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Mechanisms enabling Brazil-China soy traders to meet increasing demand while reducing deforestation

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'you can't kill the chicken to get the egg'

(Chinese idiom)

Declaration and Statement

"This dissertation is my own work and contains nothing which is the outcome of work done in collaboration with others, except as specified in the text and acknowledgements. It has not been previously submitted, in part or whole, to any university or institution for any degree, diploma or other qualification. This dissertation is less than 15,000 words in length, excluding the title, declaration and statement, acknowledgements, table of contents, list of figures, abbreviations, references and appendices."

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Abstract

China is the world's largest importer of soy and in the course of its ongoing trade war with the US it has switched to predominantly Brazilian sources. Brazil is particularly vulnerable to deforestation and this increase in demand from China, in combination with weaker enforcement of national environmental regulations under Bolsonaro's government, is likely to further accelerate deforestation. It is estimated that the area dedicated to soybean production in Brazil could increase by 13 million hectares to meet new demand from China.

In the context of a weak regulatory environment, international action led by the private sector has become critical. Within the private sector, companies trading soy between Brazil and China appear to hold a significant influencing role due to the high concentration of soy-volumes they manage (five traders account for 52% of Brazil-China soy trade).

This study aimed to identify mechanisms with potential to enable Brazil-China soy traders to meet increasing demand while reducing deforestation. The factors undermining current anti-deforestation mechanisms were analysed and it was found that the lack of long-term incentives for behavioural change was a major barrier to the implementation and efficacy of key mechanisms. Qualitative research was then conducted to explore the potential of sustainability-linked loans (SLLs) both to incentivise (and thereby accelerate) traders' anti-deforestation action and to facilitate farmers' access to finance that incentivises forest conservation. Additionally, the potential of Brazil-China soy traders to influence Chinese soy buyers was explored.

Relevant professionals from Brazil-China soy trade companies and from banks involved in funding such companies were interviewed. Collectively, the traders who were interviewed represented over 54% of Brazil-China soy exports in 2018 and over 60% of the total deforestation-risk linked to this trade flow.

The study concluded that SLLs can potentially act as a catalyst and accelerate traders' anti-deforestation action if a series of limiting and enabling factors are addressed first. Additionally, it was identified that joint action by traders and banks could incentivise upstream and downstream anti-deforestation action. Upstream, traders and banks could

jointly offer producers SSLs that incentivise forest preservation and production intensification. Downstream, by leveraging China's dependence on imported soy, they could offer Chinese buyers SSLs that incentivise the demand for zero-deforestation soy.

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List of Acronyms

ABC Program	"Low-Carbon Agriculture" program (Brazil's)
BEI	Banking Environment Initiative
CAPEX	Capital Expenditure
CAR	Cadastro Ambiental Rural (Brazil's Environmental Registry of Rural Properties)
CCICED	China Council for International Cooperation on Environment and Development
CDP	Carbon Disclosure Project
CISL	Cambridge Institute for Sustainable Leadership
EU	European Union
FIP	Forest Investment Program
GHG	Greenhouse Gases
IFC	International Finance Corporation
IPCC	Intergovernmental Panel on Climate Change
KPIs	Key Performance Indicators
MDB	Multilateral Development Bank
NGO	Non-Governmental Organization
PCI	Produce, Conserve and Include
RCF	Revolving Credit Facility
RTRS	Roundtable on Responsible Soy
SLLs	Sustainability-linked Loans
SNCR	National Rural Credit System (Brazil's)
SSL-KPIs	Sustainability-linked Loans' Key Performance Indicators
TFA	Tropical Forest Alliance
TFDs	Traders' Financial Divisions
TRADE HUB	Trade, Development and the Environment Hub
UKRI GCRF	UK Research and Innovation Global Challenges Research Fund
UNEP-FI	United Nations Environment Programme Finance Initiative
UNEP-WCMC	United Nations Environment Programme World Conservation Monitoring Centre
US	United States (of America)
WTO	World Trade Organisation
WWF	World Wide Fund

1 Introduction and background

1.1 The negative impacts of agriculture-driven deforestation

Continued global population growth and the associated increase in food consumption have caused unprecedented rates of deforestation linked to agricultural expansion (FAO, 2016). Deforestation in turn is the second largest driver of climate change which puts at risk the sustainability of agricultural production (Scherr et al., 2017). Associated extreme weather events such as droughts, floods or ice storms are becoming more frequent, and consequently the IPCC (2019) forecast a decline in agricultural productivity that could lead to an increase in food prices of up to 23% by 2050. This would cause greater global food insecurity and hunger.

Forests are essential to combating climate change as they absorb and store large amounts of CO_2 (UNCTAD, 2019). Between 1990 and 2007 global forests sequestered approximately 60% of the fossil emissions generated in the same period (Pan et al., 2011). Additionally, forests stabilize soils, retain water and mitigate the severity of heat-related events by cooling the environment.

While authors such as Griscom et al. (2017) affirm that planting new trees could provide over one-third of the climate change mitigation needed by 2030, newly planted forests cannot replace the carbon stocks and biodiversity of primary forests (European Commission, 2019). Failure to curb ongoing deforestation will therefore make the challenge of addressing climate change and biodiversity loss significantly more difficult (IPBES, 2019).

Pendrill et al. (2019) attribute approximately 26% of global deforestation to international trade in commodities such as cattle products, soy, palm oil, forestry products and cereals and according to Curtis et al. (2018) companies must eliminate 5 million hectares of deforestation from supply chains annually in order to end deforestation.

This study focuses on mechanisms to reduce deforestation associated with the soy trade between Brazil and China (Brazil-China soy supply chain).

1.2 The significance of the Brazil-China soy supply chain

Soy has become the primary protein crop globally and it plays a pivotal role in ensuring global food security. It is present in food products, oilseed and biofuels, and over 75% of the global soy supply is used as feed in the livestock and farmed fish industries (Duncan Brack et al., 2016). It is therefore linked to the booming meat, fish, dairy, and egg industries.

Brazil is currently the largest soy exporter in the world (Statista, 2020). Since the 1970s, the increase in global demand for protein has led Brazil to adopt economic policies which create favourable exchange rates designed to improve the competitiveness of its exports (Brown-Lima et al., n.d.). However, while the increase in soy production and exports might be a positive trend for Brazil's economy in the short term, instability in temperatures and rainfall resulting from deforestation (Lawrence & Vandecar, 2015) could reduce Brazil's growing area suitable for soy production by up to 28% by 2030 (UNCTAD, 2019) and Brazil's soy productivity by up to 28% by 2050 (Oliveira et al., 2013).

Two recent events have put Brazil at even higher risk of deforestation. First, in the course of the ongoing trade war between China and the US, the Chinese government imposed tariffs of 25% on US goods. Consequently, China has shifted most of its soy demand to Brazil and Fuchs et al. (2019) estimate that an area equivalent to 13 million hectares will be required to meet China's increased demand. Second, Bolsonaro's government weakened the enforcement of Brazil's environmental regulations, so the risk of illegal deforestation has also increased (Arruda et al., 2019).

As the world's largest pork and egg producer and second-largest poultry producer, China is the largest consumer of soy (Kuepper et al., 2019). Soy imports are vital to China's food security and its annual demand for soy is expected to rise. In 2019 soy imports accounted for 85% of its domestic consumption (China Daily, 2020). In 2017/18, China purchased 85% of the total volume of soy that Brazil exported (Ustinova, 2019) and Brazil continues to be its largest soy source (Research and Markets, 2018). According to Fuchs et al. (2019), since 2000, China's imports of Brazilian soy have risen by 2,000%.

Long-term access to imported soy depends on the preservation of ecosystems in source countries (Potts et al., 2014). If deforestation continues, Brazilian soy production will be adversely affected, and as Brazilian soy imported by China is linked to 50% of the total deforestation-risk of Brazil's soy exports (CDP, 2017; TRASE, 2018), failure to halt deforestation will pose a risk to China's food security.

1.3 The role of traders in the Brazil-China soy supply

1.3.1 Soy supply chain actors

In the soy supply chain *input providers* sell seeds, fertilizers, pesticides and machinery to producers. *Producers* plant and harvest the soy, which is then bought, stored and distributed nationally and internationally by *intermediaries and traders*. After the *processing* stage, which involve transforming the soy into meal or oil and can take place before or after international shipment, processed soy is sold to different industries. The products these industries manufacture are then distributed to retailers, who sell them to end consumers. Banks have an overarching presence in the soy supply chain because they offer finance to the various actors, but input providers and traders also offer finance to producers.

All the supply chain actors mentioned above share responsibility for the deforestation linked to the soy they source.

In terms of terminology, 'upstream' refers to the part of the supply chain that, from a trader's perspective, moves towards the producers, while 'downstream' refers to the part of the supply chain that moves towards the end-consumers.

1.3.2 The role of traders

A number of authors argue that traders have a disproportionate power of influence within the supply chains they are involved in (Folke et al., 2019; Hendrickson, 2015; Heron et al., 2018; Murphy et al., 2012). For instance, in addition to international transportation infrastructure, some Brazil-China soy traders own crushing, storage and production facilities in Brazil (Duncan Brack et al., 2016; Hoffman, 2013; Rueda et al., 2017) and, even processing

facilities in China (Hendrickson, 2015; Peine, 2013). Furthermore, around 200,000 mid or large-sized Brazilian soy producers supply soy to five major traders (De Schutter, 2010), which suggests that a relatively small number of traders can influence a large proportion of soy producers. In fact, just five traders account for 52% of Brazilian soy imports into China (CDP, 2019d), and collectively such traders accounted for over 50% of deforestation-risks linked to the Brazil-China soy trade in 2017 (CRR, 2019b; TRASE, 2018).

According to Murphy et al. (2012), dominant traders have direct influence on producers' decision-making because, as well as buying their soy through their commercial divisions, traders provide them with inputs and financial services through their financial divisions. Consequently, traders can even fix market prices and determine where agricultural production is located and produce is shipped.

WWF-Brazil (2017) analysed the financial flows for soybean production in the Brazilian Cerrado, stating that in 2015/2016, 16.2% of producers' financing needs were provided by traders through barter practices (the trader supplying inputs in exchange for part of the production), cash advances (with a higher interest than that of banks) and guaranteed-purchase contracts. This has been identified as a way for traders to ensure access to specific soy volumes while controlling the quality of inputs and the delivery terms. The larger the soy volume negotiated, the better the prices and interest rates offered by traders.

While several supply chain actors acknowledge that traders' finance is crucial to soy production in Brazil and appreciate their willingness to assume the associated financial risk, NGOs highlight that, as well as creating relationships of dependency, traders' finance does not have the social and environmental conditionalities that are often required by banks (WWF-Brazil, 2017).

In a comprehensive analysis of traders' power of influence, Folke et al. (2019) argues that '**should dominant traders impose effective sustainability standards throughout their supply chains, this could influence both upstream and downstream market actors**'. This study aims to build on Folke's et al. research by exploring the mechanisms that would enable traders to accelerate the adoption of anti-deforestation measures among upstream actors (primarily) and downstream actors (as an initial exploration).

1.4 Research aim and objectives

There is extensive literature describing the deforestation issue linked to the Brazil-China soy supply chain, identifying the actors who should be held accountable for it and, highlighting the ineffectiveness of existing private and public anti-deforestation initiatives. However, while a number of sources give high-level recommendations on who should be doing what, sector-specific guidance on effective mechanisms is limited. For instance, little academic research has been done on how Brazil-China soy traders could deploy effective anti-deforestation mechanisms that influence their suppliers as well as their buyers. Research on these traders would also capture the particularities of their operational structures, internal governance, and interdependencies with other key actors and contextual factors.

The aim of this study was to identify and evaluate a mechanism with the potential to help Brazil-China soy traders leverage their power of influence to prevent deforestation in their supply chains.

In order to fulfil the above aim, the following research objectives were set:

- Review the factors influencing the efficacy of existing private sector anti-deforestation mechanisms;
- Understand the Brazil-China soy supply chain contextual factors;
- Identify a mechanism that has the potential to accelerate anti-deforestation action when leveraged by traders;
- Assess, through primary research and from a private sector governance perspective, the mechanism's potential efficacy and the main barriers to be overcome;
- Generate a list of concrete recommendations to enhance the efficacy of anti-deforestation action by traders and other actors.

1.5 Section breakdown

The next section presents insights gained from a comprehensive review of literature on factors affecting the efficacy of different anti-deforestation mechanisms available to traders (section 2). It is followed by a description of the research methodology (section 3), a

presentation of the resulting data (section 4) and a discussion of the qualitative analysis in the context of the literature review (section 5). The study concludes with suggestions for further research and gives some recommendations that traders and other key actors can consider when designing their future anti-deforestation strategies (section 6).

2 Literature review

This literature review aims to achieve the following research objectives: 1)Review the factors influencing the efficacy of existing private-sector anti-deforestation mechanisms; 2)Understand relevant Brazil-China soy supply chain contextual factors; 3)Identify a mechanism which, when leveraged by traders, has the potential to accelerate anti-deforestation action across the Brazil-China soy supply chain.

