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Agricultural Explosion in Brazil: Exploring the Impacts of the Brazilian Agricultural Development over the Amazon

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Abstract. Agriculture has always been an important economic activity in Brazil and is now among the most dynamic sectors in the Brazilian economy. However, a lot of controversy has risen over the impact of such phenomenon on the Brazilian Amazon. This paper offers a critical overview of the literature on the expansion of the Brazilian agricultural frontier, demonstrating its impact on the degradation of the Amazon forest based on secondary data and institutional document sources. An overview of the historical development of the Brazilian Amazon basin is conducted by looking in a critical way at some implications of such a phenomenon. Rather than commenting on an empirical study, the objective of this paper is to present a theoretical analysis of the models of development adopted for the Amazon region in Brazil, showing the relative importance of different variables and factors to the depletion of that ecosystem. It is argued that although the figures show net benefit to the Brazilian economy, the prosperity which is advocated to be brought by the agricultural explosion favors mostly established elites and vested international interests, which have contributed to the degradation of the Amazon forest for a long time. It is suggested that the focus on Brazilian agricultural growth as the main driver of deforestation of the Amazon has omitted the historical links to the deforestation problem and the related role of effective international cooperation.

Introduction

In 2006 Brazil was the world's largest net agricultural exporter. Brazil's agricultural exports almost tripled from 1990 to 2005, reaching more than US\$ 30 billion, making Brazil the country with the largest agricultural trade surplus in the world (Berthelot, 2005; Damico and Nassar, 2007). However, many critics perceive Brazilian agricultural growth as a great threat to the further destruction of the Amazônia.¹ The

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increasing demand for agricultural commodities, also from fast-growing developing countries such as China and Russia, increases pressure for production, historically associated with the expansion of croplands in Brazil, pushing the Brazilian agricultural frontier further into the *Amazônia*.

Although figures show net benefit to the Brazilian economy, the prosperity that is advocated to be brought by the agricultural explosion mostly favors established elites and vested international interests, which have contributed for long to the degradation of the Amazon forest and of social cohesion in that country. Following the colonial relation of exploitation, neo-colonialism taking place under global capitalism continues to take away the richness of Brazil, leaving many Brazilian citizens with profound social problems while feeding established elites with economic capital and power. An example of this is the fact that the third and fourth largest exporting companies in Brazil are Bunge and Cargill, both corporations from the USA operating in the agribusiness and food sector (Brazil International Trade, 2007, p. 98). A critical analysis of such links can demonstrate the real complexity of the challenge and provides us with the opportunity to promote actions that truly address the preservation of the Amazon rainforest.

Brazilian Agricultural Growth

Brazil is now one of the most agriculturally competitive countries in the world, showing the increasing importance of its agribusiness over the last decade (Berthelot, 2005; Damico and Nassar, 2007). In 2006, Brazil was the world's largest exporter of complex soy products, orange juice, coffee, beef, ethanol, sugar, tobacco, poultry, and a significant world supplier of pork, cotton, cocoa, corn and fresh fruit (Ministry of Agriculture of Brazil, 2007). The country also registered its first-ever trade surplus in dairy products in 2004. Brazil is also a world leader in the production and commercialization of biofuels, being the world's largest ethanol producer (Outlaw et al., 2007). The exceptional performance of the agricultural sector is shown by its soaring production, which together with the stagnation of agricultural imports has resulted in the agricultural trade surplus skyrocketing from US\$ 10 billion in 2000 to nearly US\$ 30 billion in 2005 (Damico and Nassar, 2007).

The agro-industry in Brazil has experienced explosive growth in the last few years, especially beef and soybean production. In 2004, Brazil surpassed the US and became the world's number one beef exporter. In 2006, Brazil surpassed the US becoming the world's largest soybean exporter (Llana, 2007). Only in the Brazilian Amazon basin states, soybean production grew as much as 60% between 1998 and 2002. The total cattle herd in the same region increased from 26.2 million to 51.6 million over the 1991–2001 period (Woods Whole Research Center, 2007).

