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Common-Pool Resource Management

Insights from Community Forests

Johan A. Oldekop and Reem Hajjar

Abstract

Community-based natural resource management (CBNRM) initiatives aim to link socioeconomic development with sustainable natural resource use and the conservation of biodiversity of natural resources. The principal ethos of CBNRM relies on the concept that rights, responsibilities, and authority for natural resource management decisions should rest, at least in part, with local communities, and there is an increasing recognition among policy makers and practitioners that the decentralization of natural resource management is central to a rights-based sustainable development approach. Although there has been a global push to decentralize natural resource governance over the past two decades, outcomes have been mixed, with many initiatives failing to reach their intended goals of both natural resource conservation and socioeconomic development. Over the past few decades, much research has focused on identifying the kinds of enabling conditions and accompanying institutional arrangements needed to promote collective action (investing) and reduce free riding (exploitation) to bring about more sustainable and equitable management of shared resources. This chapter reviews the theory and conditions thought to aid and allow communities collectively to manage resources more equitably and sustainably. The management of community forests is used to explore current knowledge gaps related to collective resource management and discuss what these gaps represent for sustainable development interventions.

Introduction

Conserving the world's natural resources while ensuring human well-being and socioeconomic development is central for a transition to a more sustainable development path (UN 2015; UNFCCC 2015). Community-based natural resource management (CBNRM), which aims to link socioeconomic

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development with sustainable natural resource use and conservation, emerged in the 1980s as a way to counter conservation inefficiencies and the negative social outcomes associated with top-down natural resource management initiatives (Batisse 1997). The fundamental principles of CBNRM are centered on the concept that rights, responsibilities, and authority for natural resource management and conservation decisions should rest, at least in part, with local communities. Evidence suggests that local communities are managing an increasing amount of the world's natural resources,[1] and it is now widely accepted that the decentralization of natural resource management is central to a rights-based sustainable development approach (UN 2015).

The theoretical framework underpinning CBNRM, and its justification as a sustainable development and conservation strategy, is largely based on common-pool resource theory. In his seminal article, "The Tragedy of the Commons," Garret Hardin essentially describes an *n*-person cooperative game in which resources "open to all" are inexorably destined to be overexploited: individuals will always "seek to maximize [their] gain" because the consequences of overexploitation "are shared by all" (Hardin 1968:1244). In this context, the tendency would be for all individuals to play the role of "exploiters" until the resource is depleted. This understanding of the consequences of an open-access resource spurred a generation of top-down natural resource conservation policies and interventions (one of his recommendations for overcoming the tragedy), where rules are set from the top-down to limit resource use and punish exploiters (West et al. 2006a).

Hardin's work, however, has been widely criticized for failing to distinguish between "open-access resources," which are devoid of any property rights, and "common-pool resources," where property rights are clearly defined (either formally or informally) and held by a specific set of individuals (e.g., Ostrom 1990). There is substantial evidence that communities with devolved decision-making powers and secure rights to resources will often act collectively to create local institutions (rules, practices, and norms) to manage local resources and avoid tragedy of the commons scenarios. Key to these local institutions is the ability to monitor compliance and administer sanctions against transgressors and free-riding individuals that exploit more than their allocated share of a collective resource. The relationship between cooperating individuals and free riders in common-pool resource systems is, hence, conceptually analogous to other "investor–exploiter" models, such as those found in social foraging scenarios in many animals: "exploiter" individuals or species exploit the investment made by "investor" individuals that either provide or discover new resources. The aim of local institutions in common-pool resource systems is to create social and economic incentives that will shift livelihood strategies within a group of resource users from short-term individual maximization of

[1] Tenure Data Tool, Rights and Resources Initiative, http://www.rightsandresources.org/en/resources/tenure-data/tenure-data-tool/ (accessed Aug. 25, 2016).

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gains or less collective action (exploiting) to long-term sustainable collective management (investing) (Ostrom 1990).

Beginning in the mid-1980s, a large and rich literature combining elements of political science, behavioral economics, anthropology, and ecology has focused on the kinds of enabling conditions and accompanying institutional arrangements that promote collective action and reduce free riding to bring about more sustainable and equitable management of shared resources (Ostrom 1990; Agrawal 2001; Cox et al. 2010). Understanding the factors and conditions under which communities can encourage shifts from exploitative unsustainable livelihood strategies toward ones in which collective resources are managed more sustainably and equitably is of paramount importance for the design and implementation of better conservation strategies at local and global scales.

