The data not collected on community forestry

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Abstract

Conservation and development practitioners increasingly promote community forestry as a way to conserve ecosystem services, consolidate resource rights, and reduce poverty. However, outcomes of community forestry have been mixed, with many initiatives failing to achieve intended objectives. There is a rich literature on community forestry institutional arrangements, but fewer efforts to examine the role of socioeconomic, market, and biophysical factors in shaping both land cover change dynamics, and individual and collective livelihood outcomes. We systematically reviewed the peer-reviewed literature on community forestry to examine and quantify existing knowledge gaps about these factors in the community forestry literature. In examining 697 cases of community forest management, extracted from 267 peer-reviewed publications, we find three key trends that limit our understanding of community forestry. First, there are substantial data gaps linking population dynamics, market forces, and biophysical characteristics to both environmental and livelihood outcomes. Second, most studies focus on environmental outcomes, and the majority of studies that do assess socio-economic outcomes rely on qualitative data, making it difficult to make comparisons across cases. Finally, we find a heavy bias towards studies on South Asian forests, indicating that the literature on community forestry might not be representative of decentralization policies and community forest management globally.

Introduction

Decentralization of natural resource management is central to a rights-based approach to conservation and sustainable development (UN 2015). Decentralization of forest management has been a major trend in global forest governance since the 1980s (Agrawal et al. 2008), and international conservation and development practitioners have increasingly promoted community-managed forests as a way to enhance sustainable forest use, consolidate rights over traditional lands and resources, and reduce rural poverty (Molnar et al. 2008; Bray et al. 2003). Case studies from around the world show that community forestry has the potential to deliver economic, socio-cultural, and ecological benefits to local communities, and improve sustainable

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forest use and livelihood outcomes (Pagdee et al. 2006; Bowler et al. 2012). Despite successes, outcomes generally have been mixed, with many initiatives failing to achieve intended objectives (Edmunds & Wollenberg 2003; Oyono 2005; Pokorny 2009).

To gain a better understanding of livelihood and forest outcomes, several studies have focused on the effects of institutional arrangements associated with community forests, examining, *inter alia*, design principles of community-based resource management (Ostrom 1999; Gibson et al. 2000), and tenure and institutional settings, and their influences on forest decision-making, local livelihoods, forest biodiversity, and carbon storage (Agrawal & Gibson 1999; Bray et al. 2003; Chhatre & Agrawal 2009; Persha et al. 2011). A number of 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 reviewing the links between community tenure and forest condition (Seymour et al. 2014), and examining whether formal community forest management (CFM) has been more effective than either no CFM or than alternative tenure arrangements (Bowler et al. 2012).

Previous analyses determining community forest outcomes have focused predominantly on limited subsets of key institutional and socioeconomic variables. However, the relative effects of different community forestry arrangements, and the role of social, political, economic, and biophysical factors in shaping community forest outcomes, remain poorly understood. Elucidating these relationships, which are known to affect livelihood decisions and forest dynamics at various scales, is key for providing a strong evidence base to design and implement better decentralized natural resource management policies.

To identify further areas of research and assess whether the available literature allows for meaningful conclusions to be made about the broader set of community forestry arrangements, and the social, political, economic, and biophysical drivers of community forest outcomes, it is important to first examine and quantify existing knowledge gaps related to these drivers and outcomes. To do so, we compiled more than two decades of peer-reviewed research on community forestry and describe the frequency and types of information collected and published regarding community forestry efforts around the world.

Methods

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Our methodology was peer-reviewed and published (Newton et al. 2015). Here, we provide a brief overview of our methods, elaborating only when they evolved from those originally published.

Framing the study

We expanded the PICO (Population, Intervention, Comparator, Outcomes) framework, traditionally used to frame systematic review questions, search terms, and study inclusion criteria (CEE 2013; Counsell 1997), to include a broader set of contextual factors (PICO**C**) that might act as mediators of community forestry arrangements (Petticrew & Roberts 2006). Our population of interest was individual forest units and the communities of people managing them, with a "community forest" defined as that being shared between at least three households (as defined by the International Forestry Resources and Institutions (IFRI) research network (2012)). We focused on community forests in less industrialized nations in Latin American, African and Asia-Pacific regions, which is where the majority of community forests are located (RRI 2013). Cases of afforestation (except enrichment planting) or exotic species plantations were not included to ensure comparability between environmental outcomes across natural forests.

