Regulating Sugarcane Cultivation in Brazil

Fig. 1. Sugarcane field treated with the herbicide Roundup after six harvests, ready for replanting. The trees seen in the distance could be Areas of Permanent Preservation along the waterways. Sugar plant Ester, Cosmópolis, São Paulo, Brazil. Photo October 2010 KH.

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1 Contact: kenneth.hermele@hek.lu.se. This report is partly based on fieldwork in Brazil in the states of Goiás and São Paulo in September-October of 2010. I am much obliged to my hosts, the Masters Programme Society, Technology and Environment at the UniEvangélica in Anápolis, Goiás, and to all who shared their experiences and knowledge of sugarcane and ethanol production with me: friends and colleagues at universities, NGOs, trade unions and in the business community in Goiás, Brasília, São Paulo, Piracicaba, Campinas and São Carlos, staff of Congress, ministries and government institutions, as well as the friendly reception that was accorded me by sugarcane and ethanol plants Denusa in Indiara, Jalles Machado and Usina Goianésia in Goianésia (GO), and Ester in Cosmópolis (SP).
Part I. Land Use Institutions as Governance of Common Resources

The sugarcane-ethanol complex in Brazil is governed by – or should at least be governed by – a series of laws, regulations, and agreements regarding how, where and under what conditions sugarcane is grown and harvested. This regulatory set-up includes the Brazilian forest law and voluntary regional and national agreements between public entities, the sugarcane industry, and the labour unions, as well as international requirements for entering the markets of the European Union and the USA.

In other words, there are many regulations and many stakeholders, and this makes the Brazilian reality somewhat more complex than the discussion of how to manage common resources that has been influenced by the work of Elinor Ostrom (1990), who during the last two decades has been central to the debate, in academia as well as for a broader audience.

Ostrom takes as her point of departure an influential article by Garret Hardin, The Tragedy of the Commons (Hardin 1968). Hardin only recognized two alternatives for managing common resources: privatization or state regulation. It is this understanding that Ostrom questions, based on a series of case studies of governance institutions to manage common resources. Her conclusion is that there are many different – albeit variously effective – governance systems, not just a sterile polarization between two extremes. The official motivation for laureating Ostrom with the “Nobel prize” in economics sums up her position neatly:

“[...] based on numerous empirical studies of natural-resource management, Elinor Ostrom has concluded that common property is often surprisingly well managed. Thus, the standard theoretical argument against common property is overly simplistic. It neglects the fact that users themselves can both create and enforce rules that mitigate overexploitation. The standard argument also neglects the practical difficulties associated with privatization and government regulation.”

Ostrom argues that it is usual for the kind of abstract reasoning that Hardin exemplifies to be based on “idealized markets or idealized states” (1990:216).³ Her own account, on the other hand, is based on case studies, from which she attempts to deduct general rules of understanding of what works, and what does not, when it comes to governing common resources.

However, one point in Ostrom’s account of the management of common resources sets it apart from the case of Brazilian sugarcane and ethanol production. Ostrom underlines that her cases are instances where (op cit:26):

“the users [of a common resource] can substantially harm one another, but not situations in which participants can produce major external harm for others”. ³

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³ Hardin subsequently appeared to retreat from his first provocative formulation when he “revisited” the debate thirty years after the publication of his original article. He then recognized that he ought to have titled his article The Tragedy of the Unmanaged Commons, a correction which at first glance appears to bring Hardin quite close to Ostrom’s stance. But Hardin still only recognized two regimes, even for “managed” commons: “A ‘managed commons’ describes either socialism or the privatism of free enterprise. Either one may work, either one may fail” (Hardin 1998). Thus, Hardin remains essentially limited to his own alternatives, still suffering from binary thinking, either-or.
But the case of Brazilian agrofuel is precisely a case where “major external harm for others” is frequent, from the impact of the smoke from burnt sugarcane fields on the health and well-being of the people living in the vicinity of the plantations, to the situation of the cane cutters families when the bread winner is away for months cutting sugarcane. Similarly, the land use change taking place in the various biomes of Brazil to make room for sugarcane do impact not only locally but equally regionally and on people living far away; indeed, land use change and deforestation constitute global issues.

In other words, the scale of Ostrom’s studies is quite restricted to local and perhaps regional settings, while the Brazilian regulation is concerned with a wider range of scales, from local via national and international to global scales. The use of different scales, I argue, is especially topical when we consider global environmental issues such as climate change and biodiversity.⁴

The Convention on Biological Diversity (CBD), adopted by the United Nations Conference on Environment and Development in 1992 (United Nations 1992), tried to deal with such varying scales when stating as its main Principle (Article 3) that countries have

“the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction.”

The national and international scales are embraced in the same paragraph of the Convention, but with different implications: the right of a country to exploit its “own resources” co-exists with the need to avoid impacting negatively outside its borders. Here, a rather simplistic understanding of ecological relationships is evident, implying that negative impacts that could be made to remain within borders would be acceptable. As we will see, this distinction domestic or national scale vis-à-vis international or global scale, is not possible to maintain, at least not when the talk is of goods that are traded globally, and of common resources on an international scale.

Part II. Work in the Sugarcane fields

The way the sugarcane sector in Brazil is depicted by the sugarcane industry is seductive: clean, carbon neutral, geopolitically secure, without ecological or labour drawbacks, the ideal raw material for fuelling the world’s automobiles. As we are led to understand in a recent publication by UNICA – the Sugarane Industry Association in São Paulo, the Brazilian ethanol industry’s leading lobby group – ethanol is socially beneficial, environmental friendly, and economically profitable (UNICA 2009:8).

However, already a superficial visit to one or two sugarcane growing districts will disclose a totally different picture, at least for the part of the production process where manual labour is essential: the cutting of the sugarcane is arduous, dirty, and hazardous work, and the living conditions of the workforce is degrading. It does not help that the ecological consequences also are dubious, at least when it comes to sugarcane’s impact on biodiversity.

⁴ The importance of scale is stressed in the tradition of Political Ecology, see Paulson & Gezon (2005).
All sugarcane that is cut manually is first burned on the preceding night in order to facilitate the cutting as superfluous parts of the cane not useful for sugar production is eliminated. In this way, productivity is increased, and so are pulmonary infections and diseases, also for people not directly involved in the cutting but living in the vicinity of the sugarcane areas, or in urban settlements near by. The smoke that is emitted contains cancerogene substances coming from the chemicals applied to the sugarcane in order to increase production. Studies show that the frequency of reported pulmonary problems almost doubles during the burning season in Ribeirão Preto, São Paulo, the prime sugarcane region of Brazil (Silva 2010a).

Fig. 2 and 3. Clean and not-so clean sugarcane

Fig. 2. Very clean sugarcane. From UNICA pamphlet. Photo KH.