In this chapter, we provide a brief overview of the conditions thought to facilitate collective action and effective common-pool resource management. Using the community forest management literature as a case study, we explore current knowledge gaps related to common-pool resource management and discuss what these gaps represent for sustainable development interventions. We focus on community forests for three principal reasons. First, community forests represent one of the most widely researched collectively managed resource systems, with direct measurable links to both local livelihoods and key environmental outcomes (Hajjar et al. 2016). Critically, they share fundamental commonalities with other common-pool resource systems (a clearly defined resource managed by a clearly defined group of users) such as fisheries or irrigation systems, and are influenced by similar internal and external factors (e.g., markets, population dynamics, and local institutions). Thus, key lessons gleaned from community forest management studies will also apply to other common-pool resource systems. Second, community forests are central to national and international sustainable development agendas (UN 2015; UNFCCC 2015), including key global initiatives such as the United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation (REDD). Finally, many governments have implemented forest decentralization policies. Communities are thought to manage approximately 15% of forests globally,[2] and thus play a key role in conservation efforts.

Conditions Facilitating Implementation and Longevity of Local Institutions

In her influential book, "Governing the Commons," Elinor Ostrom (1990) exhaustively analyzed different common-pool resource management arrangements

[2] Tenure Data Tool, Rights and Resources Initiative, http://www.rightsandresources.org/en/resources/tenure-data/tenure-data-tool/ (accessed Aug. 25, 2016).

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around the world and identified a series of principles that facilitate collective action and the implementation and longevity of common-pool resource institutions. Since its publication, this initial list has been revised to include additional factors (e.g., Agrawal 2001; Cox et al. 2010), which collectively focus on:

- the resource system being managed,
- the user group managing the resource system,
- the relationships between the resource system and the managing group,
- the institutional arrangements and their relationship to the resource system, and
- external factors, such as market forces, and higher-level governance arrangements.

Resource System Characteristics

Factors related to the resource system include the size of the resource, with evidence that local institutions are more easily enforced in communities managing smaller-sized resources with well-defined boundaries than larger ones (e.g., Chhatre and Agrawal 2008). Similarly, resources whose availability or quantity is unpredictable in space and time, and difficult to store, or those where the individual resource units are highly mobile are thought to be more difficult to manage and monitor. For example, it is easy to foresee that monitoring the abundance of game species or fish stocks that move in and out of a given collectively managed area might pose significant difficulties (e.g., Jenkins et al. 2011).

User Group Characteristics

There is substantial evidence that leadership and the way in which local leaders dispense sanctions for transgressions and free riding play a vital role in mediating the success of collective action and the outcomes of common-pool resource management (e.g., Kosfeld and Rustagi 2015). In addition, the size of a group is thought to influence a group's ability to forge relationships and trust, and mobilize resources to implement local institutions (e.g., hiring a guard to monitor compliance). Smaller, better-defined groups might be more willing to work together because their shared contributions and collective benefits might be more tangible: if benefits are dispersed over too large a group or if an individual contribution is perceived as inconsequential, the incentive to work collectively diminishes (Poteete and Ostrom 2004). Evidence suggests that the relationship between group size and collective action is, however, complex and nonlinear (e.g., Oldekop et al. 2010). Some studies suggest that larger groups might be able to manage common-pool resources more effectively than smaller ones (Nagendra et al. 2005) but that collective efficiency diminishes as groups get too large; that is, when the costs associated with collective

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management supersede both individual and collective benefits (Agrawal and Goyal 2001; see also Burton-Chellew et al. and Valone et al., this volume). Similarly, groups which share values and common goals might be more willing to work together (Poteete and Ostrom 2004). However, the relationship between social heterogeneity and collective action is highly complex. Some evidence suggests that greater socioeconomic heterogeneity affects collective decision making negatively (e.g., Balooni et al. 2007), whereas others suggest that the causal relationship between collective action and social heterogeneity flows both ways, and that highly heterogeneous groups might act collectively when faced by a common threat (e.g., Johnson 2001).

