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NEW FRONTIERS OF LAND AND WATER COMMODIFICATION: SOCIO-ENVIRONMENTAL CONTROVERSIES OF LARGE-SCALE LAND ACQUISITIONS

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ABSTRACT

A growing number of regions in the developing world are targeted by transnational investors who are acquiring large amounts of land and natural resources. Driven by the increasing global demand for agricultural products, such investments are often considered an opportunity for economic development in the target country. However, there are concerns about the social and environmental impacts on local communities. In this brief review, we discuss some key socio-environmental controversies surrounding large-scale land acquisitions (LSLAs). LSLAs often target common property systems and lead to privatization and commodification of land through long-term land concessions. There is a debate between supporters of foreign land investments as a means to attract modern agricultural technology that would decrease the yield gap in underperforming agricultural land and those who question such a development model because it is seldom coupled with policy instruments that would ensure that the benefits improve food security in local populations. Large-scale land investments displace a variety of systems of production ranging from small-scale farming to (arguably) "unused" land such as forests and savannas on which local communities often depend. Moreover, LSLAs entail an appropriation of water resources that may negatively impact local farmers or downstream human and natural systems. In most cases, investors keep the land fallow but, when they put it under productive use, they typically change land cover and land use to start intensified commercial farming, often for nonfood crops. Copyright © 2017 John Wiley & Sons, Ltd.

KEY WORDS: large-scale land acquisitions; water grabbing; land grabbing; deforestation; land degradation

INTRODUCTION

Large tracts of agricultural land are being acquired globally and converted from semi-subsistence farming to large-scale commercial agriculture (Anseeuw *et al*., 2012a; Nolte *et al*., 2016). Similar land deals and direct investments are also being made for mining, logging, energy production, dams/reservoirs, conservation, carbon sequestration, or other environmental uses (Fairhead *et al*., 2012; Klare, 2012; Matondi *et al*., 2011; Scheidel & Sorman, 2013). Through these acquisitions, land is often transferred from the control of local communities to agribusiness multinational corporations, investment funds, or government-owned companies (Robertson & Pinstrup-Anderson, 2010). In many cases, these investors are from other countries, but domestic corporations and mixed domestic–foreign ventures are also involved (e.g., Cotula, 2013a,b). Since 2002, about 48 Mha of land for agriculture and forestry – more than four times the area of Portugal – have been acquired (i.e., "contracted") by international investors through sales, leases, or concessions, mostly in the developing world (Figure 1) (The Land Matrix, 2017). However, only about 20% of this land (15% if only agricultural land is considered) has been put under production. The direction of the ongoing investments is not only from the "North" to the "South" of the world but also within the global South (Kugelman & Levenstein, 2013). These land negotiations often occur with little or no regard for transparency, the involvement and prior informed consent of local communities, or potential social and environmental impacts. Land acquisitions leading to speculations that violate the rights of local communities or do not give them a voice in the negotiations are denounced as "land grabs" (ILC, 2011; Grain, 2012; Pierce, 2012a; Cotula, 2013a). The use of this term, however, is debated in the scholarly literature because it is politically charged, pejorative, and stresses only the negative aspects of the phenomenon. Other expressions such as "land rush" (e.g., Klare, 2012) or "large-scale land acquisitions (LSLAs)" are often used (The Land Matrix, 2016). In most cases, acquisitions are motivated either by the need to enhance food and energy security in countries with limited agricultural resources or by the prospects of making profitable investments (Cotula, 2012; Robertson & Pinstrup-Anderson, 2010). Proponents of large-scale land investments and foreign direct investments, instead, emphasize how this kind of agricultural development can enhance food security in developing countries (Chakrabarti & Da Silva, 2012). However, there are debates on the most

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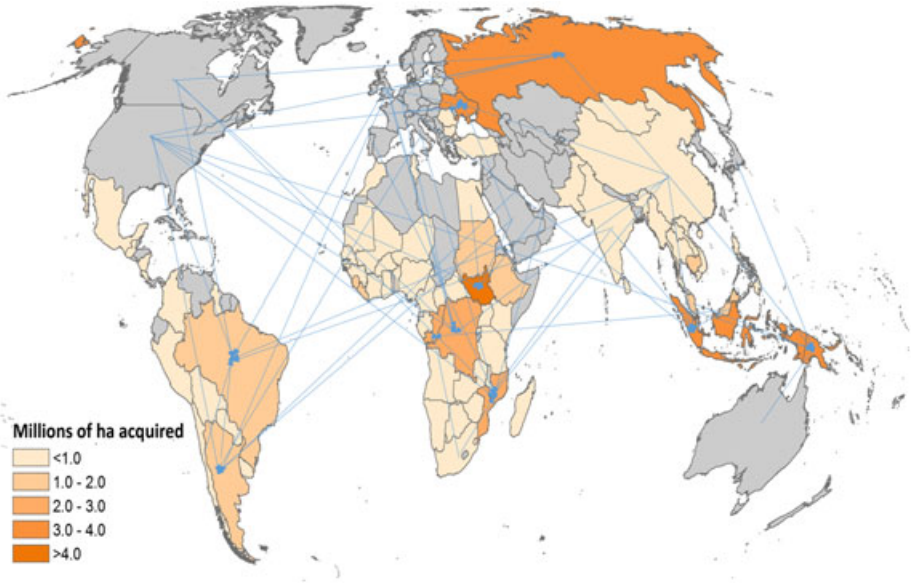

Figure 1. A map of global land grabbing showing 76 major target countries. Investment flows are shown only for the 10 top investor countries (data from The Land Matrix, 2017). [Colour figure can be viewed at wileyonlinelibrary.com]

effective legal and technical options that could maximize the benefits while minimizing risks and negative impacts of this typology of investments. Therefore, there continue to be outstanding policy and governance questions on key issues, such as the adherence to the principles and guidelines identified by the United Nations, the World Bank, and other international organizations, and reliance on investments as a possible pathway to agricultural development that could lead to closing the yield gap in underperforming agricultural lands (Borras & Franco, 2012; Cotula, 2009; De Schutter, 2011a; D'Odorico & Rulli, 2013; Von Braun & Meinzen-Dick, 2009; Deininger & Byerlee, 2011).