Fig. 3. Not so clean cane cutter, Denusa, Indiara, Goiás. The sky is covered by smoke and the air is full of soot. Photo September 2010 KH

Box 1. Laws, Regulations and Agreements concerning manual sugarcane cutting

A series of regulations – legally binding or voluntary – establish the conditions for the manual labourers on the sugarcane plantations.

1. Law prohibiting slave labour.
   Article 149 of the Brazilian penal code “Reduction of conditions analogous to slavery” metes out a punishment of 2-8 years imprisonment for anyone who uses compulsion, exhaustive working days, degrading working conditions, or limits the possibility for indebted employees to leave their employment. The Ministry of labour provides a website where violators of this law are listed, the “Dirty List” (Lista Suja, see http://www.mte.gov.br/trab_escravo/lista_suja.pdf; 2011-02-10) By end-December 2010,
214 firms and farms were on the list; such enterprises are blocked from federal public finance and some private banks also follow suit.

2. **Regulatory Norm.**
   A national Regulatory Norm regarding “Safety and Health in Agricultural Work” was adopted in 2005 (see Norma Regulatora NR 31 2005). The cane cutter in Fig. 3 is equipped with gloves, cap, glasses, shirt, shoes and leg protection, all part of what NR 31 stipulates. However, he does not carry the facemask that he needs to protect himself from the smoke.

3. **Collective agreements.**
   Collective labour agreement for the sugarcane sector which stipulates how salaries are paid, piece rates for different quality of sugarcane, working hours and working days, the right to safety protection (and other rules of NR 31) as well as the right to leave-of-absence for menstruating women (without remuneration; see Convenção Coletiva 2010).

4. **Voluntary Agreements.**
   A voluntary agreement – see Protocolo de cooperação 2007 – to mechanize the harvesting of sugarcane in the state of São Paulo has been signed between the state government and UNICA to terminate all manual harvesting by 2014 (for land with slopes less than 12 degrees). The agreement thus is more demanding than the national regulation which stipulates full mechanization only by 2021. For slopes over 12 % the time limit for total mechanization is set for 2017 (as compared to the national goal 2031).

   A national agreement to improve labour conditions (see Compromisso Nacional 2009) was concluded in 2009 between trade unions, the sugarcane industry, and the federal government to secure “decent work and quality of life” in the work on the sugarcane plantations. The agreement explicitly refers to NR 31 but also promises to prohibit the use by the employers of recruiting middle men (called “gatos”, cats) who often trick migrating cane cutters into debt on their way to work, a prohibition which also is part of collective agreements.

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**Box 2. Daily toil of a cane cutter**

Cutting cane manually is hard work, carried out by approximately several hundred thousand workers during the harvesting season (which runs from April to October), the majority are young men in the age brackets below 30 years, many are migrants from the North and NorthEast of Brazil, but many also live in the vicinity of the sugarcane plantations; approximately 10 percent are women.

The only work tool is a machete, which the worker sharpens and sometimes adapts to his/her own cutting technique. On the sugarcane plantations that I visited, most of the requirements of the NR 31 were followed (protective equipment, bus transport, lunch brakes in the shade), perhaps exceptional cases if we are to go by many studies of the working conditions of cane cutters.

Pay is according to a piece rate system, where the workers are getting paid by tons cut, but in order to facilitate the measurement of their work, weight is transformed into metres cut of five rows (“linhas”) of sugar cane plants. Depending on the quality of the sugarcane, whether it is standing up or lying down after being burnt, etc, the foreman establishes a rate in kgs per meter, higher for the cane that is more difficult to cut, lower for the easier cane. The outcome is that workers who are given less productive rows to cut, still make approximately as much as they would have, had they been given easier rows.
The average production has increased substantially, today 12 tons per worker and day is held up as “norm” in a race towards ever higher performance: in the 1950’s average daily production was 3 tons, in the 1960’s 6 tons.

According to measurements of average work days, this is the day of a cane cutter: He/she walks 8800 metres a day, bends down and strikes close to the ground with his/her machete 133 332 times, makes 36 630 rotations of his/her spine, loses 8 litres of sweat daily. He/She also carries the 12 tons of sugarcane in 800 instalments of 15 kgs each (Alves 2006).

The minimum pay in Brazil is only 510 reais (300 USD end 2010) and a cane cutter may make twice or even three times that during the months of the cane harvest. On a yearly basis, however, the pay is not that impressive, even for Brazilian conditions.

Accidents caused by stress, exhaustion and over-exploitation are common, workers’ heartbeat in the sun is exceedingly high, as is the overall strain. More than 20 workers are reported to have died in the fields or in connection with exaggerated workloads 2004-2007 (Rede Social de Justiça e Direitos Humanos 2008).

Slave labour is reported in frightening many instances: for the whole of Brazil 6-7 000 workers were liberated on average each year 2005-2009, half of which were kept in slavery to work on sugarcane plantations. During the same period, approximately 30 people were killed each year in local struggles, and numerous conflicts about access to and ownership of land occurred, involving an average of 750 000 people each year (CPT 2010:16, 173). These struggles take place all over Brazil, there are no exceptions for more “developed” areas as compared to the poorer and more “backwards”.

An especially noteworthy case of slave labour included Cosan, the leading sugarcane corporation in Brazil (Mendonça 2010). Cosan blamed the recruiter of labour (the “gato”) it had used for the slave conditions of the workers; but according to national agreement, as well as following the collective agreements entered into by Cosan, no such middlemen are to be allowed.  

All in all, it can be said, without exaggeration, that although there exist good intentions on the legal  

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5 The practice continues, however, and “gatos” now advertise “Excursions to São Paulo” since open recruitment is no longer acceptable. (Interview Maria Luisa Mendonça).
as well as the voluntary level, reality is still extremely exploitative. The average “useful” life of a manual cane cutter is only 15 years, which makes his or her working life in the sugarcane fields shorter than during the times of slavery in Brazil, where the slaves at least lasted 20 years (Silva & Ribeiro 2010:3).  

The trend towards mechanized harvesting will change most of this, however. Although manual harvesting can be expected to continue on the plantations with less suitable lands—and apart from some tasks which always will be handled manually also in otherwise mechanized plantations due to steep slopes, stony grounds, or areas with difficult access, as well as the (primarily female) task of picking up what the harvesters miss to collect, called “bituca” – mechanization is arguably being introduced on ever more plantations. The demands of the market, internationally but also domestically, for instance by the dominating distributor Petrobras, require the termination of burning and manual cutting (as the two are linked). Already today, approximately half the sugarcane harvest is mechanized, with higher rates in the South and lower in the NorthEast.  

