



Agency shifts in agricultural land governance and their implications for land degradation neutrality

Niels Debonne^{a,*}, Jasper van Vliet^a, Graciela Metternicht^b, Peter Verburg^{a,c}

^a Environmental Geography Group, IVM Institute for Environmental Studies, VU University Amsterdam, de Boelelaan 1087, 1081 HV Amsterdam, The Netherlands

^b School of Biological, Earth and Environmental Sciences, PANGAEA Research Centre, UNSW Sydney, Australia

^c Swiss Federal Research Institute WSL, Zürcherstrasse 111, CH-8903 Birmensdorf, Switzerland

ARTICLE INFO

Keywords:

Sustainable land management
Contract farming
LDN
Large-scale land acquisition
Medium-scale farm
UNCCD

ABSTRACT

Given current land degradation trends, Land Degradation Neutrality (LDN, SDG Target 15.3) by 2030 could be difficult to attain. Solutions to avoid, reduce, and reverse land degradation are not being implemented at sufficiently large scales, pointing to land governance as the main obstacle. In this paper, we review dynamics in agricultural land governance, and the potential this may have to enable land degradation or provide solutions towards LDN. The literature reveals agency shifts are taking place, where value chain actors are given increasing decision-making power in land governance. These agency shifts are manifested in two interrelated trends: First, through agricultural value chain coordination, such as contract farming, value chain actors increasingly influence land management decisions. Second, international large-scale land acquisitions and domestic larger-scale farms, both instances of intensified direct involvement of value chain with land management, are overtaking significant areas of land. These new arrangements are associated with agricultural expansion, and are additionally associated with unsustainable land management due to absent landowners, short-term interests, and high-intensity agriculture. However, we also find that value chain actors have both the tools and business cases to catalyze LDN solutions. We discuss how governments and other LDN brokers can motivate or push private actors to deploy private governance measures to avoid, reduce, and reverse land degradation. Successful implementation of LDN requires refocusing efforts to enable and, where necessary, constrain all actors with agency over land management, including value chain actors.

1. Introduction

Land degradation, defined broadly as a reduction of biological productivity and a decrease in ecosystem complexity, has affected over 20% of the global vegetated land area and 1.5 billion people in the last two decades (UNCCD, 2017). On agricultural land, land degradation is mostly anthropogenic, due to unsustainable agricultural practices and ill-adapted land and water management. Underlying drivers include both socio-economic and political factors (Vorovencii, 2016). On a global scale, degradation of agricultural landscapes undermines food security, reduces carbon storage in soils and biomass, and causes major economic losses, especially in already poor areas (Muchena et al., 2005; UNDP/UNCCD, 2011).

A structural answer to the land degradation issue has been proposed by the United Nations Convention to Combat Desertification (UNCCD) through the concept of Land Degradation Neutrality (LDN). LDN has

been adopted as a target under the Sustainable Development Goals (SDGs) as target 15.3. A range of LDN brokers, actors aiming to drive progress towards the attainment of LDN, help countries to set targets and their implementation, including international NGOs, knowledge institutes, and funding mechanisms. Conceptually, LDN sets out the ambition to, on balance, maintain or increase the amount and quality of land resources by compensating any land degradation with land restoration, within specified time- and spatial-scales (Cowie et al., 2018). Technical implementation of LDN interventions occurs at a national scale, by compensating any ongoing land degradation within a land type by restoration and rehabilitation of the same amount of land of this type elsewhere. To this end, National Action Programmes are developed to envision pathways towards LDN, and concrete actions are outlined in Target Setting Programmes (Global Mechanism, 2019a).

LDN on agricultural land is feasible from a technical standpoint, as sustainable land management (SLM) and restoration techniques are

* Corresponding author.

E-mail address: n.debonne@vu.nl (N. Debonne).

<https://doi.org/10.1016/j.gloenvcha.2020.102221>

Received 17 December 2019; Received in revised form 26 December 2020; Accepted 29 December 2020

Available online 15 January 2021

0959-3780/© 2021 The Author(s). Published by Elsevier Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

readily available to counteract a wide range of land degradation issues. Yet, the bottleneck is the adoption of these techniques (Pacheco et al., 2018; Thomas et al., 2018). Land management decisions are made and influenced by a diverse set of actors, including for example smallholders, agribusinesses, agricultural cooperatives, and local to national land administrations. All of these need to be enabled and incentivized to avoid, reduce and reverse land degradation. Policy makers therefore face the challenge to create an enabling environment, i.e. a context that allows progress towards LDN (Akhtar-Schuster et al., 2017). This challenge is essentially an exercise of land governance (i.e. the *processes by which decisions are made regarding the access to and use of land, the manner in which those decisions are implemented and the way that conflicting interests in land are reconciled* (Borras and Franco, 2010; GLTN, 2018)). Land governance encompasses elements of land use policy (the laws and regulations around land use and management) and land tenure (the bundle of rights endowed on various users and user groups). Consistently, a lack of effective and responsible land governance has been cited as a major constraint for large-scale adoption of SLM and restoration/rehabilitation projects (Nkonya et al., 2016; Verburg et al., 2019).

Traditional land governance assessments assume that agency over agricultural land management (i.e. the capacity to make decisions on land use and management) lies primarily with local or national actors, such as farmers or public land administrations (Sikor et al., 2013). However, land governance can be influenced by a much broader range of actors, including for example agribusinesses, retailers and other value chain actors (VCAs) (Lambin and Thorlakson, 2018), as well as consumers. As land systems globalize, agency over rural land management decisions has expanded to include urban elites and non-local actors along commodity value chains (Peluso and Lund, 2011).

Recent literature points to major dynamics in land tenure and agency over land management decisions in the agricultural sector over the past two decades. Noteworthy are recent developments in large scale land acquisitions (LSLA), where (often foreign) investors acquire large tracts of land (Nolte et al., 2016), medium-scale farms in Sub-Saharan Africa (Jayne et al., 2016), land concentration in South America (Gómez, 2014), and contract farming (Otsuka et al., 2016). These trends point to a drastic diversification of actors relevant in contemporary land governance.

While the wider range of possible actors in land governance and environmental management is increasingly being recognized (Peluso and Lund, 2011), knowledge on their characteristics and geography is limited and scattered across disciplines. Furthermore, understanding of the implications for global environmental change issues, both in terms of threats and innovative solutions, has emerged only recently. Yet, new actors and value chain coordination are found to be associated with both severe land degradation (e.g. Liao et al., 2020), and with innovative solutions for environmental stewardship (e.g. Rueda et al., 2017). Because the heterogeneity of contexts of land degradation makes scalable LDN governance solutions highly needed (Ariti et al., 2019; Seppelt et al., 2018; Sparrow et al., 2020), it is pertinent to identify new ways to make progress towards LDN with a full consideration of the threats and opportunities that new actors present.

Most current efforts to combat land degradation and create an enabling environment for LDN are poorly reconciled with the changing land governance context. Geared towards state actors and local land managers, they remain somewhat inattentive to the role VCAs could play. For example, the National Action Programmes made by UNCCD's parties contain plans for governmental agencies, scientific institutions, and local communities (UNCCD, 2020), and rarely consider the role of VCAs as drivers of or solutions to land degradation.

The objective of this paper is to quantify and map recent dynamics in agricultural land governance and assess the implications of these dynamics for the attainment of the LDN target, both in terms of new drivers of land degradation and innovative governance solutions towards LDN. We review evidence from recent peer-reviewed and grey literature on agency shifts in land governance and their consequences for enabling

land degradation or leveraging LDN. The study focuses specifically on agricultural land and agricultural value chains. Three steps are taken towards this goal: (1) to quantify and, where possible, map current dynamics of land control and value chain coordination, and link these hitherto disparate dynamics within a framework of agency in land governance, (2) to describe the mechanisms by which land control dynamics and value chain coordination is associated with land degradation, and (3) to present ways for LDN brokers and actors along agricultural value chains to reposition themselves in this changing reality, so as to unlock novel, catalytic governance solutions for the attainment of land degradation neutrality.

2. Methods

2.1. Analytical framework and definitions

LDN requires major transitions in land use and land management, raising the question on who decides on these issues. This paper adopts the perspective of agency to formulate answers to this question. Agency is defined as the capacity of an actor to instigate changes in land use and land management. This agency is usually not wielded by a single person or institution, but rather distributed across multiple actors. As the focus is primarily on the agricultural sector, other land-based activities (mining, forestry, etc.) that are relevant for LDN are not considered.

Conceptually, we distinguish three actor groups in land governance: individual land managers, state actors, and VCAs. First, we consider land managers, defined as people with rights to control land (Table 1). Control rights are an element of land tenure next to use and transfer rights (FAO, 2002). We use the term *land manager* to denote people who are entitled to change land use and management (setting them apart from *land users*, who do not enjoy such rights). Land managers can be *land owners* if they also enjoy land transfer rights, but in many situations, the land owner and land manager of a specific parcel are not the same.

A second actor group are state actors, defined as governmental institutions at any administrative level that decide on land-related issues. This is in itself a heterogeneous group, consisting of, among others, municipalities, agricultural and environmental ministries, and landscape planners.

VCAs (i.e. actors up- and downstream of the farm in agricultural value chains) compose the third group. These actors include, among others, agribusinesses, retailers, processors, and land investors, and influence land management by setting production requirements, providing agricultural technologies, and in some cases claiming full land control and/or land transfer rights.

The relative agency of these actor groups in a given land system can be visualized in an agency diagram (Fig. 1). This diagram shows how agency is shared among the three groups, with each corner representing full agency of a single actor group. For example, the top corner represents a land system where state actors hold all authority over land-related issues, a situation that may be found in strictly protected natural reserves. In the bottom right corner, a land system of pure land

Table 1

Distinction between land user, land manager, and land owner in terms of their respective land tenure rights. Definitions are based on FAO (2002). In these definitions, rights may be formal, customary or assumed.

Has right to...	Right to use use land	Right to control use land change land use manage land grant use rights	Right to transfer use land change land use manage land grant use rights grant control rights sell/transfer land to others
Land user	Yes	Optional	Optional
Land manager	Yes	Yes	Optional
Land owner	Yes	Yes	Yes

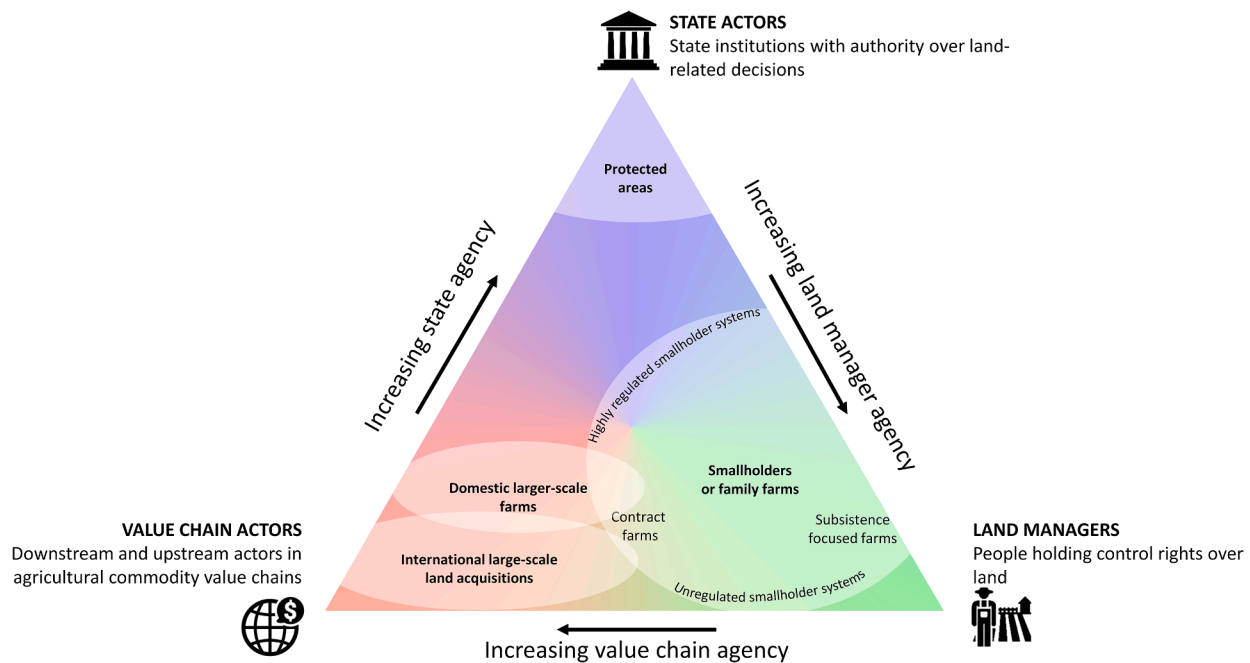


Fig. 1. Agency diagram. Land governance in a given land system is characterized by the extent to which either of three agent groups have agency over the land management decision-making process. Smallholder or family farms are a heterogeneous group of land systems, which are dominated by individual land managers but may have significant state or value chain agency. Novel land systems such as international LSLAs or domestic larger-scale farms, occupy different positions on the diagram. The position of a given land system on the diagram informs the design of interventions to, for example, avoid, reduce or reverse land degradation, and indicates the primary partner(s) to address. Positions on the diagram can shift through time.

manager agency is depicted, which is perhaps most closely approximated by subsistence-focused communities in remote places where state actors have no effective power. The bottom left corner represents a context where land decisions are made only by VCAs, a situation that is approximated by certain instances of plantations in countries with weak land governance institutions. In reality, however, agency is usually shared by at least two actors, and is therefore situated more centrally in the diagram. For example, most smallholder farmers act with relative autonomy but are subjected to the land laws set out by state actors insofar as these are effectively enforced, and will respond to land management requirements set by VCAs insofar as following these requirements is beneficial to them.