2.1 Corporate anti-deforestation mechanisms and their efficacy

2.1.1 Voluntary anti-deforestation commitments

'*Anti-deforestation commitments are a type of voluntary sustainability initiative that companies adopt to signal their intention to reduce or eliminate deforestation associated with commodities that they produce, trade, and/or sell'*(Garrett et al., 2019). Of the over 400 anti-deforestation targets set by companies for 2020, none have been reached (Forest 500, 2019; NYDF Assessment Partners, 2019; Rainforest Action Network, 2020). Moreover, while in 2017 49% of Brazilian soy exports were covered by some kind of anti-deforestation commitment (CRR, 2017), traders with anti-deforestation commitments have been associated with similar deforestation-risk rates to those of traders without commitments (TRASE, 2018), suggesting that policy definitions and implementation mechanisms have not been effective.

There are a number of reasons for this limited progress to date. Donofrio and Hamrick (2019) found that only 2.4% of companies joining multi-stakeholder anti-deforestation initiatives are reporting quantitative progress, and none set intermediate milestones. Garrett et al. (2019) identified one of the reasons for the low efficacy of existing anti-deforestation commitments as the weak definition of targets (zero-net deforestation instead of zero-deforestation) and implementation deadlines (a future date rather than an immediate one). It seems that commitments and policies vary in their efficacy depending on how 'forest' and 'deforestation' are defined. For instance, while companies committing to 'zero-deforestation' should not deforest at all, those committing to 'zero-net deforestation' can deforest by offsetting

through reforestation, and those committing to 'no deforestation' can convert low carbon stock areas(Feige, 2017).

The indirect impacts of such commitments also need consideration if a global reduction in deforestation is to be achieved. First, region-specific commitments might contribute to reducing deforestation in one region but have the indirect effect of pushing new soy production and deforestation to other regions (CRR, 2019c; Kuepper et al., 2019). Second, when two alternative forest-risk commodities are linked to the same demand market (e.g. soy and palm oil to the vegetable oil market), stringent commitments applied to one of them can trigger a switch of demand towards the alternative commodity and displace deforestation elsewhere (le Polain de Waroux et al., 2019a). Third, if soy-linked deforestation is reduced by expanding soy production on land previously used for another commodity (e.g. cattle), this commodity might be grown elsewhere, resulting in deforestation if its production cannot be intensified (Barona et al., 2010). Fourth, if corporate commitments are only supported by international actors, local actors might continue to source soy linked to deforestation(Haupt et al., 2018).

The factors mentioned above highlight the relevance of harmonizing commitments and associated policies across different producing regions and different commodities. Otherwise, badly designed commitments could even increase global deforestation if, for instance, they push production to regions with lower yields(Carrasco et al., 2014).

According to Haupt et al. (2018), to ensure on-the-ground impact, commitments should be defined using a common set of science-based targets that facilitate systematic quantitative measurement and progress monitoring. They also highlight the importance of engaging top management to implement the required operational changes and incentivise key employees. Additionally, Garrett et al. (2019) recommends the adoption of zero-deforestation targets with immediate implementation deadlines and clear sanction-based mechanisms.

2.1.2 Supplier codes of conduct (policies)

For traders to meet their anti-deforestation commitment, it is essential that their suppliers adopt the same level of commitment by setting time-bound targets and reporting progress

annually (CDP, 2019b). The Sustainability Consortium developed a framework for companies in agri-commodity supply chains to use when creating and evaluating their supplier codes of conduct that contain sustainability considerations (including deforestation). However, only a small proportion of food and agriculture companies employ sustainability specifications when procuring commodities and, when they do, they tend to prioritise social issues over environmental issues (TSC, 2017). Furthermore, when they do consider environmental issues, they often focus on operational GHG emissions, resource efficiency, and waste management rather than on deforestation(TSC, 2017).

Major soy traders have recently launched new policies and commitments aiming to reduce the risk of deforestation in their supply chains. A general assessment of these policies was carried out as part of this literature review and revealed them to be very varied in scope, implementation mechanisms and exclusion criteria. For instance, some are region specific whereas others are generally applicable; some are only applicable to producers financed by the trader whereas others are aimed at any supplier; some define their own criteria for compliance whereas others are based on soy certification criteria; some commit to exclusion, a few report specific progress, and a minority publish an action plan with time-bound targets (COFCO International, 2019)(ADM, 2019)(Cargill, 2019).

2.1.3 Soy certification schemes

Certification schemes based on sustainability assessments are increasingly used by agri-commodity companies to label products as environmentally or socially sustainable (OECD, 2016).

For soy, ProTerra and the Roundtable on Responsible Soy (RTRS) are the main certification schemes. While both have similar criteria in terms of GHG emissions, waste, pollution, labour and pesticides, they stipulate different cut-off dates for the use of deforested land. ProTerra's cut-off date is 1994 (accepting cleared land up to 2004 if compensatory measures are undertaken) and RTRS's cut-off date is May 2009 (Meyer & Cederberg, 2013).

A limitation of certification schemes is their low levels of uptake. They represent a minimal market share – less than 1 % of the global market for RTRS and under 2 % for Proterra (Garrett

et al., 2016) – and only half of RTRS-certified soy was sold in 2014 (WWF, 2014). This suggests that certification has limited potential to accelerate change, yet many companies and banks link their policy compliance to supplier/customer engagement with RTRS (FOREST500, 2020).

The TFA (2018a) found that the additional costs required to produce RTRS-certified soy ($3 to $4 per metric ton) are too high for the Chinese soy industry, which needs to keep processing costs below $20 per metric ton to be profitable. Moreover, although surveys of Chinese consumers by Hayward's et al. (2013) and Xinhua (2017) respectively found that 44% of those surveyed actively look for information on product sustainability and over 70% are willing to pay a 10% premium for sustainably produced products, this has not translated into higher demand for certified soy. Soy is a low-visibility commodity on product labels (e.g. meat packaging), so the potential for product differentiation is negligible, and this also makes it difficult to justify premium prices (Mayer & Gereffi, 2010; Rueda et al., 2017). A lack of downstream demand from consumers thus appears to be a key barrier to the mainstreaming of private 'market-based' certification schemes.

2.1.4 Traceability and transparency

Traceability of soy to the farm level and enhanced access to supply chain information is essential to meet traders' anti-deforestation commitments (Haupt et al., 2018). Traders need to know the exact location of the farms they source from in order to monitor potential deforestation activity so that they can then disengage from producers deforesting and incentivise producers preserving forest.

While traders can easily trace the soy they buy directly from producers, when they buy from cooperatives a number of indirect suppliers come between traders and the farm. To increase indirect supplier visibility, the Soy Toolkit recommends using contract clauses indicating that traceability to the farm is required (Good Growth Partnership, n.d.).

While the blending of soy at several stages in the supply chain poses a great challenge in this regard, emerging technologies could provide a solution (TFA, 2018a). Traceability in soy supply chains requires collection, communication, exchange and management of critical information. The precise origin of soy needs to be tracked and regularly updated as part of a

dynamic process which enables relevant decision-makers to be informed about deforestation activity. Current systems suffer from data fragmentation and are also centralized (meaning that data can be manipulated by a single actor), but new technologies such as blockchain and smart contracts can facilitate the collection and exchange of data along the supply chain in a distributed, trusted, traceable and instant way (Salah et al., 2019).

Some of the gaps identified by Gardner et al. (2019) in the information systems currently supporting sustainability in agricultural commodity supply chains are relevant to this study, including:

- low coverage of:
    - major consumption markets such as China;
    - internal domestic consumption in major producer countries such as Brazil;
    - producers, consumers, investors, and credit providers;
    - links between actors and locations; and
    - level/type of sustainability governance in different stages of the supply chains.
- lack of information on the methods and data sources used to generate indicators.
- scarce data on financial transactions and benefits accrued to different actors.

2.1.5 Incentivising producers

Producers are more likely to comply with downstream actors' commitments when the incentives for compliance exceed the benefits of non-compliance (Börner et al., 2015). However, according to Solidaridad (2019a), current policies are generally restrictive, offer minimal economic incentives, and stress the need to put in place mechanisms that pay for forest conservation (e.g. premium prices or payment for ecosystem services). Stabile et al. (2020), for instance, suggest that market initiatives could support the use of Brazil's Forest Code to facilitate payments for ecosystem services.

2.1.6 Promote intensification of production

Strassburg et al. (2017) found that current productivity of Brazilian cultivated land is 33% of its potential and that by increasing productivity to 50% it will be possible to meet demand for

meat, crops and biofuels until 2040 without further deforestation. More intensive soy cultivation can be achieved either by replacing pasture with cropland or by increasing soy productivity per hectare on existing plantations.

A number of authors who analyse the drivers for more intensive cultivation of soy and the associated impacts agree that promoting intensification requires financial support and incentives that facilitate the adoption of the necessary technologies (Garrett et al., 2018; le Polain de Waroux et al., 2019b; Stabile et al., 2020).

2.1.7 Joining multi-stakeholder anti-deforestation initiatives

A number of sources highlight the relevance of multi-stakeholder collaboration between the private sector, NGOs and/or national governments to halt deforestation (CDP, 2019b; Haupt et al., 2018; Heron et al., 2018).

The most frequently cited initiative is the Amazon Moratorium, an agreement whereby signatories committed not to trade or finance soy produced in areas deforested after July 2008 (ABIOVE, 2019). By 2014 the moratorium had helped achieve a 70% reduction in deforestation in the Brazilian Amazon alongside a 60% increase in soy production (CRR, 2019c; Heron et al., 2018; Howard, 2014). Gibbs (2015) attributes its success to factors such as the involvement of a limited number of actors able to exert control, the simplicity of requirements, streamlined monitoring, and coordination between the Brazilian government, NGOs and government agencies.

A relevant observation made by Castro (2017) is that, to enhance the local impact of multi-stakeholder initiatives, there must be a focus on in-the-field actions and local people must be involved and empowered. While these factors were included in the Amazon Moratorium, this is not the case with many other initiatives, for example the Amsterdam Declaration (2019). Over the last decade the signatories of this European initiative aiming to incentivise deforestation-free supply chains have been exposed to similar or higher levels of deforestation risk than non-committing countries such as China (TRASE, 2018).

On the Chinese side, actors in the Chinese soy and meat industries have joined the Sustainable Soy Trade Platform (Paulson Institute, 2016) and the Chinese Sustainable Meat Declaration (WWF, 2017) and collaborated in the drafting of new Responsible Soy Sourcing Guidelines (Solidaridad, 2018, 2019b). However, there is no documented evidence that this has been translated into demand for soy with anti-deforestation credentials (Haupt et al., 2018). And it seems that, generally speaking, only a very small proportion of companies joining multi-stakeholder anti-deforestation initiatives follow through by setting individual commitments (Donofrio & Hamrick, 2019). An additional gap of some of these initiatives is that they focus on preventing only illegal deforestation. A brief summary of the initiatives mentioned above is included in Appendix A.

2.2 Contextual factors affecting the Brazil-China soy supply chain

Folke et al. (2019) argue that trader leadership is blunted if governments and anti-trust institutions do not provide a regulatory framework that supports their environmental efforts. Garrett et al. (2019) argue that the financial framework used in the regions of implementation also has a bearing on the efficacy of anti-deforestation efforts.

2.2.1 Regulatory contexts

2.2.1.1 Brazil

In Brazil, the Forest Code enforces the preservation of a minimum percentage of producers' land (called legal reserves). The percentage varies depending on the type of vegetation and location. It ranges from 20% (e.g. in the Cerrado) to 80% (e.g. in the Amazon). In addition, the Cadastro Ambiental Rural (CAR) enforces the registration of all farm boundaries, which facilitates monitoring of Forest Code compliance.

As of January 2020 the CAR had registered 6.5 million rural properties accounting for over 540 million ha (Serviço Florestal Brasileiro, 2020), but its implementation presents challenges. Carvalho et al. (2019) argue that Brazil's enforcement and legal systems provide multiple opportunities for infractions of environmental laws. For example, it is easy to obtain deforestation permits because CAR information is based on unverified self-declarations but

accepted by licensing authorities as proof of producers' right to deforest (when they have an area of forested land larger than the minimum legal reserve required). Jung et al. (2017) argue that CAR weaknesses result in overlapping claims and stress the need to complement CAR with proper incentive-schemes that compensate producers for its negative impacts on their livelihoods (which otherwise can drive further deforestation).

This contextual factor became more problematic when Bolsonaro's administration suggested that Brazil might leave the Paris Agreement, whereby Brazil committed to reducing its GHG emissions by 43% by 2030 in part by ending illegal deforestation (Artaxo, 2019).

