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Rethinking Landscape Conservation: Linking Globalized Agriculture to Changes to Indigenous Community-Managed Landscapes

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Abstract

Community-managed landscapes have valuable conservation potential. In particular, indigenous community management has slowed deforestation. However, globalized agriculture is an underlying driver of changes to indigenous community-managed landscapes. Our objective is to explain a hypothesized global-to-local causal pathway that stems from processes of globalized agriculture and changes to indigenous community-managed landscapes. The global-to-local pathway involves a nested hierarchy of political–economic processes, specifically land and natural resource privatization, commodification, and acquisition. At the local landscape level, we focus on changes to land tenure, livelihoods, land use, and land cover. Changes to land tenure involve a shift away from community and toward individual ownership and management. Concurrently, livelihoods shift away from subsistence and toward market-oriented activities. Subsequently, land use shifts away from small-scale extensive and toward large-scale intensive crop cultivation, away from diverse crop cultivation and toward monocropping, and away from crop toward livestock farming. Ultimately, land cover shifts away from diverse agro-forested and toward homogeneous deforested lands. We illustrate our approach using ejidos, a type of community-managed lands, in Yucatán, México as an exploratory example. We use descriptive statistics to initially assess the shift in ejido land tenure, from community to individually parcelized systems, and the shift in a principal subsistence livelihood and land use activity, from maize cultivation to cattle rearing. We highlight that individually parceled areas within ejidos are more deforested than community-managed areas. In all, we urge landscape conservation scientists to more fully consider not just local actions but also impacts stemming from globalized agriculture and to advance the breadth and depth of more extensive studies and analyses.

Keywords

globalized agriculture, indigenous communities, land tenure, livelihoods, land use and land cover

Introduction

Community-managed landscapes have valuable conservation potential (Harvey et al., 2008). For example, community-managed forests across the tropics have showed lower and less-variable annual deforestation rates than protected forests (Porter-Bolland et al., 2012). In particular, indigenous or native peoples' community management has slowed deforestation and land degradation (Blackman, Corral, Lima, & Asner, 2017; Ceddia, Gunter, & Corriveau-Bourque, 2015). Maya Community Forest Reserves (MCFR) across the Yucatán Peninsula are an example of where plant diversity is sustained at a high level (Levy-Tacher, Ramírez-Marcial, Navarrete-Gutiérrez, & Rodríguez-Sánchez, 2019). Although landscape conservation depends on the social, political, and economic context (Baynes, Herbohn, Smith, Fisher, & Bray, 2015),

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as well as de jure, de facto, or mixed community regimes (Agarwala & Ginsberg, 2017), community-managed landscapes often sustain biodiversity at levels comparable to old-growth forests and pristine reserves (Jose, 2012). As a result, community-managed landscapes are becoming a global trend (Baynes et al., 2015) and offer potential management options that conservationists have come to acknowledge (Sistla et al., 2016; Vallejo-Ramos, Moreno-Calles, & Casas, 2016).

Land tenure systems are important to landscape conservation. As informal and formal resource management institutions, land tenure systems determine the relationships among people and their land (Barnes, 2009; Spalding, 2017) and are intricately tied to culture (Berkes, 2012). For many indigenous societies, land tenure follows cultural norms and values based on land use over many generations. Hence, livelihoods are based on detailed knowledge about local ecological conditions, plants, animals, and interconnecting ecological processes that culminate in complex systems for categorizing ecological characteristics and patterns (Altieri, 2004; Kassam, 2009). Consequently, indigenous land and resource management can be quite sophisticated and adaptive (Berkes, 2009), often involving low-intensity inputs with little mechanization, multiple and intermingled use, and rotational strategies (G. M. Robinson, 2018). Traditional knowledge and practices can therefore result in extensive ecological gradients, diverse patches and high-quality habitat, and ecosystems and landscapes with a wide array of species and considerable biodiversity (Fischer, Hartel, & Kuemmerle, 2012; Ribeiro Palacios et al., 2013).

Despite the importance of indigenous community-managed landscapes to conservation, globalized agriculture—integration of local-to-national agriculture markets into the global market economy via the reduction of international trade barriers and subsequent expansion of trade—is an underlying driver of changes to them. Specifically, globalized agriculture is influencing a shift in (a) land tenure away from community and toward individual ownership and management and (b) livelihoods away from subsistence and toward market-oriented activities. In turn, land use and land cover are changing away from diverse landscape mosaics and toward homogeneous landscapes. Moreover, the changes to indigenous community-managed landscapes can lead to broader landscape impacts and more extensive consequences for global biodiversity (Jose, 2012).

In rural agrarian-based tropical countries, the changes stemming from globalized agriculture can be particularly acute and widespread (Laurance, Sayer, & Cassman, 2014), making indigenous landscapes increasingly vulnerable (Harvey et al., 2008; Rudel, Defries, Asner, & Laurance, 2009). For example, agricultural expansion and exports are considered a primary driver of tropical deforestation (Chowdhury, 2010; DeFries, Rudel, Uriarte, & Hansen, 2010; Laurance et al., 2014). The changes are especially noticeable in landscapes comprised of swidden or rotational (slash-and-burn) agroforestry (see Mertz et al., 2009 for a thorough definition and discussion of the types of swidden agriculture), which are often cited as biodiversity-friendly land use systems (Padoch & Pinedo-Vásquez, 2010; Schmook, van Vliet, Radel, de Jesús Manzón-Che, & McCandless, 2013). However, in the last few decades, political–economic pressures have encouraged or enforced changes from swidden to more intensive and permanent agriculture practices (van Vliet et al., 2012). Such patterns are troubling because many of these same countries harbor extensive global biodiversity and diverse indigenous cultures (Ribeiro Palacios et al., 2013).

Despite their potential importance, it is rare that political–economic processes related to globalized agriculture, such as international trade, are analyzed as a key driving force of landscape change (Pace & Gephart, 2017). In particular, the influence of globalized agriculture on changes to indigenous community-managed landscapes is seldom acknowledged and is afforded minimal consideration in regional or international conservation planning (Treweek, Brown, & Bubb, 2006). For example, the Convention on Biological Diversity addresses issues concerning local development and poverty reduction (Secretariat of the Convention on Biological Diversity, 2010). However, these and similar efforts fall short of addressing broader political–economic forces, such as global agricultural commodity markets as underlying driving forces of change to indigenous landscapes (DeFries et al., 2010; Meyfroidt et al., 2014; Meyfroidt, Lambin, Erb, & Hertel, 2013; Pace & Gephart, 2017). Rather, land privatization and its integration into the global agriculture and food economy is often seen as a key strategy toward improving food security, reducing poverty, fostering growth, and promoting natural resource management (Spalding, 2017). Indeed, these are some of the important potential benefits of such integration into global markets. Similarly, the International Union for the Conservation of Nature emphasizes how traditional knowledge and practices can contribute to conservation (Secretariat of the Convention on Biological Diversity, 2014), but discussions about how globalized agriculture affects such knowledge and practices are often lacking.

