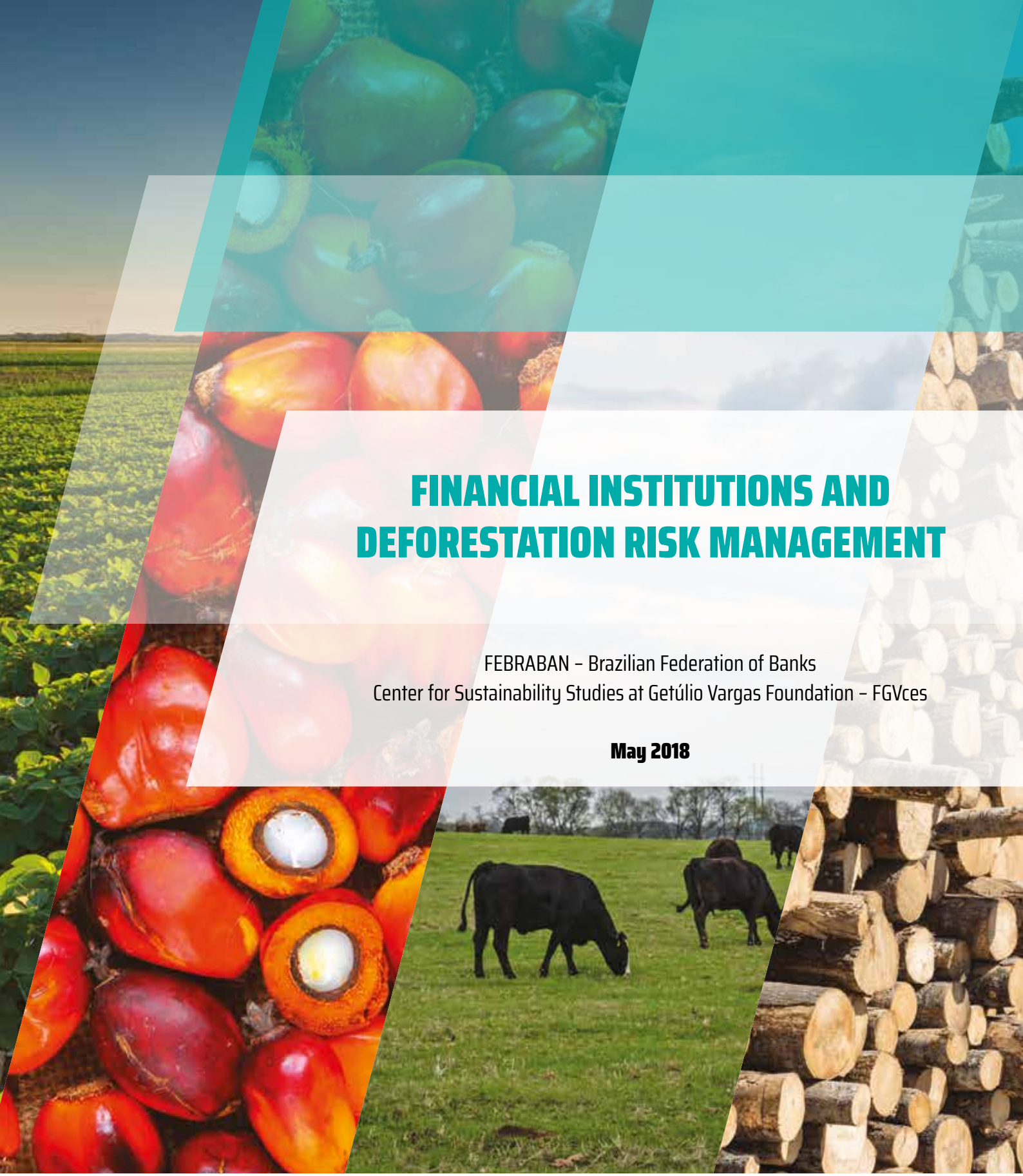

FINANCIAL INSTITUTIONS AND DEFORESTATION RISK MANAGEMENT

FEBRABAN – Brazilian Federation of Banks
Center for Sustainability Studies at Getúlio Vargas Foundation – FGVces

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Prepared for:

FGV EAESP
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Financial Institutions and Deforestation Risk Management

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Contents

List of figures

List of tables

List of boxes

List of abbreviations and acronyms

2BSvc – Biomass Biofuel Sustainability Voluntary Scheme
Abiove – Brazilian Association of Vegetable Oil Industries
ADM – Archer Daniels Midland
ANEC – National Association of Cereal Exporters
APP – Permanent Preservation Area
CAR – Rural Environmental Registry
CCIR – Certificate of Registration of Rural Property
CG – Geodesic Coordinates
CGF – Consumer Goods Forum
CRA – Environmental Reserve Quota
FEBRABAN – Brazilian Federation of Banks
FEFAC – European Feed Manufacturers' Federation
FGVces – Center for Sustainability Studies at Getulio Vargas Foundation
FUNAI – National Indian Foundation
GIPS – Indicators Guidebook for Sustainable Livestock
GTA – Animal Transit Guide
GTPS – Brazilian Roundtable on Sustainable Livestock
GTS – Soybean Workgroup
Ibama – Brazilian Institute of Environment and Renewable Natural Resources
IBGE – Brazilian Institute of Geography and Statistics
INPE – National Institute for Space Research
ISCC – International Sustainability and Carbon Certification
Matopiba – Maranhão, Tocantins, Piauí and Bahia
MCR – Rural Credit Manual

NYDF – New York Declaration on Forests
PIB – Gross Domestic Product
PNRA – National Land Reform Program
Pronaf – National Program for the Strengthening of Family Farming
RAC – Rainforest Alliance Certified
RL – Legal Reserve
RTRS – Roundtable on Responsible Soy
SAN – Sustainable Agriculture Network
SFN – National Financial System
Sicor – Rural Credit and Proagro Operation System
Sisbov – Bovine and Bubaline Production Chain Traceability Service
SNUC – National System of Units of Conservation
TAC – Term of Adjustment of Conduct
ZAE – Agro-ecological Zoning
ZEE – Ecological-Economic Zoning

Presentation

The Brazilian Federation of Banks (FEBRABAN) and the Sustainability Study Center of Fundação Getulio Vargas (FGVces) have established a partnership that is now in its fourth cycle of activities to analyze the possible ways to leverage the transition toward a Green Economy in Brazil by using resources brokered by the National Financial System (SFN).

Throughout the year of 2017, four studies were conducted, three of which give continuity to the studies started in the previous year. The first of them analyzes the economic-financial feasibility of adopting photovoltaic systems in Brazil to determine the scalability of financing for such projects. The second study tries to evaluate the economic-financial feasibility of bank financing models for forest restoration, taking into account the economic exploration of Legal Reserve areas (ARL). The third study addresses the management of climate risk by banks and companies, by evaluating the possible impact of the adoption of carbon pricing systems in Brazil on financial institutions, in particular in relevant economic sectors of bank financing portfolios. Finally, the fourth study, which is the subject matter of this report, tried to analyze the implications and risks for financial institutions of deforestation on the livestock, soybean, wood products and palm oil supply chains.

Introduction

The development of this study, which is a continuation of the report published in 2016 - "Risks and Opportunities Related to Natural Capital for the Financial Sector" – was motivated by four main factors:

The first of them refers to the relevance of agribusiness for the Brazilian economy – taking into account that the sector accounts for 23.6% of GDP[1] and is responsible for 46.6% of the country's exports[2] – and for bank credit portfolios – as just the rural credit contracted in the 2016/2017 *Plano Safra* (Agriculture and Livestock Plan) alone accounted for some 10% of the total individual and corporate lending portfolio.[3]

Deforestation rates in the Legal Amazon and Savanna areas remain high. In the Amazon, the rate decreased by 16% in 2017 after increasing by 73% between 2012 and 2016[4], but it is still far from the national target of 3,925 square kilometers for 2020. In the Savanna area, the deforestation rate in 2015 (9,483 km²) was 52% higher than that of the Amazon in the same year[5].

It is necessary for the financial institutions to meet the requirements of the *Manual de Crédito Rural* – MCR (Rural Credit Manual) related to the environmental regularization of rural clients (Brazilian Central Bank Resolutions 4,427/2015, 4,422/2015 and others).

Lastly, it is noted that there is a trend among the Brazilian public supervising bodies to hold accountable not only the agent that is directly responsible for the environmental damage, but also the different members of the value chain indirectly linked, including the financing agent, thus generating a greater legal risk to financial institutions.[6]

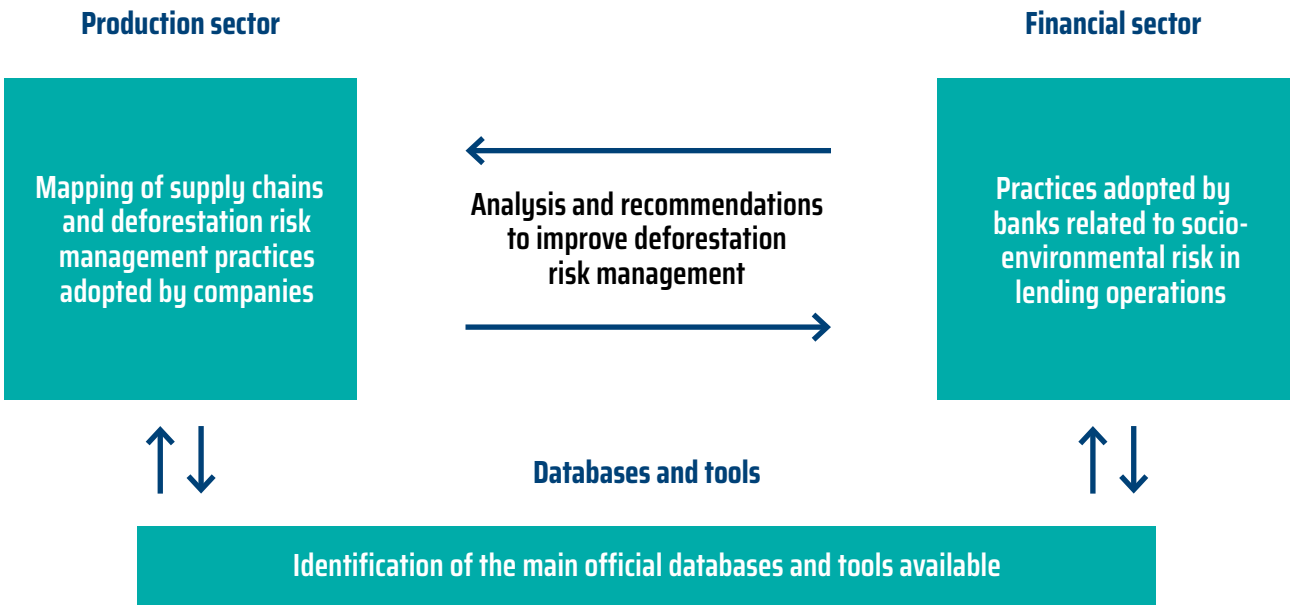
[1] (Cepea, 2016b; IBGE, 2017)
[2] (Cepea, 2016a; MDIC, 2017)
[3] (Central Bank of Brazil, 2017)
[4] (INPE, 2017)
[5] (Climate Observatory, 2017)
[6] (Borges, 2016; Ninni, 2011)

Therefore, this study intends: (1) to improve the financial institution's deforestation risk management practices by means of (1a) recommendations on criteria to be analyzed before granting credit and (1b) provide information on tools and databases available for consultation on deforestation risk; and (2) to provide subsidies to allow the banks to respond to the national and international demands related to deforestation reduction.

To achieve such objectives, the report is structured in three parts. The first of them maps the physical incidence of deforestation in selected agriculture supply chains and analyzes the way in which the companies of different links of the chain are managing the deforestation risk. The second part examines the requirements related to deforestation risk management to be met by financial institutions upon granting credit to rural producers and agribusiness corporate clients. It also identifies which of the main databases and tools in place are able to help the institutions to manage their risk. The third part concludes and makes recommendations on (i) which elements of the financial institutions' socio-environmental risk analysis contribute to deforestation risk reduction of their clients in the agriculture sector and (ii) what are the available tools that contain the necessary information for such deforestation risk management.

The figure below schematically shows the report's framework:

Figure 1. Framework of FEBRABAN deforestation risk management report



Source: Elaborated by authors

The study was prepared through a bibliographic review, an analysis of sustainability reports of the analyzed supply chain members, a review of the CDP Forest Program questionnaires answered by the companies and a face-to-face application of these questionnaires on deforestation risk management including 10 financial institutions (public and private) that lend to these agriculture sectors.

Part I. Physical incidence of deforestation in agricultural supply chains

This section of the report will analyze the potential deforestation risk in cattle, soybean, wood product and palm oil chains. More specifically, it will discuss: (i) the main characteristics of the industry and the different links of these supply chains; (ii) the Brazilian regions and the links in which the highest potential deforestation risk is concentrated; (iii) the procedures that have been adopted by the supply chain players to manage the deforestation risks of their suppliers; and (iv) the existing initiatives to support the fight against deforestation in these agricultural supply chains.

1. Cattle Chain

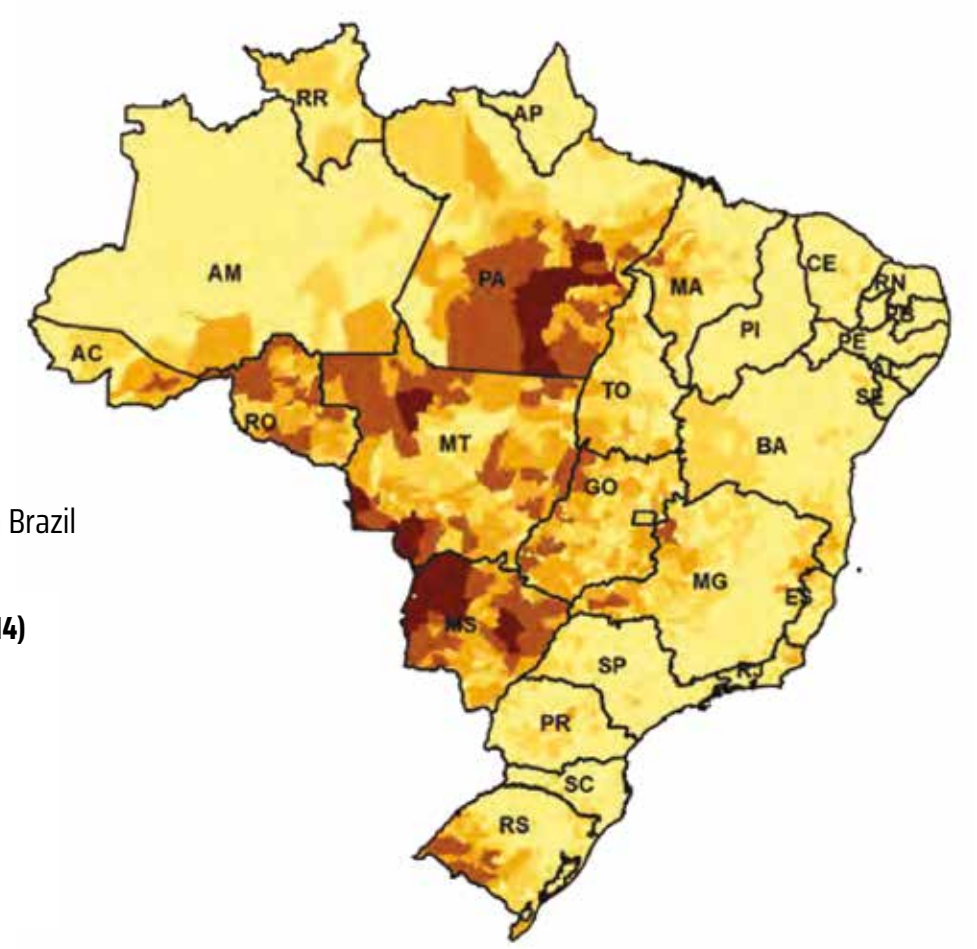
Brazil has some 209 million heads of cattle, the most worldwide, distributed over 167 million hectares (1.25 head per hectare) concentrated in the states of Mato Grosso (13.6%), Minas Gerais (11.3%) and Goiás (10.4%).[7] Legal Amazon[8] alone has 85 million heads or 40% of the total national cattle.[9] The map below shows the concentration of cattle per Brazilian municipality and state:

[7] (ABIEC, 2016)

[8] Legal Amazon covers the territories of Acre, Amapá, Amazonas, Mato Grosso, Pará, Rondônia, Roraima and Tocantins and part of Maranhão (Ipea, 2008)

[9] (Barreto, Pereira, Brandão, & Baima, 2017)

Figure 2. Number of cattle heads in Brazil



Number of cattle heads in Brazil

Heads per municipality (2014)

- State limit
- 0 - 50.000
- 50.000 - 150.000
- 150.000 - 350.000
- 350.000 - 800.000
- 800.000 - 2.500.000

Source: (ABIEC, 2016)

In 2016, livestock accounted for 7.3% of GDP generating R$ 458 billion, and for 2.9% of exports equivalent to US$ 5.36 billion.[10] Out of 9.56 million tons of carcasses (from a total of 39.16 million heads slaughtered) produced in 2015, 81% were consumed by the internal market and 19% were exported primarily to China, Egypt, Russia and Iran.[11]

[10] (ABIEC, 2017; Cepea, 2016a, 2016b; IBGE, 2017)

[11] (ABIEC, 2016)

a) Livestock supply chain players

The beef cattle production chain is composed of seven main components: (1) the producers of basic inputs (the "before the gate" segment); (2) livestock producers – (2a) breeding farms, (2b) rearing farms and (2c) fattening farms (the "within the gate" segment); (5) primary and secondary processing industries; (6) wholesale and retail industries; and (7) the end consumers (the "after the gate" segment). The table below details such components:

Table 1. Description of components of beef cattle production chain

	Description	Profile	Main players
Input producers	Producers of inputs related to nutrition, reproduction, animal health, fuels, agricultural inputs and maintenances[1]	Large multinational companies	Bayer-Monsanto, Basf, Syngenta, Dow AgroSciences
Breeding farms	Operate from calf birth to weaning that occurs between six and eight months of age and eventually extends up to 12 months.[2]	In general, this phase occurs under an extensive grazing regime with native or cultivated pastures and is focused on small scale production. The breeding phase has not benefited from technologies incorporated into the production process at the same intensity as compared to those participating in the rearing and fattening stages.[3]	Fazenda Nova Piratininga (GO) – 135K ha (105,000 nelore heads); Fazenda Conforto (GO) (80,000 heads)[4]
Rearing farms	Cover the period from weaning to the start of female reproduction or male fattening and may persist for 30 months in 4-year old slaughtered animals.[5]	Rearing and fattening stages are mostly concentrated in larger areas/properties[6] and receive a greater allocation of technologies as compared to breeding stage.[7]	
Fattening farms	The fattening stage ends when the animal is ready for slaughter;[8] when it occurs under a predominant pasture regime, it takes six to eight months.[9]		

	Description	Profile	Main players
Primary and secondary processing industries	Primary processing industries slaughter animals and obtain beef cuts, while secondary processing industries incorporate beef into their products or add value to it	Large multinational companies	Marfrig, JBS, Minerva, BRF, McDonald's, Burger King
Wholesalers, exporters and retailers	Wholesalers or exporters carry out the role of storage and/or delivery agents, while the retailers make the direct sale of beef to end consumers	Large multinational companies	Unilever, Walmart, Carrefour, Pão de Açúcar, Dia, Extra
End Consumer	The end consumer is responsible for the acquisition, preparation and use of final product [10]	individual	individual

Source: Elaborated by authors based on (Famato & Fabov, 2007; MAPA, SPA, & IICA, 2007; Pires, n.d.)

[1] (ABIEC, 2016)

[2] (Famato & Fabov, 2007; Pires, n.d.)

[3] (Famato & Fabov, 2007; Pires, n.d.)

[4] (Compre Rural, 2017; Dinheiro Rural, 2015; Rodeo West, 2017)

[5] (Famato & Fabov, 2007)

[6] (Pires, n.d.)

[7] (Famato & Fabov, 2007)

[8] (Pires, n.d.)

[9] (MAPA et al., 2007)

[10] (Famato & Fabov, 2007; Pires, n.d.)