2.2.1.2 China

Although China has the largest national Natural Forest Conservation programme in the world (Ouyang et al., 2016) (Liu et al., 2008) and is currently building an 'Ecological Civilization' that incorporates environmental considerations into its GDP-growth strategy, its primary focus has been on its own national ecosystems rather than on overseas ecosystems impacted by Chinese imports (CCICED, 2016). In fact, it is one of the countries with the most imported deforestation with the highest levels of deforestation linked to imported products (Pendrill et al., 2019).

According to the China Council for International Cooperation on Environment and Development (CCICED), most Chinese firms have not yet made firm commitments to greener global value chains as they need a clear signal from the Chinese government to do so. Furthermore, while different Chinese trade associations have issued guidelines that provide a clear signal regarding government priorities, this is not yet the case for soy (CCICED, 2016). However, Solidaridad (2018) has been drafting sustainable soy guidelines for China. These are now in consultation process with representatives of the Chinese government, actors from the Chinese and international private sector and academics (Solidaridad, 2019b).

China's Five-Year 2016-2020 National Plan on Implementation of the 2030 Agenda for Sustainable Development included a call for action on several fronts that could have encouraged Chinese soy buyers to adopt mechanisms to reduce deforestation rates linked to their soy supply chain (e.g. setting ambitious green procurement policies and incentivising

sustainable forest management in developing countries) (The Government of China, 2016). However, practitioners working for the past five years on developing a Chinese framework for sustainable soy (including overseas deforestation) state that progress has been slow and that the Chinese government has given no clear signal to address this issue in the short term (Haupt et al., 2018; Solidaridad, 2017).

2.2.1.3 International

Over the past decade, the World Trade Organisation (WTO) has received an increasing number of regulatory proposals addressing environmental issues and forest conservation is among the most frequently requested topics (WTO, 2019b). However, the WTO is concerned that environmental requirements could impede trade and even be used as an excuse for protectionism. Consequently, the WTO has not introduced an environment-specific agreement. Instead, it allows the adoption of trade-related measures aimed at protecting the environment provided a number of conditions are met that prevent the misuse of such measures as a form of disguised protectionism (WTO, 2019a)(WTO, 2019c).

2.2.2 Financial context

2.2.2.1 Brazil

In Brazil, financial mechanisms promoting sustainable soy focus on producers. Brazilian banks are legally required to contribute to the Brazilian National Rural Credit System (SNCR), which is designed to provide rural credits at low interest rates to producers. The ABC Program was created in 2010 specifically to finance agricultural practices aiming to intensify production and reduce GHG emissions. However, due to the lack of banks readiness to develop a market for it and the difficulties for producers to meet its eligibility criteria, its uptake has been very low. For instance, in 2015 it only represented 1.9% of the total rural credit available. Therefore, its potential to promote sustainable practices was considered limited (Lopes and Lowery, 2015).

2.2.2.2 China

In China, at least 40% of the total loans provided by Chinese financial institutions to companies in the soy sector are exposed to deforestation risks (CDP, 2019b). However, none of the Chinese financial institutions assessed by CDP (2019b) have a policy addressing deforestation risks as they mainly focus on local pollution issues.

Recognising that there is little incentive for Chinese soy buyers to take overseas deforestation into consideration, CDP (2017) recommended that the Chinese Ministry of Finance create favourable financing conditions (such as lower loan interests) for companies buying deforestation-free soy. However, three years on there is no sign of implementation.

2.2.2.3 International

In recent years international banks have put in place new anti-deforestation policies to manage their exposure to deforestation risks. They are generally applied during their customers' onboarding process and adopt an inclusion-exclusion approach (FOREST500, 2020b, p. 500; Obregón et al., 2019).

While there is limited information about the impact these policies have created (Haupt et al., 2018), the experience of practitioners working on sustainable soy casts doubt on the efficacy of policies based on restrictions and exclusion, which stress the need to incentivize behavioural change (Solidaridad, 2019a).

In terms of mechanisms to incentivise trade in sustainable commodities, the Banking Environment Initiative (BEI) argued in 2016 that linking sustainability incentives to the cost of trade finance was the most viable option in the short term (CISL, 2016). The Tropical Forest Alliance (2018a) also called for new financing models that incorporate supply chain sustainability incentives (e.g. linking interest payments to sustainability performance) as a mechanism to remove deforestation from commodity supply chains. These initiatives led to the creation of sustainability linked loans (SLLs), which incentivise the borrower to achieve predetermined sustainability performance targets measured through specific key performance indicators (KPIs) (Loan Market Association, 2019).

2.3 Mechanism chosen for primary research exploration

Given that government policies and regulatory frameworks in Brazil and China are not halting deforestation linked to the Brazil-China soy supply chain, private sector action is an alternative way forward. Homogeneous, ambitious and time-bound anti-deforestation commitments adopted by traders could be enforced upstream and downstream and thus accelerate change if implemented effectively (Folke et al., 2019; Garrett et al., 2019).

In a comprehensive study of bio-trade over a twenty-year period, Castro (2017) states that the involvement and empowerment of local stakeholders is absolutely critical for ecosystem preservation purposes. In the present context the most relevant local stakeholders are soy producers because without their engagement traders will be unable to achieve their anti-deforestation commitments. A key barrier identified in the literature is the lack of scalable incentive schemes that either compensate farmers for the opportunity cost of not deforesting and/or facilitate investment in production intensification (CDP, 2017; Garrett et al., 2018; Jung et al., 2017; le Polain de Waroux et al., 2019b; Solidaridad, 2019a; Stabile et al., 2020).

As many of the mechanisms examined were seen to be ineffective because the appropriate incentives were lacking, this study seeks to explore the potential of sustainability-linked loans to incentivize the acceleration of anti-deforestation action across the Brazil-China soy supply chain when adopted and promoted by traders.

Brazilian banks have already tried for a decade to incentivise sustainable production practices through the ABC Program, but its adoption has been limited due to barriers encountered when attempting to develop a market for Brazilian producers. This study will focus instead on exploring the potential of sustainability-linked loans (offered by international banks to international traders) to incentivise traders to act on and enforce their anti-deforestation commitments upstream and downstream.

International banks have an overarching presence in the soy supply chain as they can finance all actors. Furthermore, according to the WTO (2020), 80-90% of global trade relies on finance, so international banks are well positioned to influence and incentivise traders to act on their anti-deforestation commitments.

A further reason for choosing this focus was that traders and banks have power of influence on multiple points in the supply chain. Given the interdependencies between actors and commodities in the Brazil-China soy supply chain, a focus on these actors will facilitate the promotion of mechanisms and associated metrics across the whole supply chain.

3 Research design and methodology

This section describes the approach for each phase of the research: literature review (Section 3.1), consultation with forest-protection experts (Section 3.2), strategy for primary data collection (Section 3.3), selection of companies and interviewees (Section 3.4), interview process (Section 3.5) and data analysis (Section 3.6). Limitations of this methodology are also discussed (section 3.7).

3.1 Literature review

The literature review aimed to identify key actors and mechanisms with the potential to accelerate the reduction of deforestation in the Brazil-China soy supply chain. Factors affecting the effectiveness of existing mechanisms were also reviewed. The search terms utilised included “soy”, “supply chain”, “Brazil”, “China”, “deforestation”, “halt”, “zero”, “net”, “corporate commitment”, “policy”, “initiative”, “effectiveness”, “concentration”, “power distribution”, “trade”, ”transnational”, “trader” and “trade company”. The search uncovered articles in academic journals, government reports and practitioner reports (Section 2).

The literature review provided substantial background to the dissertation’s objectives 1-3 and informed the primary research focus. First, as the main focus, the potential of sustainability-linked loans - offered by banks to traders - to incentivise the acceleration of anti-deforestation action was explored in depth. Second, a preliminary exploration was undertaken of whether traders consider they can influence their own buyers and, if so, how.

3.2 Consultation with forest-protection experts

During and after the literature review, a number of forest-protection experts were engaged to discuss insights arising from the literature review and to garner feedback on the proposed primary research focus (Kallio et al., 2016). These consultations provided additional context from a practitioner perspective and ensured the research would address a known knowledge-gap.

Consultations took place with experts working at ten different non-profit organisations or initiatives at the forefront of forest protection and private sector engagement (e.g. WWF Brazil, The Global Canopy, UNEP-WCMC Brazil, the Tropical Forest Alliance China, UNEP-FI, the Soft Commodities Compact by CISL's BEI).

Following this consultation an additional topic was added to the primary research scope: how the role of traders in financing soy producers can be leveraged to prevent deforestation.

3.3 Primary research and data collection strategies

Of the various research methods available, quantitative and qualitative strategies were reviewed to ascertain which was most suitable given the primary research focus and the type of information available. As the primary research aimed to explore very specific areas around corporate governance in banks and trade companies, the data needed to conduct a purely deductive study using quantitative research methods was not publicly available, so a qualitative research approach was adopted (Bell et al., 2019).

A qualitative and exploratory semi-structured interview technique was chosen as the method of data collection. This is considered to be an adequate approach to achieve a holistic understanding of a phenomenon within a particular context by revealing the experiences, motives, opinions and multiple realities of individuals (Edwards & Holland, 2013; Rubin & Rubin, 2005). Furthermore, semi-structured interviews facilitate structured and consistent extraction of information while allowing a degree of flexibility to adapt to different interviewee-profiles and relevant topics that might arise unexpectedly (Ritchie et al., 2013).

As a specific focus and set of themes had been clearly defined, a semi-structured approach was considered preferable to an unstructured approach (Bell et al., 2019). Surveys were also considered, but an exploratory method was thought more appropriate as it would capture spontaneous reflections through a dynamic conversation (Corbin & Strauss, 2008).

Executives working in relevant banks and trade companies who were likely to be involved in the definition, implementation and/or adoption of mechanisms to incentivise or enforce the prevention of deforestation in the Brazil-China soy supply chain where selected as

interviewees (Section 3.4). Although two different interview guides were created, one for traders and one for banks, they contained the same set of questions with slight adaptations for each sector. Both guides were tested with experts and refined (Kallio et al., 2016). The questions aimed to obtain information about:

- Sustainability-linked Loans (SLLs) offered by banks to traders:
    - Level of uptake.
    - Drivers and barriers affecting their uptake.
    - Extent to which SLLs are driving further sustainability action.
    - Extent to which SLLs are addressing prevention of deforestation within their targets.
    - How SLL targets addressing deforestation are defined.
- Finance offered by traders to producers through traders' financial divisions (TFDs):
    - Potential of TFDs to influence producers in reducing deforestation.
    - Banks' views on and links with TFDs.
- Perceived barriers that traders and banks encounter that affect the efficacy of their anti-deforestation efforts.
- The potential of traders and banks to influence Chinese soy buyers to include deforestation considerations in their demand specifications.

To facilitate subsequent thematic analysis across the whole sample of interviews, questions were kept as broad as possible, but probing questions were used where appropriate to encourage granularity in the responses (Appendixes B and C).

3.4 Sample of interviewees

A semi-structured exploratory interview audience was selected through non-random purposive sampling. Purposive sampling consists of selecting individuals who are particularly experienced with the subject matter and able to communicate experiences and opinions in a reflective way (Bernard, 2006; Palinkas et al., 2015). Given the specificity and complexity of the subject matter, this was deemed the most appropriate form of sampling (Saunders et al., 2016).

Selected companies were identified in the literature review. Firstly, trade companies with higher Brazil-China soy trade volumes (TRASE, 2018) were targeted. Secondly, banks publicly identified as financing such traders (Amazon Watch, 2019; CRR, 2019a) were targeted. Relevant experts (Section 4.1) were identified through LinkedIn or through quotes in relevant online articles. They were then contacted and invited through LinkedIn, third party introductions and/or referrals by other interviewees. A small proportion of snowball sampling took place when confirmed participants invited a colleague to participate jointly or separately.

As there is no clear and definitive answer in the literature on the recommended number of interviews for qualitative research, a pragmatic approach was adopted regarding the number of interviews to be undertaken (Baker, 2012). A target was set of representatives from at least six of the main trade companies (accounting for over 50% of the total Brazil-China soy trade volumes) and six of the main banks financing them. Although the recruitment of interviewees required multiple attempts and confidentiality commitments, a total of 13 interviews to 16 interviewees representing 6 traders and 6 banks were completed (Section 4.1). A certain degree of saturation was reached as after the penultimate interview new substantive information became more difficult to acquire (Bell et al., 2019).

3.5 Interview process

All interviewees were sent an email with a background document which gave details of:

- The objective of the study;
- Potential questions that would be covered during the interview;
- Ethics of participation including a signed permission statement, a confidentiality statement and information ensuring the participants understood that they could withdraw at any time.

Interviews were designed to last approximately 1 hour. However, there was no strict time limit or a closed set of questions. Completed interviews ranged between 45 and 70 minutes, depending upon the number of participants and the length of their answers. Interviews were conducted and recorded through a phone conferencing system. Audio files of the interviews

were transcribed into text-based data. They were initially transcribed through automatic transcription software (Trint) and then revised manually. Given the variety of nationalities involved and the frequent use of sector-specific terminology, the automatic transcriptions required significant amendment. The transcripts provided over 70,000 words of text-based data (excluding the introduction and closure of interviews).