Globalized agriculture as a driving force of landscape change is seldom discussed partly because systematic explanations and empirical evidence are lacking (Carrasco, Chan, McGrath, & Nghiem, 2017; Jepsen et al., 2015; Liu, Mooney, et al., 2015; Plieninger et al., 2016; Spalding, 2017). Consequently, global-to-local causal pathways that impact landscape patterns remain

poorly understood (Garrett, Lambin, & Naylor, 2013; Meyfroidt et al., 2014; Pereira, Simmons, & Walker, 2016; Riekkinen, Toivonen, Krigsholm, Hiironen, & Kolis, 2016; Taylor, Aguilar-Støen, Castellanos, Moran-Taylor, & Gerkin, 2016; Yu, Anderies, Lee, & Perez, 2014). Distant political–economic driving forces of landscape change have been studied for decades (Blaikie & Brookfield, 1987; Bürgi, Hersperger, & Schneeberger, 2005; Hersperger & Bürgi, 2010) using household surveys (Hersperger, Gennaio, Verburg, & Bürgi, 2010) or remote sensing and census data (Castella & Verburg, 2007). However, these approaches often focus on land use and land cover patterns (Chowdhury, 2006), rather than examining underlying *processes* that drive these changes (Hersperger & Bürgi, 2009). Moreover, rarely integrated with land use and land cover change analyses is agrarian change: the shift in rural agrarian land tenure and livelihoods, from non-capitalist to capitalist relations due to broader scale political–economic forces (Akram-Lodhi & Kay, 2010a, 2010b). Nevertheless, the need for such synthesis is increasingly acknowledged (Borras & Franco, 2012; Borras, Hall, Scoones, White, & Wolford, 2011; Holland et al., 2014; Lambin, Geist, & Lepers, 2003; Robbins, Chhatre, & Karanth, 2015; Robinson, 2014; Wittman et al., 2017). Overall, impacts to indigenous community-managed landscapes that stem from globalized agriculture are likely to increase. This topic deserves greater attention (Pace & Gephart, 2017).

In Lawrence, Morreale, and Stedman (2019), the authors empirically analyze global-to-local linkages that stem from processes of globalized agriculture and drive changes to indigenous (Maya) community-managed landscapes across Yucatán, México. Our objective in this article is to complement Lawrence et al., which emphasized spatial aspects of change, by broadening the scope and providing a broader conceptual approach to guide additional research on this topic. Our conceptual approach to hypothesizing global-to-local causal pathways involves a nested hierarchy of three political–economic forces: land and natural resource privatization, commodification, and acquisition. At the landscape level, and following Lawrence et al., we focus on connections between globalized agriculture and shifting land tenure, livelihoods, land use, and land cover. With our conceptual approach, we aim to contribute to more contextually and historically place-based hypotheses and explanations, better data collection instruments, more robust models and empirical analyses, and ultimately guide more effective conservation policy, planning, and action (Hersperger et al., 2010; Ostrom, 2009; Verburg et al., 2015). We also include an exploratory example to illustrate our approach. The exploratory example provides an initial assessment of changes in Yucatán, México using ejidos, a type of de jure community-managed lands. Specifically, we use descriptive statistics to highlight the effects of parcelization on deforestation, the shift in ejido land tenure, from community to individually parcelized systems, and the shift in a principal subsistence livelihood and land use activity, from maize cultivation to cattle rearing.

Global-to-Local Pathways

A Nested Hierarchy of Political–Economic Processes

Investigating globalized agriculture and its influence on indigenous community-managed landscapes involves analyzing a nested hierarchy of the political–economic forces at work. This nested hierarchy approach entails political–economic actors on a global scale, such as transnational corporations and international banks, interacting with political–economic actors on smaller spatial scales, such as national governments and local businesses. In particular, this approach emphasizes (a) shifts in political–economic activity to the global scale, (b) shifts in the distribution of power to the global scale, and (c) cause-effect mechanisms whereby political–economic processes at the global scale affect political–economic processes on smaller spatial scales. In all, the nested hierarchy approach helps to separate and clarify the political–economic processes embedded at varying spatial scales that create a top-down influence on indigenous community-managed landscapes.

The nested hierarchy approach is particularly important because agriculture markets have changed dramatically over the last few decades. Prior to the 1980s, agriculture trade involved an increase in the *distance* of exchange beyond national borders. Accordingly, the processes scaled up an agricultural economy, from the local to the regional, to the national, to the global, in a linear way (Bridge, 2002). Although economic activity extended beyond national borders, it was regulated from within nations. Consequently, the world's agriculture markets were subservient to national interests, which guided public policies that influenced nationally based markets (Rodrik, 2011). In this context, an indigenous community-managed landscape may have been involved in agriculture production for export, but the cross-scale power distribution remained largely within the nation of residence.

More recently, agriculture trade has involved a nested hierarchy of political–economic forces (Borras, 2009; McMichael, 2017), in addition to increasing geographic distances between production and consumption (Defries et al., 2010; Liu, Hull, et al., 2015). The influence over agriculture markets is now centralized in global institutions that operate outside national boundaries (Griffin, 2003; McMichael, 2012). As a result, national interests

have become subservient to the global agricultural market economy (McMichael, 2009), while transnational corporations, investors, and banks influence globally based markets (Rodrik, 2011). This is largely because present-day economic globalization has fundamentally transformed the scales over which agriculture's political–economic activity historically has been organized (Bridge, 2002). Accordingly, agricultural market activity and its management have shifted to larger scales. The scale transformations create and reinforce nested hierarchical organizational structures with a more complex web of relations, involving more actors and linkages from the global to the local scale (Brenner, 2001). In this context, the power distribution has shifted to the global scale, which can increasingly marginalize indigenous community-managed landscapes at the local level, further accelerating the shift.

Despite the change to the agricultural economy's structure, globalization-based studies have continued to favor operational approaches that emphasize distance between key actors and sites (MacKinnon, 2011). Telecoupling, the socioeconomic and environmental interactions between two or more places over distances (Liu et al., 2013; Liu, Hull, et al., 2015; Liu, Mooney, et al., 2015; Moser & Hart, 2015; Seto et al., 2012; Yu et al., 2014), is an example of a recently developing approach to investigate sustainability in a globalized world. For example, studies on telecoupling have mainly focused on linkages related to specific land uses, sectors, or other natural resources, such as soybean and beef production for international trade (Friis & Nielsen, 2017). Such a framework can contribute to understanding landscape change, particularly with regard to land and natural resource supply and demand between distant locations (Munroe, McSweeney, Olson, & Mansfield, 2014). However, telecoupling and similar approaches lack the operationalization of the local in relation to larger spatial scales, including the global scale.

Political–Economic Processes Related to Globalized Agriculture

The agricultural economy's globalization in recent years has involved unprecedented increases in land and natural resource privatization, commodification, and acquisition (Clapp, 2015). These processes are linked to political–economic forces, involving widespread state reform of property rights, resource access, local-to-global commodity-chain corporatization, and the global agro-industry's financialization (Bernstein, 2008). Moreover, these changes have contributed to the central role the agro-industrial food system now plays in the global market economy (McMichael, 2009); namely, acquiring large tracts of agricultural land around the world (Sonnenfeld, 2008). These processes and the interactions between the associated political–economic forces form a global-to-local pathway that may bring about profound changes in indigenous community-managed landscapes by initiating a gradual process of change that is more insidious than foreign investors merely buying up land, as is the case with land grabbing (Borras & Franco, 2012).

Land and natural resource privatization undermine indigenous community-managed landscapes, as the market economy usually places greater importance on the market value of land and its resources, than their social and cultural worth. However, in indigenous landscapes, the relationship between people and land is often intricately tied to its social and cultural importance (Berkes, 2012). Governments strongly influenced by economic globalization emphasize the market value of land and resources over its social and cultural value. Although transnational corporations and investors lead investments in land at the global scale (Borras, Franco, Gomez, Kay, & Spoor, 2012), national governments often play a key role in land privatization that undermine indigenous land tenure systems. For example, in 2001, Panama established the National Land Administration Program to provide free land titles to the rural population and then in 2010 created the National Land Administration Authority to regulate and streamline all processes related to land privatization (Spalding, 2017). Although indigenous territories (Comarcas) encompass 12% of Panama, in addition to customary lands through defacto rights of possession (Vergara-Asenjo & Potvin, 2014), formal or legal recognition does not guarantee tenure security to these communities as foreigners and corporations seek investments in land (Smith, Holland, Michon, Ibáñez, & Herrera, 2017). The land titling and similar programs throughout Latin America seek to regulate private property and to facilitate a market for land, often neglecting traditional indigenous land tenure systems and their associated conservation potential (Barnes, 2003).