Linking Resource System and User Group Characteristics

Several conditions and relationships between common-pool resource users and the resource system are thought to mediate collective action (Agrawal 2001). First, physical proximity between resource users and the resource itself is considered to be crucial because there is an increased cost to monitoring distant resources. Second, levels of resource demand by the user group should be low and changes in demand should be gradual. Communities might be less willing or able to manage vital resources that are in high demand because the immediate individual cost of overexploitation is lower than the perceived benefit gained from collective long-term management. Furthermore, local institutions might not be able to change or adapt fast enough to sudden changes in demand. Third, resources should be perceived as finite, as there is little incentive to manage resources that are not perceived as scarce (Oldekop et al. 2012). Finally, the allocation of benefits and access to resources should be equitable; competition for resources by economically differentiated groups might lead to conflict and hence lower collective action (Poteete and Ostrom 2004).

Institutional Arrangements

The creation and implementation of rules, monitoring protocols, and sanctions in relation to the use of common-pool natural resources is considered key for the promotion of collective action and reduction of free riding necessary for effective common-pool resource management (e.g., Persha et al. 2011). In some instances, these institutions can be based largely on traditional resource use and management systems, as is the case in many indigenous reserves in Latin America (Davis and Wali 1994), whereas in others, institutions are embedded within official management plans that are devised in conjunction with government departments, as is the case in both India and Nepal (Agrawal and Ostrom 2001). Whenever possible, however, resource access and management rules should be locally devised, simple, and easy to understand, enforce, and arbitrate, and they should match natural resource regeneration rates and cycles (Ostrom 1990; Agrawal 2001). For example, the establishment of monitoring

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protocols to oversee noncompliance and graduated sanctions to punish free riders has been linked to better resource management outcomes (Ghate and Nagendra 2005; Chhatre and Agrawal 2008). Critically, those involved in monitoring should also be locally accountable (Gautam and Shivakoti 2005).

External Factors

Common-pool resources and their users are embedded within highly complex, broad social and ecological systems and governance arrangements (Ostrom 2009). Overall, local common-pool resource management institutions are thought to be more effective when they are supported by broader governance arrangements and not undermined by regional authorities or central governments (Ostrom 1990). Similarly, commodity and labor markets can influence individual and collective livelihood decisions, including the increase of harvesting rates (Oldekop et al. 2013), decisions to emigrate (Uriarte et al. 2012), and changes in the distribution of benefits within local communities. This can reduce collective action, weaken local institutions, and result in negative environmental outcomes.

Over the past decade, the effects of climate change have become of central concern to CBNRM debates, both because the rural poor are likely to experience the greatest disadvantages and because local communities that manage common-pool resources might be able to play critical roles in climate change mitigation efforts, including payment for ecosystem services schemes such as REDD+. However, to date we lack an adequate understanding of the direct effects of climate change (including climate change-related policy changes and interventions) and the impact of private sector investments (e.g., large-scale land transactions) on local communities, collective action, and their abilities to implement local institutions.

Forest Commons as a Way to Understand Common-Pool Resource Management

The literature on community forests provides a useful and policy-relevant case study with which to explore our theoretical and applied understanding of common-pool resource management (e.g., Persha et al. 2011). Many governments have decentralized forest management since the 1980s (Agrawal et al. 2008). In Nepal, for example, current legal rights that permit local communities to take part in forest management are enshrined in the country's Forest Act of 1993 and the Forest Regulations of 1995 (Agrawal and Ostrom 2001), and today there are more than 18,000 community forest user groups managing more than a quarter of Nepal's forests. Similarly, in Mexico, the communal Ejido system—officially introduced as part of agricultural land reforms in the 1930s—has been strengthened through a series of policies since the 1970s,

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and estimates suggest that local communities manage more than half of the country's forests (Bray et al. 2003). Indeed, conservation and development practitioners have increasingly promoted community forestry initiatives as a way to enhance sustainable forest use, consolidate rights over traditional lands and resources, and reduce rural poverty (Bray et al. 2003; Molnar et al. 2008). Community forest management has become central to global sustainable development initiatives, such as REDD+. The longevity and scale of many community forestry initiatives, and their direct link to environmental and social outcomes and sustainable development policies, have led to a rich body of research focused on trying to understand the factors that lead to successful community forest management outcomes (Hajjar et al. 2016).