3.6 Data analysis

The content of the interviews was analysed inductively and common themes emerging from the data were identified as the analysis progressed (Thomas, 2006). By proceeding in this way, it was possible to identify key insights that would help fulfil the objectives of the research, and to select quotes illustrating interviewees' opinions. Insights provided by the participants were then compared to insights gained from the literature, so that the initial analysis was enriched by using a deductive approach (Hyde, 2000).

NVivo was employed to facilitate a rigorous and structured analysis of the data (Academic Consulting, n.d.). However, due to the wide range of themes identified and terminology used by different interviewees, automatic analysis was not feasible. This observation is consistent with Zamawe's (2015) position that software cannot analyse qualitative data but just help in the process.

The text-based data that emerged from the interviews were grouped, coded and analysed separately for the banks and traders. In both cases, thematic analysis was used. Common themes were identified from the answers to the interview questions using a grounded theory approach (Bell et al., 2019). The identification and classification of themes was an iterative process which was adjusted at different stages during the analysis process. Although the majority of text segments assigned to a specific theme (NVivo nodes) were found within the answers of a specific question, some answers included text segments related to different themes. Additionally, relevant topics raised unexpectedly by interviewees were treated as themes for analysis too.

In the results section it was considered necessary to use quotations in order to allow the interviewees to speak in their own voice. Twelve of the sixteen interviewees did not speak

English as their first language, so their use of English was not always perfect. However, it was decided that there was a risk of distortion and too much would be lost if their actual words were rephrased. It was therefore accepted that these quotations might contain a number of linguistic mistakes.

3.7 Limitations

A significant proportion of the literature available on this topic is considered to be "grey literature" and as such has not been academically peer-reviewed, so the evidence it presents has not been evaluated independently.

While participants' companies were collectively linked to over 54% of Brazil-China soy trade volumes, the number of participants is relatively small when compared with the total number of traders and banks involved in this supply chain. This suggests that it is difficult to draw general conclusions from the information gathered.

Participants were mainly representatives of trade companies and banks that had already started their sustainability journey. It would have been interesting to compare their views with those of representatives of trade companies and banks that have not yet started their sustainability journey. This would have shown whether the conclusions that emerged from the study are also likely to be more widely applicable in that context. However, companies that have not started their sustainability journey do not always have a sustainability/environment department, so it was more difficult to identify and reach suitable interviewees from these companies within the time frame of the present study.

Among the participants there was good representation of trade companies operating locally in both Brazil and in China, but the representation of banks came primarily from people working for international banks. Although there was representation of local branches of international banks in both countries, there was no representation of Brazilian domestic banks and limited representation of Chinese domestic banks. International banks were deliberately selected because they were identified in the literature as main financiers of international traders, but future research could capture the views of domestic banks and provide an additional dimension to our understanding of the overall context.

While the interviewee sample represented the targeted audience, it is acknowledged that the varying roles of the interviewees and the wide range of themes discussed during the interviews might lead to some bias in the results. A few interviewees could not answer all the questions.

4 Results

This section focuses on summarising the data from the interviews. Data has been classified in four main themes (which are then divided into sub-themes):

1. Potential of banks' sustainability-linked loans (SLLs) to incentivize the acceleration of traders' anti-deforestation action.
2. Potential of traders' financial divisions to influence producers to prevent deforestation.
3. Perceived barriers and enablers for effective anti-deforestation action.
4. Potential of traders and banks to exert influence downstream.

Participants requested that their names, those of their organisations, their job titles and their specific locations should not be mentioned in the study so that their contributions remained completely anonymous. Information about the interviewee sample is therefore given at the high-level and shown statistically. Additionally, interviews' quotations and paraphrased statements are linked to anonymous codes (TR-X for trader interviews and FI-X for bank interviews), except when a statement makes it possible to identify the corresponding organisation (in which case XX will be used).

The anonymous codes were assigned from the initial scheduling of the interviews to guarantee confidentiality throughout the process. As a few interviews were cancelled due to covid-related issues, the numbering does not represent the order or number of interviews.

In this section, 'traders' and 'banks' are used to refer to sectoral groups of interviewees. Associated statements reflect personal views rather than official positions of their companies or sectors.

4.1 Demographics

A total of 13 interviews were undertaken with 16 experts working both in major Brazil-China soy trade companies and in major international banks funding such traders.

4.1.1 Description of trader sample

A total of 6 experts working in 6 major international trade companies were interviewed. The trade companies they represented collectively accounted for over 54% of soy exports from Brazil to China in 2018 (TRASE, 2020b) and for over 60% of the total deforestation-risk linked to this trade flow in 2018 (TRASE, 2020a).

Regardless of their nationality, all these trade companies have physical assets in Brazil and transport soy to China. Most of them also have processing facilities in China.

The sample included experts working in the main sustainability department of each trade companies: Sustainability (3 Global Heads and 1 Manager), Environment (1 Global Head) and Sustainable Development (1 Director).

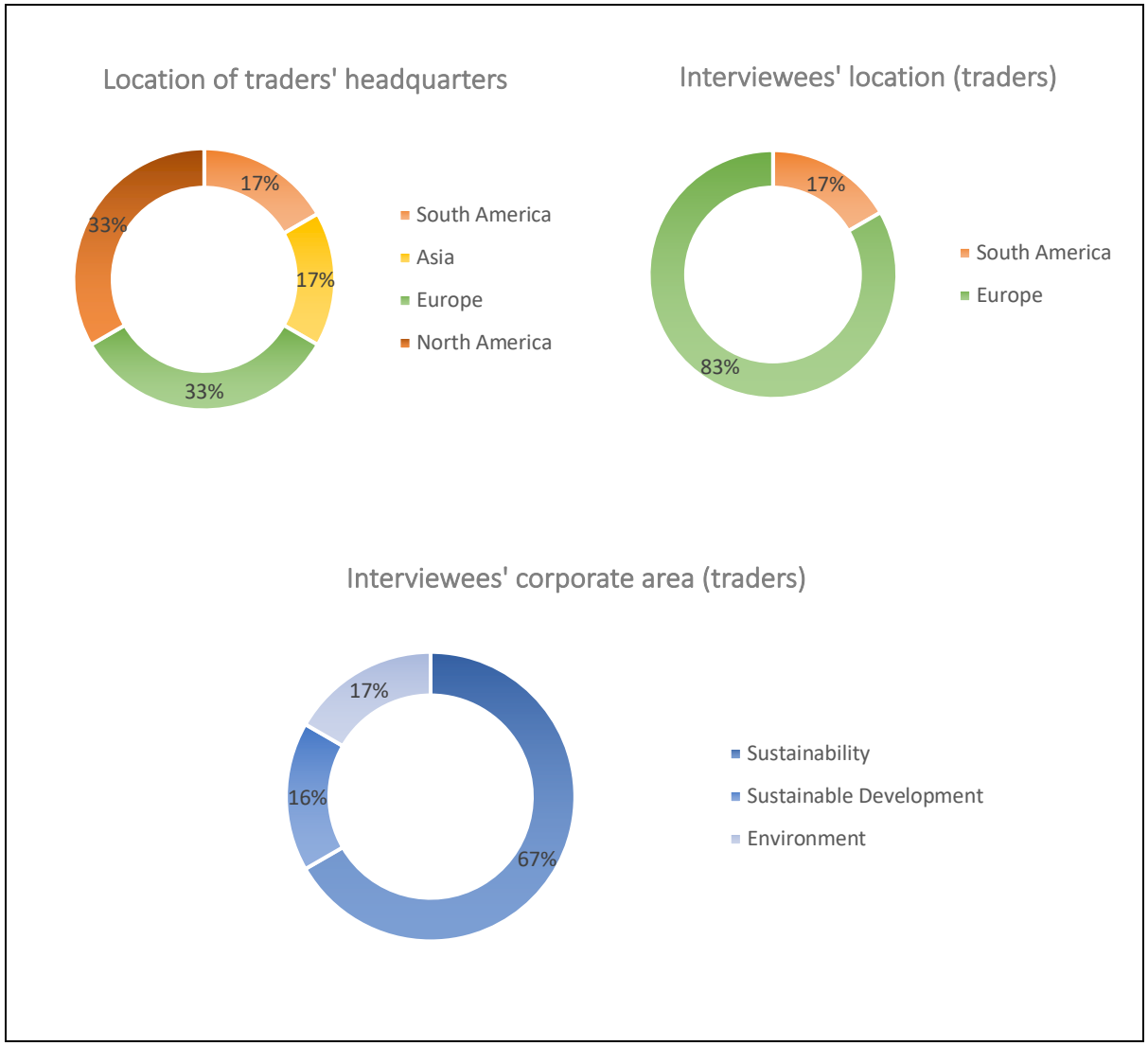

Figure 1- Details of trader sample.

4.1.2 Description of the bank sample

A total of 10 experts working in 6 international banks were interviewed. Figure 2 gives a high-level representation of the bank sample.

Views from professionals working in 4 relevant departments were captured: Sustainable Finance (2 Heads and 2 Managers), Environmental and Social Risk (2 Heads and 1 Manager), Trade Finance (1 Director) and CSR (1 Head and 1 Manager). The bank sample allowed the main topics to be explored from both a Brazilian and a Chinese perspective as it included participants working for the Brazilian branches of international banks and for Chinese banks or banks operating predominantly in China.

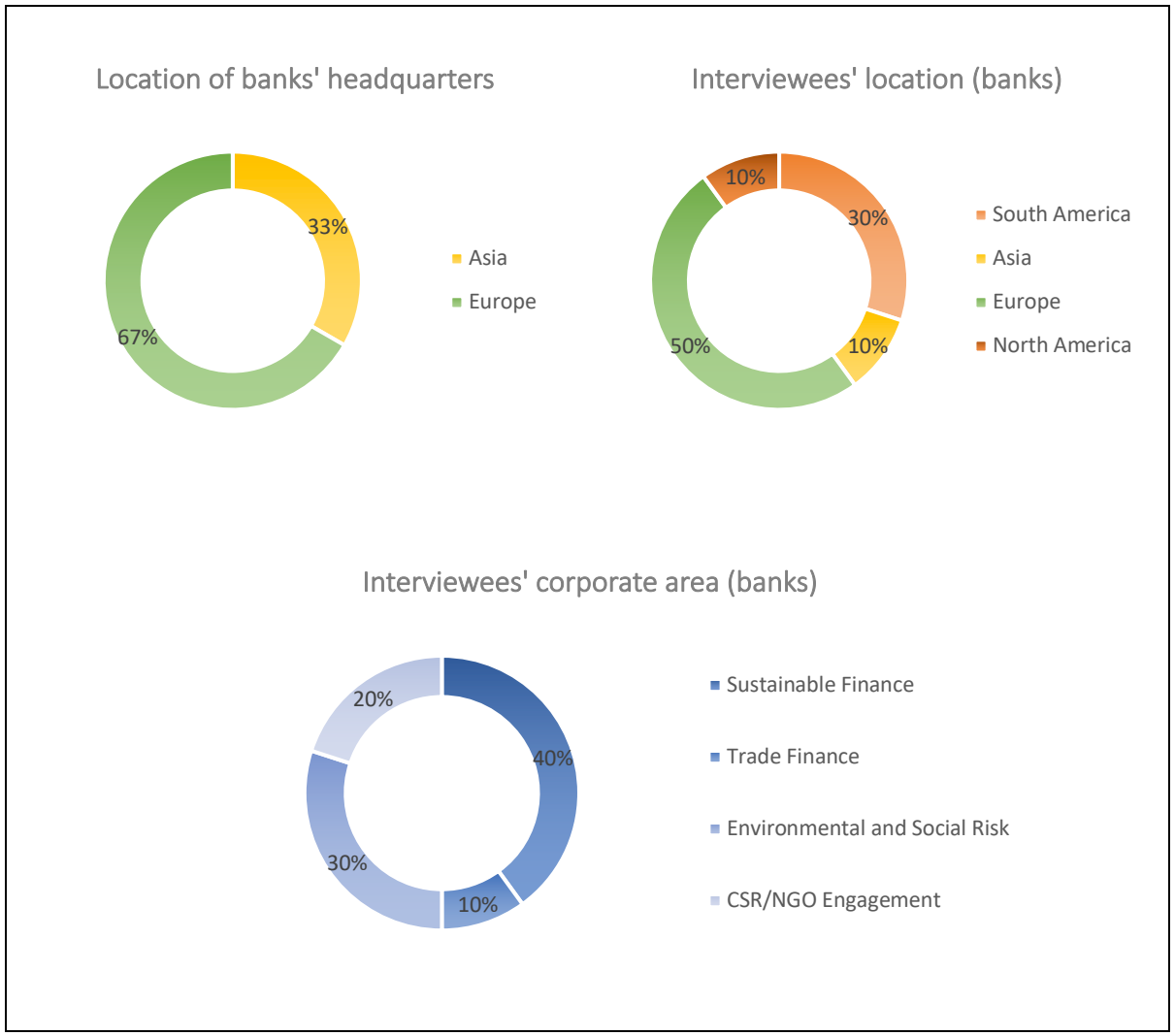

Figure 2- Details of bank sample.