Following privatization, land and resource commodification for global agricultural markets can further weaken indigenous community-managed landscapes. Cultural norms and values in indigenous community-managed landscapes often involve noncapitalist relations to land that ultimately define the potential land uses for subsistence and petty trade. However, the expansion of markets for land and resources can lead to a more economically efficient land system that will, in turn, facilitate the increased foreign investment (Spalding, 2017) and may ultimately displace the traditional land use practices. For example, prior to the 1980s, local state-controlled agricultural commodity chains operated in many rural agrarian-based tropical countries, which covered much of the world's

agricultural areas (McMichael, 2009). Trade in these countries also remained largely under state control, including high tariffs on imported agricultural inputs restrained food exports, and state subsidies supporting subsistence agriculture. Widespread trade liberalization initiated in the 1980s and subsequent international development agencies' actions, such as the World Trade Organization's Agreement on Agriculture (Blandford, 2015), led to the state-controlled agriculture and food systems being reorganized into a small number of transnational corporate-owned entities (McMichael, 2012). Government agricultural subsidies were restructured to encourage market participation or sizably reduced or eliminated altogether, resulting in foreign investors obtaining greater access to land and resources. However, the local food system's reorganization, from state to market control, can strongly influence the community land tenure systems as local livelihoods are more tightly linked to broader markets.

Land acquisition can also have considerable social and ecological impacts on indigenous community-managed landscapes (Borras & Franco, 2012). In rural agrarian-based tropical countries, communities are often displaced from their land due to land acquisitions intended for agricultural and forestry production as well as energy and mining (Borras, 2009). As a result, land use and land cover are also altered. With transnational corporations and investors now playing a key role in organizing production, including the land and resources utilized for production, the acquisition by these actors of large tracts of land has increased dramatically over the last decade (Clapp, 2015). Such land acquisition is a consequence of the gradual process of land privatization and commodification. Therefore, land acquisition should be analyzed in the context of this *process* of change, rather than solely as foreigners buying land. Land acquisition is nothing new, but the character, scale, pace, and key drivers of the recent wave of land acquisition are historically distinct and closely linked to major shifts in agricultural production (Margulis, McKeon, & Borras, 2013). In turn, overall agricultural exports into the global market economy rapidly increased to 60% between 2000 and 2012 (Carrasco et al., 2017). Land acquisition thus undercuts community land tenure systems as well as impacts associated with livelihoods, land use, and land cover.

Land and natural resource privatization, commodification, and acquisition reinforce authority at broader scales; disempower local actors; and undermine resource management (Adger, Brown, & Tompkins, 2006). For example, global corporations and financial actors play an increasingly active role in food retailing and processing, commodity trading, setting prices, distributing agricultural risks and agricultural input's provisioning, and agricultural lands' ownership and control (Isakson, 2014). As land and resources become more concentrated in a small number of global capital-intensive agro-industries and foreign investors, indigenous community-managed landscapes shrink and local markets for small-scale producers are eliminated (Moore, 2010). As a result, new differentials in bargaining power emerge that favor transnational agro-food corporations, and global food retailers and supermarkets, such as Walmart (McMichael, 2012), which have been quick to establish retail outlets in developing countries with open trading systems (Biles et al., 2007). Moreover, global food retailers have emerged as the most powerful actors within the agro-food system (Isakson, 2014) and never before have commoditized exchange and the power of large-scale food retailers been so great (McMichael, 2009). In all, land and resource privatization, commodification, and acquisition lead to broader shifts in food supply where widespread state reform, trade liberalization, corporatization, and financialization are rapidly reorganizing agro-industry and precipitating a decline in the relative power of nations, and particularly of local indigenous community-managed landscapes (Margulis & Porter, 2013).

Although political–economic processes related to globalized agriculture can be distant and diffuse, these processes initiate a series of top-down changes in rural agrarian-based tropical countries. Thus, indigenous community-managed landscapes become embedded within more complex global-to-local interactions through market and urban expansion within a region (Wittman et al., 2017). Such global-to-local linkages and interactions represent a dominant pathway, which changes these landscapes (Robbins et al., 2015) by replacing or rearranging local political–economic factors and shifting the political–economic and environmental relationships from the local to the global scale (Meyfroidt et al., 2013). Figure 1 demonstrates how political–economic processes of globalized agriculture alter how people relate to resources, to each other, and to the broader political economy.

Changes to Indigenous Community-Managed Landscapes

Based on the aforesaid discussion, rural agrarian-based tropical countries are seeing traditional land tenure systems moving away from community-managed and toward individually managed privatized systems. A shift from community to individual management often involves land parceling, exclusive access, private ownership, and ownership loss as outside investors purchase land and resources (Barnes, 2009; Oliveira & Hecht, 2016). Some of these changes are privatization, displace landless and rural poor who are driven toward marginal landscapes and frontiers, or urban slums

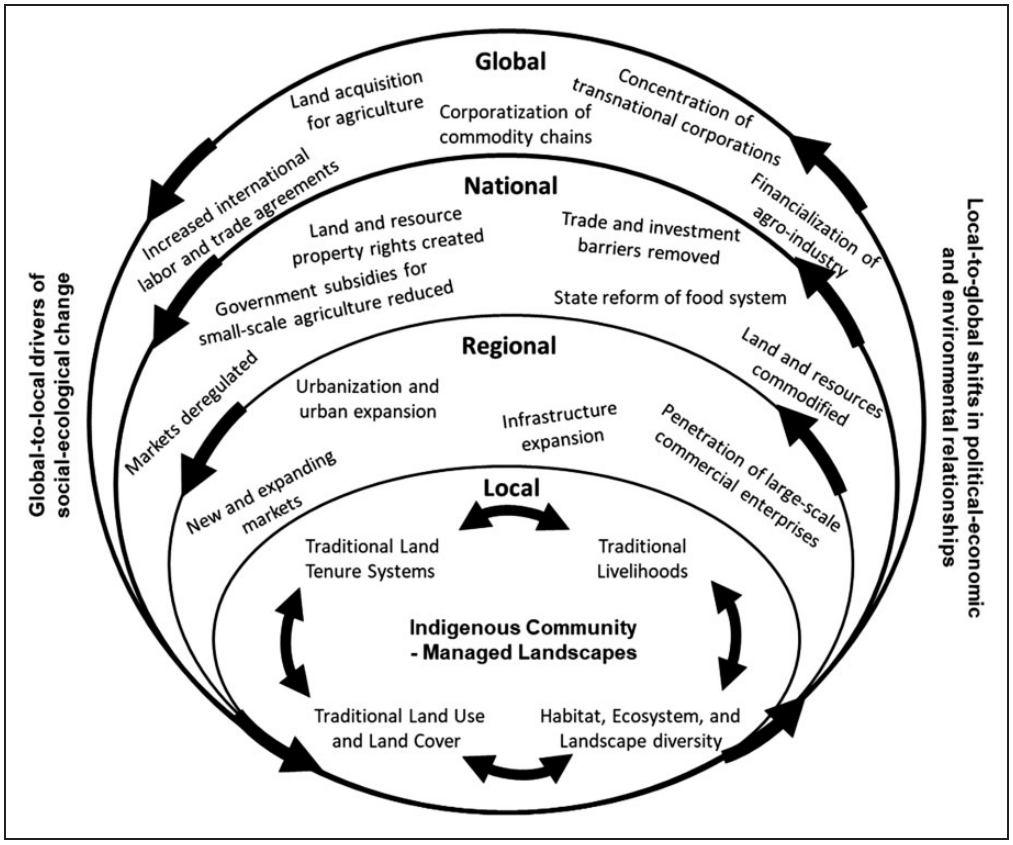

Figure 1. A nested hierarchy of political–economic processes of globalized agriculture. Indigenous community-managed landscapes are embedded in a multiscale process of change where political–economic and environmental relationships shift from the local to the global, and broader scale factors drive changes to local social–ecological systems. The changes to indigenous community-managed landscapes involve the complex interaction of changes to traditional land tenure, livelihoods, land use, and land cover that can impact broader landscape and biodiversity patterns.

(Hecht, 2010; Robson & Berkes, 2011). Regardless of the particulars, shifting land tenure regimes is a powerful driving force of change (B. E. Robinson, Holland, & Naughton-Treves, 2014).