Along the chain it is noted that input producers, primary and secondary processing industries and wholesale and retail industries are dominated by large multinational companies. However in the cattle production, the rearing and fattening stages are dominated by larger farms endowed with a greater technological apparatus while the breeding farms are smaller and less technologically equipped.[12] Data from the last IBGE 2006 Farming Census shows that 12% of Brazilian cattle are directed to the breeding stage, 6% to the rearing stage, 13% to the fattening stage, 15% to the breeding and rearing stages, 3% to the breeding and fattening stages, 10% to the rearing and fattening stages and 41% to the breeding, rearing and fattening stages.[13] Therefore, 33% of the cattle are in breeding and rearing stages that, as discussed later, tend to be less inspected by the monitoring controls existing in slaughterhouses, wholesalers and retailers.

b) Location of deforestation risk in the livestock chain

As shown in Figure 3, there is a concentration of meat packers in Mato Grosso do Sul, Goiás, Rondônia, Pará, Mato Grosso, Minas Gerais, and in the North of Paraná and São Paulo. Therefore, a significant number of slaughterhouses are in Amazon and Savanna[14] biomes, which are regions rich in biodiversity and with a high level of deforestation. The Amazon, which has 20% of the world´s freshwater and a forest coverage of 77.5% of its region[15], had a surface area of 6,624 km^2 deforested between 2016 and 2017.[16] On the other hand, the Savanna biome, which is recognized as the richest Savanna in the world from a biological diversity[17] standpoint and whose vegetation is essential for the main Brazilian hydrographic basins[18], had 9,483 km2 deforested between 2014 and 2015.[19]

[12] (Famato & Fabov, 2007; Pires, n.d.)

[13] (IBGE, 2009)

[14] Savanna comprises the Federal District and parts of 11 states: Piauí (37%), Maranhão (64%), Tocantins (91%), Bahia (27%), Mato Grosso (40%), Minas Gerais (57%), Goiás (97%), Mato Grosso do Sul (61%), São Paulo (33%), Paraná (2%) and Rondônia (0.2%) (Agrosatélite, 2015)

[15] (Assunção, Gandour, Hemsley, Rocha, & Szerman, 2013; Brazilian Forest Service, 2013)

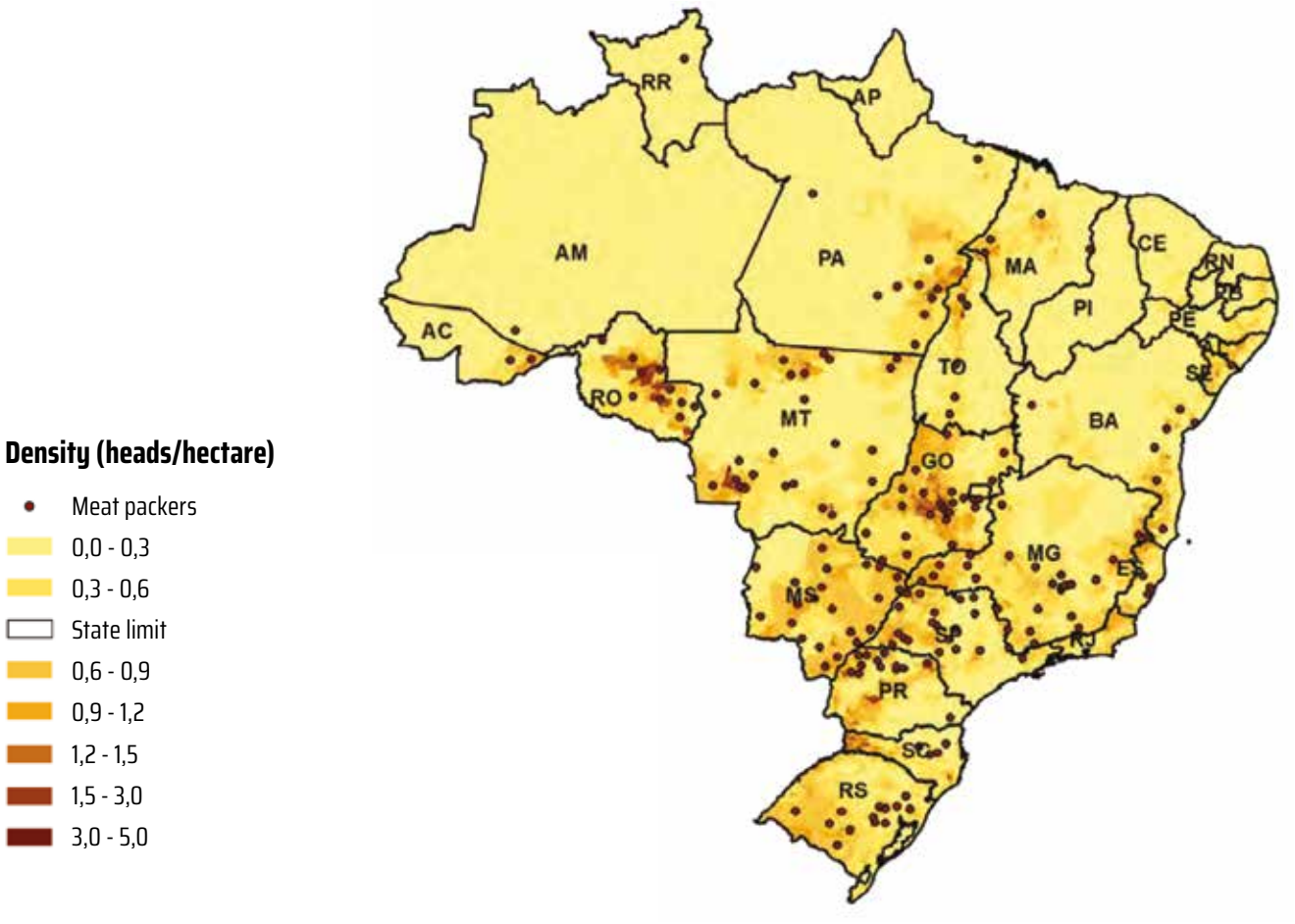
[16] Data refers to Legal Amazon (INPE, 2017)

[17] (MMA & Ibama, 2015; Brazilian Forest Service, 2013)

[18] (Pinto, 2017)

[19] (MMA, 2017)

Figure 3. Location of meat packers



Source: (ABIEC, 2016)

A study conducted in 2017 by Paulo Barreto and other researchers[20] analyzed the risk of deforestation of slaughterhouses located in the Legal Amazon, which is a region that comprises the whole Amazon biome and 20% of Savanna[21]. The researchers:

[20] (Barreto et al., 2017)

[21] (GVagro, 2016)

(I) mapped the location of meat packers in the Legal Amazon (a total of 128 meat packers in 99 companies);

(II) estimated the potential cattle purchase zones of slaughterhouses based on the maximum purchase distances as reported by interviewees and access routes;

(III) analyzed the exposure of meat packers to the risk of purchasing from deforestation areas, by overlapping the potential areas with areas embargoed by the *Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis* – Ibama (Brazilian Institute of Environment and Renewable Natural Resources), areas recently deforested between 2014 and 2015 and areas in risk of future deforestation (2016-2018).

The study showed that Pará, Mato Grosso and Rondônia concentrated 63% of meat packers in Legal Amazon, while the three largest companies - JBS, Minerva e Marfrig - concentrated 21% of meat packers and 42% of slaughtering capacity. The study also estimated that the 99 companies owning the analyzed meat packers influence the behavior of some 390,000 farms with a herd comprising approximately 79 million heads. With respect to the deforestation risk of meat packers , the study generated a ranking of more exposed companies, by considering the overlap of potential purchase areas with areas embargoed by Ibama, recently deforested areas and areas with risk of future deforestation. JBS ranked first, Marfrig ranked fifth and Minerva ranked tenth. Therefore, the largest meat packers in the country are highly exposed to potential involvement with illegal deforestation, with the development of robust monitoring systems of direct and indirect suppliers being fundamental, from a deforestation risk management standpoint.

The study also indicated that 69 of 128 surveyed meat packers belong to companies that have not signed the Livestock *Termo de Ajustamento de Conduta* – TAC (Term of Adjustment of Conduct) with the Public Prosecutor's Office (see more information in Annex I); that is to say, they have not signed the term of commitment to abstain from purchasing cattle in areas where deforestation has occurred after 2009, to purchase cattle only from properties registered with the *Cadastro Ambiental Rural* – CAR (Rural Environmental Registry), and to abstain from purchasing cattle in areas located in Conservation Units and indigenous lands. As such meat packers have an installed slaughtering capacity of 30% of the total regional capacity and there is no public evidence that they have adopted methods to determine whether their suppliers deforest illegally or not, the potential risk that they are purchasing cattle in recently deforested regions is high, especially in Pará, Mato Grosso and Rondônia, where most non-signatory cooling companies are located and the deforestation rates have been higher. Therefore, such meat packers may potentially be involved with deforestation.

It should also be noted that although there are some commitments made by the livestock sector to control deforestation in Amazon, such as the Public Livestock Commitment and TACs signed by meat packers , there is no public commitment by the sector related to the protection of the Savanna biome. On September 11, 2017, a group of 40 non-governmental organizations signed a manifesto calling on the beef and soybean companies and their investors to mobilize themselves to adopt effective policies and commitments to eliminate deforestation and release the production chains from recently converted natural areas[22]. However, so far there have been no concrete measures disclosed on this matter.

There also have been no concrete measures related to requirements to fight deforestation by countries that purchase livestock products. However, some initiatives by importing countries have been started for that purpose. For example, France has declared that it will gradually block the import of commodities that contribute to deforestation.[23]

c) Deforestation risk monitoring by livestock chain players

✓ Identification of the main deforestation risks by livestock chain companies

In 2017, FEBRABAN established a partnership with CDP, which is a non-governmental organization operating in a global disclosure system where companies, cities, states and regions in more than 90 countries report environmental data.[24]

One of the results of that partnership was the publication of the report "Deforestation risk management – Analysis of companies responding to the CDP Forest Program", where the CDP analyzed the management of deforestation risk of companies that answered the questionnaire from its Forest Program in 2016 and that operate in livestock, soybean, palm oil and/or wood chains in Brazil, whether by having a physical presence in the country or through the commercialization of Brazilian products.

[22] (WWF, 2017)

[23] GT for Zero Deforestation (2017)

[24] (CDP, 2017)

Out of 46 analyzed companies that operate in the livestock chain, 43% reported that reputation risks related to deforestation have generated operational or financial impacts.[25] With respect to qualitative matters, most of them mentioned the pressure exerted by global and local NGOs to make the chain adopt free deforestation practices. More specifically, major meat packers - JBS, Marfrig and Minerva – and some processing companies mentioned the 2008 Greenspace campaign "Ox Spree" and its developments.

> **"Since 2007, the non-governmental organization Greenpeace has studied the behavior of livestock production chains in the Amazon region. In 2009, after a lengthy investigation, the organization published the report "Eating the Amazon", which showed the relationship between processing companies and their suppliers of cattle involved with deforestation and slave labor, and products for sale in the market. JBS was one of the processing companies included in the list. This fact gave rise to negative impacts on JBS' goodwill and among its consumers"**
> **(2016 JBS CDP Forest Questionnaire).**[I]

Additionally, 21% of the surveyed companies mentioned physical risks that caused operational and financial impacts. According to some companies, deforestation has affected the supply of commodities by enhancing extreme dry season events.

> **"In the first quarter of 2015, the cost of cattle increased because of the dry season that affected the pasture availability, thus compromising cattle fattening and reducing beef production in Brazilian industry"**
> **(2016 Marfrig CDP Forest Questionnaire).**[II]

✓ Monitoring systems of primary and secondary processing industries

According to CDP Forest Program data (2016) and sustainability reports of companies, the three largest Brazilian meat packers have been provided with monitoring systems intended to determine whether their direct suppliers are involved with illegal deforestation practices. In general, the companies' processes consist of comparing the CPF/CNPJ data of their suppliers to the Ibama information on embargoed areas.[III] In the Amazon biome, monitoring by meat packers is more rigorous because of the Public Livestock Commitment

[25] Question F1.3a – Please identify the impacts related to products of forest risk that have generated substantial changes to your operations, revenues or business costs over the last 5 years

of which those three meat packers are signatories and Livestock TACs were signed between the cooling companies and the Public Prosecutor's Office. The companies compare the maps of suppliers' properties to deforestation maps of the *Instituto Nacional de Pesquisas Espaciais* – INPE (National Institute for Space Research), indigenous lands of the *Fundação Nacional do Índio* – Funai (National Indian Foundation), areas embargoed by Ibama and the *Sistema Nacional de Unidades de Conservação* – SNUC (National System of Units of Conservation) to detect suppliers that are located in recently deforested areas or in regions where production activity is forbidden.[IV] In addition, every year the meat packers are audited by independent organizations to determine whether they are in conformity with the Commitment.[26]

While JBS and Minerva monitor exclusively direct suppliers, Marfrig also tries to monitor indirect suppliers by asking its suppliers to inform them via the company's system of the origin of animals purchased from other farms, including data on the property, municipality, State, owner's name and identification (CNPJ or CPF in Portuguese). The company then cross-references the indirect suppliers' data with Ibama embargoed areas and slave labor lists.[V] However, auditors of the company's Livestock Commitment assert that the examination is not systematically conducted by the company yet.[VI]

Table 2. Monitoring of deforestation risk by different links of livestock chain

Link	Deforestation risk monitoring	Monitoring gaps	Best practices
Fattening farms	In general, breeding and rearing farms are not monitored	Low control over their suppliers Cattle commercialization by auctions and intermediate traders[11]	

[26] (JBS, 2017)

Link	Deforestation risk monitoring	Monitoring gaps	Best practices
Primary and secondary processing industries	They mostly monitor the direct suppliers Geospatial monitoring of the Amazon biome Most slaughterhouses without a TAC do not monitor suppliers[12]	Low monitoring of indirect suppliers Commercialization of cattle of ilegal origin ("laundering" and "leaking" processes)[13] Lack of individual traceability	Marfrig "Request for Information" Program[14] JBS and McDonald's Sustainable Hamburger Program[15] Beef with Marfrig Rainforest Alliance Certified seal[16]
Wholesalers, exporters and retailers	They mostly monitor the direct suppliers Some companies are developing geospatial monitoring systems	Low monitoring of indirect suppliers	Safe Trace System implemented by Pão de Açúcar Beef with Marfrig Rainforest Alliance Certified seal traded by Carrefour

Source: Elaborated by authors

[11] (Barreto et al., 2017; Camara, 2017)

[12] (Barreto et al., 2017)

[13] (Barreto & Gibbs, 2015)

[14] (Marfrig, 2016)

[15] (JBS, 2017)

[16] (Marfrig, 2013)

With respect to the secondary processing industry, the companies' practices are varied. For example, since 1989 McDonald's has had a global policy that forbids the purchase of beef produced in the Amazon biome and requires that the company's suppliers sign a commitment to that policy.[VII] It is also working with the Agrotools geographic intelligence consulting firm to map the origin of beef acquired in Brazil and check the compliance with the policy.[VIII] In addition, the company has established a partnership with JBS in the Sustainable Hamburger Program that provides the production of hamburgers with respect to socio-environmental and quality criteria. In addition to meeting the criteria already adopted by JBS – beef suppliers cannot be involved with deforestation, overlap of indigenous lands or Conservation Units – the Program also focuses on the conformity of suppliers with the Guidebook of Indicators for Sustainable Livestock (GIPS) of the *Grupo de Trabalho da Pecuária Sustentável* – GTPS (Brazilian Roundtable on Sustainable Livestock detailed in Annex II), cattle monitoring since their origin and an independent auditing of the whole project management system.[IX]

✓ Gaps in primary and secondary processing industry monitoring

In general, only those slaughterhouses that signed a TAC with the Public Prosecutor's Office are the signatories of the Public Livestock Commitment that have any type of supplier monitoring, while the other slaughterhouses purchase the cattle without checking their origin.[27] In addition, although the largest slaughterhouses are provided with monitoring systems in place, there is the possibility that they may purchase cattle from an illegal deforestation area, what may occur for some reason.

First, as the slaughterhouses primarily monitor the direct suppliers, they have no control on those who supply their suppliers. According to its answers to the 2016 CDP Forest questionnaire, Marfrig has a system that checks their indirect suppliers, but does not analyze 100% of them. In addition, the forms of trade between producing farms and slaughterhouses may make traceability difficult. For example, in some Amazon regions, cattle commercialization through auctions or a *catireiro*, which is a kind of intermediary that gathers animals from several properties to be resold to fattening farms and slaughterhouses, is very common.[28] Therefore, slaughterhouses hardly get to trace their indirect suppliers.

Second, leaking and laundering mechanisms help the commercialization of cattle of illegal origin in the chain. Laundering is the process to make the cattle of illegal origin apparently legal. Leaking, on the other side, occurs when the illegal farm finds a purchaser that purchases its cattle without checking or partially checking its origin.[29] To "leak" or "launder" the cattle, the farms may:

- ✓ Register false information with CAR (taking into account that Environment Secretariats have not validated yet the information of most of the CAR), by omitting illegal deforestation areas and preventing the slaughterhouses from detecting that illegality;

[27] (Barreto et al., 2017)

[28] (Camara, 2017)

[29] (Barreto & Gibbs, 2015)

- ✓ Transport fat cattle from illegal farms to legal farms before their sale to slaughterhouses – that may happen when an owner of several farms uses one of them to "launder" the cattle from other illegal farms or when the legal farmer sells cattle belonging to illegal farmers;

- ✓ Rent their land out to farmers that are not included in the list of areas embargoed by Ibama. After registering the property with CAR in their own name as lessee, they may sell the cattle to slaughterhouses, as they are not included in the embargo list;

- ✓ Sell to slaughterhouses that do not check or partially check the cattle's origin.[30]

Additionally, the low level of individual control of cattle in Brazil makes the traceability of an animal to its origin difficult. Currently, in the country, there are two main models of cattle traceability, both of which have a sanitary purpose (not environmental). The first is the individual traceability that is obligatorily used – mostly – by producers that export to the European Union. In this system, each animal is registered with the *Serviço de Rastreabilidade da Cadeia Produtiva de Bovinos e Bubalinos* – Sisbov (Bovine and Bubaline Production Chain Traceability Service) of the Ministry of Agriculture and identified, registered and monitored by a chip containing information about the animal, such as its origin, movements, health state, production and productivity.[31]

The second type of traceability that is more common and collective is made by the *Guia de Trânsito Animal* – GTA (Animal Transit Guide), which is a document issued by environmental bodies when there is cattle transportation with the purpose to make disease control easier. The GTA contains information, such as the quantity and purpose of transported animals (breeding, fattening or slaughtering), age, name and identification (CNPJ or CPF in Portuguese) of both the seller and the purchaser of the animals' lot. However, as there is no environmental control purpose or individual animal traceability (traceability is made by the animals' lot), there is only information about their traders (rather than the whole history of cattle transportation) and the GTA is secret (it is only open to traders, issuing bodies and the Ministry of Agriculture, Livestock and Supply), the meat packing facility is not able to trace the animal to its birth place through the GTA, but only to the immediately previous place where the cattle was.[32]

[30] (Barreto & Gibbs, 2015)

[31] (Camara, 2017)

[32] (Camara, 2017)

Some organizations, such as the JBS meat packing facility, defend the issuance of the GTA conditional to a consultation to the list of areas embargoed by Ibama. In the state of Pará, a 2013 decree binds the issuance of the GTA to the Ibama list, although that has not been effectively put in practice so far. On the other hand, some organizations of the production and sanitation sectors refuse the GTA connection to the consultation of embargoed areas, by saying that such connection will stimulate fraud in a consolidated system and may generate sanitary problems. In addition, they argue that the system, being automated, would prevent the issuance of a GTA for a property where only a part of it is embargoed[33]

✓ Wholesaler and retailer monitoring systems

Wholesalers' and retailers' practices to monitor beef suppliers are varied and have different control levels. For example, Carrefour is developing a georeferenced system to monitor its supply chain[X], while Walmart and Pão de Açúcar already have geospatial traceability systems. Walmart, which currently monitors the Amazon region, by overriding the suppliers' farm areas with deforestation maps, wishes to expand the program scope to other biomes.[XI] Pão de Açúcar announced publicly in March 2016 its Beef Purchase Policy and undertook to achieve 100% transparency with respect to animal origin to the last farm where the animal was before being owned by those who slaughtered it. A sustainable origin is understood by the company as referring to beef that is not involved with deforestation, slave labor and conflict related to land ownership due to the invasion of conservation areas or confrontation with indigenous communities, *quilombo* or other traditional communities. To determine the compliance with the policy, a system has been implemented by the company Safe Trace to monitor, trace, make a critical analysis and report of socio-environmental conformity data related to beef origin.[XII] [34]

[33] (Camara, 2017)

[34] (GPA, 2016, 2017)

Another retailers' practice related to the traceability of beef origin refers to the development of partnerships with slaughterhouses to make differentiated products available to consumers. An example of a differentiated product arises from the partnership between Marfrig and Carrefour to commercialize beef certified by the Rainforest Alliance Certified (RAC). In 2012, the Marfrig unit in Tangará da Serra (MT) was the first one to receive the beef certification seal testifying that the beef-supplying farms follow the rules established by the Sustainable Agriculture Network (SAN). Among others, such rules establish that certified farms have not cut down forests or other natural ecosystems over the five years before certification.[35] In 2013, Carrefour started to trade beef possessing the seal. Currently, in addition to Tangará da Serra, Marfrig operations in Promissão (SP) and Pampeano (RS) are also certified.[XIII]

✓ Gaps of wholesaler and retailer monitoring

Like slaughterhouses, most wholesalers and retailers only monitor the direct suppliers, by determining through the documentation or geospatial systems whether their suppliers are involved with recent deforestation practices. Walmart is an exception to that rule, which is training its direct suppliers to insert their suppliers' farm coordinates in the company's system.[XIV] In addition, the Pão de Açúcar Group is using the traceability system developed by Safe Trace to trace the beef origin through the use of chips and tags and expects to trace, in the short term, 100% of cattle, from birth to slaughtering.[36]

However, such cases are exceptions, as most companies still have difficulties in tracing the whole production chain of commercialized beef. Thus, there are gaps in monitoring made by that link of their supply chain.

