Rigorous Literature Review

IS THE USE OF RENEWABLE NATURAL RESOURCES IN THE DEVELOPING WORLD MORE OR LESS SUSTAINABLE, PRO-POOR AND PROFITABLE UNDER CONTROLLED ACCESS COMPARED TO OPEN ACCESS?

Review Report

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SUMMARY

Background

Property rights to natural resources are at the centre of contemporary development policy. Governments around the world are in the process of creating, formalising or modifying property rights to natural resources. Property reforms not only include land reforms, as currently implemented across Central Asia, East Asia, Latin America and Sub-Saharan Africa (Sikor and Mueller 2009), but also extend to forests (Larson et al. 2010) and fisheries (Costello et al. 2008). These reforms raise the question of how the implementation of access controls or changes in property regimes affect the sustainability, pro-poorness and profitability of natural resource use.

Review questions

We use the following key question for the review: *Is the use of renewable natural resources in the developing world more or less sustainable, pro-poor and profitable under controlled access compared to open access?*
Access is understood as the right to use a particular resource, or in terms of Schlager and Ostrom (1992), the right of withdrawal. Access refers to *de facto* rights (and not statutory rights), as we seek to compare situations in which such rights are limited to a few (by law, customs or other social institutions) with those when rights are available to everyone.
In addition to the key question, we proposed the following two sub-questions for the review: (a) Under what conditions is controlled access more or less sustainable, pro-poor and profitable than open access? (b) Is the use of renewable natural resources in the developing world more or less sustainable, pro-poor and profitable under private ownership compared to common property?
The property regimes are defined as follows:
- Open access: Mechanisms to limit resource use are absent or not enforced.
- Controlled access: Mechanisms to limit resource use are present and enforced (could involve common property or private ownership).
- Common property: Locally shared resource rights combined with presence of collective use regulation (a form of controlled access).
- Private ownership: Individual, transferable and long-term resource rights (a form of controlled access).

Methods

The final set of inclusion criteria was as follows: Subject - Use of renewable natural resources (RNR) in developing countries, limited to forests and/or fisheries; Intervention: comparison between controlled and open access conditions or between common property and private ownership; Methodologies: primary research only, both before/after and concurrent assessment of outcomes of different regimes, quantitative or qualitative designs; Outcomes - at least one the following is mentioned: (a) Sustainable use of RNR, (b) Pro-poorness of use and (c) Profitability; Report language - English, French, German, Spanish or Portuguese.

The quality of methodology (validity) of eligible studies was addressed as part of the data extraction. The validity assessment was based on characteristics suggested for randomised and non-randomised studies by the Cochrane Collaboration and the EppiCentre, and adapted to the nature of the evidence base on outcomes of property rights in natural resources use systems. We extracted all evidence and contextual

information which was relevant to the review key question and sub-questions. Some studies presented quantitative measurements, including statistical estimates of variability, but the majority of cases consisted of reports based on qualitative research. As a result, we could not sample data for meta-analyses, and instead organised all information gathered in tables for synthesis.

Results

The inclusion/exclusion process is summarised as follows:
- 2005 studies identified via searches on ISI Web of Knowledge (1603 hits) and other sources (649 hits).
- Titles and abstracts were screened and a set of 110 studies were considered relevant for full-text assessment.
- The full-text assessment stage was concluded with the final inclusion of 33 studies for data extraction and validity assessment.

Description of included studies
Forests were the predominant type of renewable natural resource (RNR) focused in the included studies, accounting for two thirds of all studies. The majority (~80%) of cases reported on research carried out in "low" and "lower middle income" countries (World Bank categories based on Gross Domestic Income). Concurrent comparisons were the most frequently applied research design (26 cases), while before-after comparisons were carried out in one quarter of the cases. There were relatively even numbers of cases applying "open vs. controlled access" and "common vs. private property" designs. Over 70% of cases looking at forest use compared private versus common property. The most frequent comparisons in fisheries studies involved cases of open and controlled access – practically all under conditions of common ownership. With regards to the quality of methodology, seven of the included studies were assessed as cases of moderate risk of bias, the remaining 26 were at high risk of bias and none were at low risk.

Key question: controlled versus open access
A total of 20 studies reported relevant outcomes on the comparison between controlled and open access. Only two studies included data on all three outcomes (sustainability, pro-poorness, profitability). Fourteen reported an overall improvement in at least one important outcome, with no negative outcomes under controlled access in comparison with open access. Seventeen studies reported data related to sustainability effects, seven studies compared controlled and open access resource use in terms of its effects on poverty alleviation, and two studies examined the profitability of resource use in a comparative manner. The four studies with a moderate risk of bias reported that resource use was more sustainable under controlled access, two found it more pro-poor and none reported profitability outcomes.
Fifteen of the 17 studies reporting sustainability outcomes found controlled access to produce superior outcomes over open access. The other two studies did not detect any difference
The results on the pro-poorness of resource use were more mixed than on sustainability: four found controlled access superior, one open access and two reported mixed outcomes. A closer look at the studies reveals that controlled access is only more pro-poor than open access if there is an equitable distribution of access rights within the local community.
Both studies reporting profitability outcomes find controlled access superior, but their number is too small to allow any meaningful generalization.

Sub question 1: Under what conditions is controlled access more or less sustainable, pro-poor and profitable than open access?

Due to the paucity of systematic data, the only robust comparison possible was between forest use (8 studies) and fisheries (12 studies). The superior sustainability outcomes of controlled access were equally strong for both types of resources: eight of the nine fishery studies and five of the six forestry studies with reporting sustainability outcomes found more favourable sustainability outcomes under controlled access – although it must be noted that out of 12 studies pointing to controlled access superiority only one study on fisheries and two on forests were assessed as at moderate risk of bias. As for the pro-poorness of resource use, two of the three forestry studies reporting relevant outcomes found controlled access superior (both at moderate risk of bias), the other one open access. Two of the four fishery studies considering pro-poorness found controlled superior (both at moderate risk of bias), the other two reporting mixed outcomes. As for profitability, one study only on each resource type reported relevant observations, consequently blocking any attempt to draw general conclusions.

Sub question 2: common property versus private ownership
A total of 13 studies reported relevant outcomes on the comparison between common property and private ownership. Only two of the studies included data on all three outcomes. Twelve of the studies dealt with forest use, only one with fisheries. Studies with moderate and high risk of bias reported very similar results. All three studies of moderate risk of bias reported on sustainability outcomes. Two of those found common property to be superior, and one suggested that private ownership was better. In terms of pro-poorness, the evidence was evenly split between no differences due to property regimes (two studies, moderate risk of bias), and suggestion of common property as a superior regime (two studies, high risk of bias).

Validity assessment
The studies included in this rigorous literature review represent research from widely different methodological and epistemological traditions. We based our assessment of the quality of methodology on existing validity criteria applied in structured assessments of evidence, but also strived to adapt them to the specific demands in our review. By doing so, our aim was to perform a rigorous assessment of the methodology of studies which took into account the heterogeneous nature of research on property rights. The criteria covered several aspects of research design and reporting, and the assessment was summed up in a "summary of validity" where each study was assigned to three categories of overall bias (high, moderate and low). The "summary of validity" reflected all criteria, but hinged upon the quality of reporting on the similarity of the units of analysis (regimes and resources under comparison). As a result, in studies assessed as at high risk of bias – the majority of cases in this review - the reader is not able to fully appraise whether the difference in outcomes reported has to do with different access conditions or whether other factors, methodological or contextual, explain those differences. Nonetheless, it is still possible to gain insights from those studies by looking at individual validity criteria and re-assessing the study for particular findings which have a reliable methodological foundation.

Conclusions

The review findings lend cautious support to policy that seeks to impose or strengthen access controls for the sake of sustainable resource use, even though the interpretation

of findings reported here must take into account the observed risks of bias. Despite the limitations imposed by heterogeneous nature of methods and evidence, and potential for bias outlined above, the cases reviewed suggest that the transfer of property rights to resource users and efforts to improve the enforcement of statutory property rights can be expected to improve the sustainability of resource use. The property transfers do not necessarily imply privatization, however. All but two of the comparisons with open access included in this review refer to common property situations. Both common property and private ownership can bring about access controls with positive effects on the sustainability of resource use.

The review findings also demonstrate the potential contributions of such policy for poverty alleviation. Poor resource users who gain exclusive access to forests or fisheries are likely to benefit – with two caveats. First, the poorest will only benefit if there are rules in place to distribute resource benefits among the local population in an equitable manner. Second, access controls may allow some local poor to benefit, but they may exclude other (non-local) poor groups at the same time.

As for the form of access control, the review findings provide some support for the promotion of common property regimes in forests and fisheries, although they need to be treated with caution for the reasons noted above. Policy that strengthens and enhances common property regimes appears more likely to support poverty alleviation efforts than the extension of private ownership. In addition, such policy seems unlikely to cause more detrimental effects on the sustainability than private ownership.

Future research on property and resource use may want to develop research designs and improve the reporting of relevant observations by investigating the profitability of resource use, differentiating groups of poor more clearly, providing more comprehensive descriptions of resource systems and paying more attention to the potential influence of ‘confounding’ factors. Research may also want to build in direct comparisons over time and between sites more often. Paired or small number case studies may provide the comparative evidence that remains rare in research on property and resource use. In addition, future research needs to develop approaches to meta-assessment of case studies which improve their applicability to standard practice in research on property and resource use.

1. Background

Property rights to natural resources are at the centre of contemporary development policy. Governments around the world are in the process of creating, formalising or modifying property rights to natural resources. Property reforms not only include land reforms, as currently implemented across Central Asia, East Asia, Latin America and Sub-Saharan Africa (Sikor and Mueller 2009), but also extend to forests (Larson et al. 2010) and fisheries (Costello et al. 2008). These reforms raise the question of how the implementation of access controls or changes in property regimes affect the sustainability, pro-poorness and profitability of natural resource use.

The implementation of access controls is typically justified with reference to the 'tragedy of the commons': users enjoying unlimited access to a resource enter a 'race' in which they seek to maximise their own short-term gain, leading to resource over-exploitation (Hardin, 1968). In his seminal article Hardin (1968) discussed state-led control and privatisation as the alternatives to counter-act the outcome of such "open access" conditions. The debate around access to common resources has advanced since then: research has clarified how both state and private control may be associated to more degradation than access regimes based on customary rules, and has gathered ample evidence on the ability of collective action to successfully regulate the use of common resources through diverse types of institutions (Ostrom et al. 1999).

The concept of access is at the core of these debates. In this report, we define access to refer to the right to use a particular resource. In the terms of Schlager and Ostrom (1992), we use access to denote withdrawal rights and compare situations in which such rights are limited to a few with those when they are available to everyone. In addition, access refers to actual conditions, i.e. de facto use rights independent of statutory rights. Statutory rights may overlap with de facto rights when there is sufficient enforcement capacity, or they may be different from statutory rights, e.g. when actual social relations such as ethnic or caste identities override statutory designations of entitled users.

Open access is understood in this review as a regime of resource use in which rules are absent or exist without implementation – in other words, we aim to look beyond the formal identification of who owns the resource and their duties regarding its use (evidence of *de jure* controlled access), and seek to clarify cases in which those entitlements and rules are not actualised (indicating *de facto* open access conditions). Even though strictly open access conditions are seldom identified empirically - as it has been shown by a solid body of research on so called "common-pool resources" (CPR), e.g. Ostrom et al (1999) - evidence on *de facto* open access is unequivocal in pointing to the dilemmas faced by resource users under such conditions: there is high cost in restricting access to CPR and resource extraction by individuals inevitably subtracts from the pool shared by the group, thus making the control of "free-riding" behaviour a tall order for users.

In contrast to open access, private ownership and common property are expected to align the interests of resource users (individually or collectively) with societal interest in the sustainable use of the resource in the long term, use that contributes to poverty alleviation and generation of wealth. A similar reasoning is often applied to the privatization of resources previously held under common property, which assumes that individual private ownership aligns the interests of resource users better with the societal objectives of sustainable resource use, poverty alleviation and wealth generation (Grafton et al 2005). Nevertheless, such argument has not gone unchecked:

for example, research on fisheries has recently contested the assumption that sustainability is positively affected by privatization (Sumaila 2010; Clark et al 2010), and has also offered a critical analysis of the potential of privatization to benefit small-scale fisheries in developing countries (Allison et al. 2011).