Accompanying shifting land tenure are changes to livelihoods: away from subsistence and toward market-oriented activities. For example, swidden agriculture has been a dominant form of subsistence livelihood in the tropics for centuries (Mertz et al., 2009). Notwithstanding regional differences, swidden agriculture tends to decrease in landscapes with access to local, national, and international markets that encourage cattle production and cash cropping (van Vliet et al., 2012). Such market integration has led to decreases in swidden agriculture throughout South and Southeast Asia (Heinimann et al., 2017). Agricultural policies to encourage cash crop production have also resulted in declines in swidden agriculture in East Africa and in South and Central America through credit or subsidies that support market-oriented agricultural practices (van Vliet et al., 2012).

The shift in livelihoods, away from subsistence and toward market-oriented practices, often results in mixed subsistence and market-oriented practices, but the market-oriented approaches ultimately can altogether replace long-standing traditional land and natural resource management practices. Changes to livelihoods generally involve declines and losses of traditional knowledge and practices as people increasingly rely on broader regional-to-global markets (Butler et al., 2014; Sreeja, Madhusoodhanan, & Eldho, 2015). For example, a shift away from traditional livelihoods can involve an increase in wage-earning and market-oriented activities, further resulting in declining subsistence activities and, ultimately, the loss of associated knowledge (Hecht, 2010). Despite globalized agriculture, some level of market integration likely occurs among indigenous communities, which provides livelihood opportunities and benefits, but globalized agriculture has become a key driving force of livelihood change among indigenous communities. Subsequently, migration toward urban centers can further exacerbate

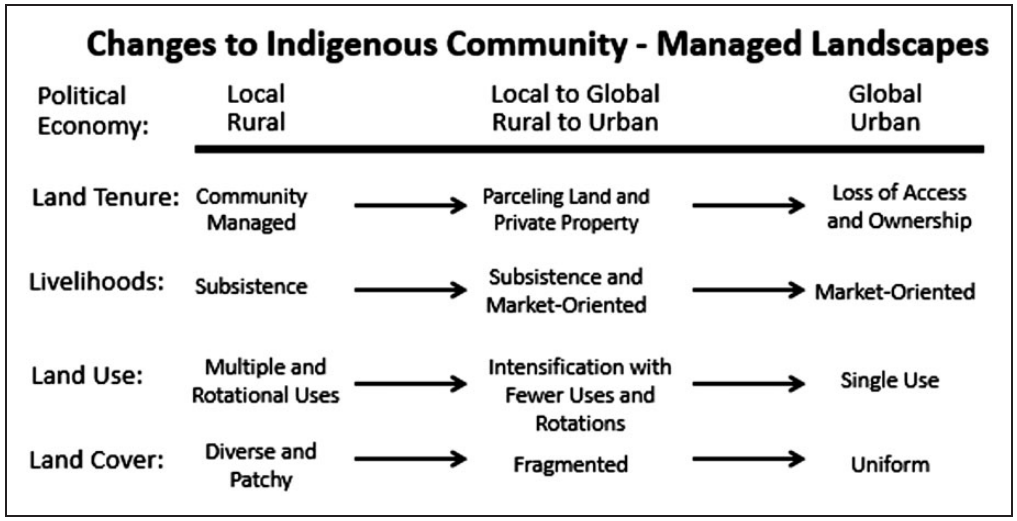

Figure 2. The process of change that indigenous community-managed landscapes undergo due to globalized agriculture. Traditional land tenure, livelihoods, and land use and land cover shift along a spectrum as a society transitions from a local rural to a global urban political economy.

livelihood change (De Janvry, Emerick, Gonzalez-Navarro, & Sadoulet, 2015).

Following the changes to land tenure and livelihoods are changes to land use: away from small-scale extensive and toward large-scale intensive crop cultivation, away from diverse crop cultivation and toward monocropping, and away from crop and toward livestock farming practices (Lambin & Meyfroidt, 2011). For example, over the last several decades, agro-forested landscapes worldwide have been substantially transformed from swidden cultivation to more intensive and permanent cultivation systems (Rudel et al., 2005; van Vliet et al., 2012; Schmook et al., 2013). These changes to land use are partly because land management strategies and adaptive capacities are also constrained and altered, and resources become restricted, thus intensifying land use (Turner, 2010). In turn, forest–agriculture cycles and rotational and intermingled land use become more uniform and homogenized (Barsimantov, Racelis, Barnes, & DiGiano, 2010). Commonly, traditional land use patterns are modified and new cultivars, new domestic animal breeds, and new technologies are adopted, bringing about further modifications to the landscape. Associated with many of these changes are higher nutrient inputs and pesticide application and increased mechanization (G. M. Robinson, 2018). The changes to traditional land use patterns can further lead to the penetration of large-scale commercial enterprises into indigenous landscapes, including industrial agriculture, forestry, and ranching.

Accompanying these changes to land use are changes to land cover: away from diverse agro-forested and toward homogeneous deforested lands. As indigenous landscapes become fragmented, primary habitat and ecosystems are reduced and isolated with fewer resources available to maintain viable populations of many species (Fischer et al., 2012). Soil also degrades as forested areas become sparse and agriculture intensifies. Ultimately, the land cover transforms almost entirely into a single type of land use that severely restricts landscape composition, configuration, and structural connectivity. In turn, landscape functioning and diversity diminishes. As a result, reductions in landscape connectivity and fewer patches large enough to support viable populations lead to substantial declines in local biodiversity (Vallejo-Ramos et al., 2016).

Overall, the changes to indigenous lands can produce broader scale landscape fragmentation and homogenization. Such changes can ultimately impact, and extensively alter, global biodiversity patterns, as landscape heterogeneity is often critical to broader biodiversity patterns (Vallejo-Ramos et al., 2016). Thus, beginning at a global level, as shown in Figure 1, we can trace a global-to-local pathway through the combined changes in traditional livelihoods and land use accompanying shifting land tenure, illustrating a top-down sequence that impacts a much broader landscape (Ogden et al., 2013). Exemplified in Figure 2 is the process of change, away from indigenous community-managed landscapes as a local rural political economy transitions to a global urban political economy.

Globalized Agriculture and Yucatán, México: An Exploratory Example

Globalized Agriculture and México

Many processes associated with globalized agriculture are exerting themselves through shifting land tenure in

México's ejidos, which are a type of community landholding that the federal government created during the early 1900s through Article 27 of México's constitution. The creation of ejidos was intended to support small-scale subsistence agriculture and to redress long-standing land and natural resource inequality (Barnes, 2009; Perramond, 2008). Following the logic described earlier, we initially assess changes to México with a focus on its ejido land tenure system as an exploratory example of the influence of globalized agriculture on indigenous community-managed landscapes. We use descriptive statistics to illustrate (a) the influence of globalized agriculture on changes to indigenous (Maya) ejido landscapes in the State of Yucatán, through land tenure shifting from community to individual management; (b) the associated change in traditional livelihoods away from subsistence agriculture; and (c) how these changes impact forest cover and ultimately landscape patterns and biodiversity.

In México, approximately 30,000 ejidos comprise 52% of all land and 80% of forestlands and involve over 60 indigenous groups as land stewards (Instituto Nacional de Estadística y Geografía de México, 2016). In all, thousands of México's indigenous communities possess legally recognized land rights in the form of ejidos (Smith, Herlihy, Kelly, & Viera, 2009). Such landholdings are considered social property, intended to be managed at the community level (Barnes, 2009). Because of their ubiquity, ejidos drive local political–economic and environmental relationships and power distribution (Perramond, 2008). Thus, the ejido system influences the rural sector's social–ecological complexity and contributes to the conservation of cultural and natural heritages. Although Mexico's unique land history distinguishes it from other countries that comprise community-managed landscapes, we believe that in many ways Ejidos are a prime example of community-managed landscapes that support biodiversity, intertwined with subsistence-based livelihoods and long-standing indigenous cultural beliefs and land use practices (Ellis, Kainer, et al., 2015). As such, the ejido system has played a critical role in defining indigenous peoples' relationships with each other and their land and natural resources. All told, ejidos have influenced and shaped México's social, economic, and ecological landscape for much of the 20th century (Loewe & Taylor, 2008).

