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Zero-deforestation commitments in the Brazilian Amazon: Progress, limits and proposal for a jurisdictional approach

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Introduction

The annual rate of deforestation in the Brazilian Amazon has decreased dramatically from a peak of 27 000 km² in 2004 to 457 in 2012, and has fluctuated between 5 012 and 7 989 km² from 2013 to 2016 (i.e. a 59 % decrease between 2004 and 2016). The fourth federal Action Plan to Prevent and Control Deforestation in the Amazon (PPCDAM IV), starting in 2016, plan to decrease the annual rate of deforestation down to 3 925 km² in 2020. Some innovative institutional arrangements between the public and private sector, which induced major shifts in the governance of the soybean and beef cattle value chains, in association with strengthened command-and-control measures, explain such decrease. The soy moratorium has been signed by the major soy buyers forbidding them to trade soybean planted in areas deforested after 24th July 2006. This has been successfully monitored and renewed since 2007 (Rudorff et al. 2011, Gibbs et al., 2015a). Regarding the beef cattle value chain, two agreements have been signed between the main meatpackers, NGOs and the government in which the former commit to getting rid of any of their suppliers who are involved in illegal deforestation after 2009 (Nepstad et al. 2014, Gibbs et al. 2015b, Tonneau et al. 2016).

This contribution analyzes the main features of these two governance systems in the Brazilian Amazon, and stresses their potential and limits to monitor their impact on deforestation and promote eco-efficient⁶ landscapes in the Amazon. To overcome the persisting limits, we propose to discuss the potential of a complementary approach based on the monitoring and certification of jurisdictional performances regarding sustainability.

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⁶ Eco-efficient landscapes refer in this paper to landscapes that are producing more agricultural or forest outputs, in terms of quantity and quality, with less input in natural resources.

1. Main Features of the Soy Moratorium and Cattle Agreements in the Brazilian Amazon

The Soy Moratorium and Cattle Agreements have involved differently public, private and civil institutions in their agenda setting, implementation, monitoring and enforcement (Table 1). We will detail in this section the role of each entity involved and the main outcomes achieved.

Table 1: Actors and institutions involved in the Soy Moratorium and Cattle Agreements

	Lead Actors	Agenda setting	Implementation	Monitoring and Enforcement
Soy Moratorium	Civil society Soy traders	Soybean Working Group (Soy traders, MMA, NGOs)	Soybean Working Group Soy traders	Soybean Working Group
Public Cattle agreement (TAC)	Federal prosecutors (Public)	Federal prosecutors Meatpacking companies	Meatpacking companies	Federal prosecutors Meatpacking companies
Private Cattle Agreement	Civil/ Private	Greenpeace JBS, Minerva, Marfrig ⁷	JBS, Minerva, Marfrig	Greenpeace

1.1. The Soy Moratorium

The Soy Moratorium was signed in 2006 by ABIOVE (Brazilian vegetable oil industries association) and ANEC (National grain exporters association), that trade the major part of the Brazilian soy production. Initially proposed for two years, this voluntary agreement stipulates that traders cannot purchase, trade or finance soybean grown in land of the Amazon biome deforested after July 2006 or from areas embargoed by the national environmental enforcement agency (IBAMA) or by the Ministry of Labor (for slavery work). The agreement has been renewed annually between 2008 and 2015. After the reform of the Forest Code in 2012, the reference period for the Moratorium passed from July 2006 to July 2008. Indeed, the 2012 Forest Code has provided amnesty to some illegal deforestation occurred before July 2008 (Brasil 2012).

The Working Group on Soybean (GTS by its Portuguese acronym) composed by members of the firms associated to ABIOVE and ANEC, of the civil society and of the federal public institutions (Ministry of Environment and Bank of Brasil), is responsible for the implementation, monitoring and improvement of the Agreement. In 2016, the Agreement was renewed indefinitely with additional commitment from the private sector: buy and trade soybean only from properties with a Rural Environmental Registry (Portuguese acronym CAR), and working towards the monitoring of indirect suppliers. The CAR is a mandatory digital registry, which aims to integrate environmental information and actual land uses in landholdings. This information makes it possible to check the existence of the Forest Legal Reserve and the

⁷ JBS, Minerva and Marfrig are Brazil's largest meatpacking companies.

conservation of riparian forests.