While LSLAs for commercial farming have been discussed in terms of their potential and significance for economic development and food security (Deininger & Byerlee, 2011), the phenomenon has also been described as a form of neocolonialism based on unbalanced power dynamics between investors and local land users (Borras *et al*., 2010). In this synthesis, we identify five controversial socio-environmental dimensions of the debate on LSLAs, namely, land commodification and speculation; the social and ethical implications of land investments; the associated appropriation of freshwater resources; its implications for local food supply and access; and the environmental impacts associated with land use change, land development, and land degradation. Despite the political nature of the debate on different development models, it is important to acknowledge and address these controversial aspects in order to advance our understanding of the implications of this major transformation of rural landscapes in developing countries.

COMMODIFICATION OF LAND AND DISPOSSESSION OF THE "COMMONS"

The frontiers of commodification, that is, the multidimensional process through which goods that are not traditionally priced, enter the market and the world of money (Polanyi, 1944; Bakker, 2005) and expand through land investments (White *et al*., 2012; Cotula, 2013a,b). In the views of mainstream economic development and technological optimism, defining property rights, modernizing traditional systems of production, and integrating local economies into global markets will promote economic growth and lead to a more efficient use of natural resources and reduction of negative environmental externalities (Sachs, 2012; Breakthrough Institute, 2015).

Nevertheless, for a large majority of rural people in developing countries, land represents a critical asset for subsistence and production. Land embodies a plurality of values that cannot adequately be reflected in a monetary unit. From an emic perspective, land has a cultural, spiritual, and societal value that is dismissed when it is reduced to a commodity. On the other hand, LSLAs – involving sale of the land and its resources and services (including carbon credits, water, and biodiversity) – put a "price tag" on natural resources and are driven by the rationale of profit making or conservation (Fairhead *et al*., 2012). LSLAs often take place in the presence of common property systems in regions such as in sub-Saharan Africa where over 70% of the land is governed by customary, traditional, and indigenous institutional arrangements (Wily, 2011a,b).

Land investments in these areas can lead to a phenomenon defined as "commons grabbing" that occurs when the acquired land was previously used for smallholding and traditional uses, the land ownership exhibits multiple claims and unclear property or use rights, and the dynamics of acquisition are characterized by power imbalance and coercion (Dell'Angelo *et al*., 2017a). In the literature on the recent global land rush, it is often reported that LSLAs occur under these three concomitant conditions. Such coercive dynamics characterize the contemporary global agrarian

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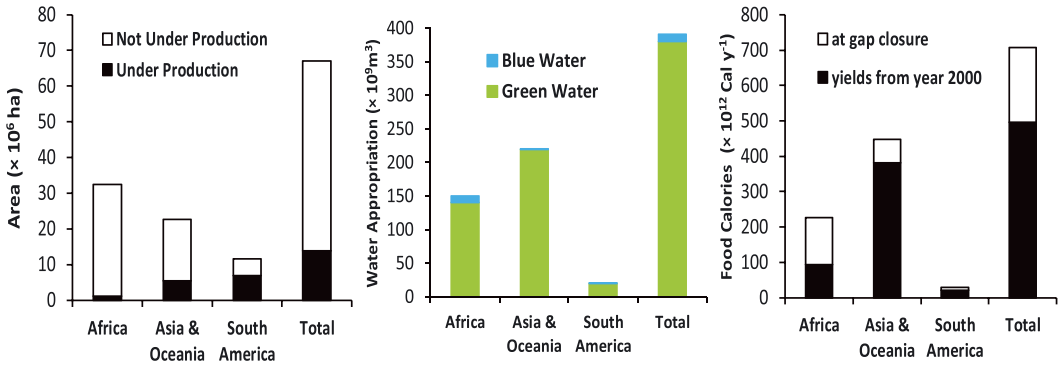
transition, imposing new systems of agricultural production and natural resources extraction at the expense of traditional land users and small-scale farmers and neglecting local institutional arrangements. Land use change associated with LSLAs can have many faces that result from the interplay between change in land property relations, concentration of land ownership, and shifts in production, for example, if the land is transformed from idle to intensified agriculture (Borras & Franco, 2012). Commodification of land and food production processes do not only alter property relations but drastically transform the ability of people to access and benefit from natural resources and the land (Ribot & Peluso, 2003). Traditional and community systems governing natural common-pool resources, which provide long-term sustainability and high levels of socio-ecological resilience (Berkes *et al*., 1989; Ostrom, 1990; Agrawal, 2001; Dietz *et al*., 2003) can therefore collapse in the face of globalizing pressures of agricultural production and extractive enterprise (Dell'Angelo *et al*., 2017a).