Part of this astonishing growth can be explained by domestic and international reasons. Domestically, this is evidenced by the devaluation of the Brazilian currency, the development of new varieties of soybean more resistant to the hot and humid climate of the Amazon region (through heavy investments in research and development into a premier agricultural research institute called EMBRAPA), and efforts to eradicate foot-and-mouth disease in much of the Middle-West and North regions of Brazil, as indicated by Kirby et al. (2006). Internationally, factors such as increased international demand for beef stimulated by the mad cow disease increased demand for grass-fed cattle – such as those from most cattle-raising farms in Brazil – alongside

the increasing demand for soy from developing countries which have been experiencing high levels of economic growth, such as China (Woods Whole Research Center, 2007).

According to the Ministry of Agriculture, Brazil's agricultural exports to China grew by 22% over the 2005–2006 period alone. Developed countries used to be the main destinations of Brazilian agricultural products, but since 2004 more than 50% of agricultural exports are destined for developing countries and other non-traditional export destinations, as reported by Damico and Nassar (2007). Even though the agricultural explosion has brought economic prosperity to the country, many critics perceive Brazilian agricultural growth as a great threat to further destruction of the Amazon rainforest.

The Expansion of the Brazilian Frontier and the Amazônia

The Amazon rainforest covers an area of approximately 5.5 million km². More than 60% (3.6 million km²) is located inside Brazil, encompassing more than 50% of the country's territory. In this article, the Brazilian Amazônia is defined as the North region of Brazil plus northern Mato Grosso and western Maranhão (see Figure 1). The Amazônia still comprises 72% of forest-land area, 15% of savanna, 8% of inundated lowland, and 5% of ecological transition area (Serrão & Homma, 1993).

The models of development employed in Amazônia have had dangerous ecological consequences and brought about little improvement to the quality of life of most people living in the region (Barbosa, 2000; Carvalho et al., 2002; Campari, 2005). According to Carvalho et al. (2002, p. 36), nearly half of the population of Amazônia still lives below the poverty line. Barbosa (2000) argues that these models have been implemented by Brazilian technocrats as a way of incorporating Amazônia into

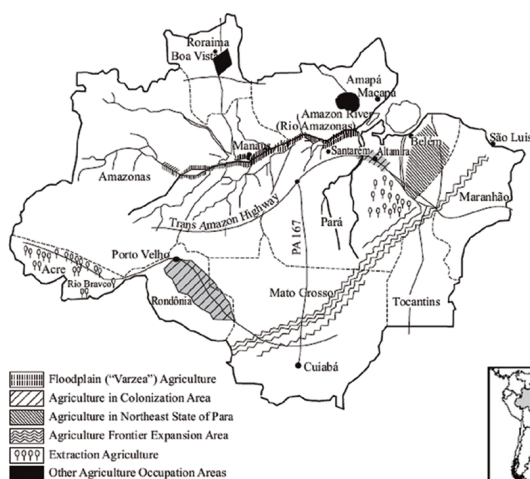


Figure 1. Main agriculture development areas in the Amazon.
Source: Serrão and Homma (1993).

Brazil's capitalist economy. In these models, clearing land of jungle and putting it into production was viewed as development.

Until 1996, the federal government stimulated deforestation of as much as 50% of the land as the main factor for recognizing land tenure (Kirby et al., 2006). Even in cases where there has been clear evidence of the unsustainability of certain economic activities, such as the case of cattle ranching for most of the region, it received both federal economic incentives and investments from abroad (Campuzano, 1979; Campari, 2005). Similar to the Americans' 19th century perception of the West, Brazilians have perceived the *Amazônia* as an empty wilderness in need of civilization (Barbosa, 2000).

The geopolitical position of the region (sharing borders with eight other countries), its size and its low population density have been approached by Brazilian planners with strategies aimed at its vulnerability and economic under-utilization (Carvalho et al., 2002; Campari, 2005). Incentives to encourage colonization and intensive economic activities in the region as well as improvement of transport infrastructure were the government focus throughout the 1964–1985 military dictatorship period (Campari, 2005). These incentives were highly directed at extensive cattle ranching projects. In addition, the construction of roads was necessary for the development of large-scale mining, timber extraction and hydroelectric energy projects undertaken (Carvalho et al., 2002). Through these economic activities, the government proposed to produce revenues that would be directed to finance further development and payment of Brazil's foreign debt (Barbosa, 2000; Carvalho et al., 2002; Kirby et al., 2006).