In forestry, tenure transfers from open access situations to common property or private ownership take the form of forest land allocation (in East Asia, particularly China, Laos and Vietnam) and forest devolution (e.g. woodlots in Ethiopia, panchayats in India, indigenous land titling in Latin America). Common property and private ownership coexist in some countries, such as in Guatemala and Honduras, whereas other countries favour one property regime over the other. Yet the outcomes of property reforms remain unclear in forestry. Empirical research has so far not revealed any direct relationship between tenure transfer and resource use but highlights the significance of various mediating factors (Agrawal et al. 2008).

The predominant forms of tenure transfer in fisheries are the allocation of Individual Transferable Quotas (ITQs), involving transfers to groups - such as "territorial use rights in fisheries" (TURFs) (Christy, 1982) - and common property (Acheson, 2003). Originally conceived in industrialised countries, ITQs have become increasingly popular in developing countries, including Chile, Mexico, Morocco and Namibia (Arnason, 2002). Some research on ITQs suggests that the shift from open access situations to individual rights may promote the sustainable management of fisheries (Costello et al. 2008). At the same time, other research indicates that the allocation of ITQs may not enhance the sustainability of management and may not favour the poor (Pinkerton and Edwards 2009), while others have demonstrated "limits to socially optimal privatisation" in fisheries and argued for state control over ITQ schemes (Clark et al, 2010).

This review sets out to take a fresh look and to generate sound evidence on the relationship between property regime and resource use in the use of renewable natural resources (RNRs). Its seeks to make a novel contribution to the existing large body of research on the topic by (a) assessing the available knowledge in a systematic fashion and (b) focusing on studies involving direct comparisons between different access regimes and reporting key outcomes. The review will focus on two fields, where property reforms have received much attention in policy and research: forestry and fisheries. The decision to focus on forest use and fisheries was done on consultation with DFID for reason of scope.

Thus, the review is intended to feed into the effort emerging in recent years aimed at reviewing evidence on issues related to access in fisheries and forests (although, to our knowledge, none has looked at both resources). Where forest is concerned, access control has been the focus of reviews on the effectiveness of conservation strategies (Brooks et al, 2006; Lund et al, 2009), including specific efforts looking at national parks (Bruner et al, 2001; Hayes 2006), and analysis of trade-offs between use and biodiversity conservation (Persha et al. 2011). Reviews dealing with fisheries have focused on the "ecological performance" of marine protected areas (Pollnac et al, 2010), conditions for success of co-management (Gutierrez et al, 2010) and the impact of co-management in developing countries (Evans et al, 2011). In comparison to access issues, property rights have received very little attention in reviews or large N comparative analysis. In fisheries, the work by Costello et al (2008) is the only empirical study to date applying a meta-analysis design specifically set up to analyse effects of privatisation (in that case, ITQs) – the subject is the focus of decades of

research in fisheries, but initiatives tend to have relatively limited scope (e.g. Grafton et al. 2000) or to be based exclusively on modelling (e.g. Clark et al, 2010).

2. Objectives – Review questions

2.1 Key question

We use the following key question for the review:

Is the use of renewable natural resources in the developing world more or less sustainable, pro-poor and profitable under controlled access compared to open access?

The question, originally posed in the DFID (Department for International Development, UK government) call for review proposals, was: How effective is the transfer of common property to private ownership, through conferring property rights on individuals, in providing more sustainable and pro-poor exploitation of renewable natural resources in the developing world?

We proposed reformulating the question to make it more neutral than the original one. After extensive consultations with DFID staff, we also made three further alterations to the original question.

(1) Include attention to the 'profitability' of resource use: We define resource use as 'profitable' when it generates a surplus above costs. This stems from the interest in wealth generation expressed to us by DFID staff.

(2) Changes in terminology: We replaced the term 'common property' with 'open access' as DFID was interested in understanding change from a 'property-less' situation to property. In the light of the literature, open access was the more appropriate term to reflect DFID's interest. We use the term 'controlled access' to refer to both private ownership and common property as the classic property regimes, i.e. situations of controlled access.

(3) Attention to 'transfer': We proposed to consider the effects of the transition process from open-access situations to a property regime in two ways. First, we intended to use the time since the transition in the characterisation of included studies and as an effect modifier. Second, we decided to focus the analysis on the *de facto* situation in each case. This would allow us to 'rule out' cases where there may have been a transfer of legal tenure rights but *de facto* property rights have not been established on the ground (e.g., due to a lack of government enforcement power).

In addition, we agreed with DFID to limit the considered renewable natural resources to forests and fisheries due to the limited time and resources available for the review.

2.2 Sub-questions

In addition to the key question, we proposed the following two sub-questions for the review:

(a) Under what conditions is controlled access more or less sustainable, pro-poor and profitable than open access?

(b) Is the use of renewable natural resources in the developing world more or less sustainable, pro-poor and profitable under private ownership compared to common property?

The conditions we have been interested in exploring include two types: variation in question elements and in contextual factors. Our particular interest was with governance factors, such as the capacity of governments or other institutions to set rules, enforce them, monitor resource use and resolve disputes. Governance factors are considered a key reason why *de facto* property rights on the ground are often different from statutory property rights (Sikor and Tran 2007).

Variation in question elements: In addition to the use of inclusion criteria, we aimed at characterising all studies included in the review according to the following criteria:

- Subject: Type of RNR. Size of RNR. Resource abundance. Type of developing country (by development status and geographic region).
- Outcomes: Short-term versus long-term outcomes.
- Controlled access: Nature of right holder (group versus individual; type of group: incorporated group of individuals/cooperative, local community, regional association; type of individual: household, domestic private company, publicly-owned company, transnational corporation). Extent of rights (limited withdrawal right, unlimited withdrawal right, management right, alienation right – cf. Schlager and Ostrom 1992). Duration of rights (short-term/1-20 years, long-term/20-100 years, indefinite). Extent of obligations (conservation of stock, approval of management plan, management duties). Presence of secondary right holders under common and private property. Nature of right-transferring institution (state, customary authority, supra-state institution). Gender distribution of private property rights.
- Open access: Nature of lack of exclusion (who does not get excluded? outsiders only, such as migrants or powerful actors; insiders only; insiders and outsiders). *De jure* situation (public, common property, private, undefined).

3. Methods

3.1 Question formulation

Following the consultation with DFID and reformulation of the review question we were able to define the question elements in detail (Table 01), which point to the characteristics of studies that would best provide the evidence required for our review. See also “study inclusion criteria” below for comment on methodology and language of studies assessed for the review.

Table 01. Question structure and inclusion criteria (see notes below for further clarification on specific terms*)

Question Elements	Description
Subject	Unit of study: Use of renewable natural resources (RNR) in developing countries. Use defined as active extraction by humans. "Developing countries" defined according to World Bank Global Development Indicators, including low & middle income countries; see appendix 2. Focus: Forests and fisheries. Defined according to FAO criteria; see appendix 1.
Intervention or condition	Access regime: Controlled access - mechanisms to limit use are present and enforced. Private ownership: individual, transferable and long-term rights to RNRs. Common property: locally shared rights to RNR combined with presence of collective use regulation.
Comparison	Open access: mechanisms to limit use are absent or not enforced.
Outcomes	Reliable measurement of the level of achievement of intervention goals: (a) Sustainable use of RNRs: ability to extend use of RNR into the future at the current level. (b) Pro-poorness of use: ability of local poor to benefit from use of RNRs; poor to be defined in relative and absolute terms at the individual and community level. (c) profitability: generation of surplus above costs.

Notes on terms

> access is understood as the right to use a particular resource, or 'withdrawal rights' in terms of Schlager and Ostrom (1992), referring to actual conditions, i.e. de facto use rights independent of statutory rights.

> private ownership includes government ownership if governmental entities receive and exercise 'private' rights to resources, as in the case of a publicly owned forest company that gets private title to forestland.

> common property does not include cases of co-management in which local groups do not receive any significant rights to RNRs.

> pro-poorness of use assumes that 'local' refers to people living in geographical proximity of the RNR, the actual extent of proximity depending on the size of the resource (e.g. a village for a small forest, many villages around a lake, etc.).

> profitability assumes costs as defined according to context. In subsistence settings, they include variable costs and exclude the costs of household labour and capital depreciation, mirroring local people's calculations of surplus. In commercialized settings, they include the costs of labour and capital depreciation. In the latter settings, surplus equates profit, but not so in the former type of settings.

3.2 Search strategy

Our search employed the following strategies:

(1) Primary databases searched. General databases focused on peer-reviewed journals and other academic literature: ISI Web of Knowledge, Scopus, JSTOR and EBSCO. Except for the ISI Web of Knowledge, searches in the other three major databases resulted in hits exceeding 5,000 references. Such results could not be handled within

the time frame for submission of this review, especially with the limited staff hours available. Nonetheless, the case of Scopus was examined further due to the database relevance and wide coverage. The number of hits was particularly high and comprehensive tests of the search strategy were carried out aimed at reducing the number of hits. See Section 4.1 and appendix 5 for detailed description of these results.

(2) Specialist databases: the Library of the Commons (IASC), International Institute for Fisheries Economics and Trade (IIFET), World Agricultural Information Centre portals (FAO - Food and Agriculture Organization of the United Nations / SIFAR - Support unit for International Fisheries and Aquatic Research), JOLIS (World bank and International Monetary Fund libraries); general databases and portals focused on international development (ELDIS and Zetoc - British Library's database). Titles and abstracts were assessed for each individual result from specialist databases.

(3) Web searches: additional searches for unpublished material and grey literature were carried out on Google Scholar and the meta-search engines Yippy and Dogpile. The first 50 hits in each of those search engines were checked for potentially relevant studies. Except for three cases of peer-review articles, we did not find cases with potential for inclusion in the review among the grey literature shown in the first 50 hits of web searches. As a result, we did not carry out the examination of further hits.

(4) Consultations with experts and organisations: We have consulted with our own advisory team (Tim Daw – DEV UEA, Lorenzo Cotula - IIED, Edward Allison – WorldFish FAO), and also directly contacted Arun Agrawal (IFRI network). Such expert recommendation was aimed at assisting with the refinement of the search strategy, but did not determine it and neither was used for the inclusion of specific studies. The cases suggested by advisors and experts as well as those identified in the reference lists of included studies have only contributed to the development of the search strategy. In all but one case those studies did not meet the criteria for inclusion in the review (for the exception, see McClanaham, 2010 in the table of characteristic of included studies, appendix 9).

The search strategy varied depending on the database and/or search engine used, but followed the general syntax shown below[1]. Each line of the strategy is related to a specific review question element. The objective was to maximise the chance of identification of relevant research, those studies which covered as fully as possible the review question. Searches were always carried out without limiting the date range.

Question element		**Syntax**
Population	*Subject*	(countries names truncated) AND
	Focus	(forest* OR fisher* OR fishing OR wood* OR timber*) AND
Intervention and comparison		(private OR common OR shared) AND
		(property OR rights OR access OR quota* OR tenure OR title OR deed OR governance OR market

[1] Syntax applied in all databases to searches on titles, abstracts and keywords. Boolean operators "AND" and "OR" and the wilcard "*" are used to show the general structure of the search strategy. Specific operators and syntax differ between databases.

OR ownership)

The search strategy included countries names and truncated forms describing demonyms of developing countries and transitional economies (see appendix 2 for the list of "developing countries" according to the World Bank classification adopted in this review). See also the appendix 4 for detailed search terms, particularly specific syntax of countries names.

We have carried out direct searches for studies available in English, with the possible assessment of cases in French, German, Spanish and Portuguese when relevant studies were suggested by the reference list or expert consultation. Only one case of non-English language was considered for inclusion: a report written in Portuguese and published in Brazil as a book chapter (see Castello et al., 2009 in the table of characteristic of included studies appendix 9). Direct search was restricted to English due to time and budget limitations – searches and screening of studies in databases covering all languages initially proposed would not be possible within the period (eight months) and with the staff (one lead reviewer) available to conduct the review.

3.3 Study inclusion criteria

The question elements framed the definition of criteria which studies had to meet to be considered for inclusion in the review process. The final set of criteria is shown below.

- Subject: Use of renewable natural resources (RNR) in developing countries and RNR limited to forests and/or fisheries.
- Exposure or intervention: comparison between controlled (existence and enforcement of mechanisms limiting access) and open access (absence or lack enforcement of such mechanisms) conditions OR between common property (locally shared use of RNR combined with presence of collective use regulations) and private ownership (individual, transferable and long-term rights to RNRs)
- Methodologies: primary research only, at least one of the following - intervention studies (before/after change in property regime), controlled studies (assessment of outcomes of different regimes), and observational or qualitative designs (comparison of areas with both regimes). Primary research excludes cases such as theoretical papers, literature reviews (except for systematic reviews), policy briefs, book reviews and commentary/position papers.
- Outcomes - at least one the following is mentioned:
  (a) Sustainable use of RNR (ability to extend use of RNR into the future);
  (b) Pro-poorness of use (ability of local poor to benefit from use of RNR)
  (c) Profitability (described in either the formal or informal sense – e.g. as in profit of a cooperative or net income of a household)
- Report language: English, French, German, Spanish or Portuguese.

