no surprise to some, it is still useful to examine the conditions which have led to the unexpected success by the authorities in reducing deforestation over the previous 5 years. The more so in that these years were characterized by rising agricultural commodity prices, usually a key driver in deforestation dynamics. We argue here that, despite the strong efforts by national and regional authorities to control deforestation processes a reversal of the trend was bound to occur as new policies were set into motion during the relatively quiet deforestation period to accommodate the economic aspirations of a growing population in Amazonia. Such aspirations were voiced in the National Congress, when deputies voted in May 2011 to relax the forest code laws. In a probable anticipation of such reform, an unambiguous upsurge in deforestation was observed in early 2011.

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Facts and Figures

At the end of 2010, the Brazilian Government announced that deforestation in the Brazilian Amazon had come down from more than 27 000 km^2 in 2004 to just over 7000 km^2 in 2010 (a drop of

74%) (INPE 2010). The data were provided by the Brazilian National Space Research Institute—INPE—and can be trusted as reflecting the situation according to the formal definition of deforestation proper (Fig. 1). This latter can be defined as the permanent removal by clear cutting of the forest cover (IPCC 2000). The dramatic downtrend observed between 2004 and 2010 is interesting in more than one way; its relative suddenness raises new questions regarding the dynamics of tropical deforestation. The data hide a complex intertwining of drivers more than they reveal forcing by a single agent. Forests have now become key target ecosystems in the pursuit of sustainability agendas (carbon stocks, biodiversity, and protection of the indigenous way of life) and the drastic downturn in deforestation rates observed over the past decade is highly relevant for future international policies (e.g., REDD—Reducing Emissions from Deforestation and forest Degradation). There are, in addition, compelling reasons for assessing whether such a trend can continue or whether new drivers are replacing old ones in spurring a new deforestation wave. Finally are there hidden social and economic implications emerging from the current situation?

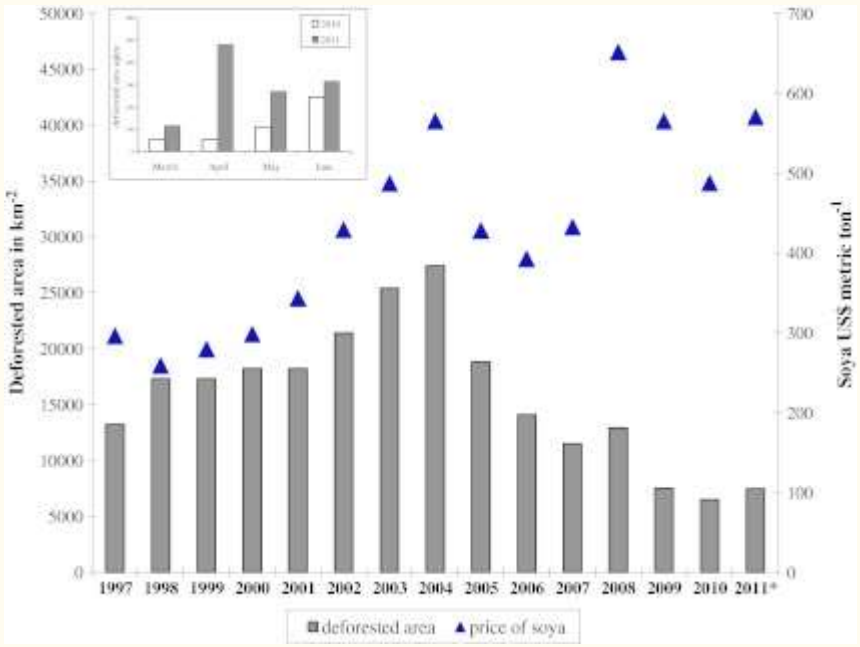

Fig. 1

Gross deforestation in the Legal Amazon (km^2) and average soya price. *The 2011 deforestation area is an estimate. *Inset* is the comparison of monthly deforestation alerts from early 2011 compared to 2010 (sources INPE and CEPEA/ESALQ)

The classical tension, between market pull, mainly the world price for soya and beef, (Brazilian timber is still a limited export commodity) and public forest protection policies needs to be examined first. A rapid increase in soya and beef prices accompanied by a steep rise in deforestation was noted during the period 2001–2004 (see Fig. 1). This positive relationship does, however, not hold during the following 6 years. Despite a sharp fall back to 2002 prices in 2004, prices started rising again in 2006, although profitability for farmers was further affected by increased transport costs and a stronger Real. The singular spike of deforestation in 2008 (an additional 1500 km^2 as compared to 2007) is likely to have been caused by the record price of soya in that period, but the effect was short lived with deforestation falling by over 6000 km^2 in 2010. Finally, thanks to continuing agricultural research, a double cropping, better soil and crop management and other new high input practices (Schnepf et al. 2001), yields continued to increase thereby reducing the amount of land necessary to raise the same amount of food.