During the 1980s and 1990s, the World Bank and International Monetary Fund influenced México's political–economic system to shift from a government-led and locally focused economy toward a free market and globalized economy. Specifically, policies known as structural adjustments were initiated (McMichael, 2017). These policies sought to reduce the state's role in the economy, reduce its expenditures on social services, including agricultural subsidies, and expand trade liberalization, resource privatization, and market deregulation (Edelman & Haugerud, 2005). Following this shift in the mid-1980s, México's government began to withdraw from its role in the country's agricultural sector and, in 1986, entered into the General Agreement on Tariffs and Trade (Carte, McWatters, Daley, & Torres, 2010). Around the same time, federal agrarian policies and laws that supported ejidos were altered in favor of more globally integrated market-oriented approaches to agriculture (McAfee & Shapiro, 2010).

Multiple changes to México's constitution were initiated in 1992, specifically Article 27, which originally established the ejido system. These changes allowed ejido lands to be sold as private property (Perramond, 2008). In addition, the creation of new ejido landholdings ended; land parceling and legal certification began through PROCEDE (Programa de Certificación de Derechos Ejidales y Titulación de Solares); restrictions on ejido lands being rented, sold, bought, or leased were eliminated; and a series of policies were initiated to pave the way toward land privatization and the eventual displacement of the ejido system (Loewe & Taylor, 2008; Smith et al., 2009). In 1994, México joined the North American Free Trade Agreement, furthering private investment in México and integrating its markets into the global economy. The changes were further supported in 1995 through the World Trade Organization's establishment and its Agreement on Agriculture (Blandford, 2014), which provided a framework for long-term agriculture trade reform and domestic policies, leading to the state-controlled agriculture and food systems' reorganization into a small number of transnational corporate-owned entities (McMichael, 2012). Accordingly, México removed high tariffs and ended import restrictions, thereby allowing increased trade and investment in agriculture and forestry. Therefore, land privatization, along with repeal of government subsidies, encouraged international private investment in large-scale commercial agriculture, rather than state investments in small-scale subsistence agriculture that can be traced down to the local level (Carte et al., 2010). As a result, shifting cultivation practices have been decreasing and switching to other types of land use, such as permanent agriculture (Heinimann et al., 2017).

Overall, the changes to México's political economy were based in global political–economic forces that sought to restructure México's national economy, redistribute power, and open the door to foreign ownership of assets. For example, shares in México's food retailing by global supermarkets rose from approximately 5% to 10% in 1990 to 50% to 60% by the early 2000s (McMichael, 2017). Much of these chronicled changes due to an expanded global influence in México have also manifested and are evident in ejidos across the State of Yucatán.

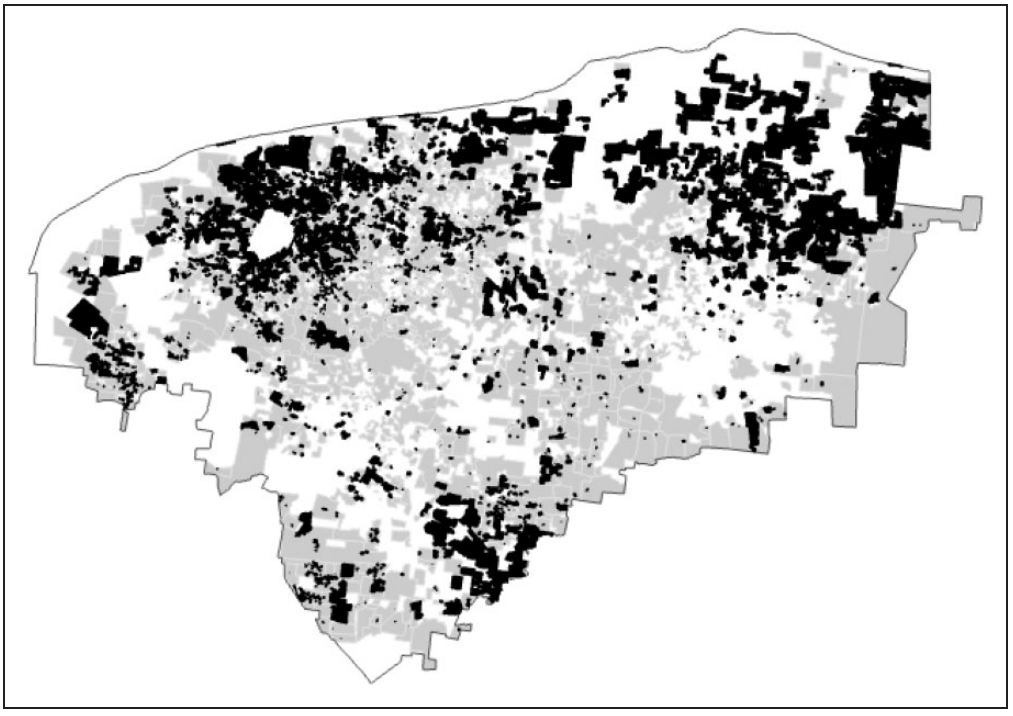

Figure 3. Ejidos across the State of Yucatán. Parceled ejido areas are shown as black polygons; community-managed or common use ejido areas are shown as gray polygons. The remaining white areas represent land outside of ejidos, which include private- and government-owned land. The ejido polygons and data on parceled and common use areas were obtained from México's Registro Agrario Nacional, March 2017.

Changes to Ejido Land Tenure in Yucatán

Approximately 700 ejido lands, primarily under the stewardship of indigenous (Maya) communities, occupy over 2.5 million hectares of the State of Yucatán or nearly 60% of all land in the state (Registro Agrario Nacional, 2017). As such, ejidos have great potential to contribute to landscape conservation on a broad spatial extent (Ellis, Romero Montero, & Hernández Gómez, 2017). Consequently, shifting land tenure has affected both the ejido system's social–ecological complexity and the overall landscape composition. Currently, about two thirds of the state's ejidos remain mostly community-managed, while the remainder have shifted toward parcelization and individual-based land management/ownership (Figure 3). The progression toward privatization has been gradual. In some ejidos that are in the process of parcelization and where there is a shift toward individual management, some tracts of land may be retained for common use. In such cases, land use management decisions for common use areas remain at the community level. Even when ejidos are fully parcelized and distributed among individuals, the community's ejido assembly retains some governing responsibilities. In Yucatán, 64% of all ejidos are completely common use, or contain less than 20% parceled land, and land use decisions remain mostly at the community level. At the other extreme, 5% of all ejidos contain 80% or more parceled land, and management decisions are mostly individual, with a lesser degree of community governance (Figure 4). The shifts in tenure arrangements within Yucatán have all occurred in recent years and are part of a larger complex of social and environmental changes within the region.

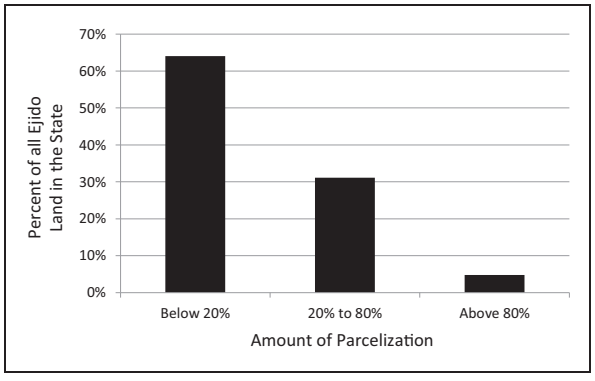

Figure 4. The distribution and degree of parcelization with ejido lands across the State of Yucatán. Sixty-four percent of all ejidos contain from 0% to 20% parceled land, 31% contain 20% to 80% parceled land, and 5% of ejidos are more than 80% parcelized. Ejido parcelization data were obtained from México's Registro Agrario Nacional, March 2017.