[35] (SAN, 2017)

[36] (Barreto, 2015)

2. Soybean supply chain

Brazil is the largest exporter and the second largest producer of soybeans in the world, behind only the United States. In the 2016/2017 crop, the country produced 113.923 million tons of soybean grain in a planted area of 33.89 million hectares (a productivity of 3,362 kg/ha), equivalent to 32.4% of world production.[37] Grain production is concentrated in Savanna (47%) and Atlantic Forest (35%) biomes[38], while the states producing the most are Mato Grosso (27%), Paraná (17%) and Rio Grande do Sul (16%).[39]

41.5% of total soybeans produced are used for direct consumption and 58.5% (67.2 million tons) are exported. In 2016, the country exported an amount equivalent to US$ 19.3 billion of soybean grains, US$ 5.2 billion of soybean meal and US$ 898 million of soybean oil, amounting to 13.7% of Brazilian exports.[40] China is the main destination of Brazilian soybeans (63% of exported soybeans[41]) to supply its increasing pork industry.[42] It is followed by the European Union with 15%[43], which is a region that increased the role of soybeans as animal food after banishing the use of beef for animal consumption upon the mad cow disease crisis in 2001.[44]

a) Soybean supply chain players

The soybean supply chain is composed of the following links: suppliers of agricultural input, producers, originators (traders, storage warehouses and cooperatives), the crushing industry, vegetable oil industries and distributors (wholesalers, retailers and institutional market) as shown in Table 3.[45]

[37] (Embrapa, 2017)
[38] (Imaflora, 2016)
[39] (Embrapa, 2017)
[40] (ABIOVE, 2017)
[41] (ABIOVE, 2017)
[42] (WWF, 2012)
[43] (ABIOVE, 2017)
[44] (KPMG, 2013)
[45] (Lazzarini & Nunes, 2008)

Table 3. Description of the components of the soybean production chain

Link	Description	Profile	Main players
Producers of agricultural inputs	They represent the industry of fertilizers, pesticides, machines and seeds (genetic)[17]	Large multinational companies	Bayer-Monsanto, Basf, Syngenta, Dow AgroSciences
Producers	They represent the agricultural segment itself[18]	There are larger producers with their own storage structure, and small and medium producers without storage and primary processing structure[19]	SLC Agrícola, AMAGGI and smaller producers
Originators	They represent the traders, cooperatives, brokers and storage companies that are in direct contact with producers in acquisition, storage and distribution of raw material[20]	Global trade is concentrated in four multinational companies (ADM, Cargill, Louis Dreyfus and Bunge)[21]	ADM, Cargill, Louis Dreyfus, Bunge, AMAGGI
Crushing and vegetable oil industry	Soybean processors that perform the crushing, degumming and refinement processes[22]	Soybean processing is concentrated in four multinational companies (ADM, Cargill, Louis Dreyfus and Bunge) [23]	ADM, Cargill, Louis Dreyfus, Bunge, AMAGGI, JBS, Marfrig
Distributors	Represented by wholesaler and retailer segments, they act as a bridge between the crushing and soybean derivative industry and the end consumer[24]	Large multinational companies	McDonald's, Burger King, Unilever, Danone, Mars, Walmart, Carrefour, Pão de Açúcar Group
End consumers	They include both industrial purchasers in external trading sales and processing industries and end consumers of oil and beef derivatives[25]	Physical individual and legal entities	Physical individual and legal entities

Source: Elaborated by authors based on (Lazzarini & Nunes, 2008)

[17] (Lazzarini & Nunes, 2008)

[18] (Lazzarini & Nunes, 2008)

[19] (Imaflora, 2016)

[20] (Lazzarini & Nunes, 2008)

[21] (Imaflora, 2016)

[22] (Lazzarini & Nunes, 2008)

[23] (Imaflora, 2016)

[24] (Lazzarini & Nunes, 2008)

[25] (Lazzarini & Nunes, 2008)

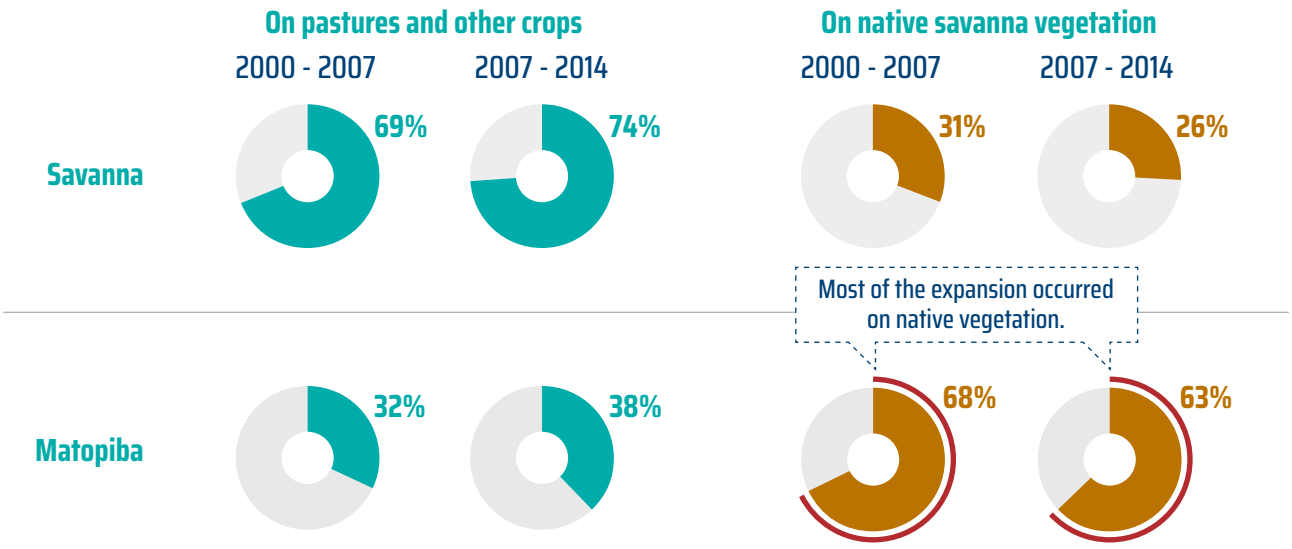
b) Location of the soybean supply chain deforestation risk

Out of the total soybean production in Brazil, 47% is in the Savanna biome, 35% in Atlantic Forest, 12% in Amazon and 6% in Pampa.[46]

In the Savanna, a study produced by Agrosatélite in 2015 shows the impact of soybean culture on biome deforestation, by analyzing the dynamics of agricultural expansion in the years of 2000/2001, 2006/2007 and 2013/2014, as well as the land use change in the analyzed periods.

Between 2000/2001 and 2013/2014, there was an increase of 108% in soybean planted areas, which increased from 7.53 to 15.66 million hectares in the Savanna, while the states of Mato Grosso and Goiás accounted for 53.3% of that increase. With respect to land use change, between 2000 and 2007, 69% of soybean expansion took place on pasture areas and other crops and between 2007 and 2014, that percentage increased to 74%. In the Matopiba region (which is located in the Savanna region and comprises the states of Maranhão, Tocantins, Piauí and Bahia), where there were no converted areas with conditions for agriculture, the largest expansion occurred in native vegetation areas: between 2000 and 2007, 68% of soy expansion occurred in native vegetation areas, while 63% occurred between 2007 and 2014, thus indicating that the region is the current agricultural frontier of the Savanna.[47]

Figure 4. Change of land use and cover between 2000/2001-2006/2007 and 2006/2007-2013/2014



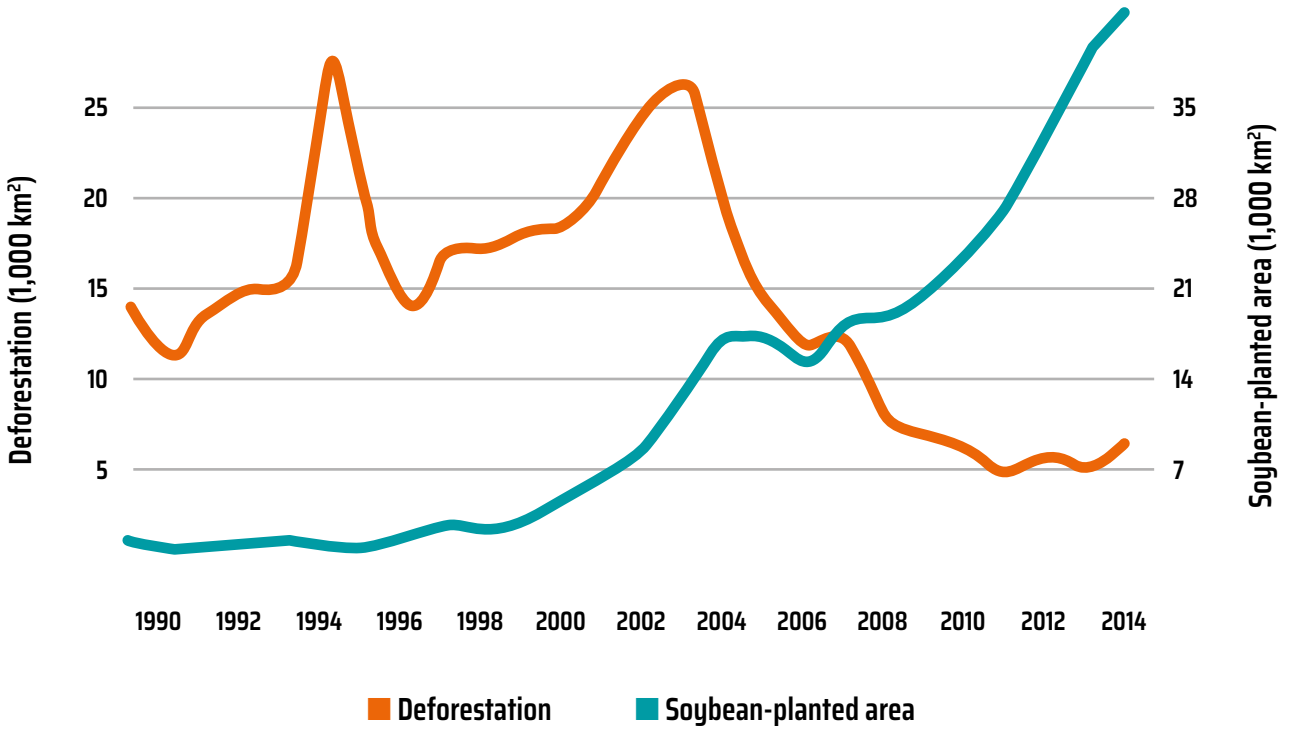
Source: (Carneiro Filho & Costa, 2016)

[46] (Imaflora, 2016)

[47] (Agrosatélite, 2015; Carneiro Filho & Costa, 2016)

In the Amazon biome, the Soybean Moratorium has contributed to prevent deforestation from increasing. Signed in 2006 by the *Associação Brasileira das Indústrias de Óleos Vegetais* – Abiove (Brazilian Association of Vegetable Oil Industries) and the *Associação Nacional dos Exportadores de Cereais* – ANEC (National Association of Cereal Exporters), the associated companies or those signatories of the Moratorium undertook to abstain from acquiring soybeans from deforested areas in the Amazon biome as of July 22, 2008. Results of the 2015/2016 soybean crop monitoring in that biome showed that the Moratorium had been effective in fighting deforestation: by including 98% of the soybean-planted area in Amazon, the monitoring identified only 1.2% of the area in disagreement with the Moratorium.[48] Another study conducted by Holly Gibbs and other researchers, which was published in Science magazine, also evidences the effect of the Moratorium: in the two years before the Moratorium, almost 30% of soybean expansion in the Amazon occurred by means of deforestation and, after the Moratorium, there was a significant decrease in deforestation derived from soybean production to 1% in 2014.[49]

Figure 5. Development of soybean planted area as compared to deforestation in Amazon biome



Source: (Imaflora, 2016)

[48] (Imaflora, 2016)

[49] (Gibbs et al., 2015)

It should be noted that there are no specific criteria related to fighting against deforestation by soybean-importing countries.

c) Deforestation risk monitoring by soybean supply chain players

✓ Identification of the main deforestation risks by soybean chain companies

According to the CDP study "Deforestation risk management – Analysis of companies responding to the CDP Forest Program", which evaluated the deforestation risk management practices of companies operating in Brazil that completed its Forest questionnaire in 2016, 21% of 46 companies identified reputation risks that gave rise to operational or financial impacts. In the qualitative answers, the companies of different links of the soybean chain mentioned the title role of clients and consumers, different from the one verified in the livestock chain. In addition, 21% of companies also mentioned physical risks that caused operational and financial impacts, such as the Sainbury's supermarket network.

> "In the past, droughts affect soybean production in important regions, thus compromising the global offer and increasing the soybean and food price. Food price is an important factor of animal breeding costs and of the production of milk and beef products"
> **(2016 Sainsbury's CDP Forest Questionnaire).**[XV]

✓ Trader monitoring systems

As associates of Abiove, the main traders that commercialize soybeans in Brazil – ADM, AMAGGI, Bunge, Cargill and Louis Dreyfus – are signatories of the Soybean Moratorium. Therefore, they are committed to abstain from trading or financing soybean produced in areas deforested in the Amazon biome after July 22, 2008. Cargill is also a signatory of the New York Declaration on Forests and therefore is committed to reduce the deforestation of the whole agricultural supply chain by 50% by 2020 and 100% by 2030.[XVI]

Additionally, most of the main traders have the practice of forbidding the commercialization of grains from areas included in the list of Ibama embargoes for illegal deforestation, thus blocking the producer's registration until their situation is legalized.[XVII] The company AMAGGI also checks if the producer is located in areas of indigenous lands and Conservation Units.[XVIII]

Some traders are developing remote monitoring systems to evaluate and monitor their suppliers. For example, at the end of 2016, ADM selected two remote monitoring tools that will analyze any changes to the use of soil in municipalities and farms in the company's priority regions.[XIX] AMAGGI, on the other hand, acquired a monitoring platform developed by the Agrotools consultancy – Originar – AMAGGI Responsible Origination – which allows the analysis of all socio-environmental data related to producers and properties with which the company trades.[XX] For producers financed by the company, AMAGGI also makes on-site visits to the property.[XXI]

Another strategy used by traders to acquire soybeans free of illegal deforestation is the incentive to certification. ADM supports the producers in Brazil to make them obtain and maintain the International Sustainability and Carbon Certification (ISCC).[XXII] AMAGGI finished 2016 with 46 rural properties certified by AMAGGI Responsible Soy Standard, which is a standard recognized by the European Feed Manufacturers' Federation (FEFAC); 35 by the RTRS[50]; and 389 properties by the International Sustainability & Carbon Certification (ISCC).[XXIII] Bunge uses the Biomass Biofuel Sustainability Voluntary Scheme standard (2BSvc) and exported some 420,000 tons of soybeans in 2016 according to that standard.[XXIV]

[50] 290 thousand tons of certified soy through the mass balance system and 149 thousand tons of soy through the book and claim system. In the mass balance system, the certified and non certified soy are mixed, but the percentages of each type of soy are monitored in such a way that the correct proportions are sold in the Market. (Forest 500, 2017).
An RTRS certified organization can market certificates through the Certificate Trading Platform, where certificates are separated from the physical volume. An Indian organization may, for example, sell the physical soybeans in the local market and, at the same time, sell the certificates through the platform to an European country (RTRS, 2017d).

Table 4. Deforestation risk monitoring by different links of soybean chain

Link	Deforestation risk monitoring	Monitoring gaps	Best practices
Input producers	Assistance to rural producers for recovery of degraded areas		Soja + Verde (Greener Soybean Project), a partnership between Syngenta and TNC
Originators Crushing and vegetable oil industries	Support to soybean producer certification Forbidding suppliers in Ibama embargo list Some traders develop geospatial monitoring systems	Low monitoring of indirect suppliers	Originar – AMAGGI Responsible Origination
Distributors	Acquisition of certified soybean	Low monitoring of indirect suppliers	Partnership between Unilever and Aliança da Terra for soybean producer certification

Source: Elaborated by authors

✓ Gaps in trader monitoring

Although the major traders have a monitoring system to evaluate their direct suppliers, they do not exercise the practice of monitoring indirect suppliers yet.

In general, indirect suppliers are small and medium producers without a storage structure, who commercialize soybeans through cooperatives or intermediate storing companies, without negotiating directly with traders. As they are not monitored, soybeans produced by indirect suppliers in an illegal deforestation area may "contaminate" soybeans commercialized by traders. With the purpose to fight that product leakage, traders add clauses to soybean purchase agreements addressing the intent of the direct supplier to comply with the Moratorium. However, in general the indirect suppliers' compliance with the Moratorium is not evaluated.[51]

[51] (Imaflora, 2016)

✓ Wholesaler and retailer monitoring systems

One of strategies to fight deforestation adopted by soybean wholesalers and retailers is the purchase of certified soybeans and/or supporting soybean producers to certify themselves. In Unilever, all 20 soybean producers that supply grain for Ades beverages are certified by the RTRS.[XXV] In addition, the company, through a partnership with *Aliança da Terra*, is supporting a group of 42 soybean oil producers to obtain the RTRS certificate. The company Mars is working to ensure that, by the end of 2017, 100% of soybeans acquired from Brazil be certified by an independent inspection system, such as the RTRS or the *ProTerra*, and meet the Forest Code.[XXVI]

In relation to engagement with indirect suppliers, very little has been done, but there are exceptions. For example, Carrefour informs that it works only with direct suppliers, but motivates its suppliers to engage in a discussion with their own suppliers.[XXVII] Unilever says that it knows the exact location of individual farms and cooperatives that supply soybeans to direct suppliers.[XXVIII] In addition, in 2015, Danone made a pilot investigation in Brazil to trace soybeans in 79 municipalities in six states, and concluded that 28% of soybeans indirectly purchased by the company come from municipalities considered as having a high or very high risk with respect to deforestation. As a next step, the company will develop a plan based on a study made to eliminate deforestation risks in its supply chain.[XXIX]

✓ Wholesaler and retailer monitoring gaps

In general, practices to fight deforestation used by wholesalers and retailers consist mainly of the purchase of certified soybeans and the inclusion of the Moratorium clauses in supply agreements. An analysis made with 500 companies, investors and governments that may influence deforestation (Forest 500) indicated that such commitments like the Consumer Goods Forum (CGF) and the New York Declaration on Forests (NYDF) shall not be met until 2020 or 2030 if the progress pace recorded until 2016 is maintained. Additionally, the lack of sanctions of the CGF and the NYDF as well as the lack of restrictive purchase measures in importing countries are barriers for the progress of such commitments.[52]

[52] (Barreto et al. 2017)

✓ Input producers' practices to fight against deforestation and forest restoration

In addition to supplier monitoring systems implemented by the soybean chain players, initiatives developed by input producers to fight against deforestation and promote forest restoration should also be mentioned.

Syngenta developed, in 2010, in partnership with The Nature Conservancy (TNC), the Greener Soybean program, with the objective of contributing to the preservation of diversity and protection of pollinating species in the Savanna. In the first phase of the project, which lasted six years, 8 million hectares were mapped, including rural properties, natural areas and other uses of soil, which served as a base to diagnose the need of restoration of riparian forests. Such maps contributed to make the producers obtain CAR for their properties and to the creation of the Strategic Forest Restoration Plan. The first phase also focused on the capacity of local producers and technicians to adopt simple and inexpensive forest restoration practices, thus contributing to recover 20,000 degraded hectares that created natural corridors in Permanent Preservation Areas.

