



# What are the biophysical, institutional, and socioeconomic contextual factors associated with improvements in livelihood and environmental outcomes in forests managed by communities?

A systematic review protocol

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# Table of contents

Acknowledgements	iv
<b>1 Introduction</b>	<b>1</b>
1.1 Background	1
1.2 Objective of the review	1
1.3 PICOC framework	2
<b>2 Methods</b>	<b>4</b>
2.1 Search strategy	4
2.2 Estimating the comprehensiveness of the search	4
2.3 Study inclusion criteria	5
2.4 Description of methods used in primary research	5
2.5 Screening	5
2.6 Potential effect modifiers and reasons for heterogeneity	5
2.7 Study quality assessment	6
2.8 Data extraction strategy	6
2.9 Data synthesis and presentation	6
<b>3 References</b>	<b>7</b>
<b>Annexes</b>	<b>9</b>

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# 1 Introduction

## 1.1 Background

International conservation and development practitioners have promoted community-managed forests as an alternative to centralized forest management for greater sustainability of forests, higher and more equitable livelihood outcomes for stakeholders, and less adversarial relationships between stakeholders and government agencies (Borrini-Feyerabend et al. 2004). A substantial body of research has demonstrated that improved environmental and livelihood outcomes have been achieved within community-managed forests (Padgee et al. 2006; Chhatre and Agrawal 2008, 2009; Bowler et al. 2010; Persha et al. 2011), at least in some contexts. However, there remains an inadequate understanding of whether these outcomes are synergistic or trade-offs, and how they vary in relation to biophysical, institutional, and socioeconomic contextual factors (Chhatre and Agrawal 2009). The salience of these issues is demonstrated by the continued growth in the numbers of countries and sites in which community-managed forests are being established.

A large number of publications explore these issues, illustrating the conditions under which community-managed forests are most successful, and including long-term research programs that have used standardized research protocols. These include a large body of work by the International Forestry Resources and Institutions (IFRI) research network (Wollenberg et al. 2007) established in 1992 by Nobel Laureate Elinor Ostrom. The IFRI research network has carried out rigorous research to assist policy makers and forest users in designing and implementing improved evidence-based forest policies. Today the IFRI research network comprises a partnership of 14 organizations that have carried out research on community-managed forests in 15 countries, and have comparable data from 250 research sites in Latin America, Africa, Asia and North America. In each site, a common set of data collection protocols has been used to measure, monitor and analyze community-managed forest institutions, forest-user livelihoods, biodiversity and forest carbon, and associated covariates.

Despite an extensive literature on environmental and socioeconomic outcomes in community-managed forests, there have been few systematic efforts to collate the collective experiences of multiple decades of research on community-managed forests around a common set of comparable indicators (Padgee et al. 2006; Bowler et al. 2010; Oldekop et al. 2010; Waylen et al. 2010;

Seymour et al. 2014). Such an effort would provide a strong evidence base to answer key questions about the outcomes associated with community-managed forest initiatives, and the contextual factors that support those outcomes. Previous systematic reviews have asked whether formal community forest management (CFM) has been more effective than either no CFM (using before and after data) or more effective than other tenure arrangements (comparing CFM to other management regimes) (Bowler et al. 2010). However, to our knowledge, no previous systematic review has either (1) compared all forms of community-managed forests, whether *de facto* or *de jure*, or (2) compared outcomes in community-managed forests across a range of contexts, with an explicit emphasis on understanding the influence of variation in those contexts.

We will address this knowledge gap through a systematic review of the literature framed around an analysis of key population, intervention, comparator and outcome indicators that have proven central to assessments of the success of community-managed forests. The review will enable policy makers and practitioners to make more informed, evidence-based decisions about when, where, and how best to support existing and new community-managed forest initiatives that effectively achieve desired environmental and livelihood outcomes. In particular, the identification of characteristics associated with improved outcomes, globally as well as regionally, will help highlight those factors that are most malleable by policy.

The systematic review will: (1) assess whether published studies demonstrate that community-managed forests lead to improvements or declines in environmental and livelihood outcomes, and (2) analyze how these outcomes vary across a range of biophysical, institutional, and socioeconomic contexts.