The savanna areas, part of the transition zone between the Brazilian *Cerrado* and the *Amazônia*, have played an important role in this process. These plain drier areas along with vast areas of the *Cerrado*² are important for agriculture, and they have been used primarily for pasture and consecutively for mechanized soybean cultivation, despite their generally poor soils. This region occurs mainly along a band varying in width between 200 and 600 kilometers. This is where much of the deforestation in the Brazilian *Amazônia* has taken place. The band stretches from the north-eastern state of Maranhão, through Pará, Tocantins, Mato Grosso and includes colonization areas in *Rondônia* (see Figure 1). The frontier expansion areas and the government-sponsored colonization areas coordinated by INCRA (the National Institute of Colonization and Land Reform) came into being in the late 1960s (Barbosa, 2000; Campari, 2005).

The expansion of the Brazilian agricultural frontier has certainly been an important activity directly contributing to the deforestation of the *Amazônia* (Barbosa, 2000; Carvalho et al., 2002; Kirby et al., 2006; Wallace, 2007). Since colonial times, the settlement of new frontiers has been undertaken to open access to land and other natural resources. It is assumed that initially (from the late 1960s and throughout the 1970s) high-profile development projects sponsored by the federal government, along with fiscal and credit incentives for private colonization enterprises, coupled with the construction of infrastructure (such as hydro-electric dams and roads) were the main factors affecting the movement of the frontier (Carvalho et al. 2002; Campari, 2005; Kirby et al., 2006). From the 1980s on, as old colonization areas became more oriented towards agribusiness farming (Campari, 2005), relative product prices, factor availability, land and transportation costs are identified as important factors affecting the movement of the frontier (Kirby et al., 2006).

Agropastoral land uses, particularly cattle ranching, and most recently extensive plantation, especially soybean, have been considered by many critics as the main

drivers of deforestation. That is clearly observed in the *National Geographic* issue of January 2007 that carried the title 'Amazon – Forest to Farms' for its main article (Wallace, 2007). The historical role of cattle ranching in Amazonian deforestation can be perceived as resulting partly from favorable international and national incentives throughout the 1965–1985 period (Campari, 2005), partly from the traditional market and natural advantages intrinsic to the practice (Kirby et al., 2006).

In this context, international forces played an important role in promoting cattle ranching as a development strategy for the early stages of colonization of the Amazônia (Campari, 2005). One of the examples being the United Nations Food and Agricultural Organization (FAO) and the Economic Commission for Latin America (ECLA) publication in 1964 of an influential report summarizing the international perspective on the expansion of the Brazilian herd. According to Campari:

The FAO report indicated that while Brazil's existing productive capacity was rather low, it had great potential for expansion through the incorporation of new land and the rationalization of production. The report argued that overcoming certain bottlenecks, primarily related to credit, would be essential for Brazil to capture a sizable market share of world beef production. This document concluded that beef markets were buoyant and would continue to expand as national and international demand increased, a tendency that was particularly strong in the mid-1960s (Campari, 2005, p. 31).

Another influential document pointed out by Campari (2005) as underlying the promotion of cattle ranching in Amazônia during the 1960s (the period when the governmental strategies for the development of Amazônia were first drafted) was *Technology in Australia 1788–1988*. The report indicated that Brazil could turn into a 'premier beef exporter' if the conditions of credit and better grass varieties were met (suggesting the use of Australian pasture technologies). For Campari, international agencies such as the World Bank, based on this data, were able to argue that 'with the proper technology and better credit lines, livestock represented an excellent investment for development. As a consequence, during the mid- to late 1960s, financial resources (national and international) poured into livestock projects, mostly developed in the Amazon' (Campari, 2005, p. 31).

Even though different analyses have shown that, where credit was available, converting forest to pasture was more profitable than the sustainable use of already-cleared land, clearing in some areas took place in large agricultural establishments that received no government subsidies, reflecting the advantages of the activity to farmers in Amazônia (Kirby et al., 2006). These farmers, according to Campari (2005), are made of colonists (farmers who are original owners of colonization plots, either sponsored by the government during the 1970s or by private colonization companies in response to government incentives in latter years) who stayed on their plot and were relatively successful in agriculture. Some of the advantages of ranching activity to those farmers are well-established local markets for beef all over Brazil, turning cattle into a highly liquid investment, and no requirement of transport infrastructure (cattle can be brought to the market on foot, an important advantage in a region of difficult access). Sales of cattle can be delayed without incurring major losses, becoming less vulnerable to annual variation in weather than crops. Cattle grazing is certainly the cheapest and most efficient way of maintaining cleared land, conferring eligibility for propriety tenure, which has been an important motivation for much of the cattle ranching in the region (Mertens et al., 2002; Kirby et al., 2006).