The Agreement also sets the commitments of the members of the civil society and of the Ministry of Environment. The civil society commitments consist in (i) providing technical assistance and the information to effectively implement the agreement (ii) promoting payments of Environmental Service and forests conservation in rural properties covered by the Agreement. The Ministry of Environment commitments consist in (i) supporting the implementation of CAR and PRA (Program of Environmental Restoration) in priority in Municipalities producing soybean (ii) defending at the national and international levels the development of program attesting the sustainability of soybean production in Brazil (iii) inspecting through IBAMA, the areas where the monitoring through satellite imagery has identified soybean planted after July 2008 and present the results of this inspection to the GTS.

The Agreement has been monitored in the municipalities responsible for almost all the soybean produced in the Brazilian Amazon. The monitoring occurs in all municipalities of the Amazon Biome with more than 5000 hectares planted in soybean. Analysis of satellite imagery allows detecting areas planted of more than 25 ha in soybean after July 2008. Those data are crossed with database of private properties allowing to identify, through IBAMA inspection, the soybean producers infracting the moratorium. This information is then provided to the GTS and the list of the producers in infraction is made available to soybean buyers. Soybean buyers have also to set an external audit procedure to prove that they did not buy soybean from producers in infraction. Whereas the annual monitoring based on satellite imagery are public and can be found on ABIOVE website, the results of those external audits are only available for members of the GTS.

1.2. The Cattle Agreements

For the beef meat sector, two main governance mechanisms have emerged since 2008. One of them is the Agreement for the Adjustment of Conduct (from the Portuguese, *TAC - Termo de Ajustamento de Conduta*) or the “public cattle agreement” as we refer to it in the following paragraphs. The other is the “private cattle agreement” with Greenpeace, signed only by the three largest meatpacking companies (JBS, Marfrig and Minerva).

The first public cattle agreement was elaborated by the public prosecutors in the state of Pará to be applied only to meatpacking companies of this state. In 2013, prosecutors in the States of Pará, Mato Grosso, Rondônia and Amazonas joined forces and negotiated a new version of the public cattle agreement with the meatpacking companies in the four states. This version of the agreement extends the law to the beef chain in the Amazon region as a whole. The agreement entails the responsibilities and obligations only between public prosecutors and meatpacking companies. There are no other stakeholders involved in the agreement.

The agreement involves two commitments from the meatpacking companies. The first commitment is to eradicate illegal deforestation in the supply chain. The meatpacking companies agreed not to buy cattle from producers who conduct illegal deforestation. The new Brazilian Forest Code reformed in 2012 still allows deforestation in Amazon

biome up to a limit of 20% of the whole property (Brasil, 2012). All deforestation beyond this threshold is illegal unless it occurred before July 22, 2008. As a result, meatpacking companies now have to demonstrate with satellite images that their cattle suppliers respect the new Brazilian Forest Code and are not located inside conservation units or on indigenous land.

The second commitment is to prove their suppliers' compliance with other environmental and social requirements. For instance, the public cattle agreement forbids companies to buy cattle from suppliers who are on the environmental agency's "black list" (e.g. cattle ranchers fined or whose licenses were suspended for breaking environmental laws) and on the Ministry of Labor's slavery list. In addition, the companies may only buy animals from suppliers with a CAR and a Rural Environmental License to produce (Portuguese acronym LAR). As for the CAR, the LAR is mandatory and provides proof that production respects environmental laws as a whole (avoids source water pollution, conserves riparian forest, etc.).

Regarding public commitments, the federal prosecutors have made public statement announcing they will work to simplify the procedures to withdrawn the embargo of the properties that are committed to regularization. They also committed themselves to work with state authorities to make improvements in animal traffic control systems and to give priority to cattle ranchers in land regularization and in the registration of rural properties (MPF, 2013).

Beyond the public cattle agreement, JBS, Marfrig and Minerva signed a private agreement with Greenpeace in 2009, which includes the "Minimum criteria for operation with cattle and bovine products on an industrial scale in the Amazon biome." The agreement also contains a negotiated six-year plan (2009-2015) with multiple actions to eliminate illegal suppliers of the supply chain. This agreement was renewed in 2012 under the same conditions (Greenpeace, 2012).