## 1.2 Objective of the review

The principal objective of this review is to integrate and summarize empirical research on environmental and livelihood outcomes in community-managed forests, and the biophysical, institutional, and socioeconomic contextual factors associated with those outcomes. The review will systematically collate more than two decades of research on the subject, and in doing so will review the available evidence supporting community management of forests as a strategy for achieving sustainable environmental and livelihood outcomes, and generate policy-relevant information about the conditions under which community-managed forests achieve different outcomes.

The primary question is: *What are the biophysical, institutional, and socioeconomic contextual factors associated with improvements in livelihood and environmental outcomes in forests managed by communities?* We will examine livelihood and environmental outcomes separately and in combination to look for associations, and better understand the trade-offs and synergies across studies in different contexts.

The same review protocol and resulting dataset will enable a number of interesting and relevant questions to be answered. These include, but are not limited to, understanding whether the contextual factors identified as important in response to the primary question vary between: (1) studies conducted by the IFRI research network and other research efforts (i.e. are IFRI findings consistent with those by other researchers?), (2) studies of project/state-initiated versus endogenous initiatives for community-managed forests, and (3) studies that used quantitative versus qualitative research methods. One would expect, for example, that different methodologies collecting data on similar variables and at similar scales would generate results that are more similar to each other than to other studies. Conversely, we might expect differences in the variables collected, and in the precision of those data, between studies using different methodologies.

### 1.3 PICOC framework

The review will assess multiple livelihood and environmental outcomes of community-managed forest initiatives and how a suite of biophysical, institutional, and socioeconomic factors influences these outcomes. To do so, we will use a PICOC (Population, Intervention, Comparator, Outcomes, Context) framework (Table 1).

#### 1.3.1 Population

In this framework, we define “population” as individual forests and the communities of people that manage them. We focus only on less industrialized, forested nations, as these are the countries where the majority of community-managed forests are situated. Adopting the definition of the IFRI network; while forests do not need to be managed by a community as a whole, they do need to be a shared resource among at least three households. This excludes studies focused on privatized use, leasehold or outright forest ownership.

#### 1.3.2 Intervention

We broadly define community management of forests as forest use and governance arrangements

under which the rights, responsibilities and authority for forest management rest, at least in part, with local communities. Within the wide range of community management of forest contexts, interventions of interest include projects and programs that have been introduced by external actors, (whether through NGO or government initiatives aimed at decentralization of forest management, land tenure reform, natural resource and biodiversity conservation projects, or other targeted rural development initiatives), as well as endogenous initiatives undertaken by forest user groups, communities or local leaders.

#### 1.3.3 Outcomes

Our ‘outcomes’ of interest are environmental and livelihood metrics associated with community-managed forest interventions. Environmental outcomes will focus on increases or declines in forest cover and/or condition (including forest degradation - interpreted as changes in vegetation structure, or changes in species richness or diversity of flora or fauna). Livelihood outcomes will focus on improvements or declines in households’ commercial and subsistence livelihoods (including food security). We do not assume any two outcomes are positively correlated, so we will analyze these separately.

#### 1.3.4 Comparator

Our ‘comparator’ will compare cases varying across spatial dimension between different locations (i.e. cross-sectional comparisons), and temporal dimension overtime (i.e. before and after changes within cases).

#### 1.3.5 Contextual factors

Newton et al. (in prep.) identify a suite of 38 contextual factors that represent sources of variation associated with forest outcomes in different community-managed forests.

These contextual factors can be categorized into:

- (1) user-group factors that assess forest user-group socioeconomic characteristics;
  - (2) demographic factors that assess population dynamics;
  - (3) institutional factors that assess user-groups’ tenure rights and formal management regimes;
  - (4) market factors that assess the influence of market forces on user-group livelihood decisions;
  - and (5) biophysical factors that assess abiotic and abiotic processes influencing forest dynamics.
- Based on a preliminary screening from a full review of 100 papers that are accepted through the screening process, this number of contextual factors will be reduced to target the most frequently utilized (discussed further below).