2.2. Synthesis of agency shifts and their implications for LDN

We combine quantitative and qualitative approaches to synthesize the extent and geography of agency shifts in land governance and their implications for LDN, in three steps.

First, we quantified and mapped agricultural land governance dynamics. Value chain coordination was approximated by the scientific literature describing contract farming arrangements. Recent literature (2007 and onwards) on contract farming was collected using Keywords “Contract farming” and “Contract Farm” in Web of Science. Papers were screened on relevance, retaining only those describing pre-harvest agreements between farmers and buyers. A cartography of retained papers was prepared by pinpointing the location of the case(s) described, and a timeline of publications was made. A distinction between local, regional and national case studies was made, with local case studies describing a relatively small area (e.g. a village), regional case studies describing a larger subnational area (e.g. a province) and national studies characterizing a country. Where a single paper described multiple cases, these were mapped separately.

International LSLAs were mapped and quantified using data available in the crowdsourced Land Matrix (Land Matrix, 2019) database. We used this database to map transnational land acquisitions for which

contract negotiations have been concluded. Domestic Larger-Scale Farms (DLSFs) are not mapped, as this highly heterogeneous process is not easily captured under a single, quantifiable denominator. Instead, we discuss the various shapes DLSFs take in different parts of the world, and provide statistics where these are available.

Second, to describe the mechanisms by which agency shifts can lead to land degradation, we synthesized the current state of knowledge on the environmental impacts of value chain coordination, LSLAs, and DLSFs. We searched academic search engines and repositories, including Google Scholar and Web of Science, using keywords including “large-scale land acquisition”, “land grab(bing)”, “land tenure”, “agricultural commercialization”, and more, and identified papers or grey literature that address environmental impacts of LSLAs, DLSFs, and the many instances of value chain coordination. Retained documents were used for forward and backward snowballing to retrieve additional entries. From the collected literature, we retrieved and coded evidence for causal inferences (where land degradation is merely found to be associated with the process) and mechanisms (where the way in which the process leads to land degradation is empirically evidenced), for LSLAs, DLSFs, and value chain coordination separately. We used Mendeley to group and annotate retrieved literature (Mendeley database available at request). This allowed us to list the mechanisms (hypothesized to be) at play in specific contexts, and the agreement and confidence of the current state of scientific knowledge concerning these mechanisms.

Third, to identify ways for VCAs, governmental actors, and other LDN brokers to reposition themselves and unlock novel, catalytic governance solutions for the attainment of LDN, we similarly performed a synthesis exercise on literature retrieved using keywords including “private land governance”, “corporate sustainability”, as well as keywords relating to specific instruments (e.g. “certification”). Adopting and combining existing frameworks (Rueda et al., 2017; Schaltegger and Burritt, 2018), we question to what extent VCAs can be instrumental for LDN, and how LDN brokers can leverage motivators to move VCAs to do so. We retrieved and coded evidence on the use and effectiveness of instruments described in the abovementioned frameworks from the

collected literature, using Mendeley to group and annotate documents, and assessed the agreement and confidence apparent in the current state of the art.

3. Land governance dynamics

Two interrelated trends of the 21st century, with relevance to the questions surrounding the distribution of agency to decide over land management, are of interest. We present literature on value chain coordination, where downstream and upstream actors in agricultural value chains use contracts and other mechanisms to influence land management of farmers embedded in the value chain. Subsequently we present evidence of the shift of land control rights have towards new actors. Here, we focus specifically on LSLAs and DLSF, two highly visible trends that introduce new actors and break away from the family farming structure.

3.1. Value chain coordination: supermarkets, processors and contract farming

Agricultural value chains can shape land management of farmers embedded within them, through predicating inputs and technologies that are available to farmers, and standardizing agricultural production (Reardon et al., 2009; Zagata and Sutherland, 2015). A major restructuring of the global agri-food industry is taking place, characterized by a closer direct involvement of VCAs with the land management of their producers, especially in areas near urban centers (Lee et al., 2012; Masters et al., 2013). Such value chain coordination can lead to on-the-ground land management changes (Rueda and Lambin, 2013). A highly visible symptom of this trend is the global rise of supermarkets (Blandon et al., 2009; das Nair, 2018; Reardon and Gulati, 2008). Supermarkets tend to set specific standards for how crops should be produced and impose quality standards on the products themselves (Hazell et al., 2010). This has the potential to influence land management practices (Handschuch et al., 2013; Neven et al., 2009).

Agricultural processors and large-scale trading firms are also increasing their market share and are increasingly engaging in closer relationships with supplying farmers. Documented sharp increases are reported in Kenya and Zambia, but the full extent of this dynamic is not yet fully understood (Sitko et al., 2018). Large-scale trading firms are often found to provide agricultural inputs and farmer trainings, thereby influencing land management (Sitko et al., 2018).

The relations between VCAs (supermarkets, trading firms, processors) and land managers are increasingly formalized through contract farming; which encompass a variety of agreements between farmers and buyers (Meemken and Bellemare, 2019). Three types of contract arrangements exist, each with increasing control over the land management of the contracted farmers (Prowse, 2012). Through marketing contracts, a processor and farmer only specify the quantity, price and quality of the product in a contract; resource-providing contracts require the processor to provide inputs (seeds, fertilizer, specific hardware), often as a loan, thereby exerting some control over the use of these inputs; whereas production-management contracts include specific production preconditions. A special form of contract farming associated with frontier contexts are crop boom-and-bust cycles (Hall, 2011; Ornetsmüller et al., 2019), often described in Southeast Asia. These cycles see smallholder farmers offered contracts which are to some extent predatory in nature, to grow cash crops. After a surge in contract adoption, a combination of land degradation and indebtedness creates a crop bust (Mahanty and Milne, 2016).

A global overview of the extent of contract farming is currently lacking. Data from the United States, Japan and Europe indicate that roughly more than a third of total agricultural production is produced under contracts (Otsuka et al., 2016). In the Global South, contract farming is important in some countries, (e.g. in Kenya, where 40% of farmers produce under contract), while in other countries (Vietnam,

Ghana, Uganda), scarce evidence suggests that 5% of farmers produce under contract (Oya, 2012).

While empirical evidence is scarce, most literature reports on a rising importance of contract farming, both in developed and developing countries (Bellemare and Lim, 2018; Otsuka et al., 2016). Furthermore, a wealth of case studies (Fig. 2) scrutinizing the micro- and macro-economic impacts of contract farms signals their increasing importance (Smalley, 2013; Wang et al., 2014). These case studies indicate that value chain coordination through contract farming is a global phenomenon, with case study hotspots in East Africa, Ghana, Southeast Asia and the Indian subcontinent.

3.2. Land control dynamics: International LSLAs and DLSFs

Concurrent with the trend towards increased value chain actor involvement with land management, major land control dynamics are taking place. Land control dynamics are changes in the type of actor that hold control rights over land (see Table 1), and can therefore decide on land use and land management. These land control dynamics introduce international actors (e.g. international LSLAs), or a variety of novel domestic actors that diverge from typical family farming operations.

International LSLAs are acquisitions through lease, concession, or sale of large tracts of land to international agribusinesses, investors, and foreign countries. The most extensive global repository of verified LSLAs indicates that, since 2000, over 80 million hectares of land has been acquired (Land Matrix, 2019). A timeline of LSLAs (Fig. 3) shows a very rapid rise between 2007 and 2014, after which an apparent stagnation is observed. This stagnation could represent an actual trend, but is also partly explained by time lags between the land acquisition and its reporting in the Land Matrix database (Nolte et al., 2016).

Plantation-style agriculture managed by foreign parties is historically no novelty, with similar instances having existed in Roman, medieval, colonial and modern times (Alden Wily, 2012). However, in post-colonial times, the policy environment changed to foster small-scale, family farm production in most areas of the Global South. The sudden surge in plantation-style agriculture since 2007 is, therefore, a trend-breaking aberration (Byerlee, 2014).

The LSLA phenomenon is global in reach (Fig. 3), with hotspots in Sub-Saharan Africa, Southeast Asia, Eastern Europe and Latin America (Constantin et al., 2017; Rulli et al., 2012). Land is acquired by an opaque plethora of international agribusinesses and investment funds (Cotula, 2012) mostly for agriculture, although forestry, tourism, industry, conservation projects and speculation are also notable intentions for such investments (Nolte et al., 2016).

LSLAs have been problematized from different disciplinary perspectives (Dell'Angelo et al., 2017). LSLA intentions often fail to come to fruition, because frequently, land rights have been transferred to nonviable businesses, or to actors interested in the speculative future value of the land rights (Deininger et al., 2011). Violations against local land rights have been widely reported (Anseeuw et al., 2011). The aspiration that LSLAs would develop intensive agriculture on non-forested, unused land (Deininger et al., 2011) has largely been debunked, as LSLAs target land with these characteristics in only a quarter of land deals globally. Oppositely, most deals target either populated croplands (displacing local people and creating secondary land expansion), or forests (Messerli et al., 2014).

Domestic larger-scale farms are observed in many countries and contexts. In general, these land systems capture a removal from family farming towards more capital-intensive, larger-scale farming controlled by domestic elites. Family farming is still the dominant mode of agricultural production worldwide when quantified in terms of the number of farms (Lowder et al., 2016). However, literature suggests that, across the globe, domestic elites are (re-)entering the agricultural sector, engaging in farming at larger spatial and capital scales using business models that diverge from family farming in numerous ways.

In Sub-Saharan Africa, DLSF is framed under the narrative of “the

Contract farming case studies

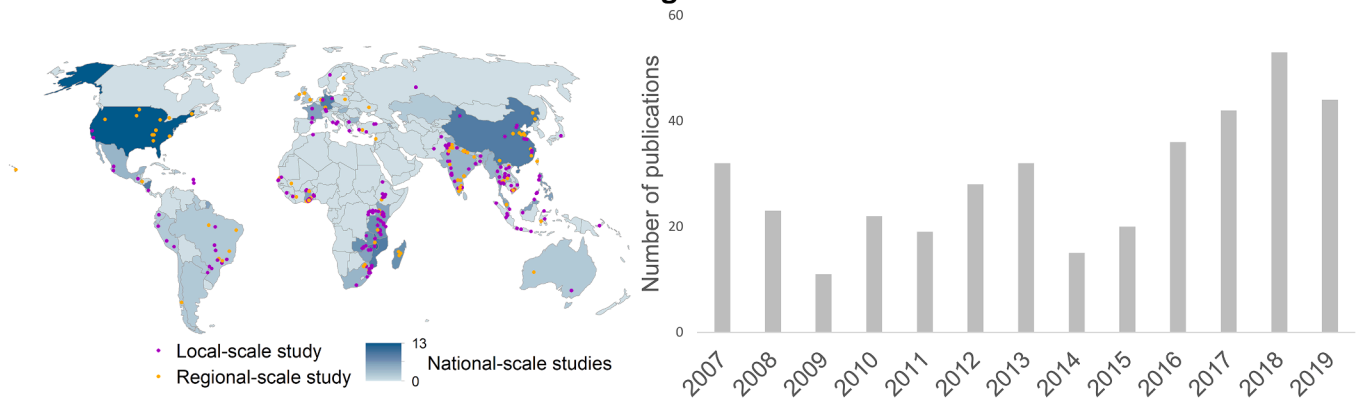


Fig. 2. Timeline and locations of case studies reporting on contract farming as a proxy for the geographical extent and importance of value chain coordination. Hotspots of literature on contract farming are apparent in East Africa, Ghana, Southeast Asia, and the Indian subcontinent. Relative cold spots are Latin America and Australia. Developing countries are more often covered by local case studies, while developed countries have more national-scale studies.