There are several overlaps between the public and private cattle agreements. All bans on buying from illegal suppliers are also part of the clauses of the private agreement as is the obligation to produce geo-referenced maps and check the suppliers' documentation. The most important additional commitment of the private agreement is the obligation to control indirect suppliers. The indirect suppliers in the beef chain are breeders who sell calves to fattening farms (Gibbs *et al.*, 2015b).

The Working Group for Legal Amazon monitors the public cattle agreement. It was created in 2009 and is composed exclusively of the federal prosecutors of all Amazon States. Public prosecutors make information public on Internet. All the meatpacking companies that have signed the agreement are listed on the Public Prosecutors Office website. The content of the agreements is the same for all companies, but each company signs a separate document. Once the document is signed, the meatpacking companies are responsible for implementing the controls. The prosecutors' role is to monitor compliance.

The cattle agreement established a progressive schedule for meatpacking companies to prove their suppliers' compliance with the laws. The time allowed for compliance was shorter for large landholders (one year) than for medium and small landholders

(properties with less than 3 000 hectares have about three years). The agreement states that the meatpacking companies are subject to fines if it is proved that they have purchased cattle in disagreement with the rules established by the public agreement. However, the meatpacking companies can justify non-compliance any time before completion of the action (i.e. environmental licenses were not issued by state authorities in time or there were changes in the implementation schedule of the Forest Code).

Regarding monitoring, the public agreement obliges the companies to send prosecutors the up-to-date list of suppliers and the geo-referenced maps of the properties twice a year. Furthermore, the meatpacking companies shall perform annual independent audits to verify their compliance with the agreement. According to the actors we interviewed, until the end of 2016, only the large companies (JBS, Marfrig and Minerva) fulfilled the demand for annual independent audits, mostly because their agreement with Greenpeace included the same requirement.

Finally comparing our case studies (soy moratorium, public and private cattle agreements), members of NGOs, and particularly Greenpeace, seem to have played much role in the elaboration, implementation of the Soy Moratorium and private cattle Agreement than for the TAC. This is particularly true for the issue of monitoring and enforcement of such agreements.

2. The limits

The significant positive outcomes of the soy moratorium and cattle agreements on the reduction of deforestation and, for the cattle agreements, on the registering of landholdings into CAR, have already been evidenced (Gibbs and al. 2015a, 2015b). We choose here to focus on the persisting limits regarding their monitoring and boundaries, some remaining public policies failures, the risks of smallholders' exclusion and the possible low eco-efficiency of zero-deforestation landscapes.

2.1. Monitoring and boundaries

In order to detect the possible areas planted in soybean on land deforested after 2008, satellite images are analyzed covering the municipalities with more than 5 000 ha planted in soybean and located in the Amazon Biome. Such criteria led to select 87 municipalities in the last monitoring 2015/2016 report: 62 in the State of Mato Grosso, 17 in the State of Para, 9 in the State of R ndonia, 3 in the State of Roraima and 2 in the State of Amapa⁸. These different municipalities represent 87 % of the soybean planted in the Amazon biome in 2015. Accumulated deforestation between 2009 and 2015 amounts to 30 506 km² and 8 040 km² respectively in these four states and 87 monitored municipalities. The monitoring considers only deforestation of more than 25 ha, that occurs in private landholding and outside Conservation Units, Indigenous Reserves and Agricultural Settlements. It led to monitor effectively 4 914 km². The report detected 372 km² of soybean planted in these areas mainly distributed in the States of Mato Grosso (283 km²), Para (75 km²) and Rond nia (14 km²). Infraction

⁸ http://abiove.org.br/site/_FILES/Portugues/09112016-141009-relatorio_da_moratoria_da_soja_2015-16_gts.pdf

were found concentrated in a relatively small number of municipalities amongst them four in the State of Mato Grosso (Santa Carmen, Feliz Natal, Nova Ubirata, Nova Maringa) and two in the State of Para (Dom Eliseu and Paragominas).