In the stage that started in 2017, the TNC and Syngenta will perform the *Projetos de Restauração de Áreas Alteradas e Degradadas* – PRADA (Project for Restoration of Changed and Degraded Areas) in 100 rural properties in Alto Teles Pires (MT), according to criteria established by the Mato Grosso *Programa de Regularização Ambiental* - PRA (Environmental Regularization Program). They will also enable rural producers and growers on PRA, PRADA and forest restoration topics. Greener Soybean is one of the main projects related to The Good Growth Plan, which is a global initiative of Syngenta to promote the sustainable food production.[53]

[53] (Globo Rural, 2016; PR Newswire, 2104; Syngenta, 2017)

3. Pulp and Paper Supply chain

The Brazilian forest-based industry is recognized worldwide for the high productivity of its planted areas. In 2016, the country led the global ranking of forest productivity with an average of 35.7 m^3/ha per year for eucalyptus plantations, and 30.5 m^3/ha per year for pine plantations. They include 7.84 million hectares of trees planted in the country, 34% of which belong to pulp and paper companies.[54]

Brazil ranks second as the largest world producer of pulp, behind only the United States. Out of 18.8 million tons produced in 2016, 16.2 million tons included short-fiber pulp (produced from eucalyptus), 2.1 million tons of long-fiber pulp (produced from pine) and 0.5 million tons of high-yield pulp. Exports accounted for 69% of total production[55], the main purchasers of which were China and Europe.[56]

In relation to paper production, Brazil occupied the eighth place in the world ranking, having produced 10.3 million tons in 2016. 80% of production was for domestic markets and 20% for export[57], especially to Latin America countries that acquired 61% of total exports.[58]

a) Pulp and Paper supply chain players

The pulp and paper supply chain is composed of the following links: (1) forest planters; (2) pulp producers; (3) paper and packing producers and (4) end consumers. Table 5 details the links of that chain:

[54] (Ibá, 2017b)
[55] (Ibá, 2017b)
[56] (Ibá, 2017a)
[57] (Ibá, 2017b)
[58] (Ibá, 2017a)

Table 5. Description of components of pulp and paper supply chain

Link	Description	Profile	Main players
Forest planters and wood cutters	Includes the period from plantation to harvest, starting with the implantation and maintenance of forests until the forest harvest, fall and transportation.[26]	Because it is a highly intensive use of capital sector, the market is concentrated in large companies, the production of which is integrated from forest plantation to the manufacture of paper products.[27] Companies with a low operation level buy pulp in the market to produce papers or buy papers to produce artifacts[28]	Klabin, Suzano, Fibria
Pulp producers	At this stage, wood preparation, peeling and chipping take place. Subsequently, the stages of wood cooking, washing, purification and the whitening process of the pulp occur.[29]		
Paper and packing producers	The pulp is used for paper and packing production.		
End consumers	Large companies buy paper and packing material.	Large multinational companies	BRF, Marfrig, McDonald's, Unilever

Source: Elaborated by authors based on (FIEP, n.d.; Montebello & Bacha, 2011; Osório, 2007)

[26] (Osório, 2007)

[27] (FIEP, n.d.)

[28] (Montebello & Bacha, 2011)

[29] (Osório, 2007)

b) Location of the deforestation risk in the pulp and paper chain

In general, the risk with deforestation of companies in the sector seems to be low. That is because the industry is concentrated in large companies, the production of which is integrated from forest plantation to paper production. In addition, the rate of the certification of trees planted in Brazil is high: 3.1 of 7.84 million hectares of planted forests (39.5%) are certified for Forest Management by such organizations as the Forest Stewardship Council (FSC) and the Programme for the Endorsement of Forest Certification Schemes (PEFC), represented by Brazil in the *Programa Nacional de Certificação Florestal* – Cerflor (National Forest Certification Program). According to the PECF, the conversion of primary forests to planted forests cannot occur after December 31 2010, except under specific conditions established for certification.[XXX] According to the FSC, on the other hand, the conversion of natural forests is not allowed after November 1994, unless the manager/owner provides evidence that he was not directly or indirectly responsible for that conversion.[XXXI]

Additionally, Brazil has 47,000 hectares of tree plantations certified by the Small and Low-Intensity Managed Forest Standard (SLIMF).[59] Having been developed in 2013 by a joint initiative of the FSC, the WWF, the Federal University of Viçosa and members of the forest chain, the SLIMF certification has adapted the FSC principles and criteria to small producers, communities and companies that handle or explore small or low-intensity areas.[60] Just like the FSC Forest Management Standard, the conversion of natural forests is not allowed after November 1994, except in cases where the manager provides evidence that he has not been responsible for the conversion.[xxxii]

c) Deforestation risk monitoring by pulp and paper supply chain players

✓ Identification of the main deforestation risks by pulp and paper chain companies

According to the CDP study "Deforestation risk management – Analysis of companies responding to the CDP Forest Program", 20% of 46 pulp and paper sector companies operating in Brazil that completed the CDP Forest questionnaire in 2016 believe that physical risks related to deforestation have caused operational and financial impacts. In addition, 15% of companies have mentioned the impact of reputation risks and 13% of regulatory risks. In the qualitative answers, no statement by sector-related companies mentioning specific cases where risks associated with deforestation had generated operational and financial risks was found. However, the companies, such as Unilever, made comments on the potential impact of risks:

> The lack of certified sustainable material for our paper and cardboard packaging products may affect our capacity to honor our sustainable supply commitments. In addition, continuous criticisms and concerns of NGOs related to deforestation may potentially affect our business.
> **(2016 Unilever CDP Forest Questionnaire).**[xxxiii]

[59] (Ibá, 2017b)

[60] (Magela, 2013)

✓ Monitoring systems of pulp and paper companies

One of the main strategies of large pulp and paper companies to monitor the production process against deforestation is the certification of their own forests and the requirement of certification of suppliers. Fibria, for example, has 942,000 hectares of forests, 729,000 of which are certified by the FSC standard and 761,000 by the Cerflor/PEFC standard.[XXXIV] Klabin, on the other hand, has 100% of its forests certified under the FSC Sustainable Management process, amounting to more than 425,000 hectares[XXXV]. Klabin also declares that is the first and only company in the sector in Latin America to ensure the origin of wood used in the manufacture of industrial bags, cardboard and kraft paper under the FSC Chain of Custody certification.[XXXVI]

With respect to the purchase of wood from suppliers, 30% of wood requirements by Klabin[XXXVII] and 28% of wood requirements by Fibria[XXXVIII] come from small producers.

In Fibria, rural producers located close to their production units are encouraged to plant eucalyptus under the Forest Savings Program.[XXXIX] In total, 1,995 producers participating in the program are from 202 municipalities of Espírito Santo, Mato Grosso do Sul, Minas Gerais and São Paulo.[XL] All producers that are partners of Fibria are required to have their properties legalized according to the Forest Code and state laws.[XLI]

Klabin, with a target of having 100% of producers certified by the Small and Low Intensity Managed Forests standard (SLIMF) by 2018, supports them in obtaining that certification.[XLII] The company also operates the Legal Woods Program in partnership with the *Associação de Preservação do Meio Ambiente e da Vida* - Apremavi (Association for Environment and Life Preservation), by advising the producers to comply with the Forest Code, restore and preserve the Permanent Preservation Areas (APPs) and improve the environmental conditions of the property.[XLIII]

Table 6. Deforestation risk monitoring by different links of the pulp and paper supply chain

Link	Deforestation risk monitoring	Monitoring gaps	Best practices
Pulp and paper companies	Self-owned forests certified by the FSC or Cerflor/PEFC Support to rural producers to legalize and certify themselves	Spot market purchase	Klabin support to make wood producers obtain the SLIMF certification
Companies consumers of paper and cardboard	Purchase of certified or recycled paper and packing material		Unilever Global Traceability System

Source: Elaborated by authors

✓ Gaps in monitoring pulp and paper companies

The gap in monitoring pulp and paper companies that report to the CDP seems to be small when compared to the livestock and soybean chains, as those companies report that they encourage their suppliers to obtain sustainability certification seals, comply with environmental law and/or restore and preserve APPs. In addition, for certain products, they track the wood to its origin through the FSC Chain of Custody or the PEFC certification. A risk exists in cases where the companies cannot meet their wood needs from their own forests or from suppliers, being required to purchase wood in the spot market. However, the purchase from that market is not a common practice. Therefore, the trend is that the low deforestation risk will be reduced by the progress of initiatives focused on supplier partners.

✓ Monitoring systems of companies consuming paper and cardboard

Large companies that consume paper and cardboard also use certifications to manage the deforestation risk in their supply chain.

JBS, which is a major consumer of paper and cardboard in Brazil, only purchases them from suppliers certified by the FSC under the Chain of Custody form.[XLIV]

McDonald's prefers products certified by the FSC when such products meet the performance requirements and the competitive conditions of the market. In addition, it declares that it will require the certification of products from countries with a high deforestation risk by 2020, when all paper and packing material factories shall be required to have a certification by the FSC Chain of Custody, the Sustainable Forestry Initiative or PEFC, or upon the certification by third parties that the paper used is 100% recycled.[XLV]

Danone´s target is that 100% of its packing material be originated from sustainable sources by 2020 and, in countries of high deforestation risk (such as Brazil, Russia, Indonesia, Malaysia, Australia and the Democratic Republic of Congo), the deadline for achieving that target was 2015 (today, 97% of packing materials of priority countries meet that criterion). The company considers recycled fibers, whether certified or not, as sustainable sources, and when they are not available, it checks the legal origin of fibers and the traceability of the chain of custody. Currently, 86% of its packaging purchases in the world meets that criterion.[XLVI]

Finally, Unilever has a Global Traceability System used to trace the paper and cardboard to the paper factory and the country of origin of the fiber. In 2016, the company purchased 99% of paper and cardboard packing material from sustainable sources: 59% of the total volume was certified by third parties (FSC or PEFC Custody) and 40% came from recycled material. As of 2019, Unilever will require the Chain of Custody certification for all recycled materials.[XLVII]

✓ Gaps in monitoring of companies consuming paper and cardboard

The gap in monitoring the companies that consume paper and cardboard with respect to their involvement to deforestation tends to reduce as large companies start to require certification by third parties upon the purchase of forest products.

4. Palm oil supply chain

Palm oil is the technical term most used worldwide to refer to the palm tree from whose fruit palm oil is produced. In Brazil, the palm tree is commonly known as the *dendezeiro*. Palm oil and its derivatives are ingredients that are common in many products that are highly consumed in the food industry, such as margarines and creams, ice creams, biscuits, chocolates, fillings, substitutes of cocoa butter and kitchen oil. The oil is also used in the manufacturing of hygiene and cleaning products, cosmetics, medicines, lubricants, biofuels and bioenergy.[61]

The main palm oil producers in the world are Indonesia (25.4 million tons) and Malaysia (18.48 million tons), which account for approximately 85% of world production. Brazil is the ninth largest producer, producing some 300,000 tons per year, most of which (90%) in the state of Pará. However, the country is not yet self-sufficient in the production of palm oil as a commodity, as the internal consumption is 200,000 tons higher than production.[62]

a) Palm oil supply chain players

The palm oil supply chain is composed of the following links: (1) palm oil producers; (2) palm oil extraction plants; (3) refineries; (4) traders; (5) manufacturers; (6) retailers; and (7) end consumers. Table 7 details the chain links:

[61] (Canal Jornal da Bioenergia, 2017)

[62] (Abrapalma, 2017)

Table 7. Description of components of palm oil production chain

Link	Description	Profile	Main players
Palm oil producers	They cultivate palm oil and harvest the stalks and bunches of fresh fruits[30]	Large companies and small producers[31]	Agropalma, Biopalma, Mejer[32]
Palm oil extraction plants	They transform fresh fruit stalks and bunches into palm oil and kernel oil. They work independently with palm oil producers (fruits should be processed no more than 24 hours after harvest). [33]	Large producing companies have their own plants[34]	Agropalma, Biopalma, Mejer
Palm oil refineries	They process and refine raw palm oil.	Large companies	Agropalma, Mejer, ADM, Cargill
Traders	Responsible for transferring palm oil and its derivatives from suppliers to purchasers.[35]	Large multinational companies	ADM, Bunge, Cargill
Manufacturers	They use palm oil to produce food, cosmetics and cleaning products.[36]	Large multinational companies	Nestlé, Unilever, Mars, Carrefour
Retailers	They distribute palm oil products to consumers.[37]	Large multinational companies	Sainsbury's, Tesco, Carrefour, Walmart
End consumers	They acquire palm oil products	Individuals	Individuals

Source: Elaborated by authors

[30] (SPOTT, 2017d)
[31] (SPOTT, 2017d)
[32] (Andrade, 2015)
[33] (SPOTT, 2017d)
[34] (SPOTT, 2017d)
[35] (SPOTT, 2017b)
[36] (SPOTT, 2017c)
[37] (SPOTT, 2017a)

b) Location of deforestation risk in the palm oil chain

The risk of involvement with deforestation of companies in the palm oil industry in Brazil is low when compared to livestock and soybean chains. This is especially the case because of the *Zoneamento Agroecológico* - ZAE (Palm Tree Agro-ecological Zoning), which is a territorial planning instrument used by the Federal Government to ensure the country´s sustainable expanded cultivation of the palm tree free of deforestation. Carried out under the coordination of the *Empresa Brasileira de Pesquisa Agropecuária* - Embrapa (Brazilian Agricultural Research Corporation), agro-ecological zoning was obtained by overlapping areas that are suitable in terms of climate and potential use of land.[63]

According to the Decree 7,172/2010, areas considered within agro-ecological palm oil zoning are suitable anthropized areas in the states of Acre, Amazonas, Amapá, Maranhão, Mato Grosso, Pará, Rondônia, Roraima, Alagoas, Bahia, Espírito Santo, Pernambuco, Rio de Janeiro and Sergipe. From these areas, areas of native vegetation, regions deforested after 2007, Conservation Units, indigenous lands, urban areas and public right-of-way areas were removed.[64] Thus, under the zoning rules, the identified areas which amount to 31.8 million hectares[65], protect the region against deforestation.

c) Deforestation risk monitoring by palm oil supply chain players

✓ Identification of the main deforestation risks by palm oil supply chain companies

According to the CDP study "Deforestation risk management – Analysis of companies responding to the CDP Forest Program", 25% of palm oil supply chain companies operating in Brazil declared that reputational risks related to deforestation have caused operational and financial impacts. With respect to reputational risk, it should be remembered that the campaign promoted by Greenpeace in 2010 exposed the multinational Nestlé for having purchased palm oil from the company Sinar Mars, which had been accused of involvement with deforestation activities in Indonesia.[66]

[63] (Incra, 2010)
[64] (Planalto, 2010)
[65] (MAPA, 2016)
[66] (Armstrong, 2010)

McDonald's made comments on the greater exposure of corporations to reputational risks from the acquisition of palm oil associated with deforestation:

> "There is an increasing interest from non-governmental organizations and customer interest groups in global brands acquiring sustainable palm oil and reducing the deforestation impacts associated with the palm tree. Although we have committed ourselves to being part of a sustainable supply chain before any campaigns, we recognize that they may have an impact on the brand and understand the importance of ensuring a sustainable and reliable palm oil supply chain."
> **(2017 McDonald's CDP Forest Questionnaire).**[XLVIII]

✓ Monitoring systems of palm oil producers

Among the producers of palm oil in Brazil, only Agropalma answered the CDP Forests questionnaire in 2016.

The company declares that it produces 77% of required palm fruits used in its industrial plant.[XLIX] Agropalma forest reserves are monitored on a daily basis by a dedicated team of forest guards to prevent hunting activities, fire, deforestation and timber harvesting in the region.[L]

In addition, 100% of its production is certified by the Roundtable for Sustainable Palm Oil (RSPO). According to that certification, the conversion of primary native vegetation or areas that are necessary to maintain or improve one or more High Preservation Value attributes is forbidden as of November 2005.[LI]

To complement its demand for palm fruits, Agropalma purchases from 192 family producers and 45 subcontracted palm fruit growers.[LII] Before starting a commercial relationship with a palm supplier, the company declares that it makes several evaluations of the supplier, such as an analysis of property documentation, an analysis of production and interviews with suppliers to ensure that no deforestation occurred in recent years or is expected to occur in the next 25 years (the term of agreement with suppliers). In addition, the technical assistance team visits all suppliers on a weekly basis to support them and check the performance of the agreement.[LIII] New suppliers are selected according to strict social and environmental criteria, and they have a period of two years from the signing of the contract in order to certify themselves.[LIV]

Biopalma, on the other hand, declared in its 2016 Sustainability Report that its agricultural plantations and factories are located in appropriate areas according to the regulations of the Ecological-Economic Zoning Law of the state of Pará.[LV] In addition, it informs that it plans to obtain RSPO certification in 2018 for its planted areas (56,487 hectares) and for the plant located in the municipality of Moju.[LVI] In addition to using its own production of palm fruits, the company purchases raw materials from family farmers. Under the Biopalma Family Agriculture Program, launched in 2010, the company is a partner of families of rural farmers in Pará northeast, who dedicate part of their lands to palm tree plantation and receive free technical assistance and the guarantee of purchasing raw materials from Biopalma.[LVII]

Table 8. Deforestation risk monitoring by different links of the palm oil chain

Link	Deforestation risk monitoring	Monitoring gaps	Best practices
Palm oil producers and extractors	Certification of own production Purchase from certified suppliers Social and environmental criteria for selection of suppliers Frequent monitoring of suppliers	Non-certified suppliers	Agropalma has 100% of its production certified by the RSPO
Traders	Traceability of palm oil supply chain Purchase of certified palm oil Support to rural producers	Chain traceability is lower than 100% Certified palm oil is not 100% segregated	71-80% of palm oil purchased by ADM is certified by the RSPO or the ISCC
Manufacturers	Traceability of palm oil supply chain Purchase of certified palm oil Support to rural producers	Chain traceability is still below 100% Certified palm oil is not 100% segregated	100% of palm oil purchased by Carrefour is certified by the RSPO Unilever funding amounting to US$ 50 million to invest in palm oil industry sustainability Mars suppliers use WRI PALM Risk tool to evaluate deforestation risk

Source: Elaborated by authors

✓ Gaps in the monitoring of palm oil producers

The gap in monitoring the deforestation risk of Agropalma and Biopalma is apparently low, as the production of palm oil by these companies complies with Ecological-Economic Zoning and/or is certified by RSPO. The greatest deforestation risk is among non-certified suppliers of companies. However, as Agro-ecological Palm Zoning is enforced and the suppliers are frequently monitored (in the case of Agropalma, on a weekly basis) and meet the socio-environmental criteria established by the clients, the gap in monitoring the suppliers of these companies is lower.

✓ Monitoring systems of palm oil traders

The palm oil traders' main deforestation risk monitoring practices consist of tracking their palm oil supply chain, acquiring certified palm oil and evaluating and supporting rural producers.

ADM declares that it globally traces 98% of palm oil and 95.5% of kernel oil purchased by it to their oil extraction plant.[LVIII] Cargill, on the other hand, has achieved an average global traceability of 94% to the extraction plant (100% for kernel oil and 93% for palm oil) and 42% to the plantation (23% for kernel oil and 46% for palm oil).[67] To be sure about the origin of its raw materials, Cargill uses geographic monitoring systems to analyze the grain supply chain in addition to checking the list of Ibama embargoes for every new agreement.[LIX]

As regards to certification, ADM declares that all palm oil processing plants are certified by the RSPO[LX] and 71% to 80% of its palm oil purchases are certified by the RSPO or by the International Sustainability Carbon Certification (ISCC).

[67] (Cargill, 2017a)

In terms of evaluation of and engagement with suppliers, ADM declares that they are working with 270 families in Pará to acquire palm from small owners, by offering training, encouraging good management and environmental education practices and supporting the producers to be certified by the RSPO.[LXI] Cargill, on the other hand, has visited several of the company´s suppliers to check their compliance with the company's Sustainable Palm Oil Policy and RSPO criteria.[LXII]

✓ Gaps in monitoring palm oil traders

In general, traders have monitoring practices, by purchasing certified palm oil, analyzing the suppliers' properties by satellite and/or helping the suppliers to achieve higher sustainability standards. The increase in traceability to 100% until its origin and the purchase of certified palm oil in a segregated form would help to reduce the deforestation risk of traders.