International large-scale land acquisitions

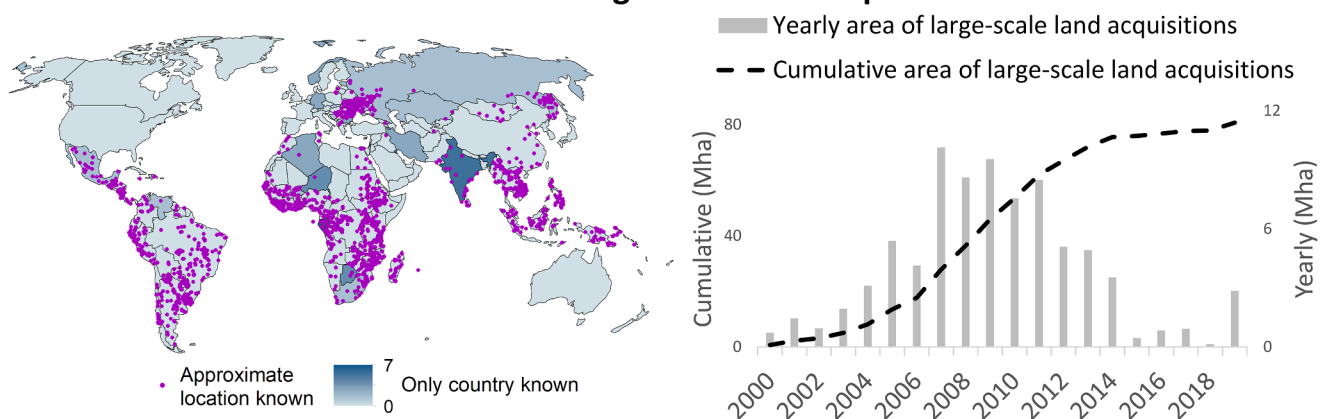


Fig. 3. Timeline and location of international LSLAs as reported in the Land Matrix database. LSLAs for which the location is known with at least regional precision are shown as dots, while LSLAs for which only the country is known are shown as blue shades. The timeline shows a stagnation in recent years, which may be partly explained by a data gathering time lag but could also indicate actual stagnation. Figures represent concluded international deals since 2000. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

rise of medium-scale farms” (Jayne et al., 2016). These are entrepreneurial farms run by domestic, often urban-based managers operating at a larger scale and in a more capital-intensive way than is usual in their regional or national context. There are indications that medium-scale farms represent a relatively rapid urban takeover of the countryside. Empirical evidence on medium-scale farms comes from a number of national-scale case studies for Zambia (Sitko and Jayne, 2014), Malawi (Anseeuw et al., 2016), Ghana (Chapoto et al., 2013), Kenya (Debonne et al., 2020) as well as multi-country studies in West Africa (Hilhorst et al., 2011) and Southern Africa (Hall et al., 2017; Jayne et al., 2016). The most complete empirical study (Jayne et al., 2016) builds on repeated agricultural censuses (Kenya, Ghana, Tanzania, Zambia) and finds that the share of land belonging to the smallholder segment (defined as smaller than 5 ha in the study) is generally declining, while the medium-scale segment (5 – 100 ha) is growing. Newcomers in this segment are often urban-based individuals, and depart from the family farm business logic (Anseeuw et al., 2016; Sitko et al., 2018; Sitko and Chamberlin, 2015). Geographical analyses find that medium-scale farms are located in highly accessible areas close to major towns and cities (Sitko and Chamberlin, 2015). However, results of a systematic survey of medium- and small-scale farms in the Kenyan Rift Valley finds that the qualities attached to this farm size bracket in earlier studies, such as their urban origin, entrepreneurship, or tendency to grow non-staple

crops, are only valid for a subset of medium-scale farms, and are also found in a subset of small-scale farms (Debonne et al., 2020). This indicates that, while larger, business-oriented farms may be overtaking the African countryside in some places, the evidence is mixed and the extent of this dynamic remains difficult to estimate.

Medium-scale farms can either be characterized as an element of structural transformation which is part of other megatrends such as urbanization and the rise of supermarkets (Meyfroidt, 2017a; Neven et al., 2009), or as an elite capture akin to LSLA (Sitko and Jayne, 2014). The fragmented nature of landholdings under customary land tenure regimes in Africa has been noted as a major obstacle to the adoption of some agricultural technologies (notably mechanization), and the scope to consolidate landholdings from within a customary land tenure system is often limited (Asiama et al., 2019). Medium-scale farms break with customary tenure, and use statutory land tenure arrangements that, when backed by state power, can overrule existing customary land rights (Chimhowu, 2018). Whether this lateral entry of capital-intensive farmers is a necessary source of dynamism or a hostile takeover of customary spaces is an open debate (Hall et al., 2017).

In Latin America, DLSFs are captured under the umbrella of “land concentration”, most notably in Argentina and Brazil. While land concentration is to a large extent a historical relict, it has intensified since 2000 (Gómez, 2014). In Argentina and Paraguay, small family farms are

consolidated into larger farms, often for soy production, through leasing by capital-endowed individuals. These tenants lease and pool numerous adjacent farms, often without personally residing on-site (Elgert, 2016; Urcola et al., 2015). In Brazil, land concentration is partly attributed to elite capture of land for speculative and productive purposes, enabled by unclear land tenure regulations (Reydon et al., 2015; Sparovek et al., 2019). Rapid concentration has also been noted in Uruguay, where land is transferring from individuals to domestic corporations (Piñeiro, 2012). To varying extents, such processes are taking place across the continent (for an overview, see Borras et al., 2012).

Likewise, a fast-paced increment of farm scale enlargement is occurring in Europe. The number of farms in the European Union has decreased by 25% between 2005 and 2016. Most of the disappearing farms are small (<5 ha), and are being consolidated into larger farms; the only growing farm size segment is the one of 100 ha and above (EUROSTAT, 2018). The specific dynamics of farm consolidation in Europe are highly context-specific, and driving factors include demography, economic liberalization and competitiveness, and policy biases (Bartolini and Viaggi, 2013; van Vliet et al., 2015). A significant fraction of the resulting large farms (40% of 304 000 farms with an output of over 250 000 euro per year) are owned by various types of agribusiness holdings (EUROSTAT, 2018), signaling that European land is increasingly being managed and owned by business interests instead of family farmers.

3.3. Land governance agency shift

Value chain coordination and land control dynamics are shifting agency in land governance, causing a redistribution of agency over land

management decisions (Fig. 4). In other words, the answer to “who decides?” on land management is changing. As VCAs set production standards and provide access to agricultural inputs and technologies, they co-determine land management practices at global scales. This significant agency is, for example, leveraged to enforce health and safety standards across entire value chains, including soil and water management (Subervie and Vagneron, 2013).

Land control dynamics further contribute to these agency shifts. This occurs directly, as land control rights are being transferred away from state actors (e.g. when LSLAs target protected areas or other state land) and from individual land managers. Land becomes controlled by actors that are more closely associated with VCAs: they are wholly reliant on VCAs through contracts or, in the case of many LSLAs, are owned by agribusinesses.

Indirectly, land control dynamics are additionally found to override state regulations, either by clientelism or by unpenalized rule breaking (Cotula et al., 2011; Messerli, 2015; The World Bank, 2014), thereby significantly reducing state agency. The various modes of DLSFs are similarly associated with a redistribution of agency away from state actors. For example, African medium-scale farms managers have been found to dominate agricultural policy-making processes by occupying powerful positions in farmer organizations (Jayne et al., 2016).

4. Agency shifts as enablers of land degradation

A document analysis on literature associating LSLAs, DLSFs, and/or value chain coordination with processes of land degradation reveals that agency shifts are associated with two key processes of land degradation: conversion of natural areas (e.g. deforestation), and introduction and

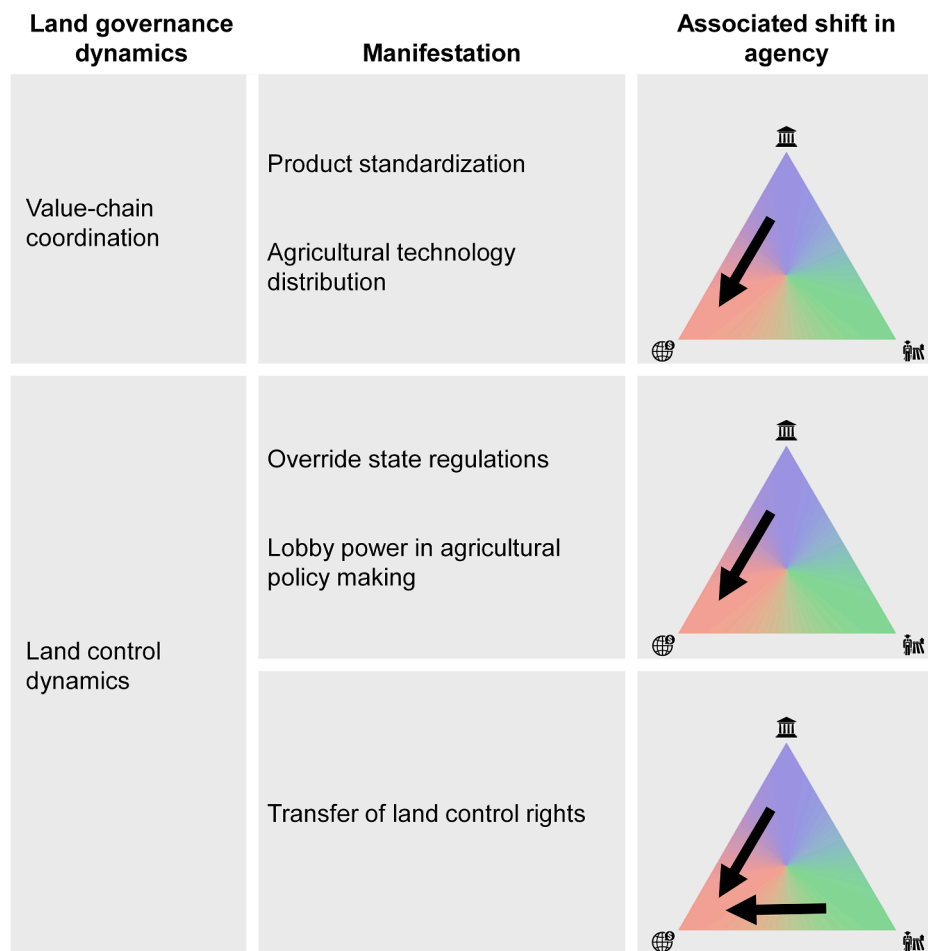


Fig. 4. Agency shifts as a consequence of value chain coordination and land control dynamics.

incentivization of unsustainable land management. The degree to which it can be claimed various forms of agency shifts are a necessary or sufficient cause of land degradation, and the certainty surrounding such claims, varies per land degradation process and per land governance dynamic. In most cases, the agency shift is at least found to be generating the possibility of intensified land degradation, e.g. by providing technology or institutional capacity that was not present before. Therefore, while in some cases, stronger causal language may be appropriate, we opt to frame agency shifts more carefully as enablers of land degradation, implying that they widen the range of land management options and thereby include damaging options. We discuss the specific causal mechanisms described in literature below.

4.1. Conversion of natural areas: Ecological and institutional unlocking

The scope for expansion of global cultivated areas at the cost of natural areas is dependent on ecological limitations and institutional rulesets (Eitelberg et al., 2015). Ecological limitations and institutional rulesets limit where agriculture is feasible and allowed, thereby safeguarding areas that are ecologically too unsuitable for agriculture and/or are adequately protected. We indicate below how VCAs have ecologically and institutionally unlocked some of these safe havens.