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The Actors

The Lula presidency (2003–2011) was characterized by a constant enhancement of Brazil's position on the reduction of greenhouse gas emissions associated with deforestation (Brasil, Governo Federal 2008). Appropriate legislation ensued and a concerted effort by the Brazilian Government—essentially by a number of control actions—was effective in curtailing deforestation; enforcement was put into place at various levels of administration. Fires were closely monitored and fines levied on people caught burning for land clearing. An embargo was declared on municipalities and regions where illegal lumber and livestock were produced along with fines (previously not collected (Bito 2009)), for those caught 'handling' these illegal products. From a regime of near impunity, laissez-faire and resulting criminality (Boekhout van Solinge 2010) vast tracts of the Amazon fell under more controlled measures. Such measures and associated fines had an impact on deforestation with the area

saved (avoided deforestation) in 2008 through taxation measures evaluated at 1760 km^2 (Barreto et al. 2009). A much more receptive urban population provided the political back up for such an aggressive implementation of environmental laws; NGOs successfully campaigned for bans on cattle products and soya derived from deforested areas (Greenpeace 2006).

Meanwhile, a new set of protected areas, effective as barriers to the colonization (Nepstad et al. 2006), were established across the Amazon—some with the express purpose of cutting off access to the forested area. In this way, land zoning together with increased yields on cleared lands represent an essential component of land use policies aiming at preserving natural forest ecosystems while enhancing food production (Lambin and Meyfroidt 2011).

As a result 54% of the Legal Amazon is now under some form of protection (Soares-Filho et al. 2010). NGOs supported this drive providing information both to the public and to public authorities on forest fires, deforestation, illegal mining, and logging inside protected areas (IMAZON 2011; Ricardo and Rollo 2006). Clearly, the effective implementation of existing laws, at times combined with fluctuating profit margins, dissuaded excessive and illegal deforestation activities.

Pressure continued on deforestation when President Lula launched the Plan of Action for Protection and Control of Deforestation in the Legal Amazon (Brasil, Presidência da República 2004) for the period 2008–2011, opening a fund (the Amazon Fund) for external partners to contribute on a payment-by-results basis. The benefits of this initiative have yet to be felt, with the first projects receiving grants in late 2009.

Yet, for all their encouraging nature, the official data also hid other trends and processes taking place. The Brazilian Amazon is now populated by more than 25 million inhabitants (13% of Brazil's population (IBGE 2011)) and has seen an urban growth rate five times that of the whole country over the last 20 years, with the proportion of the urban population (79%) now approaching the national average (82%). Upon their arrival in the region most of

the migrants are at some stage engaged in clearing land for subsistence agriculture, logging or, pending credit availability, opening up small holdings, often in a chaotic manner. Many of these activities lead to small land clearings or forest degradation (e.g., selective logging), the features of which are below the resolution of the current surveys (6 ha)—see Fig. 2.

Fig. 2

a Airborne photo of clear cutting probably for pasture—note the felled logs are still on the ground. Photo credit: Liana John. **b** Airborne photo of a degraded forest, the result of 'super-logging'. This will not be counted in the deforestation statistics. Photo credit: Hugh Eva

Meanwhile, extreme El-Niño related dry years such as 2005 and 2010 (Lewis et al. 2011) have favored the extension of fires in non-resistant vegetation. If all such disturbances were taken into account, an area as large as 7000 km^2 (i.e., 15% more) would be added to the official 2010 data, while further degradation by logging could be as much as up to 20 000 km^2 a year (Asner et al. 2005). It has been tentatively reported that up to 60% of the remaining closed forest of the entire Amazon basin could be affected to one degree or another by degradation (Dourojeanni 2011). To keep such trends into account, attention must now shift away from deforestation proper (e.g., clear cutting) to the continuous assessment of degraded forest ecosystems. Such knowledge must be urgently acquired if goals related to carbon emissions and biodiversity are to be seriously pursued. Furthermore, degraded forest land could be restored to produce food; research and agriculture subsidies will come into play in that context.