As mentioned in the previous section, results from specialist databases, web searches and expert consultations were all assessed individually at title and abstract level and, despite providing relevant cases where the overall topic of the review was concerned, did not meet the criteria for inclusion. See Figure 01 (section 4.1) for details on the

screening stage and appendix 6 for reasons for exclusion of all studies which made to the full-text assessment stage. Once thorough tests and alternative versions of the search strategy failed to achieve a workable set of references for Scopus and other databases we settled for the assessment of results from ISI Web of Knowledge. Our aim was the timely conclusion of the review process up to the draft review stage, with the further analysis of other databases pending a re-assessment after draft report submission.

3.4 Study quality assessment

Study validity (quality of methodology) was addressed as part of the data extraction. The validity assessment was based on characteristics suggested for randomised and non-randomised studies by the Cochrane Collaboration ('Chapter 8: Assessing risk of bias in included studies' and '13.5 Assessing risk of bias in non-randomized studies' in the Cochrane Handbook[2]) and from work by the EppiCentre[3],[4].

Our method of assessment includes most but not all of validity domains used in the Cochrane and EPPI frameworks (see Table 02). We did not combine the measures of validity in an overall score or weight them in any way, but reported the study strengths and weaknesses by domain (see appendix 7 for a table reporting in detail the validity of each included studies). Our set of adapted criteria covered several aspects of research design and reporting, and the assessment was summed up in a "summary of validity" where each study was assigned to three categories of overall bias (high, moderate and low – see last row in Table 02). The "summary of validity" reflected all criteria, but hinged upon the quality of reporting on the similarity of the units of analysis (regimes and resources under comparison). For instance, studies at high risk of bias do not allow the reader to fully appraise whether the difference in outcomes reported are due to different access conditions or whether other factors, methodological or contextual, explain those differences.

3.5 Data extraction and synthesis

We extracted all evidence and contextual information which was relevant to the review key question and sub-questions. Some studies presented quantitative measurements, including statistical estimates of variability, but the majority of cases consisted of reports based qualitative research. As a result, we could not sample data for meta-analyses, and instead organised all information gathered in tables for synthesis. Data extraction was carried out by a single reviewer for the full set of included studies. The resulting synthesis was revised independently afterwards by the other two members of the review team. During this revision both the data extracted and the validity assessment of each included study were discussed by all reviewers.

We focused particularly on two points. Firstly, we revised the classification of studies according to the regime type – even in cases of high quality of reporting, the

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[2] Higgins JPT, Green S (editors). *Cochrane Handbook for Systematic Reviews of Interventions* Version 5.0.0 [updated February 2008]. The Cochrane Collaboration, 2008. Available from www.cochrane-handbook.org.

[3] Gough D (2007) Weight of evidence: a framework for the appraisal of the quality and relevance of evidence. In J. Furlong, A. Oancea (Eds.) Applied and Practice-based Research. Special Edition of Research Papers in Education, 22, (2), 213-228

[4] EppiCentre website, 'Quality and relevance appraisal', http://eppi.ioe.ac.uk/cms/Default.aspx?tabid=177 (accessed January 2011)

complexity of access and property regimes often means that categories cannot be applied in a straightforward manner (for example, cases of mixed regimes in which individual rights have been allocated, but customary rules regulate transferability and access to resources). Secondly, we cross-checked the interpretation of outcomes, revising whether it was accurate, and relevant to the review question – similarly to the regimes type classification, the interpretation of outcomes can be made difficult by the very nature of the processes at stake (for example, linking the benefits for the poor to specific conditions of access to the natural resource is notoriously complex, and often the information provided is not sufficient to establish the link or rule out other factors than resource use which may explain the benefits to users). An agreement was reached in all cases - see appendix 9 for a sample of the full data set extracted (the table shows key features describing the included studies). Refer to the "data extraction and validity assessment form" in the appendix 3 for the full list of data categories extracted.

Table 02. Criteria for validity assessment.
See also appendix 3 for the data extraction and validity assessment form

Criterion	Score as:
Clarity of the research question	'done' when the question addressed by the research is clear, specific and addressed by the methods & results 'not done' when there are any major problems with the above
Description of RNRs	'done' when the RNRs are well described (to include size, species composition, abundance/scarcity, stock unit, availability of technology to assist in harvesting, duration of current exploitation levels) 'partial' when one to three of these factors are not well described 'not done' when four or more factors are not well described
Similarity of RNR between controlled and open or private ownership and common property	'done' when before/after study and when RNRs appear very similar (e.g. geographically close, similar ecosystems & context – including migration, market integration, infrastructure access, resource abundance) 'partial' when there are both similarities and differences (or some factors are similar and some unclear) 'not done' when the RNRs exhibit substantial differences (or several factors are unclear) 'unclear' – where there is not enough detail reported to assess
Temporality	'done' when the time of assessment of the 2 systems is equivalent and both systems are equivalently 'settled' 'not done' when differences in time or in how settled a system is may alter the outcomes 'unclear' where either are unclear
Confounding	'done' when the study attempts to account for and minimise the effects of any differences in area, level and type of poverty (or these are equivalent in both settings) 'partial' when one or two of these factors are not equivalent, accounted for or minimised (or are unclear) 'not done' when three or more factors are not equivalent, accounted for or minimised (or are unclear)
Description of conditions	'done' when the access regimes (controlled and open access or private ownership and common property) are well described, and have been well investigated on the ground 'partial' when these factors are described in parts only 'not done' when these factors are not well described
Researcher bias	'done' when study funding and financial interests of authors are declared, no bias is apparent, and the selection of the case(s) is justified in appropriate manner 'partial' when funding or financial interests are not declared (but case selection is justified in appropriate manner) 'not done' when funding, financial interests or case selection are not declared and there is potential bias apparent
Outcome ascertainment	'done' when outcome measures are appropriate for both systems, and appear valid and well executed (in terms of sample size, sampling strategy, rigorous data aggregation) 'partial' when any one criteria above is not met 'not done' when at least 2 criteria are not met 'unclear' where it is not possible to tell
Any other validity problems for this study?	'Done' if no further issues around validity 'not done' if additional validity issues are raised
Summary of validity	Low risk of bias when all criteria above are 'done' Moderate risk of bias when similarity of RNR is 'done' but one or two other criteria are partial, not done or unclear High risk of bias for all remaining studies

4. Results

4.1 Review statistics

As mentioned in the "Search strategy" section above, the results from electronic databases considered for the draft review stage were identified only via the ISI Web of Knowledge. Despite the use of a very specific search strategy and several attempts to refine syntax and search terms, Scopus generated more than 19,000 hits in total. JSTOR and EBSCO showed similar behaviour. In a re-run of the searches at the moment of writing this draft review, Scopus and JSTOR still returned an extremely high number of hits, while EBSCO showed a number of hits comparable to the ISI Web of Knowledge – yet, with approximately 20% of results missing year or author. See appendix 4 and 5 for full search strategies employed in ISI and Scopus, as well as all details of the results aforementioned.

The inclusion/exclusion process is summarised as follows:

- Searches on ISI Web of Knowledge resulted in 1603 hits, as depicted in Figure 01, which details the whole process of identification, screening and inclusion of studies following guidelines suggested for transparency in assessments and meta-analysis of evidence[5].

- Other sources yielded 649 hits, consisting of searches on ELDIS (including both ELDIS resource library and the portal's Google Custom Search), FAO (Waicent), IASC digital library, World Bank (JOLIS) and ZETOC (British Library).

- As a next step, the lead reviewer checked the titles and abstracts of the 2005 studies for relevance and consequent inclusion in the eligibility stage. Two other members of the review team double-checked a random sample of 10% of the studies collected via the electronic database, also using titles and abstracts to filter relevant studies. Kappa tests were carried out and coefficients varied between 0.24 and 0.57 (Table 03). In reaction to the relatively low level of agreement in one comparison (reviewers 2 and 3, kappa=0.24), we revised all cases of disagreement in the random sample. Title and abstract of each case was cross-checked in conjunction by two reviewers. An agreement on exclusion at title and abstract level was reached in all but seven cases, which then were subject to further screening, done independently by the two reviewers. Six studies were confirmed for exclusion, and one case was considered eligible for inclusion. All studies considered relevant after the title and abstract screening were included for full-text assessment, producing a set of 110 studies.

- In a final step, the lead reviewer assessed all 110 studies in their full-text versions, with clear-cut decisions for the inclusion of 33 and exclusion of 60 studies. Another member of the review team independently assessed a sub-set of 17 studies for which the lead reviewer did not reach a final decision. Each case was them revised in conjunction by both reviewers, resulting in the inclusion of two studies and the confirmed exclusion of the 15 remaining studies.

[5] For example: Liberati A, Altman DG, Tetzlaff J, Mulrow C, Gøtzsche PC, et al. (2009) The PRISMA Statement for Reporting Systematic Reviews and Meta-Analyses of Studies That Evaluate Health Care Interventions: Explanation and Elaboration. PLoS Med 6(7)

Summing up, the full-text assessment stage was concluded with the exclusion of 75 studies and inclusion of 33 studies selected for data extraction and validity assessment - note that after the submission of a draft version of the review report we carried a further revision of the eligibility and inclusion stages, consisting of a re-assessment of each included study by two reviewers in conjunction. As a result, two studies were excluded and the final review report was updated accordingly (see also Fig 01). The appendix 6 shows the full list of excluded studies with a brief description of reasons for exclusion in each case of full-text assessment.

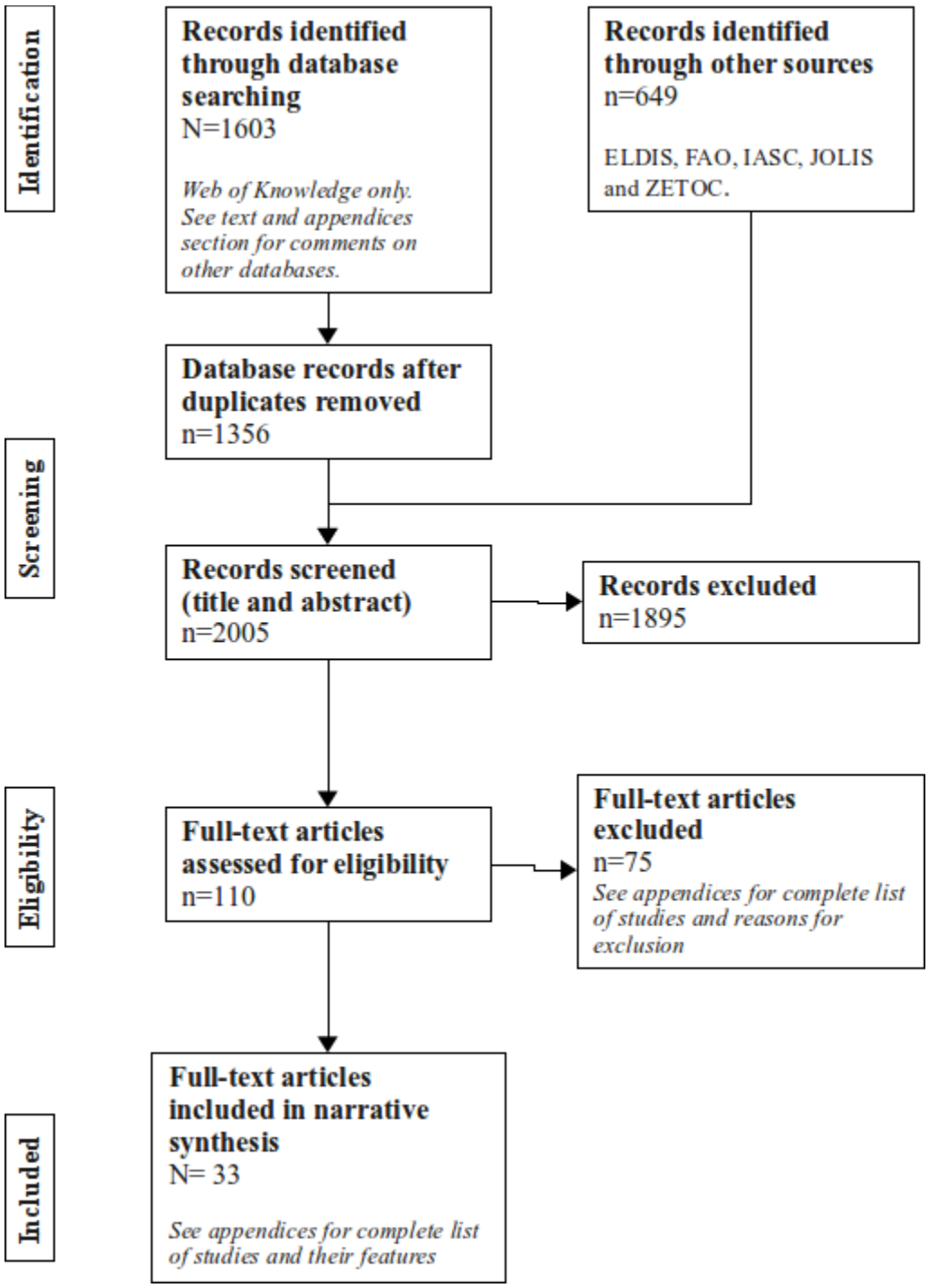
Table 03: Comparison between reviewers and kappa test results.