First, ecological limitations can to some extent be overcome by technology-intensive farming systems using, for example, irrigation technology or synthetic fertilizers (Angelsen and Kaimowitz, 2001; Hall et al., 2017). This “ecological unlocking” is described in a number of case studies. For example, the conversion of an extensively used dryland area to a biofuel LSLA in Mozambique was made possible by developing irrigation infrastructure at a scale unattainable by local smallholders (Borras et al., 2011). For LSLAs, ecological unlocking has not been an accidental by-product, but rather an explicit element of its supporting narrative to develop “underused”, “marginal” lands in “land-abundant areas” (Deininger and Byerlee, 2012).

Ecological unlocking is also a central tenet of many contract farming schemes where downstream VCAs provide inputs or hardware to farmers to enable them to adopt crops. A prime example is the rapid spread of rubber in Southeast Asia, which is replacing shifting cultivation landscapes and forests (Ahrends et al., 2015). Similarly, boom and bust dynamics build on dispersion of technologies such as hybrid maize and synthetic fertilizers through middle men, thus allowing crops to be grown outside of their ecologically suitable range, albeit only for a limited time and at the cost of severe land degradation (Ornetsmüller et al., 2019).

Second, institutional unlocking denotes the diminishing power of regulation, land use planning, or protected areas, in limiting where agriculture can expand into. This further enables conversions of natural areas, again especially in the case of LSLAs. The apparent disregard of LSLAs to respect the integrity of protected areas or stay clear of valuable ecosystems (Koh and Wilcove, 2008; Messerli, 2015) indicates that institutional barriers against degradation have become largely irrelevant in an LSLA context.

Many LSLAs are expansionist in nature and thereby often claim new areas beyond the extent of current agricultural areas at the expense of nature. Geographic analysis has shown that, globally, LSLAs often target forested areas (e.g. in Brazil, Papua New Guinea, Indonesia, Congo), and acquired areas and their surroundings are found to be deforested at faster rates than comparable non-acquired areas (Davis et al., 2015; Eakin et al., 2014; Magliocca et al., 2019). Besides forests, other important habitats such as savannas are lost to LSLAs, thereby undermining efforts to safeguard biodiversity (Debonne et al., 2019).

In contrast to the expansionist nature of LSLAs, preliminary spatial analyses of DLSFs in Africa indicates that these farms predominantly develop in areas with high agricultural potential (Sitko and Chamberlin, 2015), and may, therefore, be less likely to cause natural ecosystem losses (as target areas are usually already cultivated). For contract farming, natural area loss is found when the short-term lucrativeness

and/or indebtedness drives farmers to expand their landholdings, as has been observed in the Southeast Asian rubber sector (Ahrends et al., 2015), cattle rearing in the Brazilian Amazon (Pereira et al., 2016), or the many oil palm outgrower schemes in the global tropics (e.g. in Indonesia: Euler et al. (2015) and Peru: Bennett et al. (2018)).

4.2. Introduction and incentivization of unsustainable land management

Agency shifts in land governance may also enable land degradation in cases where the affected areas were already under agricultural use, if the agency shift incentivizes or introduces unsustainable land management practices. As VCAs increase their agency over land management decisions and land control dynamics introduce new actors, three causal links explain an often-observed shift to more unsustainable land management practices.

First, capital and technology can significantly intensify land management. Value chain coordination delivers capital and technology, notably through input-providing contract farming. Moreover, compared to smallholder farms, LSLAs and DLSFs are typically more capital-intensive. Conventional agricultural intensification, while able to increase crop yields in the short term, can come at the expense of other ecosystem functions and can be unsustainable in the longer term (Deguines et al., 2014). For example, crop boom and bust cycles are instigated by VCAs introducing seeds and inputs for intensive agriculture in extensively used landscapes, leaving depleted and eroded soils after the bust phase (Ornetsmüller et al., 2019). Overuse of inputs and a switch from diverse cropping systems to monocultures has also been described for LSLAs (e.g. Friis, 2015; Mann and Bonanomi, 2017). A World Bank study found that 32 out of 33 surveyed LSLAs engaged in patently deleterious land management, including unsustainable monocropping, excessive use of pesticides, and water resource depletion and pollution (The World Bank, 2014). Similarly, a multi-country West-African study found anecdotal evidence of more soil erosion occurring in DLSFs relative to smallholder farmers (Hilhorst et al., 2011).

Second, land control dynamics have introduced actors that often act as absentee, distant land owners/managers, creating a situation where land management decisions are made by people who are physically disconnected from the land they manage. Similarly, VCAs up- or downstream of the farm influence land management of farms without residing on, or near to, these farms. It can be hypothesized that absentee land owners/managers are less inclined to value sustainability, as they are protected from immediate negative effects of unsustainable practices. Corroborating evidence for this hypothesis is found in several cases; in the United States, absentee land owners have been found to be less likely to manage against soil erosion or participate in soil conservation programs (Petrzelka and Armstrong, 2015; Stroman and Kreuter, 2015); in a case study from the Philippines, Ravnborg (2003) found that absentee land managers were the only land manager group contesting restrictions on adverse agricultural practices, pushing for more lenience in the use of chemical inputs and opposing to land restoration projects. Contrastingly, in Australia, absentee land owners using their land mostly for recreational purposes have been found to engage in conservation efforts (Kam et al., 2019). Currently, the evidence concerning this hypothesis is still too anecdotal to warrant strong claims.

Third, the agency shift may promote a short-term economic interest in land, undermining longer-term sustenance of productive capacity. Growing crops in suboptimal environments can cause severe or even irreparable land degradation, yet still make business sense to actors who do not rely on that specific land for their long-term sustenance and livelihood. This is a defining characteristic of crop booms (Hall, 2011; Mahanty and Milne, 2016). Furthermore, many studies have noted the surprisingly large amount of failed LSLAs, where production stops within a few years after startup (Nolte et al., 2016), often due to ecological unsustainability and soil depletion (Messerli, 2015; Schönweger and Messerli, 2015). DLSFs are estimated to be more embedded within their local communities and to create long-term

economic linkages, but empirical evidence is scarce (Hilhorst et al., 2011; Meyfroidt, 2017).

5. Responses to the agency shift

Responses and measures to attain the LDN target may be more effective if they are tailored to the new global land governance contexts. Hereafter we outline how value chain coordination and land control dynamics can be leveraged to implement LDN measures at scale. First, we discuss the instruments that VCAs have at their disposal to avoid, reduce, and reverse land degradation. Second, we identify motivators for the adoption of these instruments, and how state actors and other LDN brokers can interact with these motivators.

5.1. Instruments of VCAs

VCAs may use a mix of metaphorical carrots, sticks, and sermons to, respectively, promote LDN, penalize unsustainable land management, and foster awareness, knowledge, and partnership towards LDN in their value chain (Fig. 5). Following Rueda et al. (2017), we organize the possible value chain instruments based on stringency. We further assess to what extent, and how, instruments can be used in either step of the LDN response hierarchy. Instruments aiming to avoid land degradation must be able to purge the value chain from products associated with ongoing processes of land degradation. Reduction of land degradation in value chains can be achieved by ensuring that suppliers transition to SLM and abandon degrading land management practices. Land degradation reversal requires that the productive potential and ecological functioning of degraded landscapes is (partially) restored.

Trainings are often used by agribusinesses, in a fashion similar to governmental or NGO-led agricultural extension (Anderson, 2008). While the overall focus of such trainings is usually farm yield maximization, sustainability can be part of the curriculum too. For example, Callebaut, a major chocolate processing company, assists its suppliers to enhance the carbon sequestration potential of cocoa farms, among others by promoting tree-shaded cocoa (Barry Callebaut, 2018; Cocoa Horizons, 2018). Such interventions constitute an effort to not only avoid and reduce degradation, but also to reverse it.

Codes of conduct are intentions and targets set and evaluated by companies. They are low-stringency interventions because, while their goal is a modicum of self-regulation, non-adherence is not penalized - and in many cases not made public. Their effectiveness is, therefore, entirely dependent on the internal discipline of the company and the extent to which the code of conduct is able to affect the core business model (Mårtensson and Westerberg, 2016). In most cases, a supplier's non-compliance will not constitute grounds for exclusion from the

supply chain (Lund-Thomsen and Lindgreen, 2014). Unilever provides an example of a wide-ranging environmental code of conduct. Their Sustainable Agriculture Programme defines 11 standards, among which are soil health, soil loss, nutrients, pest management, and biodiversity. Supplying farmers and companies are encouraged to comply with these standards, and develop strategies to book incremental progress. Despite the non-compulsory nature of the standards, the code of conduct provides a common definition of sustainability and allows Unilever to track its progress (Unilever, 2019).

Roundtables are sector-wide platforms where multiple stakeholders (farmers, processors, retailers, NGOs) meet to share best practices and strive towards sector-wide sustainability (Schouten and Glasbergen, 2011). Typically, roundtables produce a shared code of conduct to which participating companies commit to comply. Examples include the Roundtable on Sustainable Palm Oil, the Roundtable on Sustainable Biofuels, and the Roundtable on Sustainable Soy. Their scope is similar to the codes of conduct for individual companies, although the focus of roundtables has typically been on halting rampant deforestation rather than the promotion of SLM practices. Roundtables can issue certificates for compliant producers, thereby setting stricter requirements than are provided in the national laws of producers (Garrett et al., 2016).

Eco-certification is a communication tool developed to allow producers to ascertain the sustainability of their products to obtain a premium price from consumers with a sustainability preference (Defries et al., 2017). The certification is performed by an external auditor based on a set of criteria and allows for a label to be displayed on certified products. For example, the Rainforest Alliance currently certifies 1.3 million farmers operating on 3.5 million hectares and auditing based on 23 mandatory and 77 flexible criteria. Criteria include nature conservation and proper agricultural input use (Rainforest Alliance, 2018). Whether eco-certification (or the certification issued by roundtables) is able to spread SLM rather than merely reward current SLM practitioners remains unclear (Blackman and Rivera, 2011).

Contract conditions are clauses attached to contract farming schemes. Where contract farming takes the form of a production-management contract, downstream VCAs can demand crops to be produced under a specific land management (Abebe et al., 2013; Bellemare and Lim, 2018). These conditions are often related to food safety, imposing, for example, specific food storage conditions. However, sustainability can be part of these conditions as well. For example, in Madagascar, Minten et al. (2009) reported that farmers producing vegetables under contract for European markets face strict requirements, and as a consequence show more sustainable management of resources. Similarly, Van Hoi et al. (2010) describe input limitations imposed on Vietnamese farmers that produce vegetables for export.

Retailer standards are developed to enable retailers to perform due

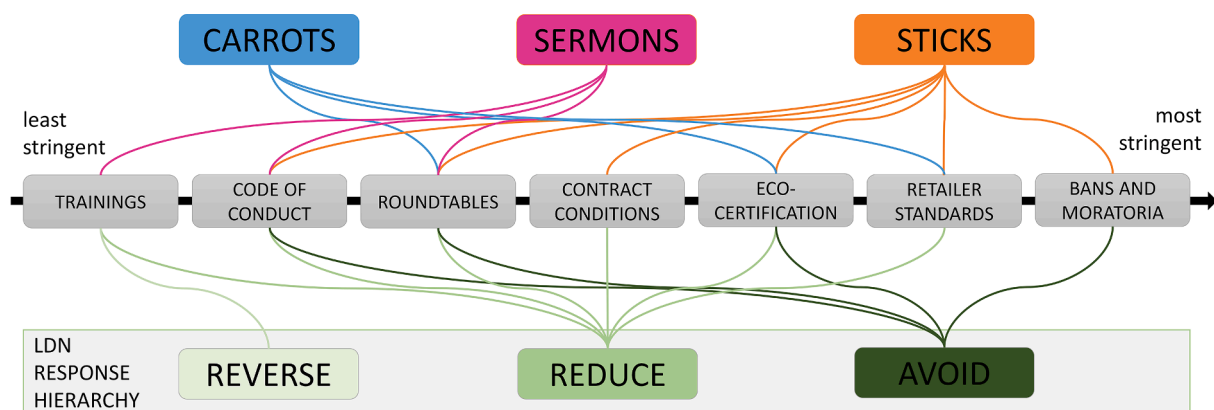


Fig. 5. Instruments available to VCAs to promote SLM and self-regulate sustainability take the form of carrots (rewarding positive action), sticks (penalizing negative action) or sermons (sharing information and best practices). Interventions are ordered from least to most stringent (left to right). There are numerous interventions that can be instrumental in avoiding or reducing the land degradation associated with a value chain. The scope for reversal of land degradation remains limited.

diligence, and share similarities with eco-certification schemes. For example, GlobalGAP (Global Partnership for Good Agricultural Practices) is used by over 40 large retailers in 15 countries (mainly in Western Europe). These retailers thereby ensure that products in their shelves meet all GlobalGAP criteria. The certification is very broad, incorporating elements of hygiene, traceability, on-farm labor, and food safety. While sustainability and environmental criteria are present, these are typically “recommended” rather than imposed. For example, GlobalGAP asks that consideration be given to enhancing the environment and to minimize environmental impact (GlobalGAP, 2017). For farmers wishing to export to the United Kingdom, the Netherlands or Germany, being certified by GlobalGAP is a de facto requirement as virtually all retailers in these countries require it (Colen et al., 2012). In Vietnam, rice farmers certified by GlobalGAP and VietGAP (the Vietnamese certification institution) are found to use significantly less inputs (fertilizers and pesticides) compared to non-certified farmers (Stuart et al., 2018).