'Land abundance and labor scarcity encouraged low-technology, low-capital activities with few labor or infrastructure requirements, such as cattle ranching' (Carvalho et al., 2002).

However, in the last 10 years the importance of soy farming as a land-demanding economic activity has dramatically increased (Fearnside, 2001). Although soy producers have historically been concentrated in southern and central Brazil, agricultural financing and increasing product price have fostered the rapid expansion of the soy industry in Brazil, pushing the frontier northwards into cheaper land in the Amazon forest (Fearnside, 2001; Kirby et al., 2006). Furthermore, the problem here is not only related to the actual land used by soybean production, but extends to the impacts brought about by the displacement of small farmers, whose cleared lands are cheaply bought by wealthy soy farmers (depending heavily on agricultural inputs and machinery, soy farming in Brazil is the domain of wealthy agribusinessmen, being associated with extreme income concentration). As a result, small proprietors are displaced to urban areas or to new frontier areas. This process generates either the increase in social problems in the outskirts of urban areas or reinitiates the process of land establishment further into forest areas. As pointed by Campari (2005), much of the migration flow in the Amazon region in the last 15–20 years has been intraregional, rather than the original interregional flow between southern and north-eastern Brazil and the north-western Amazonian region during the 1960s and 1970s.

Soy production in the Amazon region has also put pressure on the opening and paving of further roads in the region, exactly the factor most strongly related to deforestation, according to diverse critics (Barbosa, 2000; Alves, 2001; Carvalho et al., 2002; Kirby et al., 2006). As soy is a major source of foreign currency for Brazil (Damico and Nassar, 2007), the needs of the sector have been used to justify many controversial transport infrastructure projects taking place in *Amazônia*, such as Cargill's grain terminal on the margins of the Tapajós River (subject to embargo by Brazilian environmental authorities). The grain terminal was built by the North American corporation and has operated since 2004 without a thorough assessment of the environmental impacts of a project of such magnitude, as required by the Brazilian Constitution. Experts have alerted to the negative impact of the project on the intensification of deforestation of Amazon forest in that region (Greenpeace, 2007). Since 2000, when the construction started (already under legal actions from Brazilian governmental authorities), instead of adjusting its export operations to the Brazilian environmental laws, Cargill opted to exploit loop-holes in the Brazilian legislation to gain time through a long judicial battle, enabling the construction and operation of the terminal in *Amazônia*. The long judicial battle culminated in the grain terminal embargo of March 2007 by Brazilian environmental authorities and the interruption of activities of the North American corporation in the region until the conclusion and approval of the environmental impact assessment and report, the EIA-Rima (Ministério Público Federal, 2007).

Strong export markets for soybeans and cattle (activities which most frequently favor the wealthy large-scale farmers part of the Brazilian elite and international food companies) can continue to provide strong incentives for future deforestation of *Amazônia*. The rationale behind the integration plans for *Amazônia* has shifted from geopolitical (as they were in the military period) to economic. Nevertheless, the potential for environmental impact posed by recent development projects in *Amazônia* under this circumstance can achieve an even larger scale than that of past policies.

Plans of projects such as *Avança Brasil* – which in the 2000–2003 period included over US\$40 billion in infrastructure projects for the Amazon region (Fearnside, 2002) – have the broader aim of integrating *Amazônia* into global markets (Carvalho et al., 2002).

A Challenge and an Opportunity

The expansion of the agricultural frontier in *Amazônia* brings new challenges to development and conservation in the region. The capitalist forces driving forest destruction have become more powerful, indicating that if the current trend continues, we are likely to repeat the most developed countries' legacy of agricultural replacement of forests and ecosystems. In the regions of *Amazônia* where cattle ranching and soybean are lucrative it will be difficult to prevent forest degradation purely through command-and-control approaches (Barbosa, 2000; Kirby et al., 2006).