		Reviewer 2		Observed Kappa
		exclude	include	
Reviewer 1	exclude	108	15	0.5
	include	2	11	

		Reviewer 3		
		exclude	include	
Reviewer 1	exclude	122	1	0.57
	include	7	6	

		Reviewer 3		
		exclude	include	
Reviewer 2	exclude	108	2	0.24
	include	21	5	

Figure 01. *Stages of identification and selection of studies for the review*.



4.2 Description of studies

Forests were the predominant type of renewable natural resource (RNR) focused on the included studies, accounting for two thirds of all studies. The majority of cases (~80%) reported on research carried out in "low" and "lower middle income" countries (Table 04). The studies included were similarly distributed across geographical regions outside Europe (similar numbers in South Asia, Latin America and Africa), while only one study was focused on a European case (Albania: Muller and Munroe, 2008) (Table 05). A relatively large number of studies on forest use looked at cases in South Asia. See appendix 9 for the detailed list of characteristics of included studies.

Table 04: Number of studies per RNR type and country income category (World Bank classification)

Income category	RNR_type		
	fisheries	forest	Total
Low	5	9	14
Lower Middle	4	8	12
Upper Middle	3	4	7
Total	*12*	*21*	*33*

Table 05: Number of studies per RNR type and geographic region

Region	RNR_type		
	fisheries	forest	Total
South Asia	1	8	9
Latin America	3	7	10
Africa	5	2	7
East Asia and Pacific	3	3	6
Europe	0	1	1
Total	12	21	33

Concurrent comparisons were the most frequently applied research design (26 cases), while before-after comparisons were carried out in one quarter of the cases. (Table 06). A similar trend was observed for both types of RNR, with the exception of a single case in which the design combined concurrent and temporal comparisons (McClanaham, 2010).

Studies did not focus predominantly on any specific comparison of access regimes, with relatively even number of cases applying "open vs. controlled access" and "common vs. private property" designs (Table 07). Only two of the 16 studies comparing controlled and open access situations dealt with private ownership, the others all comparing open access to common property. Each type of RNR showed

contrasting patterns. Comparative designs which looked at private versus common regime conditions were predominant in studies focused on forests, with over 70% of cases. In fisheries studies the more frequent comparisons involved cases of open and controlled access – practically all under conditions of common ownership - and there were only two studies comparing resource use under private ownership and common property.

Table 06: Number of studies per type of research design and RNR

RNR type	Research design			
	before-after	**concurrent**	**both**	**Total**
fisheries	3	8	1	12
forest	4	17	0	21
Total	7	25	1	33

Table 07: Number of studies per access regime comparison and RNR

RNR type	Regime comparison			
	open vs. controlled common only	*open vs. controlled: common and private*	*private vs. common*	Total
fisheries	9	1	1	11
forest	9	1	12	22
Total	18	2	13	33

4.3 Study quality assessment

Over two-thirds of the included studies fell into the "high risk of bias" category (summary of validity, see appendix 7 for the full list of validity criteria). All remaining cases (7 studies) were ranked as presenting "moderate bias" (Table 08). The validity summary considered several criteria, but was determined mostly by the level of detail and clarity in reporting the similarities between the cases under comparison. We found that with few exceptions, studies tended to report only certain features of the regimes/units being compared, with the notable absence or lack of detail in the description of conditions of access (withdrawal, management, exclusion and alienation rights) in several cases.

The studies assessed as cases of "high risk of bias" can be classified in three groups according to the "similarity of RNR" criterion:

1) Cases where the similarity of RNR was clearly reported, but more than two other criteria were partial, not done or unclear. Three studies fell into this group, in which sources of bias persisted despite clearly established designs and overall accurate reporting. In one case there was partial description of the access regime and RNRs across sites and confounding effects were only partially accounted for (e.g. no information provided on poverty levels in the study sites; Cinner et al., 2006). In the following study there was potential high risk of bias due to conflict of interest of the main author (direct participation in the implementation of the controlled access regime; Cudney Bueno and Basurto, 2009), and in the remaining case the researcher bias could not be ruled out due to partial reporting of methods and RNR description, and information on research funding was absent (Peluso, 1992).
2) Cases where the similarity of RNR was unclear. Also with three studies, this group consisted of the following cases: in the first study, there was limited description of the access conditions and RNR features, as the focus was mostly on the methodology used for comparison (McClanaham et al, 2010), in the second case the analysis relied on large-scale database and the information regarding the study sites was limited or absent (e.g., justification of choice of sites; Nagendra, 2007), while the last study only reported partially on features of the RNR, regime description and confounding factors (Fernandez, 1997).
3) Cases where the similarity of RNR was partial. This group comprised the majority of cases, with 21 studies. The group was characterised by limited reporting on features of the RNR and access regime, coupled with partial consideration for confounding factors in the regime comparison. Note that in spite of the general pattern describe above individual studies varied considerably in the accuracy and completeness of reporting in those and other criteria - see Table 08 below for breakdown on the number of studies per assessment category, and refer to appendix 7 for details on the assessment of each individual study.

Table 08. Validity assessment of studies: number of cases per assessment category in each validity criterion, grouped according to the “summary of validity” (high or moderate risk of bias).

Validity Criteria	Assessment	High risk of bias	Moderate risk of bias	Row total
Clarity of question	done	24	7	31
	not done	2	0	2
RNR description	done	2	1	3
	not done	2	0	2
	partial	22	6	28
Similarity of RNRs	done	3	7	10
	partial	20	0	20
	unclear	3	0	3
Temporality	done	18	7	25
	not done	6	0	6
	unclear	2	0	2
Confounding	done	4	3	7
	not done	2	0	2
	partial	21	4	25
Description of conditions	done	8	7	15
	not done	2	0	2
	partial	16	0	16
Researcher bias	done	21	7	28
	partial	5	0	5
Outcome ascertainment	done	19	6	25
	partial	7	1	8
Other validity problems	done	18	7	25
	not done	8	0	8

4.4 Narrative synthesis

This section provides a brief synthesis of the main review results. It is organized around the three questions.

Key question: controlled versus open access

A total of 20 studies reported relevant outcomes on the comparison between controlled and open access. Only two studies included data on all three outcomes. At the same time, 14 out of the 20 studies reported an improvement overall in at least one important outcome with no negative outcomes under controlled access in comparison with open access.

Seventeen studies reported data related to sustainability effects (Table 09 and Figure 02). This is the highest reporting rate among all questions and types of outcomes, amounting to 49 per cent of all included studies and 89 per cent of all studies comparing controlled and open access. Fifteen studies found that resource use is more sustainable under controlled access than open access. For example, Cinner et al. (2006) found that fish average size and fish biomass were higher in fishing areas of Indonesia and Papa New Guinea with periodic closures than outside those. Nagendra et al. (2008) reported that forestland under controlled access in Nepal included a larger percentage of stable forest area, larger patches of stable forest and lower percentage of stable non-forest area.

Seven studies compared controlled and open access resource use in terms of its effects on poverty alleviation (Table 09). Four of them concluded that resource use is more pro-poor under controlled access. For example, Haller and Merten (2008) showed in their historical analysis of changes in resource property and use in Zambia that access controls allowed local people to keep outsiders out and benefit from local fisheries in the past, something that is no longer possible in the absence of access controls today. Castello (2009) produced insights from Brazil showing that mean annual income from a local fishery more than doubled and fishing families' purchasing power doubled within 5-6 years with the implementation of access controls.

Only two studies examine the profitability of resource use in a comparative manner (see Table 09). Both suggest that resource use is more profitable under controlled than open access. Den Hertog and Wiersum (2000) report from Nepal that resource use produces higher yields of a particular high-value non-timber forest product, and that product collection is more efficient under controlled access than open access. McClanahan (2010) derive that per capita revenues and net income increased after the imposition of access controls in Kenyan fisheries.

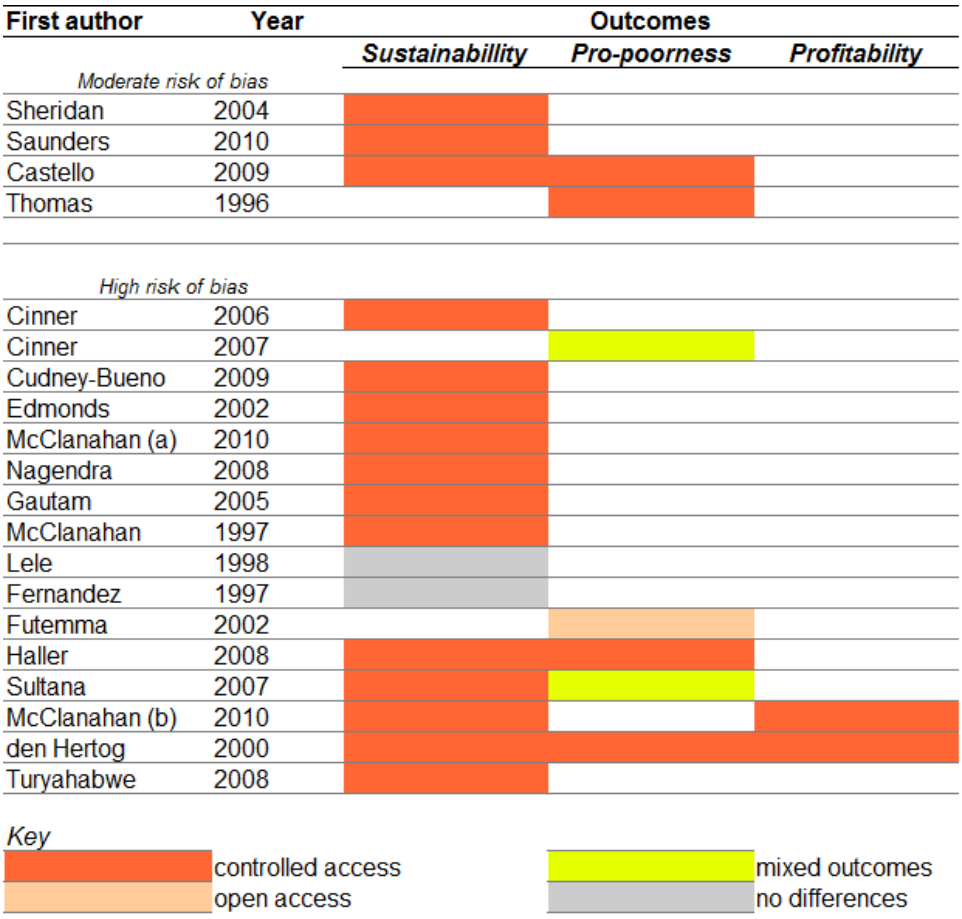
Table 09: Comparison of renewable resource use under controlled and open access

	Number of studies reporting	Controlled superior	Open superior	No difference	Mixed outcomes
Sustainability	17	15	0	2	0
Pro-poorness	7	4	1	0	2
Profitability	2	2	0	0	0

Source: Tables in appendix 9

Sensitivity analysis: The four studies with a moderate risk of bias all report that controlled access is superior to open access on at least one outcome (with no negative relationship) (Figure 02). Three studies report that resource use is more sustainable under controlled access, and two find it more pro-poor. None reports profitability outcomes. The results of these four studies, thereby, suggest that the results of the larger sample are robust, even though 16 of the 19 studies have a high risk of bias.