Bans and *moratoria* are high-stringency tools that aim to completely remove producers that practice degrading land management from the value chain. The Amazon Soy Moratorium, for example, precludes farmers operating within recently deforested areas of the Amazon rainforest to sell to participating processors. Because participants include major processors like Cargill and Bunge, a significant part of the soybean sector could be cornered. If complemented by remote sensing-based monitoring, deforestation can be attributed to individual producers, thus creating a major disincentive to further degradation (Nepstad et al., 2014). However, critics argue that this moratorium ignores the stepwise nature of land use changes (e.g. where forest is first converted to pastures, and only later these pastures are converted to soy plantations; Arima et al. (2011)). Furthermore, as soy expansion is effectively curtailed in the regulated area, it moves towards unregulated areas instead (Gibbs et al., 2015).

Whether or not VCAs can be effective environmental stewards is heavily debated. In the field of forest conservation, value chain initiatives have been found to exert relatively minor and often unverifiable impacts, and where local effectiveness is evident, it is often offset by leakage of deforestation to other areas (Blackman and Rivera, 2011; Gibbs et al., 2015; Lambin et al., 2018). However, as an increasing amount of brands and companies are adopting standards, incremental positive changes are occurring (Defries et al., 2017). Whether or not current approaches are effective, the increasingly consolidated nature of many food supply chains, where a handful of companies control the markets for e.g. coffee, banana, palm oil or cocoa, creates an imperative to interact with VCAs to develop more effective measures (Folke et al., 2019).

5.2. Motivators for value chain action towards LDN and options for policy makers

Following the previous section, we now question why VCAs would

adopt instruments in line with the LDN target. Instruments are adopted when there is a business case to do so, and these can range from reactionary appeasement of environmental criticism to reputational business cases or the recognition of LDN as an inherent quality of responsible agribusiness (Schaltegger and Burritt, 2018). We identify four motivators that interfere with such business cases and explore the role of policy-making to stimulate, enable, or push VCAs (Table 2).

First, to motivate VCAs concerned with building or maintaining a brand reputation, the link between products and their associated land degradation should be made transparent. Innovative tools, such as the TRASE database (www.trase.earth) are allowing researchers to scrutinize commitments (e.g. zu Ermgassen, 2020). However, agricultural value chains remain opaque (Keene et al., 2015; McSweeney and Coomes, 2020), and attributing land degradation to specific actors or products continues to be challenging (Paitan and Verborg, 2019).

Second, land degradation often leads to reduced yields. Therefore, SLM can — in many cases — maintain or increase yields, although effects may not be immediate (Schmidt and Tadesse, 2019). However, for some forms of SLM and in certain contexts, yields will not increase but will rather be part of a trade-off against other co-benefits (Seufert and Ramankutty, 2017). When SLM increases yield or reduces risks, it is well-aligned with business interests. Governments can enable this motivator by supporting innovation, e.g. by providing transitional funding, microfinance, or linkups with research institutes. For example, the LDN Fund is a global initiative to provide structural funding to businesses aiming to contribute to LDN (Global Mechanism, 2019b; Quatrini and Crossman, 2018). However, as described above, institutional and ecological unlocking processes imply that, from the perspective of a VCA, degraded land can easily be replaced by tapping into frontier land. A disregard for the long-term productive capacity in a context of narratives of available land (Deininger et al., 2011) may therefore pose a challenge to triggering this motivator. Secure land tenure for smallholders and stringent land zoning policies can dissuade unmitigated agricultural expansion and encourage VCAs to maintain or enhance the soil quality of current agricultural land.

A third motivator is the ability for sustainability leaders to tap into niche markets, using certificates and labels to attest to sustainable practices. The potency of this motivator grows when more consumers are willing to pay higher premiums. Policy makers can further mainstream and regulate certificates and labels, create awareness among consumers, and provide financial assistance to support sustainable transitions and certification. However, the amount of consumers willing to pay for less degrading products is limited (Wei et al., 2018). Certification may help to support an ecological vanguard, but niche markets are easily saturated and therefore relying on consumer preferences is unlikely to be sufficient (Rueda et al., 2017).

Fourth, VCAs may be pushed towards sustainability by legal requirements, taxes, or subsidies. These motivators are especially required to move environmental laggards (i.e. those who fail to find a business

Table 2
Motivators for value chain action towards LDN, and their respective enablers, triggers, and challenges.

Motivator	Enablement / trigger	Challenges
Reputational damage	- Scrutiny, naming and shaming - Value chain transparency (e.g. TRASE)	- Lack of traceability and value chain opaqueness
Land degradation reduces yields, SLM provides long-term yield stability and/or increases yields	- Support SLM innovation (transitional funding, microfinance) - Limit agricultural expansion by securing land rights and enforcing deliberate land use plans - Provide transitional funding / microfinance	- Ecological and institutional unlocking makes new, non-degraded land available, removing the incentive to invest in maintenance of productive capacity - Trade-offs between SLM and short-term yields for many crops
Access to sustainable niche markets	- Support and regulate certification schemes - Increase consumer awareness	- Saturation of niche markets limits potential
Legal requirements, taxes and subsidies	- Set standards, adopt existing certification as minimum requirement - Make specific, highly degrading practices illegal (e.g. pesticide bans) - Financial incentives	- Lack of traceability and value chain opaqueness - VCAs seeking lowest governance denominator

case for action against land degradation). Governments can for example turn existing voluntary certification into a minimum production prerequisite, thus requiring due diligence from, for example, supermarkets (Colen et al., 2012). More classical approaches include using land use planning to require or restrict specific land management in specific places (Metternicht, 2018), or the banning or taxing of specific practices (e.g. pesticide bans; Maggi et al., 2019). However, beyond issues of attributing land degradation to products or companies, a major challenge lies in the globalized nature of the agrifood industry and the limitations of national governments in a context of international trade agreements (Eyhorn et al., 2019). Transnational companies may flee countries with strong environmental governance (Le Polain De Waroux et al., 2016). Supranational organizations and conventions, such as the UNCCD, may therefore have a role in facilitating a harmonized and sufficiently ambitious policy framework, as is also requested by the business community (WBCSD, 2019).

5.3. Towards a new strategy for LDN

Governments and other LDN brokers have several ways to reposition themselves given the agency shifts and the implications thereof, outlined above. This repositioning can take three forms, which we discuss below.

First, a re-appreciation of territorial land governance implies that state actors reclaim some agency at the expense of VCAs. In this, they acknowledge that the agency shift, if left unchecked, enables new forms of intensified land degradation. State actors may reclaim agency, e.g. through enforcement of environmental regulations. While market-based policies and instruments may have a potential to regulate value chains (Baumber et al., 2019), issues arising from land control dynamics (agricultural expansion and unsustainable land management) remain unresolved. Therefore, enforcement of environmental regulations becomes necessary to reestablish the agency of state actors where it has shifted excessively towards VCAs. Interestingly, such regulations are requested by VCAs (WBCSD, 2019). For example, a survey among LSLAs (The World Bank, 2014) found that most LSLA managers welcome stricter environmental impact assessments. Insofar as these are equally applied to all competitors, they would enable the adoption of required SLM measures.

Second, a hybridization of land governance recognizes that spontaneous private environmental governance, while promising, is not sufficient (Dauvergne and Lister, 2012; Lambin et al., 2014). This is especially so for LDN, where the scope of VCAs to turn degradation reversal into a business case is limited. Therefore, there are calls for governments to collaborate with private actors in hybrid land governance arrangements, where they complement each other's possibilities and constraints (Rueda et al., 2017). Sikor et al. (2013) define such governance applied to value chains as flow-centered governance, which stands in contrast with traditional territory-centered governance. Flow-centered governance has significant benefits in terms of scalability. Baumber et al. (2019) assess to what extent existing market-based instruments, such as the offsetting of damaging practices, mandates and obligations, grants, subsidies, or tax instruments, could be applicable and effective for LDN. These instruments are currently being applied in the realm of carbon emissions, biodiversity and other ecosystem services, and the authors conclude that LDN could be integrated in such existing instruments, although this hasn't been done yet.

Third, the coordination of the LDN target is primarily in the hands of the UNCCD, and their role may increase in importance because of the agency shift. The current policy dialogue to attain LDN is mostly a dialogue between state actors and the parties of the convention. As an example, the UNFCCC has since 2011 organized the Momentum for Change initiative, which takes the shape of a platform where businesses can share best practices in the fight against climate change. As a result, numerous partnerships between businesses have arisen (Hickmann et al., 2019). The UNCCD is finding a similar strategy, engaging with business platforms in the Conference of the Parties (Decision 6 COP.14),

organizing seed funding for private LDN action through the LDN Fund (Global Mechanism, 2019b), and engaging with existing business platforms (WBCSD, 2019). Furthermore, the profile of LDN as an urgent and worthwhile international target with multiple co-benefits (Allen et al., 2020) can be raised among business communities. Moving further on this pathway, LDN could become part of existing or new sustainability standards, retailer standards, certification boards, and roundtables.

6. Conclusion

Our findings are based on a broad literature review in which the multiple dynamics in agricultural land governance are confronted with the current approach towards LDN. LDN does not only pertain to agricultural land, and further inquiries into similar dynamics in, for example, the forestry or mining sectors, could complement our findings. Furthermore, we note that certain aspects of the interface between land governance agency shifts and environmental management remain understudied. For example, while gender dimensions of (the efforts against) land degradation are found to be a key aspect of LDN (Collantes et al., 2018), there are currently no studies into gender dimensions of LDN in relation to the land governance dynamics described here. Lastly, while this paper includes perspectives from research institutes, international organizations, and other grey literature, it can only serve as a proxy of the agency shifts described here. Continued efforts to map and track global agricultural dynamics could complement and improve our approximations, while a dialogue with stakeholders may bring additional nuance to the perspectives in this paper. With these limitations in mind, our literature review has indicated that:

- 1) Land governance is undergoing drastic changes, mostly manifested in a considerable agency shift towards VCAs at the expense of state actors and land managers.
- 2) This agency shift can lead to conversion of natural land to agricultural land and incentivize unsustainable agricultural intensification, thereby undermining progress towards LDN.
- 3) Newly empowered VCAs have instruments and business cases for actions aligned with the LDN target.

The UNCCD, state actors, and other LDN brokers can reposition themselves to respond to this changing context in three ways: regaining control to curtail VCAs driving land degradation, hybridizing land governance to leverage the many tools and business cases VCAs have to be instrumental towards LDN, and coordinating an intensified dialogue between VCAs and LDN brokers to mainstream LDN in agribusiness value chains.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

This work has emerged from the implementation of a Science-Policy Interface Objective of the UNCCD: Creating an enabling environment for land degradation neutrality. We acknowledge the discussion on this topic by the SPI members involved in this topic, and specifically Barron J. Orr, Marcelo Inácio da Cunha and Mariam Akhtar-Schuster for inputs to an earlier background paper underpinning this research. Support for the research reported in this paper was provided by the European Research Council under the European Union's Seventh Framework ERC Grant Agreement 311819 (GLOLAND). We thank Mengmeng Li for assistance in visualization. The research reported in this paper contributes to the Global Land Programme (GLP.earth). We thank three anonymous reviewers for their insightful comments and suggestions.