✓ Monitoring systems of companies that consume of palm oil

The main practices for deforestation risk monitoring adopted by the large companies that consume palm oil consist of the purchase of certified palm oil, traceability of the palm oil supply chain, the selection of suppliers with good practices and engagement with suppliers.

With respect to certification, Carrefour undertakes to purchase only palm oil certified by the RSPO. In 2016, the company used more than 12,000 tons of palm oil for its own brand products, 15.5% of which were certified by RSPO under a segregated form, 49.4% certified by the RSPO under mass balance form and 35.1% with GreenPalm certificates (book-and-claim).[LXIII] Carrefour considers the RSPO as the best certification available to prevent deforestation in the supply chain and is trying to increase the percentage of certified palm oil in segregated form for its own brand products to 30% by 2018.[LXIV]

McDonald's, on the other hand, has established a target for 2020 where 100% of the whole palm oil and kernel oil used by suppliers as ingredients of the company's products be certified or hold the GreenPalm certificate.[LXV]

According to the Unilever Sustainable Palm Oil Supply Policy, all palm oil purchased by the company shall be physically certified until 2019.[LXVI] In 2016, the company acquired 1.5 million tons of palm oil, 36% of which was physically certified under segregated forms and mass balance or held the certificates of small independent owners.[LXVII] Unilever declared that it intends to invest US$ 50 million for a period of five years in a palm transformation fund to increase the availability of physically certified palm oil and, under more focused approaches, for the transformation of the palm oil sector.[LXVIII]

With respect to palm oil supply chain traceability, Nestlé declares that it traces 92% of palm oil suppliers to the extraction plant and 47% to its origin.[LXIX] Unilever, however, traces 73% of palm oil to the extraction plant and has established a target that, by the end of 2017, all palm oil will be traceable to its origin and by 2018 all palm oil will be traceable to its area of influence.[LXX]

In selection processes and supplier engagement, Mars declares that it has integrated sustainability criteria to the palm oil supplier bidding process. As a part of that process, the company asks the largest palm oil suppliers to evaluate the deforestation risks of extraction plants where they purchase raw palm oil by using the PALM Risk tool of the World Resources Institute. The tool allows the users to evaluate the risk that activities related to deforestation are occurring in areas surrounding such plants. Mars is also working with suppliers to make them implement action plans.[LXXI]

Carrefour is engaging with its suppliers for the sustainable production of commodities, by sending regularly a questionnaire to all those who use palm oil to make them evaluate the quantity of oil used and be encouraged to incorporate sustainability to their supply chain.[LXXII]

McDonald's has also established that by 2018 all palm oil shall be acquired from approved suppliers. To be approved, the supplier shall provide the company with evidence that it has a traceability system and an action plan to manage the deforestation risk.[LXXIII]

✓ Gaps in monitoring companies that consume palm oil

Deforestation risk monitoring practices used by companies that consume palm oil have been developed as the companies have become signatories of non-deforestation commitments (for example, Unilever, Nestlé, Mars and Carrefour are members of the Consumer Goods Forum, while McDonald's, Nestlé and Unilever are signatories of the New York Declaration on Forests) and try to implement such commitments. The traceability increase of 100% to its origin, the purchase of certified palm oil in a segregated form and the engagement with suppliers to make them acquire sustainable materials since its origin would help to reduce the deforestation risk of such companies.

Part II – Management of financial institutions' deforestation risk

This part of the report describes which requirements related to deforestation risk should be met by financial institutions upon lending to rural producers and companies of farming chains.

1. Legal requirements related to deforestation risk

a) Rural producers

The Rural Credit Manual (MCR) and Resolutions no. 3,545/2008 and no. 4,427/2015 of the *Banco Central do Brasil* (Central Bank of Brazil) establish that financial institutions should require a documentary evidence of environmental regularity and other conditions for the purpose of rural financing.

To grant rural credit, financial institutions are required to:

✓ Follow the recommendations and restrictions of the Agro-ecological Zoning and of the *Zoneamento Ecológico-Econômico* – ZEE Ecological-Economic Zoning) (MCR 2-1-1-g);

✓ Record the geodesic coordinates of the project financed by credit operations to cover agricultural working capital and credit operations for investments related to (i) forestation, reforestation, deforestation and stump removal; (ii) creation of permanent crops; and (iii) formation or recovery of pastures under the *Sistema de Operações do Crédito Rural e do Proagro* - Sicor (Rural Credit and Proagro Operation System) (Resolution 4,427/2015, 1-2);

- As of 1/1/2017, in projects with financing above R$ 40,000.00 (MCR 2-1-2-a-III);
- Coordinates should comprise of the exact points necessary for identification of the perimeter of the area of land to be cultivated or, as applicable, of two or more areas of land that are in the same financing operation (MCR 2-1-2-b);

- Coordinates should be recorded in the Rural Credit and Proagro Operation System (Sicor) by the financial agent after determination of the accuracy of data related to the:
  - Location of the area of land in municipalities where the relevant property is located (MCR 2-1-2-c-I);
  - Compatibility between the area calculated by geodesic coordinates and the financed area set out in the credit agreement (MCR 2-1-2-c-II).

✓ In working capital and investment operations for the acquisition of bovine cattle and buffaloes, the financial institution shall require the beneficiary to provide the bill that proves the sale issued on the date of presentation of the financing proposal or later, as well as the Animal Transit Guide (GTA) issued on the same date of presentation of the financing proposal to the financial institution or later. For other working capital operations, the financial institution shall also require a health sheet or equivalent document related to the benefited cattle, issued by the competent state body not more than one year before the proposal presentation (MCR 2-1-21).[68]

✓ As of 06/01/2018, the financial institution should require the presentation of evidence of registration in the Rural Environmental Registry (CAR) (MCR 2-1-12-A).[69]

To grant a rural credit to finance agricultural activities in municipalities that integrate the Amazon biome, the financial institutions shall:

✓ Require the presentation of evidence of registration with the Rural Environmental Registry (CAR) (MCR 2-1-12-b);[70]

✓ Check the existence of current embargoes of economic use of areas illegally deforested in the property as disclosed by the Brazilian Institute of Environment and Renewable Natural Resources (Ibama) (MCR 2-1.12-c-I);

[68] Although the objective of the Animal Transit Guide (GTA) is to trace the animal to make the disease control easier, some players of that sector had defended the connection of GTA issuance to a consultation to the list of areas embargoed by Ibama, by also using it for environmental purposes (Camara, 2017).

[69] Although the deadline for the registration of rural landowners in CAR has been extended by the President of the Republic to 05/31/2018 and the Rural Credit Manual (MCR 2-1-12-A) establishes that "obligatorily, as from 6/1/2018, grant of rural credit to finance farming activities shall be conditional to the presentation of evidence in registration in Rural Environmental Registry (CAR)", Law no. 12,651/2012 (art. 78-A) continues to read as follows: "After December 31, 2017, the financial institutions shall only grant agricultural credit, in any of its forms, to owners of rural properties registered with CAR."

[70] Art. 12 – Grant of rural credit to finance farming activities in municipalities integrating the Amazon Biome, except for the provisions of items 14 and 15, shall be conditional to:
b) presentation by the interested parties of an evidence of registration with the Rural Environmental Registry (CAR) established by Law no. 12,651, of 2012 (MCR 2-1-12-b).

- ✓ Include a clause in the credit instruments of new investment operations establishing that, in case of embargo of economic use of areas illegally deforested in the property (as disclosed by Ibama) after the operation is contracted, the release of contractual installments shall be suspended until the environmental regularization of the property and, if that regularization is not made within 12 months from the first notice related to the matter, the agreement shall be considered terminated by the financial agent (MCR 2-1-12-d);

- ✓ Require the *Certificado de Cadastro de Imóvel Rural* – CCIR (Certificate of Registration of Rural Property) in force (Resolution 3,545/2008);

- ✓ Require the license, certificate or any other similar documentary evidence of current environmental regularity of the property where the project to be financed will be implemented, issued by the competent state body (Resolution 3,545/2008).

b) Agribusiness corporations

For evaluation of company members of the agribusiness corporations with respect to deforestation risk, the requirements of Central Bank Resolution 4,327/2014 providing the guidelines to be followed by the financial institutions to establish and implement the *Política de Responsabilidade Socioambiental* – PRSA (Social and Environmental Responsibility Policy) shall be met.

The Resolution that defines the socio-environmental risk as "the possibility of occurrence of losses to institutions (...) derived from socio-environmental damages" establishes that the financial institutions shall develop and implement a PRSA containing principles and guidelines guiding the socio-environmental actions in business and the relationship with stakeholders. It also establishes that the management of the socio-environmental risk of financial institutions should consider:

"**I -** Systems, routines and procedures allowing the identification, classification, evaluation, monitoring, mitigation and control of socio-environmental risk existing in the institution's activities and operations;

II - Record of data related to effective loss due to socio-environmental damages for the minimum period of five years, including amounts, type, location and economic sector object of the operation;

III – Prior evaluation of potential adverse socio-environmental impacts of new kinds of products and services, including with respect to goodwill; and

IV – Procedures to adapt the socio-environmental risk management to legal, regulatory and market changes."

As financing to companies or projects involved with deforestation practices may cause losses to the financial institutions, the deforestation risk is a socio-environmental risk that the institutions are required to manage by considering the establishment of systems and procedures that allow to identify, classify, evaluate, monitor, mitigate and control the deforestation risk of lending operations by the institution.

Box 1. Interviews with financial institutions on deforestation risk management

FEBRABAN and FGVces did some interviews throughout the year of 2017 with ten financial institutions to evaluate how such organizations have managed their deforestation risk when lending to rural producers and agribusiness corporations. By adopting different minimum credit limits to evaluate the client more strictly, most interviewed banks analyze the following official databases related to deforestation risk management:

a) **Analysis of the list of embargoed areas disclosed by the Brazilian Institute of Environment and Renewable Natural Resources (Ibama): they determine whether the client is included in the list of Ibama embargoes or their rural property overlaps with the areas embargoed for illegal deforestation.**

b) **Analysis of the *Sistema de Cadastro Ambiental Rural* – Sicar (National Rural Environmental Registry System): they check the client's registration in the Rural Environmental Registry (CAR) as well as property information in the CAR.**

c) **Analysis of overlap with Conservation Units: they check if the client's rural property overlaps with the Conservation Unit where the performance of agricultural activities is forbidden. The shapefile of Conservation Units is in the website of the National System of Units of Conservation (SNUC).**

d) **Analysis of overlap with indigenous lands: they check if the client's rural property overlaps indigenous lands where the performance of farming activities is forbidden. The shapefile of indigenous lands are in the website of the National Indian Foundation (Funai).**

e) **Analysis of environmental licenses: they check if the client has the environmental licenses that are necessary to perform their farming activities. Consultation to environmental licenses can be made in the *Portal Nacional de Licenciamento Ambiental* – PNLA (National Environmental Licensing Portal) or through federal, state and municipal environmental bodies responsible for their issuance.**

2. Deforestation risk management tools

To support the deforestation risk management by financial institutions, banks – and other interested parties – mainly count on three types of databases or tools:

✓ Databases and tools developed by governmental bodies;
✓ Geospatial tools with free public access that are generally developed by non-governmental organizations;
✓ Geospatial tools with restricted access (paid) generally developed by geographic intelligence consulting firms.

a) Official databases and tools

The main databases and tools developed by governmental bodies that can be used by financial institutions to manage the deforestation risk are listed in the table below:

Table 9. Official databases and tools

Database or tool	Objective
Embargoed areas – Ibama	The list of Areas Embargoed by the Brazilian Institute of Environment and Renewable Natural Resources (Ibama) is a database that includes areas that cannot be used for having illegal activities such as unauthorized deforestation. Consultation to this database may be made on the basis of the interested municipality, name or surname of the individual or legal entity subject to the embargo, provided that it is possible to download the full updated list.
Embargoed areas – ICMBio	The list of embargoed areas related to the Conservation Units includes areas that have received an administrative sanction and/or administrative injunctive relief preventing their use with the purpose of allowing the environment regeneration and making its recovery feasible.[38] This list is published on the *Instituto Chico Mendes de Conservação da Biodiversidade* - ICMBio (Chico Mendes Institute for Biodiversity Conservation) website in a PDF file and also in KMZ/shapefile format.
National Environmental Licensing Portal (PNLA)	A database containing unified information on environmental licensing at state, federal and district levels.
National Environmental Registry System (Sicar)	Sicar is a database containing environmental information on rural properties in the country and their respective Rural Environmental Registries (CAR), being an instrument for implementation of the Forest Code (Law 12,651/2012).
Amazônia Protege	A project conceived by the Federal Public Prosecution, which intends to fight illegal deforestation in the Brazilian Amazon Forest. It is possible to survey the municipality overlap with indigenous lands, CAR, embargoes and UCs. It is also possible to check the existence of public civil proceedings by individual identification (CPF/CNPJ in Portuguese) or geographic coordinate.

Source: Elaborated by Authors

[38] (ICMBio, 2018; o Eco, 2013)

✓ Strengths and weaknesses of official databases and tools for credit analysis

A short summary of strengths and potential for improvement of official databases with respect to their use by financial institutions for credit analysis and deforestation risk management is shown below. In general, such strengths refer to the fact that they are free, easily accessible and provided by governmental bodies. Among their weaknesses, the fact that some databases include outdated information (like the Ibama embargo list) and that they are not integrated to some state databases (like the PNLA) stands out.

Table 10. Strengths and weaknesses of official databases and tools

Database or tool	Strengths	Weaknesses/Potential for improvement for credit analysis
IBAMA embargoed areas	• Easy access and consultation • Free tool	• No update of (cleared) embargoed areas • Errors in location accuracy of embargoed areas
PNLA	• Unified registry, easy access and consultation • Free tool	• Systems in some State Departments are not integrated to national database • No updates
ICMBio embargoed areas	• Easy access and consultation • Free tool • PDF list and KMZ/shapefile map	• No historical data of embargoes areas • Training required to use KMZ or shapefile
Sicar	• Unified federal registry • Free tool	• CAR information not validated by State Departments yet • No information available by personal Identification (CPF in Portuguese)
Amazônia Protege	• Free tool • Search of civil proceedings by personal Identification (CPF in Portuguese), geographic coordinates and map locations available • Easy access to diverse information on environmental regularization per municipality	• Shows deforestation only above 60 hectares • Tool update periodicity is not clear

Source: Elaborated by Authors

b) Geospatial tools with free public access

The main tools with free public access developed by non-governmental organizations, which can be used by financial institutions for deforestation risk management, are shown in the table below:

Table 11. Free tools

Tool	Objective
Google Earth Engine	Global platform developed by Google to analyze environmental data, how to detect deforestation, classify and analyze the land coverage and its changes.
Global Forest Watch	Online forest monitoring and dynamic warning system developed by the World Resources Institute (WRI), Google and partners, which allows deforestation to be monitored practically in real time per country, state and user's interest area (possibility of drawing or uploading the area shapefile).
Trase	This platform allows the traceability of global commodities and their trade flows from production regions (according to biome, state, municipality or logistic hub) to consumer countries. It also allows the analysis of the socio-environmental profile of states and municipalities, such as deforestation rates, number of environmental embargoes, size of cattle herd, soybean production and land conflicts.
Agroideal	Interactive platform that stores data from different sources to allow the user to evaluate the economic opportunities available in a particular territory and its related environmental risks. The user may, for example, check economic and socio-environmental data of municipalities and particular areas in the Savanna region, such as areas adequate for soybean production, number of Ibama embargoes, rate of land conflicts and location of Conservation Units and indigenous lands.
Socio-environmental Risk (WWF)	This platform is currently in "beta" version and was created under a partnership between the WWF and the *Laboratório de Processamento de Imagens e Geoprocessamento* – Lapig (Image and Processing Laboratory) of the *Universidade Federal de Goiás* (Federal University of Goiás). It aims to facilitate overlapping information that allows for the identification of potential environmental and social impacts related to agricultural production in the country. The user may, for example, check socio-environmental data of states, municipalities, biomes and particular regions (Deforestation Arch and Matopiba), such as lack of APP and RL, Conservation Units and remaining vegetation cover.

Source: Elaborated by Authors

The five tools described above analyze the following topics related to deforestation:

Table 12. Scope of free tools per topic

Tools	List of areas embargoed by Ibama	Environmental licensing	Rural Environmental Registry	Certificate of Registration of Rural Property	Conservation Units	Indigenous lands
Google Earth Engine	x	x	x		x	x
Global Forest Watch					x	x
Trase	x				x	x
Agroideal	x		x		x	x
Socio-environmental Risk (WWF)	x				x	x

Source: Elaborated by Authors

Details on the scope of free tools per country, biome and commodity are described below:

Table 13. Scope of free tools per country, biome and commodity

Tool	Scope per country	Scope per biome	Scope per commodity	Detail level
Google Earth Engine	All	All	No classification per commodity	May reach the exact geo coordinates of the area to be financed: it makes credit monitoring easier
Global Forest Watch	All	All	No classification per commodity	May reach the exact geo coordinates of the area to be financed: it makes credit monitoring easier
Trase	Brazil, Paraguay, Argentina, Indonesia	All	Soybean, beef, palm oil	Analysis only per municipality: makes credit monitoring difficult
Agroideal	Brazil	Savanna	Soybean	Analysis only per municipality: makes credit monitoring difficult
Socio-environmental Risk (WWF)	Brazil	All	Cotton, maize, sugarcane, soybean, wood and livestock	Analysis only per municipality: makes credit monitoring difficult

Source: Elaborated by Authors

✓ Characteristics of free tools used for credit analysis

Their strengths include the fact that they are free and easily accessible. Among their weaknesses, the fact that some tools do not cover all commodities or Brazilian biomes (for the time being, Agroideal only covers soybeans in the Savanna biome) is highlighted. Emphasis is also given to the fact that some tools (Trase, Agroideal and Socio-environmental Risk - WWF) only analyze the characteristics of the municipality or region where the rural property is located, instead of the characteristics of the exact geo coordinated of the area to be financed, which helps less the banks to monitor the clients' socio-environmental risk. On the other hand, information per municipality may help the financial institutions to make strategic decisions (for example, which regions should not be financed because of the high rate of recent deforestation) and evaluate the exposure of their credit portfolios to socio-environmental risks.

Table 14. Strengths and weaknesses of free tools

Tool	Strengths	Weaknesses/potential for improvement for credit analysis
Google Earth Engine	• This tool allows the user to confront maps from official sources (e.g.: areas embargoed by Ibama, indigenous lands, Conservation Units) with potential areas to be financed.	• Technical knowledge required to use the tool and analyze map information.
Global Forest Watch	• Possibility to monitor and trace deforestation practically in real time in areas of the user's interest. • IFs may include the coordinates of potential areas to be financed.	• Confidentiality of data inputed without a login • New Version of Global Forest Watch will include: - Possibility to create login and password for information security Analysis in a portfolio Level - If needed, new Global Forest Watch can be inputed in the users system
Trase	• It allows the user to trace the commodity of interest from the producer's biome/state/ municipality/logistic hub to the purchasing market. • It allows the user to analyze municipalities, commodities and traders more exposed to deforestation.	• It is not possible to analyze an area that can be potentially financed (analysis at municipality level). • Is does not include analysis of commercial flow of commodities in internal market.
Agroideal	• It allows the user to check the municipalities and regions with more capacity for soybean production and confront with socio-environmental information (e.g.: embargoed areas, indigenous lands). • Information may be used for strategic decision-making (e.g.: opening of new offices or industries, areas of higher risks).	• Scope: at the moment, only soybean. • It is not possible to analyze an area that can be potentially financed (analysis at municipality level). • In construction.
Socio-environmental Risk (WWF)	• It allows the user to check the economical and socio-environmental indicators of municipalities, states, biomes and certain regions.	• Scope: cotton, maize, sugar cane, soybean, wood and livestock. • It is not possible to analyze an area that can be potentially financed (analysis at municipality/region level). • "Beta" version.