The last monitoring report thus clearly demonstrates that the area of soybean planted in areas of the Amazon biome deforested after 2008 in private properties remains negligible. However, it does not monitor soybean eventually planted illegally in Conservation Units, or soybean planted in Agricultural Settlements or Indigenous Reserves. Moreover, the documents and audit of traders commercial operations remains until now confidential, so there is no way to effectively avoid laundering (Rausch and Gibbs 2016).

The soybean moratorium takes into account only some of the legal obligations. It does not guarantee that the properties are in compliance with the Brazilian Forest Code. This code stipulates in particular that the owners must retain between 50% and 80% of the surface area of their land as forest reserves. The moratorium also does not guarantee that owners with properties that are deficient in legal forest reserves or permanent preservation areas will restore deforested lands ('environmental liability'). The Forest Code has also not yet clearly established the possible modes and speeds of restoration of legal reserves and permanent preservation areas, preventing clear requirements from private landholders (see section 2.2). Indeed, the moratorium is deeply unfair as it allows equal access to the market for owners who have fully cleared their property before 2008 and for those who have fully respected the Forest Code or are engaged in a process of restoration (Tonneau and al 2016). Furthermore, the monitoring is also restricted to the Amazon Biome with possible leakages effects in other biomes particularly in the states of Maranhão, Tocantins, Bahia, and Piauí, where large surface areas have been planted with soybeans at the expense of the native vegetation of the Cerrado and the Caatinga (Gibbs *et al.*, 2016). Finally no evidence exist that the public institutions have effectively support the implementation of the CAR and PRA in priority in municipalities producing soybean.

Regarding the monitoring of the public cattle agreement, in 2014, public prosecutors and the government of the State of Pará announced an independent audit to assess compliance of meatpacking companies. According to official data, prosecutors met with all the meatpacking companies to present the results of an initial pilot audit conducted in only three firms. The names of the firms assessed in this audit were not disclosed in this official communication. The experimental audit showed the prosecutors that these companies were falling in analyzing the satellite image data to confirm non-deforestation in their supplier's properties after July 2008. The official records report that small and medium meatpacking companies claimed that technical and financial problems prevented them from achieving this goal (i.e. hiring specialists for such analysis is costly). The minutes of this meeting also reported an attempt to create a working group to support small and medium companies in fulfilling the agreement (Governo do Pará, 2014).

At the end of 2015, no information was available about the completion of the independent audit in the State of Para (Barreto and Gibbs, 2015). Moreover, no information is available about how prosecutors, state governments, and meatpacking

companies in the State of Mato Grosso and Rondônia are monitoring compliance with the TAC.

Concerning the private agreement between Greenpeace and the three largest meatpacking companies, the parties meet annually to discuss the progress of an established working plan. But neither Greenpeace nor the meatpacking companies publish the results of their periodic meetings. The sustainability departments of each company are responsible for communicating progress.

Greenpeace monitors the fulfillment of the agreement through annual audits made by auditors contracted by companies to verify their compliance. These annual audits reports contain information that makes it possible to check how each firm is complying with the agreement. These audit reports are published on the firms' websites. In addition, Greenpeace publishes an official communication after each report released. Until February 2015, Greenpeace expressed its satisfaction with the evolution of the industries control over direct suppliers (Greenpeace, 2015).

However, the available information does not include a report on progress in controlling indirect suppliers. The companies' plans and schedule state that full control of indirect suppliers depends on government actions. The companies have proposed to work with the government, but they insist that the government should first improve traceability to allow them control their indirect suppliers. Accordingly, Greenpeace has accepted the fact that indirect suppliers are not yet controlled. The private agreement is thus still a replication of the public agreement with the addition of transparency mechanisms regarding its monitoring.

No further data was available concerning the full implementation of the private cattle agreements at the scale of the three main exporting Amazon states. Even the analysis of the success of the implementation made by Gibbs *et al.* (2015b) considered only the four large JBS slaughterhouses in southeastern Pará, which signed both agreements in 2009. As the authors pointed out, these slaughterhouses account for only 30% of slaughter in Pará. In addition, the four slaughterhouses owned by JBS were the only ones in the state operating before and after the agreements with deforestation monitoring systems. This methodological choice is evidence for the difficulties involved in gathering comparable data for all meatpacking companies. Gibbs *et al.* (2015b) showed that JBS slaughterhouses actively excluded ranches with deforestation from their supply chain and encouraged their suppliers to rapidly register their properties in the CAR system.