References

- Abebe, G.K., Bijman, J., Kemp, R., Omta, O., Tsegaye, A., 2013. Contract farming configuration: Smallholders' preferences for contract design attributes. *Food Policy* 40, 14–24. <https://doi.org/10.1016/j.foodpol.2013.01.002>.
- Ahrends, A., Hollingsworth, P.M., Ziegler, A.D., Fox, J.M., Chen, H., Su, Y., Xu, J., 2015. Current trends of rubber plantation expansion may threaten biodiversity and livelihoods. *Glob. Environ. Chang.* 34, 48–58. <https://doi.org/10.1016/j.gloenvcha.2015.06.002>.
- Akhtar-Schuster, M., Stringer, L.C., Erlewein, A., Metternicht, G., Minelli, S., Safriel, U., Sommer, S., 2017. Unpacking the concept of land degradation neutrality and addressing its operation through the Rio Conventions. *J. Environ. Manage.* 195, 4–15. <https://doi.org/10.1016/j.jenvman.2016.09.044>.
- Alden Wily, L., 2012. Looking back to see forward: the legal niceties of land theft in land rushes. *J. Peasant Stud.* 39, 751–775. <https://doi.org/10.1080/03066150.2012.674033>.
- Allen, C., Metternicht, G., Verburg, P., Akhtar-Schuster, M., Inacio da Cunha, M., Sanchez Santivañez, M., 2020. Delivering an enabling environment and multiple benefits for land degradation neutrality: Stakeholder perceptions and progress. *Environ. Sci. Policy* 114, 109–118. <https://doi.org/10.1016/j.envsci.2020.07.029>.
- Anderson, J.R., 2008. Background Paper For The World Development Report: 2008 Agricultural Advisory Services, Innovating through science and technology.
- Angelsen, A., Kaimowitz, D., 2001. Agricultural Technologies and Deforestation. <https://doi.org/10.1093/obo/9780199766581-0148>.
- Anseeuw, W., Jayne, T.S., Kachule, R., Kotsopoulos, J., 2016. The quiet rise of medium-scale farms in Malawi. *Land* 5, 19. <https://doi.org/10.3390/land5030019>.
- Anseeuw, W., Wily, L.A., Cotula, L., Taylor, M., 2011. Land Rights and the Rush for Land, ILC Rome report.
- Arima, E.Y., Richards, P., Walker, R., Caldas, M.M., 2011. Statistical confirmation of indirect land use change in the Brazilian Amazon. *Environ. Res. Lett.* 6, 10.1088/1748-9326/6/2/024010.
- Ariti, A.T., van Vliet, J., Verburg, P.H., 2019. The role of institutional actors and their interactions in the land use policy making process in Ethiopia. *J. Environ. Manage.* 237, 235–246. <https://doi.org/10.1016/j.jenvman.2019.02.059>.
- Asiama, K., Bennett, R., Zevenbergen, J., 2019. Towards responsible consolidation of customary lands: a research synthesis. *Land* 8, 1–22.
- Barry Callebaut, 2018. 2017/18 Forever Chocolate Progress Report.
- Bartolini, F., Viaggi, D., 2013. The common agricultural policy and the determinants of changes in EU farm size. *Land Use Policy* 31, 126–135. <https://doi.org/10.1016/j.landusepol.2011.10.007>.
- Baumber, A., Berry, E., Metternicht, G., 2019. Synergies between Land Degradation Neutrality goals and existing market-based instruments. *Environ. Sci. Policy* 94, 174–181. <https://doi.org/10.1016/j.envsci.2019.01.012>.
- Bellemare, M.F., Lim, S., 2018. In all shapes and colors: varieties of contract farming. *Appl. Econ. Perspect. Policy* 40, 379–401. <https://doi.org/10.1093/AEPP/PPY019>.
- Bennett, A., Ravikumar, A., Paltán, H., 2018. The political ecology of oil palm company-community partnerships in the peruvian amazon: deforestation consequences of the privatization of rural development. *World Dev.* 109, 29–41. <https://doi.org/10.1016/j.worlddev.2018.04.001>.
- Blackman, A., Rivera, J., 2011. Producer-Level Benefits of Sustainability Certification. *Conserv. Biol.* 25, 1176–1185. <https://doi.org/10.1111/j.1523-1739.2011.01774.x>.
- Blandon, J., Henson, S., Cranfield, J., 2009. Small-scale farmer participation in new agri-food supply chains: case of the supermarket supply chain for fruit and vegetables in Honduras. *J. Int. Dev.* 21, 971–984. <https://doi.org/10.1002/jid>.
- Borras, S.M., Fig, D., Suárez, S.M., 2011. The politics of agrofuels and mega-land and water deals: insights from the ProCana case, Mozambique. *Rev. Afr. Polit. Econ.* 38, 215–234. <https://doi.org/10.1080/03056244.2011.582758>.
- Borras, S.M., Franco, J.C., 2010. Contemporary discourses and contestations around pro-poor land policies and land governance. *J. Agrar. Chang.* 10, 1–32. <https://doi.org/10.1111/j.1471-0366.2009.00243.x>.
- Borras, S.M., Franco, J.C., Gómez, S., Kay, C., Spoor, M., 2012. Land grabbing in Latin America and the Caribbean. *J. Peasant Stud.* 39, 845–872. <https://doi.org/10.1080/03066150.2012.679931>.
- Byerlee, D., 2014. The Fall and Rise Again of Plantations in Tropical Asia: History Repeated? *Land* 3, 574–597. <https://doi.org/10.3390/land3030574>.
- Chapoto, A., Mabiso, A., Bonsu, A., 2013. Agricultural commercialization, land expansion, and homegrown large-scale farmers: Insights from Ghana.
- Chimhowu, A., 2018. The 'new' African customary land tenure. Characteristic, features and policy implications of a new paradigm. *Land use policy* 1–7. 10.1016/j.landusepol.2018.04.014.
- Cocoa Horizons, 2018. The cocoa snapshot 17/18 year review.
- Colen, L., Maertens, M., Swinnen, J.F.M., 2012. Private Standards, Trade and Poverty: GlobalGAP and Horticultural Employment in Senegal. *World Econ.* 1073–1088. <https://doi.org/10.1111/j.1467-9701.2012.01463.x>.
- Collantes, V., Kloos, K., Henry, P., Mboya, A., Mor, T., Metternicht, G., 2018. Moving towards a twin-agenda: gender equality and land degradation neutrality. *Environ. Sci. Policy* 89, 247–253. <https://doi.org/10.1016/j.envsci.2018.08.006>.
- Constantin, C., Luminita, C., Vasile, A.J., 2017. Land grabbing: a review of extent and possible consequences in Romania. *Land Use Policy* 62, 143–150. <https://doi.org/10.1016/j.landusepol.2017.01.001>.
- Cotula, L., 2012. The international political economy of the global land rush: a critical appraisal of trends, scale, geography and drivers. *J. Peasant Stud.* 39, 649–680. <https://doi.org/10.1080/03066150.2012.674940>.
- Cotula, L., Vermeulen, S., Mathieu, P., Toulmin, C., 2011. Agricultural investment and international land deals: evidence from a multi-country study in Africa. *Food Secur.* 3, 99–113. <https://doi.org/10.1007/s12571-010-0096-x>.
- Cowie, A.L., Orr, B.J., Castillo Sanchez, V.M., Chasek, P., Crossman, N.D., Erlewein, A., Louwagie, G., Maron, M., Metternicht, G.I., Minelli, S., Tengberg, A.E., Walter, S., Welton, S., 2018. Land in balance: the scientific conceptual framework for Land Degradation Neutrality. *Environ. Sci. Policy* 79, 25–35. <https://doi.org/10.1016/j.envsci.2017.10.011>.
- das Nair, R., 2018. The internationalisation of supermarkets and the nature of competitive rivalry in retailing in southern Africa. *Dev. South. Afr.* 35, 315–333. 10.1080/0376835X.2017.1390440.
- Dauvergne, P., Lister, J., 2012. Big brand sustainability: governance prospects and environmental limits. *Glob. Environ. Change.* 22, 36–45. <https://doi.org/10.1016/j.gloenvcha.2011.10.007>.
- Davis, K.F., Yu, K., Rulli, M.C., Pichdara, L., D'Odorico, P., 2015. Accelerated deforestation driven by large-scale land acquisitions in Cambodia. *Nat. Geosci.* 8, 772–775. <https://doi.org/10.1038/ngeo2540>.
- Debonne, N., van Vliet, J., Ramkat, R., Snelder, D., Verburg, P.H., 2020. Farm scale as a driver of agricultural development in the Kenyan Rift Valley. *Agric. Syst.* In Press.
- Debonne, N., van Vliet, J., Verburg, P.H., 2019. Future governance options for large-scale land acquisition in Cambodia: impacts on tree cover and tiger landscapes. *Environ. Sci. Policy* 94, 9–19. <https://doi.org/10.1016/j.envsci.2018.12.031>.
- Defries, R.S., Fanzo, J., Mondal, P., Remans, R., Wood, S.A., 2017. Is voluntary certification of tropical agricultural commodities achieving sustainability goals for small-scale producers? A review of the evidence. *Environ. Res. Lett.* 12, 1–11.
- Deguines, N., Jono, C., Baude, M., Henry, M., Julliard, R., Fontaine, C., 2014. Large-scale trade-off between agricultural intensification and crop pollination services. *Front. Ecol. Environ.* 12, 212–217. <https://doi.org/10.1890/130054>.
- Deininger, K., Byerlee, D., 2012. The rise of large farms in land abundant countries: Do they have a future? *World Dev.* 40, 701–714. 10.1016/j.worlddev.2011.04.030.
- Deininger, K., Byerlee, D., Lindsay, J., Norton, A., Selod, H., Stickler, M., 2011. Rising Global Interest in Farmland, can it yield sustainable and equitable benefits?, 1st ed, World Bank. The World Bank, Washington D.C. 10.1596/978-0-8213-8591-3.
- Dell'Angelo, J., D'Odorico, P., Rulli, M.C., 2017. Threats to sustainable development posed by land and water grabbing. *Curr. Opin. Environ. Sustain.* 26–27, 120–128. <https://doi.org/10.1016/j.cosust.2017.07.007>.
- Eakin, H., Defries, R., Kerr, S., Lambin, E.F., Liu, J., Marcotullio, P.J., Messerli, P., Reenberg, A., Rueda, X., Swaf, S.R., Wicke, B., Zimmerer, K., 2014. Significance of telecoupling for exploration of land-use change. *Rethink. Glob. L. Use an Urban Era* 14, 141–162.
- Eitelberg, D., van Vliet, J., Verburg, P.H., 2015. A review of global potentially available cropland estimates and their consequences for model-based assessments. *Glob. Chang. Biol.* 21, 1236–48. 10.1111/gcb.12733.
- Elgert, L., 2016. 'More soy on fewer farms' in Paraguay: challenging neoliberal agriculture's claims to sustainability. *J. Peasant Stud.* 43, 537–561. <https://doi.org/10.1080/03066150.2015.1076395>.
- Euler, M., Schwarze, S., Siregar, H., Qaim, M., 2015. Oil palm expansion among smallholder farmers in Sumatra, Indonesia. *EFFORTS Discuss. Pap. Ser.* 8.
- EUROSTAT, 2018. Eurostat 2018 - Agriculture, forestry and fishery statistics 2018 Edition, Eurostat.
- Eyhorn, F., Muller, A., Reganold, J.P., Frison, E., Herren, H.R., Luttkholt, L., Mueller, A., Sanders, J., Scialabba, N.E.H., Seufert, V., Smith, P., 2019. Sustainability in global agriculture driven by organic farming. *Nat. Sustain.* 2, 253–255. <https://doi.org/10.1038/s41893-019-0266-6>.
- FAO, 2002. Land tenure and rural development, *FAO Land Tenure. Studies.* 9251048460.
- Folke, C., Österblom, H., Jouffray, J., Lambin, E.F., Adger, W.N., Scheffer, M., Crona, B.I., Nyström, M., Levin, S.A., Carpenter, S.R., Anderies, J.M., Chapin iii, S., Crépín, A., Dauriach, A., Galaz, V., Gordon, L.J., Kautsky, N., Walker, B.H., Watson, J.R., Wilen, J., de Zeeuw, A., 2019. Transnational corporations and the challenge of biosphere stewardship. *Nat. Ecol. Evol.* 10.1038/s41559-019-0978-z.
- Friis, C., 2015. Small-scale land acquisitions, large-scale implications: The case of Chinese banana investments in Northern Laos. *L. grabbing, Confl. Agrar. Transform. Perspect. from East Southeast Asia.* An Int. Acad. Conf. 5–6 June 2015 1–20.
- Garrett, R.D., Carlson, K.M., Rueda, X., Noojipady, P., 2016. Assessing the potential additionality of certification by the Round table on Responsible Soybeans and the Roundtable on Sustainable Palm Oil. *Environ. Res. Lett.* 11 <https://doi.org/10.1088/1748-9326/11/7/079502>.
- Gibbs, B.H.K., Rausch, L., Munger, J., Schelly, I., Morton, D.C., Noojipady, P., Barreto, P., Micol, L., Walker, N.F., 2015. Brazil's Soy Moratorium. *Science* (80-). 347, 2015–2017.
- Land Degradation Neutrality Target Setting: Initial Findings and Lessons Learned. Bonn. Global Mechanism, 2019b. Land Degradation Neutrality (LDN) Fund: An innovative impact investment fund for sustainable land use, with a linked TA facility. Paris.
- Integrated Farm Assurance: All Farm Base - Crops Base - Fruit and Vegetables - Control Points and Compliance Criteria - Version 5.1.
- GLTN, 2018. Global Land Tool Network [WWW Document]. Good L. Gov. Policy Pap. URL www.gltn.net (accessed 10.5.18).
- Gómez, S., 2014. The land market in Latin America and the Caribbean: concentration and foreignization. *The land market in Latin America and the Caribbean: concentration and foreignization.*
- Hall, D., 2011. Land grabs, land control, and Southeast Asian crop booms. *J. Peasant Stud.* 38, 837–857. <https://doi.org/10.1080/03066150.2011.607706>.
- Hall, R., Scoones, I., Tsikata, D., 2017. Plantations, outgrowers and commercial farming in Africa: agricultural commercialisation and implications for agrarian change. *J. Peasant Stud.* 44, 515–537. <https://doi.org/10.1080/03066150.2016.1263187>.
- Handsusch, C., Wollni, M., Villalobos, P., 2013. Adoption of food safety and quality standards among Chilean raspberry producers - do smallholders benefit? *Food Policy* 40, 64–73. <https://doi.org/10.1016/j.foodpol.2013.02.002>.

