

The Use of Satellite Images for Prosecuting Persons and Companies That Have Caused Deforestation in the Amazon Region

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At the request of the Brazilian Government, the Brazilian National Institute for Space Research (INPE) has used satellite imagery to make a systematic study of Amazon deforestation since April 1989. INPE's projects related to Amazon, namely PRODES and DETER, include the use of remote sensing satellite images for deforestation assessment. Data obtained using these projects are fundamental to define the measures that will be taken by the Brazilian Government, including public policies of prevention and surveillance where deforestation has increased. According to PRODES data, the Amazon's deforestation reached 7,000 km² from August 2009 to July 2010. One of the causes of deforestation is the use of the areas for livestock, especially to raise cattle. It is cheaper to overthrow the forest to transform it in a pasture area than investing money in research and technology. The Amazon is the region in Brazil where the herd of cattle has been more increased in the last years. According to the Brazilian Institute of Geography and Statistics (IBGE), since 1995, 70% of the overthrown areas in the Amazon region have been used for raising cattle. In order to change this scenario, the Federal Public Prosecution (MPF)¹, the Brazilian governmental institution that is in charge of defending collectives and social rights (including the environment's defense), has taken measures to punish ranchers and fridge companies that do not obey the environmental legislation. In 2009, several lawsuits were proposed by MPF against persons and companies that caused 157,000 hectares of deforestation in the Brazilian State of Pará (who was the champion of deforestation over the past four years). In such lawsuits, MPF claimed the amount of US\$ 1 billion² to compensate damages caused by deforestation. The Brazilian judicial courts have taken into account data from PRODES and DETER to validate the deforestation and to convict those who have overthrown the forest. This paper presents an overview of the succeeded actions undertaken by MPF to mitigate Amazon's deforestation, based on data

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1 MPF is an acronym for the Portuguese expression "Ministério Público Federal".

2 Considering the exchange rate of US\$ 1.00 = R\$ 2,00.

provided by INPE's projects, as well as the brief history of the program "Legalized Meat", implemented by MPF to enhance the consumption of meat produced in farms committed with the sustainable livestock.

I. Introduction

First of all, it is important to establish the difference between the area where the Amazon River flows and the area which is covered by the Amazon forest. The Amazon River flows through seven Brazilian states: Acre, Amazonas, Amapá, Mato Grosso, Pará, Rondônia, and Roraima. However, the area where the Amazon Forest spreads, which is the object of this paper, includes nine states: Acre, Amazonas, Amapá, Maranhão, Mato Grosso, Pará, Rondônia, Roraima, and Tocantins. This area is known as "Legal Amazon" and its size is approximately 5,217,423 km², which corresponds to 61% of the Brazilian territory.

During decades, the Amazon forest has been deforested with the purpose of using its wood to attend the needs of industries in Brazil and abroad. The method generally used for deforestation is really aggressive: trees are not overthrown individually by the use of chainsaws; instead, dozens of trees are overthrown simultaneously by the use of trucks and huge chains. That is a brutal crime against environment.

Nowadays livestock has been the greatest vector of deforestation in Legal Amazon and it is responsible for one in each eight hectares of forest overthrown worldwide³. According to scientists from local universities, deforestation has been caused by the equation adopted by ranchers: one animal per hectare of forest. The Brazilian Company for Agriculture and Livestock Research (EMBRAPA) evaluated in US\$ 400.00⁴ the cost to overthrow the forest in order to obtain one hectare of pasture area. However, to increase production in the same area – one hectare - it would be needed to invest US\$ 600.00. That is why ranchers prefer to overthrow the forest instead of investing in research and technology.

Brazil has the greatest herd of cattle in the world and it is also the world's greatest exporter of bull's meat. The Brazilian Government intends to duplicate its participation in the global market of bull's meat by 2018.⁵

II. Decree # 6,321/2007

The Brazilian Decree #6,321 as of December 21st, 2007 establishes the actions to be taken in order to prevent, survey, and control deforestation in Legal Amazon.