**Table 1. The Population, Intervention, Comparator, Outcome, and Context (PICOC) framework, as applied to a systematic review of environmental and livelihood outcomes in community-managed forests.**

Population	Intervention	Comparator	Outcomes	Contextual factors
Individual forests and the communities of people that manage them	Community management of forests	<p><b>Spatial</b> variation between community management of forests in different locations (i.e. cross-sectional comparisons), with respect to the contextual factors</p> <p><b>Temporal</b> variation within a community-managed forest over time (i.e. longitudinal comparisons), with respect to the contextual factors</p>	<p><b>Livelihood outcomes:</b> Contribution of forests to subsistence and income-generating livelihoods</p> <p><b>Environmental outcomes:</b> Changes in forest cover and condition (including forest degradation)</p>	<p><b>User-group characteristics</b></p> <ol style="list-style-type: none"> <li>1. Heterogeneity</li> <li>2. Social capital/collective action</li> <li>3. History/ experience</li> <li>4. Education</li> <li>5. Forest dependence</li> <li>6. Remoteness</li> <li>7. Public attitudes</li> <li>8. Poverty</li> </ol> <p><b>Market characteristics</b></p> <ol style="list-style-type: none"> <li>9. Liberalization</li> <li>10. Roads</li> <li>11. Distance to administrative center</li> <li>12. Technological advances</li> <li>13. Market demands</li> <li>14. Input prices</li> <li>15. Product prices</li> <li>16. Income</li> <li>17. Wage levels</li> </ol> <p><b>Institutional characteristics</b></p> <ol style="list-style-type: none"> <li>18. Weak state</li> <li>19. Property rights</li> <li>20. Tenure security</li> <li>21. Local autonomy</li> <li>22. Monitoring</li> <li>23. Enforcement</li> <li>24. Accountability</li> <li>25. Formal authority</li> <li>26. Well-defined rules</li> </ol> <p><b>Demographic characteristics</b></p> <ol style="list-style-type: none"> <li>27. Population levels</li> <li>28. Population density</li> <li>29. Population change</li> <li>30. Migration</li> </ol> <p><b>Biophysical characteristics</b></p> <ol style="list-style-type: none"> <li>31. Soil fertility</li> <li>32. Elevation</li> <li>33. Slope</li> <li>34. Vegetation density</li> <li>35. Fragmentation</li> <li>36. Precipitation</li> <li>37. Fire</li> <li>38. Forest size</li> </ol>

## 2 Methods

### 2.1 Search strategy

We will conduct searches for literature to capture peer-reviewed journal articles focused on case studies in Latin America, the Caribbean, Africa, and Asia and the Pacific. This search strategy will limit its scope to studies that are published in peer-reviewed journals (see ‘Study quality criteria’, below) and in English. Two publication databases will be searched: Web of Knowledge and CAB Abstracts.

In addition to searching the aforementioned databases, we will complement search results through snowballing from reference lists of key meta-analyses and systematic reviews.

#### 2.1.1 Search terms and strings

Following our review of other relevant systematic reviews and meta-analyses, we adopted many search terms used by others (Haddaway et al. 2013; Macura et al. 2013; Pullin et al. 2013). Review team members and library science specialists further suggested additional terms and different combinations of search strings using Boolean operators. The complete list of search terms is organized according to their PICOC categories, as follows (noting interchangeability between certain population and intervention terms).

#### Population terms

Forest, rainforest, agroforests, woods, woodland, forest reserve, extractive reserve, protected area, indigenous and community conserved area, ICCA, indigenous forest reserve, communal leasehold forest, communal agroforestry, community concession, collective forest, participatory forest, common property forest, forest cooperative, communal woodlot, forest garden, farm forest, village forest.

#### Intervention terms

Community forestry, community forest management, CFM, community-based forestry, community-based natural resource management, CBNRM, social forestry, decentralization, co-management, joint forest management, JFM, integrated conservation and development project, ICDP, participatory, collective, collaborative, customary, cooperative forest management, governance, tenure, regime, property rights.

#### Outcome terms

1. Livelihood outcome indicators: food security, employment, livelihood, subsistence, income, fuelwood, fodder.
2. Environmental outcome indicators: ecosystem, carbon, forest cover, species diversity, vegetation density, desertification, reforestation, afforestation, regrowth, leakage, forest, clearance, land cover change, land use change, land conversion, species richness, degradation, environment, deforestation, stand density, biodiversity, species composition, forest productivity.

Based on the PICOC framework outlined in Table 1, we will use the following search terms in the database searching:

1. Population terms (separated by Boolean operator “OR”), to be combined (using the Boolean operator “AND”) with;
2. Intervention terms (separated by Boolean operator “OR”), to be combined (using the Boolean operator “AND”) with;
3. Livelihood and environmental outcome terms (separated by Boolean operator “OR”); to be combined (using the Boolean operator “AND”) with.