Often, investors also see LSLAs as a mechanism to develop and intensify agricultural production in "unused land" and consider land a valuable commodity because its future demand is expected to increase. For example, in many reported cases, the acquired land (Figure 2) remains fallow (Deninger & Byerlee, 2011), suggesting that land investments can also be driven by mere speculation rather than farming purposes (e.g., Robertson & Pinstrup-Anderson, 2010). If the land is treated as a fungible commodity, short-term returns are preferred against long-term sustainability. Thus, the ethic of environmental stewardship, which invokes a responsible use of natural resources, is lost. Land acquisitions are often conducted by foreign investors (Figure 2), suggesting that local knowledge is replaced by decision from afar, a model of land management that is typically less committed to good land stewardship (Chapin *et al*., 2009).

SOCIAL CONSEQUENCES

The ongoing land rush generates a debate between those who see in it business and development opportunities and those concerned about the detrimental impacts on rural livelihoods and food security in the target countries (e.g., Narula, 2013; Oberlack *et al*., 2016; Schiffman, 2013). Proponents of the economic development argument maintain that large-scale investments in agricultural land are a "win–win" strategy that will create new jobs and bring



	Africa	Asia & Oceania	S. America	Total Global
Acquired Land (× 10^6 ha)[a]	32.4	22.6	11.5	67.1
% Under production	3.6	24.2	59.2	20.6
% Foreign	71.8	71.0	74.9	71.9
Potential Food Appropriation (×10^{12} kcal y^{-1})[a]				
– yields of 2000	93	381	21	496
– at gap closure	227	448	30	708
People who could be fed (millions)[a]				
– yields of 2000	52-89	123-263	13-18	188-371
– at gap closure	123-212	157-312	21-26	303-551
Potential loss of rural livelihoods (×10^9 USD)[b]	11.5	21.2	1.5	34.2

Figure 2. Areas acquired by continent, fraction that has been put under production, or acquired by foreign investors (data from The Land Matrix, 2017). Water appropriation associated with large-scale land acquisitions, calculated as water used by crops, including both rain water (green) for all contract areas and irrigation water (blue) only for areas under production (based on Rulli & D'Odorico, 2013). Food that could be produced by the acquired land ([a]Rulli & D'Odorico, 2014). Number of people who could be fed by this food, based on a daily diet of 3,000 kcal (including unavoidable waste), 20% of which from animal products; the range corresponds to different scenarios of food calorie availability ([a]based on Rulli & D'Odorico, 2014). Potential loss of income with respect to a scenario in which the land would be cultivated by local communities, using crop yields with low technological inputs and crop price values at the farm gate ([b]based on Davis *et al*., 2014). [Colour figure can be viewed at wileyonlinelibrary.com]

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new investments in the developing world. Such investments should increase the productivity of underperforming agricultural land thereby improving food security (e.g., Chakrabarti & Da Silva, 2012). This is because LSLAs provide the financial capital required to invest in modern agricultural technology, offering greater promise for increasing crop production in regions of the developing world with relatively large yield gaps. These views are in contrast with those who stress the negative impacts on the local populations and their food security (e.g., De Schutter, 2011b). A fundamental element of criticism for such land deals is that the land often remains fallow (Figure 1), indicating that, while the local communities lose access to ecosystem services and natural resources, no new jobs or business opportunities are created (e.g., Deininger & Byerlee, 2011). Further, even in concession areas that are actively utilized by investors, the food produced in the acquired land is many times exported to the investor's country – although there are certainly exceptions (Lisk, 2013) – or sold in the international food market at prices that are not affordable for the local community particularly during food crises (Chinsinga *et al*., 2013; Lavers, 2012). To date, however, quantitative assessments of the impact of land investments on economic development, crop exports, food security, and agricultural production in target countries are still missing.

Thus, LSLAs can turn into profit opportunities for agribusiness corporations and livelihood losses for local populations (Chinsinga *et al*., 2013; Davis *et al*., 2014). In several cases, land acquisitions have also led to evictions and forced migrations (e.g., Adnan, 2013; Feldman & Geisler, 2012; Siciliano, 2014). Such consequences therefore raise important ethical concerns related to violations of human and land tenure rights (Anseeuw *et al*., 2012b; Toft, 2012; Toft, 2013), particularly of women (Behrman *et al*., 2012; White, 2012). Some of these issues, however, remain difficult to demonstrate. In addition, the institutional reconfigurations associated with land tenure transformations induced by LSLAs involve important societal transitions. For instance, in the case of pastoralist groups, an important component of the developing world's farming system, privatization, and exclusion processes resulting from the expansion of commercial farming directly compromises the viability of traditional systems of grazing and transhumance. Several other uses of traditional land and natural resources on which rural communities rely are also not compatible with extensive commercial agricultural production (De Schutter, 2011b; Golay & Biglino, 2013).

The social implications of acquiring land that is claimed by multiple users while expanding commercial and intensive systems of agricultural production are problematic. What is certain is that small-scale farming represents, in terms of cultivated area, the main system of agricultural production globally (Samberg *et al*., 2016) and that the rural population of developing countries directly depends on local land and natural resources (Godfray *et al*., 2010; IAASTD, 2009; Turner *et al*., 2007). A large share of this population is comprised of traditional users of natural common-pool resources. Disrupting these systems of resource governance through external, often coercive, systems of production might open the way to negative and possibly irreversible socio-environmental consequences.

The role of indigenous and local populations in governing natural resources, biodiversity, and ecosystems and their importance in the climate change mitigation goals is often proclaimed in global governance agreements and conventions (Brondizio & Le Tourneau, 2016). The importance of their role is related to the fact that traditional systems have codeveloped through centuries of practices that reflect the local environmental conditions and produced valuable traditional ecological knowledge (Berkes *et al*., 1989). Despite the early claims of the "tragedy of the commons" theory (Hardin, 1968), common-pool resources are often managed through traditional institutions and governance systems that in many cases have impeded unsustainable practices and overexploitation by the members of the community (Ostrom, 1990; Cox *et al*., 2010). While in certain instances they might be resilient to endogenous drivers and dynamics, the sustainability of traditional systems of production based on common property regimes appears more vulnerable to external pressures such as those associated with LSLAs (Dell'Angelo *et al*., 2017a).