***Figure 02**. Comparison of controlled vs. open access. Colours represent which regime conditions showed superior indicators in each outcome category, as well as studies where no differences or mixed outcomes were reported. Studies grouped according to validity assessment (summary risk of bias). Refer also to appendix 9 for details on each study.*



Sub question 1: variation in outcomes

Two of the 16 studies reporting sustainability outcomes found no difference between controlled and open access, thereby indicating that the effects of access controls on sustainability are not automatic. The effects are mediated by a variety of other influences, which may dominate changes in resource use in particular locations and at particular times. Lele et al. (1998), compared land cover on open access land with private land in 66 Indian villages, and did not detect any significant difference in land degradation, as indicated by both total and high density forest cover. Fernandez and Castilla (1997) found no significant difference in crab size and sex ratio between open waters and managed areas in two Chilean sites. It is impossible, however, to relate these two apparent 'exceptions' to particular factors which explain or are related to the difference observed in the other studies.

The results on the pro-poorness of resource use are more mixed than on sustainability. One study concluded that resource use served the poor better under open access than controlled access because better-off villagers were able to monopolise access to a floodplain that was once open to all (Futemma 2002). Two studies reported mixed results. Sultana (2007) suggested that controlled access allowed local residents to benefit from a particular resource, but also that better-off residents benefited more than others, the net outcome for the poor being unclear. Cinner et al. (2007) found that communities may be better off on average under open access, but also noted that the distribution of wealth within communities was more unequal than under controlled access.

The variation in pro-poor outcomes indicates the significance of intra-community distribution. Access controls did not serve poor local residents when the already advantaged were able to capture the benefits derived from resource use. The absence of equitable intra-community distribution explains the lack of pro-poor outcomes in all three studies discussed above. Vice versa, controlled access can serve poor local residents if mechanisms are in place to distribute the benefits derived from resource use in an equitable manner, as illustrated by the studies reporting superior pro-poor outcomes under controlled access. Den Hertog and Wiersum (2000) showed that functioning rules secure equitable access to a high-value non-timber forest product. Haller and Merten (2008) emphasized the significance of customary rules securing equitable access to all local residents under controlled access in the past. Saunders (2010) noted the significance of alternative livelihood projects targeted intentionally at marginalized local people, in particular women.[6]

[6] Castello (2009) did not differentiate local residents by wealth, which makes it impossible to know the intra-community distribution of benefits derived from fisheries.

Was there any systematic difference between the effects of access controls in forest use and fisheries? The results do not suggest so (Tables 10 and 11). The results reported above for both kinds of resources taken together also hold for the resources looked at individually. Forest use and fisheries tended to be more sustainable under controlled than open access. This result was particularly strong for fisheries, as nine out of twelve included fishery studies reported sustainability outcomes, and eight of them found fisheries to be managed in a more sustainable manner under controlled access. Similarly, forest use and fisheries were likely to be more pro-poor under controlled access than open access, even though the number of relevant studies was small. As for profitability, there is one study only on each resource reporting relevant observations.

Table 10: Comparison of forest use under controlled and open access

	Number of studies reporting	Controlled superior	Open superior	No difference	Mixed outcomes
Sustainability	6	5	0	1	0
Pro-poorness	3	2	1	0	0
Profitability	1	1	0	0	0

Source: Tables in appendix 9

Table 11: Comparison of fisheries under private property and common ownership

	Number of studies reporting	Controlled superior	Open superior	No difference	Mixed outcomes
Sustainability	9	8	0	1	0
Pro-poorness	4	2	0	0	2
Profitability	1	1	0	0	0

Source: Tables in appendix 9

Sub question 2: common property versus private ownership

A total of 13 studies reported relevant outcomes on the comparison between common property and private ownership. Only three of the studies included data on all three outcomes. 12 of the studies dealt with forest use, only one with fisheries.

All 13 studies compared the sustainability of resource use under common property and private ownership (see Table 12 and Figure 03). Slightly more than half (seven) found common property to be associated with more sustainable resource use than private ownership. For example, Gibson et al. (2002) used the results of satellite imagery analysis to show that forest commons have higher tree density than private

forest in Guatemala. Satria et al. (2006) indicated that fisher folk in Indonesia put effective measures in place to control fishing and protect fish stock.

Nevertheless, there was significant variation in sustainability outcomes, indicating the influence of other factors. Two studies found no difference between resources managed under common property and private ownership (Southworth and Tucker 2001; Tucker 1999). Two reported mixed outcomes (Sakurai et al. 2004; Tucker et al. 2007). Four suggested that resource use was more sustainable under private ownership than common property.

***Figure 3**. Comparison of common vs. private ownership. Colours represent which regime conditions showed superior indicators in each outcome category, as well as studies where no differences or mixed outcomes were reported. Studies grouped according to validity assessment (summary risk of bias). Refer also to appendix 9 for details on each study.*

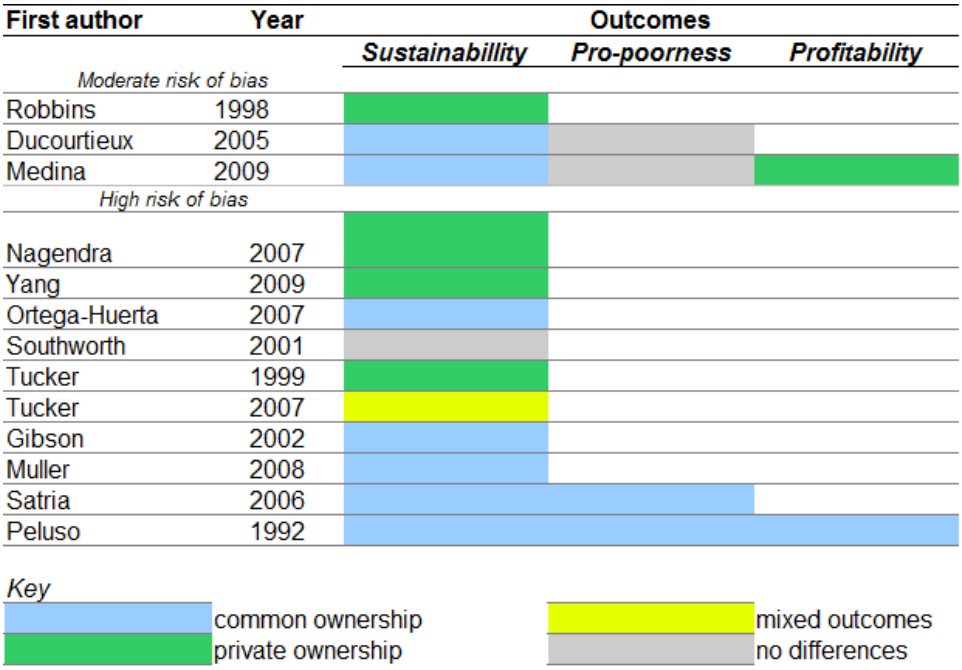


Table 12: Comparison of renewable resource use under common property and private ownership

	Number of studies reporting	Common superior	Private superior	No difference	Mixed outcomes
Sustainability	13	7	4	2	1
Pro-poorness	4	2	0	2	0
Profitability	2	1	1	0	0

Source: Tables in appendix 9

A mere four studies compared resource use under common property and private ownership in terms of its differential implications for poor and better-off people. Three found common property to generate more beneficial outcomes for the poor than private ownership. For example, Peluso (1992) observed in an Indonesian village that the better-off benefited more from the privatization of ironwood rights than old and weak villagers as they could handle the chainsaws required for logging. Satria et al. (2006) found that common property allows poor villagers to secure a share in overall profits in the pearl harvest in an Indonesian fishery.

Two studies reported no difference between the pro-poorness of common property and private ownership, attesting to the influence of other factors mediating the association between property regime and poverty alleviation. Medina et al. (2009) showed that local communities in four Latin American sites recognized the benefits attached to both common property (in terms of training, access to transport, land tenure) and private ownership (access to roads and vehicles, jobs, loans). Ducourtieux et al. (2005) found that the better-off benefited more from access to forests in Laos, regardless of the question whether access was private or common.

Only two studies examined the profitability of resource use in a comparative manner, reporting contradictory results. Peluso (1992) found that private ownership on forests in Indonesia brought along high inefficiencies in forest management due to increased production and transaction costs, such as those due to the need to hire equipment individually and due to cancelled logging deals. Medina et al. (2009) drew on insights from forest use in Bolivia, Brazil and Peru to suggest that private ownership produced a higher income per person per day than common property.

Sensitivity analysis: The three studies with a moderate risk of bias reported very similar results as discussed above (Figure 03). All three studies reported sustainability outcomes, with two finding common property to be superior and one suggested that private ownership was better. In terms of pro-poorness, the two studies reporting on that outcome did not detect any difference between property regimes.

5. Discussion

5.1 Effects of access control: evidence and reasons for variation

The results highlight the relative paucity of systematic evidence on the relationship between access controls and resource use. We identified 20 studies only out of a set of 2005 studies considered of potential relevance initially. We evaluated only four of these to be of moderate risk of bias, the rest possessing a high risk of bias. Only two studies compared open access with private ownership, the remaining 18 comparing it with common property. Furthermore, there was a tremendous variation in study designs and the reporting of observations. The 20 studies consequently only included seven that reported effects on poverty alleviation, and only two looked at the profitability of resource use.

Even though the review findings allowed to us to identify overall trends and relationships between access regime and resource use, the limit to generalisation is stressed by the validity assessment of included studies. Any attempts at reaching

definite conclusions based on these findings should explicitly take into account the predominance of high risk of bias among included studies - as well as the relatively small number of studies found to have moderate risk of bias, and absence of cases of low bias.

In terms of sustainable resource use, controlled access appears superior to open access. In the 17 studies reporting sustainability outcomes, the reported evidence suggests that resource users managed forests and fisheries in a more sustainable manner if they had the ability to exclude others. This finding matches the widely-shared emphasis on the critical importance of property rights for sustainable resource use in the literature.

In terms of poverty alleviation effects, the results indicate positive outcomes of access controls but are more ambivalent than on sustainability. On the one hand, this does not come as a surprise as property is only one mechanism that enables people to benefit from natural resources (Ribot and Peluso 2003). Other mechanisms include product markets, for example, as traders may derive significant profits from buying and selling goods, thereby diminishing the benefits accruing to local producers. On the other, the results were no longer ambivalent once one considered the distribution of resource benefits among local resource users. In the relevant studies, better-off households were able to reap the benefits of access controls. In the presence of intra-community differences, access controls may benefit better-off community members and not poor ones.

There was not enough evidence to identify significant findings on the profitability of resource use. The two studies reporting relevant outcomes indicated, however, that resource use was more profitable under controlled access. This matches theoretical expectations, as resource users tend to make more efficient use of resources if they possess the right to decide about resource use and the ability to exclude others.

We did not find any significant differences between forest use and fisheries. Resource use both in forestry and fisheries management tended to be more sustainable under controlled access than under open access. Resource use was also more pro-poor in both fields in the absence of intra-community differences. This is an interesting finding, as biophysical differences between forests and fisheries did not influence the results. Both resources displayed the characteristics of common-pool resources, for which access controls are a critical precondition for sustainable and, under certain conditions, pro-poor resource use.

The relative paucity of systematic evidence did not allow us to establish the effects of any other mediating factors besides the two discussed above.

5.2 Effects of property regime: evidence and reasons for variation

Just as pointed out above for the key question, systematic comparisons between resource use under private ownership and common property were relatively scarce. We identified only 13 such studies out of the initial set of 2005. Only three of the 13 studies revealed a moderate risk of bias, the remaining ten having a high risk. Also, only one study dealt with fisheries, the large majority looking at forest use. Moreover, there was large variation in the reporting of observation, leaving us with only two studies looking at profitability. Thus, just as stressed in the previous section, the

validity assessment demonstrates the limited ability to draw general conclusions from this review, even though the review findings allowed to us to identify overall trends and relationships between property regime and resource use.

In terms of sustainable resource use, there was no evident relationship between property regime and resource use. Common property generated superior outcomes in some situations, private ownership in others. Two studies did not detect any apparent influence of property on the sustainability of resource use. This ambiguity reflects a general finding in the larger literature that there is no clear relationship between property regime and sustainable resource use. The underlying reason is that the property regime is only one among many influences on resource management (e.g. Agrawal et al. 2008).

In terms of poverty effects, the results suggest that common property generates superior outcomes in comparison with private ownership. Private ownership tended to work to the advantage of those already better off, as illustrated by a large number of case studies discussed in the literature. In contrast, common property offered possibilities for the protection of the poor, particularly in the presence of local rules securing equitable access. Nonetheless, even under common property, the better-off may be able to derive larger benefits from natural resources, as illustrated by Futemma et al. (2002).