Our intervention of interest was community forestry, broadly defined as forest use and governance arrangements under which the rights, responsibilities, and authority for forest management rest, at least in part, with local communities. Here, we included both traditional and/or endogenous community forestry initiatives undertaken by forest user groups as well as initiatives introduced by external actors (e.g. NGOs or governments). The latter includes both project-based initiatives and policies aimed at decentralizing forest management or reforming land or resource tenure. As 'comparators', we examined variations across temporal and spatial dimensions (differences over time and across locations).

Our outcomes of interest are environmental and livelihood indicators representing key aims of community-managed forest interventions (Persha et al. 2010; Charnley & Poe 2007). These include measures of environmental change related to forest cover, forest condition, and biodiversity, and livelihood change related to access to forest resources for either commercial or subsistence use, food security, household and community income, employment, and benefit distribution. We also examined 40 variables (contextual factors) representing sources of

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variation associated with forest outcomes, including: (1) user-group socioeconomic and demographic characteristics; (2) forest and agriculture related market factors; (3) institutional factors related to forest management; and (4) biophysical factors (Fig. 1). We created this list through a preliminary review of 35 frequently-cited articles on community forestry and forest cover change (Supplementary Information), identified through a search on Google Scholar and Web of Science, with variables modified or added during the testing phase of the data extraction protocol.

Search strategy

We performed a series of Boolean searches between May and October 2014 in two publication databases (Web of Knowledge and CAB Abstracts). We list the 76 search terms and search strings in Newton et al. (2015).

Study inclusion criteria

We included only publications that were 1) written in English, 2) met criteria for population and intervention definitions as outlined in the PICOC, 3) contained data on any of the environmental and/or livelihood outcome metrics, and 4) contained at least one of the contextual variables. Articles also had to be published in a peer-reviewed journal; although this excluded the extensive "grey literature" on community forests, it ensured that (1) data was less likely to be double-counted if published in various formats; and (2) studies had undergone an independent, peer-review process prior to publication. An article needed to contain new primary data to be included; review papers and meta-analyses were excluded.

Screening process

We screened papers for inclusion criteria in three stages: (1) titles and abstracts; (2) full texts, (3) availability of data for extraction (see section 2.5). To ensure inter-rater consistency, we performed free-marginal kappa analyses (Randolph 2005) at the beginning of each screening

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stage on a subset of randomly selected studies, until the screening and extraction teams reached acceptable levels of agreement (κ >0.60).

Data extraction

We extracted quantitative and qualitative data on contextual and outcome variables for each community forest case presented in each paper that passed through the entire screening processes. For studies presenting multiple cases of community-managed forests, we extracted data for each case, representing a unique community forest separately, to the extent possible.

Results

From our initial pool of 15,879 articles, we extracted data from 267 papers. Using these papers, we identified 735 cases of community-managed forests, yielding data on a total of 697 cases for subsequent analysis once duplicate cases focusing on the same sites were consolidated.

Variables

The extent to which the reviewed papers analyzed or reported on particular variables varies enormously (Fig. 1). Institutional factors were the most frequently included, and market factors the least. Less than 30% of the cases reported on most biophysical attributes, market characteristics, and user-group characteristics. Rights, existence of well-defined local rules, and levels of autonomy were most frequently included ($\geq$ 70% of cases), while other institutional factors, such as strength of non-local government institutions, stakeholder understanding of and adherence to local rules, and accountability of local leaders to their community, were included far less frequently. In terms of user-group characteristics, studies most frequently focused on levels of forest subsistence (51-58%) and socio-cultural heterogeneity within groups (42%), and focused less on basic demographics such as population density and change, migration, education, and cash poverty (all approximately 15%). Few studies attended to biophysical factors other than forest type and size (56% and 49%, respectively).