The risk is that, in addition to the direct negative impacts on local and indigenous populations, the land acquisition phenomenon might erode entire traditional systems of existence that include institutions, practices, values, and beliefs that underlie the ethic of environmental stewardship and its crucial contribution to global sustainability (D'Odorico & Rulli, 2014). When this happens, populations affected by LSLAs often react by entering into explicit conflict. Dell'Angelo *et al*. (2017a) show with a meta-study on LSLAs and land grabbing that in almost half of the cases reviewed, the local users engaged in different typologies of conflicts that ranged from non-peaceful contestation to violent confrontation. Social actors facing dispossession and injustice organize. A variety of coordinated efforts of resistance and political reactions "from below" that include different forms of transnational and local conflict are described in a recent special issue in the Journal of Peasant Studies (2015).

The social outcomes associated with LSLAs produced different policy responses and consequently a debate on what measures would effectively safeguard rural populations and what instead would be ineffective if not pejorative. Nevertheless, there are strongly diverging views on the possibility that the social risks of these investments could be minimized by following the codes of conduct, principles of responsible investment, and voluntary guidelines developed by the World Bank and the United Nations international development organizations such as International Fund for Agricultural Development and Food and Agriculture Organization and private self-regulatory sustainability schemes promoted by the private sector (Borras & Franco, 2010; 2013; De Schutter, 2011b; Margulis *et al*., 2013; Von Braun & Meinzen-Dick, 2009).

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WATER GRABBING

Land, nutrients, and water represent the three main resource demands for crop production. It could be argued that plenty of land exists around the world with temperature regimes suitable for agriculture. Even if the soils are poor in nutrients, fertilizers could be used to enhance their productivity. On the other hand, water remains a major limiting factor for agricultural production worldwide. In regions of the world with increasing water scarcity, LSLAs provide a mechanism, through virtual water trade, to appropriate water from other countries without having to actually transport it (Rulli & D'Odorico, 2013). Recent work has shown that LSLAs are one of the systems through which appropriation of water resources in developing countries occurs (Mehta *et al*., 2012; Rulli *et al*., 2013). "Water grabbing" has been defined as the process through which powerful actors take control of water resources at the expense of local communities (Franco *et al*., 2013).

However, this concept can be interpreted in different ways, from the redefinition and reallocation of water rights (e.g., Sosa & Zwarteveen, 2012) to the diversion of rivers and reconfiguration of waterscapes (e.g., Matthews, 2012) and to virtual appropriation of freshwater through agricultural production (Breu *et al*., 2016; Rulli *et al*., 2013). Indeed, several studies point to commercial farming through LSLAs as the most impactful system of freshwater appropriation in developing countries (Anseeuw *et al*., 2012b; Mehta *et al*., 2012; Rulli *et al*., 2013). Globally, acquired water accounts for about $0{\cdot}4 \times 10^{12}$ m^3 y^{-1} (Figure 2), including both rainwater (or "green water") and irrigation water (or "blue water") transpired by plants (Rulli & D'Odorico, 2013). This volume is quite substantial in comparison with other forms of human appropriation of freshwater resources, such as groundwater depletion ($0{\cdot}14 \times 10^{12}$ m^3 y^{-1}) and groundwater used for irrigation ($0{\cdot}54 \times 10^{12}$ m^3 y^{-1}) (e.g., Konikow, 2011; D'Odorico & Rulli, 2013). While blue water consumption (i.e., the appropriation of irrigation water from aquifers or surface water bodies) is only a tiny fraction of the total appropriation (Figure 2), LSLAs may serve to increase pressure on blue water resources as such investments often entail the installation of irrigation systems. Unlike the case of green water, it is expected that such investments and the associated appropriation of blue water resources will occur only after the land has been put under production (Figure 2). As such, water appropriation may not only reduce the availability of freshwater resources for ecosystem functioning and services but also has a direct effect on society by reducing the potential for food production for local communities relying on the same freshwater resources and possibly inducing or exacerbating water conflicts (Rodríguez-Labajos & Martínez-Alier, 2015; Zerrouk, 2013).

Symptoms associated with appropriation of freshwater resources, in particular blue water, observed in developing countries have consistent characteristics. This has been defined as a "global water grabbing syndrome," because of the size of the phenomenon, the consistent patterns, and the associated negative socio-environmental effects (Dell'Angelo *et al*., 2017b). A diagnostic framework has been developed that defines "blue water grabbing" and identifies the likelihood of its occurrence based on malnourishment as well as water scarcity indicators. Based on the ethical principle of the human right to food, Dell'Angelo *et al*., (2017b) link LSLAs to the issue of food security and point to the fact that export of agricultural commodities for commercial purposes from countries that have high rates of malnutrition and high levels of water stress may enhance food insecurity in the local communities and therefore violate basic human rights. For these reasons in this context, water appropriations can be considered as a form of "grabbing."