Mechanization is most frequently presented as a result of the demand from the overseas markets, which do not accept that a supposedly clean biofuel is produced under slave-like conditions that remind us of the 16th century. But although such pressure may constitute the main driver, there also exist other factors that have contributed to this shift. For one, profit motive: a harvester replaces 80-100 workers, and the average cost per ton harvested is almost halved. (Interview Fábio Alves de Moura).

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Exceptions exist, of course, especially in the macho culture of cane cutters. As an example, a trade union representative said he had cut sugarcane for 20 years and managed 12 tons/day. (Interview Valdemar Garrido).

And the “oldest cutter” at a plant in Cosmópolis, 61 years old, after more than 50 years of cane cutting, proudly stated that “work don’t kill nobody, otherwise I’d be dead!” (Interview Paulo Panceroli).

This level of production may earn the cutter the “golden machete” premium – padrão de ouro – sometimes amounting to a motorbike, more frequently “uma cesta básica” (basic food needs). (Interview Antônio Canuto and Isolete Widriweski).

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Surprisingly, there has been a movement to stop the trend towards mechanization, or at least to slow it down. With this purpose, a law was proposed in 2008 at the state parliament of Goiás, aiming to block mechanization rates above 50 percent of a plantation until 2020, and only allowing the mechanized area to grow to 70 percent by 2030. In other words, 30 percent of the harvesting is to be done manually, at least for the coming generation. The concern here, of course, is employment, which the proposed law wants to protect. (Projeto de Lei 2008, proposed by a member of the Partido Democrático Trabalhista, PDT, part of the ruling PT alliance). No mention is made of work issues or health problems related to cane cutting.

All this will most likely be in vain, as stressed by one of my interviewees: Recalcitrant sugar cane plantations will have to conform to the overall trend, the “market” simply will not permit continued burning and manual cutting. (Interview Eduardo Assad). One indication that this is so, is that São Paulo is not alone in fostering mechanization: also the state of Minas Gerais concluded a similar agreement in 2008, see [http://www.siamig.org.br/dmdocuments/Protocolo%20Minas%20Gerais%20-%2013-08-08.doc](http://www.siamig.org.br/dmdocuments/Protocolo%20Minas%20Gerais%20-%2013-08-08.doc).
Another factor is the fact that workers are known to resist the exploitation by different actions that will decrease the yield of the plant without endangering their own pay. For instance, small scale resistance (called “resistência miúda”) can consist of hiding uncut sugarcane below the heaps of cut cane that the workers gather for transport to the mill, or by cutting too high above the ground to speed up cutting and save strength; since the pay is according to metres cut, only the factory will suffer a loss (Silva 2008:21, Silva & Ribeiro 2010:7-8, interview Maria Aparecida de Moraes Silva).

Also contributing to this shift towards mechanization have been frequent strikes, and especially the major one that occurred in 1984 in São Paulo (Moraes 2007, Alves 2006, Silva & Ribeiro 2010:7). Also the fact that the children of today’s cane cutters prefer to stay away from the sugarcane fields and aspire to find employment elsewhere rather than being subjected to the degrading working conditions on a sugarcane plantation have pushed the sugar and ethanol industry in this direction (Plancherel et al, n d, Assad de Ávila et al 2010, interview Mário Ávila and Silvia Assad de Ávila, Maria Aparecida de Moraes Silva).

However, although mechanized harvesting would do away with some of the worst characteristics of manual cane cutting by getting rid of most of the cutters, there also exist problems related to mechanization, especially when it comes to its environmental consequences. Land will be ever harder and more compacted, with increasing dangers of water and wind erosion; likewise, efficient mechanization requires that there are no obstacles along the roads and fields, which may further endanger biodiversity (although the stop to burning will enhance it). (Interview José Paulo Pietrafesa).

In the face of this trend of mechanization, primarily in the state of São Paulo but increasingly also in other states, there exists an urgent need to protect the cane cutters’ livelihood and employment. Some of my interviewees did not want to enter into a discussion that they felt was too speculative – “I prefer to talk of what is, not of what may be”, as both Maria Luisa Mendonça and Maria Aparecida de Moraes Silva told me – and they also felt that the reforms of the labour process of the sugarcane plantations ought not to be separated from the wider issues of land reform and access to land for the landless (a point that also was stressed by Verena Glass).

This stance is then combined with an attempt to improve “what is”, i.e. the continued plight of the manual cane cutters, in order to achieve decent working and living conditions. The principal issue seems to be the stress that the ever increasing demands for a minimally acceptable salary exerts on the individual cutter, together with the strain that the heat and smoke brings. Hence, if we look for solutions other than doing away with burning and the manual cutting, some measures have been suggested: fixed salary, no piece rate, maximum production standards, no burning of the fields prior to cutting, no working at high temperatures, decent living conditions, etc, all this could possibly make manual cutting acceptable. Also families should be able to accompany their husbands and fathers in order

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8 The proposals were discussed with Maria Luisa Mendonça and Maria Aparecida de Moraes Silva.
9 But I am doubtful, not only about the possibility to resist the mechanization trend, but also about its advisability. I tend to concur with one of my interviewees, who maintained that manual cutting kills people, and that it has to be stopped. (Interview José Paulo Pietrafesa). In other words, the laws, norms and voluntary agreements that have been established do not manage to change the essence of manual cane cutting, and not
to put an end to the isolation of the women – known as “viúvas de maridos vivos”, widows of living husbands – who remain in the poor home villages of the migrant workers. (Interview Verena Glass).

Compare this with what sugarcane enterprises are offering, in the form of re-educating the soon to be superfluous cutters, or to engage them in other manual tasks at the plants: UNICA proudly announces that they are letting 7 000 cutters pass through a programme of re-education to soften the blow of mechanization, a small effort considering the number of manual cutters involved. A similar idea is to employ some of the redundant cutters to take care of other crops on the plantation, such as natural rubber.

**Part III. Brazil’s Forest Law**

The Brazilian post-dictatorship constitution of 1988 accepts varying kinds of ownership of land, but underlines the social function of the ownership and the use of the resource (see Article 186 of the Constitution, and Sauer 2010). The constitution unequivocally states that “all [citizens] have a right to an ecologically balanced environment, a good of common use to the people” (Article 225). This turn of words – a good of common use – was not new to the democratic constitution and had already appeared in the forest legislation that preceded it.

The 1934 and 1965 forest laws Already the forest law of 1934 contained in its opening Article a statement which safeguarded the common social value of forest resources (see Ahrens 2003:5):

“The forests of the national territory, seen as a whole, constitute goods of common interest to all the inhabitants of the country”.

This was subsequently followed up by the forest law of 1965 (during the military dictatorship, see Presidência da República 1965) which declares in its Article 1 that Brazil’s forests “are goods of common interest to all the inhabitants”; the right that ownership bestows on the owners of such goods should be used “with the limitations that the law” establishes.