Cereal grains make up about 80% of the world's food, and according to the Food and Agricultural Organization from the United Nations (FAO, 1961–1999) food per capita has been declining since 1984, based on available cereal grains. Even though grain yields per hectare are still increasing in both developed and developing countries, the gains are slowing down while the world population continues to increase (FAO, 1961–1999). The increasing rate of soil degradation around the world pointed out by Pimentel and Kounang (1998), combined with population growth, will create further pressure for additional land for crops and cattle ranching to supply international markets, possibly generating further degradation of the Brazilian Cerrado and *Amazônia*.

Protection of *Amazônia's* ecosystem as well as of the environmental services it provides to society will require fostering a sustainable development model that promotes the rational use of its great resources. Not only the ones we can extract, but also the ones we benefit from having the forest there, such as carbon storage, conservation of biodiversity, the regulation of regional hydrological cycles (Fearnside, 1997), which are environmental services of local and global importance. Most of all, it requires a development model addressing issues which have always been clearly connected to the degradation of primary forests in Brazil: the *latifúndio*³ and its export-oriented agricultural production model. According to McMichael (2000), under the pressure of debt rescheduling and market reforms imposed by international financial institutions, agricultural regions across the developing world, traditionally used for subsistence agriculture, have been reshaped into agro-export platforms. That is certainly a reality for much of agriculture developed in *Amazônia*. This signals an underlying historical process at work: a vicious relation of supplying raw materials and agricultural goods to core countries. A process that can be contemporarily evidenced on 'a widespread subordination of producing regions to global production and consumption relations organized by transnational food companies' (McMichael, 2000, p. 23).

Furthermore, the increasingly complex international system limits the autonomy of individual nation-states and, in this context, environmental rights – arguably an evolution of social citizenship rights, as they are ultimately related to the welfare of citizens (the kind referred to by T. H. Marshall) – face the challenge of an international order structured by agencies over which citizens have minimal control (Newby, 1996). 'The international agencies that comprise this global system not only

lack legitimacy but respond only slowly and imperfectly to the changing demands of a disenfranchised and fragmented citizenry' (Newby, 1996, p. 214).

Sustainable development is perceived as providing us with 'a sense of ecological rationality to balance against the irrationality of capitalism itself: the irrationality of sacrificing vital ecosystems such as the *Amazônia* for the sake of consumerism' (Barbosa, 2000, p. 12). Environmentalism and the concept of sustainable development have provoked a greater recognition of the fact that economic wellbeing does not necessarily promote civility or social cohesion (Newby, 1996). In this context, in spite of its limitations, sustainable development presents an alternative paradigm to challenge legitimately the prevalence of 'business as usual' and 'predatory capitalism', which has been guiding our way of living and shaping our relationship with the environment since the European expansion of the 'long-sixteenth century' (1450–1650) (Barbosa, 2000, p. 16).

Colonialism modified how people in the periphery (colonies, most part of what today is known as countries from the South) perceived themselves. At the same time, parts of the New World were incorporated into the European economy; not only did the traditional way people connected themselves to environment change, but also their culture and aspirations were transformed. The European ideas of progress and modernization advanced to the new colonies placed Europeans at the top and the natives at the bottom (Barbosa, 2000). 'While Europeans had access to wealth, prestige, and power, the locals worked in manual jobs often catering for the needs of colonial masters' (2000, p. 20). Brazilian natives fast associated better life with being westernized, with following those cultural principles of progress advanced by the colonizers. By the time colonies gained their political independency, European ideas of modernization were already intrinsic to the way of thinking of the people in the colonies; these would often look to the West for their model of economic development (Barbosa, 2000).

As stated by Barbosa (2000, p. 20), 'political independence for the former colonies did not translate into economic independence, since they continued to be peripheries in the capitalist world-economy. Colonialism transformed itself into neo-colonialism'. The majority of peripheral countries (ex-colonies) were already part of a vicious relation of supplying raw materials and agricultural goods to the core countries (ex-colonizers), and that is how the majority continued to participate in global capitalism – under continued economic exploitation. Differently affecting world regions, this circumstance has shifted agriculture from its historical role of anchor of societies, states, and cultures into a component of corporate global sourcing strategies (McMichael, 2000).