Source: Elaborated by Authors and interviews.

c) Paid geospatial tools

The main tools with restricted/paid access developed by geographic intelligence consulting firms, which may be used by financial institutions for deforestation risk management, are listed in the table below:

Table 15. Paid tools

Consulting Firm	Objective and tools
Agrotools	Company specialized in technological geospatial solutions and delivery of insights to agribusiness sector. It has three main tools and services, including Terrasafe, which is a technological solution linked to a geographic database of rural properties for socio-environmental consultations for the use of input suppliers or lending operations.
Agrosatélite	Consulting firm provided with the *Sistema de Monitoramento de Fazendas* - SIMFAZ (Farm Monitoring System), which aims to evaluate and monitor rural properties and lands with a series of functionalities. One of them is the socio-environmental functionality: an interactive tool for evaluation of a series of items of socio-environmental compliance of rural properties. It has tools for an intelligent search of databases as Sicar and Ibama and provides instantaneous results through maps, thus allowing a full view of risks of noncompliance with the institutions' policies.
Audsat	It offers three tools: Geo Crédito Agrícola, which is a tool that provides mitigation, management and monitoring of operation risks and environmental compliance in rural financing operations, in addition to compliance with legal and regulatory rules, such as the BACEN 4,427 Regulation; *Sistema de Informação para Gestão do CAR* -SIG-CAR (CAR Management Information System), which makes a series of automatic analyses intended to reduce possible errors in the client's registration process by showing necessary adjustments to allow technicians and portfolio managers to create and issue reports with the necessary information for this process; Landscope, which allows the traceability of companies' value chain through analysis and continuous monitoring of agricultural production and socio-environmental risk areas, such as the deforestation history of the area since 2008 (Forest Code), together with the Rural Environmental Registry, embargoed areas and issuances, in addition to the development of environmental regularization plans.

Source: Elaborated by Authors.

The consulting tools mentioned above analyze the following topics related to deforestation:

Table 16. Scope of paid tools per topic

Tool	Lists of areas embargoed by Ibama	Environmental licensing	Rural Environmental Registry	Certificate of Registration of Rural Property	Conservation Units	Indigenous Lands
Agrotools	x	x	x	x	x	x
Agrosatélite		x	x	x	x	x
Audsat		x	x	x	x	x

Source: Elaborated by Authors.

Tool scope per country, biome and commodity:

Table 17 – Scope of paid tools per country, biome and commodity

Tool	Scope per country	Scope per biome	Scope per commodity	Detail level
Agrotools	Brazil	All	Livestock Soybean Wood Palm Oil Sugar cane	It may reach the exact geo coordinates of the area to be financed: its makes credit monitoring easier
Agrosatélite	Brazil	All	Livestock Soybean Wood Palm Oil Sugar cane	It may reach the exact geo coordinates of the area to be financed:: its makes credit monitoring easier
Audsat	Brazil	All	Livestock Soybean Wood Palm Oil Sugar cane	It may reach the exact geo coordinates of the area to be financed:: its makes credit monitoring easier

Source: Elaborated by Authors.

✓ Characteristics of paid tools for credit analysis

A brief summary of strengths of paid tools with respect to their use by financial institutions for credit analysis and deforestation risk management is shown below. Due to the fact that they are paid and have restricted access, it was not possible to test them to evaluate their potential improvements. Among their strengths, the fact that the financial institutions may look for detailed socio-environmental information on a particular area stands out, by making the analysis of deforestation risk easier upon a lending request. In addition, the tools may be customized for banks to meet their individual needs.

Table 18. Strengths and weaknesses of paid tools

Tool	Strengths	Weaknesses/potential for improvement for credit analysis
Agrotools Agrosatélite Audsat	• Easy and fast access and capture of data. • Detailed socio-environmental information of the particular area (shapefile), thus meeting the IF information requirements. • IFs may filter the information on a particular area to be analyzed and customize the tool according to the needs of the Social Environment Risk area.	• As the tools are paid, it was not possible to test them to evaluate their weaknesses.

Source: Elaborated by Authors and interviews.

Part III – Recommendations to financial institutions for deforestation risk management

This section of the report provides recommendations to financial institutions to improve the deforestation risk management in lending operations. More specifically, it is recommended that the financial institutions:

1. **Check the environmental regularity of the activity and area to be financed by considering especially:**
   - **a)** The existence of embargoes for illegal deforestation by checking Ibama and ICMBio embargo lists;
   - **b)** Overlap of operation area and/or rural property borders with areas classified as Conservation Units included in the National System of Units of Conservation (SNUC) website;
   - **c)** Overlap of operation area and/or rural property borders with areas classified as Indigenous Lands included in the National Indian Foundation (Funai) or *Quilombola* websites;
   - **d)** Registration number with the Rural Environmental Registry (CAR);
   - **e)** Environmental license in the case of activities entitled to licensing.

2. **Use geospatial tools to analyze socio-environmental risks, thus complementing the consultation to official databases;**

3. **Establish the scope of analysis - per type/amount of operation and client profile – based on an evaluation of credit portfolio exposure to deforestation risks.**

4. **For operations considered of higher risk, whether because of the size of operation or incidence of deforestation in the region or link in the supply chain, it is recommended that financial institutions make a deeper analysis of the client by considering, for example, the following matters:**

Table 19. Matters for analysis of deforestation risk management of potential clients

Management of deforestation related risks	Governance	Monitoring and traceability
Is the deforestation risk management integrated to the company's risk management?	Which is the highest level of direct responsibility for the company's deforestation risks?	Does your company have a traceability system all the way to the product's origin? Which is the system's range (according to biome and chain link)? Which indicators are used to manage the company's deforestation risks?
Engagement initiatives	**Deforestation reduction policy**	**Certification of sustainable production**
Is your company involved with multistakeholder initiatives related to the fight against deforestation?	Is your company committed to fight deforestation?	What percentage of your production is certified by sustainability standards? Which are the adopted standards? Does your company have targets for certification of commodities?

Source: adapted from the CDP Forest questionnaire.

Institutional Engagement

With the purpose to improve the processes for collection and analysis of information by financial institutions, FEBRABAN will operate in two fronts as of 2018:

1. Articulate with the Ministry of the Environment (MMA, Ibama, ICMBio and Brazilian Forest Service) and other Ministries and relevant governmental bodies to improve the integration of several official databases related to the environmental aspects of land use;

2. Obtain a better articulation with the agents responsible for databases and tools with the objective of disseminating knowledge in the financial system, identifying possibilities of improvement of these tools, and stimulating the exchange of expertise among its users.

References

ABIEC. (2016). Perfil da Pecuária no Brasil - Relatório Anual 2016. Retrieved from http://abiec.siteoficial.ws/images/upload/sumario-pt-010217.pdf

ABIEC. (2017). Exportações Brasileiras de Carne Bovina. Retrieved from http://www.abiec.com.br/download/exportacoes-jan-dez-2016.pdf

ABIOVE. (2017). Brasil - Exportações do Complexo Soja. Retrieved from http://www.abiove.org.br/site/_FILES/Portugues/10052017-171604-exp_201704.pdf

Abrapalma. (2017). A palma no Brasil e no mundo. Retrieved from http://www.abrapalma.org/pt/a-palma-no-brasil-e-no-mundo/

ADM. (2015). Our commitment to no deforestation. Retrieved from https://s3-us-west-2.amazonaws.com/adms3/Sustainability/ADM-No-Deforestation-Policy.pdf

ADM. (2017). 2016 Corporate Sustainability Report. Retrieved from https://assets.adm.com/Sustainability/ADM_Sustainability_CorporateSustainabilityReport_2016.pdf

Agrosatélite. (2015). Análise geoespacial da dinâmica das culturas anuais no bioma Cerrado. Retrieved from http://biomas.agrosatelite.com.br/img/Analise_geoespacial_da_dinamica_das_culturas_anuais_no_bioma_Cerrado_2000a2014.pdf

AMAGGI. (2017). Relatório de Sustentabilidade 2016. Retrieved from http://www.amaggi.com.br/relatorio2016/pdf/rs2016_versao_integral.pdf

Andrade, E. B. de. (2015). A cadeia produtiva da palma de óleo no Estado do Pará: Uma avaliação crítica. Retrieved from http://www2.camara.leg.br/atividade-legislativa/comissoes/comissoes-permanentes/capadr/audiencias-publicas/audiencias-publicas-2015/audiencia-publica-26-de-marco-de-2015-faepa

Armstrong, P. (2010). Greenpeace, Nestlé in battle over Kit Kat viral. Retrieved from http://edition.cnn.com/2010/WORLD/asiapcf/03/19/indonesia.rainforests.orangutan.nestle/index.html

Assunção, J., Gandour, C., Hemsley, P., Rocha, R., & Szerman, D. (2013). Production and Protection: A First look at key challenges in Brazil.

Banco Central do Brasil. (2017). Política Monetária e Operações de Crédito do SFN. Retrieved from https://www.bcb.gov.br/htms/notecon2-p.asp

Barreto, P. (2015). Como reduzir a contribuição da pecuária brasileira para as mudanças climáticas? Imazon.

Barreto, P., & Gibbs, H. (2015). Como melhorar a eficácia dos acordos contra o desmatamento associado à pecuária na Amazônia? Retrieved from http://imazon.org.br/publicacoes/como-melhorar-a-eficacia-dos-acordos-contra-o-desmatamento-associado-a-pecuaria-na-amazonia/

Barreto, P., Pereira, R., Brandão, A., & Baima, S. (2017). Os frigoríficos vão ajudar a zerar o desmatamento na Amazônia? Retrieved from http://www.imazon.org.br/PDFimazon/Portugues/livros/Frigorificos e o desmatamento da Amazônia.pdf

Barros, B. (2017). Greenpeace deixa pacto firmado com frigoríficos. Retrieved from http://www.valor.com.br/agro/4993598/greenpeace-deixa-pacto-firmado-com-frigorificos

Biopalma. (2016). Relatório de Sustentabilidade Biopalma 2016. Retrieved from http://www.biopalma.com.br/pdf/relatorio-sustentabilidade-2016.pdf

Borges, A. (2016). Ibama multa o Santander em R$ 47,5 milhões. Retrieved from http://economia.estadao.com.br/noticias/geral,ibama-multa-o-santander-em-r-47-5-milhoes,10000083694

Bunge. (2017). 2016 Relatório de Sustentabilidade. Retrieved from http://www.bunge.com.br/sustentabilidade/2017/port/downloads/Bunge_RS17.pdf

Camara, B. (2017). O drible do gado: a parte invisível da cadeia da pecuária. Retrieved from http://www.oeco.org.br/reportagens/o-drible-do-gado-a-parte-invisivel-da-cadeia-da-pecuaria/

Canal Jornal da Bioenergia. (2017). Óleo de Palma no Brasil e suas potencialidades para as indústrias. Retrieved from http://www.canalbioenergia.com.br/oleo-de-palma-no-brasil-e-suas-potencialidades-para-as-industrias/

Cargill. (2017a). Palm Traceability: Moving forward with traceability to plantation. Retrieved from https://www.cargill.com/sustainability/palm-oil/palm-traceability

Cargill. (2017b). Relatório de Sustentabilidade 2016. Retrieved from https://www.cargill.com/static/brazil-annual-report/2016/

Carneiro Filho, A., & Costa, K. (2016). A expansão da soja no Cerrado: Caminhos para a ocupação territorial, uso do solo e produção sustentável. Retrieved from http://www.inputbrasil.org/wp-content/uploads/2016/11/A-Expansão-da-Soja-no-Cerrado_Agroicone_INPUT.pdf

CDP. (2017). CDP. Retrieved from https://www.cdp.net/pt

Cepea. (2016a). Índices Exportação do Agronegócio. Retrieved from http://www.cepea.esalq.usp.br/upload/kceditor/files/2016.pdf

Cepea. (2016b). PIB do Agronegócio Brasil. Retrieved from http://www.cepea.esalq.usp.br/upload/kceditor/files/Relatorio PIBAGRO Brasil_DEZEMBRO.pdf

Compre Rural. (2017). Conheça a maior fazenda do Brasil que planeja ter 200mil cabeças de gado. Retrieved from https://www.comprerural.com/conheca-a-maior-fazenda-do-brasil-que-planeja-ter-200mil-cabecas-de-gado/

Dinheiro Rural. (2015). A super fazenda. Retrieved from http://www.dinheirorural.com.br/secao/capa/super-fazenda

Embrapa. (2017). Soja em números (safra 2016/2017). Retrieved from https://www.embrapa.br/soja/cultivos/soja1/dados-economicos

Famato, & Fabov. (2007). Diagnóstico da cadeia produtiva agroindustrial da bovinocultura de corte do Estado de Mato Grosso. Retrieved from http://www.fabov.com.br/arquivos/fab0121081200939477.pdf

FIEP. (n.d.). Papel e celulose. Retrieved from http://www.fiepr.org.br/fomentoedesenvolvimento/cadeiasprodutivas/uploadAddress/papelcelulose%5B19555%5D.pdf

Forest 500. (2017). Roundtable on Responsible Soy. Retrieved from http://forest500.org/rankings/other-powerbrokers/round-table-responsible-soy

FSC. (2013). Padrão de Certificação do FSC para o Manejo Florestal em Pequena Escala e de Baixa Intensidade (SLIMF). Retrieved from https://br.fsc.org/pt-br/polticas-e-padres/padres-nacionais/padres-de-manejo-florestal

FSC. (2014). Avaliação de Plantações Florestais na República Federativa do Brasil: Padrão Harmonizado entre as Certificadoras. Retrieved from https://br.fsc.org/pt-br/polticas-e-padres/padres-nacionais/padres-de-manejo-florestal

Gibbs, H. K., Rausch, L., Munger, J., Schelly, I., Morton, D. C., Noojipady, P., ... Walker, N. F. (2015). Brazil's Soy Moratorium. Science, 347(6220), 377–378.

Globo Rural. (2016). Entrevista: "Temos uma área equivalente a Suíça para ser recuperada." Retrieved from http://revistagloborural.globo.com/Integracao/noticia/2016/08/entrevista-temos-uma-area-equivalente-suica-para-ser-recuperada.html

GPA. (2016). Política de Compras de Carne Bovina. Retrieved from http://www.gpabr.com/wp-content/uploads/2016/10/politica-de-compras-carne-bovina.pdf

GPA. (2017). Relatório Anual e de Sustentabilidade 2016. Retrieved from http://www.gpabr.com/wp-content/uploads/2017/06/RA_GPA_2016-2.pdf

Greenpeace. (2015). Auditorias reforçam sucesso do Compromisso Público da Pecuária. Retrieved from http://www.greenpeace.org/brasil/pt/Noticias/Auditorias-reforcam-sucesso-do-Compromisso-Publico-da-Pecuaria/

GTPS. (2017a). Guia de Indicadores da Pecuária Sustentável. Retrieved from http://www.gtps.org.br/guia-de-indicadores/

GTPS. (2017b). Missão e objetivos. Retrieved from http://www.gtps.org.br/institucional/quem-somos/

GVagro. (2016). Amazônia Legal: Propostas para uma exploração agrícola sustentável. Retrieved from http://bibliotecadigital.fgv.br/dspace/bitstream/handle/10438/17672/Amazônia_Legal_Propostas_para_uma_Exploração_Agrícola_Sustentável_Relatório_Completo.pdf?sequence=1&isAllowed=y

Ibá. (2017a). Estatísticas da Indústria Brasileira de Árvores. Retrieved from http://iba.org/images/shared/Cenarios/Cenarios_Jan_2017.pdf

Ibá. (2017b). Relatório Anual 2017. Retrieved from http://iba.org/images/shared/Biblioteca/IBA_RelatorioAnual2017.pdf

IBGE. (2009). Censo Agropecuário 2006. Retrieved from https://biblioteca.ibge.gov.br/visualizacao/periodicos/51/agro_2006.pdf

IBGE. (2017). Estatísticas - Contas Nacionais. Retrieved from https://www.ibge.gov.br/estatisticas-novoportal/economicas/contas-nacionais.html

ICMBio. (2018). Áreas embargadas. Retrieved from http://www.icmbio.gov.br/portal/infracoesambientais/areas-embargadas

Imaflora. (2016). 10 anos da Moratória da Soja na Amazônia: História, Impactos e a Expansão para o Cerrado. Retrieved from http://www.imaflora.org/downloads/biblioteca/58d01187c0fff_esse.pdf

Incra. (2010). Governo Federal lança Programa de Produção Sustentável de Óleo de Palma. Retrieved from http://www.incra.gov.br/governo-federal-lanca-programa-de-producao-sustentavel-de-oleo-de-palma

INPE. (2017). Projeto PRODES: Monitoramento da floresta amazônica brasileira por satélite. Retrieved from http://www.obt.inpe.br/prodes/index.php

Ipea. (2008). O que é? Amazônia Legal. Retrieved from http://www.ipea.gov.br/desafios/index.php?option=com_content&id=2154:catid=28&Itemid

ISCC. (2017a). ISCC for Feed. Retrieved from https://www.iscc-system.org/process/certification-scopes/iscc-for-feed/

ISCC. (2017b). ISCC for Food. Retrieved from https://www.iscc-system.org/process/certification-scopes/iscc-for-food/

ISCC. (2017c). Overview ISCC for the food market. Retrieved from https://www.iscc-system.org/wp-content/uploads/2017/05/Overview-ISCC-PLUS-for-the-food-market.pdf

ISCC. (2017d). Welcome to ISCC. Retrieved from https://www.iscc-system.org/

JBS. (2017). Relatório Anual e de Sustentabilidade 2016. Retrieved from http://jbss.infoinvest.com.br/ptb/4069/JBS RAS 2016 PT 170502 Final.pdf

Klabin. (2017). Relatório de Sustentabilidade 2016. Retrieved from http://rs.klabin.com.br/

KPMG. (2013). A roadmap to sustainable soy: Approaches to increase certification and reduce risk. Retrieved from https://www.idhsustainabletrade.com/uploaded/2016/11/KPMG-Roadmap-to-responsible-soy-2013.pdf

Lazzarini, S. G., & Nunes, R. (2008). Competitividade do sistema agroindustrial da soja. In E. M. M. Q. Farina & D. Zylbersztajn (Eds.), Competitividade no agribusiness brasileiro: Introdução e conceitos (pp. 194–420). São Paulo.

Magela, G. (2013). Novo padrão de certificação florestal beneficia pequenos produtores. Retrieved from https://www.wwf.org.br/informacoes/noticias_meio_ambiente_e_natureza/?35602

MAPA. (2016). Palma de óleo - Programa de Produção Sustentável. Retrieved from http://www.agricultura.gov.br/acesso-a-informacao/acoes-e-programas/cartas-de-servico/politica-de-agroenergia/palma-de-oleo-programa-de-producao-sustentavel

MAPA, SPA, & IICA. (2007). Cadeia produtiva da carne bovina - Volume 8. Retrieved from http://www.iica.org.br/docs/cadeiasprodutivas/cadeia produtiva da carne bovina c capa.pdf

Marfrig. (2013). Carrefour e Marfrig lançam a primeira carne bovina com o selo Rainforest Alliance Certified no mundo. Retrieved from http://www.marfrig.com.br/pt/documentos?id=351

Marfrig. (2016). Relatório Anual de Sustentabilidade 2015. Retrieved from http://www.marfrig.com.br/Uploads/Arquivos/Marfrig_RA15.pdf

MDIC. (2017). Balança comercial: Janeiro-dezembro 2016. Retrieved from http://www.mdic.gov.br/index.php/comercio-exterior/estatisticas-de-comercio-exterior/balanca-comercial-brasileira-acumulado-do-ano?layout=edit&id=2205

MMA. (2017). Os Plano de Prevenção e Controle do Desmatamento em Âmbito Federal. Retrieved from http://combateaodesmatamento.mma.gov.br/

MMA, & Ibama. (2015). Monitoramento do desmatamento nos biomas brasileiros por satélite - Cerrado 2010-2011. Retrieved from http://www.mma.gov.br/publicacoes/biomas/category/62-cerrado?download=1138:monitoramento-do-desmatamento-dos-biomas-brasileiros-por-satélite-cerrado-cerrado-2010-2011

Montebello, A. E. S., & Bacha, C. J. C. (2011). O setor de celulose e papel na economia brasileira. O Papel, 72(4), 47–50.

Ninni, K. (2011). MPF no Pará processa Basa, Banco do Brasil e Incra. Retrieved from http://sustentabilidade.estadao.com.br/noticias/geral,mpf-no-para-processa-basa-banco-do-brasil-e-incra,700107

o Eco. (2013). O que são áreas embargadas. Retrieved from http://www.oeco.org.br/dicionario-ambiental/27742-o-que-sao-areas-embargadas/

Observatório do Clima. (2017). Desmatamento do Cerrado supera o da Amazônia, indica dado oficial. Retrieved from http://www.oeco.org.br/reportagens/desmatamento-do-cerrado-supera-o-da-amazonia-indica-dado-oficial/

Osório, E. G. (2007). Indústria de papel e celulose: Estudo de caso da implantação da VCP Florestal no extremo sul do Rio Grande do Sul. Universidade Federal de Santa Catarina.