The forest law, as it stands today, has quite far-reaching demands on private property owners, who must set aside two separate areas for preservation and biodiversity purposes: a
Legal Reserve (Reserva Legal, RL) and an Area for Permanent Preservation (Área de Preservação Permanente, APP):

- The Legal Reserve is different for the various biomes of Brazil; in the Amazon biome, 80 percent of private property holdings are to be set aside; for the Cerrado biome within the Legal Amazon, the share is 35 percent.
- For the remainder of the Brazilian territory the reserve should be 20 percent. This lower requirement also applies to the Cerrado outside of the Legal Amazon.
- The Legal Reserve may be secured outside of a given piece of land as long as it is situated in the same hydrological basin.
- The Areas of Permanent Preservation are stipulated in metres on each side of water bodies (rivers, lakes etc), steep slopes, hilltops, and high altitudes (> 1800 m above sea level). Depending on the width of the water body the requirements vary.  

The forest law can be seen as trying to protect biodiversity in sensitive areas (especially the Amazon) and in connection with water bodies, while also fighting erosion and protecting the water cycle. Here, the conservationist perspective is seen as more important than the economic concerns.

Simultaneously, the law may liberate other areas for economic activities (or should I say, following the Convention on Biological Diversity, exploitation?), which is obvious from the varying requirements that it applies to the different Brazilian biomes, most importantly the Cerrado (which was largely intact at the time of the law, while some of the other biomes already had been seriously damaged).

Although the Amazon is regarded as containing the world’s richest biodiversity resources, it is the Cerrado which has been named one of the 25 global biodiversity hotspots on account of its high biodiversity density in combination with the threats that the biome is facing (see Myers et al 2000; in addition to the Cerrado, another Brazilian biome is also a biodiversity hotspot, the Atlantic Forest, N° 5 in Figure 6). The two biomes, the Amazon and the Cerrado, are also similar with respect to what deforestation means for climate change. Although the Amazon harbours much more greenhouse gases (per hectare) above ground, the Cerrado contains relatively more below.  

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13 Article 2 of the forest law stipulates the following APPs along rivers: 30 metres for rivers 10m wide, 50m for rivers 10-50m wide, 100m for 50-200m wide, 200m for 200-600m wide, and 500m for rivers wider than 600m.
14 According to Neves do Amaral et al 2008:122-123 the carbon dioxide content per hectare (above and below ground) is approximately 80 Mg/ha for Cerrado and 270 Mg/ha for tropical rain forests.
Box 3. Brazilian Vegetation Zones (biomes)

In Brazil, a distinction is made between the state of Amazon (Amazonas), the biome Amazon (Amazônia), and the “legal Amazon” (Amazônia Legal).

- The Amazon biome (N° 1 in Figure 6) covers almost half of Brazil’s territory, 49 percent, including all of today’s states of Acre, Amapá, Amazonas, Pará and Roraima, and parts of Rondônia (98 %), Mato Grosso (54 %), Maranhão (34 %), and Tocantins (9 %).
- Legal Amazon is the totality of all the states (and the lion’s share of Maranhão) that harbour parts of the Amazon biome, totalling 61 % of Brazil’s territory (see Fig. 7).

Fig. 6. The Brazilian Vegetation Zones (“biomes”)  
Fig. 7. Legal Amazon

Source Fig. 5: WWF Brazil, [http://www.wwf.org.br/informacoes/questoes_ambientais/biomas/](http://www.wwf.org.br/informacoes/questoes_ambientais/biomas/).
The Brazilian vegetation zones are fixed at the time of the arrival of the first European colonizers, approximately 1500.

Source Fig. 6: Haller et al 2000. The Legal Amazon encompasses the states of Amazonas (AM), Acre (AC), Rondônia (RO), Mato Gross (MT), Tocantins (TO), Pará (PA), Amapa (AP), Roraima (RR) and most of Maranhão (MA).

- The Cerrado, which covered 24 % of Brazil’s territory (N° 4 in Figure 6), was the dominating vegetation cover of the Distrito Federal (100 % of the area) as well as the states of Goiás (97%), Maranhão (65%), Mato Grosso do Sul (61%), Minas Gerais (57%) and Tocantins (91%); minor areas of Cerrado were also found in another six states (IBGE 2010).
For administrative purposes, Brazil is divided into five regions: *North* (Acre, Amapá, Amazonas, Pará, Rondônia, Roraima), *NorthEast* (Alagoas, Bahia, Ceará, Maranhão, Paraíba, Pernambuco, Piauí, Rio Grande Norte, Sergipe), *SouthEast* (Espírito Santo, Minas Gerais, Rio de Janeiro, São Paulo), *South* (Paraná, Santa Catarina, Rio Grande do Sul) and *SouthWest* (Distrito Federal, Goiás, Mato Grosso, Mato Grosso do Sul, Tocantins).

**Effectiveness of the Forest Law**

Although the forest law in no way has stopped the deforestation processes taking place in Brazil, it has had an influence on where and how they evolve. A certain slow-down of the speed of deforestation in the legal Amazon has been noticed during the last couple of years: while the annual deforestation recorded in the 1980s was of the order of 20 000 km$^2$/year, today this rate has been halved, to 11 000 km$^2$/yr 2007-2008 (Sawyer 2009:150); last year, 2010, the rate declined even further, reaching 6 500 km$^2$ (www.ecodebate.com.br, 2010-12-28). However, in the Cerrado, with much less attention, national and international, deforestation has continued apace, estimated at 22 000 km$^2$/yr. (Embrapa 2008:10, Fischer et al 2008:42).

This constitutes in essence a shift in the deforestation logic from the Amazon to the Cerrado, and the overall deforestation which has taken place in the Cerrado is greater than in the Amazon, both in absolute and in relative terms. While the Amazon is estimated to have lost approximately 700 000 km$^2$ (or 20 percent of its total area), the Cerrado shows a loss of 800 000 km$^2$ (or 40 percent of its total area, Sawyer 2009:150-151). From being the dominant cover in the whole of the Centre-West, the Cerrado now is threatened, although 60 percent remains.