3 Data from <www.prpa.mpf.gov.br>.

4 Considering the exchange rate of US\$ 1.00 = R\$ 2,00.

5 Data from <www.prpa.mpf.gov.br>.

According to Article 2, the Brazilian Ministry for the Environment shall present, annually, a list of cities located in the Legal Amazon region and their individual data regarding deforestation, based on information provided by INPE. Such list will contain: (i) total area of deforestation; (ii) total area of deforestation in the last three years; and (iii) rate of deforestation in each of last five years.

Article 3 foresees the need of a registry for identifying rural properties located in Legal Amazon. The purpose of this registry is to gather data and information in order to survey, in a preventive way, new deforestations. The Brazilian Government will use remote sensing techniques to establish the geographical coordinates of the rural properties, as well as on-site visits.

New deforestations will only be allowed in specific situation, such as those mentioned in article 8: (i) activities related to national security or sanitary protection; (ii) essential works for public infrastructure services (transport, sanitation, and energy); (iii) research activities and extraction of minerals, allowed by the competent authority through the appropriate environmental license; (iv) archaeological research; and (v) activities essential to the protection of the integrity of native vegetation, such as fire-fighting, erosion control, eradication of plagues and protection of native species of trees, in accordance with the established by the competent environmental authority.

Art. 14 §1 states that the Brazilian Government will provide economic incentives to the municipalities whose annual rate of deforestation drops below the limit set by the Ministry for the Environment.

The Brazilian Government is committed with the sustainable development, so it has been taking measures to reduce gradually and significantly the deforestation in Legal Amazon. Among these measures, the Brazilian Government has restricted credits and access to federal resources to states that are not committed to ending deforestation.

III. PRODES Data

According to PRODES most recent data⁶, from August 2010 to July 2011, the rate of deforestation in Legal Amazon reached 6,418 km². This result was obtained through the analysis of 213 images of Landsat 5 and DMC Satellites. The rate of deforestation in 2011 was distributed as follows: Acre = 280 km²; Amazonas = 502 km²; Amapá = 66 km²; Maranhão = 396 km²; Mato Grosso = 1,120 km²; Pará = 3,008 km²; Rondônia = 865 km²; Roraima = 141 km²; and Tocantins = 40 km².

This area of deforestation – 6,418 km² - represents the lowest one, since INPE started to assess it in 1988. In that year, the rate of deforestation in Legal Amazon reached over astonishing 20,000 km². In the years 1995, 2003, and 2004 the deforestation rates were over unbelievable 25,000 km². The rate of deforestation below 10,000 km² only has been registered over the past three years.

⁶ See <www.obt.inpe.br/prodes>.

Given the space resolution of the satellites used by PRODES Project, it considers as deforested areas those bigger than 6.25 hectares where the complete overthrown of the forest has occurred. Taking into account this parameter, some farmers and ranchers have deforested areas up to the limit of 6.25 hectares. It has been causing a new kind of deforestation, where small points of degraded areas have been detected. This attitude has called the attention of the Brazilian authorities, which are intensifying actions of ground surveillance. The rate of deforestation verified in 2011 indicates a reduction of 8% in comparison with the rate registered in 2010, which was 7,000 km². This result confirms the tendency of reduction registered since 2005.

IV. Deter Data

On August 2nd, 2012, INPE unveiled the latest DETER's Project data⁷. According to it, from April to July 2012, 650.3 km² of deforested and degraded areas were identified in Legal Amazon. From this amount 232.6 km² occurred in April; 97.5 km² in May; 107.5 km² in June; and 212.7 km² in July.

DETER is an alert system that detects deforestation in Legal Amazon based on data from satellite with high frequency of re-visitation.

The Brazilian Institute for the Environment (IBAMA) has been using DETER's data to orientate surveillance as well as to coordinate efficient ground actions against deforestation.

DETER uses images from Modis sensor of the Earth Satellite. This satellite has 250 meters of space resolution which allows it to detect deforested areas bigger than 25 hectares. The low resolution of the sensor used by DETER is compensated by its quick response, which enables authorities to take immediate measures to contain new deforestations.

DETER data indicates, in a fast way, areas where the forest was completely overthrown as well as areas increasingly degraded. However, the official data regarding the annual rate of deforestation in Legal Amazon is provided by PRODES, because it uses better space resolution images that allow identifying even small points of deforestation.