- Hazell, P., Poulton, C., Wiggins, S., Dorward, A., 2010. The future of small farms: trajectories and policy priorities. *World Dev.* 38, 1349–1361. <https://doi.org/10.1016/j.worlddev.2009.06.012>.
- Hickmann, T., Widerberg, O., Lederer, M., Pattberg, P., 2019. The United Nations Framework Convention on Climate Change Secretariat as an orchestrator in global climate policymaking. *Int. Rev. Adm. Sci.* 002085231984042 <https://doi.org/10.1177/0020852319840425>.
- Hilhorst, T., Nelen, J., Traoré, N., 2011. Agrarian change below the radar screen : Rising farmland acquisitions by domestic investors in West Africa Results from a survey in Global Land Grabbing. *Int. Conf. Glob. L. Grabbing* 1–29.
- Jayne, T.S., Chamberlin, J., Traub, L., Sitko, N.J., Muyanga, M., Yeboah, F.K., Anseeuw, W., Chapoto, A., Wineman, A., Nkonde, C., Kachule, R., 2016. Africa's changing farm size distribution patterns: the rise of medium-scale farms. *Agric. Econ.* 47, 197–214. [10.1111/agec.12308](https://doi.org/10.1111/agec.12308).
- Kam, H., Metternicht, G., Bumber, A., Cross, R., 2019. Engaging absentee landholders in ecosystem service delivery in south-eastern Australia. *Ecosyst. Serv.* 39 <https://doi.org/10.1016/j.ecoser.2019.100988>.
- Keene, S., Walsh-Dille, M., Wolford, W., Geisler, C., 2015. A view from the top: examining elites in large-scale land deals. *Can. J. Dev. Stud. / Rev. Can. d'études du développement* 36, 131–146. <https://doi.org/10.1080/02255189.2015.1044503>.
- Koh, L.P., Wilcove, D.S., 2008. Is oil palm agriculture really destroying tropical biodiversity? *Conserv. Lett.* 1, 60–64. <https://doi.org/10.1111/j.1755-263X.2008.00011.x>.
- Lambin, E.F., Gibbs, H.K., Heilmayr, R., Carlson, K.M., Fleck, L.C., Garrett, R.D., Le Polain De Waroux, Y., McDermott, C.L., McLaughlin, D., Newton, P., Nolte, C., Pacheco, P., Rausch, L.L., Streck, C., Thorlakson, T., Walker, N.F., 2018. The role of supply-chain initiatives in reducing deforestation. *Nat. Clim. Chang.* 8, 109–116. [10.1038/s41558-017-0061-1](https://doi.org/10.1038/s41558-017-0061-1).
- Lambin, E.F., Meyfroidt, P., Rueda, X., Blackman, A., Börner, J., Cerutti, P.O., Dietsch, T., Jungmann, L., Lamarque, P., Lister, J., Walker, N.F., Wunder, S., 2014. Effectiveness and synergies of policy instruments for land use governance in tropical regions. *Glob. Environ. Chang.* 28, 129–140. <https://doi.org/10.1016/j.gloenvcha.2014.06.007>.
- Lambin, E.F., Thorlakson, T., 2018. Sustainability standards: interactions between private actors, civil society, and governments. *Annu. Rev. Environ. Resour.* 43, 369–393. <https://doi.org/10.1146/annurev-environ-102017-025931>.
- Land Matrix, 2019. Land Matrix Global Observatory [WWW Document]. URL www.landmatrix.org (accessed 3.3.17).
- Le Polain De Waroux, Y., Garrett, R.D., Heilmayr, R., Lambin, E.F., 2016. Land-use policies and corporate investments in agriculture in the Gran Chaco and Chiquitano. *Proc. Natl. Acad. Sci. U. S. A.* 113, 4021–4026. [10.1073/pnas.1602646113](https://doi.org/10.1073/pnas.1602646113).
- Lee, J., Gereffi, G., Beauvais, J., 2012. Global value chains and agri-food standards: Challenges and possibilities for smallholders in developing countries. *Proc. Natl. Acad. Sci. U. S. A.* 109, 12326–12331. <https://doi.org/10.1073/pnas.0913714108>.
- Liao, C., Jung, S., Brown, D.G., Agrawal, A., 2020. Spatial patterns of large-scale land transactions and their potential socio-environmental outcomes in Cambodia, Ethiopia, Liberia, and Peru. *L. Degrad. Dev.* 1–11 <https://doi.org/10.1002/ldr.3544>.
- Lowder, S.K., Skoet, J., Raney, T., 2016. The number, size, and distribution of farms, smallholder farms, and family farms worldwide. *World Dev.* 87, 16–29. <https://doi.org/10.1016/j.worlddev.2015.10.041>.
- Lund-Thomsen, P., Lindgreen, A., 2014. Corporate social responsibility in global value chains: where are we now and where are we going? *J. Bus. Ethics* 123, 11–22. <https://doi.org/10.1007/s10551-013-1796-x>.
- Maggi, F., Tang, F.H.M., la Cecilia, D., McBratney, A., 2019. PEST-CHEMGRIDS, global gridded maps of the top 20 crop-specific pesticide application rates from 2015 to 2025. *Sci. Data* 6, 170. <https://doi.org/10.1038/s41597-019-0169-4>.
- Magliocca, N.R., Khuc, Q. Van, Ellicott, E.A., de Bremond, A., 2019. Archetypical pathways of direct and indirect land-use change caused by Cambodia's economic land concessions. *Ecol. Soc.* 24 <https://doi.org/10.5751/es-10954-240225>.
- Mahanty, S., Milne, S., 2016. Anatomy of a boom: Cassava as a gateway crop in Cambodia's north eastern borderland. *Asia Pac. Viewp.* 57, 180–193. <https://doi.org/10.1111/apv.12122>.
- Mann, S., Bonanomi, E.B., 2017. Grabbing or investment? On judging large-scale land acquisitions. *Agric. Human Values* 34, 41–51. <https://doi.org/10.1007/s10460-016-9688-1>.
- Mårtensson, K., Westerberg, K., 2016. Corporate environmental strategies towards sustainable development. *Bus. Strateg. Environ.* 25, 1–9. <https://doi.org/10.1002/bse.1852>.
- Masters, W.A., Djurfeldt, A.A., De Haan, C., Hazell, P., Jayne, T.S., Jirström, M., Reardon, T., 2013. Urbanization and farm size in Asia and Africa: implications for food security and agricultural research. *Glob. Food Sec.* 2, 156–165. <https://doi.org/10.1016/j.gfs.2013.07.002>.
- McSweeney, K., Coomes, O.T., 2020. Who owns the Earth? A challenge for the land system science community. *J. Land Use Sci.* 00, 1–7. <https://doi.org/10.1080/1747423X.2020.1765428>.
- Meemken, E., Bellemare, M.F., 2019. Smallholder farmers and contract farming in developing countries. *10.1073/pnas.1909501116*.
- Messerli, P., Giger, M., Dwyer, M.B., Breu, T., Eckert, S., 2014. The geography of large-scale land acquisitions: analysing socio-ecological patterns of target contexts in the global South. *Appl. Geogr.* 53, 449–459. <https://doi.org/10.1016/j.apgeog.2014.07.005>.
- Messerli, P., Peeters, A., Schönweger, O., Nanthavong, V., Heinemann, A., 2015. Marginal Land or Marginal People? Analysing Patterns and Processes of Large-Scale Land Acquisitions in South-East Asia, in: *International Development Policy series* (Ed.), Large-Scale Land Acquisitions: Focus on South-East Asia. Brill-Nijhoff, Boston, pp. 136–171.
- Metternicht, G., 2018. *Land Use and Spatial Planning*. Springer.
- Meyfroidt, P., 2017. Mapping farm size globally: benchmarking the smallholders debate. *Environ. Res. Lett.* 12, 10–13. <https://doi.org/10.1088/1748-9326/aa5ef6>.
- Meyfroidt, P., 2017. Trade-offs between environment and livelihoods: bridging the global land use and food security discussions. *Glob. Food Sec.* 16, 9–16. <https://doi.org/10.1016/j.gfs.2017.08.001>.
- Minten, B., Randrianarison, L., Swinnen, J.F.M., 2009. Global retail chains and poor farmers: evidence from Madagascar. *World Dev.* 37, 1728–1741. <https://doi.org/10.1016/j.worlddev.2008.08.024>.
- Muchena, F.N., Onduru, D.D., Gachini, G.N., de Jager, A., 2005. Turning the tides of soil degradation in Africa: capturing the reality and exploring opportunities. *Land Use Policy* 22, 23–31. <https://doi.org/10.1016/j.landusepol.2003.07.001>.
- Nepstad, D., McGrath, D., Stickler, C., Alencar, A., Azevedo, A., Swette, B., Bezerra, T., Digiano, M., Shimada, J., Seroa, R., Armijo, E., Castello, L., Brando, P., Hansen, M.C., McGrath-horn, M., Carvalho, O., Hess, L., 2014. Slowing Amazon deforestation through public policy and interventions in beef and soy supply chains. *Science* 80-, 344.
- Neven, D., Odera, M.M., Reardon, T., Wang, H., 2009. Kenyan supermarkets, emerging middle-class horticultural farmers, and employment impacts on the rural poor. *World Dev.* 37, 1802–1811. <https://doi.org/10.1016/j.worlddev.2008.08.026>.
- Nkonya, E., Mirzabaev, A., von Braun, J., 2016. Economics of Land Degradation - A Global Assessment for Sustainable Development. 10.1021/om200683q.
- Nolte, K., Chamberlain, W., Giger, M., 2016. International Land Deals for Agriculture Fresh insights from the Land Matrix: Analytical Report II. Bern, Montpellier, Hamburg, Pretoria. 10.7892/boris.85304.
- Ornetsmüller, C., Castella, J.-C., Thanichanon, P., Lestrel, G., Verburg, P.H., 2019. Modelling the location and spatial pattern of a crop boom. A case study from Laos. *Environ. Sci. Policy* 99, 58–71. <https://doi.org/10.1016/j.envsci.2019.04.001>.
- Otsuka, K., Nakano, Y., Takahashi, K., 2016. Contract farming in developed and developing countries. *Annu. Rev. Resour. Econ.* 8, 353–376. <https://doi.org/10.1146/annurev-resource-100815-095459>.
- Oya, C., 2012. Contract farming in Sub Saharan Africa: a survey of approaches, debates and issues. *J. Agrar. Change.* 12, 1–33.
- Pacheco, F.A.L., Sanches Fernandes, L.F., Valle Junior, R.F., Valera, C.A., Pissarra, T.C.T., 2018. Land degradation: multiple environmental consequences and routes to neutrality. *Curr. Opin. Environ. Sci. Heal.* 5, 79–86. <https://doi.org/10.1016/j.coesh.2018.07.002>.
- Paitan, C.P., Verburg, P.H., 2019. Methods to assess the impacts and indirect land use change caused by telecoupled agricultural supply chains: a review. *Sustain.* 11 <https://doi.org/10.3390/su11041162>.
- Peluso, N.L., Lund, C., 2011. New frontiers of land control: introduction. *J. Peasant Stud.* 38, 667–681. <https://doi.org/10.1080/03066150.2011.607692>.
- Pereira, R., Simmons, C., Walker, R., 2016. Smallholders, Agrarian reform, and globalization in the Brazilian Amazon: cattle versus the environment. *Land* 5, 24. <https://doi.org/10.3390/land5030024>.
- Petrzelka, P., Armstrong, A., 2015. Absentee landowners of agricultural land: Influences upon land management decision making and information usage. *J. Soil Water Conserv.* 70, 303–312. <https://doi.org/10.2489/jswc.70.5.303>.
- Piñero, D.E., 2012. Land grabbing: concentration and “foreignisation” of land in Uruguay. *Can. J. Dev. Stud.* 33, 471–489. <https://doi.org/10.1080/02255189.2012.746216>.
- Contract farming in developing countries - A Review, The A Savoir collection.
- Quatrini, S., Crossman, N.D., 2018. Most finance to halt desertification also benefits multiple ecosystem services: a key to unlock investments in Land Degradation Neutrality? *Ecosyst. Serv.* 31, 265–277. <https://doi.org/10.1016/j.ecoser.2018.04.003>.
- Rainforest Alliance, 2018. Rainforest Alliance Impacts Report Partnership, Learning, and Change.
- Ravnborg, H.M., 2003. Poverty and environmental degradation in the Nicaraguan hillsides. *World Dev.* 31, 1933–1946. <https://doi.org/10.1016/j.worlddev.2003.06.005>.
- Reardon, T., Barrett, C.B., Berdegue, J.A., Swinnen, J.F.M., 2009. Agrifood industry transformation and small farmers in developing countries. *World Dev.* 37, 1717–1727. <https://doi.org/10.1016/j.worlddev.2008.08.023>.
- Reardon, T., Gulati, A., 2008. The supermarket revolution policies for “competitiveness with inclusiveness”. IFPRI Policy Br. 2.
- Reydon, B.P., Fernandes, V.B., Telles, T.S., 2015. Land tenure in Brazil: the question of regulation and governance. *Land Use Policy* 42, 509–516. <https://doi.org/10.1016/j.landusepol.2014.09.007>.
- Rueda, X., Garrett, R.D., Lambin, E.F., 2017. Corporate investments in supply chain sustainability : selecting instruments in the agri-food industry. *J. Clean. Prod.* 142, 2480–2492. <https://doi.org/10.1016/j.jclepro.2016.11.026>.
- Rueda, X., Lambin, E.F., 2013. Linking globalization to local land uses: how eco-consumers and gourmards are changing the colombian coffee landscapes. *World Dev.* 41, 286–301. <https://doi.org/10.1016/j.worlddev.2012.05.018>.
- Rulli, M.C., Savio, A., D'Odorico, P., 2012. Global land and water grabbing. *Pnas* 110, 892–897. [10.1073/pnas.1213163110/-DCSupplemental](https://doi.org/10.1073/pnas.1213163110/-DCSupplemental). www.pnas.org/cgi/doi/10.1073/pnas.1213163110.
- Schaltegger, S., Burritt, R., 2018. Business cases and corporate engagement with sustainability: differentiating ethical motivations. *J. Bus. Ethics* 147, 241–259. <https://doi.org/10.1007/s10551-015-2938-0>.
- Schmidt, E., Tadesse, F., 2019. The impact of sustainable land management on household crop production in the Blue Nile Basin. *Ethiopia. L. Degrad. Dev.* 30, 777–787. <https://doi.org/10.1002/ldr.3266>.
- Schönweger, O., Messerli, P., 2015. Land Acquisition, Investment, and Development in the Lao Coffee Sector: Successes and Failures. *Crit. Asian Stud.* 47, 94–122. <https://doi.org/10.1080/14672715.2015.997095>.