Although scores of case studies around the world show that community forestry, collective action, and the implementation of local institutions can potentially improve sustainable forest use and livelihoods (Pagdee et al. 2006; Oldekop et al. 2010; Bowler et al. 2012), outcomes have often been mixed. Many initiatives have failed to reach their intended goals (Edmunds and Wollenberg 2003; Oyono 2005). To date, most studies focusing on social and environmental outcomes of community forest management have concentrated on assessing the effects of institutional arrangements associated with community forests, examining both the effects of tenure, local institutional arrangements, and collective action on livelihoods, forest biodiversity, and carbon storage (e.g., Chhatre and Agrawal 2008; Persha et al. 2011; Newton et al. 2016). Several meta-analyses have aimed to determine factors that lead to community forestry success (Pagdee et al. 2006; Oldekop et al. 2010; Baynes et al. 2015), including a review of the links between land tenure and deforestation (Robinson et al. 2014), and an examination of whether formal community forest management has been more effective than other management arrangements (Bowler et al. 2012).

In comparison to the social conditions and institutional arrangements that can lead to collective action and more efficient local institutional arrangements, our understanding of the role of social, political, economic, and biophysical factors in shaping collective action and community forest outcomes—or indeed, the comparative effect of different kinds of community forest management arrangements—remains very limited (Hajjar et al. 2016). However, elucidating the relationships known to affect livelihood decisions, collective action, and forest dynamics at various scales is key for providing a strong evidence base, which in turn is needed to design and implement better decentralized natural resource management policies.

In their recent systematic review of 735 cases from the peer-reviewed literature on forest commons, Hajjar et al. (2016) evaluated the occurrence with which studies reported information on 53 variables related to user group characteristics and demographic factors, local institutional arrangements and market characteristics, and biophysical characteristics. Their results highlight several important issues and knowledge gaps. First, research on community

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forest management continues to focus on assessing the role of institutional factors (see Appendix 5.1), despite significant evidence that demographic changes (e.g., migration-led population shifts), market forces, and biophysical factors significantly influence collective action and resource management decisions (Agrawal and Yadama 1997; Agrawal and Chhatre 2006; Uriarte et al. 2012; Oldekop et al. 2013) as well as forest and land cover change dynamics (Geist and Lambin 2002; Rudel et al. 2005; Meyfroidt and Lambin 2011). Second, most studies used qualitative measures to assess the effect that community forest management and collective action have on livelihood outcomes. Furthermore, other critical development outcomes (e.g., food security, which some have suggested could be promoted through community forest management initiatives) have not been given much formal attention. Although these studies have provided valuable insight into the kinds of socioeconomic impacts that community forestry initiatives can have and the types of collective management arrangements and local institutions that drive them, there is an urgent need to complement these studies with quantitative measures using standardized indicators to make comparative assessments of intervention outcomes across sites, and to help establish baselines for longitudinal studies.

Finally, there appears to be a heavy bias in the forest commons literature toward South Asian countries (predominantly India and Nepal). Thus the literature might not be representative of global decentralization and community forestry interventions. The area of forests in Latin America under community control is an order of magnitude larger than in Africa or South Asia (225.75 Mha versus 22.89 Mha and 28.27 Mha, respectively[3]), yet cases from Africa represent a quarter of the reported analyses in the literature, and India and Nepal represent more than half.

Filling in the Knowledge Gaps

Arguably, forest commons represent one of the best-studied common-pool resource systems. The rich literature on community forest management has provided valuable theoretical insight into the social and institutional conditions that promote positive socioeconomic and environmental outcomes of collective action and common-pool resource management arrangements. To date, however, studies on social and environmental outcomes of community forest management have typically only focused on individual case studies and analyzed a limited set of variables at a single point in time. Analyses that focus on general patterns and overall trends at larger geographical scales have either relied on meta-analyses (Pagdee et al. 2006; Oldekop et al. 2010) or relatively small-*n* studies (e.g., Persha et al. 2011). These studies have focused

[3] Tenure Data Tool, Rights and Resources Initiative, http://www.rightsandresources.org/en/resources/tenure-data/tenure-data-tool/ (accessed Aug. 25, 2016).