Changes to Traditional Maya Livelihoods in Yucatán

Accompanying the shifts in México's ejido land tenure are changes to livelihoods in México that are, at least partly, due to new corporate commodity chains. Prior to the mid-1980s, México's food production was subsidized and a state-led governance structure (*parastatals*) managed the food commodity chains that were regionalized within national borders (Galvan-Miyoshi, Walker, & Warf, 2015). At this time, only a few regional supermarkets existed in México; these accounted for less than 20% of all food sales, while small-scale grocers and municipal markets serviced most of the population (Biles et al., 2007). Overall, México's food production system was largely locally based, while the federal government exercised control over land distribution, prices, agricultural extension services, and food supply patterns. Such policies supported the ejido land tenure system across México. Following important changes to federal agrarian laws between 1986 and 1994, price controls were abandoned and the parastatal system was eliminated (Galvan-Miyoshi et al., 2015). As a result, the commodity chain governance shifted from parastatals and small retailers to large foreign transnational corporations, bringing about rapid expansion in large-scale and capital-intensive production systems (Biles et al., 2007).

Currently across the State of Yucatán, the milpa, a traditional Maya swidden system that has existed for millennia and that involves rotational cutting of forest, burning, and planting maize mixed with squash and beans, exemplifies the diverse subsistence and livelihood practices (Schmook et al., 2013). As land tenure shifts toward individual management, Maya livelihoods are transitioning away from subsistence agroforestry and agricultural ecosystems that primarily involve growing maize and are moving toward market-oriented farming production of new crops and livestock (Lawrence et al., 2019). Such a livelihood transition is counter to the Maya people's indigenous traditional knowledge regarding the use, management, and conservation of their lands that have been passed down across generations for millennia (Puc-Alcocer, Arce-Ibarra, Cortina-Villar, & Estrada-Lugo, 2019). Nevertheless, government programs, such as PROCAMPO (Program of Direct Payments to the Countryside) and Alianza para el Campo (Alliance for the Countryside), have encouraged the shift toward market-oriented agriculture and pasture land use, particularly in ejidos (Daniels, Painter, & Southworth, 2008).

Since the change to Article 27, traditional crop growing activities have largely decreased in highly parcelized ejidos across the State of Yucatán as many ejido farmers have turned their milpas into maize monocrops (Schmook et al., 2013), while traditional farming has increased in ejidos with little to moderate parcelization

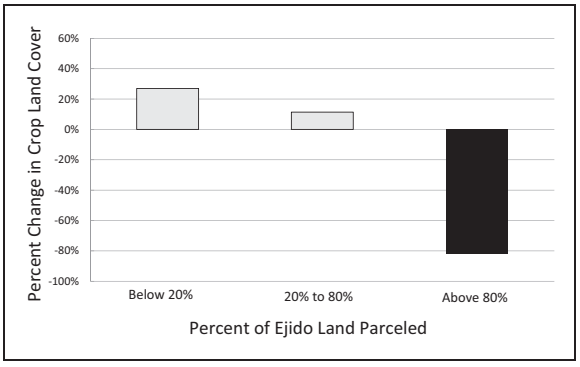

Figure 5. Change in agricultural cropland cover across all Yucatán ejidos between 1991 and 2007. During that period, the total amount of cropland increased 25% in ejidos containing from 0% to 20% parceled land, and 11% in ejidos containing from 20% to 80% parceled land. In contrast, for ejido land that was more than 80% parcelized, cropland decreased by more than 82%. Data obtained from México's Instituto Nacional de Estadística y Geografía, ejidal census, 2007.

(Figure 5). The decrease in traditional crop growing activities is at least partly due to a reconfiguration of maize and cattle commodity chains for distant markets (Appendini, 2014; Ellis, Gomez, & Romero-Montero, 2017; Galvan-Miyoshi et al., 2015). The observed changes to livelihoods and land use reflect a common pattern among farmers of swidden agriculture across the globe when access to local, national, and international markets that encourage cattle production and cash cropping increases (van Vliet et al., 2012). For example, in 1991, only 64 of the roughly 700 ejidos in the state had cattle rearing as a principal livelihood activity, whereas in 2007, there was nearly a ninefold increase, with 567 ejidos engaged in cattle rearing as a principal livelihood activity (Instituto Nacional de Estadística y Geografía de México, 1994, 2007; Lawrence et al., 2019). Parcelized ejido lands are primarily clustered in Yucatán's cattle producing region around the City of Tizimín and the metropolitan region surrounding the City of Merida, the state's main export hub. A similar smaller cluster of parcelized ejido lands is in Yucatán's southern fruit producing region, primarily around the Town of Peto (Figure 6). Undoubtedly, variations in biophysical factors across Yucatán such as soil types and growing conditions likely influence the observed spatial clustering of cattle production in the north and fruit production in the southern region of the state. In addition, Yucatán has an extensive territory of undulating topography and shallow karstic soils (Bautista, Díaz-Garrido, Castillo-González, & Zinck, 2005; Bautista, Palacio-Aponte, Quintana, & Zinck, 2011) that limit the expansion of some commercial interests, such as mechanized commercial agriculture (Ellis, Kainer, et al., 2015). Natural land cover also varies according to regions of the state.

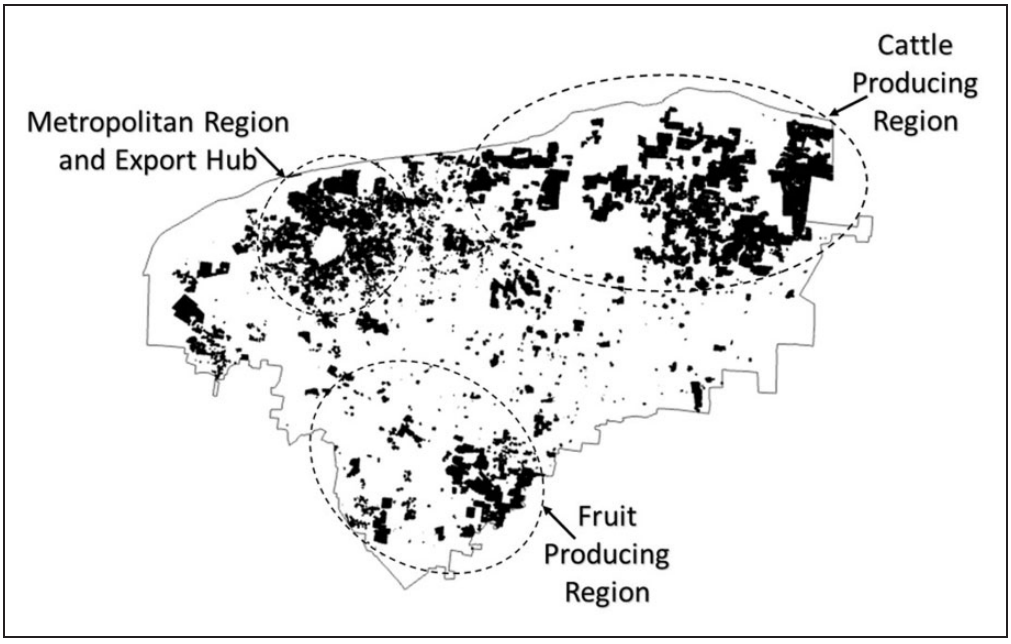

Figure 6. Parcelized ejido lands. Parcelization is primarily clustered in Yucatán's cattle producing region around the City of Tizimín and metropolitan region around the City of Merida, the state's main export hub. A smaller cluster of parcelized ejido lands is in Yucatán's southern fruit producing region, primarily around the Town of Peto. Ejido parcelization data were obtained from México's Registro Agrario Nacional, March 2017.