FOOD GRABBING

By restricting access to natural resources, land acquisitions can have important impacts on the self-sufficiency of rural communities and limit potential food security options within subsistence livelihoods. Some estimates suggest that LSLAs have the potential to affect the income of 12 million people globally (Davis *et al*., 2014). To better understand this impact on food security, it is possible to estimate the amount of food that can be produced in the acquired land. By conservative estimates, about 200 million people could be fed by crops that could be planted in this land (Figure 2), with an additional 100 million after productivity improvements through investments in agrotechnology (Rulli & D'Odorico, 2014). Thus, these large amounts of potential crop production would be able to feed 25–30% of the malnourished people in the world. For Africa alone, acquired lands could sustain the production of enough food to feed 52–89 million people with the existing technology (Rulli & D'Odorico, 2014). LSLAs are also often touted as a mechanism for introducing modern agricultural technology that could lead to the closure of the yield gap. In these conditions, the acquired land could produce enough food to feed 123–212 million people (about a 140% increase). However, to date, roughly only 20% of the concluded agricultural land deals have been put under production (Land Matrix, 2017), suggesting that, while local communities may lose access to the land, no real increase in food production is achieved. Moreover, crops are often used for bioenergy and not food production. Indeed, biofuel investors are major contributors to LSLAs, accounting for about 20% of the acquired land, 35% of the water potentially appropriated through LSLAs, and 88% of the acquired land that is already in production (Rulli & D'Odorico, 2014; Land Matrix, 2017), although these figures likely change with market conditions. The use of the land for biofuel production in countries affected by malnourishment has further enhanced the debate on transnational investments in agricultural land (Borras *et al*., 2010; Fairhead *et al*., 2012; Kugelman & Levenstein, 2013; Matondi *et al*., 2011).

The paradox is that many of the target countries are affected by malnourishment and rely on food aid programs (e.g., Rulli *et al*., 2013), which means that food is taken

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away from those who are most in need. The counterargument has often been that the acquired lands were either not used or underutilized because of lack of investments in modern technology. However, almost no land is ever "empty" or "unused," and even a non-intensive use of the land by local populations can provide important ecosystem services that are crucial to their food and economic security (Knight, 2015; Kugelman & Levenstein, 2013).

LAND DEGRADATION AND OTHER ENVIRONMENTAL IMPACTS

An often-overlooked aspect of LSLAs is the impact they can have on the environment. These effects are most apparent where investors put forested land under production, many times causing environmental damage through logging, habitat destruction, and soil tillage and leading to biodiversity losses, greenhouse gas emissions, and soil erosion (Runyan & D'Odorico, 2016). While land deals are granted in many forested areas across the global South (e.g., Brazil, Cambodia, Congo, Indonesia, Malaysia, and Papua New Guinea), their links with deforestation are better understood in Southeast Asia (Figure 3). In Cambodia, annual rates of forest loss within land concessions have been 29–105% higher than in comparable non-acquired areas since the start of the century, while land concessions account for about 12·4% of Cambodia's forests; in 2012, they contributed to 27% of the country's deforestation (Davis *et al*., 2015a). Granted in areas where more than 200,000 people currently live, these concessions have also raised concerns about displacement and violations of land rights. In Indonesia's Kalimantan, 56% of oil palm expansion between 1990 and 2005 occurred at the expense of primary forests (Naylor, 2011). This extensive and ongoing land use change is often driven by the increasing demand for oil palm for biodiesel production. CO_2 emissions from Indonesia's oil palm sector are expected to increase from 0·01 $GtCO_2eq\ y^{-1}$ during the 1990s to as high as 0·15 $GtCO_2eq\ y^{-1}$ by this decade (Carlson *et al*., 2012), a carbon debt that can take 86–420 years to pay back (Fargione *et al*., 2008). In other words, it will take an exceedingly long time for biofuel usage to offset the CO_2 emissions resulting from this land use change. While these concessions are often given for free by the Indonesian government with the expectation that smallholders will also benefit from these investments (Naylor, 2011), there are frequent reports that customary land rights are violated.

Land acquisitions are also suspected of causing indirect land use change and deforestation. In Brazil, for example, where rangelands are replaced by acquired croplands and forests are in turn converted into grazing areas (Hermele, 2014). Further, large-scale land investments can also have important implications for human health. For instance, in West Africa, land concessions for logging and oil palm production are encroaching in forested areas (e.g., Hirsch, 2012), causing habitat fragmentation, biodiversity losses, possible spillover of zoonotic diseases from wildlife to humans (Rulli *et al*., 2017), and reduced access to forest products such as timber, bush meat, and firewood by local communities. In Indonesia, emissions from peatland burning and land conversions in oil palm plantations and timber concessions could have contributed to more than 100,000 deaths across Indonesia, Malaysia, and Singapore (Koplitz *et al*., 2016). While studies are beginning to quantify the environmental impacts of land acquisitions, further research – as well as information on the geographic coordinates of specific lands deals – is urgently needed in order to better understand the suite of potential environmental consequences of this phenomenon.

In the context of land degradation and development, LSLAs are emerging as new drivers of land use and land cover change in the developing world both through agricultural intensification and extensification. It has been argued that land acquisitions may bring investments in modern technology to intensify agriculture and close the yield gap in underperforming agricultural land (e.g., D'Odorico & Rulli, 2013). There are some concerns, however, that these acquisitions might remove resources from the target regions, undermine rural livelihoods, and enhance food insecurity (Messerli *et al*., 2013; Schiffman, 2013). The counterargument has often been that the land was previously uncultivated and unused. In most cases, it is reasonable to expect that land, although previously uncultivated, was used by local communities as for rangeland grazing, firewood collection, timber extraction, hunting, or other social reasons (e.g., Knight, 2015). Even though these ecosystem services often remain poorly evaluated, the acquisition of "virgin land" is likely to induce a loss of their livelihoods. The development of that land entails agricultural extensification with the expansion of cultivated areas at the expense of natural ecosystems or fallow land. In some cases, it has been possible to document that LSLAs are a "new" mechanism contributing to deforestation and land degradation (Carlson *et al*., 2012; Davis *et al*., 2015a; Rulli *et al*., 2016).