V. Project REDD-PACC

INPE has also established cooperation with international partners to develop other ways to control deforestation in Legal Amazon. During a workshop held in São José dos Campos, SP, from May 22nd to 24th, 2012, the Project REDD-PACC was launched⁸.

This research project aims at developing technical know-how and capacity in designing efficient, effective and environmentally relevant REDD+ strategies. It

⁷ See <www.obt.inpe.br/deter>.

⁸ See <www.inpe.br/redd/index.php>.

will act as a global forum for sharing and improving global data on forests and deforestation drivers, and developing high-quality methodologies for REDD+ modeling as well as more general land-use planning.

The project partners include the coordinating partner IIASA (International Institute for Applied Systems Analysis, Austria), COMIFAC (Commission des Forêts d'Afrique Centrale/Central African Forests Commission), INPE (National Institute for Space Research, Brazil), and UNEP-WCMC (United Nations Environment Program - World Conservation Monitoring Centre).

REDD-PAC will build on the existing and complementary expertise of its partner organizations. IIASA will contribute with its global modeling capacity mainly through the GLOBIOM model. GLOBIOM is a global dynamic partial equilibrium model of the land-use sector. By taking into account the economic and environmental interactions between country-level policies, the model can provide an assessment of regional REDD+ initiatives in a broader worldwide framework. INPE and COMIFAC will contribute by providing high-resolution data on Brazil and countries from the Congo Basin respectively. INPE will also deliver complementary spatial results from their high-resolution models of deforestation. Given its experience in the area of biodiversity indicators and the coordination of the 2010 Biodiversity Indicators, WCMC will be leveraged for the development of consistent national biodiversity indicators.

REDD-PAC partners will act as a nucleus of experts, but collaborations from outside will be actively looked for. The modeling part of the project will focus on the Central African and Brazilian rainforests.

VI. Legalized Meat

In the seventies, thousand people from Northeast and from the central region of Brazil moved to Legal Amazon to invest in livestock. From that time to 2009, states and the Federal Government did not have control on activities related to livestock. In the State of Pará, where MPF first acted to combat illegalities on this sector, there were no data about the size and location of farms where cattle was raised. Information available about livestock came from data regarding illegality: livestock used to be the sector where slave work where most found, as well as the sector that stimulates deforestation. Due to the poverty and lack of jobs in the region, some people agreed to work just for food and a place for resting. They did not have salaries, social rights, or access to medical cares. Many crimes occurred as a result of battles by land and, also, because of the struggles between farmers and their employees.

Thanks to the actions of MPF, this scenario has been changing since 2009. MPF has been spreading its action to other states, such as Mato Grosso and Rondônia, with the purpose of preventing deforestation and implementing a sustainable livestock.

Due to the actions undertaken by MPF, many fridge companies have decided to buy meat only from legalized farms.

In 2009, MPF launched the "Legalized Meat" Program with the purpose of avoiding the Legal Amazon's deforestation as well as to promote a sustainable

livestock⁹. The expression “legalized meat” means that the commercialized meat comes from legalized farms, which are those committed with the environmental sustainability, social rights, and the legal occupation of the land. Since 2010, the major Brazilian fridge companies have adopted the guidelines from MPF to negotiate with their suppliers, especially in the Legal Amazon states, where the lack of control about livestock was causing more environmental damages.

This change of attitude has contributed to reduce activities of the ranchers who usually raise cattle in deforested areas. At the beginning, however, there were just few legalized farms in Legal Amazon. The agreement between MPF and fridge companies took a long period of discussions and adjustments before the consensus was reached.

In the State of Mato Grosso, the biggest producer of bull’s meat in Brazil, despite the reduction of its deforested area, it still remains in the second rank in those states that are responsible for deforestation in Legal Amazon. Mato Grosso has around 115,000 rural areas devoted to livestock and a 26 million bull’s herd.

In 2009, MPF initiated a negotiation with the three major fridge companies established in the State of Mato Grosso and also with the Brazilian Association Industry of Meat Exporters (ABIEC). The discussions lasted over seven months, but they finally made a deal and a Term of Conduct’s Adjustment was signed among the parties. The Term of Conduct’s Adjustment is an extrajudicial document where the ranchers or fridge companies are committed to specific conditions, with the purpose of solving problems that they are causing or compensating damages that they have already caused.