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CFM outcomes

We considered various environmental and livelihood outcomes reported in the CFM literature. Forest condition was the most frequently reported outcome variable (68%). All other outcomes were reported on in less than half the cases. Most of the livelihood outcomes were reported in 30-40% of the cases. Despite common perceptions that decentralizing forest management to communities increases local employment (e.g. Bray et al. 2003; Charnley & Poe 2007), relatively few studies (15% of cases) have measured changes in employment levels. Critically, very few studies have considered the implications of CFM on food security (7%). Public attitudes towards CFM were reported in one quarter of the cases.

Environmental outcomes were measured using quantitative approaches in 56% of cases. Livelihood outcomes, in contrast, were rarely (24%) measured using quantitative surveying techniques, except for income and benefit distribution. Rather, respondent perceptions were the typical means through which studies assessed outcomes. For example, although subsistence forest access was one of the most often recorded livelihood outcomes, few studies used surveys to record changes in forest access and usage by households.

Regional distribution

Most cases were from South Asia (Fig. 2) with community-managed forests in India and Nepal accounting for 33% and 20% of all published cases, respectively. In Latin America, Mexico dominated with 7% of all cases; in Africa, Tanzania (8%) and Cameroon (5%) had the highest number of cases; in East and Southeast Asia, the region with the fewest studies, 4% of cases were located in China.

Discussion

Our review provides a unique overview of the evidence available in the peer-reviewed literature on community forestry globally and contributes to the wider natural resources management decentralization literature in three significant ways.

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First, we find significant gaps in our understanding of the role of population dynamics, market forces, and biophysical factors as drivers of community forestry environmental and livelihood outcomes. Given the large number and variety of variables on which we collected information for this review, it is not surprising that most studies reported on less than half of all variables. Of particular importance, however, is the frequency with which some groups of factors were absent. Population dynamics, and market and biophysical factors (besides forest type and size) were rarely considered. Figure 1 shows that much of the literature on CFM continues to focus on institutional factors, despite the fact that population, market, and biophysical factors have also been shown to influence forest and land cover change dynamics (Geist & Lambin 2001, Rudel et al. 2005; Agrawal & Chhatre 2006, Meyfroidt & Lambin 2011), as well as local livelihood decisions and collective resource management dynamics and outcomes (Agrawal 2001; Agrawal & Yadama 1997; Agrawal & Chhatre 2006; Oldekop et al. 2013). It is possible that some of the gaps we identified may not be as large as they appear; some researchers may have chosen to study certain factors with an awareness that other factors would be closely correlated (e.g. altitude, slope and precipitation). Nonetheless, the absences highlighted in our dataset point towards significant and continuing gaps in our understanding of the factors driving community forestry outcomes.

Second, livelihood outcomes have predominantly been assessed using qualitative methods. Although existing qualitative studies provide useful insight into the kinds of socioeconomic impacts community forestry initiatives can have, there is an urgent need to complement these studies with non-perceptions based measures to make comparative assessments of intervention outcomes across sites, and help establish baselines for longitudinal studies.

Finally, the CFM literature is heavily biased towards cases in South Asian countries (predominantly India and Nepal) and thus likely not representative of decentralization and community forestry interventions globally. No global datasets on community forests exist, and even national inventories are rare. However, it is possible that South Asia and Africa are over-represented in the literature, particularly given trends in increasing incidence of community

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tenures in several Latin American and Southeast Asian countries. While this may be partly an artifact of our focus on the English-language literature, certainly a higher proportion of forests are under community control or ownership in Latin America compared to Africa – 36% and 6%, respectively (RRI 2013). In *absolute* terms, 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 - RRI 2013), yet cases from Africa represent a quarter of the reported analyses in the literature, and India and Nepal represent more than half.

For a more representative global understanding of community forest management outcomes, it is necessary that future research address these three critical gaps.

Acknowledgments

Supporting Information

Information on the variables chosen for inclusion in the analysis (Appendix S1) is available online. The authors are solely responsible for the content and functionality of these materials. Queries (other than absence of the material) should be directed to the corresponding author.