The net effect of larger areas of deforestation of Cerrado lands may have an impact on the climate similar to the relative more limited deforestation taking place in the Amazon. But although the effects of deforestation may be similar, at least operate in the same direction, it is mostly the Amazon which has caught the world’s attention, a fact which the forest law has contributed to.\(^1\)

Put in other words: the Brazilian forest law, while extending wide-ranging protection, at least formally, to the Amazon biome, and to the Legal Amazon in general, simultaneously liberates other regions of Brazil for deforestation (or accepts the deforestation that already has taken place). Thus, the forest law presents contradicting objectives where the economically most promising areas – such as the Cerrado – are being less restricted than the more “visible” regions such as the Amazon, a biome that has figured centrally in the international environmental debate for decades.\(^2\) Sawyer (2009:151) even concludes that

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15  The Cerrado may not be as forgotten as I postulate, though: a “Google test” gave “Amazonas” 24 million hits and “Cerrado” almost as many, 22 million (2011-01-03).
16  The reader may need to be reminded that the forest law discussed here only applies to privately held land properties. The areas already set aside as Indigenous lands (Terras indígenas) and for conservation purposes (Unidades de Conservação), which together cover 20 percent of Brazil’s area, are not covered by the forest law (Sparovek et al 2010:6049).
the total contribution to climate change from the Cerrado has been greater than from the Amazon (ibid). 17

**Part IV. Assessing the Brazilian Forest Law at Different Scales**

**Scale 1: Local Land Use**

The Brazilian forest law may be seen as successful only if we judge it exclusively by one of its purposes, to reduce deforestation in the Amazon biome. Here, at least, a slow-down has been noticed. Another way to evaluate the forest law, however, is to measure the degree of compliance with the required Legal Reserves and Areas of Permanent Preservation.

A recent survey concludes that “the legal frameworks do not effectively achieve the objectives of protecting water and native vegetation on private farmland in Brazil.” (Sparovek et al 2010:6050). The basis for this strong conclusion is that a large share of the land that should be set aside for biodiversity and conservation purposes in fact does not appear as RLs or APPs. Thus, in this perspective, the forest law has been a gigantic failure. 19

**Scale 2: National Land Use Change**

A central concern when interpreting the effectiveness of the forest law hinges upon how one sees the process of expanding sugarcane cultivation, as a process of peaceful co-existence food-feed crops, or as a conflictual process where varying land uses collide with each other: new crops with old crops, new crops with old pastures, new crops and new pastures with forests. As exemplified by the sugarcane zoning exercise (discussed in Box 4), the Brazilian government uses scale – the gigantic areas supposedly available for use – as the pacifying response to all talk of conflicting land uses. 20

**Box 4. The Misuse of Big Numbers**

When discussing Brazilian agriculture and forest institutions, the actual areas concerned are very large; but in terms of their share of the Brazilian territory, they are quite small, almost insignificant. This can be taken advantage of by any stakeholder who wishes to belittle the impact of any particular use of land.

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17 The Cerrado may be gaining in importance politically: after the UNFCCC conference in December 2009 (the so called COP 15 in Copenhagen), Brazil announced its “intention” of reducing its future emissions of greenhouse gases by 36-39 percent by 2020 (compared with what the emissions would have been without any mitigating policies), including savings in the Cerrado as the second most important reduction after the Amazon. See Brazil’s statement to the UNFCCC, [http://unfccc.int/files/meetings/application/pdf/brazilcphaccord_app2.pdf](http://unfccc.int/files/meetings/application/pdf/brazilcphaccord_app2.pdf), (2010-02-01).

18 Of the 233 Mha of Legal Reserves theoretically required, this survey could not find at least 42 Mha; of the 100 Mha required for the APPs, at least 43 Mha – or almost half – could not be detected. (Sparovek et al 2010a:5).

19 This is not a new understanding of the ineffectiveness of the law. Already based on information of the forest cover in 1996 – that is fifteen years ago – it has been shown that most Brazilian states did not have enough forested areas to comply with the requirements of the law: none of the states with required RLs of 80 percent had enough forest cover left; the more lenient demand of 20 percent LR could only be found in another 13 out of 21 states; in other words, a further 8 states did not even have this more limited protection (Alston & Mueller 2007:37-38; the existence of the APPs was not discussed in this study).

20 As was repeatedly stressed to me, “no Brasil há muita terra”, Brazil has lots of land. (Interview Eduardo Assad).
Take the growth in sugarcane production that recently has occurred in Brazil: today the total area of sugarcane – half for ethanol, half for sugar – is approximately 8.9 million hectares (Mha), twice as much as only a decade earlier. This has turned sugarcane cultivation into one of Brazil’s most widely spread crops, superseded only by soybeans (which occupied as much as 24 Mha 2010) and maize (13 Mha 2010, see Conab 2010). As a consequence, sugar was Brazil’s fourth most important export product in 2010 (after iron ore, oil, and soybeans).

However, the Brazilian government can show that this still is only a marginal share of the available land area of the country, in fact less than one percent. Even if we consider doubling sugar production the coming years, as the government does by 2017, the new areas will only require another 1 percent. Table 1 replicates how this is portrayed in the official presentation of the Brazilian zoning exercise to identify suitable areas for sugarcane.

<table>
<thead>
<tr>
<th>Table 1. Sugarcane cultivation and Brazil’s land area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millions ha</td>
</tr>
<tr>
<td>Total area</td>
</tr>
<tr>
<td>Arable lands</td>
</tr>
<tr>
<td>Used arable lands</td>
</tr>
<tr>
<td>Areas suitable for sugarcane</td>
</tr>
<tr>
<td>Sugarcane areas today</td>
</tr>
<tr>
<td>Sugarcane expansion until 2017</td>
</tr>
</tbody>
</table>

*Source: Zoneamento Agroecológico de Cana-de-Açúcar 2010*

The presidential decree that accompanied the zoning exercise (presented in Table 1, see Decreto No 6961, 17 September 2009, p 3) concluded that the future expansion of sugarcane cultivation – after setting aside lands that ought not to be considered such as the Amazon and Pantanal biomes, land with steep slopes, the APPs and the Legal Reserves – could take place without impacting “directly” on today’s areas dedicated to foodcrops.

Hence the foregone conclusion of the zoning exercise is that there exists no competition with environmental objectives (since all those areas were already set aside), nor with food security issues (since there are pastures available to be planted with sugarcane).

This result is then misused by UNICA in a statement to the European Union which erroneously claims that the sugarcane zoning “forbids” sugarcane expansion in areas rich in biodiversity. But the zoning is an indicative planning instrument with no legal power whatsoever (see Comments by UNICA to the European Commission’s Consultation on Indirect Land Use Change Impacts of Biofuels, 29 October 2010, [http://english.unica.com.br/download.asp?mmdCode={1B7F9877-BDD0-4B66-8959-1E4BB6012AE8], 2010-02-01]).

And should not scale as such be reassuring enough, an authoritative state-of-the-art publication published by the FAO, the UN Economic Commission for Latin America ECLA, and the Brazilian development bank BNDES, unequivocally assures us that the expansion of sugarcane “occurs on pastures” (BNDES & CGEE 2008:14). As this is only part of the story – not totally untrue, but also not the whole story – which legitimizes the fact that BNDES supports sugarcane expansion, including ethanol production, through the largest programme of its agro-industrial portfolio, close to 6 billion Reais (4 billion USD) in 2009 (BNDES 2010).