PEFC. (2010). Sustainable Forest Management – Requirements. Retrieved from https://pefc.org/resources/technical-documentation/pefc-international-standards-2010/676-sustainable-forest-management-pefc-st-10032010

Pinto, L. F. G. (2017). Código Florestal: o futuro depende de mudanças estruturais. In J. Gesisky (Ed.), Código Florestal Brasileiro: Haverá Futuro? Retrieved from http://d3nehc6yl9qzo4.cloudfront.net/downloads/WWF-CODFlorestal-WEB-25jul2017.pdf

Pires, J. A. A. (n.d.). A cadeia produtiva de carne bovina no Brasil: mercado internacional e nacional. Retrieved from http://www.simcorte.com/arquivosAnais/arquivo13

Planalto. (2010). Decreto no 7.172, de 7 de maio de 2010. Retrieved from http://www.planalto.gov.br/ccivil_03/_Ato2007-2010/2010/Decreto/D7172.htm

PR Newswire. (2014). TNC e Syngenta vão promover recuperação de áreas degradadas no Cerrado. Retrieved from http://www.prnewswire.com/news-releases/tnc-e-syngenta-vao-promover-recuperacao-de-areas-degradadas-no-cerrado-277087901.html

ProTerra. (2014). ProTerra Standard: Social Responsibility and Environmental Sustainability. Retrieved from https://www.cert-id.eu/downloads/ProTerra_Standard_V3-0_EN-2016

ProTerra Foundation. (2017a). Certification. Retrieved from http://www.proterrafoundation.org/non-gmo/certification/

ProTerra Foundation. (2017b). ProTerra. Retrieved from http://www.proterrafoundation.org/

Rodeo West. (2017). Top 10: as maiores fazendas do Brasil. Retrieved from https://blog.rodeowest.com.br/curiosidades-rodeio/top-10-maiores-fazendas-brasil/

RSPO. (2013). RSPO P&C 2013: Audit Checklist for assessing compliance. Retrieved from https://www.rspo.org/acop/2016/ecochem-oleochemicals-limited/RSPO Generic Checklist for audits against RSPO P&C 2013-English.pdf

RTRS. (2017a). Certificar a produção. Retrieved from http://www.responsiblesoy.org/certification/production/?lang=pt

RTRS. (2017b). Nossa certificação. Retrieved from http://www.responsiblesoy.org/certification/nuestra-certificacion/?lang=pt

RTRS. (2017c). RTRS Standard for Responsible Soy Production Version 3.1. Retrieved from http://www.responsiblesoy.org/wpdm-package/rtrs-standard-responsible-soy-production-v3-1/?lang=en

RTRS. (2017d). RTRS Updates. Retrieved from http://www.responsiblesoy.org/actualizaciones-rtrs/?lang=en

SAN. (2017). Sustainable Agriculture Standard: for farms' and producer groups' crop and cattle production. Retrieved from http://www.san.ag/biblioteca/docs/SAN-S-SP-1-V1.2_SAN_Sustainable_Agriculture_Standard_July_2017.pdf

Serviço Florestal Brasileiro. (2013). Florestas do Brasil em resumo. Retrieved from http://www.florestal.gov.br/snif/images/Publicacoes/florestas_do_brasil_em_resumo_2013_atualizado.pdf

SPOTT. (2017a). Buyers. Retrieved from https://www.sustainablepalmoil.org/buyers/

SPOTT. (2017b). Commodity brokers/traders. Retrieved from https://www.spott.org/palm-oil-resource-archive/commodity-brokers-traders/

SPOTT. (2017c). Growers. Retrieved from https://www.spott.org/palm-oil-resource-archive/growers/

SPOTT. (2017d). Producers. Retrieved from https://www.sustainablepalmoil.org/producers/

Syngenta. (2017). Produtores rurais de Mato Grosso receberão apoio para conservar o Cerrado. Retrieved from https://www.syngenta.com.br/press-release/noticia/produtores-rurais-de-mato-grosso-receberao-apoio-para-conservar-o-cerrado

Walmart. (2017). 2017 Global Responsibility Report. Retrieved from http://corporate.walmart.com/2017grr

WWF. (2012). The 2050 Criteria: Guide to Responsible Investment in Agricultural, Forest, and Seafood Commodities. Retrieved from http://awsassets.panda.org/downloads/the_2050_critera_report.pdf

WWF. (2017). Manifesto convoca o mercado para atingir desmatamento zero do Cerrado. Retrieved from http://www.wwf.org.br/informacoes/noticias_meio_ambiente_e_natureza/?60722/Manifesto-convoca-o-mercado-para-atingir-desmatamento-zero-do-Cerrado

Annex I. Livestock TAC

In 2009, the Public Prosecutor's Office and the Brazilian Institute of Environment and Renewable Natural Resources (Ibama) prosecuted slaughterhouses in Pará for purchasing cattle from farms embargoed for illegal deforestation. As a consequence, several slaughterhouses, including the largest ones at the time, signed a Term of Adjustment of Conduct (TAC), which is a legal commitment that authorizes the Public Prosecutor's Office to apply the sanctions provided in the TAC without judicial intervention in case of noncompliance.

TAC signatories undertook to acquire cattle only from farms:

- ✓ free of deforestation after 2009;
- ✓ not included in the list of slave-like labor of the Ministry of Labor;
- ✓ registered with the Rural Environmental Registry (CAR);
- ✓ not located in protected areas.

Later, other slaughterhouses signed the TAC in other states of the Legal Amazon.[71]

[71] (Barreto et al., 2017)

Annex II. Main initiatives to fight deforestation in the livestock sector

Public Livestock Commitment in the Amazon Region

In 2009, Greenpeace issued the "Ox Spree in Amazon" report showing the impact of slaughterhouses and retailers on forest deforestation. One month after the report's publication, the largest slaughterhouses in Brazil - JBS, Marfrig and Minerva – made a public commitment to only trade beef and leather with farms that have not committed deforestation since October 2009, do not use slave labor or occupy any Conservation Units or Indigenous Lands in the Amazon biome. The companies also signed, with Greenpeace[72], a Term of Reference under which they undertook, based on the same criteria, to audit and publish the program results on an annual basis.[73]

Brazilian Roundtable on Sustainable Livestock (GTPS)

Created in 2007 and formally established in 2009, the Brazilian Roundtable on Sustainable Livestock (GTPS) has as its main objective discussing and formulating the principles, standards and common practices adopted by the sector to construct a sustainable, fair, environmentally correct and economically feasible livestock. It is composed of representatives from all links of the cattle raising value chain, such as producers, businesses, sector-related organizations, producers and associations, retailers, input suppliers, financial institutions, civil society organizations, research centers and universities.[74] The GTPS offers the Guia de Indicadores da Pecuária Sustentável (Sustainable Livestock Indicator Guide), which is a self-evaluation tool for all links of the cattle raising supply chain that addresses, among other topics, deforestation and compliance with the Forest Code.[75]

[72] Due to the disclosure of a corruption scheme involving JBS, Greenpeace decided to be no longer a party of the Amazon Public Livestock Commitment (Barros, 2017).

[73] (Greenpeace, 2015)

[74] (GTPS, 2017b)

[75] (GTPS, 2017a)

Annex III. Main initiatives and certifications to fight deforestation in the soybean sector

Soybean Moratorium

On July 24, 2016, the Soybean Moratorium was signed by the Brazilian Association of Vegetable Oil Industries (Abiove) and the National Association of Cereal Exporters (ANEC) for a period of two years, under which the associated companies agreed to abstain from acquiring soybeans from deforested areas in the Amazon biome from the date of the agreement. Upon the publication of the Forest Code in 2012, the Moratorium was adjusted to the law by changing its reference date to July 22, 2008. The Moratorium was renewed for seven years until the maintenance of the agreement for an indeterminate period was decided in May 2016.

The Moratorium is coordinated by the Grupo de Trabalho da Soja – GTS (Soybean Workgroup), which is a multistakeholder dialogue space where their agreements and monitoring and evaluation mechanisms are negotiated, established and reviewed.

The initiative has two instruments in its monitoring, reporting and checking system. The first, which is executed by the Agrosatélite company, does the analysis and spatial monitoring of municipalities by evaluating 87 municipalities in the states of Mato Grosso, Pará, Rondônia, Amapá and Roraima, which account for 98% of the planted area in the Amazon biome. This monitoring generates lists of producers that should be restricted and are distributed to the signatory companies of the Moratorium to feed their corporate systems and block the purchase from these suppliers. The second instrument includes the third parties' audits to which the companies that buy soybeans in the Amazon shall be submitted to check their purchases.

Roundtable on Responsible Soy Standard (RTRS) for Responsible Soybean Production

In 2010, the Roundtable on Responsible Soy (RTRS) created the RTRS Standard for Responsible Soybean Production that refers to a series of Principles and Criteria for soybean certification as a responsible culture. The RTRS Standard pillars include: legal performance and good business practices, responsible work conditions, responsible community relationships, environmental responsibility and adequate agricultural practices.76 Based on that Standard, the RTRS created the RTRS Certification to ensure that soybeans – in the form of raw materials or byproducts – originate from an environmentally correct, socially adequate and economically feasible process.77 Certified producers may not have deforested areas critical for biodiversity (hotspots) after May 2009 or any native vegetation area after June 2016.[78]

The RTRS recognizes two certification models of chain of custody: segregation, where certified soybeans are kept separated from non-certified soybeans, and the mass balance model where certified and non-certified soybeans are mixed together, however the percentages of each type are monitored so that the correct proportions are sold in the market. The RTRS also operates a business platform for the sale of RTRS credits, where a credit is equivalent to one ton of certified soybeans.[79]

ProTerra

This is a non-profit organization that tries to improve and promote sustainability in all levels of the food supply chain system. ProTerra supports organizations of the agricultural production chain by offering tools to help them to improve their performance in sustainability.[80]

[76] (RTRS, 2017a)
[77] (RTRS, 2017b)
[78] (RTRS, 2017c)
[79] (Forest 500, 2017)
[80] (ProTerra Foundation, 2017b)

ProTerra has the ProTerra Standard certification based on the Basel Responsible Soybean Criteria, which is applicable to all agricultural sectors and all stages of the food chain. With respect to deforestation, certified organizations shall certify that native vegetation areas and other high-conservation areas have not been deforested or converted into agricultural areas or used for industrial or other commercial purposes after 2004.[81] Through this certification, the organizations inform the investors, employees, lawmakers and consumers that they do not use genetically modified soybeans and are committed to sustainability.[82]

International Sustainability and Carbon Certification (ISCC)

The ISCC is a multistakeholder initiative that involves international associations, companies, research institutions and NGOs. That is an international certification system that checks the whole production chain and all types of agricultural commodities, thus allowing the companies to show their commitment with socially and environmentally responsible production and the purchase of sustainable raw materials free of deforestation.[83] The ISCC has issued more than 13,000 certificates in more than 100 countries.[84] For soybeans, the ISCC has the "ISCC for Food" certificate that meets all responsible soybean requirements of the Soybean Group Consumer Goods Forum Retailers[85] and the "ISCC for Feed" certificate that meets the soybean supply guidelines of the European Feed Manufacturers' Federation (FEFAC).[86] With respect to deforestation, the ISCC does not allow deforestation or conversion of biodiverse prairies after 2008.[87]

[81] (ProTerra, 2014)
[82] (PorTerra Foundation, 2017a)
[83] (ISCC, 2017b)
[84] (ISCC, 2017d)
[85] (ISCC, 2017b)
[86] (ISCC, 2017a)
[87] (ISCC, 2017c)

Annex IV. Notes

I **JBS:** "The Non-Governmental Organization Greenpeace has been studying the behaviour of the production chain for cattle raising in the Amazon region since 2007. In 2009, after a long investigation, the organization published its report "Slaughtering the Amazon", which highlighted the relationship between the processing companies and their cattle suppliers involved with forest clearance and slave labour, and the products offered for sale in the market. JBS was one of the processing companies that were on the list. In fact, it brought negative impacts for JBS´ image as well as with its customers" (2016 JBS CDP Forest Questionnaire).

II **Marfrig:** "In the first quarter 2015 animal costs rose due to the scarcity resulting from a drought that affected the offer of pasture, which, in turn, affected the fattening of animals, thus reducing beef production in the Brazilian industry" (2016 Marfrig CDP Forest Questionnaire).

III **JBS:** "To manage the risk of cattle purchase from suppliers involved in native forests deforestation, protected areas invasion or child and compulsory labour use, JBS established restrictive procurement procedures performed by a social and environmental monitoring system, composed of two mechanisms of analysis, which work in an integrated manner. The first verifies the existence of the farm or livestock supplier in the lists published by the Ministry of Labour and Employment (MTE) – Registry of Employers Fined for Compulsory Labour and the list of areas embargoed due to illegal deforestation published by the Brazilian Institute of the Environment and Renewable Natural Resources (IBAMA)" (2016 JBS CDP Forest Questionnaire)

Marfrig: "The purchase system only authorizes transactions after the verification of listed properties by the Brazilian Institute of Environment and Renewable Natural Resources (Ibama) and the Ministry of Labor is confirmed." (Marfrig, 2016)

Minerva: "With managers trained to have an in-depth understanding of the commitments undertaken by the Company, purchases are preceded by consultations of the property records of the supplier of the cattle, as found on the Brazilian Institute of Environment and Renewable Natural Resources (Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis – IBAMA) and the Ministry of Labor and Employment (Ministério do Trabalho e Emprego – MTE)" (2016 Minerva CDP Forest Questionnaire).

IV **JBS:** "The second mechanism of analysis uses a geographic information system (GIS) for the geo-spatial monitoring of farms supplying the company with livestock located in the Legal Amazon region, in order to identify suppliers involved in the deforestation of native forests after October 2009, the invasion of indigenous lands or environmental conservation units" (2016 JBS CDP Forest Questionnaire)

Marfrig: "Marfrig uses this data, in addition to having at least one geographic coordinate point of all farms who supply us and georeferenced maps of each property located in the Amazon Biome, to compare to the list of embargoed areas maintained by IBAMA (the Brazilian Institute of Environment and Renewable Natural Resources)."

"The suppliers are also checked regarding land regularity (through document issued by INCRA, Brazil's National Institute for Colonization and Agrarian Reform), and in the Amazon every farm is analysed for the occurrence of new deforestation and overlap with indigenous lands and protected areas" (2016 Marfrig CDP Forest Questionnaire).

Minerva: "Minerva Foods also has a geospatial monitoring system in the Amazon biome, obtaining maps provided by satellite images from the National Institute for Space Research (Instituto Nacional de Pesquisas Espaciais – INPE). Placement of these maps over maps of rural properties allows areas of deforestation and invasion of Indigenous Lands or environmental Conservation Units by potential suppliers to be found, eliminating these suppliers as procurement options" (2016 Minerva CDP Forest Questionnaire).

v **Marfrig:** "In this sense, another unprecedented tool in livestock sector is Request for Information (RFI), which is used to control the origin of cattle bred in Amazon Biome. Cattle raisers record in RFI the origin of animals acquired from third parties (indirect suppliers). Then, Marfrig Beef technicians check the lists of Ibama and Federal Prosecutors' Office to determine the reliability of such producers with respect to socioenvironmental practices" (Marfrig, 2016).

vi **Marfrig:** "However, according to auditors, Marfrig does not check those farms in a systematic way, as the company has not gotten to adopt auditable procedures to involve such suppliers" (Barreto et al., 2017; Marfrig, 2016).

vii **McDonald's:** "Note that for more than 20 years, the Company has had a policy prohibiting the sourcing of beef from within the Amazon Biome. For over 20 years, the Company has had a policy prohibiting the sourcing of beef produced within the Amazon Biome. We ask all direct and indirect suppliers (Grinders and Abattoirs) sourcing beef from Brazil to sign a commitment to this policy" (2016 McDonald's CDP Forest Questionnaire).

viii **McDonald's:** "We continue to work with our suppliers and Agrotools, a geospatial mapping and auditing company, to map the origins of any beef sourced in Brazil back to the last farm and to verify compliance with this policy (that it did not come from within the Amazon Biome) and build more traceability into our beef supply" (2016 McDonald's CDP Forest Questionnaire).

ix **JBS and McDonald's:** "JBS is a partner and exclusive supplier of McDonald's Sustainable Hamburger launched in 2016 in São Paulo (Brazil). That initiative expects that the production of hamburgers, in addition to meeting the client's quality requirements, will meet a series of socioenvironmental criteria that are already used by the Company. Supplier may not, for example, be involved with deforestation or invasions of indigenous lands or conservation units. They should not make use labor similar to slave labor. Production of sustainable hamburger – that records a pioneering activity in the country – also complies with other three criteria: cattle monitoring since their birth, alignment with the Sustainable Cattle-Raising Guide (GIPS) of the Sustainable Livestock Workgroup (GTPS) and independent examination of the whole project management system". (JBS, 2017)

x **Carrefour:** "Thanks to the launch of a geolocation system within its supply chain, Carrefour will ensure that its products are compliant with the Policy criteria all along the supply chain (includes indirect suppliers)" (2016 Carrefour CDP Forest Questionnaire).

xi **Walmart:** "Walmart set a goal of monitoring 100 percent of the fresh beef from the Amazon sold in our stores in Brazil to source beef that does not contribute to deforestation. We created a geospatial monitoring system to help us track suppliers, volumes and farm locations and overlays that information with maps that show where deforestation is occurring. To meet our 2020 zero net deforestation goal, we will be expanding this program beyond the Amazon to other sensitive biomes in Brazil. We will also need to expand the scope of this program beyond the finishing ranch to cow/calf operations" (Walmart, 2017)

[XII] **Pão de Açúcar:** "With the strategic support of The Forest Trust, GPA published its Environmental Policy for the Beef Purchase. The objective is to ensure that the productive chain responsible for supplying the Company's stores all over the Country contributes to no type of deforestation, is not originated from farms that have been have caught using slave or degraded labor, or derives from farms where there is a land conflict – whether due to the invasion of preservation areas or confrontation with indigenous communities, maroons or other traditional communities.

"A system was implemented by Safetrace company to monitor the traceability, critical analysis and report of socioenvironmental conformity data related to beef origin" (GPA, 2017).

"For the consumer, what is more useful is the information certificated by origin quality – for example, the traceability system developed by Safe Trace, which trace the cattle origin by a chip or earring by storing the genetic, sanitary and handling history updated by a software. Retail networks, such as Pão de Açúcar Group(GPA) are using that system to trace the origin of beef and promise to trace 100% of beef in the short term, by considering animals from their birth to slaughter" (Barreto et al., 2017).

[XIII] **Marfrig and Carrefour:** "Their partnership started in 2012, when the unit in Tangará da Serra (MT) became the first food industry in the world to be awarded the Rainforest Alliance Certified seal for certification of meat, environmental, social and economic sustainability for agricultural and forest products. In the following year, Marfrig Beef, in partnership with Carrefour hypermarket network, started to commercialize beef with that Seal, which certified the origin of raw material and sustainable production processes of factories and suppliers".

"In all such initiatives, the certificate testifies that the farms that supply meat follow strict internal rules for environmental preservation and respect to workers, local communities and animal welfare rules. Currently, three operations of Marfrig Beef hold Rainforest Alliance Certified Seal for the Rule established by the Sustainable Agricultural Network (RAS) of Custody Chain: Tangará da Serra (MT), Promissão (SP) and Pampeano (RS)" (Marfrig, 2016).

[XIV] **Walmart:** "We are already training our beef suppliers from other regions to manage geographical information at their slaughterhouses and to input the coordinates of their suppliers' farms into the system" (Walmart, 2017).

[XV] **Sainsburys:** "Droughts have in the past impacted on soy production in major growing regions which has affected global supply. This has previously increased the price of soy which then impacted upon feed prices. The price of feed is an important element of the cost of rearing animals and meat and dairy production" (2016 Sainsbury's CDP Forest Questionnaire).

[XVI] **Cargill:** "In September 2014, Cargill endorsed the New York Declaration on Forests. Cargill seeks to do its part to cut natural forest loss in half in its supply chains by 2020 and will strive to end it by 2030" (2016 Cargill CDP Forest Questionnaire).

[XVII] **ADM:** "In Brazil, ADM participates in the Brazil Institute of Environment and Renewable Natural Resources embargo. Under this agreement, surveillance of deforested areas is made by satellite imaging and, if a producer clears a small fraction of native vegetation on his property and plants soy in this area, all of the farm's production becomes ineligible for trading" (ADM, 2015)

AMAGGI: "To ensure a responsible purchase, the company has Socioenvironmental Criteria to evaluate its grain suppliers, which constitute the minimum sustainability principles to be:

- Areas interdicted by the National Environment and Renewable Natural Resource Institute (IBAMA): AMAGGI forbids the commercialization of grain from areas included in the list of interdictions for illegal deforestation" (AMAGGI, 2017).