The “Legalized Meat” Program provides benefits for customers and companies. People who buy legalized meat are contributing to avoid deforestation, slave work, and illegal occupation of the land. On the other hand, a fridge company that commercializes legalized meat does not have its image associated with environmental crimes.

Since the surveillance over farms and animals has increased, the quality of meat has also been improved, reducing the risk of contamination for bacteria and other diseases, especially when the meat is manipulated in poor sanitary conditions or in unauthorized places.

MPF has been restricting the activities of those ranchers who are still reluctant to adopt new measures to commercialize meat. According to the “Legalized Meat” Program, the farms shall be monitored by satellite images and in those where deforestation is detected, the rancher will not be allowed to commercialize his product. Beyond that, the rancher will not have access to public resources and credits for investments. The farm considered a source of deforestation will not receive the electronic document for transportation of animals, which is a kind of “cattle passport”. If the rancher does not have this document, he is not able to commercialize the meat. Hence, the ranchers who cause deforestation will be considered completely out of law.

9 See <www.carnelegal.mpf.gov.br>.

The “Legalized Meat” Program also provides environmental benefits, such as, preservation of Amazon’s biodiversity; recuperation of degraded areas (those that has deforested will have to plant native trees); utilization of technology to improve the production of meat in deforested areas; reduction of risks of erosion through the recuperation of degraded areas; and mitigation of climate problems caused by deforestation (lack or excess of rain, low humidity of air, desertification, etc.).

MPF intends to foster the “Legalized Meat” Program beyond Legal Amazon and implement it over the Brazilian territory.

VII. Actions Adopted by MPF in the State of Pará

The Brazilian Constitution in its Article 127 states that MPF is “*a permanent institution, essential to the jurisdictional function of the State, and its duty is to defend the judicial order, the democratic regime and the inalienable social and individual interests*”. Art. 129 (III) includes among the institutional functions of MPF the civil investigation and public civil suit to protect public and social property, the environment and other diffuse and collective interests.

In order to fulfill its constitutional obligations regarding the environment’s protection, in June 2009, MPF and the Brazilian Institute for the Environment (IBAMA) presented 20 lawsuits against ranchers that had caused 157,000 hectares of deforestation in Legal Amazon.

In these lawsuits, the deforestation has been validated in accordance with data of PRODES. Of course, data from PRODES may be argued in the court. Persons or companies that have caused deforestation may state that data are wrong and, in this case, an on-site visit may be scheduled. In the case of Legal Amazon, Brazilian courts have been accepting data from PRODES, because this Project has been the official parameter established by the Brazilian Government to provide deforestation assessment in Legal Amazon. So, when data from PRODES are questioned, the burden of proof is on those who claim.

MPF and IBAMA claimed around US\$ 1 million for covering damages caused to environment. Fridge companies were considered as responsible as the ranchers in those lawsuits, because when they buy illegal meat, they are stimulating the deforestation of the Amazon forest. At that time, 69 companies that had bought illegal meat were notified as co-responsible for environmental damages. On June 10th, 2009, the Grupo Pão de Açúcar, the Brazilian biggest retail chain, informed MPF that it had suspended purchases of bull meat from those fridge companies which were indicated as responsible for deforestation in Legal Amazon.

Just after the lawsuits were proposed, representatives from municipalities of the State of Pará contacted MPF to claim their losses and prejudices and asked for a 60 day-period for companies adapting to the new rules. MPF refused this proposal and stated that fridge companies should sign individual Terms of Conduct’s Adjustment, where they would assume the commitment of not buying meat from ranchers that caused deforestation. Once the Term was signed,

MPF would withdraw the lawsuit against the company, but the claim would remain against the ranchers or fridge companies that caused deforestation.

At the beginning of July 2009, within those 69 companies that were notified, 35 of them suspended purchases of bull meat from ranchers and fridge companies indicated by MPF as responsible for deforestation in Legal Amazon.