As observed by Haila (1999, p. 45), the European colonial expansion was a benchmark process which 'brought all continents within the same sphere of influence and power', and once began it kept on going like 'an avalanche', and is still ongoing. Some nations attempted to escape this condition through industrialization, achieving different degrees of success (in the cases of the USA and Mexico). In Brazil, this came under the idea of import substitution, aiming to create and protect local industries that would eventually replace imports and foment local markets (Evans, 1979; Barbosa, 2000).

Industrialization involved the creation of infrastructure to support local industry, including roads and hydroelectric dams, and the development of such infrastructure in a continental-sized country as Brazil depended on foreign capital (Evans, 1979). Brazil-dependent development achieved significant levels of industrialization by bor-

rowing heavily from international institutions, and the country's achievements continued to rely mostly on international capital to finance development projects such as the ones in Amazônia.

The economic growth policies chosen by the [dictatorship] government [period when the colonization of the Amazônia intensified, as well as its impacts on deforestation] relied heavily on international borrowing, increased participation of transnational capital in the economy, and expansionist monetary and fiscal policies [forwarded by the institutions lending the funds for many of the high-profile development projects taking place in Amazônia] (Campari, 2005, p. 29).

Brazil's international debt has historically not only promoted profound social effects, such as exacerbated poverty, but also had environmental implications. Its natural resources have been depleted and cheaply sold in international markets in order to obtain hard currency to service its debt (Barbosa, 2000; Kirby et al., 2006). According to Kirby et al. (2006), in 2002 alone, debt-service payments managed by the government were equivalent to 69% of the country's export earnings. Much of the money which could have been invested in improving the quality of life of citizens – in health and education for instance, social rights already consolidated elsewhere but not for the case of many Brazilian citizens – has instead made richer and more powerful the established Brazilian elite (historically represented by the *latifúndio*) and core countries where the transnational companies operating in Brazil are from.

In addition, world-systemic organizations such as the World Bank and the IMF – which naturally represent the interest of the core countries that finance them and therefore have majority voting power – have made the adoption of global capitalist tenants a requirement for a country to receive economic assistance (Barbosa, 1993). In fact, according to the Third World Network (2001), the Bretton Woods Institutions, especially the IMF, have led many Southern countries into ineffective macro-economic policies adverse to the environment. These policies have destabilized national economies and aggravated social conditions, which in turn have put pressure on resource management.

These multilateral organizations have kept national governments busy positioning themselves within a global market order under continuous currency credibility speculation (McMichael, 2000). This pursuit of globalization ultimately expresses the crisis of development, as pointed out by McMichael (2000, p. 22): 'an exclusive global process premised on eliminating the social gains of citizenship and of national developmentalism'. Clearly illustrating what takes place in Amazônia, the expansion and dominance of an export-oriented agribusiness model has advanced to the detriment of quality of life and the displacement of small, subsistence farming with the correlated intensification of social problems provoked by such migration instability.

It is not the case that these institutions are responsible for the environmental problems in Brazil as a whole, but their disregard for environmental consequences through their development assistance and macro-economic policies have exacerbated and accelerated them. 'Their financing of environmentally destructive projects in the name of capitalist development makes them systematic agents of destruction' (Barbosa, 2000, p. 21). As to better address the environmental problems taking place in Amazônia, a critical perspective which accounts for the issues previously mentioned is vital. 'Since this dilemma was created by the expanding frontier of global capitalist, solutions will require global changes' (Barbosa 2000, p. 25). What is attempted here

is not to say that the international community has the whole of responsibility for what is taking place in Amazônia. Instead, it is attempted to show that without international cooperation in mitigating the deforestation of the Amazon forest, by addressing the whole of the issues underlying the problem, Brazilian actions to overcome such a trend have little effect of achieving the preservation of such an important ecosystem for world society. As stated by Newby (1996, p. 219), 'the problem with the global commons [the Earth's biosphere and so on] is, therefore, inseparable from that of handling effective international co-operation'.