Changes in land use and land cover are in general driven both by proximate causes and underlying factors (Angelsen & Kaimowitz, 1999; Geist & Lambin, 2002). While proximate causes are associated with local conditions determining the choices and actions of land users, these actions are, in turn, influenced by underlying drivers that act at a distance, such as macroeconomic dynamics, markets, and national and international policies (e.g., Runyan & D'Odorico, 2016; Turner & Robbins, 2008). In this sense, large-scale land investments may act as important underlying (distal) drivers of land use change and deforestation. As an effect of LSLAs, global factors may increase in importance with respect to local conditions in determining land use decisions, leading to the establishment of "teleconnections" or "telecoupling" (Liu *et al*., 2013) between the land and its managers. This phenomenon is known as "global displacement of land use" (Meyfroidt *et al*., 2013) and has only started to be investigated in the context of LSLAs (Friis *et al*., 2015; Seaquist *et al*., 2014) (Figure 4). When decisions

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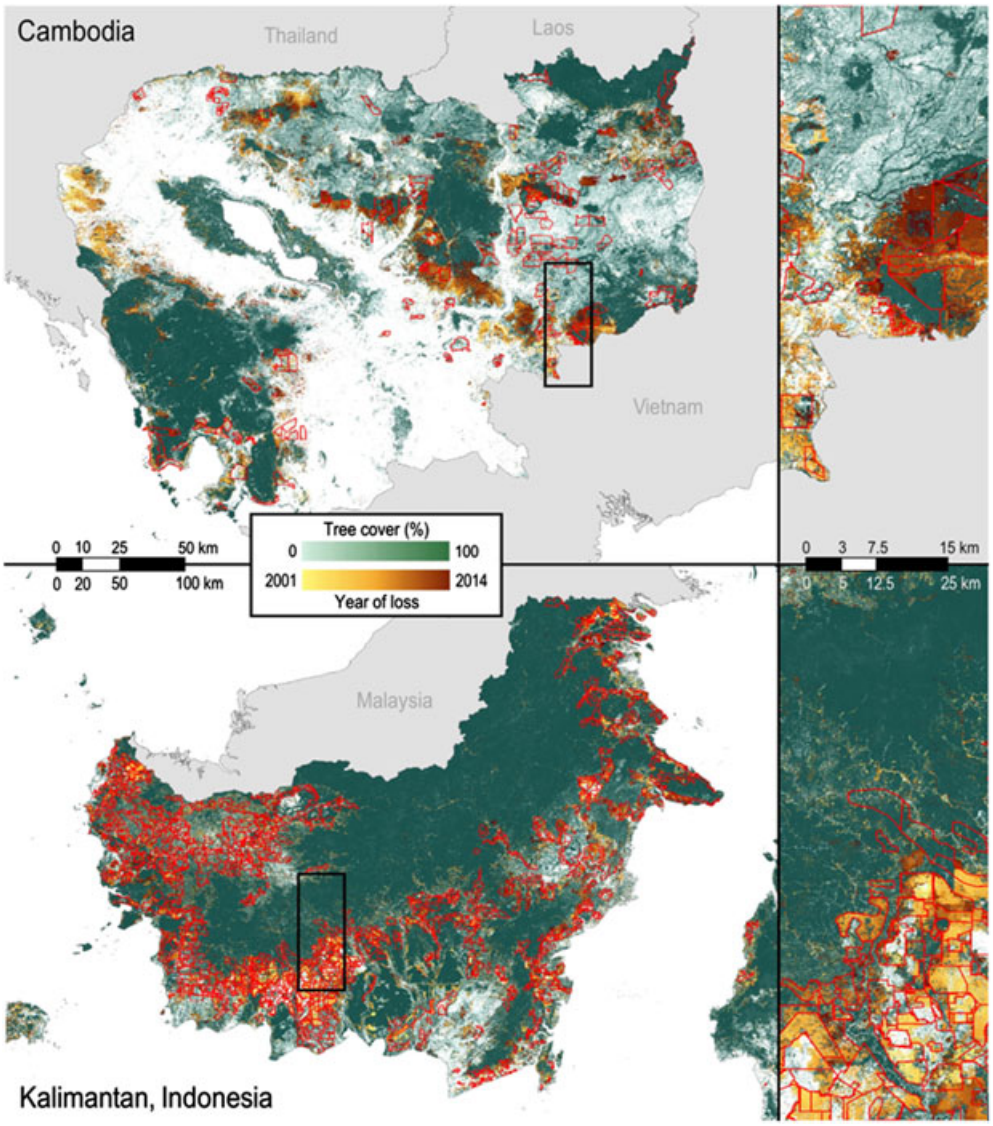