Cargill: "In conformity with the Brazilian Law, Cargill does not acquire agricultural products or grains from illegally deforested areas. To ensure the origin of our raw material, we are currently provided with advanced information analysis mechanisms. Through geographic information systems, we are able to monitor and analyze our grain supply chain. Cargill also has a partnership with NGO World Resources Institute (WRI) for the development of public bases of global georeferenced information to monitor supply chains associated with the agricultural sector. Another basic reference in that process is the list of interdicted parties – producers that are not up to date with the law – which is made available by the Brazilian Environment and Renewable Natural Resource Institute (Ibama). The document is consulted by Cargill at every new agreement and we undertake to abstain from trading products from such areas or negotiate the sale of inputs or financing intended to them. For that, we have strict internal procedures to ensure that we do no business with an interdicted area" (Cargill, 2017b).

[xviii] **AMAGGI:** "Indigenous Land and Conservation Units: the company does not trade with producers in productive areas included in Indigenous Land and Conservation Units" (AMAGGI, 2017).

[xix] **ADM:** "In Q4 2016, we selected two remotesensing monitoring tools, both of which will undergo further testing in a subset of ADM supplier farms. The results will provide regional and farm-level analysis of land-use change in municipalities within ADM's high risk priority areas for No Deforestation" (ADM, 2017)

[xx] **AMAGGI:** "As a way to fight illegal deforestation and foster a sustainable agriculture, in 2016 AMAGGI made a great investment with the acquisition of a platform to manage and monitor its grain chain, known as ORIGINAR – AMAGGI Responsible Origination – developed by means of Agrotools technology".

"That tool allows to analyze with more accuracy and details the areas with which the company negotiates, thus allowing the generation of a socioenvironmental record of the property and producer, which may be compared to data from its Socioenvironmental Criteria" (AMAGGI, 2017).

[xxi] **AMAGGI:** "For producers trading in the modality of advance on account of price, AMAGGI has a specific evaluation. In addition to evaluating the Socioenvironmental Criteria, the local team of AMAGGI branch having a direct relationship with the rural producer makes on-site inspection in such properties to evaluate several environmental, labor and social questions by completing a Socioenvironmental Record and after its respective validation by Sustainability Team. The property area is also analyzed through satellite images to ensure the grain is originated from an area that meets the company's socioenvironmental criteria. In that modality of commercialization, 696 operations were analyzed in 2016" (AMAGGI, 2017).

[xxii] **ADM:** "ADM supports farmers in Paraguay and Brazil to reach and maintain their International Sustainability and Carbon Certification (ISCC) certification. ADM was the first company in South America to achieve ISCC certification for soybeans by working with growers in both Brazil and Paraguay to successfully complete exacting third-party audits." (2016 ADM CDP Forest Questionnaire)

[xxiii] **AMAGGI:** "AMAGGI closed 2016 with 470 certified rural properties, 46 of which certified by A.R.S., 35 by RTRS and 389 by ProTerra" (AMAGGI, 2017).

[xxiv] **Bunge:** "Since 2012, Bunge has operated in the market of soybean certificated for export to Europe, by using Biomass Biofuel Sustainability Voluntary Scheme standard (2BSvs)". "In 2016, we exported some 420,000 tons of soybean certificated by that standard – a volume that was 17% higher than that exported in 2015" (Bunge, 2017).

[xxv] **Unilever:** "In Brazil we have defined a group of 42 farmers who supply our soy oil volume through our partnership with Allianca de Terra to become Round Table for Responsible Soy (RTRS) certified by 2016. I. Our 20 direct supplying soy bean farmers for our AdeS soy protein drink are already RTRS certified" (2016 Unilever CDP Forest Questionnaire)

[xxvi] **Mars:** "Our ambition is to ensure that, by the end of 2017, 100% of the soy we purchase in Brazil will be certified. This means that, from and after 2018, Mars will only source material in Brazil that has been certified by a third party verification system, such as RTRS or ProTerra" (2016 Mars CDP Forest Questionnaire)

[xxvii] **Carrefour:** "Carrefour only works with its first tier suppliers, but strongly encourages suppliers to engage the discussion with their own suppliers" (2016 Carrefour CDP Forest Questionnaire).

[xxviii] **Unilever:** "In Brazil & the USA we know the exact locations of individual farmers & the co operatives supplying our Tier 1 suppliers" (2016 Unilever CDP Forest Questionnaire)

[xxix] **Danone:** To reach those strategic goals, Danone has been engaging in a multi-stakeholder dialogue and consultation process with the suppliers, players, experts and NGOs in the priority countries – business units consuming soy and production basins - of its chain. The first pilot investigation launched in early 2015 in Brazil allowed to trace back, according to suppliers' declaration, the soy to 79 Brazilian municipalities located in 6 states (Minas Gerais, Tocantins, Goias, Districto Federal, Rondonia and Mato Grosso do Sul) and to point out that 28% of the volumes of soy entering indirectly Danone Brazil's chain originated from municipalities considered as high to very-high risk in terms of deforestation. Through this process, Danone Brazil has been able to define and approve with stakeholders a roadmap for Transparency, Risk Mitigation and Industry Transformation specific to its soy supply chain" (2016 Danone CDP Forest Questionnaire).

[xxx] "The requirement for the "conversion of forests to other types of land use, including conversion of primary forests to forest plantations" means that forest plantations established by a forest conversion after 31 December 2010 in other than "justified circumstances" do not meet the requirement and are not eligible for certification." (PEFC, 2010)

[xxxi] "Plantations made in converted areas of natural forests after November 1994 should not be normally qualified for certification. Certification shall be allowed under a circumstance where there is a sufficient evidence submitted to the certifier indicating that the manager/owner is not directly or indirectly responsible for that conversion" (FSC, 2014).

[xxxii] "Plantations made in converted areas of natural forests after November 1994 should not be normally qualified for certification. Certification shall be allowed under a circumstance where there is a sufficient evidence submitted to the certifier indicating that the manager/owner is not directly or indirectly responsible for that conversion" (FSC, 2013)

[xxxiii] **Unilever:** "The lack of certified sustainable material for our paper and board packing could affect our ability to realize our sustainable sourcing commitments. Secondarily, continued NGO criticism and concerns around deforestation even if sources are certified can potentially harm our business" (2016 Unilever CDP Forest Questionnaire).

[xxxiv] **Fibria:** "Considering our forests that supply Aracruz, Jacareí and Três Lagoas mills, 942,521 hectares, we have 729,378 ha certified by FSC and 761,956 certified by Cerflor/PEFC" (2016 Fibria CDP Forest Questionnaire).

[xxxv] **Klabin:** "Our own wood (coming from our planted forests) are 100% FSC certified." (2017 Klabin CDP Forest Questionnaire).

"All Klablin Forest handling units are certified by FSC®, amounting to 425,519.93 hectares" (Klabin, 2017).

[xxxvi] **Klabin:** "Klabin is the first and only company in the sector in Latin America to guarantee the origin of the raw materials used in the manufacture of its products through FSC® certification. The certificate covers the chain of custody of industrial sacks, paperboard and kraft paper in Brazilian units" (2017 Klabin CDP Forest Questionnaire).

[xxxvii] **Klabin:** "The raw material purchased from smallholders forest growers corresponds up to 30% of the total wood used in the production process" (2017 Klabin CDP Forest Questionnaire).

[xxxviii] **Fibria:** "In 2016, 28% of Fibria's wood supply came from the neighboring producers who participate in the Forestry Savings Program" (2017 Fibria CDP Forest Questionnaire).

[xxxix] **Fibria:** "Related to our supply chain, Fibria has developed the Forestry Savings Program, encouraging rural producers near the production units to plant eucalyptus" (2017 Fibria CDP Forest Questionnaire).

[xl] **Fibria:** "Currently, 73,028 hectares from 1,995 producers participate in the program, in 202 cities in Espírito Santo, Matro Grosso do Sul, Minas Gerais, and São Paulo" (2017 Fibria CDP Forest Questionnaire).

[xli] **Fibria:** "all producers should have their properties regularized according to the rules of the Forestry Code and state laws" (2017 Fibria CDP Forest Questionnaire).

[xlii] **Klabin:** "Klabin is providing technical knowledge and training to improve the ability of producers to obtain certification. One of the actions were a joint effort developed with FSC Brasil, other forest companies and WWF to adapt principles and criteria for small landowners producers (SLIMF). Klabin aims to certify all its partner suppliers by 2018, and actively works to help them achieve this objective." (2017 Klabin CDP Forest Questionnaire).

[xliii] **Klabin:** "Partner suppliers participate in Klabin's Legal Woods Program (Programa Matas Legais), which guides forestry producers to comply with the Forest Code and improve the environmental condition of their property." "The smallholders' production supported by the Legal Woods Program provides guidance to forestry producers on the recovery and conservation of APP's (Areas of Permanent Preservation)" (2017 Klabin CDP Forest Questionnaire).

"Created in partnership with the Environment and Life Preservation Association (Apremavi), Legal Forests Program includes furthered and independent producers. The Program guides the forest producers in Santa Catarina and Paraná on the sustainable use of their lands, by stimulating the recovery of remaining native forests, silviculture by responsible methods, organic agriculture, ecotourism and preservation of natural assets" (Klabin, 2017).

XLIV **JBS:** "JBS is one of the largest consumers of paper/cardboard in Brazil, as it uses the material to produce the packaging for its products. 100% of the paper/cardboard acquired has FSC certification, which is part of the selection criteria for suppliers of this material." (2017 JBS CDP Forest Questionnaire).

XLV **McDonald's:** "We give preference to Forest Stewardship Council (FSC) certified fiber when it meets product performance requirements and competitive market conditions and will require FSC certification for all fiber-based packaging products sourced from high-deforestation risk countries by 2020 as outlined in the Timber policy section." "100% of fiber-based packaging from certified or recycled sources. In order to achieve this 2020 target, every paper mill and packaging converting facility in our supply chain will have to achieve chain of custody certification to either Forest Stewardship Council (FSC), Sustainable Forestry Initiative or Programme for Endorsement of Forest Certification, or achieve 3rd party verification of 100% recycled content for paper used in McDonald's products" (2017 McDonald's CDP Forest Questionnaire).

XLVI **Danone:** "Danone has engaged in a strategy to "eliminate deforestation impacts from its supply-chain" as well as "reforestation program" by 2020. This ambition covers all paper-based packaging products (used for primary, secondary or tertiary packaging) which could have a potential negative impact on forest management. Concretely this commitment is split in three main objectives. Progress will be tracked, quantified and reported in our Integrated Sustainability report: 1.Reduce: actively reduce paper based packaging weight by product. 2.Recycled: develop the use of recycled fibres for packaging as a priority, certified or not. 3.Certified sources: when it is not possible to use recycled fibres, ensure virgin fibre legal origin and chain-of-custody traceability. The group ambition is to reach 100% supply from recycled and responsibly managed forest sources by 2020, and as early as 2015 for High Deforestation Risk areas, with a priority to either recycled fibres or FSC certified sources for virgin fibres."

"Danone Forest Paper & Board Policy has the goal to achieve 100% of sustainably sourced paper-based packaging by 2020, and before in high risky countries, either from recycled sources of virgin certified fibers. We are 86% compliant to our Forest Paper & Board Policy, 97% in our priority countries (Russia, Amazon region, Brazil, Indonesia, Malaysia, Australia and Popular Republic of Congo)"

"We are 86% compliant to this goal for sustainable procurement of paper-based products, and 97% in high risk countries." (2017 Danone CDP Forest Questionnaire).

XLVII **Unilever:** "To track and monitor the origin of our paper and board, Unilever has implemented a Global Traceability System (GTS) to report on our paper and board (P&B) volumes and sustainability claims, on a quarterly basis. GTS is used to trace our P&B materials back to the city of paper mills, and country of fibre origin. All certified materials are required to show proof with FSC or PEFC chain of custody certification. This information is verified annually through third party verification."

"We sustainably sourced 99% of our paper and board packaging in 2016: 59% of our total volume (from sustainably managed forests or recycled material) was received with a third party certification claim and full chain of custody. The remaining 40% came from recycled material."

"For all recycled material, we will require chain of custody certification by 2019." (2017 Unilever CDP Forest Questionnaire).

XLVIII **McDonald's:** "There has been considerable interest among non-governmental organizations and consumer interest groups for large, global brands to source sustainable palm oil and reduce deforestation impacts associated with palm. While we have been committed to sustainable sourcing prior to any campaigns, we recognize these can have an impact on the brand and understand the importance of ensuring sustainable, reliable supply of palm oil" (2017 McDonald's CDP Forest Questionnaire).

XLIX **Agropalma:** "Agropalma produces 77% of FFB processed in its mills, while 192 family farmers and 45 integrated outgrowers produces 23% of it." (2017 Agropalma CDP Forest Questionnaire)

L **Agropalma:** "Agropalma's own forest reserves are monitored every day by a dedicated team of forest guards, to avoid any hunting, fires or logging/deforestation." (2017 Agropalma CDP Forest Questionnaire)

LI "New plantings since November 2005 have not replaced primary forest or any area required to maintain or enhance one or more High Conservation Values." (RSPO, 2013)

LII **Agropalma:** "Agropalma produces 77% of FFB processed in its mills, while 192 family farmers and 45 integrated outgrowers produces 23% of it." (2017 Agropalma CDP Forest Questionnaire)

LIII **Agropalma:** "Before we start business relationship with a FFB supplier, we run a series of assessments, including land documentation, land use change analysis, production analysis and interviews with the supplier to assure in recent years and in the next 25 years, no deforestation occurred or will occur. We establish a 25 year selling/purchasing contract with each FFB supplier where no deforestation is one of the duties of supplier. Our dedicated technical assistance team visit all suppliers every week to support them and check if they are following the contract, including the no deforestation rule." (2017 Agropalma CDP Forest Questionnaire)

LIV **Agropalma:** "In the year of 2016, new potential FFB suppliers showed interest in supply to Agropalma. They are not certified yet, but company run an strict selection process to assure that only producers with high social and environmental performance engage in our supply chain, while they prepare for certification. They have two years to achieve certification since contract was signed with company" (2017 Agropalma CDP Forest Questionnaire)

LV **Biopalma:** "Both agricultural plantations and industries are located in appropriate areas according to the regulations of the Agroecological Zoning Law of the State of Pará". (Biopalma, 2016)

LVI **Biopalma:** "... Biopalma is planning to obtain RSPO Certification in the year of 2018 for planted areas and plant located in the municipality of Moju, the total surface area of which amounts to 30,000 hectares, 11,000 of which are plantations". (Biopalma, 2016)

LVII **Biopalma:** "Launched in February 2010, Biopalma Family Agriculture Program – PAF consists of establishing a partnership for production of palm oil fruits among the families of rural farmers in Northeaster Paraná and Biopalma, which is a company that producer palm oil". (Biopalma, 2016)

LVIII **ADM:** "98% of palm oil and 95.5% of palm kernel oil is traceable to the mill." (2017 ADM CDP Forest Questionnaire)

LIX **Cargill:** "To ensure the origin of our raw material, we have currently advanced information analysis mechanisms. Through geographic information systems we are able to monitor and analyze our grain supply chain". (Cargill, 2017)

[LX] **ADM:** "In addition, all ADM facilities who process palm oil are RSPO certified." (2017 ADM CDP Forest Questionnaire)

[LXI] **ADM:** "ADM is working with 270 families in Para, Brazil to source palm from small-holders. ADM actively works with the growers to provide training including safety and PPE, foster the formation of local associations, economics 101 program, best management practices, environmental stewardship education including riparian areas along stream. We are also working to help growers become RSPO certified." (2017 ADM CDP Forest Questionnaire)

[LXII] **Cargill:** "Cargill, in partnership with Proforest and TFT, have carried out assessments, workshops and other engagements in Brazil, Colombia, Guatemala, Papua New Guinea, Malaysia, and Indonesia with mills and the estates, small growers, smallholders and dealers in their supply base as well as with companies considering new developments." (2017 Cargill CDP Forest Questionnaire)

[LXIII] **Carrefour:** "Carrefour used 12 330 T of palm oil for its own brand products at the level of the Group in 2016 of which 15.5% were RSPO certified 'segregated' (fully traced), 49,4% RSPO certfied 'mass balanced' (partially traced palm oil) and 35,1% covered by Green Palm certificates." (2017 Carrefour CDP Forest Questionnaire)

[LXIV] **Carrefour:** "Regarding palm oil, Carrefour recognizes RSPO as the best available and main stream certification to avoid deforestation within supply chains. Carrefour asks its suppliers to use RSPO certified palm oil and has achieved its target to source 100% certified palm oil by 2015 in its own brand products. Carrefour is now working on increasing the share of segregated RSPO palm oil within the certified palm oil used in its products." "Carrefour has a target to increase the percentage of Segregated palm oil (with the highest traceability) to 30% by 2018 in its own brand products (15.5% in 2016)." (2017 Carrefour CDP Forest Questionnaire)

[LXV] **McDonald's:** "In 2011 the Company became a member of the Roundtable on Sustainable Palm Oil. We subsequently developed the following goals:

- 100% of palm oil used for restaurant cooking or by McDonald's suppliers to par-fry chicken & potato products will be RSPO-certified sustainable or covered by GreenPalm Book & Claim certificates by 2015. This was nearly achieve, with 99.7% in 2015.
- 100% of all palm oil or palm kernel oil used as an ingredient by McDonald's suppliers for use in McDonald's products will be RSPO-certified sustainable or covered by GreenPalm Book & Claim certificates by 2020." (2017 McDonald's CDP Forest Questionnaire)

[LXVI] **Unilever:** "In our policy, we have committed to 100% physically certified palm oil by 2019 for core volumes, but recognize the challenge for sustainable sourcing of palm kernels." (2017 Unilever CDP Forest Questionnaire)

[LXVII] **Unilever:** "Globally we source 1.5 million tonnes. 36% of our palm volumes are physically certified in 2016 through a combination of segregated and mass balance supply, and independent smallholder certificates." (2017 Unilever CDP Forest Questionnaire)

[LXVIII] **Unilever:** "Instead, we will invest $50million into a palm transformation fund to accelerate the availability of physically certified palm oil & in more targeted approaches to the transformation of the palm oil sector." (2017 Unilever CDP Forest Questionnaire)

[LXIX] **Nestlé:** "At the end of 2015 92% of of our supplies were traceable to mill and 47% back to plantation." (2017 Nestlé CDP Forest Questionnaire)

[LXX] **Unilever:** "In 2016, we had 73% traceability to mill for our core volumes, and visibility of around 1,300 mills in our supply chain. By origin, 90% are in Malaysia and Indonesia, with the remaining 10% in Brazil, Colombia, Costa Rica, Cote d'Ivoire, Ecuador, Ghana, Honduras, India, Mexico, Papua New Guinea, Sri Lanka and Thailand. We will continue working with our suppliers to provide GPS coordinate of the mills from which they source. As per our policy, from end 2017, all the palm oil we source will be traceable to known origins, and from end 2018, all the palm oil we source will be traceable back to a known catchment area that is attached to a mill, including dedicated plantations, plasma smallholders and independent smallholders." (2017 Unilever CDP Forest Questionnaire)

[LXXI] **Mars:** "In September 2016, we integrated sustainability criteria into our global bidding process for palm oil suppliers, using their responses to assess potential deforestation impacts in their supply chains. We are using the results to shift our business to suppliers aligned with our policy. As part of our bidding process, we asked our major palm oil suppliers to evaluate the deforestation risk posed by the mills they source from, using the World Resources Institute (WRI) Global Forest Watch Commodities online PALM Risk tool. This tool enables users to assess the risk that deforestation-related activities are occurring in the areas surrounding individual palm oil mills, and helps prioritize supply chain engagement to address these risks. We are working with suppliers to put in place action plans to address the risks identified, where necessary." (2017 Mars CDP Forest Questionnaire)

[LXXII] **Carrefour:** "Carrefour is engaging with its supply chain to improve awareness, better understand the challenges and opportunities to driving sustainable production of these commodities. Regularly, Carrefour quality and purchasing team send a questionnaire to all suppliers using palm oil in order to measure the amount of palm oil used and to push them towards more sustainability in the supply chain." (2017 Carrefour CDP Forest Questionnaire)

[LXXIII] **McDonald's:** "All palm oil sold to McDonald's must be covered under the following criteria: 1. By 2018 at the latest, all palm oil will be sourced from approved suppliers. To become an approved supplier, the palm oil supplier must demonstrate to McDonald's that they have a traceability system & action plan to address deforestation" (2017 McDonald's CDP Forest Questionnaire)

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