The purpose of MPF was to reach a deal with ranchers, because they were those who initiate deforestation. The first measure proposed by MPF is the geographical assessment of the rural areas, in order to establish the correct location and size of a specific rural property. These data would provide MPF with means to survey deforestation as well as to identify the property where it has occurred. Ranchers would also have to present a schedule for recuperating degraded areas; otherwise they would not commercialize their products.

In that same year of 2009, the State of Pará, through its Secretary for the Environment, establishes an Environmental Rural Registry (CAR), with the purpose of identifying properties used for livestock. Since the property is registered, the State is able to control new deforestations. On September 2nd, 2009, MPF and fridge companies from the State of Pará, signed an agreement where the companies assumed that, from January 2010, they would only buy meat from farms registered in CAR.

On December 9th, 2009, the Brazilian Ministry for the Agriculture and the State of Pará launched the Program “Boi Guardião” (meaning the “Guardian Ox” Program) which would undertake, through the use of satellite images, the remote sensing of farms located in that region. Only the farms where new deforestations had not occurred would be able to receive the document for animal traffic (GTA). Ranchers could not commercialize their bulls if they did not have a GTA. Hence, ranchers had to stop deforestation, otherwise their business would bankrupt.

Both CAR and GTA are based on information provided by satellite data.

VIII. The G-Amazônia Group

During the Rio+20, held from June 13th to 22nd, 2012, in Rio de Janeiro, the Group for the Integration of Legal Amazon (G-Amazônia), coordinated by the Advocacy-General of the Union – AGU - presented 21 lawsuits against the biggest responsible for deforestation in Legal Amazon¹⁰. G-Amazônia is claiming the amount of R\$ 181,118,690.01¹¹ for covering damages against environment. Differently from those lawsuits presented by MPF in 2009, the lawsuits proposed by G-Amazônia are not restricted to deforestation caused by livestock. Actually, in those lawsuits the purpose of deforestation – livestock, agriculture, commerce of wood, etc – is not relevant, but only its effects and the prejudice to the environment in Legal Amazon.

10 <www.agu.gov.br/sistemas/site/TemplateTexto.aspx?idConteudo=145456&id_site=3>.

11 Around US 90 million, considering the exchange rate of US\$ 1.00 = R\$ 2,00.

G-Amazônia was created by the Directive #23, as of June 16th, 2010, with the purpose of acting in the judicial defense of the public policies for the environment's protection in Legal Amazon.

The amount that has been claimed by G-Amazônia corresponds to penalties from R\$ 1 to R\$ 10 million applied by IBAMA against persons that have caused deforestation in Legal Amazon.

According to the lawsuits, persons that have caused deforestation shall rebuild degraded areas. Furthermore, any tax incentives granted by the Brazilian Government shall be suspended until the sites are fully recovered.

There are no conflicts between the functions of MPF and G-Amazônia: the first – MPF – gets autonomy to sue anyone who is causing deforestation in Legal Amazon or in other regions of the Brazilian territory; G-Amazônia gets a specific geographical jurisdiction (Legal Amazon) and it acts according to the public policies. However, in some cases, it is possible that MPF and G-Amazônia act conjunctly, in order to protect the environment in Legal Amazon.

IX. Conclusion

MPF and IBAMA withdraw all of those 20 lawsuits against ranchers and fridge companies presented in 2009, because in all of them agreements were reached. Ranchers assumed the commitment of not starting new deforestations, as well as reforesting degraded areas. They also assumed the commitment to invest in research and technology for sustainable livestock, instead of overthrowing the forest. On the other hand, fridge companies assumed the commitment of buying meat only from ranchers who have signed the Term of Conduct's Adjustment proposed by MPF.

In the State of Pará, federal, state and municipal authorities have given total support to the actions undertaken by MPF. The registry of rural properties in CAR helps the authorities to control new deforestations and the document GTA avoids the commerce of animal growth in degraded areas.

MPF has also been intensifying its actions in other states of Legal Amazon, especially in Mato Grosso, the biggest producer of bull meat in Brazil.

Taking into account the huge size of Legal Amazon, it is not an easy task to control and avoid new deforestations. However, thanks to the actions of MPF and to the use of satellite images for deforestation assessment, the number of ranchers and fridge companies that have adopted sustainable livestock has been increased. So, it can be said that actions undertaken by MPF have reached their target.