4.2 Theme_1: The potential of SLLs to incentivise traders' anti-deforestation action

Although the concept of sustainability-linked loans (SLLs) was described in the literature, a more detailed description incorporating statements made by interviewees is provided here to inform the discussion that follows. For traders, SLLs are typically a one to five-year revolving credit facility (RCF) whereby several banks put together a specific amount of capital. This capital is available to the trader if/when they need it and such loans are not necessarily linked to a specific investment or use of proceeds. Generally, one bank leads the loan coordination and negotiation with the trader. A series of sustainability-related targets (henceforth referred to as SLL-KPIs) are set and linked to the loan interest rate through a discount proportional to the achievement of the targets. The discount can depend on the number of targets met or on the degree to which a target is met.

The first part of interviews explored aspects relevant to the potential of SLLs to incentivize Brazil-China soy traders to accelerate anti-deforestation action:

- Degree of SLL uptake;
- Attractiveness of SLL incentives to traders;
- Proportion of traders' finance that SLLs cover;
- Degree of ambition of SLL-KPIs; and
- Extent to which SLL-KPIs currently address deforestation.

4.2.1 The low uptake of SSLs by traders and barriers to adoption

Only two of the six traders confirmed the uptake of SLLs as part of their corporate financing.

Among those not yet engaging with SLLs, two said they were discussing them with banks and two had not yet considered them. Reasons for non-engagement included:

- Because the interest rate of SLLs is higher than conventional finance and they also involve costs for third-party verification of associated KPIs (XX).
- Because SLL incentive schemes are more rewarding to companies starting their sustainability journey (as they have more and cheaper opportunities to improve) than

to those which are already performing well (for which any further improvement involves greater effort and cost) (XX).

- Because, due to their ownership structure, they rely mainly on investor capital (XX).
- Because they want to be certain of what they commit to and the associated monitoring implications (XX).

Banks acknowledged the low uptake of SLLs from traders and attributed this to a range of factors:

- Low demand from traders (FI-7,FI-9,FI-8).
- Maturity: '*many of the customers […] don't have clear sustainability performance indicators we can link [to] a banking facility'* (FI-5).
- Disconnect between traders' sustainability teams and their treasury/finance teams (FI-5).
- Lack of incentives for traders' treasurers to embed sustainability considerations in financial decisions (FI-1).
- Banking market competitiveness: *'if you do not provide the [traditional] loans, they will just go to the other [banks] that are happy to provide the loans*' (FI-4).

Several interviewees highlighted that a level of readiness to monitor and report specific sustainability targets is required before engaging with SLLs (TR-2,FI-4,FI-5). This suggests that the scalability of SLLs among traders will depend on whether most traders already have a sustainability agenda with specific targets first.

4.2.2 Attractiveness of SLL incentives to traders

Traders agreed that the only kind of economic incentive they have been offered through SLLs is a reduction in capital interest proportional to the degree of achievement of the associated KPIs. A number of traders added that the incentives currently granted by SLLs are not economically attractive (TR-1,TR-2,TR-3,TR-4) pointing out that it '*is never payable*'(TR-2), '*it's not competitive with the conventional finance that has less conditionality*'(TR-3) and that '*the discount […] [is] offset by the verification costs*'(TR-4). However, traders did suggest conditions that would make SLLs more attractive:

- **Higher discount** (TR-1, TR-4). By offering an interest discount that covers at least the extra costs associated with the required measurement and reporting of SLL-KPIs (TR-1).
- **A longer tenor or risk-sharing** are incentives TR-5 was interested in. However, TR-4 did not think they needed them.
- **Supply chain finance**. TR-5 was more interested in enhancing the access to finance of their suppliers (the producers) and highlighted the need for the public sector '*to step in*' for this to happen.

While banks acknowledged that a reduction of capital interest is the only incentive they currently offer through SLLs, some shared their experience with alternative incentives linked to other sustainable finance products:

- FI-5's bank offers supply chain finance, which facilitates access to up to a 100% of the capital expenditure (CAPEX) required for the sustainability investments of their customers' suppliers. Additionally, they reward their suppliers' sustainability improvements. For instance, in China they *'provide cash repays',* which are granted either in the form of *'a longer tenor, a higher loan value ratio or a lower interest rate.'* According to FI-5, in China having access to up to 100% of the required CAPEX is already an incentive as loans there will generally only cover up to 70 % of a project's CAPEX.
- FI-7's bank offers producers a special fund that grants a longer tenor as well as a capital interest discount. In Brazil banks generally offer up to seven-year loans, but fund can grant up to ten-year loans (FI-7).

FI-1 revealed that '*the [interest] rate is really the easiest and the quickest [incentive] to administer'*. However, when asked about offering a higher interest discount, a couple of banks questioned the feasibility:

- FI-4: *'[the] bank it's not getting any cheaper financing […] we are giving discounts out [of] our pockets and, also, we are managing someone else's money. […] I don't know whether providing a lot more discount is even viable for us.'*

- *FI-6: 'the business has to be profitable […] this has to equate to a profitable product […] reduced interest has to equate to a reduced risk.'*

Aside from the economic incentive, traders acknowledged that there are reputational (TR-1,TR-5) and profiling (TR-2,TR-4,TR-5) drivers behind their engagement with SLLs and TR-4 stressed the relevance of their relationship with banks: *'finance is really the lifeblood of our business, […] having access to adequate finance and funding is really key for us […] so relationships with the banks are paramount'.* One of the traders also recognised that the main reason why they started setting targets in sustainability was the fact that International Finance Corporation (IFC) is one of their shareholders. TR-3 highlighted that some traders engage with SLLs because of '*their ownership structure*' and their '*particular set of borrowing needs*'.

4.2.3 Proportion of traders' finance that SLLs can cover

While participants couldn't disclose exact figures, traders that have contracted an SLL stated that their current SLLs cover a relevant proportion of their working capital. When asked about specific regions, one confirmed that their SLL is the largest finance facility they have and covers most of their operations (in any region). Another one pointed out that, while they have an SLL covering Asian operations, Brazilian operations are financed by individual banks based in Brazil.

Traders currently negotiating an SLL stated that they plan to start with a percentage of their financial needs, 'more than 20%' said TR2. While TR1 envisioned the possibility of covering all their finance needs with '*green finance*', TR-3 did not see this happening because they considered that they '*are not quite at the stage of seeing a maturity where that's [SLLs] routinely the offering*'. However, FI-4 confirmed that technically the association of sustainability conditionality '*it can be done for term loan, it can be done for RCF [revolving credit facilities], it can even be done for trade finance'* and that *'they can embed [a] sustainability margin adjustment'.*

4.2.4 Degree of ambition in SLL-KPIs

Traders were asked whether they had or will have to make operational changes to achieve their current/future SLL-KPIs. A number of them acknowledged that they are setting SLL-KPIs linked to sustainability targets they already had (TR-1,TR-2,TR-4,TR-5). One trader recognised: '*we didn't adapt we just linked the finance to what we were doing already*'. However, two traders confirmed that meeting such targets will require operational changes (TR-2,TR-5), one stating: '*having this commitment [SLL KPIs] […] have put a very tight schedule […] this has definitely provided a positive motivation […] to fulfil our sustainability objectives*'.

Bank participants explained that KPIs linked to SLLs are set in a negotiation between the trader and the bank coordinating the SLL, revealing that generally the trader proposes a set of targets aligned with their sustainability agenda and the bank (having previously reviewed traders' sustainability trajectory and opportunities to improve) considers them (FI-1, FI-4, FI-7, FI-9).

Some banks think it is too soon to determine the impact of SLLs (FI-1,FI-9). According to FI-4 '*it really depends on the client'* as clients set their own targets and, while they try to make them *'as ambitious as possible',* banks do not set a minimum threshold of ambition (FI-4). However, the acceleration of internal '*processes and governance'* in order to qualify (FI-5), a greater engagement of customers' top management with sustainability (FI-4), the alignment of aspirations across supply chains (FI-6), and the identification of new opportunities to improve clients' sustainability performance (FI-7) were mentioned by banks as examples of changes that SLLs can drive.

4.2.5 SLLs are not yet linked to KPIs on deforestation

Both banks and traders recognised that to date they have not set SLL-KPIs specifically for deforestation. In one case they use KPIs to address energy usage, GHG emissions and water usage and waste. In another case they use KPIs established by the Sustainalitics reporting framework.

TR-4 stated that, if SLL-KPIs addressing deforestation were to be set, they would initially commit to farm-level traceability for a percentage of their total soy trade. TR-4 thought that they would only be able to set a KPI to report on deforestation if traceability to the farm was achieved. Although with a different approach, TR-2 agreed that a KPI addressing deforestation prevention would depend on traceability and involve increasing the sourcing from low or medium risk areas and decreasing it from high risk areas.

4.3 Theme_2: Potential to influence producers' anti-deforestation behaviour through traders' financial divisions

As explained in section 1.3.2, some soy producers are financed through traders' financial divisions (TFDs). The second set of interview questions therefore explored whether there is an opportunity to embed sustainability conditionality within the finance that traders offer to producers. Participants were asked:

- What the contextual factors are that drive traders' financing to producers;
- What the links are between traders' financial services and banks;
- Whether traders could use their financial services to engage producers to stop deforesting.

4.3.1 Contextual factors that drive the traders' financing to producers

All traders (TR-1,TR-3,TR-4,TR-5,TR-6) except one (TR-2) acknowledged that they offered some sort of financial service to producers. They pointed out that, compared with ten years ago, they now provided finance to a more limited and decreasing extent (TR-1,TR-3,TR-4, TR-6), only to producers who are also their suppliers (TR-6,TR-4,TR-3) and by redirecting bank capital (TR-1, TR-2TR-4,TR-6). TR-1, TR-3 and TR-4 all said that producers now have a better finance structure that makes them eligible for finance from commercial banks. TR-4 stated that '*mostly local, but also some international banks operating locally will be lending direct to farmers*' and pointed out that '*in other instances banks would rather lend to us and have us [traders] take the risk, the cost of lending to far*mers'. TR-6 pointed out that while banks '*finance [farm] infrastructure, the buying of land or even some big investments'*, traders only

finance '*inputs for the production'*, which is a relatively small proportion of overall soy producers' financial needs.

Although a number of bank participants stated that they did not know much about TFDs (FI-4, FI-6, FI-9), FI-1 stated that traders financed producers '*to secure a volume of soybeans every year*' and, along with FI-5, drew attention to the low appetite of banks to offer financial products to farmers (due to the small loan-amounts involved and the associated risk). Interestingly, these two participants saw traders as part of a potential solution:

- FI-1: '*our credit appetite for the region[Brazil] today basically only allow us to work with the large traders […] Brazilian banks are even obliged by their regulators to serve that part of the economy[framers']*' and '[it] *is a very risky business for banks depending on where they are […] but for traders, who have commercial teams very close to the farmer, the risks are easier for them to control*'.
- *FI-5: 'to make it bankable […] we need the traders to be willing to do that demand aggregation for the bank'.*

A different bank participant also stated that they had launched a new financial product, in collaboration with a trader, for soy producers. The capital is provided by the bank and the operation is facilitated by the trader. The loan can be of up to 10 years and '*one of the requirements is that the farmer has to sell to [the trader] for the entire term of the line'*.

On the same theme, TR-5 and TR-6 stated that they are currently discussing potential partnerships with banks to offer '*green finance that can incentivize producers to implement sustainability practices*' (TR-6) and '*to make the bank give the sustainable loan to the farmer, instead of using our[trader's] own working capital*' (TR-5). TR-5 stated that banks '*are actively seeking partnership with traders […] for risk-sharing, for due diligence of the farmers[…]*' and suggested that '*financial institutions and traders, and other supply chain players, could team up very well to share the burden of the unknown risks*'. However, TR-5 qualified this suggestion by saying that this '*has proven difficult with pure commercial banks'* and that '*blended finance is needed*' as '*public money needs to step in further to either take the first loss or provide guarantee to help reduce the risks'*. He added that, whereas to date '*pre-financing by traders*

or by input companies to farmers have been annual', new finance initiatives in partnership with banks that are currently being discussed aim to offer '*long tenor [loans], which for the agriculture sector is not very common*'. TR-4 made similar comments.

4.3.2 Potential of traders' finance to influence producers in preventing deforestation

When traders where asked whether they link any sustainability incentive or conditionality to the financial services they offer to producers, three gave examples: paying the costs for soy certification of some producers (TR-1), applying their deforestation-related policy '*across all business groups*' (TR-3), and offering '*preferential financing*' to farmers who preserve native vegetation they could legally convert (TR-4). In addition, TR-5 and TR-6 said that, while they are not yet embedding sustainability conditionality in their financial services, they are exploring potential ways to do so.