During field interviews, cattle ranchers interviewed in the municipalities of Redenção and Rio Maria, both located in the southeastern of Pará, confirmed that JBS invested in legalizing the company's most important suppliers. This included hiring a consultancy firm to systematically analyze satellite images of the properties and to prepare and upload their suppliers' CAR in the official database. We received similar responses from cattle ranchers who supply JBS and Marfrig in Ariquemes in the state of Rondônia. However, in the municipalities of Novo Progresso in the western of the state of Pará, in Alta Floresta and Juara in the northern region of the state of Mato Grosso, cattle ranchers reported that they were not affected by the agreements because they mostly sell cattle to medium and small slaughterhouses.

As for the soy moratorium, both cattle agreements mostly led to enforce some laws. These cattle agreements have contemplated more rules since their inception (not only deforestation but also CAR and LAR requirements). Federal prosecutors dominated the agenda setting process of the public cattle agreement and they also provided the basis for the private agreement. The private agreement added only one additional and voluntary commitment i.e. the obligation to control indirect suppliers. However, almost exclusively meatpacking companies are responsible for the implementation of both agreements and they have succeeded in shaping this implementation by postponing actions in time. They argued that the control over the indirect suppliers depends on government actions, thus they finally stand a minimal level of compliance. The time schedule to producers to obtain their environmental licenses was also postponed several times. Meatpacking companies never presented the required environmental licenses and the public prosecutors never applied the fines foreseen in the agreement because the meatpacking companies argued they had no control over the state agencies responsible for LARs attribution.

As for the soy moratorium, there has been no evidence that public institutions fulfilled their commitments: one cannot observe evolutions nor in the animals control system nor in giving priority to land regularization. Cattle ranchers often stress their disappointment with the issue of the lack of land titles (see section 2.2).

Finally both cattle agreements have critical issues regarding the scope, accuracy and transparency of monitoring even when NGOs is involved in such monitoring.

In September 2016, the Greenpeace started to demand more ambition of the three large meatpacking companies to achieve their commitments. The NGO alerted that the lack of control of indirect suppliers was not acceptable. Greenpeace also highlighted the companies were failing in publishing the complete list of suppliers as demand by the public agreement. Moreover, the NGO pointed out the companies were buying meat from farmers that have not the CAR. This was not illegal once the government postponed the obligation of submit the CAR until the end of 2017. But, Greenpeace claimed for more engagement of companies to lead farmers to submit their CARs. Finally in Mars 2017, Greenpeace withdrew their agreement only with JBS just after the allegations of fraud involving JBS and the Ministry of Agriculture.

2.2. Public policies failure

The 2012 Brazilian Forest code has provided full amnesty to illegal deforestation that has occurred in small properties before July 2008. For medium and large farms, illegal deforestation before 2008 has not been fined but farmers have to restore riparian forests and their forest legal reserves (Guidotti et al. 2017). However the specific rules defining if they have to reforest up to 50 or 80% of their landholdings, the conditions and time to perform such restoration are dependent on complementary public regulations, particularly those defined by the Environmental Restoration Program (PRA by it Brazilian Acronym) of each Brazilian State. However, those PRAs are emerging very slowly. First, they depend on Federal rules regarding those PRA, that were only published in 2014 (Brasil 2014), establishing that government of each State had to define the specific conditions and responsibilities for the restoration of environmental

liabilities. In the Brazilian Amazon, only the States of Para and Mato Grosso published their PRA in 2016, but with still significant shortcomings. For example, in Para State, the landholders have to face bureaucratic hurdles since several public departments must analyze their restoration proposal without any deadline for them to deliver their decision. In Mato Grosso State, the PRA does not define yet the conditions to legalize deforestation after July 2008 (Lima and Munhoz 2016).

If they are not solved, such shortcomings can effectively postpone indefinitely forest restoration and justify that producers covered by the Soy Moratorium or Cattle Agreements do not invest in the resolution of their environmental liabilities.