Figure 3. Land concessions and deforestation patterns in Cambodia and Kalimantan. While deforestation has occurred both inside and outside of concessions since the start of the century, obvious differences in the pattern of this forest removal are apparent. At present, Cambodia has 128 economic land concessions – equal to 0·9 Mha – that have not been adjusted or revoked (shown here). In Kalimantan, there are currently 1,242 deals equaling 10·6 Mha. In the year 2000, Kalimantan's forests covered 460,000 km^2 – 19% of which were located in oil palm concessions. Yet between 2000 and 2014, 43% of forest loss occurred within these land deals. Similarly, one recent study (Davis *et al*., 2015a) found that deforestation rates in Cambodia's land concessions were 29–105% higher than in comparable non-leased lands. Data on tree cover and forest loss came from an updated version of the Landsat product produced by Hansen *et al*. (2013). Forested areas were defined as those pixels having >30% tree cover. Data on economic land concessions in Cambodia came from Open Development Cambodia and was based on information from the Cambodian Ministry of Agriculture, Forestry and Fisheries (Davis *et al*., 2015a). Data on oil palm concessions in Kalimantan came from Global Forest Watch (www.globalforestwatch.org) in cooperation with the Indonesian Ministry of Forestry. [Colour figure can be viewed at wileyonlinelibrary.com]

on land use are taken from afar without capitalizing on local knowledge, there is the risk of neglecting long-term sustainability goals and environmental stewardship (D'Odorico & Rulli, 2014). Ironically, in some cases, underlying drivers of land degradation in the developing world are associated with environmental policies promoting forest conservation or biofuel use in other regions (Meyfroidt *et al*., 2010). Often known as the "leakage effect" (Meyfroidt *et al*., 2013), these unintended consequences of environmental policies can be associated with LSLAs (e.g., Davis *et al*., 2015b) and "green grabbing" (i.e., land acquisitions for environmental goals; Fairhead *et al*., 2012) (Figure 4).

MOVING TOWARDS AN INTEGRATED UNDERSTANDING OF LARGE-SCALE LAND ACQUISITION IMPACTS

Research on LSLAs has investigated mostly the social impacts with a focus on rural livelihoods, economic development, systems of agricultural production, human rights, land tenure, food security, and access to natural resources. Studies on environmental conditions have concentrated on freshwater use, land use, and land cover change, particularly deforestation, the associated habitat destruction, biodiversity loss, and land degradation. However, there has been little

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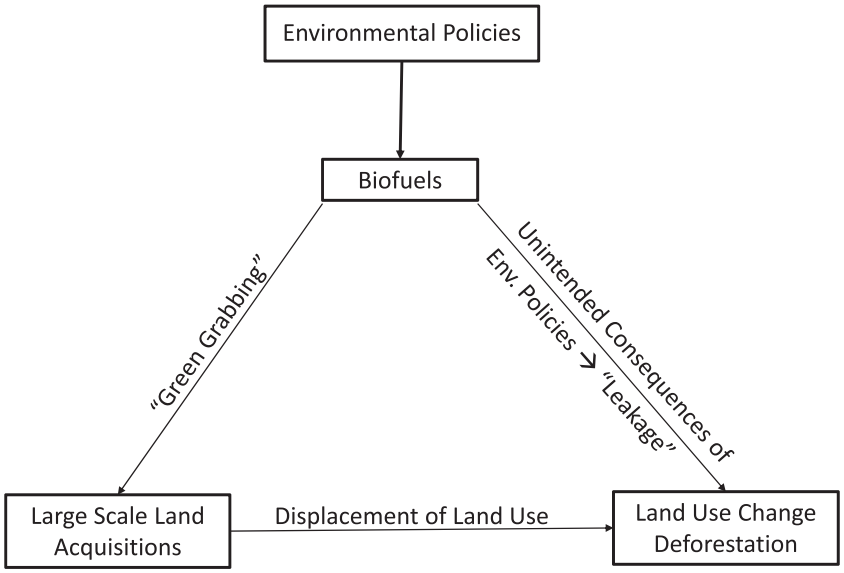

Figure 4. Interactions among environmental policies, large-scale land acquisitions, and land use change/deforestation in the context of biofuel production. About one-third of the global biodiesel consumption is from oil palm accessed through international trade, mostly produced in Indonesia and Malaysia (Rulli *et al*., 2016). When environmental policies have unintended negative environmental impacts (e.g., habitat and biodiversity loss and carbon emissions from deforestation), a "leakage" effect is said to occur (Meyfroidt *et al*., 2013). Large-scale land acquisitions for environmental goals such as bioenergy production to curb CO_2 emissions have been termed "green grabs" (Fairhead *et al*., 2012). Land use change and deforestation resulting from distal drivers such as the globalization forces underlying large-scale land acquisitions are often known as "global displacement of land use" (Meyfroidt *et al*., 2013).

attention until now to the socio-environmental dynamics and interdependencies of LSLAs.

The impacts on rural livelihoods have been addressed by a number of case studies reported in this synthesis. Like in the case of foreign direct investments (e.g., Pandya, 2014), advocates of LSLAs highlight that they could turn into a promising pathway to economic development because they could bring the financial capital, technology, and knowledge required to improve the productivity of the land while providing employment opportunities and improving the average income levels (Chakrabarti & Da Silva, 2012). It has been stressed however that in many cases, the negative impacts on the local populations outweigh the benefits because LSLAs (i) erode rural livelihoods, (ii) bring food insecurity by turning farmers into employees who have access to food commodities through highly volatile markets, (iii) exclude local communities from the access to environmental good and services, (iv) replace subsistence/semi-subsistence farming with highly mechanized large-scale commercial agriculture that is less labor intensive and therefore provides fewer employment opportunities; moreover, (v) in most cases, the land is not put under production and neither economic development nor productive uses of the land are observed. There are critics of the LSLAs phenomenon that exclude any possibility that this model could be beneficial to developing countries because of its structural dispossession characteristics, while other analysts observe that pros and cons of LSLAs need to be assessed on a case-by-case basis, with respect also to the policies in place in the target country, their implementation, and the institutional and political conditions underlying land tenure and natural resource governance.