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predominantly on evaluating the effect of institutional arrangements on forest outcomes, and relatively little attention has been paid to other potential confounding factors. Currently we know of only two studies that have used a more robust impact evaluation approach to assess deforestation over time (Rasolofoson et al. 2015) and livelihood outcomes (Pailler et al. 2015) of community forest management at the country level, while also controlling for a large set of potentially confounding variables. Thus, understanding of the impacts of decentralization policies remains limited.

National- and regional-level evaluations, such as the ones conducted by Rasolofoson et al. (2015) and Pailler et al. (2015), are critical because they provide general assessments of the effectiveness of policies and interventions, which often operate at large geographical scales. Assessments at these larger scales can highlight significant regional variations and provide critical information about specific enabling conditions and circumstances (social or biophysical) that lead to different outcomes or trade-offs between social and environmental goals of interventions (e.g., Andam et al. 2010). Critically, understanding the overall impacts and enabling conditions along with their nuances is necessary for the design and implementation of more effective policies and interventions.

The increasing ease of using remote sensing tools (e.g., Hansen et al. 2013) has delivered standardized measures with which to assess environmental outcomes in forests over large areas (e.g., Nagendra et al. 2005). However, the collection of socioeconomic data is typically costly and difficult to implement in a sufficiently coordinated fashion to allow the creation of comparative data sets for more robust analyses (Poteete and Ostrom 2008). For example, the International Forestry Resources and Institutions research program has been collecting data on community forests, using a standardized methodology, in 11 countries for over twenty years but has only been able to start revisiting some of these sites in the past few years, which will no doubt provide valuable insight into the long-term outcomes of community forest management.

No central databases on community forests currently exist, and there is a clear need to devise better data collection programs and assessment protocols to evaluate outcomes of CBNRM initiatives (Baylis et al. 2016; Oldekop et al. 2016). Global, publically available data sets at high spatial resolutions are becoming more widely available, and can provide standardized, consistent, and longitudinal information on a host of social and environmental variables, including agricultural suitability[4] and climate data (e.g., Hijmans et al. 2005), socioeconomic data and measures of poverty,[5] travel times to population centers

[4] METI-NASA, http://asterweb.jpl.nasa.gov/gdem.asp (accessed Aug. 26, 2016).

[5] World Bank. Living Standards Measurement Survey. http://microdata.worldbank.org/index.php/catalog/lsms (accessed Aug. 18, 2016).

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and distance to markets,[6] subnational-level administrative areas,[7] forest cover (e.g., Hansen et al. 2013), and biomass (e.g., Avitabile 2016). While these data sets can provide valuable information on variables that may likely influence the outcome of community forest management initiatives, efforts to combine them with fine-scale data on local institutional arrangements and collective action are still lacking. Better coordination among academics is clearly needed; however, governments, donor agencies, and implementation agencies also need to invest and implement better monitoring and evaluation protocols and ensure that the resultant data sets are publically available. Collectively, these efforts could provide both better understanding of successes, failures, and trade-offs between social and environmental outcomes. This is clearly needed for both better theory and the design and implementation of more effective policies and interventions. Critically, developing better analytical protocols for the analysis of community forests can also provide valuable frameworks for the assessment of other common-pool resource systems, including community-based fisheries management and collective pasture management systems.

Conclusion

Communities that have decision-making powers and secure rights to the natural resources upon which they depend will often act collectively to design and implement local institutions to manage them. These local institutions, in turn, operate as social and economic incentives that aim to shift livelihood strategies within a group of users managing a common-pool resource from short-term overexploitation (exploiters) to long-term sustainable collective management (investors). Over the past 25 years, a rich and diverse scientific literature has focused on trying to understand the social, economic, and environmental enabling conditions that promote collective action and the implementation of long-lasting institutions, and whether these lead to better local socioeconomic and environmental outcomes. A review of the community forest management literature, which provides a large and useful case study example of common-pool resource management, shows that studies to date have predominantly focused on understanding the local institutional arrangements and how these are linked to sustainable outcomes for both people and forests. Despite being acknowledged as important, much less attention has been given to demographic factors (such as population shifts, e.g., outmigration), market forces, or biophysical factors that impact forest dynamics. Understanding how these factors influence the ability of communities collectively to manage forests and

6 Global Accessibility, https://people.hofstra.edu/geotrans/eng/ch1en/conc1en/global_accessibility.html (accessed Aug. 18, 2016).