Land tenure regularization by public institutions also suffers shortcomings delaying the effective attribution of private responsibilities and investment in environmental restoration. The Program “Terra Legal” from the Ministry of Agrarian Development, designed to accelerate land titling in areas of federal responsibility, has progressed very slowly: the objective of this program was to provide land titling to 150 000 landholdings but, between 2009 and 2014, on average, only 1900 properties were titled annually (Brito and Cardoso Junior 2015).

2.3. Risks of smallholders exclusion

Since 2005, deforestation has not decreased at the same rate in small and large landholdings. Indeed, several authors have evidenced that the decrease of deforestation has been less significant in areas occupied by smallholders (Godar and al. 2011, Piketty and al. 2015). The analysis of satellite images performed in some municipalities evidence that smallholders close to the cities and road have stopped to deforest for several years. However, smallholders in remotes areas still rely on slash and burn practices, mainly for subsistence farming and calves breeding. They are highly vulnerable to any restrictions regarding market access and deforestation. They are often the indirect suppliers of the beef supply chain, selling calves to fattening farms (Gibbs and al. 2015b, Pocard-Chapuis and al. 2005). Their land use is usually very extensive and not highly profitable, but calves’ breeding is crucial for their viability. Technical change allowing to abandon the use of slash and burn are costly and are not economically viable without market insertion and access to collective storage or transport infrastructures. Without additional measures, excluding indirect suppliers from the beef chain can thus have very detrimental social consequences with ambiguous effect on deforestation.

2.4. Low eco-efficiency of zero-deforestation landscapes

Land use changes before 2005 in the Amazon has been mainly linked with pasture expansion (Bustamante et al. 2012)) and has led to a mosaic of forests in very different states. So-called secondary forests of varying ages have replaced cleared but uncultivated areas. Various primary forests are fragmented and degraded with structure, functions and ecological services very different from those of mature forests (Berenguer *et al.*, 2014, Bourgoin *et al.*, 2016). Inside landholdings, deforestation has often been systematic and various low productive areas such as slopes, marshes, and soils with low fertility levels are deforested.

Forbidding any kind of forest removal can translate into forest mosaics with low potential to conserve ecosystem services and land use intensification in deforested areas with more potential for the provision of ecosystem services through forest regeneration. Moreover, if forest regeneration is only based on individual strategy, the connectivity between forest patches may be insufficient to restore some ecological functions. The remaining landscapes main remain poorly eco-efficient in the use of their natural resources.

3. A jurisdictional approach to manage and monitor eco-efficient landscape

3.1. Why land use transitions need a jurisdictional approach in a zero deforestation context?

Zero-deforestation commitments have been efficient to stop the profitability of forest resources mining, however additional governance arrangements are needed to face remaining deforestation and enhance eco-efficiencies in a zero-deforestation future. A jurisdictional approach, based in the Brazilian Amazon on institutions at the municipal level, could be decisive for both, by solving three kinds of difficulties.

In a zero-deforestation context, farmers must innovate to produce without mining their natural resources. However, most available land use intensification techniques seek to increase productivity per hectare without really considering the functioning of the agro-ecosystem as a whole. These forms of intensification result from individual farmer strategies that have the higher innovation capacities (Poccard-Chapuis *et al.*, 2015a), are often based on the massive use of chemical inputs, and are mostly found on the most fertile and accessible land where they are very profitable (Piketty *et al.*, 2015). Many farmers, especially the most vulnerable, remain outside of this dynamic. Many deforested areas, especially the most distant from road and with lower potential to respond to the use of chemical inputs (sandy soils, areas with moderate to severe declivity....), are not adequate for such forms of intensification.

Land use intensification based on agricultural practices that make better use of the functioning and complementarity of the different natural resources often take more time to start producing economic returns and they remain sensitive to the risk of accidental fires. Collective action and the mobilization of jurisdictional actors are necessary for their adaptation and dissemination (Poccard-Chapuis *et al.*, 2015b)

Land use transition in a zero-deforestation context needs to promote land use intensification, forest regeneration and avoid forests further degradation. It is technically possible to map the best place for regeneration, the best other places for intensification, and the critical places to tackle degradation. These locations make sense not at the farm level, but at the landscape level, where the ecosystem is organized, and the municipal level, where the governance is organized. This governance level is essential, especially to build the rules and individual farm protocols for landscape design, monitoring the land use changes, and guarantee legitimacy of the tradeoffs between conservation and production.