The low rate at which farmers currently adopt incentive mechanisms was identified as a major barrier by TR-3 and TR-4. TR-4 shared that '*the political environment in Brazil and the current administration [and] sort of anti-environmental rhetoric has empowered a group of farmers to […] steer away from environmental preservation […] perceived as a foreign imperialist approach […] seeking to apply European or American standards to Brazilian agriculture'*.

While interviewees acknowledged that sustainability conditionality in traders' finance for producers could drive change, they did not see this as the main solution and thought that other mechanisms would need to be put in place first. The mechanisms they suggested were the application of traders' corporate policies to producers to prevent deforestation (TR-3,FI-8), premium price-based incentives (TR-2, FI-9), economic incentives to compensate producers for the cost of opportunity of not deforesting areas that could be legally deforested (TR-3,TR-6) and the alignment of sustainability conditionalities across all sources of finance (TR-1,TR-3).

4.4 Theme_3: Factors influencing the effectiveness of private sector anti-deforestation efforts

In the course of the interviews the traders and banks mentioned a series of barriers, and necessary enablers, influencing effective implementation of anti-deforestation efforts. These were captured to enrich the contextual understanding and have been summarised together to give a balanced picture from a supply chain perspective.

4.4.1 Barriers

4.4.1.1 Mentioned by traders and banks

Lack of downstream demand with anti-deforestation considerations (TR-1,TR-2,TR-3,TR-4,TR-5,FI-7,FI-8).

Conflicts between the Brazilian legal framework and initiatives aiming to prevent legal deforestation (TR-1,TR-2,TR-3,FI-1,FI-7,FI-8). According to FI-1, farmers are approaching the Brazilian government '*trying to find a legal way to force*' traders to buy their soy as farmers argue that, if they are following Brazilian regulations (which allow legal deforestation), traders must buy their soy or otherwise be penalized. According to TR-3, the challenge is *'where might that [traders' anti-deforestation initiatives] limit the ability of producers to access markets, that could be antitrust.'.*

Traceability (TR-1,TR-2,TR-3,TR-4,FI-6,FI-9). Several interviewees agreed that the mapping of soy supply chains requires a great deal of time and resources and they were uncertain as to when they will be able to fully map their supply chains.

Lack of farmers' collaboration and representation (TR-2,TR-3,TR-6). TR-2 revealed that they receive *'pressure from farmers and farmer organizations not to be involved in that [Soft Commodities Forum]'.* TR-6 stressed that '*most of the times we just create policies and the ones that are not on the table are the farmers*'.

The opportunity cost for farmers (TR-2,TR-5,FI-7). FI-7 stressed that '*legal deforestation, that's legal […] if I don't want him [the farmer] to deforest, I need to provide him […] a benefit*'.

Deforestation displacement between commodities and markets (TR-1,TR-2,FI-7)**.**

4.4.1.2 Mentioned only by traders

High-level definition of commitments without in-the-field awareness (TR-3,TR-6). TR-3 stated that *'we need to do more to understand what's happening on the ground, what's driving producers' decisions […] opposed to a binary include/exclude producers.'*

Lack of alignment and volatility of criteria (TR-2, TR-3). TR-3 observed that '*in soy, we're aligned on the end goal[…] of ending conversion in the shortest time possible […] but we're not aligned on the how*' and TR-2 expressed frustration that 'what today is seen as a high-risk area […] tomorrow is not a high-risk area anymore but the risk is somewhere else'.

Lack of enforcement of Brazilian regulations (TR-1,TR-3).

4.4.2 Required enablers

4.4.2.1 Mentioned by traders and banks

Cross-sectoral collaboration (TR-1,TR-3,TR-4,TR-5,FI-9). T-1 suggested that, to mitigate indirect impacts between sectors, actors operating in different economic sectors in the same region should collaborate to achieve common goals on deforestation. FI-9 stressed the need for 'cross-sectoral collaboration' in making decisions and devising solutions.

Enhancing traceability (TR-3,TR-4,FI-7). TR-4 recognised that all farms in the soy supply chain should be mapped and then monitored through satellite technology.

Involve local stakeholders (TR-3,TR-6) '*local stakeholders need to have a much greater voice and they need to be understood […] unless we unlock that, to have forest positive and people positive, I don't think we'll make the progress we need*'(TR-3).

4.4.2.2 Mentioned only by traders

Production intensification. TR-2 stated that Brazilian producers could increase yields from 3.5 Tn/ha to over 6 Tn/ha and said that, if yields were increased and cattle was intensified, no deforestation would be required.

Strengthening governance and enforcement in Brazil (TR-3).

4.5 Theme_4: Potential of traders and banks to exert influence downstream

One interview question explored the argument by Folke et al. (2019) that traders could also enforce their sustainability standards downstream. Although this question was formulated with traders in mind, banks were also asked so that their perspective could be captured.

4.5.1 Traders

While traders acknowledged an increase in the number of Chinese companies attending forums on deforestation linked to soy (TR-1,TR-3,TR-4,TR-6), they stated that Chinese buyers have never demanded deforestation-free soy (TR-1,TR-2,TR-3,TR-4,TR-5).

Most of traders believed that the only way they could influence Chinese companies was by raising awareness about products and tools that could help prevent deforestation (TR-1,TR-4, TR-5). For instance, TR-5 stated that '*it's hard for them [Chinese buyers] to understand why they should bother because it's just something happening in another country*'.

A number of traders highlighted that Chinese companies only act on guidelines determined by the Chinese government (TR-2,TR-3,TR-4,TR5). In that regard, both TR-4 and TR-5 emphasized that there is a need to build a business case for China to address deforestation in Brazil in order to guarantee its own food security. TR-4 stated that '*China needs increasingly to realise that unsustainable practices will impact their ability to purchase what they demand in future*'. TR-5 stated that '*we need the Chinese government to really understand the implications of conservation for their own food security in the long term and, on that basis, hopefully some policy guidance will be out there that will be ultimately helpful to mobilize the Chinese soy sector*'.

4.5.2 Banks

Banks acknowledged their potential role in stimulating demand for deforestation-free soy in China by asking soy buyers to disclose on their efforts to address deforestation issues linked

to their supply chains (FI-4,FI-5,FI-9), incentivising better behaviour (FI-4,FI-5), promoting certification schemes (FI-6,FI9), penalising bad behaviour with higher capital interest rates (FI-4,FI-5), or disengaging when a customer doesn't meet the bank policies (FI-9).

5 Discussion

The aim of this section is to discuss key findings in the context of existing knowledge in the academic and wider literature.

5.1 Theme_1: The potential of SLLs to incentivise traders' anti-deforestation action

5.1.1 Insight_1.1

SLLs can accelerate change, but they need to set anti-deforestation KPIs

SLLs are a new product and although their adoption among Brazil-China soy traders is still low, this study identified a willingness from traders for much broader adoption covering most of their funding.

While several participants stated that SLL-KPIs are linked to existing corporate targets (instead of encouraging new or more ambitious targets), they recognised that SLLs could motivate a faster achievement of traders' targets. However, further evidence to support this hypothesis is required.

The factors mentioned previously would suggest that SLLs can accelerate achievement of traders' sustainability targets. However, to date traders' SLLs have tended to focus on energy efficiency, GHG emissions, and traceability and they have not been linked to specific KPIs on deforestation reduction. The first step in using SLLs as an anti-deforestation mechanism would therefore be to link targets that quantify traders' progress in deforestation prevention to the loan.

Traceability to the farm-level was commonly mentioned as the step that would then enable deforestation to be monitored. According to the media, two major Brazil-China soy traders have already set SLL targets to increase traceability of commodities, one of them specifically for Brazilian soy. While the scope of these targets is not specified and reporting on deforestation does not seem to be involved, this does appear to prepare the way for SLL KPIs on deforestation in the near future. One of these traders recently made public its aim to

achieve full traceability of soy sourced directly from Brazilian farmers by 2023. However, as indicated in the Soy Toolkit guidelines, traceability of directly sourced soy is more straightforward than that of indirectly sourced soy, so this commitment does not address the unresolved challenge of tracing indirectly sourced soy (Good Growth Partnership, n.d.).

A different way to link SLLs to anti-deforestation action would be by mapping high-risk areas and then reducing soy sourcing from these areas. As well as being mentioned by interviewees, this approach is promoted by the Soft Commodities Forum in the Cerrado and has been adopted by some major traders (WBCSD, 2019). However, it worth noting that anti-deforestation commitments that only target regions with high conversion rates have been shown to be more likely to result in deforestation displacement to other regions unless they are combined with more intensive production (le Polain de Waroux et al., 2019b; Strassburg et al., 2017).

5.1.2 Insight_1.2

Several factors limit more widespread adoption of SLLs among traders

Several factors limiting the adoption of SLLs by Brazil-China soy traders were identified through the interviews:

- the economic incentive of SSLs was not considered to be attractive for traders as associated costs for third-party verification can be higher than savings;
- adopting a SLL requires an existing sustainability agenda with mechanisms in place to measure progress on specific KPIs, which means that traders beginning their sustainability journey are not be eligible and thus cannot be incentivized through this mechanism;
- it was perceived that, among eligible companies, SLLs can be more rewarding for companies performing badly (as they have more cost-effective opportunities for improvement) than for companies already performing well (as incremental improvements are likely to involve greater efforts and costs);
- the lack of incentives for traders' treasurers to embed deforestation considerations into their decision-making;
- traders with different ownership structures can have different levels of dependence on banks' finance; and

- both investor capital and financial products with less sustainability conditionality were identified as competing options which could make it difficult to scale SLLs and, as a consequence, diminish their potential to accelerate change.

Banks can have greater impact on the Brazil-China soy supply chain through the SLLs they offer if they reflect on the above points and make appropriate adjustments to increase traders' eligibility and take-up rates. For instance, SLLs could incentivise traders to introduce the initial commitments and measurement mechanisms when companies are starting their sustainability journey.

5.1.3 Insight_1.3

SLLs can be made more attractive to traders, but banks need an incentive too

Other incentives traders said they would be interested in (e.g. supply chain finance, risk-sharing or a longer tenor) were also acknowledged by banks to be part of non-SSL products they offer. This suggests that it might be technically possible to use them as incentives to increase the attractiveness of SLLs to traders. However, while it was confirmed that sustainability conditionality could be embedded in any financial facility, some banks questioned the viability of offering higher discounts unless Central Banks facilitate cheaper capital for such transactions or the associated risk is low or otherwise shared.

In this regard, the Banking Environment Initiative has highlighted the relevance of adjusting the cost of capital available to banks to promote sustainable finance (CISL, 2016). It has suggested that Central Banks, Multilateral Development Banks, Export Credit Agencies and government funds could facilitate access to cheaper capital and/or share risk for sustainable finance purposes. In fact, Brazil's Treasury already pays for the difference between the market interest rates and the discounted interest rates offered through rural credits to promote sustainable agriculture (Lopes & Lowery, 2015). However, this only applies to Brazilian banks and producers. A more widely applicable solution for international banks to raise cheaper capital that incentivises anti-deforestation action implemented by international traders is required.

The Forest Investment Program (FIP) (n.d.), administered by the World Bank and implemented with four other Development Banks, finances public and private investments designed to reduce deforestation and forest degradation in developing countries. International banks could collaborate with the FIP to facilitate the provision of greater incentives to soy supply chain actors reporting progress in deforestation prevention.

5.2 Theme_2: Potential to influence producers' anti-deforestation behaviour through traders' financial divisions

5.2.1 Insight_2.1

Traders finance a small but not negligible proportion of the soy production

Traders stated that, as producers are increasingly eligible for bank financing, they are finding themselves financing fewer producers. This might suggest that the proportion of producers that traders can influence through their financing is small. However, several sources state that in regions of soy expansion traders provide 16-17% of the total capital used in soy production (CRR, 2018; WWF-Brazil, 2017), which accounts for 27.5% of the total capital needed to finance producers. Although there is no publicly available information about the number of producers financed by traders, it is certainly not negligible given that there are over 200,000 soy producers in Brazil (De Schutter, 2010).

5.2.2 Insight_2.2

Collaboration between banks and traders to offer sustainable finance to producers could drive greater change

International banks acknowledged their low appetite for financing producers due to the small size of loans producers require, their disperse locations and the high risk of such operations. This was consistent with the literature, which revealed that private banks only financed a 10.8% of the financing needs for soy production in the Cerrado (the region of greatest soy expansion) in 2016/2017 (WWF-Brazil, 2017).

Several banks recognised their interest in collaborating with traders to offer finance to producers. One interviewee stated: '*to make it bankable […] we [banks] need the traders to be willing to do that demand aggregation for the bank*'.

The concept of traders financing producers has been criticized by NGOs (Murphy et al., 2012; WWF-Brazil, 2017) because it creates relationships of dependency with vulnerable producers and does not generate the social and environmental conditionalities that are required by banks. However, it is broadly recognised that partnerships are needed to address supply chain sustainability challenges (Blowfield,2012; Nelson,2017). If proper sustainability conditionality and incentives are included in the finance they offer to producers, traders in partnership with banks will be able to offer them better financial options and incentivise forest conservation. For instance, loans with a longer tenor could incentivise long-term forest preservation.