We do not include any of the contextual factors in our search strings because our test searches (see below) indicated that the relevant search terms might not always be present in study titles and abstracts.

Within CAB Abstracts and Web of Science, search strings will utilize truncation or wild card symbols, as appropriate, to search for alternative spellings and endings; the specific search strings developed for application in this systematic review are presented in the Annex. The search results will be refined by restricting papers from Web of Science to those labeled as articles or reviews and within CAB Abstracts to journal articles. All results will be recorded in EndNote and duplicate articles removed prior to screening for relevance.

### 2.2 Estimating the comprehensiveness of the search

The comprehensiveness of this search strategy was first tested by verifying that our search succeeded in capturing the majority of papers reviewed in other systematic reviews and meta-analyses.

Initial testing of the search strategy found approximately 8000 hits on Web of Science following delimitation by language and article type; preliminary title screening of the first 1000 results (as ranked by relevance) found that a large proportion of these studies were potentially relevant to the review. Moreover, initial searching of CAB Abstracts returned approximately 8000 results after delimiting by language and article type; the first 1000 results were reviewed by title and abstract and found to be of high potential relevance. Thus the combined searching of the two databases ensured the capture of a comprehensive body of evidence as represented in English language journal articles.

## 2.3 Study inclusion criteria

In order to be included, an article needs to fulfill each of the following aspects:

- **Relevant population:** Forests, as defined by individual studies, including mixed-use forests (agro-forests), but excluding tree plantations, and the communities of people that manage them.
- **Relevant intervention:** The study examines community-managed forest initiatives, whether as introduced externally or through endogenous institutions.
- **Relevant context:** The study contains data or information on at least one of the 38 contextual factors.
- **Relevant outcomes:** Livelihood outcomes of interest are those forest contributions to human subsistence and income-generating livelihoods. Relevant environmental outcomes include measures of change in forest cover and condition (e.g. measures of species diversity and forest degradation), and the provision of ecosystem services (e.g. carbon storage and sequestration).
- **Relevant region:** The study focuses on countries of Latin America and the Caribbean, Africa, Asia and the Pacific.
- **Novel empirical data:** For inclusion, studies must contain either new primary data, or new analyses (including meta-analyses). Literature reviews and theoretical/conceptual papers are not valid, though literature reviews will be used to “snowball sample” back to the original data studies.

## 2.4 Description of methods used in primary research

This study will review a range of different journal article types including: (1) single case studies, where data were collected in one site at one point in time;

(2) comparative meta-analyses, which analyze multiple case studies in aggregate; (3) cross-sectional studies, which compare outcomes across multiple sites exposed to similar interventions; and (4) longitudinal studies, which track change over time in a single site or multiple sites (e.g. before and after the implementation of an intervention). In all cases, our unit of analysis will be a forest patch and the associated community of forest users. Some studies will therefore provide multiple case studies; others will provide just one. We will incorporate papers based on quantitative or qualitative methodologies and data, and those that combine the two.

## 2.5 Screening

We will review all collected studies in a three-stage screening process based on: (1) titles, (2) abstracts, and (3) full texts according to our study inclusion criteria (see above). During the first two stages of screening, we anticipate that the contextual variables may not be explicitly stated, but if the other requirements are met, these papers may be included for third-stage screening (full-text).

We will use Abstrackr (Byron et al. 2012) to expedite the screening process. To ensure inter-rater consistency, we will perform free-marginal kappa analyses (Randolph 2005) at the beginning of each stage on a subset of 50 randomly selected studies. Should the kappa statistic fail to reach an acceptable level of agreement ( $>0.6$ ), the reviewers will discuss differences of interpretation and repeat the exercise on another subset of 50 studies, if necessary, repeatedly, until the kappa statistic reaches a value of 0.6 or higher. During the full-text screening stage, records will be kept of both included and excluded studies. Those studies that are included will then proceed to the quality assessment stage.

## 2.6 Potential effect modifiers and reasons for heterogeneity

Our review will evaluate the effect of 38 contextual factors (Table 1) that have been identified as being commonly associated with forest cover change and degradation in writings on drivers of deforestation and forest governance (Newton et al. in prep.). While these variables have been identified as important they have not been studied equally frequently. For our final analysis.