7 GADM database of global administrative areas, version 2.8, http://gadm.org (accessed Aug. 18, 2016).

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implement local institutions is a crucial first step in figuring out how to impact positive change in terms of socioeconomic and environmental outcomes.

From both a theoretical and applied empirical perspective, solely focusing on institutional arrangements to explain "investor–exploiter" relationships in CBNRM and the effect of these relationships on social and environmental outcomes is insufficient, because such efforts fail to account for important contextual factors. We argue that the increased availability of publically available environmental and socioeconomic data, such as remote sensing and national census data sets, can provide novel theoretical and empirical insights on the effectiveness of CBNRM initiatives. Although the integration of such data sets is not straightforward, the opportunities which they provide for broader regional- and national-level studies could yield key insights on the factors that drive variation in social and environmental outcomes. This, in turn, is key for understanding the socioeconomic and biophysical factors that drive sustainable livelihood shifts in common-pool resource management systems and is of paramount importance if we are to design better targeted policies and interventions that support them.

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Appendix 5.1 (next page) Data map indicating the incidence of reported variables in 735 case studies of the community forest management literature (dark gray = recorded data, pale gray = missing data). Variables are thematically grouped and data rows are grouped by country highlighting those countries with ten cases or more. The community forest literature has predominantly focused on institutional factors and environmental outcomes. Variables associated with population dynamics (density, change, and migration), market forces, and biophysical factors feature less prominently. Reproduced from Hajjar et al. (2016).

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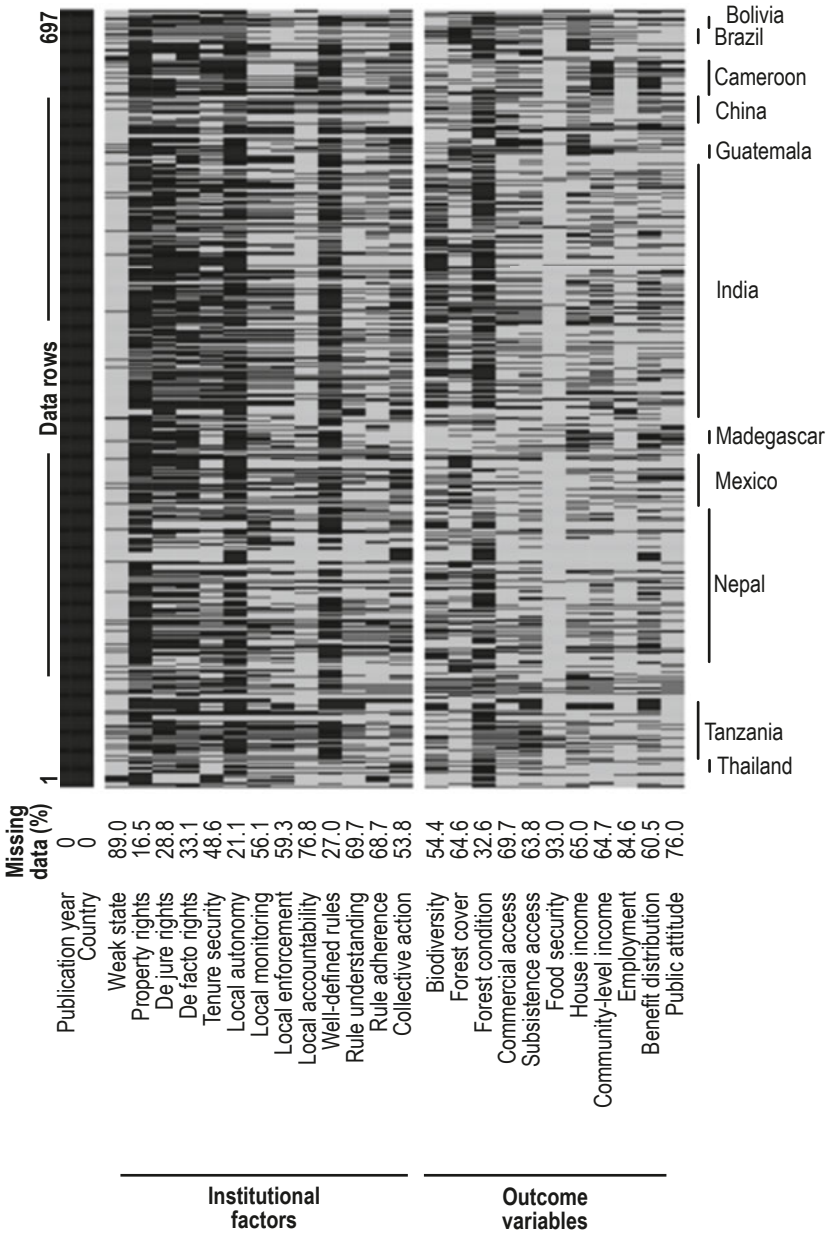