Finally, alternatives to slash and burn needs secure access to market and inputs and to public services, especially for the small and medium farms, unable to compensate alone their land deficiencies. The role of the local actor, public or private, is here fundamental to develop the infrastructure in the whole municipality. State and Federal levels are important too, but they carry about the main regional infrastructure, not the capillary local networks in rural areas, especially these remote areas that are critical for remaining deforestation.

3.2. How a jurisdictional approach can allow to overcome some of the persisting limits of the Soy Moratorium and Cattle agreements

Tackling some of the remaining shortcomings of the Soy Moratorium and Cattle Agreements need a bottom up approach, in order to adapt rules and incentives to the local ecological and socio-economic specificities, and to monitor, enforce transparently and legitimate public and private commitments.

To make land use intensification and forest regeneration a viable option for all landholders, in particularly smallholders, it is necessary to identify moderate intensification pathways compatible with their remaining endowment in natural resources and their livelihood strategy. Such target requires some coordination of local institutions, to define technical priorities, the specific need in incentives and technical support and organize learning process and the sharing knowledge between landholders. For example, a significant number of smallholders are improving their income from the diversification of their activity in rural and urban areas. They have not necessarily the conditions or the capacities to invest their whole workforce in land use intensification or forest regeneration.

Until now, the soy moratorium and cattle agreements succeeded in targeting mostly only zero-deforestation because public institutions themselves have failed to define and enforce more regulations regarding the restoration of farmers environmental liabilities. Expecting that farmers, as private entities, will decide to voluntarily restore their environmental liabilities and taking the risk to compete with those remaining illegal seems poorly realistic. Such public regulations are involving several agencies at the State and Federal levels and their enforcement remain a strong challenge at these scales. At the municipal level, such challenges can be more easily overcome: municipal rules can be defined to define the period and conditions of restoration, compensation etc... inside the municipality boundaries and their monitoring and enforcement can be more easily implemented.

It appears difficult to enhance transparency in the monitoring of private commitments in the soy and cattle agreements. Private entities advocate confidentiality of their commercial operations. However, a partial and not fully transparent monitoring of such private commitments may undermine the trust in those agreements. A transparent certification of jurisdiction that can prove progress towards sustainability beyond zero-deforestation could be a way forward. The issue of confidentiality would not be anymore a barrier, quite the contrary, more transparency could increase attractiveness for investors needing to be sure that their activities and investments do not have environmental or social negative impacts.

Jurisdiction could define a development project (i) specifying the sustainable development goals at their level, beyond the sole goal of zero-deforestation, (ii) identifying the criteria and indicators to monitor transparently progress towards these goals. A participative validation could enhance the legitimacy of such development project and the involvement of the local society. The collection of information and monitoring of indicators need an institutional arrangement, possibly a multi-stakeholders local platform. It can initially start to be performed by the different municipal secretaries or agencies.

Conclusion

In the Brazilian Amazon, the Soy moratoria and the Cattle agreements have successfully contributed to decrease illegal deforestation associated with the expansion of soybean and cattle ranching. Those agreements mostly led to enforce some components of public regulations. However, public, private and civil society actors are struggling to move private commitments beyond the zero-deforestation targets and include more ambitious social and environmental goals. More, targeting zero-deforestation only can have social and environmental negative impacts and are limited to support the transition to more eco-efficient land uses that combines improved soy and pasture management and allow for forest regeneration, along with conservation practices. Finally, the monitoring of such agreements at the level of the entire Amazon is difficult.

Additional governance mechanisms are needed to face remaining deforestation, enhance eco-efficiencies and include all farmers in land use intensification, forest conservation and regeneration. A jurisdictional approach, based on the monitoring and certification of the progress of municipality towards sustainability can allow to overcome some of the persisting limits of the Soy moratorium and Cattle Agreements, while addressing some structural challenges that prevent investments and innovations.

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