Just as noted above, there was not enough evidence to identify any finding on the profitability of resource use under the two property regimes.

The relative paucity of systematic evidence did not allow us to establish the effects of mediating factors on outcome variation.

5.3 Review limitations

In the most fundamental sense, this review has been limited by the mismatch between its design and the nature of the literature on property and resource use. Most of the research on access regimes, property and resource takes the form of single-case studies. The emphasis is on qualitative research designs to understand concrete practices, to illuminate underlying processes and to capture contextual influences. The focus is on questions about how and why access, property and resource use change in particular economic, political and ecological settings. The research is less interested in isolating the impacts of certain interventions, such as the imposition/termination of access controls or changes between private ownership and common property, and consequently rarely uses comparative research designs.

In contrast, this review attributed critical significance to comparative research design. The centrality of a controlled comparison becomes clear in the formulation of the key question. It also influenced the choice of indicators used for the validity assessment, which were derived from rules applied to comparative research designs and demand highly structured and standardised reporting. As a result, a large proportion of existing research on property and resource use did not fit the design of this rigorous review: neither does the research follow any clear rules on the reporting of observations nor does it use comparative research designs often.

In the absence of relatively uniform reporting, it was extremely difficult to assess the abundant empirical evidence in the rigorous manner required by the design of this review. Due to the general preference for single-case studies, very few studies performed concurrent comparisons between different property regimes. Furthermore, we were not able to pair up case studies for analysis in the review as each study reported on specific cases in different geographical locations. Single-case study designs could have incorporate temporal comparisons, however we found that only 7 studies compared conditions before and after changes in the access regime.

The review was unable to perform a search on another major database, in particular Scopus, within the resources available to the review. The number of studies included in this review, therefore, must be considered in the light of this restriction. We acknowledge that more studies were likely to be included if results from Scopus were screened - despite the overlap in the coverage by major databases such as ISI Web of Knowledge and Scopus, they do not present totally duplicated results (Gavel and Iselid 2008). Unfortunately, such task requires far more staff hours than were available to conduct the review, but is technically possible and recommended in order to strengthen the basis for the review's conclusions.

In addition, we ended up including only 33 studies out of a total set of 2005 identified initially to be of potential relevance. Out of these 33 studies, only four studies reported all three outcomes. The 2005 studies were considered of potential relevance as they contained the employed search terms in their titles and abstracts. Many of these were understood to contain relevant information for understanding the effects of property on resource use, but did not fit the inclusion criteria, in particular the requirement of a comparative research design. Approximately 5% (110 studies) were found to be eligible for full-text assessment, with only 33 of them making it through to the data extraction and validity assessment stage (see appendix 6). The choice of inclusion criteria, which bound eligibility with comparative designs, led to a significant loss of information in comparison with the empirically-rich understanding of the relationship between property and resource use provided by existing research.

Moreover, the results of the validity assessment demonstrate the mismatch between standard practice in research on property and resource and the validity criteria employed in this review. Applying rules developed by the validity assessment conducted in this review ended up to characterize not a single study to be of low risk of bias and 26 out of the 33 of high risk. The high incidence of a high risk of bias clearly demonstrates the limitations of this review. The findings reported above need to be treated with caution, as stressed above.

The mismatch with standard practice in research on property and resource use diminished the utility of the validity assessment employed in this review as a tool to differentiate study quality. It effectively prevented a validity assessment of the included studies that is tailored to actual practice in the field and allows the review team to differentiate study validity according to the standards applied in the literature reviewed. Research on property and resource use tends to lack rigour in describing the renewable resource of interest, establishing the similarity of study sites, or capturing potential confounding factors. This can obviously be improved, particularly in studies making direct comparisons. Yet it also originates from a widely shared scepticism in qualitative research about the possibility to perform controlled comparisons

considering that social processes tend to be complex and have multiple causes (Miles and Huberman 1994; Yin 2003).[7]

In the absence of uniform reporting, the review has had to employ significant pragmatism in the measurement of outcomes. On sustainability, all included studies use selective indicators instead of a more comprehensive assessment. Many employ a single indicator only to determine the sustainability of resource use (e.g. canopy cover or fish biomass). In addition, the included studies tend to employ different indicators, making comparisons problematic and quantitative syntheses impossible. More broadly, the sustainability assessment throws up complex conceptual issues, as there is no objective way to measure sustainability. As different actors have different interests in resource use, they tend to assert different priorities for what needs to be sustained. For example, Lele et al. (1999) noted that the definition of 'degraded' forest on the basis of canopy cover was problematic. Looking at Indian villages, they suggested that changes from closed forest canopy to open canopy tree-grass combinations may result in an "increase in socially useful biomass", particularly grazing land to local people. In consequence, sustainable management may mean to local villagers that grasslands with trees are conserved, not dense forest.

The study also encountered vexing issues in the determination of poverty alleviation outcomes. The first originates from research design: the potential exclusion of 'outsiders' is rarely considered. Most studies focused on the effects of access controls on the local population only (e.g. Castello 2009, Haller 2008). In this way they failed to explore the potentially negative outcomes of access controls on outsiders. Outsiders often include poor people and are in some situation among the most vulnerable people affected by changes in property. As much as access controls may benefit the local poor, they may easily discriminate against non-local poor by excluding them from the use of resources critical to their livelihoods (e.g. Sikor and Tran 2007).

The second issue encountered on the measurement of pro-poorness is that very few studies distinguish different poor groups. In most cases, local people were all assumed to be poor, or all poor people were treated as a homogeneous group. They were assumed to be affected by access controls or property regimes in similar ways. The limitations of this approach are highlighted by the few studies which disaggregate between different kinds of villagers. As noted in section 5.1 and 5.2, better-off villagers are often able to derive larger benefits from resources than their poor fellows. In such situations, resource use may aggravate existing intra-community differences and make the poor worse off even though the local population benefits as a whole (e.g. Sikor and Nguyen 2007). Research designs that do not differentiate local people are not able to capture such effects.

The study has not been able to identify clear findings on the profitability of resource use due to the absence of any significant evidence. Virtually all studies simply did not report profitability outcomes, as their primary concern is with sustainability and, to a lesser extent, poverty alleviation. In addition, the four studies characterized as reporting profitability outcomes use fairly simplistic measures or impressionist evidence. For example, Hertog and Wiersum (2000) conclude that NTFP collection was more efficient under controlled access, but do not provide any further empirical evidence or suitable indicators. Another problem encountered in the measurement of profitability outcomes was that, in the case of a few studies, it was hard to distinguish

[7] A next step is to adjust the assessment criteria and develop a complementary validity assessment, something we have not been able to do because of a lack of time and resources.

between income effects (captured under poverty alleviation outcomes) and changes in surplus (i.e. profitability).

Just as it was often difficult to measure outcomes, the classification of studies into different exposure/intervention classes was problematic. Actual access to renewable resources tends to be a lot more nuanced than suggested by the employed distinction between open access and controlled access. For example, official regulations often establish access controls, yet these may not be followed in practice. Vice versa, local users may have developed customary access rules for areas where access is not regulated formally. Similarly, the distinction between private ownership and common property is often a lot more difficult to establish in practice than in theory. For example, individual people may hold use rights to a resource managed in common by a social group. As a result, the review was unable to capture the full range of access and property regimes affecting resource use in multiple ways.

Another, final effect of the lack of shared research designs and uniform reporting is the general lack of concrete findings on the reasons for outcome variation. As noted in Sections 5.1 and 5.2, variation in some outcomes clearly displays the influence of mediating factors. Yet the absence of sufficient data on potential influences makes it impossible to single out any influences of particular relevance, with the exception of elite capture on poverty alleviation. There are clearly a number of factors besides property which influence resource use. These could have been identified in a long list of mediating influences, but the utility of such a list would have been limited considering existing discussions in the literature (e.g., Agrawal 2001).

6. Reviewers' Conclusions

6.1 Implications for policy

Given the caveats outlined above, the findings of this review lend further support to policy that seeks to impose clear boundaries of inclusion/exclusion for the sake of sustainable resource use. This is the key aim of policies such as the devolution of resource rights to local users, registration of customary rights, allocation of ITQs, and designation of community-managed fisheries. Nevertheless, the implementation of boundaries is a complex process, which can result in adverse and unforeseen consequences for both those included and excluded (Saito-Jensen and Jensen, 2010). The transfer of property rights to resource users and efforts to improve the enforcement of statutory property rights can be expected to improve the sustainability of resource use. The property transfers do not necessarily imply privatization, however. All but two of the comparisons with open access included in this review refer to common property situations.

The review findings also indicate the potential contributions of such policy for poverty alleviation. Poor resource users who gain exclusive access to forests or fisheries are likely to benefit – with two important qualifications. First, the poorest will only benefit if there are rules in place to distribute resource benefits among the local population in an equitable manner. The poor will not benefit from access controls when local elites are able to capture a large share of benefits. Second, access controls may allow some local poor to benefit, but they may exclude other poor

groups at the same time. Potential exclusion of poor 'outsiders' is a key problem in policy that devolves resource rights to the local poor.

As for the form of access control, the review findings suggest the benefits of promoting common property regimes in forests and fisheries. Policy that strengthens and enhances common property regimes is more likely to support poverty alleviation efforts than the extension of private ownership. In addition, such policy is less likely to cause detrimental effects on the sustainability of resource use than private ownership.

At the same time, as pointed out above, the limitations of this review also originate from mismatch between the employed validity criterion and common standards in research on property and resource use. This mismatch highlights important lessons for future generation of evidence in support of policy making on property and access controls. Rigorous approaches to literature review need to be sufficiently flexible to be able to adequately explore and assess fields based on diverse methodologies and epistemologies. By doing so, such reviews may become more useful in the generation of evidence from research on property and resource use. The overwhelmingly qualitative research in the field requires review procedures different from those commonly applied in other fields where more structured and quantitative research designs are employed.

6.2 Implications for research

The findings of this review bear implications for both the conduct of reviews of evidence and research on questions of property and resource. As for the former, experience from this review suggests that rigorous review approaches may not be at their greatest strengths when they focus on research characterized by the absence of shared research designs and standardized reporting – this is due to the mismatch mentioned previously, between those features and inclusion criteria determined by comparative designs and validity assessment based on assumptions from highly structured research fields. This becomes very apparent in the results of the validity assessment, which caution against the generalization of the review findings. Researchers may want to employ other methods for meta assessments of case studies, as exemplified by Geist and Lambin (2002) and Agrawal et al. (2008).

Future research on property and resource use may want to develop research designs further and to improve the reporting of relevant observations. There are four obvious possibilities for improvement. First, policy-makers' interest in the profitability of resource use could be met through a larger number of studies investigating the profitability of resource use under different property regimes. Second, studies interested in the poverty effects of property would benefit from differentiating groups of poor more clearly, considering local and non-local poor. Third, analysis of resource use would gain depth by moving away from a reliance on singular indicators towards more comprehensive descriptions of resource systems. Fourth, comparative research would increase its validity by paying a lot more attention to the potential influence of other, 'confounding' factors and to the comparability of different study sites. This would begin with the simple reporting of contextual conditions and concurrent changes in resource users' biophysical and socio-economic environment.

Future research may also want to build in direct comparisons more often. Paired case studies or other studies involving a small number of cases may provide the comparative evidence that is so rare in research on property and resource use. They will provide such evidence if they select appropriate sites and justify the selection of sites explicitly. The studies included in this review provide some very fine examples of suitable research designs. In contrast, the development of large research programs may not be an appropriate reaction to the findings of this review. Although they would be designed to allow large-number comparisons and to distinguish causal relationships from contextual influences, they would encounter vexing issues of comparability and measurement, just as encountered in other applications of standardized research designs and measures across a diversity of dynamic ecological, socio-economic and cultural settings.

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8. Potential Conflicts of Interest and Sources of Support

Thomas Sikor has conducted empirical research on property regimes and the use of RNRs for some 15 years, including research on the devolution of forestland in Vietnam and privatisation of land rights in Albania and Romania. He has also been a leading participant in international debates on property and is a long-time member of the International Association for the Study of the Commons. Yet throughout his engagement with property issues, he has sought to maintain a critical and scholarly approach and not to take sides in the sometimes 'ideological' debates about the desirable forms of property. Denis Hellebrandt and Lee Hooper have no known conflicts of interest.