For example, the northeast region exhibits more grasslands that are more amenable to cattle production, compared with the rest of the state. Moreover, the shallow karstic soils across the state are better suited for the expansion of cattle production rather than attempting to scale up mechanized commercial agriculture. Notwithstanding the different physical environmental factors, with reductions in government subsidies supporting traditional subsistence agriculture, along with the expansion of corporate commodity chains across the state, the Maya people in the state increasingly participate in market-oriented activities, such as chili or pasture cultivation, rather than traditional subsistence activities such as those involved in milpa livelihoods (Schmook et al., 2013).

Ejido Forest Cover in Yucatán

Following ejido land parcelization and changes to livelihoods, there has been a decrease in traditional land uses involving small-scale crop cultivation, grasslands, and multiple tracts of forests and other varying successional habitats. Across México, both forest resources and available arable land are becoming increasingly limited as large-scale supermarkets and commercial agriculture and forestry industries penetrate into different regions (De Janvry et al., 2015). Government programs further exacerbate this problem. For example, PROCAMPO (Program of Direct Payments to the Countryside) and Alianza para el Campo (Alliance for the Countryside) have been associated with increased levels of deforestation in México (Ellis, Romero Montero, & Hernández Gómez, 2015), including the ejido landscapes of Yucatán. These government programs are intended to increase agriculture investment, increase productivity and intensification in ejidos, and facilitate the integration of México's agricultural sector into the global market economy (Schmook & Vance, 2009). In addition, the government of México has simultaneously reduced the support for community forest management and has shifted the forest management and production back toward industry. This shift was codified in the 1992 Forest Law (Ellis, Kainer, et al., 2015). As a result of these and México's efforts to embrace and encourage global economic forces, Yucatán ejidos are being increasingly integrated into the global agriculture market economy in ways reflected in Figure 1.

In the State of Yucatán, shifts in land tenure and changes to traditional Maya livelihoods and land uses have been strongly associated with diminishing forest cover. For example, parcelized ejido lands in the Yucatán peninsula have more land in use and higher deforestation rates than common-use ejido lands (DiGiano, Ellis, & Keys, 2013). Moreover, Lawrence et al. (2019) showed that common-use ejido lands across the State of Yucatán comprise more densely forested lands than parcelized ejidos lands, and that the difference in forest cover can be attributed to market-

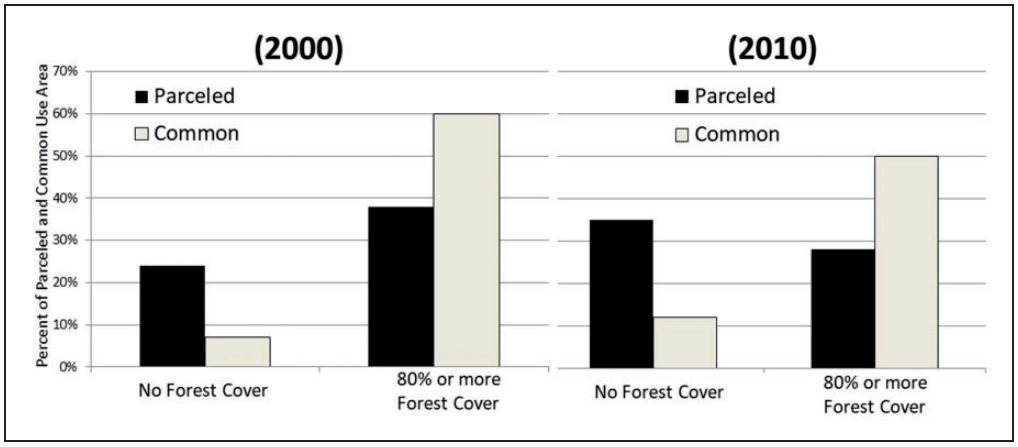

Figure 7. Amount of forest cover relative to the percentage of ejido land that is parceled or common use (i.e., community-managed) in the year 2000 and 2010 for the State of Yucatán. In the year 2000, within parceled land, more than 24% of the area had no forest cover, whereas only 6% of common use areas had no forest cover. In addition, only 37% of parceled areas have 80% or more forest cover, whereas 60% of common use areas have 80% or more of forest cover. In the year 2010, the amount of parceled land devoid of forest cover increased to 34%, and land with 80% or more forest cover decreased by 10%. Dense forest cover also decreased by 10% in common use areas, but the amount of land with no forest cover only increased by 5%. Forest cover data were obtained from Global Forest Change Data (Hansen et al., 2013).

oriented agricultural production on parcelized ejido lands. In a complementary fashion, other types of community-managed areas across the state also contribute to forest conservation. For example, MCFR or Fundo legal allow selective regulated use of trees, but clearing to establish agricultural plots or pastures is prohibited (Levy-Tacher et al., 2019). As a result, the MCFR tend to practice sustainable forestry. Clearly, multiple factors can influence the forest loss; however, commodity markets for cash crops and livelihoods is a driving force of landscape change, and specifically of deforestation (Defries et al., 2010)

We utilized satellite imagery to calculate the forest cover—from the Global Land Analysis & Discovery (2010) and Hansen et al.'s (2013) data set—for the State of Yucatán in the year 2000, 7 years after the constitutional reforms that initiated ejido parcelization, and again in 2010, shortly following the conclusion of the first stage of parcelization through Programa de Certificación de Derechos Ejidales y Titulación de Solares (Figure 7). By the year 2000, 24% of parceled areas were devoid of forest cover, while within common-use (i.e., community-managed) areas, only 6% of the land was devoid of forest. On the other end of the forest cover continuum, more than 60% of the common-use land contained 80% to 100% forest cover, compared with only 37% of parceled areas with such high proportions of forest cover. By 2010, the complete absence of forest cover in parceled areas increased to 34%, while dense forest cover decreased to 27%. Deforested ejido lands are primarily located in the northern region of the state where parcelized ejido lands and agricultural commodity production are clustered (Figure 8).

With international trade barriers now mostly removed, large agro-businesses continue to penetrate and influence parcelized ejido lands, contributing to regional changes in land use and forest conversion. As agro-businesses have displaced traditional subsistence farming, agriculture in Yucatán has become more market-oriented, land cover even more fragmented, and patches of land that previously harbored high biodiversity levels have become more isolated, degraded, or diminished. Such observed patterns of forest loss and landscape fragmentation are likely to increase with further penetration of broader regional and global agricultural commodity chains that incentivize shifts toward different and more homogenous crops, switches from farming to cattle rearing, and changes in land use practices toward less sustainable forestry. In all, due to many forces and processes that originate from the outside world and beyond the influence of local control, ejido land cover, Maya livelihoods, land use practices, and land tenure systems in Yucatán are shifting away from traditional norms in many of the ways outlined in Figure 2.

Rethinking Landscape Conservation

In considering academic and policy recommendations, we have noticed that conservation efforts in Yucatán have mostly focused on local manifestations of broader political–economic factors, rather than distant driving forces of changing landscapes. For example, the México Reducing Emissions from Deforestation and Forest Degradation (REDD) + Alliance and the