We will identify a smaller subset from among these variables that best help to explain variations in

livelihood and environmental outcomes. We will initially select 100 random studies from our final list. For each study, we will evaluate which of the 38 variables or comparable proxies were assessed by that study. Variables that are rarely assessed (e.g. in <5% of studies) will be excluded from the subsequent analysis. Doing so will allow us to ensure statistical power for included variables. Conversely, if additional contextual variables appear in more than 5% of studies highlighted as explaining variations in outcomes, they may be added to the search strategy and analysis.

## 2.7 Study quality assessment

We will limit our analysis to studies that are published in peer-reviewed journals, for two reasons. First, only in this manner can we be sure of avoiding double-counting of data and findings that have been published first as a report or working paper, and later in a peer-reviewed journal. Second, only in this manner can we be sure that all studies included in the review have undergone a blind, independent, rigorous peer-review process that is necessary to ensure a high-quality (though sometimes imperfect) research output.

## 2.8 Data extraction strategy

Studies on community-managed forests use a variety of methodologies to assess the relationships between independent variables and outcomes (see “Description of methods used in primary research” above). In addition to extracting basic information for each individual study (e.g. author, journal, year of publication), we will devise a simple data extraction protocol focusing on our outcome, and contextual variables, which are synonyms for dependent (outcome) and independent variables (contextual variables) in statistical models.

1. Outcome variables will focus on continuous and ordinal classifications of spatial and or temporal differences in environmental and livelihood variables. For example, forest cover might be classified continuously, as the proportion of loss or gain; forest condition might be classified ordinally as “improved”, “worsened” or “unchanged”.
2. Contextual variables will use continuous, binomial and ordinal classifications in levels of, and changes in, contextual variables. To maximize the statistical power of our analysis, we will keep the classification of each variable as simple as possible, aiming for the majority of

variables to include three, and no more than five, different categories. Developing simple categories for different variables will help to ensure that our data extraction protocol is as transparent and replicable as possible. Where particular contextual variables are not reported in the study, but are easily obtained from third-party sources, they will be included. For example, if geographic coordinates are provided in a study, it is easy to look up elevation and mean precipitation values for these sites.

After devising our initial data extraction variable categorization protocol, two people will independently code the same set of 25 randomly selected studies. We will then perform a kappa analysis to evaluate inter-coder agreement and continue to refine and test our extraction protocol until our kappa statistic reaches an acceptable level of congruence >0.6.

Because we have access to the original data that underlies all IFRI studies, we are in a unique position to evaluate the effectiveness of our coding protocol in accurately characterizing the independent and dependent variables of interest. To do so, we will compare regression results obtained from the data of included IFRI studies extracted using the developed SR data extraction to those obtained using the underlying raw data used to generate the original studies.

## 2.9 Data synthesis and presentation

Given the high number of predictor variables, our initial analyses will include data mining approaches, including random forest analyses, which are increasingly being used to identify variables for subsequent regression analyses. We will analyze the database as a whole, and will also divide the data according to dichotomous axes of interest (e.g. qualitative versus quantitative studies; IFRI versus non-IFRI studies). These results will then be used for information theoretic-based regression model building as well as more traditional theory-based model building analyses. Similar approaches have been used in recent studies reviewing community-based natural resource management and governance strategies [e.g. Padgee et al. 2006; Oldekop et al. 2010; Waylen et al. 2010; Kenward et al. 2011; Brooks et al. 2012). These studies will provide a rigorous methodological starting point for the proposed systematic review. It should be noted that while the search and analysis undertaken will

include both improvements and declines in outcome indicators, the principal objective of the review is to assess which contextual factors and intervention types result in improved outcomes.

The protocol and synthesis of the final systematic review will be published on the IFRI and CIFOR websites. We will present results of the review at international meetings, including the Global Conference of the International Association for the Study of the Commons.

We believe that the dataset from this systematic review will generate several scientific articles, which will be published alongside specific policy briefs by both CIFOR and IFRI.