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10. Appendices

i. Definitions of renewable natural resources

Standard definitions regarding "fisheries" and "forest" adopted by FAO

(1) FISHERY
"Generally, a **fishery is an activity leading to harvesting of fish. It may involve capture of wild fish or raising of fish through aquaculture.** Other definitions*: A unit determined by an authority or other entity that is engaged in raising and/or harvesting fish. Typically, the unit is defined in terms of some or all of the following: people involved, species or type of fish, area of water or seabed, method of fishing, class of boats and purpose of the activities."

(2) FISHERY RESOURCE
Aquatic Resource: Biotic element of the aquatic ecosystem, including genetic resources, organisms or parts thereof, populations, etc. with actual or potential use or value (sensu lato) for humanity. **Fishery resources are those aquatic resources of value to fisheries**.

IN: FAO Fisheries Glossary- online only
<http://www.fao.org/fi/glossary/>

* Source of "Other definitions" in the FAO Fisheries Glossary: Fletcher, W.J., Chesson, J. Fisher, M., Sainsbury K.J., Hundloe, T. Smith A.D.M., and B. Whitworth (2002): National ESD reporting framework for Australian fisheries: The "How To" guide for wild capture fisheries. FRDC Project 2000/145. Canberra, Australia. p. 119-120.

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(3) FOREST
"Land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural or urban land use." (See also explanatory notes).

(4) OTHER WOODED LAND
"Land not classified as Forest, spanning more than 0.5 hectares; with trees higher than 5 meters and a canopy cover of 5-10 percent, or trees able to reach these thresholds in situ; or with a combined cover of shrubs, bushes and trees above 10 percent. It does not include land that is predominantly under agricultural or urban land use."

IN: FAO (2004) Global forest resources assessment update 2005 - Terms and definitions - (Final version). *Forest Resources Assessment Working Paper 83*. p.17.
<http://www.fao.org/docrep/007/ae156e/ae156e00.htm>
<http://www.fao.org/forestry/fra/2005/terms/en/>

Forest definition – FAO FRA “Explanatory notes”:

1. Forest is determined both by the presence of trees and the absence of other predominant land uses. The trees should be able to reach a minimum height of 5 meters in situ. Areas under reforestation that have not yet reached but are expected to reach a canopy cover of 10 percent and a tree height of 5 m are included, as are temporarily unstocked areas, resulting from human intervention or natural causes, which are expected to regenerate.

2. Includes areas with bamboo and palms provided that height and canopy cover criteria are met.

3. Includes forest roads, firebreaks and other small open areas; forest in national parks, nature reserves and other protected areas such as those of specific scientific, historical, cultural or spiritual interest.

4. Includes windbreaks, shelterbelts and corridors of trees with an area of more than 0.5 ha and width of more than 20 m.

5. Includes plantations primarily used for forestry or protection purposes, such as rubber-wood plantations and cork oak stands.

6. Excludes tree stands in agricultural production systems, for example in fruit plantations and agroforestry systems. The term also excludes trees in urban parks and gardens.

ii. List of developing countries

Income groups correspond to 2009 gross national income (GNI) per capita (World Bank Atlas method).
Source: http://data.worldbank.org/about/country-classifications/country-and-lending-groups

Low income	Lower middle income		Upper middle income
Afghanistan	Angola	Sri Lanka	Albania
Bangladesh	Armenia	Sudan	Algeria
Benin	Belize	Swaziland	American Samoa
Burkina Faso	Bhutan	Syrian Arab Rep.	Antigua and Barbuda
Burundi	Bolivia	Thailand	Argentina
Cambodia	Cameroon	Timor-Leste	Azerbaijan
Central African Republic	Cape Verde	Tonga	Belarus
Chad	China	Tunisia	Bosnia and Herzegovina
Comoros	Congo, Rep.	Turkmenistan	Botswana
Congo, Dem. Rep.	Côte d'Ivoire	Tuvalu	Brazil
Eritrea	Djibouti	Ukraine	Bulgaria
Ethiopia	Ecuador	Uzbekistan	Chile
Gambia, The	Egypt, Arab Rep.	Vanuatu	Colombia
Ghana	El Salvador	Vietnam	Costa Rica
		West Bank and	
Guinea	Georgia	Gaza	Cuba
Guinea-Bissau	Guatemala	Yemen, Rep.	Dominica
Haiti	Guyana		Dominican Republic
Kenya	Honduras		Fiji
Korea, Dem. Rep.	India		Gabon
Kyrgyz Republic	Indonesia		Grenada
Lao PDR	Iraq		Iran, Islamic Rep.
Liberia	Jordan		Jamaica
Madagascar	Kiribati		Kazakhstan
Malawi	Kosovo		Lebanon
Mali	Lesotho		Libya
Mauritania	Maldives		Lithuania
Mozambique	Marshall Islands		Macedonia, FYR
Myanmar	Micronesia, Fed. Sts.		Malaysia
Nepal	Moldova		Mauritius
Niger	Mongolia		Mayotte
Rwanda	Morocco		Mexico
Sierra Leone	Nicaragua		Montenegro
Solomon Islands	Nigeria		Namibia
Somalia	Pakistan		Palau
Tajikistan	Papua New Guinea		Panama
Tanzania	Paraguay		Peru
Togo	Philippines		Romania
Uganda	Samoa		Russian Federation
Zambia	São Tomé and Principe		Serbia
Zimbabwe	Senegal		Seychelles
			South Africa
			St. Kitts and Nevis
			St. Lucia
			St. Vincent and Grenadines
			Suriname
			Turkey
			Uruguay
			Venezuela, RB

iii. Draft data extraction and validity assessment form

Study details - Author(s): Year: Journal ref:

Reviewer:

1	**Study and subject information**	
1a	Research question as expressed in study	
1b	Clarity of question	Done Not done
1c	Type of RNR assessed	Forests fisheries
1d	Country of study plus level of development and geographic region	Country: Low income Middle income Africa Central & East Asia South Asia Latin America
1e	Design – temporal	Concurrent Before-after
1f	Design –methodology	Quantitative Qualitative
1g	Funder	
1h	Researcher bias	Done Partial Not done

	Subjects	**Open access**	**Controlled access (Common or private ownership)**
1i	Number of participants		
1j	Ethnicity		
1k	Gender mix		
1l	Level of poverty		
1 m	Degree of reliance on RNR in question		
1n	Other information on participants:		

2	**Access structure**	**Open access**	**Controlled access (Common or private ownership)**
2a	Description of conditions (describe conditions of access or ownership)	Withdrawal rights Management rights Exclusion rights Alienation rights	Withdrawal rights Management rights Exclusion rights Alienation rights
2b	Similarity of the geographical areas*		
2c	Ecosystem information		
2d	Context		
2e	Migration info		
2f	Market integration		
2g	Infrastructure access		
2h	Resource abundance		
2i	Effectiveness of RNR use regulation		
2j	Scale of shared use (no. of people/villages)		
2k	Ecosystem services supported		
2l	Ecosystem services not supported		
2m	Duration of rights (infinite/finite)		
2n	Alienability of right		
2o	Year(s) of study		
2p	Time since start of regimen (years)		
2q	RNR Description	Done Partial	Not done
2r	Similarity of RNRs	Done Partial	Not done
2s	Temporality	Done	Not done
2t	Confounding	Done Partial	Not done

For 3 provide quantitative data as feasible, including measures of mean and variance or median and CI range, as well as units and descriptions of tools for assessment. For complex and qualitative data use highlighter pen in the original document and state page numbers below.

3	**Outcomes**	**Open access**	**Controlled access (Common or private ownership)**
3a	Sustainable use of RNRs (ability to extend use of RNR into the future)		
3b	Pro-poorness of use (ability of local poor to benefit from use of RNRs, including description of which poor)		
3c	Profitability of use (define types of measures here)		
3d	Measures taken to verify the extent and type of controlled and open access		
3f	Description of conditions	Done Partial	Not done
3g	Outcome ascertainment	Done Partial	Not done

4	**Additional information and summary**	
4a	Additional validity problems:	
4b	Any other validity problems?	Done Not done
4c	Further information	
4d	Summary of validity	Risk of bias: Low Moderate High

iv. Search strategies used for the ISI Web of Knowledge (WoK).

Groups follow the World Bank classification of countries into income categories. Strategies shown in sub-groups organised in response to the WoK search engine restriction on the number of search terms per line**.**

Low income

Topic=(Afghan* OR Bangladesh* OR Benin OR "Burkina Faso" OR Burundi* OR Cambodia* OR "Central African Republic" OR Chad* OR Comoro* OR Congo* OR Eritrea* OR Ethiopia* OR Gambia* OR Ghana* OR Guinea* OR Haiti* OR Kenya* OR Korea* OR Kyrgyz* OR Lao* OR Liberia* OR Madagascar OR Malgaxe OR Malawi* OR Mali* OR Mauritania* OR Mozambique* OR Myanmar OR Burma OR Nepal* OR Niger*) AND Topic=(forest* OR fisher* OR fishing OR wood* OR timber*) AND Topic=(private OR common OR shared) AND Topic=(property OR rights OR access OR quota* OR tenure OR title OR deed OR governance OR market OR ownership)

Topic=(Rwanda* OR "Sierra Leone" "Solomon Islands" OR Somali* OR Tajikistan* OR Tanzania* OR Togo* OR Uganda* OR Zambia* OR Zimbabwe*) AND Topic=(forest* OR fisher* OR fishing OR wood* OR timber*) AND Topic=(private OR common OR shared) AND Topic=(property OR rights OR access OR quota* OR tenure OR title OR deed OR governance OR market OR ownership)

Lower middle income

Topic=(Angola* OR Armenia* OR Belize* OR Bhutan* OR Bolivia* OR Cameroon* OR "Cape OR Verde" OR Chin* OR "d'Ivoire" OR "Ivory Coast" OR Djibouti* OR Ecuador OR Ecuatorian* OR Egypt* OR "El OR Salvador" OR Georgia* OR Guatemala* OR Guyan* OR Hondura* OR India* OR Indonesia* OR Iraq* OR Jordan* OR Kiribati* OR Kosov* OR Lesotho OR Maldives OR "Marshall Islands" OR Micronesia* OR Moldova* OR Mongolia*) AND Topic=(forest* OR fisher* OR fishing OR wood* OR timber*) AND Topic=(private OR common OR shared) AND Topic=(property OR rights OR access OR quota* OR tenure OR title OR deed OR governance OR market OR ownership)

Topic=(Morocc* OR Nicaragua* OR Nigeria* OR Pakistan* OR "Papua New Guinea" OR Paraguay* OR Philippin* OR Samoa* OR "Sao Tome and Principe" OR Senegal OR "Sri Lanka" OR Sudan* OR Swaziland OR Syrian* OR Thailand* OR "Timor-Leste" OR Tonga* OR Tunisia* OR Turkmenistan* OR Tuvalu OR Ukrain* OR Uzbek* OR Vanuatu OR Vietnam* OR "West Bank" OR Gaza OR Palestin* OR Yemen*) AND Topic=(forest* OR fisher* OR fishing OR wood* OR timber*) AND Topic=(private OR common OR shared) AND Topic=(property OR rights OR access OR quota* OR tenure OR title OR deed OR governance OR market OR ownership)

Upper middle income

Topic=(Albania* OR Algeria* OR "Antigua and Barbuda" OR Argentina* OR Azerbaijan* OR Belarus* OR Bosnia* OR Botswana* OR Brazil* OR Bulgaria* OR Chile* OR Colombia* OR "Costa Rica*" OR Cuba* OR Dominica* OR Fiji* OR Gabon* OR Grenad* OR Iran* OR Jamaica* OR Kazak* OR Leban* OR Libya* OR Lithuania* OR Macedonia* OR Malaysia* OR Mauritius OR Mayotte) AND Topic=(forest* OR fisher* OR fishing OR wood* OR timber*) AND Topic=(private OR common OR shared) AND Topic=(property OR rights OR access OR quota* OR tenure OR title OR deed OR governance OR market OR ownership)

Topic=(Mexic* OR Montenegr* OR Namibia* OR Palau* OR Panama* OR Peru* OR Romania* OR Russia* OR Serbia* OR Seychell* OR "South Africa*" OR "St. Kitts and Nevis" OR "St. Lucia" OR "St. Vincent and Grenadines" OR Suriname* OR Turk* OR Uruguay* OR Venezuela*) AND Topic=(forest* OR fisher* OR fishing OR wood* OR timber*) AND Topic=(private OR common OR shared) AND Topic=(property OR rights OR access OR quota* OR tenure OR title OR deed OR governance OR market OR ownership)

v. Search strategy and results from the Scopus electronic database.

Column # identifies the individual syntaxes corresponding to the World Bank classification of countries into income categories: 1 - low income, 2 - lower middle income and 3 - upper middle income.