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21 José Goldemberg, a physicist at the University of São Paulo, who wrote this introduction to the study, has been secretary of state in the Brazilian ministry of the environment and participated in a lead role at the Rio Earth Summit 1992.
Reality is more complicated than assuming a never-ending expansive agricultural frontier, and that no sugarcane pushes out crops or leads to deforestation. A study of land use change in the main sugarcane areas of Brazil showed that sugarcane had replaced crops and pastures – with about half each, crop displacement being the slightly larger share, with the more pronounced decline in the areas dedicated to maize. Deforestation, on the contrary, only accounted for one percent of the new sugarcane areas.22

Similar conflicting patterns of land use have been reported for the Cerrado as a whole (Ribeiro et al 2009), while detailed studies of the state of Goiás (in the CentreWest, the main expansion area for sugarcane during the present period, although a minor producer compared to São Paulo) show still more worrying data with as much as 20 percent of sugarcane expansion taking place in Cerrado and other forest covered areas (de Castro et al 2010:183).

However, the fact that only a minor share of the lands taken over by sugarcane were forested, with large variations, should not lead us to conclude that there is no land competition. On the contrary: a chain of land use transformations seems to be taking place in Brazil, and it has been described as a continuous and sometimes circular process, depending on the quality of the land in question (see Fig 8):

**Fig. 8. Transformations in the status of a given piece of land over time**

![Diagram of land use transformations](image)

*Source: Fearnside 2008, Fig. 3. The case depicted is land use change in the Amazon.*

“The land in a particular place may start as public land and be invaded either by large ‘grileiros’ [landgrabbers], by individual squatters, or by ‘sem terras’ [landless]. Ranchers may purchase large blocks of land from ‘grileiros’ or may buy a number of

22 See Aguiar et al 2009. This study covered the main sugarcane states of Brazil for two cropping seasons, 2007/08 and 2008/09: São Paulo, Minas Gerais, Paraná, Mato Grosso do Sul, Goiás and Mato Grosso. In a cautious assessment, sugarcane expansion during the cropping season 2007/2008 took place on areas previously covered with pastures (67 %) and by other crops (31 %, mostly soybeans and maize); a further 2 percent was grown on Cerrado lands. (Neves do Amaral et al 2008:123). Thus, and although deforestation is only a small share of the expansion of sugarcane, we have “proof of the crime”. (Interview Laerte Guimarães Ferreira).
small colonist lots. The ranches can be invaded by squatters or ‘sem terras’, or, if the land is economically attractive for soybeans, the properties can be sold to capitalized farmers.” (Fearnside 2008).

These are only some of the actors involved in the land use changes taking place in Brazil. Land is simply not acquired – and forests not cut down – exclusively for agricultural or forestry purposes. Land is transformed in a complex socio-economic process where speculation and money laundering, drug trafficking and illicit mining, cattle raising and logging mix and blend (Hecht 2005:385–386, Sawyer 2009).

Differences in land prices are relevant indicators of these processes as the country as a whole can be said to constitute one market when it comes to land. In the state of São Paulo, the main sugarcane area, land prices (in fixed terms) increased more than fourfold 1999-2008 following the expansion of sugarcane in that state (Novo et al 2010:783). Thus, a landowner who sells a plot in the South, SouthEast or CentreWest may use his money to acquire many times as large a holding in the North (Sawyer 2008:1750). In other words, land use change has a multiplier effect, which impacts different regions differently, depending on the price of land, moving up and down along the various scales of land use change.\(^{23}\)

The areas taken over from pastures or food crops by sugarcane and soybeans enable much larger land acquisitions in other parts of the country, and indeed in other parts of the world, as land markets are increasingly international. A first indication of this is the growing presence of Brazilian commercial farming capital in the Bolivian Amazon (Hecht 2005); another is the increasing interest of international agricultural enterprises in Brazil, especially in the two growth areas soybeans and sugarcane (FASE 2009).

**Scale 3: International**

The Brazilian law must also be evaluated against the international stakeholders, whose policies have a direct impact on the land use pattern in Brazil, since a considerable share of the agrofuels on the international market in the future in all likelihood will be grown on Brazilian lands. Mandatory blending of ethanol and biodiesel is stipulated in an increasing number of countries, most importantly (in terms of the impact on production) in the USA and the EU: while US mandatory requirements are set in volumes – the US market shall use 136 billion litres of ethanol and biodiesel, twice the global production today, by 2022 (see [http://www.epa.gov/otaq/fuels/renewablefuels/index.htm](http://www.epa.gov/otaq/fuels/renewablefuels/index.htm)) – the EU has opted for a 10 percent agrofuel blend by 2020. The trend is strong in many parts of the world, and it is further pushed by international organisations such as the FAO, the International Energy Agency, and the IPCC, with claims that biomass energy is “clean, healthy, renewable, sustainable, environmentally friendly with zero net carbon emissions, commercializable (thus

\(^{23}\) One attempt to belittle the competition sugarcane-forests is especially misplaced, namely by comparing the huge areas deforested in the Amazon with the comparatively small areas dedicated to sugarcane. The underlying query is: how can large-scale deforestation be explained by small-scale sugarcane expansion? In this tradition, the same a state-of-the-art study concludes that “the production of bioethanol does not imply deforestation” as the area cleared in the Amazon 1998-2007 was ten times larger than the area where sugarcane for fuel was introduced (BNDES & CGEE 2008:195). But this neglects the more realistic assumptions that the effect of sugarcane replacing pastures and crop lands leads to more land pressure in other parts of the country on account of the price differences: more expensive lands sold in the South are turned into larger areas of cheaper land in the North.
profit yielding), competitive, and socio-economically beneficial” (Kuchler 2010:1338 summing up the key words in the jubilant discourse on agrofuels).

Box 5. Sugarcane only in safe areas?

A favourite image of UNICA, included in many of its powerpoint presentations (eg. when the Swedish minister for enterprise and energy, Maud Olofsson, visited UNICA in November 2008), is shown in Fig. 9, where the sugarcane districts of Brazil are located far from the coveted Amazon. With this image, it is easy to conclude that sugarcane expansion constitutes no threat to the Amazon rain forest. The admittedly few sugarcane plantations that exist within the Amazon biome are left out of this map altogether, which of course reinforces the image of non-competition sugarcane-rain forest.

That the central expansion areas of sugarcane already have contributed to – and continue to contribute to – the deforestation of other major Brazilian biomes – the Atlantic forest and the Caatinga and the Cerrado, see Fig. 1 – does not appear to be of any concern to the sugarcane industry.

Fig 9. Sugarcane production in Brazil and the Amazon biome according to UNICA.