5.2.3 Insight_2.3

Blended finance might help traders and banks incentivise producers

It was noted by traders that partnerships with banks had proved challenging in the past and that blended finance (a combination of public and private finance) might be required to make it work. One stated: '*public money needs to step in further to either take the first loss or provide guarantee to help reduce the risks*'.

While Rode et al. (2019) agree that new models of blended finance are required to invest in sustainable landscapes, the potential efficacy of blended finance has been questioned due to the associated high transaction costs and the complex distribution of responsibilities needed to achieve specific targets (Romero, 2013; Warner, 2013).

At a time when it is undermining its Environmental Agency to support agricultural expansion (LSE, 2019; Reuters, 2019) and farmers associations' are putting pressure on it to abolish the Amazon Moratorium, the Brazilian government is unlikely to fund the incentivisation of zero-deforestation initiatives.

The Chinese government, on the other hand, could support this process. By leveraging its position as a leader in green finance and its investments in South-South cooperation

initiatives, it could switch capital to land-based solutions to mitigate climate change (currently receiving only 3% of funding) (CDP, 2019c). However, while China (the most relevant importer of Brazilian goods) is in a position to enforce stricter environmental regulation in Brazil, it seems unlikely that the Chinese government will put at risk the good trade deals it has with Brazil by doing something the Brazilian government perceives to be against its interests (Araújo, 2019; Holland, 2019; TheNewsLens, 2019). In addition, while Chinese imports are a relevant part of Brazil's economy, China's food security is also dependent on Brazilian exports. Over 85% of China's soy consumption depends on imports mainly supplied by Brazil.

5.2.4 Insight 2.4

The risk for producer dependency still needs to be managed

With reference to an existing 10-year loan programme offered by a bank and a trader working in partnership, a participant stated that '*one of the requirements is that the farmer has to sell to [the trader] for the entire term of the [credit] line'*. While a requirement of this kind is likely be positive in terms of incentivising long-term forest preservation if proper conditionality is set, it also makes producers vulnerable by placing them in a relationship of dependency.

5.3 Theme_3: Factors influencing the effectiveness of private sector anti-deforestation efforts

Relevant factors mentioned by both traders and banks were also mentioned in the literature. Several were very context-specific:

5.3.1 Insight_3.1

Producers are resistant to collaboration with traders' anti-deforestation initiatives and the regulatory framework does not support traders' efforts

It was mentioned by participants and is widely reported in the media that producers are against zero-deforestation initiatives and attempt to frustrate them by appealing to the legality of their practices. Furthermore, traders revealed that there is an 'anti-trader rhetoric

among farmers' and pressure on them to disengage from the Amazon Moratorium(Reuters, 2019).

Conflicts between private sector zero-deforestation initiatives and Brazilian and WTO regulations protecting the market access of soy linked to legal deforestation were mentioned by participants and identified by the literature as a limiting factor (Folke et al., 2019). A bank representative revealed that producers *'are trying to find a legal way to force those trading companies to buy from them because they say: I'm doing everything according to the regulation, I do respect your [Brazil's] legislation, and there are these companies that are not buying from me so we have to penalize them'.*

This could explain why traders did not sign a letter in which 84 companies asked Bolsonaro to keep the Amazon Moratorium after soy producing associations had asked him to abolish it. Key Brazil-China soy traders have not endorsed the Cerrado Manifesto either (Cleary, 2018; CRR, 2019c).

5.3.2 Insight_3.2

Brazilian soy producers need to be involved in devising solutions and compensated through long-term incentive schemes

The importance of involving and empowering local stakeholders right from the start was stressed by participants and highlighted by Castro's (2017) 20-year case study as a key factor in any new initiatives to conserve ecosystems. However, it was identified that many initiatives and commitments are set at a high level without taking account of producers' realities and behavioural drivers.

Another key unresolved aspect is the lack of fair incentive-schemes compensating producers for the opportunity cost of preserving native vegetation they could otherwise legally convert. The relevance of incentivising producers to facilitate anti-deforestation action in Brazil was highlighted by numerous authors in the literature review (CDP, 2017; Garrett et al., 2018; Jung et al., 2017; le Polain de Waroux et al., 2019b; Solidaridad, 2019a; Stabile et al., 2020).

There are a number of initiatives which seek to incentivise Brazilian soy producers to preserve forest they could legally deforest in their farms. For instance, the Cerrado Working Group raises capital from major retailers to compensate farmers (Feednavigator, 2019) and WWF's Agribusiness Receivables Certificates (similar to the ABC Program mentioned in the literature review) offer 'low-cost' credits to producers (WWF-Brazil, 2017). However, these represent temporary rather than long-term solutions. There is a need to design ongoing incentive-schemes that guarantee the long-term preservation of forests. They could combine continued access to attractive sustainability-linked loans and the incentivisation of more intensive cultivation.

5.3.3 Insight_3.3

Lack of alignment between traders' targets

As one of the participants stressed, 'in soy, we [traders] are aligned on the end goal […] of ending conversion in the shortest time possible […] but we [traders] are not aligned on the how'. Although several traders have joined the Soft Commodities Forum, which promotes a common framework for reporting in soy sourcing areas (WBCSD, 2019), there is a lack of alignment between traders in setting and measuring SLL-KPIs and corporate anti-deforestation commitments. However, Garrett et al. (2017) suggest that for anti-deforestation commitments to be effective the global market for a particular commodity needs to have comparable implementation and verification mechanisms.

If future deforestation commitments and SSL-KPIs are harmonized among soy traders and include the features recommended by the literature (Section 2.1), they are likely to have greater on-the-ground impact. Combinations of the following features could be used: zero-deforestation criteria, immediate implementation deadlines, harmonisation of deforestation targets across regions and commodities, universal application, quantitative science-based targets to monitor progress, and sanction-based mechanisms combined with incentive-schemes (Garrett et al., 2019; Haupt et al., 2018; Kuepper et al., 2019; le Polain de Waroux et al., 2019b; Stabile et al., 2020; Strassburg et al., 2017; Vörösmarty et al., 2018).

For instance, the Accountability Framework (2019) could help to ensure that corporate commitments, activities, monitoring systems, and reporting practices reflect common and agreed-upon norms and specifications.

5.3.4 Insight_3.4

There is a need for more effective partnerships

A number of interviewees stressed the need for more effective partnerships at different levels: at the jurisdictional level, internationally across supply chain actors, within sectors and between the public and private sectors. According to Caplan (2013) three key success factors for complex multi-stakeholder partnerships are (1) being "fit for purpose", (2) adopting a systemic approach that creates and demonstrates clear impact, and (3) using accountable governance mechanisms.

These recommendations are combined with the involvement of local stakeholders and an appreciation of the interdependencies among commodities in initiatives such as Produce, Conserve and Include (PCI), which is designed to address deforestation and forest degradation in the Brazilian state of Mato Grosso and aims to incentivise more intensive production by facilitating access to EU markets for responsible soy (IDH, 2020). The PCI initiative involves soy and beef local actors, the local government, and NGOs, it raises capital from EU companies and it publicly reports key KPIs in an online dashboard (PCI, 2020). Traders could encourage their Chinese soy buyers to take part in initiatives of this kind.

5.3.5 Insight_3.5

Soy traceability to the farm is still pending

Traceability was highlighted by most participants and the literature review (Gardner et al., 2019; Haupt et al., 2018) as challenging but, at the same time, essential to the achievement of any supply chain anti-deforestation target. This is a key unresolved barrier and both digital technologies and supply chain partnerships (CISL, 2019; Salah et al., 2019) appear to be

potential solutions that require further exploration, investment and incentivisation (CISL, 2016; Karge et al., 2018).

Since 2018, major Brazil-China soy traders have co-led an initiative aiming to digitise commodity post-trade (legal paperwork) to optimise costs, times and resources (CISION, 2019). The initiative recently became a Swiss legal entity co-owned by six major Brazil-China soy traders under the name Covantis (AgriTradeNews, 2020). It focuses on grain and oilseed commodities exported from Brazil, but its scope does not include digitisation of upstream operations, so it does not involve enhancing traceability at farm-level (AgFunderNews, 2020). However, the same platform could be leveraged to coordinate joint traceability and anti-deforestation action in the Brazil-China soy supply chain.

For now, Brazil's registry system CAR, which tracks compliance with Brazil's Forest Code at the individual farm level (Carvalho et al., 2019), can help traders verify whether farmers are deforesting within their farms. Although the Forest Code allows some legal deforestation and CAR has some weaknesses (see Section 2.2.1.1.), traders can use CAR's information to verify whether a farm is legally deforesting, whether it is preserving more forest than legally required, or whether it has been linked to illegal deforestation. In addition, satellite imagery systems and mobile technology that could enhance traceability in soy supply chains are being developed. A comprehensive review of technological developments will be the subject of a separate study.

5.3.6 Insight_3.6

Intensification and deforestation targets need to go hand by hand

Although agricultural intensification in Brazil has been promoted and incentivised through rural credit schemes for some years now (Lopes & Lowery, 2015), it appears that in the case of soy the opportunity to increase yields and so reduce the amount of land converted to production has not been fully leveraged. It is surprising that 'intensification' was only mentioned by two participants as it is the in-the-field solution to the problem of meeting growing demand while reducing deforestation (Strassburg et al., 2017). A study exploring

whether SLLs are including KPIs that focus on promoting more intensive cultivation would complement the present study.

5.4 Theme_4: Potential of traders and banks to exert influence downstream

5.4.1 Insight_4.1

The power of influence of main traders on Chinese soy buyers it is not evident

Recognising the lack of demand from Chinese buyers for deforestation-free soy, most traders stated that their power of influence downstream was limited to raising awareness through existing initiatives and informing buyers about the product options (e.g. RTRS certified). By contrast, although they do not provide evidence, Murphy et al. (2012) argue that traders can decide where the soy is shipped, and Folke et al. (2019) state that traders' power of influence allows them to impose sustainability standards on their buyers.

The fact that China imports over 57% of the soy traded globally, and that no other country imports more than a 4% (OEC, 2018), suggests that it would be very challenging for Brazil-China soy traders to enforce anti-deforestation standards through market conditionalities. Disengagement or pricing conditions might work with other soy supply chains or commodities, but it would be very difficult for Brazil-China soy traders to shift part of their Chinese demand elsewhere as there is no comparable market. Europe, for instance, imports only 13% of global soy (OEC, 2018).

On the other hand, Chinese buyers are heavily dependent on imported soy. As mentioned earlier, over 85% of Chinese soy demand is imported (China Daily, 2020), a staggering figure, and this could perhaps prove to be China's Achilles heel, particularly in view of the fact that most of the imports are shipped by non-Chinese companies (TRASE, 2020b) and Chinese companies have less control over productive land in Brazil (China's largest supplier) than US and EU companies (Oliveira, 2018). In other words, the business continuity of Chinese buyers depends on the soy production and shipment of non-Chinese companies.

If the majority of Brazil-China soy traders were able to agree on a common strategy to influence Chinese soy buyers, it might be possible to leverage the dependence of these Chinese buyers on international suppliers. Further research is needed to provide evidence on the specific measures that would have to be put in place to enable traders to enforce the adoption of anti-deforestation standards among their soy buyers.

5.4.2 Insight_4.2

The Chinese government can play a key role in the conservation of Brazil's forests

Traders pointed out that Chinese companies will only take action if the Chinese government mandates them do so and stressed the need to build a business case that links forest loss in their sourcing regions with Chinese food security. Civil-society experts working on the main soy initiatives in China were also consulted and made the same points, but they acknowledged that to date they have not come across a business case based on the link between the degradation of overseas ecosystems and the risk of soy shortages in China, or at least one that is sufficiently convincing to Chinese stakeholders. Further research is required to build a business case that leverages China's dependence on imports of soy by using quantitative evidence to demonstrate that failure to prevent deforestation in soy-producing countries will adversely affect the Chinese economy and pose a threat to Chinese food security in the long term.

As CDP (2019c, 2019a) suggested, China could expand the recommendations of the Belt and Road Ecological and Environmental Cooperation Plan beyond the projects covered by the initiative. The Plan guides companies on environmental impact assessment and risk prevention (including biodiversity conservation) and promotes cooperation for ecosystem protection (Belt and Road Portal, 2017).

5.4.3 Insight_4.3

Banks and traders can join forces to influence Chinese soy buyers

The interviews suggested that banks have more opportunities than traders do to influence Chinese soy buyers (by requiring anti-deforestation reporting, promoting certified soy, incentivising, penalising or even disengaging). However, it can be argued that international banks and traders should join forces and form partnerships to influence Chinese soy buyers through sustainability-linked loans that incentivise the demand for zero-deforestation soy. This would be a way to leverage traders' direct connections with Chinese soy buyers and banks' sustainable finance budgets. It could prove to be particularly influential if applied to the Chinese feed industry as this is the largest consumer of soy (especially the pig industry) and currently not subject to market or governmental pressure. As three Chinese banks (Bank of China, Industrial and Commercial Bank of China and Agricultural Bank of China) provide 62% of loans in the Chinese soy sector (CDP, 2019d), international banks should engage with them to create joint SLLs for Chinese soy buyers.