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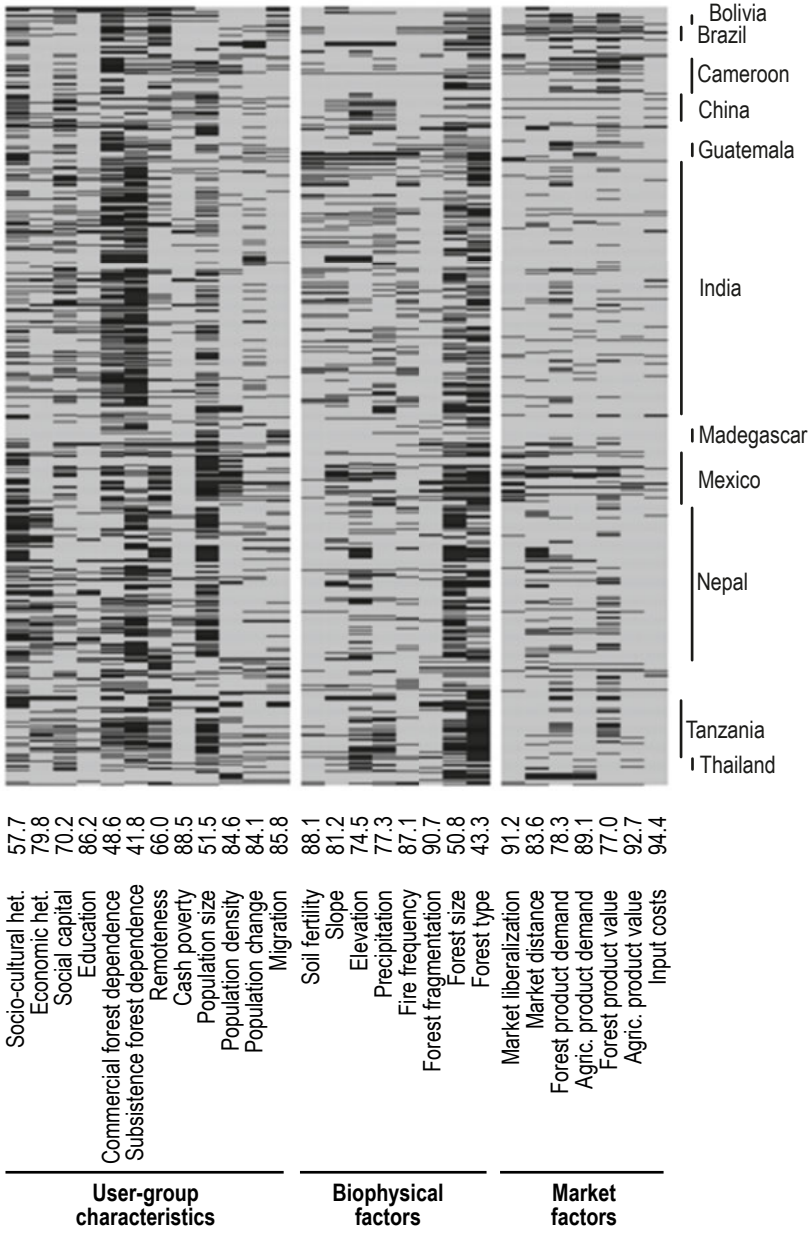

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