This rosy characterization seems somewhat exaggerated, however, considering that feedstocks for agrofuels, also in Brazil, are grown in competition with food in one form or the other (either as food crops, as feed crops, or as meat).

There is also a domestic component to this international effect. The Brazilian state subsidises the expansion of commercial crops – primarily soybeans and sugarcane – and simultaneously opens the door for international agribusiness corporations. This support goes from cheap credits, via the construction of infrastructure, especially roads and railroads, which open up new areas for commercial agriculture, to the plan announced
recently to build one or two ethanol pipelines ("alcooldutos") connecting the major sugarcane production areas with the coast (Pietrafesa et al 2009). Today, after spending public funds "for decades", the Brazilian state is offering domestic and foreign capital lands it can portray as “ready, productive and technologically efficient” (Pietrafesa et al 2010:14).

The list of international stakeholders here is truly stunning: large transnational corporations in the energy and agribusiness field – from Dreyfus and Cargill to Dow Chemical and Shell – are competing for Brazilian land resources with countries such as China and India, some of this in joint ventures, such as when Japan entered into negotiations with Petrobras for the construction of one of the ethanol pipelines (Wilkinson & Herrera 2010:751-752, Repórter Brasil 2010:58-59).

Part V. A new Forest Law – Adapting to what reality?
A reformulated forest law (see Câmara dos Deputados 1999) has been a contentious issue for over a decade and is first now, it seems, ready to be accepted by the Brazilian Congress after a series negotiations and compromises (Interview Titan de Lima).

The proposal has been called the “Chain Saw Law” ("Lei Motoserra", see Cruz 2010, FASE 2008), which gives you an idea of how the critics view it: as a reduction of the protection and as a wholesale sell-out of the impressive (albeit not fully applied) rules for protection and preservation of biological diversity.

But the proposed changes can also be seen in the light of the failure of the present law to gain compliance from its stakeholders: it is now claimed that the law is too demanding, and that the reason for non-compliance is to be found in the overzealous requirements to set aside lands for protection and preservation. The overall tendency of the proposal for a new forest law goes in this direction:

- The Legal Reserve (RL) requirements are reduced, from 80 % to 50 % in the Amazon biome, and to 20 % in the remainder of the country. The major weakening here – apart from the Amazon itself – concerns the Cerrado, which receives no special protection (that is a reduction of its legal reserves from 35 to 20 percent in the Legal Amazon).

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24 The issue of degraded lands, available for sugarcane expansion, is highly controversial in Brazil. My interviewees span the opinions that, of course, there are lots degraded lands available, 60 Mha, mostly pastures (Interview Eduardo Assad), to the position that the idea of degraded lands is highly questionable (or as one interviewee put it: é pura mentira, it’s a simple lie. (Interview Verena Glass, Maria Luisa Mendonça). In any case, it was stressed, degraded lands far away from the sugar plants are of no use since the harvested cane must be brought to the plant immediately after cutting in order not lose value. (Interview Sérgio Sauer). The ideal size of a plantation is thus considered to be approximately 15 000 ha for a plant of 1 Mton of cane; today new plants have an ideal production of 3 Mtons. (Interview Wellington Silva Teixeira, Henriques Penna de Siqueira).

25 Also less dramatic wordings evaluate the proposal in this light: a recent exchange in Science (vol 329:276-277, 1282) carried strong headlines: “Brazilian law: Full speed in reverse?” and “No return from biodiversity loss”, respectively. Likewise, the Brazilian Academy of Sciences and the Brazilian society for the advancement of Science in a joint statement (25th of June 2010) characterized the proposal as being framed “by stakeholders who would irreversibly hurt our natural ecosystems and the environmental services they perform”. See http://www.abc.org.br/article.php3?id_article=719.
Small-scale property owners are exempt from the requirement to establish legal reserves; in principle no reserves would be required if only all properties are divided into farms of less than four fiscal units. If this is accepted, the required areas of RLS would diminish by 30 Mha (or three times today’s total sugarcane area; Sparovek et al 2010a:8).

The Areas of Permanent Preservation are to be reduced along rivers and streams. The APPs may be included in the areas of the LRs, which reduces the total areas protected even further.

Still more contentious: illegal land occupations before June 2008 will be given a wholesale amnesty (WWF Brasil 2011, Interview Titan de Lima).

The underlying assumption that the law has to be weakened in order to make available new lands that are needed for the expansion of Brazil’s agriculture has been questioned as there already exist vast areas which could be used for agricultural purposes if only the areal efficiency of cattle raising was improved. As a joint statement by the Brazilian scientific community claims, the proposal for a new forest law “is based on the false premise that there is no land available for the expansion of Brazilian agriculture”. On average, the cattle density in Brazil is very low, approximately one head/hectare, thus a small intensification of cattle raising would liberate vast areas for other purposes without the need to clear new lands, or replace food crops.

Part VI. Agrofuels and Biodiversity
Evidence is forthcoming to show that the effect of sugarcane plantations on biodiversity is highly problematic in most settings (as can be gathered from Table 2). The impact depends on the previous land use. An acceptable effect of turning previously used land into sugarcane can be expected in the short run only if agrofuel feedstocks are planted on previously intensively cultivated lands (as then the chemical load will decrease). For all other previous land uses, the production of agrofuel feedstocks will lead to biodiversity loss for at least one hundred years.

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26 Fiscal units (Módulos fiscais) are differently defined for each municipality. The span is wide, from 5 to 110 hectares per unit. Four fiscal units can thus be anywhere from 20 to 440 hectares, depending on the productive potential of the land. See Ministry of Rural Development, http://www.incra.gov.br/portal/index.php?option=com_docman&task=doc_download&gid=81&Itemid=136.

27 Another proposal is to allow property owners to acquire land outside their primary properties in fulfilment of their obligations, as long as it remains in the same biome. (Today the off-property reserves have to be located in the same hydrological basin.) At the same time, however, the required size of the reserve may be increased. Donald Sawyer (2009:158) is considering an increase by a factor 2-4 compared to the stipulated Legal Reserve on the property. In this way, the total reserved area would be increased.

28 Sparovek et al 2010a, UNICA 2009, Interviews Gerd Sparovek and Donald Sawyer. When I raised this possibility with some of the interviewees they did not want to enter into speculations: “Let’s talk about what is, not about what might be.”