There is some evidence that land investors preferentially target common property systems when acquiring land (De Schutter, 2011a; Fuys *et al*., 2008; Wily, 2011a,b; Dell'Angelo *et al*., 2017a; Pearce, 2012b) likely because local communities with no formal land titles are unable to defend their land rights, or because their system of production cannot compete with large-scale commercial farming as a result of the more limited access to capital, credit, or modern technology and strong power asymmetries. This transition of the land from the control of local communities to agribusiness corporations is often favored by unbalanced power relations, ranging from unequal access to information and legal counseling to violence, forced evictions, and relocation of entire communities, lack of state of the law, and corrupted or failing governments.

Large-scale land acquisitions are also a mechanism of water appropriation. Recent studies have provided a quantitative assessment of this phenomenon (Rulli *et al*., 2013). Interestingly, land acquisitions in Asia target regions of the wet tropics where only relatively small irrigation inputs are needed to attain high agricultural yields. In these regions, land investments mostly entail appropriations of rainwater (i.e., "green water"), which are inherent to the acquisitions of land. Conversely, in the land acquired in Africa, the attainment of higher yields (or "yield gap closure") often requires irrigation, which entails water withdrawals from surface water bodies and aquifers that could compete with local land uses. Overall, land investors target regions where agricultural production is not expected to be strongly affected by increasing water stress under climate change scenarios (Chiarelli *et al*., 2016).

Several studies have stressed the possible environmental impacts of LSLAs, such as the loss of biodiversity (including crop diversity), pollution from fertilizers and pesticides, soil loss, land degradation (e.g., Lazarus, 2014), land cover change (e.g., forest loss), and the associated habitat

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destruction and greenhouse gas emissions (e.g., Kugelman & Levenstein, 2013). Some of these effects have been documented in specific case studies, while larger-scale analyses are missing, except for the case of deforestation and land cover/land use change. In fact, the use of remote sensing products combined with georeferenced maps of the acquired land has allowed for larger-scale regional studies (Davis *et al*., 2015a; Rulli *et al*., 2016) and demonstrated how LSLAs are preferential hotspots of deforestation. Large-scale land investments are important underlying drivers of deforestation (Geist & Lambin, 2002) and may serve as a major force of globalization that contributes displacement of land use (Meyfroidt *et al*., 2013). Other effects of LSLAs on the environment remain poorly quantified and are becoming a priority in research on land degradation and global rural development.

Critical to integrating these diverse (and often disparately observed) impacts of LSLAs – on social systems, institutions, food and livelihood security, and the environment – is an overall lack of adequate data, which is often because of rapidly changing nature of the ongoing land rush. While groups of investigators have developed unique data sets of LSLAs – reporting country-based estimates of the areas under contract, intended crops, and the negotiation and implementation status of land deals (The Land Matrix, 2016) – other aspects of this phenomenon remain difficult to document. For instance, whether each investment was performed with no involvement of local communities, in disregard of customary land rights, taking advantage of unbalanced power relations, or using forced evictions and dispossession of previous land users can be determined only on a case-by-case basis through intensive fieldwork. Moreover, regardless of whether land acquisitions lack transparency or violate the rights of local populations, commodification of land can negatively affect the environment and the services it provides and introduces a system of values that is at odds with some fundamental emic perspectives of agrarian societies in developing countries. Thus, LSLAs could be problematic independent of whether previous users are adequately informed, involved, and compensated (D'Odorico & Rulli, 2014).

Likewise, the evaluation of the impact on rural livelihoods requires knowledge on whether the land was previously cultivated and the type of resources it provided to the local communities (Messerli *et al*., 2014). In most cases, georeferenced information on land deals is missing, and therefore, land cover changes subsequent to land acquisitions can be determined only in some rare cases. The impact on water resources is also difficult to evaluate because no information exists on the irrigation infrastructure available in each country and the exact location of each land deal. Therefore, while we can estimate the amount of irrigation water that land managers should apply to maximize their yields, we are unable to determine whether there are adequate infrastructure and freshwater resources to sustain such withdrawals. The drivers of this recent increase in LSLAs are also difficult to determine (Byerlee & Deininger, 2013; Cotula, 2012). The increase in LSLAs during years that have seen major global food crises and investors' interest in staple rather than cash crops (e.g., Kugelman & Levenstein, 2013) suggests that land investments are often motivated by the desire to enhance (and speculate on) food and bioenergy security (Davis *et al*., 2015b). At the same time, many land deals are found to be for fibers, timber, and other forestry products, as well as for carbon sequestration and environmental conservation (The Land Matrix, 2016).

Despite these difficulties, recent research in this field has started to provide a quantitative assessment of the major biophysical aspects of the phenomenon, while interactions with social scientists are filling important gaps among the institutional, economic, and environmental dimensions of LSLAs (e.g., Lazarus, 2014; Messerli *et al*., 2014).

CONCLUSIONS

Large-scale land acquisitions are a controversial topic in the scholarly arena but also central in the agenda of rural and international development organizations. This phenomenon has fomented debate and raised international attention from academics, policy makers, and the civil society. A socio-environmental approach that integrates different scales of analysis and methodologies will continue to be necessary to address the complexity of the dynamics produced by LSLAs and to inform the policy agenda of international development organizations.

In sum, LSLAs are an expanding phenomenon that is producing radical social and environmental transformations. Understanding these patterns from a socio-environmental perspective is key to addressing the complexity of processes that affect both the natural and social dimensions. It is of fundamental importance that the international development arena, governments, and policy makers stay receptive to the insights developed by the scientific community studying these issues and that inclusive governance processes are developed to take into account the variety of perspectives and interests that are being so heavily impacted.

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