To say the Brazilian agricultural explosion is the greatest threat to the preservation of the Amazônia is to look at 'the tip of the iceberg'. The basis of the problem must be critically analyzed. After a long period of military inertia (from 1964 to 1985), Brazilian society is awakening to the problem, but local isolated achievements have little chance of changing a world-systemic pattern. Currently, experiments are taking place in many parts of the Amazônia focusing on alternative agricultural and development practices. Examples include the sustainable management of forests for timber and non-timber products, ecotourism, and the establishment of landowner-level payments for biodiversity conservation and carbon storage (Carvalho et al., 2002; Kirby et al., 2006). These initiatives promote forest-dependent land uses that provide livelihood to local inhabitants and, at the same time, incentives for conservation. However, due to the lack of international funding they are still happening at a small number (Kirby et al., 2006). Different researches have examined the benefit-cost ratio of proceeding with export-oriented development projects in relation to the returns of preserving Amazonian forest. It has been suggested that with the due development of international carbon-trading mechanisms, investing in the protection of the carbon stocks and biodiversity of the Amazon might be socio-economically profitable for Brazil in the long term (Fearnside, 1997; Carvalho et al., 2002).

However, preserving the forest is an expensive activity in the short term at a time of strong market demand for Brazilian agricultural products. As pointed by Paulo Moutinho, Research Officer of the IPAM (Institute of Environmental Research of the Amazon), the most recent decline in the deforestation rates of the Amazon has benefited the whole world, but there has been no international compensation for such effort. In his own words, 'our efforts in providing a service to the whole planet by reducing deforestation and consequently carbon emissions seem not to have any value right now' (Moutinho, 2007; author's translation). A fact that discourages further action.

If it is the Brazilian option to preserve a resource of global importance, incurring economic drawbacks, it must be compensated. If the reductions in carbon emissions promoted by the Brazilian government through decreasing deforestation were compensated through an international mechanism, the revenues would be millions, if not billions of dollars (Moutinho, 2007). This could in turn be invested in further development of sustainable projects and forest monitoring. According to Moutinho (2007), it must be understood that the option for development based in forest preservation represents to Brazil an effort as great as that of developed countries towards changing from a fossil-based energy model. In this sense, Pearce et al. (1989) argue that global environmental change presents the special challenge of which no one country alone can prevent the impacts – in our case of the depletion of the Amazônia. As stated by Newby:

Not only are the costs high in relation to consumption patterns, technological change and trading competitiveness, but there are obvious free-rider incentives to avoid such costs yet share in the benefits of the actions of others. Conversely, attempts to conserve resources or to cope with negative externalities will almost inevitably confront the problem of gross inequality in levels of exploitation and demands for redistribution – whether between North and South, or, in the short term, East and West (Newby, 1996, p. 219).

Conclusion

This paper offered a critical overview of literature on the expansion of the Brazilian agricultural frontier showing some of the incentives that have historically led to deforestation of the Amazônia by landholders. It suggested that factors related to strong export markets for soybeans and cattle may continue to provide incentives to deforestation in Brazil in the future. Current incentives to deforestation are perceived as being provided directly by transnational corporations as well as by Brazilian and international institutions. But what would be the interest of the Brazilian government in this destructive development model? Political pressure to fulfill campaign promises and clientelism (which favors the Brazilian elite established since colonial times), but certainly the foreign earnings which such export-oriented model generates. It is important to note that many politicians crafting environmental policy in Brazil are holders of *latifúndio* (sometimes representing generations of an elite), and the role of personal interest in keeping such pattern should be taken into account.

Throughout this paper, it has been suggested that, even though the Brazilian agricultural explosion is the front of deforestation, it is 'the tip of the iceberg'. If we are to make the changes necessary to preserve the richness of the Amazônia and its importance to the global environment, we must start addressing issues such as export-oriented agricultural production (controlled by transnational corporations), land reform in Brazil, North–South economic exploitation, as well as fostering sustainable agricultural practices and operationalizing transparent international mechanisms of funding for preserving primary forests. Our chances of overcoming the challenges and making the most of a sustainable development model rely on a critical analysis of such issues.

Notes

1. This article uses the Brazilian native name Amazônia to refer to what the international community calls the Brazilian Amazon basin.
2. Located in Brazil's central high plains region, the Cerrado is a tropical grassland savannah covering over 2 million km². It is considered to be the world's most biologically rich savannah.
3. *Latifúndio* in Portuguese originates from the ancient Roman expression *latifundia* (Latin: *lātus*, spacious + *fundus*, farm, estate), which in its origin refers to great landed estates specializing in agriculture destined for export.

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