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Figure 1. Data map indicating variables extracted during the review process (blue = recorded data, grey = 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, market forces, and biophysical factors feature less prominently.
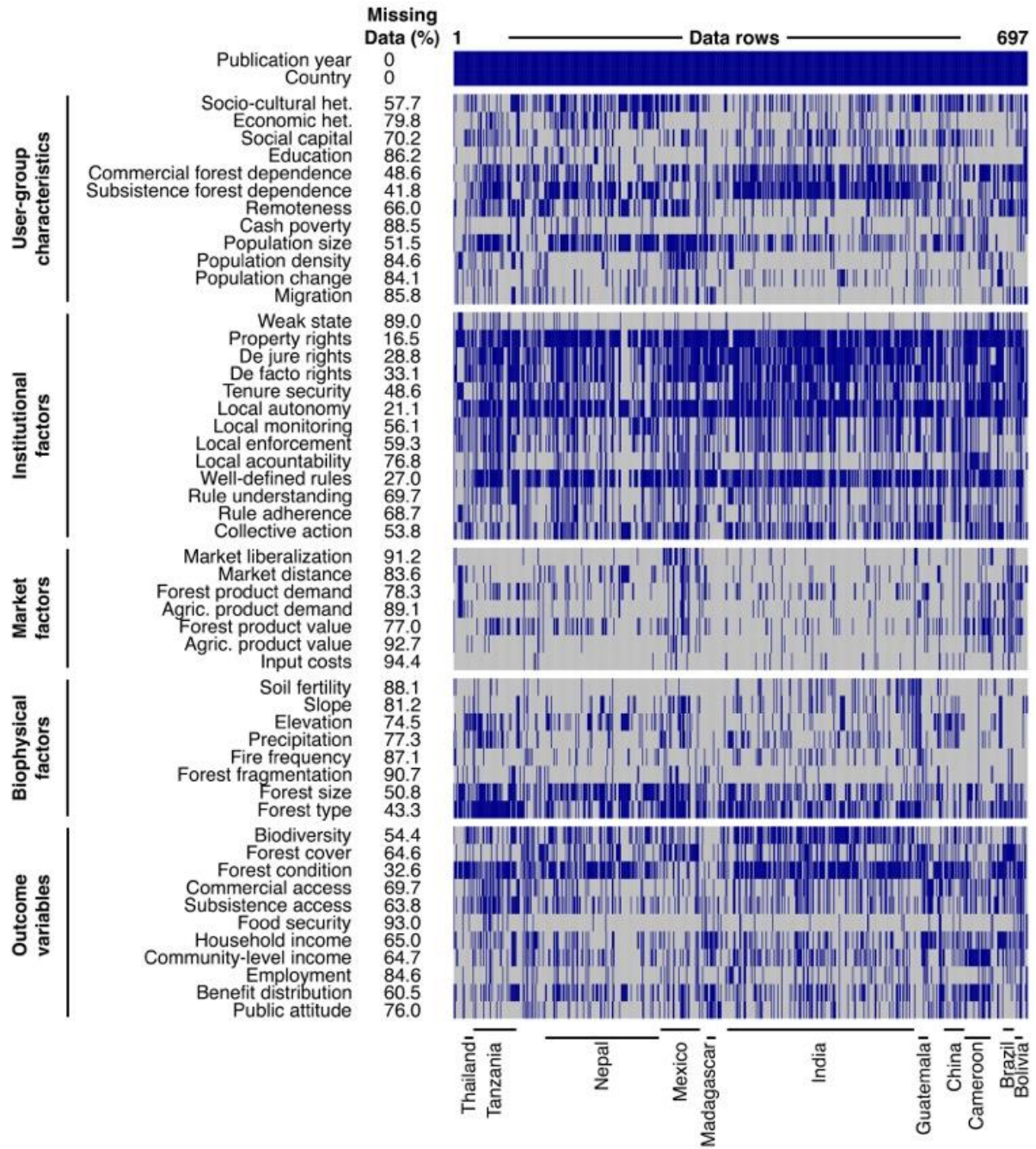
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Figure 2. Global map displaying the number of cases in individual countries within the final sample. The literature on community forestry is heavily biased towards South Asian studies, with India and Nepal constituting 52% of cases in our sample. The eleven countries with ten cases or more are listed.

Cases
227 (India)
138 (Nepal)
52 (Tanzania)
48 (Mexico)
32 (Cameroon)
25 (China)
13 (Brazil)
12 (Guatemala)
11 (Madagascar / Thailand)
10 (Bolivia)
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