Deforestation figures for the Brazilian Amazon basin need to be analyzed in a rapidly changing context of significant development of the whole region. A new urban society is being built there, located in areas hitherto believed to be un-exploitable, calling for more infrastructure, more timber, more energy supply, and better communications with the outside world. Economic development and not forest conservation is seen as the path towards reducing poverty, even if urbanization has been shown to follow a boom-and-bust dynamic (Rodrigues et al. 2009). The Brazilian Government's plan Avança Brasil in the first half of the 2000s to upgrade infrastructure in the Amazon was seen by many environmentalists as a major threat to the rainforest and its traditional inhabitants (Fearnside 2002), with predictions of an additional deforestation of between 4000 to 13 500 km^2 per year (Carvalho et al. 2001). This, however, does not appear to have happened yet.

The desire of the Brazilian government to connect to other parts of the Basin is also part of the regionalization of plans and implementation projects with both road building and new hydroelectric plants under construction. The potential for deforestation 'leakage' across common borders, notably with Peru and Bolivia, is of concern for climate change policies and biodiversity as it is likely to concentrate pockets of forest degradation along common borders (Santilli et al. 2005).

The nascent Amazonian society is significantly affected by national and international measures regarding forest land occupation since there are not enough alternatives to farming. As a consequence, a break down in the fabric of society is now observed in many parts of the Amazon with a recrudescence of criminal activities, illegal mining, trafficking, violence, and corruption. Stopping market driven deforestation without provision of alternatives will, indeed, shift the destruction around. The decision to build new dams (Pará and Porto Velho) is in the logic of the national energy strategy but also promised the beneficial effect of temporarily employing over 20 000 workers. However, local administrators have warned of a new influx of migrants, adding to the pressure on natural resources and social order. Recent reports of rises in violent crime in Porto Velho highlight the social impacts and eventual downsides of such ventures (Vizeu and Vargas 2011).

Therefore, it came as no surprise that while the Brazilian Congress was voting to relax the forest code Government officials already announced a reversal of the downtrend. Permanent satellite monitoring data were already showing signs of significant increases in deforestation early this year (see Fig. 1 inset) compared to the same period in 2010 (INPE 2011) with an possible overall increase of at least 15% in 2011 with respect to last year.

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A Reality Check

The Amazon basin cannot be considered as the singular playing field for measures which lead to internationally recognized benefits (carbon, biodiversity, and climate); policy discussions cannot anymore be held on such a single basis. On the contrary, it is the rapid upsurge in the development of the region, the sometimes ambivalent national policies and the global situation with respect to energy supply and food availability that are likely to determine future trends in the deforestation. Payments for carbon services may occupy a place in the panoply of measures; however, to be attractive such compensation approaches will have to be smoothly inserted in a regional development perspective. In addition, to be efficient, such payments may have to cope with large inter-annual fluctuations in deforestation activity departing from baseline models. A determined implementation of environmental laws has been effective in the political context of the first decade of this century. Data show that checks and controls can even counter price incentives to open new agricultural areas at the expense of the forest. How long can the same favorable context continue to prevail? Will deforestation continue to decrease to a standstill (e.g., at a base-rate, with the 2011 upsurge being a transitory situation similar to the local peak of 2008) or will forest removal pick up again under endogenous pressure for regional development and exogenous one for agricultural production? The history of the past 10 years shows that deforestation processes may be reactive to more forcing agents than previously thought with the possibility of rapid up- and downturns of significant dimensions. Such dynamics call for an improved capacity to react to events and to anticipate those new mixes of forcing agents. The strong drive to develop the Legal Amazon is itself a highly dynamic process that needs to be more realistically assessed in its entirety than in the past. The interplay between demographic, social, economic, and environmental factors now calls for the deployment of policy measures which will focus on a sustainable improvement in the well-being of a growing population while maintaining and restoring forest ecosystem services at an acceptable level.

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Footnotes

This synopsis was not peer reviewed.

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