29 See http://www.abc.org.br/article.php3?id_article=719.

30 The average Brazilian cattle stocking rates are in fact common among the world’s leading meat producers: Argentina (51 million heads of cattle in 2007) has a stocking rate for cattle of 0.51 heads/ha, China (105 million heads) 0.26, USA (97 million heads) 0.41 heads/ha. The world average is 0.46. See FAO Statistical Yearbook 2009, tables A4 and A9. A shortening of the time Brazilian ranchers take to bring cattle to slaughter – from today’s 5 years to the USA’s a year and a half – would similarly liberate vast areas of what today is pasture. (Interview Donald Sawyer).
Table 2. Biodiversity impact of land use change

<table>
<thead>
<tr>
<th>Land cover converted to agrofuel feedstock</th>
<th>Positive impact</th>
<th>Negative impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recently abandoned land after intensive use</td>
<td>Immediately positive but not substantial until after 100 years, &lt; + 25 %</td>
<td></td>
</tr>
<tr>
<td>Recently abandoned land after extensive use</td>
<td>Mildly positive after 100 years, &lt; + 25 %</td>
<td>Immediately negative, &lt; − 25 %</td>
</tr>
<tr>
<td>Abandoned partly restored lands</td>
<td></td>
<td>Immediately negative, &gt; −25 %, after 100 years still −10 − 25 %</td>
</tr>
<tr>
<td>Grasslands extensively used</td>
<td></td>
<td>Immediately negative, &gt; −50 %, after 100 years still − 25 %</td>
</tr>
<tr>
<td>Natural grasslands and forests</td>
<td></td>
<td>Immediately negative, &gt; −75 %, after 100 years still − 60 %</td>
</tr>
</tbody>
</table>

Source: UNEP 2009:71. Impact on biodiversity is measured in terms of percentage change of Mean species abundance.

Such drawbacks do not appear to break the geopolitical momentum of demanding ever more blending of agrofuels into the fuel mix in the USA: the US environmental protection agency EPA simply states that it has "determined" that sugarcane ethanol saves 50 percent of green house gases (see EPA 2009:5). 31

The European Union is less sanguine about the possibility that agroufuels may actually worsen the situation by further increasing GHG emissions and biodiversity loss. To avoid this, the EU directive requires that agrofuel feedstocks not be grown on "land with high biodiversity value", nor on lands with high carbon stocks (EU 2009, Article 17). 32 This may make it exceedingly difficult to find suitable landscapes to fulfil the EU mandate. In any case, Brazil’s Cerrado should be out of the question for future agrofuels.

Part VII. Conclusion

It is not a wild assumption that pressure on tropical lands and forests will increase, given current trends of a growing world population, a growing world economy, and a concomitant growing demand for foods, fuels, fibres and feeds. During the last twenty years, 1980-2000, the expansion of agricultural lands basically took place at the expense of existing forests: 55 percent of new agricultural lands replaced intact forests, and a further 28 percent replaced "disturbed forests", all in all 83 percent or approximately 80 million hectares. In other words: forests were turned into croplands. 33

31 This “decision” by the EPA prompted 190 scientists to write an Open Letter (2010) to the US Congress, warning that standards and benchmarks for agrofuels that are to contribute to climate stability have to be carefully thought through: "The lesson is that any legal measure to reduce greenhouse gas emissions must include a system to differentiate emissions from bioenergy based on the source of the biomass." To this I would like to add: and based on the previous use of the lands dedicated to the production of the agrofuel feedstocks.

32 According to EU 2009, high biodiversity areas are primary forests and other wooded lands where there is no clearly visible indication of human activity and the ecological processes are not significantly disturbed; nature reserves and protected areas, and highly biodiverse grasslands. High carbon stock areas are wetlands, peat lands, continuously forested areas. See EU 2009, Article 7.3.

33 In South America and in East Africa, the share of deforestation coming from closed forests increased in the 1990’s – i.e. after the adoption of the Convention on Biological Diversity – compared with the preceding
This is serious enough, but things may get worse still, at least if we are to believe forecasts for 2050 which claim that there exists a further pressure for at least 10 billion hectares of arable land (op cit). This is twice the total land area set aside today for agriculture (1.5 billion ha) and pastures (3.5 billion ha) globally.

Such pressure has a tendency to permeate the global agricultural system, erasing the border that distinguishes domestic from international. We already know that the impact of a land use regulatory mechanism, like the Brazilian forest law, has different consequences in different parts of the country. What we need to realize is that this also holds true for international rules and regulations, mirroring global geopolitical interests.

A basic predicament is that the laws and agreements that affect Brazil’s sugarcane industry are elaborated on the national level, although their driving force may well have come from the international scene (such as the Brazilian sugarcane zoning plan and the voluntary agreement on working conditions on the sugarcane plantations). On the other hand, it is only at the national level that we have any hope of imposing sanctions for non-compliance; international rules, even when binding, such as the Convention on Biological Diversity, lack teeth (that is, there are no sanction mechanisms).

The fact that the forest law has been more successful on the local than on the national scale, and more successful on the international than on the local and national scales, should not hide that the law has been an instrument to slow down a rush for an ever widening agrarian frontier that otherwise would have been even more devastating.

In any event, a new technique for controlling the impact of the forest law ought to be tried out using modern techniques such as satellite images to show how property owners are fulfilling their obligations (Sparovek et al 2010:10-11). The idea is simple: the owners would have to declare the areas that they have set aside for APPs and RLs, with satellite imagery to prove that it also has happened on the ground. A unit at the Ministry of the Environment could be tasked to verify the declarations, and also be authorized to fine landowners for non-compliance. Furthermore, with public access to satellite images and maps, environmental NGOs – Brazilian as well as international – would not forego this opportunity to exercise control over major landowners.

If such a registration and confirmation process is coupled to certification schemes of the importing countries, a strong stimulus would exist for the Brazilian government to make sure that the forest law was followed. Here, financial actors have a role to play, by blocking non-
conforming parties from finance; this may well have even greater impact on Brazilian land owners than the law as such.  

In this way, and paradoxically, a new forest law may constitute an improvement in effectiveness as well as in legitimacy although its letter will be both weaker and more lenient.

In a not too distant future, however, much of this debate may be seen to be obsolete as second generation agrofuels based on cellulosic raw materials may have come on stream. Such a development would lend at least some credence to the proposition that agrofuels can be produced without clashing head on with the production of food and feed and fibres. In other words, second generation agrofuels may attenuate the conflict with food production (see the state-of-the-art article by Robertson et al 2008).

35 Interview Selma Simões de Castro.

36 Once second generations agrofuels are viable, it can alsoi be expected that the favoured position of Brazilian ethanol will be over: with second generation biofuels there will be no external market for Brazil as cellulosic feedcrops will be grown by today’s major forest nations (Canada, US, Sweden, Finland, Russia…). (Interview Eduardo Assad).

Perhaps there ought not to be a domestic market either: although sugarcane ethanol is easy to use – “it is a drop-in solution” – it has greater value as raw material for plastics than as a fuel. (Interview Weber Amaral).

In any case, second generation technology would make sugarcane production outmoded. (Interview Maria Luisa Mendonça).
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