- Schouten, G., Glasbergen, P., 2011. Creating legitimacy in global private governance: the case of the Roundtable on Sustainable Palm Oil. *Ecol. Econ.* 70, 1891–1899. <https://doi.org/10.1016/j.ecolecon.2011.03.012>.
- Seppelt, R., Verburg, P.H., Norström, A., Cramer, W., Vaclavik, T., 2018. Focus on cross-scale feedbacks in global sustainable land management. *Environ. Res. Lett.* 10.1088/1748-9326/aadc45.
- Seufert, V., Ramankutty, N., 2017. Many shades of gray — The context-dependent performance of organic agriculture. *Sci. Adv.* 3.
- Sikor, T., Auld, G., Bebbington, A.J., Benjaminsen, T.A., Gentry, B.S., Hunsberger, C., Izac, A.M., Margulis, M.E., Plieninger, T., Schroeder, H., Upton, C., 2013. Global land governance: from territory to flow? *Curr. Opin. Environ. Sustain.* 5, 522–527. <https://doi.org/10.1016/j.cosust.2013.06.006>.
- Sitko, N.J., Burke, W.J., Jayne, T.S., 2018. The quiet rise of large-scale trading firms in East and Southern Africa. *J. Dev. Stud.* 54, 895–914. <https://doi.org/10.1080/00220388.2018.1430773>.
- Sitko, N.J., Chamberlin, J., 2015. The anatomy of medium-scale farm growth in Zambia: what are the implications for the future of smallholder agriculture? *Land* 4, 869–887. <https://doi.org/10.3390/land4030869>.
- Sitko, N.J., Jayne, T.S., 2014. Structural transformation or elite land capture? The growth of “emergent” farmers in Zambia. *Food Policy* 48, 194–202. <https://doi.org/10.1016/j.foodpol.2014.05.006>.
- Smalley, R., 2013. Plantations, Contract Farming and Commercial Farming Areas in Africa: A Comparative Review, Land and Agricultural Commercialisation in Africa.
- Sparovek, G., Reydon, B.P., Guedes Pinto, L.F., Faria, V., de Freitas, F.L.M., Azevedo-Ramos, C., Gardner, T., Hamamura, C., Rajão, R., Cerignoni, F., Siqueira, G.P., Carvalho, T., Alencar, A., Ribeiro, V., 2019. Who owns Brazilian lands? *Land Use Policy* 87. <https://doi.org/10.1016/j.landusepol.2019.104062>.
- Sparrow, B.D., Edwards, W., Munroe, S.E.M., Wardle, G.M., Guerin, G.R., Bastin, J.F., Morris, B., Christensen, R., Phinn, S., Lowe, A.J., 2020. Effective ecosystem monitoring requires a multi-scaled approach. *Biol. Rev.* 10.1111/brev.12636.
- Stroman, D., Kreuter, U.P., 2015. Factors influencing land management practices on conservation easement protected landscapes. *Soc. Nat. Resour.* 28, 891–907. <https://doi.org/10.1080/08941920.2015.1024365>.
- Stuart, A.M., Devkota, K.P., Sato, T., Pame, A.R.P., Balingbing, C., My Phung, N.T., Kieu, N.T., Hieu, P.T.M., Long, T.H., Beebout, S., Singleton, G.R., 2018. On-farm assessment of different rice crop management practices in the Mekong Delta, Vietnam, using sustainability performance indicators. *F. Crop. Res.* 229, 103–114. <https://doi.org/10.1016/j.fcr.2018.10.001>.
- Subervie, J., Vagneron, I., 2013. A drop of water in the indian ocean? The Impact of GlobalGap Certification on Lychee Farmers in Madagascar. *World Dev.* 50, 57–73. <https://doi.org/10.1016/j.worlddev.2013.05.002>.
- The World Bank, 2014. The Practice of Responsible Investment Principles in Larger-Scale Agricultural Investments: Implications for Corporate Performance and Impact on Local Communities. New York.
- Thomas, R., Reed, M., Clifton, K., Appadurai, N., Mills, A., Zucca, C., Kodsi, E., Sircely, J., Haddad, F., Hagen, C., Mapedza, E., Woldearegay, K., Shalander, K., Bellon, M., Le, Q., Mabikke, S., Alexander, S., Leu, S., Schlingloff, S., Lala-Pritchard, T., Mares, V., Quiroz, R., 2018. A framework for scaling sustainable land management options. *L. Degrad. Dev.* 3272–3284. <https://doi.org/10.1002/ldr.3080>.
- UNCCD, 2020. Action Programmes [WWW Document]. accessed 8.25.20. <https://www.unccd.int/convention/action-programmes>.
- UNCCD, 2017. Global Land Outlook, 1st ed. Bonn.
- UNDP/UNCCD, 2011. The forgotten billion. New York.
- Unilever, 2019. Our approach to sustainable sourcing [WWW Document]. URL <https://www.unilever.com/sustainable-living/reducing-environmental-impact/sustainable-sourcing/our-approach-to-sustainable-sourcing/> (accessed 6.21.19).
- Urcola, H.A., de Sartre, X.A., Veiga, I., Elverdin, J., Albaladejo, C., 2015. Land tenancy, soybean, actors and transformations in the pampas: a district balance. *J. Rural Stud.* 39, 32–40. <https://doi.org/10.1016/j.jrurstud.2015.03.001>.
- Van Hoi, P., Mol, A.P.J., Oosterveer, P., 2010. Pesticide governance in export supply chains: the case of vegetable and fruit production in Vietnam. *Environ. Plan. C Gov. Policy* 28, 97–111. <https://doi.org/10.1068/c0928r>.
- van Vliet, J., de Groot, H.L.F., Rietveld, P., Verburg, P.H., 2015. Manifestations and underlying drivers of agricultural land use change in Europe. *Landsc. Urban Plan.* 133, 24–36. <https://doi.org/10.1016/j.landurbplan.2014.09.001>.
- Verburg, P.H., Metternicht, G.I., Allen, C., Debonne, N., Akhtar-Schuster, M., Inácio da Cunha, M., Karim, Z., Pilon, A., Raja, O., Sánchez Santivañez, M., Senyaz, A., 2019. Creating an Enabling Environment for Land Degradation Neutrality and its Potential Contribution to Enhancing Well-being. *Livelihoods and the Environment. A Report of the Science-Policy Interface, Bonn*.
- Vorovencii, I., 2016. Assessing and monitoring the risk of land degradation in Baragan Plain, Romania, using spectral mixture analysis and Landsat imagery. *Environ. Monit. Assess.* 188. <https://doi.org/10.1007/s10661-016-5446-5>.
- Wang, H.H., Wang, Y., Delgado, M.S., 2014. The transition to modern agriculture: contract farming in developing economies. *Am. J. Agric. Econ.* 96, 1257–1271. <https://doi.org/10.1093/ajae/aau036>.
- WBCSD, 2019. THE UNCCD DELHI DECLARATION FROM BUSINESS. New Delhi.
- Wei, S., Ang, T., Jancencelle, V.E., 2018. Willingness to pay more for green products: the interplay of consumer characteristics and customer participation. *J. Retail. Consum. Serv.* 45, 230–238. <https://doi.org/10.1016/j.jretconser.2018.08.015>.
- Zagata, L., Sutherland, L.A., 2015. Deconstructing the “young farmer problem in Europe”: towards a research agenda. *J. Rural Stud.* 38, 39–51. <https://doi.org/10.1016/j.jrurstud.2015.01.003>.
- zu Ermgassen, E.K.H.J., Ayre, B., Godar, J., Lima, M.G.B., Bauch, S., Meyfroidt, P., Suavet, C., West, C., Gardner, T., 2020. Using supply chain data to monitor zero deforestation commitments : an assessment of progress in the Brazilian soy sector Using supply chain data to monitor zero deforestation commitments : an assessment of progress in the Brazilian soy sector. *Environ. Res. Lett.* 15.