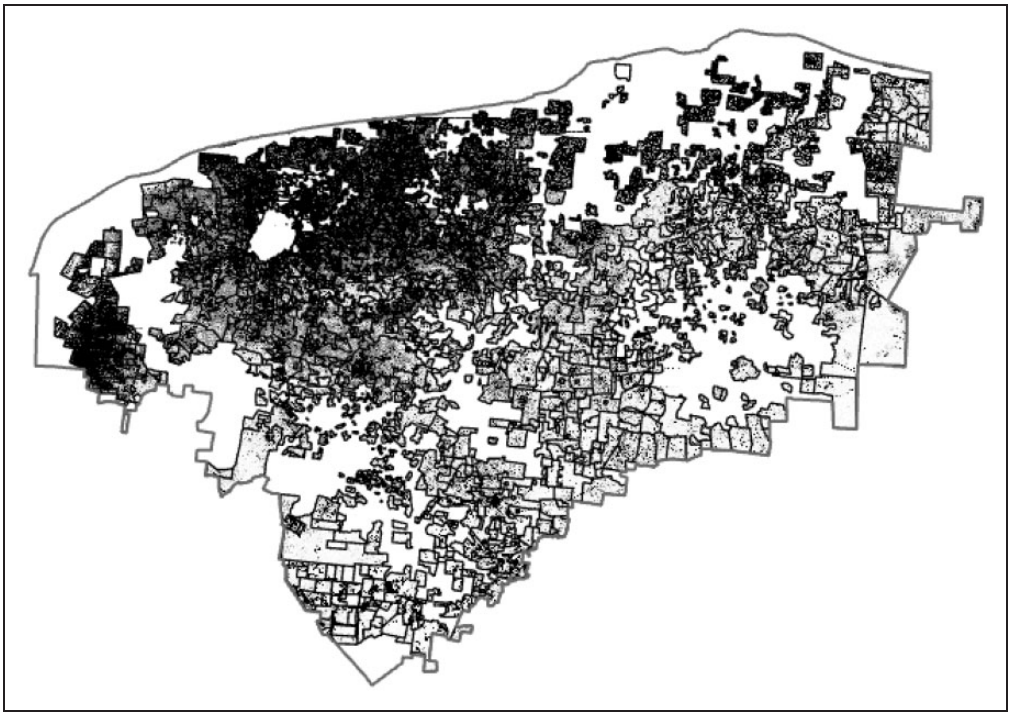

Figure 8. Deforested areas and tree cover within Yucatán's more than 700 ejidos in the year 2010. Darker to lighter colored areas represent a gradient from deforested areas (darker) to forested areas (lighter) within ejido lands. Forest cover outside of ejido polygons is not shown here. White areas within ejidos represent dense forest cover. Forest cover data were obtained from Global Forest Change Data (Hansen et al., 2013).

Tropical Research Center of Veracruz University recently conducted an exhaustive literature review on determinants of deforestation and land degradation across the Yucatán peninsula (Ellis, Romero Montero, et al., 2015). The review concluded that few studies have analyzed the underlying causes of change, including economic factors such as market growth, investment and demands, or institutional factors such as government policies. Rather, attention has focused on local small-scale agricultural practices, which are often indicted as having the greatest overall impact on environmental change, but which, we argue are more symptom than cause. The report from the study also suggests that the Méxican government considers traditional subsistence agroforestry as ecologically destructive. This is in contrast with many studies elsewhere that emphasize the impact of government-initiated agricultural development projects, which tend to foster increased modern agricultural inputs, pasture development for livestock, and commercial logging operations that are the major causes of destruction of large tracts of forests across the Yucatán (Chowdhury, 2010).

Conservation focused on local manifestations, rather than distant driving forces of changing landscapes across Yucatán is a problem because the peninsula, a global biodiversity hotspot (Vázquez-Domínguez & Arita, 2010), was recently identified by the federal government as a high priority region to address landscape change (Comisión Nacional Forestal de México, 2016). Therefore, increased efforts to better understand the structure and scale of political–economic and environmental relationships are needed. Such efforts should include more extensive and collaborative studies and analyses of global-to-local processes of change, along with causal pathways resulting in changes to livelihoods, landscapes, and biodiversity patterns. Long-term studies, such as the Global Land Project (Verburg et al., 2015) and the Land-Cover and Land-Use Change in the Southern Yucatán Peninsular Region project (Turner et al., 2016), as well as other more recent efforts, such as Lawrence et al. (2019), have contributed greatly to understanding how distant political–economic driving forces impact local landscapes. But, much work remains, particularly with respect to drivers of land tenure change and how, through this important mechanism, globalized agriculture impacts indigenous community-managed landscapes.

Analyses moving forward should focus on broader scale political–economic forces underlying globalized agriculture. Our contribution places emphasis on globalized agriculture as a driving force of change to indigenous community-managed landscapes, through the

important mechanism of shifting land tenure and the concurrent transformation of livelihoods and land use and land cover. We hope that such an expanded focus can serve as a foundation and aid the important task of landscape planning and conservation.

Promoting community sovereignty over land can empower and strengthen communities to adapt and be resilient to distant political–economic driving forces. The degree to which indigenous peoples and peasants are able to exert effective control over their livelihoods and landscapes is a significant consideration for landscape conservation (Sarkar & Montoya, 2011); their resource and property rights are increasingly relevant to landscape conservation (Blackman et al., 2017). Community-managed landscapes are common across the globe (Baynes et al., 2015) and comprise about one- third of the world's forests (FAO, 2016). In some regions of the tropics, as much as 90% of the forests are community-managed and collectively owned (Alexiades, Peters, Laird, Binnqüist, & Castillo, 2013), including the neotropics, where communities control and manage vast forest areas (Cronkleton, Bray, & Medina, 2011). However, expropriation of and encroachment on indigenous communities' lands, leading to unsustainable resource extraction and conversion of forest to agricultural use, have led to greater formalization and enforcement of these communities' rights in many developing countries, particularly in the tropics (BenYishay, Heuser, Runfola, & Trichler, 2017).

Since the 1990s, numerous policy-oriented institutions, such as United Nations Educational, Scientific and Cultural Organization, Convention on Biological Diversity, World Wildlife Fund, and International Union for the Conservation of Nature, all have commissioned studies and published articles on links between conservation and indigenous landscapes (Berkes, 2009). Yet, little is known about how indigenous community-managed landscapes, along with associated livelihoods and land uses, may be leveraged to enhance landscape conservation and inform policy (Sarkar & Montoya, 2011). One possible institution that may be used to facilitate conservation within indigenous community-managed landscapes is the Indigenous Peoples' and Community Conserved Areas, an organization promoted by International Union for Conservation of Nature. To further such a task, increased efforts are needed for intergenerational community landscape planning and institutional development over the long term that can build greater capacity for adaptive governance. Regardless of the institutional processes, it will be particularly important to retain traditional land tenure systems and to build capacity within indigenous community-managed landscapes to adapt to distant political–economic driving forces of change.

Conclusion

Globalized agriculture is one of the greatest challenges confronting landscape conservation today. In the midst of this new globalized era, indigenous community-managed landscapes also face new and greater challenges. In México, the shift in ejido land tenure toward formal land parceling, individual management, and ultimately private property threatens the vast conservation potential across the country's extensive ejido system. More broadly, similar indigenous community-managed landscapes throughout the tropics are also vulnerable to shifting land tenure. Such impacts can be compounding across a broader landscape and can culminate in widespread biodiversity loss with global consequences. Already, high rates of land conversion represent a great threat to global biodiversity (Fischer, Lindenmayer, & Manning, 2006). In addition, over half a billion people in developing countries currently depend on community-managed forests (Baynes et al., 2015), and access to land is one of the most contested issues facing indigenous groups worldwide.

Conservation efforts will be better served if we understand and engage the entire process of change that indigenous community-managed landscapes experience due to globalized agriculture. Indigenous community-managed landscapes alone cannot conserve biodiversity, but they can serve as effective conduits for biodiversity conservation (Robson & Berkes, 2011). Moreover, multiple factors influence the conservation potential of these landscapes. However, political–economic processes of globalized agriculture can be a major impediment to long-term diversity and healthy functioning of these landscapes.

Conservationists should develop new and additional ways for indigenous community-managed landscapes to increase resilience and adapt to the influence of globalized agriculture. An important endeavor would be to help revive and maintain traditional livelihood and land use practices that may have been lost through market integration. As social and ecological changes accelerate, increased attention should be given to the need for a more far-reaching vision of landscape conservation. For conservation to alleviate the massive and compounding effects of changes to indigenous community-managed landscapes now underway, we must rethink landscape conservation. We urge landscape conservation scientists to more fully consider (a) impacts stemming from globalized agriculture and dominant global-to-local pathways that extend through community-managed landscapes and (b) advancing the breadth and depth of more extensive studies and analyses. Such efforts can set the stage for social and cultural adaptations in the face of change, can improve decision-

making and planning in landscape conservation more broadly, and can better protect biodiversity at all levels.

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