While the literature highlighted that the Chinese soy industry do not have sufficient margin to pay a premium price (TFA, 2018), they could potentially collaborate with traders and publicly commit to demanding a gradually increasing proportion of zero-deforestation soy with immediate effect. This would send a clear market signal that the largest importer of Brazilian soy will no longer accepted soy linked to any kind of deforestation in the near future.

6 Conclusions

6.1 Concluding summary

This study showed the importance of addressing deforestation linked to the Brazil-China soy supply chain and identified traders' potential to influence supply chain actors both upstream and downstream. It analysed the factors undermining the efficacy of current corporate anti-deforestation commitments and associated implementation mechanisms. A review of relevant literature identified the lack of schemes to incentivise long-term behavioural change in key actors and the lack of access to finance to implement key in-the-field mechanisms (such as production intensification and enhanced supply chain traceability) as key limiting factors. It was therefore decided to focus the primary research on exploring the potential of sustainability-linked loans (SLLs) both to incentivise the acceleration of traders' anti-deforestation action and to facilitate farmers' access to finance with deforestation conditionalities. It was also decided to briefly consider the opportunities for international traders and banks to influence Chinese soy buyers. Given the focus on SLLs, and because they have an overarching presence in the soy supply chain, the role of banks gained relevance in the study.

Reflecting back on the original research question – "What are the mechanisms enabling Brazil-China soy traders to meet increasing demand while reducing deforestation?" – the study showed that there is no single mechanism that can alone drive the required change, but rather a range of them that need to be combined and coordinated by multiple stakeholders. At the same time, the research findings suggest that, if SLLs are adopted by the majority of Brazil-China soy traders and linked to harmonised and well-defined deforestation targets, this particular mechanism can act as a catalyst and significantly accelerate anti-deforestation action (indirectly involving enhanced soy traceability to the farm level to monitor deforestation). Additionally, the findings uncovered a series of factors that should be addressed by banks. Addressing them in the right way would potentially increase traders' uptake of SLLs and therefore enhance the overall anti-deforestation impact of SLLs. However, evidence showed that traders' efforts can only be effective if the actions and priorities of other key stakeholders align with those of traders. Non-supportive regulatory frameworks in

Brazil and China aside, results highlighted that farmers' lack of engagement with anti-deforestation initiatives is the major limiting factor requiring urgent attention.

It is argued that joint action by international traders and banks has the potential to incentivise upstream and downstream anti-deforestation action that aligns with traders' anti-deforestation strategies. Upstream, traders and banks could jointly offer producers SSLs that incentivise forest preservation and production intensification. Downstream, they could offer Chinese buyers SSLs that incentivise the demand for zero-deforestation soy. However, further research is needed to explore this downstream opportunity in more detail.

Initial exploration undertaken in this study suggests that Brazil-China soy traders acting alone might not be able to exert significant influence on their Chinese soy buyers from a market perspective. This implies that the argument by Folke et al. (2019), that 'should dominant traders impose effective sustainability standards throughout their supply chains, this could influence both upstream and downstream market actors', might not be generally applicable to any supply chain.

6.2 Recommendations

In the context of incentivising multiple actors through SLLs, the following recommendations summarise the actions required of different stakeholders in order to enhance the impact of traders' anti-deforestation efforts.

Brazil-China soy traders should:

- come together to agree a common framework to define harmonised anti-deforestation commitments, targets and measurement criteria. The framework should include factors identified in this study that enhance in-the-field impact.
- work together to extend the scope of Coventis to employ the new technologies they are developing to enhance traceability of soy to the farm level and share deforestation-related data to facilitate real-time decision-making in accordance with their anti-deforestation policies.

- agree a joint strategy to engage their Chinese soy buyers to publicly commit to increasing their demand for zero-deforestation soy and to support traders' anti-deforestation efforts.
- link their treasurers' remuneration packages to targets that promote the contracting of SLLs with deforestation considerations.

International banks should:

- join forces to put pressure on financial regulatory authorities to promote the establishment of a minimum threshold of anti-deforestation conditionalities that any financial institution (including investors and asset managers) must require of any borrowers in the soy supply chain.
- link specific SLL-KPIs that measure progress in deforestation prevention to SLLs adopted by any actor in the Brazil-China soy supply chain.
- promote the use of common SLL-KPIs and monitoring criteria among different borrowers in the Brazil-China soy supply chain.
- address the factors identified in this study that are limiting a more widespread adoption of SLLs among traders.
- invite major Chinese banks financing the Chinese soy industry to join them in creating SLLs for Brazil-China soy supply chain actors.

Brazil-China soy traders and international banks in partnership should:

- offer soy producers long tenor SLLs that incentivise long-term forest preservation and production intensification.
- foster conciliatory conversations with producers' associations to engage them in the co-definition of solutions to increase production while reducing deforestation.
- offer Chinese soy buyers SLLs that incentivise demand for zero-deforestation soy.

Civil society initiatives such as the TRADE HUB (with researchers in Brazil and China) could foster collaboration among national governments, private sector actors, banks and academia and assist in the definition of the required regulations, corporate policies and targets.

International Central Banks and Multilateral Development Banks should support banks by providing cheaper capital and risk-sharing for SLLs that incentivise deforestation prevention.

The Chinese government should:

- enforce sustainable soy guidelines for the Chinese soy industry (based on Solidaridad's work) that include overseas deforestation prevention.
- require the Brazilian government to halt deforestation as a conditionality linked to their trade agreements.

The Brazilian government should guarantee the enforcement of the Forest Code and the CAR and address their weaknesses.

The Brazilian and Chinese governments should:

- support initiatives that incentivise Brazilian soy producers to increase yields, intensify production and prevent deforestation.
- support traceability initiatives in the Brazil-China soy supply chain.

(from both economic and regulatory perspectives)

Chinese soy buyers should send a clear market signal that the largest importer of Brazilian soy does not accept soy linked to any kind of deforestation.

6.3 Future research

Further research could help in the implementation of the above recommendations by providing evidence on:

- How deforestation in Brazil is likely to affect soy productivity rates in the regions of the country where the soy exported to China is sourced. This would provide crucial quantitative data needed to calculate the magnitude of potential soy shortages and how these would affect the Chinese soy industry and food security. A case study based on such data would convince both the Chinese government and the Chinese soy industry of the relevance of preventing deforestation in Brazil from a Chinese

perspective. The contents of the case study should also be adapted to engage Brazilian producers as their livelihoods will be significantly impacted too.

- How the ownership structure of trade companies influences the kind of anti-deforestation mechanisms they choose and the kind of incentives they prefer. This would allow more accurate analysis of the overall impact that SLLs can have when adopted by traders.
- How feasible it is for Brazil-China soy traders to influence Chinese soy buyers and which factors would enable them to exert influence in this regard.

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8 Appendices

8.1 Appendix A: Examples of multi-stakeholder initiatives

8.1.1 Initiatives focused on the Chinese soy sector

8.1.1.1 Sustainable Soy Trade Platform (2015)

Leading organisations: The Paulson Institute, TNC, Solidaridad-China, and WWF.
Participants: the Chinese government, traders, retailers and financiers.
Aims:

- promoting environmentally sustainable production of soy in South America.
- stimulating Chinese demand for responsibly produced soy that is compliant with Brazil's Forest Code in order to prevent illegal deforestation.
- implementing sustainable purchasing policies that ensure all Brazilian soy is sourced from producers enrolled in the Brazilian rural environmental registration system (CAR).

References: Solidaridad (n.d.),Paulson Institute (2016)

8.1.1.2 Chinese Sustainable Meat Declaration (2017)

Leading organisations: WWF, the Chinese Meat Association (CMA)
Participants: the Chinese meat industry.
Aims:

- promoting sustainable meat production, trade and consumption.
- 64 companies pledged to conserve nature by avoiding deforestation in the livestock production and feed value chains.

Reference: WWF (2017)

8.1.1.3 The China Responsible Soy Sourcing Guidelines (2018)

Leading organisations: Solidaridad, Mr. Liu Denggao and Dr. Lin Tan. Supported by the Norwegian Agency for Development Cooperation.
Participants (consulted): importers, processors, crushers, feed companies, end-users, policy-makers and the financial sector.
Aims:

- preventing deforestation and land-use change
- protecting biodiversity
- promoting the imports of deforestation-free soy from South America
- continuous improvement and transparency in the soy supply chain

References: Solidaridad (2018), Solidaridad (2019b)

8.1.2 Initiatives focused on soy produced in Brazil

8.1.2.1 Amazon Soy Moratorium (2006)

Leading organisations: Brazilian Association of Vegetable Oil Industries (ABIOVE) and the National Grain Exporters Association (ANEC).
Participants: civil society, soy industry and government.
Aims:

- commitment to neither trade nor finance soy produced in areas in the Amazon biome deforested after 22 July 2008.
- commitment to zero conversion of native vegetation, encompassing both forests and non-forest ecosystems such as savannahs, grasslands and wetlands in the Amazon biome.

Reference: ABIOVE (2019).

8.1.2.2 Cerrado Working Group/Cerrado Manifesto (2017)

Leading organisations: 60 Brazilian NGOs (including WWF-Brazil, TNC, CI-Brazil and Greenpeace Brazil), IPAM (Amazon Environmental Research Institute) and Imaflora (Institute of Agricultural and Forest Management and Certification).
Participants: NGOs, consumer goods companies, and financial institutions.
Aims:

- establish an action plan to eradicate deforestation linked to soy production in Brazil's Cerrado biome.
- fundraise capital to establish a 5-year incentive scheme to reward farmers who preserve the part of the forest they could legally deforest on their land.

References: Cerrado Working Group (2017), FAIRR (2020).

8.2 Appendix B: Questionnaire for traders

Examples of questions asked in interviews with traders.

Questions around SLLs offered by banks to traders

- Has your organisation contracted any sustainability-linked loans to finance Brazil-China trade operations?
- What kind of incentives have you been offered?
- Are these incentives attractive to your organisation?
- What kind of incentives do you think would be more attractive to your organisation?
- What kind of SLL-KPIs have you set?
- Do you have any SLL-KPIs specifically on deforestation?
- What do you think SLL-KPIs on deforestation should measure?
- Has your organisation changed any internal operations or policies in order to meet targets linked to SLLs?
- Do you think your organisation is creating greater impact because of SLL-KPIs?

(If traders' companies did not use SLLs, the questions were asked from a hypothetical point of view.)

Questions around traders' finance to producers and the possibility of embedding deforestation conditionalities in it

- Does your organization offer finance to soy producers in Brazil?
- Do you set any conditionalities around deforestation prevention that are linked to the finance you offer to producers?
    - If so, how do you assess producers' compliance?
    - If not, do you envision doing so in the future?
        - If so, how?
- Do you think that setting conditionalities of this kind is likely to help you achieve your anti-deforestation targets?

Questions around traders' potential for downstream influence

- In your view, how do you think your organisation could influence Chinese soy buyers to engage with deforestation issues linked to soy production?

Questions around barriers and enablers for implementation of anti-deforestation efforts

- What are the barriers you encounter to faster progress on reducing deforestation in your soy supply chain?
- What mechanisms do you think would help you to accelerate progress?

8.3 Appendix C: Questionnaire for banks

Examples of questions asked in interviews with banks.

Questions around SLLs offered by banks to traders

- Does your organisation offer SLLs to Brazil-China soy trade companies?
- What kind of incentives do you offer them associated with SLLs?
- What kind of SLL-KPIs have you set?
- Have you set any SLL-KPIs for traders specifically on deforestation?
- To what extent do you think SLLs are driving change in traders' policies and operations?
- What do you think SLL-KPIs on deforestation should measure?
- To what extent do you think trade companies change their internal operations or policies in order to meet targets linked to SLLs?
- Are traders covering a relevant proportion of their financial needs through SLLs?
- What do you think could be done to make this proportion higher? Is it feasible?
- Is a capital interest discount the only incentive you offer to traders taking out SLLs ?
- What other incentives do you think you could offer to make SLLs more attractive to traders?

Questions around traders' financial services for producers

- What is your opinion on the fact that traders finance producers?
- What is the relationship between your bank's operations and the financial services that traders offer to producers through their financial divisions?
- Do you think that, if traders attach anti-deforestation conditionalities to the finance they provide for producers, it is likely to enhance forest preservation?

Questions around traders' potential for downstream influence

- In your view, how do you think your organisation could influence Chinese soy buyers to engage with deforestation issues linked to soy production?

Questions around barriers and enablers for implementation of anti-deforestation efforts

- What are the barriers you encounter to faster progress on meeting your anti-deforestation commitments?
- What mechanisms do you think would help you to accelerate progress?