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## Annexes

### A.1 Web of Science search string

TOPIC:(\*Forest\* OR wood\* OR “forest reserve” OR “community forest\*” OR “community-based forest\*” OR “collective forest\*” OR “extract\* reserve\*” OR “forest garden\*” OR “forest concession\*” OR “concession forest\*” OR “protect\* area\*” OR “conserv\* area\*” OR “village forest\*” OR “social forest\*” OR “farm forest\*” OR “leasehold forest\*” OR “forest cooperative\*” OR agroforest\* OR taungya OR ejido)

AND

TOPIC:(“common property” OR decentraliz\* OR co\*manage\* OR joint\*management OR JFM OR “community forest management” OR CFM OR “community-based natural resource management” OR CBNRM OR “joint forest management” OR JFM OR “integrated conservation and development” OR ICDP OR ((participat\* OR collective OR collaborative OR common\* OR customary OR cooperative) NEAR (manage\* OR govern\* OR tenure OR regime\*)))

AND

TOPIC: (“food security” OR nutrition OR well\*being OR welfare OR employment OR livelihood\* OR subsistence OR income\* OR ecosystem\* OR carbon OR “forest cover” OR “vegetation density” OR desertification OR reforest\* OR afforest\* OR regrowth OR regenerat\* OR leakage\* OR “forest clearance” OR “land cover change” OR “land use change” OR “species richness” OR “species composition” OR “species diversity” OR degrad\* OR environment\* OR deforest\* OR “stand density” OR biodiversity)

The “Topic” field was applied to each line to search for matches in study titles, abstracts, and keywords.

### A.2 CAB Abstracts search string

SUBJECT: (Forest\* OR agroforest\* OR rainforest\* OR wood\* OR “forest reserve\*” OR “protection forests” OR “community forest\*” OR “community-based forest\*” OR “collective forest\*” OR “extractive reserve\*” OR “forest garden\*” OR “concession\*” OR “protected area\*” OR “conservation area\*” OR “community conservation area” OR “village forest\*” OR “social forest\*” OR “farm forest\*” OR “leasehold forest\*” OR “forest cooperative\*” OR taungya OR ejido )

AND

SUBJECT: (“community forest management” OR CFM OR “community based natural resource management” OR CBNRM OR “joint forest management” OR JFM OR “integrated conservation and development” OR ICDP OR “common pool resource” OR “common property” OR decentral\* OR co-manag\* OR ((participat\* OR collective OR collaborative OR customary OR cooperative) AND (manage\* OR govern\* OR tenure OR regime)))

AND

SUBJECT: (“food security” OR nutrition OR wellbeing OR wellness OR welfare OR employment OR livelihood\* OR subsistence OR income OR ecosystem OR carbon OR “forest cover” OR “forest ecology” OR “species diversity” OR “species richness” OR “species composition” OR “vegetation density” OR desertification OR reforestation OR afforestation OR deforestation OR regrowth OR regenerat\* OR leakage OR clearance OR “forest decline” OR “land cover” OR “land use” OR degradation OR environment OR “stand density” OR biodiversity OR fuelwood OR “land conversion” OR productivity)

The field tag “subject term” was consistently applied to search across the “descriptor”, “organism descriptor”, and “geographic descriptor” indices, as well as “identifier” terms that have not yet been categorized by CAB Abstracts. The search string also includes relevant terms identified by the CAB Thesaurus.



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Community-managed forests can secure greater sustainability of forests and more equitable livelihood outcomes for stakeholders than centralized forest management. However, there remains an inadequate understanding of whether environmental and socioeconomic outcomes are synergistic or trade-offs, and how they vary in relation to biophysical, institutional, and socioeconomic characteristics. This systematic review will collate the collective experiences of multiple decades of research on community-managed forests around a common set of comparable indicators, identifying the characteristics associated with improved outcomes globally as well as regionally.

This protocol describes the methodology for examining the research question: *What are the biophysical, institutional, and socioeconomic contextual factors associated with improvements in livelihood and environmental outcomes in forests managed by communities?* The review will systematically collate empirical data from studies of different outcomes in community-managed forest systems, synthesizing individual studies to produce an aggregate overview of results. Data on key variables will be extracted in a comparable manner. With respect to user-group, market, institutional, demographic, and biophysical contextual factors, the study will examine both spatial variation between community-managed forest interventions in different locations (i.e. cross-sectional studies), and temporal variation within a community-managed forest interventions over time (i.e. longitudinal studies). Doing so will enable an assessment of the evidence to support community-based forest management as a strategy for achieving sustainable forest management; and will generate policy-relevant information about the conditions under which community-managed forests achieve different outcomes.



RESEARCH  
PROGRAM ON  
Forests, Trees and  
Agroforestry

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