#	Search strategy	No. of hits
1	TITLE-ABS-KEY(ANGOLA* OR ARMENIA* OR BELIZ* OR BHUTAN* OR BOLIVIA* OR CAMEROON* OR "CAPE VERDE*" OR CHINA OR CHINESE OR "D'IVOIRE" OR "IVORY COAST" OR DJIBOUTI* OR ECUADOR* OR ECUATORIAN* OR EGYPT* OR "EL SALVADOR" OR GEORGIA* OR GUATEMALA* OR GUYAN* OR HONDURA* OR INDIA* OR INDONESIA* OR IRAQ* OR JORDAN* OR KIRIBATI* OR KOSOV* OR LESOTHO OR MALDIVES OR "MARSHALL ISLAND*" OR MICRONESIA* OR MOLDOVA* OR MONGOLIA* OR MOROCC* OR NICARAGUA* OR NIGERIA* OR PAKISTAN* OR PAPUA* OR PNG OR PARAGUAY* OR PHILIPPIN* OR SAMOA* OR "SAO TOME*" OR SENEGAL* OR "SRI LANKA*" OR SUDAN* OR SWAZI* OR SYRIA* OR THAI* OR "TIMOR-LESTE" OR TONGA* OR TUNISIA* OR TURKMENISTAN* OR TUVALU OR UKRAIN* OR UZBEK* OR VANUATU OR VIETNAM* OR GAZA* OR PALESTIN* OR YEMEN*) AND (FOREST* OR FISHER* OR FISHING OR WOOD* OR TIMBER*) AND (PRIVATE OR COMMON) AND (RIGHTS OR ACCESS OR QUOTA* OR TENURE OR DEED OR GOVERNANCE OR MARKET OR OWNERSHIP)	**7490**
	AS IN 1, WITH [PROPERTY] AND [SHARED] ADDED TO THE INTERVENTION COMPONENT	**10336**
	AS IN 1: > WITHOUT [PROPERTY] AND [SHARED] IN THE INTERVENTION COMPONENT > ADDING [AND NOT (DRUG OR THERAP* OR MEDIC* OR DISEASE OR IMMUNO* OR CANCER* OR TUMOR OR SURGE*)]	**4703**
2	TITLE-ABS-KEY(AFGHAN* OR BANGLADESH* OR BENIN OR "BURKINA FASO" OR BURUNDI* OR CAMBODIA* OR "CENTRAL AFRICAN REPUBLIC" OR CHAD* OR COMORO* OR CONGO* OR ERITREA* OR ETHIOPIA* OR GAMBIA* OR GHANA* OR GUINEA* OR HAITI* OR KENYA* OR KOREA* OR KYRGYZ* OR LAO* OR LIBERIA* OR MADAGASCAR OR MALAGASY OR MALAWI* OR MALI* OR MAURITANIA* OR MOZAMBIQUE* OR MYANMAR OR BURMA OR NEPAL* OR NIGER* OR RWANDA* OR "SIERRA LEONE" OR "SOLOMON ISLANDS" OR SOMALI* OR TAJIKISTAN* OR TANZANIA* OR TOGO* OR UGANDA* OR ZAMBIA* OR ZIMBABWE*) AND (FOREST* OR FISHER* OR FISHING OR WOOD* OR TIMBER*) AND (PRIVATE OR COMMON) AND (RIGHTS OR ACCESS OR QUOTA* OR TENURE OR TITLE OR DEED OR GOVERNANCE OR MARKET OR OWNERSHIP)	**5950**
3	TITLE-ABS-KEY(ALBANIA* OR ALGERIA* OR "ANTIGUA AND BARBUDA" OR ARGENTINA* OR AZERBAIJAN* OR BELARUS* OR BOSNIA* OR BOTSWANA* OR BRAZIL* OR BULGARIA* OR CHILE* OR COLOMBIA* OR "COSTA RICA*" OR CUBA* OR DOMINICA* OR FIJI* OR GABON* OR GRENAD* OR IRAN* OR JAMAICA* OR KAZAK* OR LEBAN* OR LIBYA* OR LITHUANIA* OR MACEDONIA* OR MALAYSIA* OR MAURITIUS OR MAYOTTE OR MEXIC* OR MONTENEGR* OR NAMIBIA* OR PALAU* OR PANAMA* OR PERU* OR ROMANIA* OR RUSSIA* OR SERBIA* OR SEYCHELL* OR "SOUTH AFRICA*" OR "ST. KITTS AND NEVIS" OR "ST. LUCIA" OR "ST. VINCENT AND GRENADINES" OR SURINAME* OR TURK* OR URUGUAY* OR VENEZUELA*) AND (FOREST* OR FISHER* OR FISHING OR WOOD* OR TIMBER*) AND (PRIVATE OR COMMON) AND (RIGHTS OR ACCESS OR QUOTA* OR TENURE OR TITLE OR DEED OR GOVERNANCE OR MARKET OR OWNERSHIP)	**6273**

vi. List of excluded studies, in the full-text assessment with reasons for exclusion
(*4 pages*)

First author	*Year*	*RNR type*	*Country*	*Reason for exclusion*
Acharya	2005	forests	Nepal	no outcomes
Agrawal	1996	forest	India	no comparative design; no primary research
Alix-Garcia[1]	2005	forest	Mexico	comparative design unclear, likely to be not relevant
Armitage[1]	2002	forest	Indonesia	comparative design unclear; outcomes unclear or absent
Arnasson[2]	2002	fisheries	Chile and Namibia	no comparative design; no primary research
Baker	1998	forest	India	no outcomes
Bojanic	2002	forest	Bolivia	comparative design unclear; no primary research
Bray	2004	forest	Mexico	no comparative design; no primary research
Brockett	2002	forest	Costa Rica	primary research unclear or absent
Calvo-Alvarado	2009	forest	Costa Rica	comparative design unclear; outcomes unclear or absent
Cao	2009	forest	China	comparative design not relevant – private ownership only
Castilla	2010	fisheries	Chile	no primary research
Cereceda	1991	fisheries	Chile	no primary research
Chakraborty	2001	forest	Nepal	comparative design not relevant – common ownership only
Cinner	2005	fisheries	Papua New Guinea and Indonesia	no outcomes
Clement[1]	2008	forest	Vietnam	no comparative design
Colin	2006	forest	Cote d'Ivoire	comparative design unclear; no outcomes
Costello[2]	2008	fisheries	Not reported	does not focus on developing countries
Crook	2002	fisheries	South Africa	comparative design unclear; methodology unclear
da Silva	2004	fisheries	Brazil	no comparative design, outcomes unclear or absent

First author	*Year*	*RNR type*	*Country*	*Reason for exclusion*
Dalle[1]	2006	forest	Mexico	comparative design not relevant – common ownership only
Damodaran	2006	fisheries	India	comparative design not relevant – controlled access only
Doolittle[1]	2001	forest	Malaysia	comparative design unclear or absent
Ernst	2010	fisheries	Chile	comparative design not relevant – controlled access only
Fernandez	2006	forest	Indonesia	no primary research
Fernandez-Gimenez[1]	2002	forest (pasture)	Mongolia	comparative design unclear or absent
Freudenberg	1997	forest	Gambia, Guinea and Sierra Leone	comparative design not relevant – common ownership only
Frost	2007	forest	Zimbabwe	comparative design not relevant – common ownership only
Gebremedhin	2003	forest	Ethiopia	comparative design not relevant – controlled access only
Gelcich	2006	fisheries	Chile	comparative design not relevant – controlled access only
Gill	2009	forest	Malaysia	no comparative design
Goebbel	1999	forest	Zimbabwe	comparative design not relevant – controlled access only
Guthiga[1]	2008	forest	Kenya	outcomes unclear or absent
Haenn	2006	forest	Mexico	no comparative design
Haller	2009	fisheries and forest	Zambia	no primary research
Hayes	2007	forest	Honduras and Nicaragua	comparative design not relevant – controlled access only
Holder	2004	forest	Guatemala	comparative design not relevant – controlled access only
Husain	2004	fisheries	India	no comparative design
Hutton	2001	fisheries	South Africa	comparative design not relevant – controlled access only
Ibarra	2000	fisheries	Chile, Mexico and Peru	comparative design unclear, outcomes unclear or absent
Iversen	2006	forest	Nepal	comparative design not relevant – common ownership only
Jagger	2008	forest	Zimbabwe	comparative design not relevant – common ownership only

First author	*Year*	*RNR type*	*Country*	*Reason for exclusion*
Karki	1991	forest	Nepal	comparative design unclear; methodology unclear or absent
Klooster[1]	1999	forest	Mexico	comparative design unclear or absent
Klooster[1]	2000	forest	Mexico	comparative design unclear or absent
Kumar	2002	forest	India	comparative design not relevant – controlled access only
Lazdinis	2009	forest	Lithuania	no comparative design; no primary research
Lobe[1]	2004	fisheries	India	no primary research – secondary sources most study sites
Mantjoro	1996	fisheries	Indonesia	comparative design unclear or absent; methodology unclear
Metcalfe[1]	2008	forest	Zambia	comparative design unclear, likely to be absent
Mhlanga	2009	forest	Zimbabwe	no comparative design
Mosse	1997	forest	India	subject not forest or fisheries
Mvula	2009	fisheries	Malawi	no comparative design; no primary research
Nagendra[3]	2009	forest	India	comparative design unclear
Neiland	2000	fisheries	Nigeria	comparative design not relevant – controlled access only
Njaya	2009	fisheries	Malawi	no primary research
Oke	2007	forest	Nigeria	not forest – agroforestry only
Pandit	2003	forest	Nepal	comparative design not relevant – controlled access only
Pandit	2004	forest	Nepal	comparative design not relevant – controlled access only
Paudel	2002	forest	Nepal	no outcomes
Perez-Cirera	2006	forest	Mexico	no comparative design; no primary research
Persha	2009	forest	Tanzania	comparative design not relevant – controlled access only
Rangan[1]	1997	forest	India	comparative design unclear; outcomes unclear or absent
Ratner[1]	2006	fisheries	Cambodia	mostly based on literature review and secondary data

First author	*Year*	*RNR type*	*Country*	*Reason for exclusion*
Sarch	2001	fisheries	Nigeria	no comparative design
Saunders	2008	forest	Tanzania	comparative design not relevant – controlled access only
Sakurai[3]	2004	forest	Nepal	comparative design not relevant
Shams	2000	forest and fisheries	Cambodia	no comparative design
Stanley	1991	forest	Honduras	comparative design unclear or absent; methodology unclear
Stave	2001	forest	Kenya	comparative design not relevant – common ownership only
Thorburn[1]	2000	fisheries	Indonesia	comparative design unclear; outcomes unclear
Toufique	2008	fisheries	Bangladesh	comparative design not relevant – private ownership only
Tubtim	2005	fisheries	Laos	comparative design not relevant – controlled access only
Walker	2002	fisheries	Ghana	comparative design unclear; outcomes unclear or absent
Young[1]	2001	fisheries	Mexico	comparative design not relevant – common ownership only
Ziker	2003	forest	Russia	comparative design not relevant – controlled access only
Zulu	2010	forest	Malawi	no comparative design

[1] Studies identified after methodological protocol approval. Exclusion based on assessment by two independent reviewers.
[2] Studies identified during the draft of the methodological protocol. Exclusion based on assessment by two independent reviewers.
[3] Exclusion after submission of draft report, based on assessment by two reviewers in conjunction.

All remaining studies identified after methodological protocol approval, with exclusion based on assessment by one reviewer.

vii. Summary of validity.

(3 pages) See "Data Extraction Form" in the appendix for reference to the validity criteria (columns).

Study	Clarity of question	Researcher bias	RNR Description	Similarity of RNRs	Temporality	Confounding	Description of conditions	Outcome ascertainment	Other validity problems	Summary of risk of bias
Castello et al., 2009	done	done	done	done	done	partial	done	partial	done	moderate
Cinner et al. 2006	done	done	partial	done	done	partial	partial	partial	done	high
Cinner et al. 2007	done	done	partial	partial	not done	partial	partial	partial	done	high
Cudney-Bueno and Basurto, 2009	not done	partial	partial	done	done	partial	partial	done	not done	high
den Hertog and Wiersum, 2000	not done	partial	partial	partial	not done	partial	partial	partial	done	high
Ducourtieux et al., 2005	done	done	partial	done	done	partial	done	done	done	moderate
Edmonds, 2002	done	done	partial	partial	not done	partial	partial	done	done	high
Fernandez and Castilla, 1997	done	done	partial	unclear	done	partial	partial	done	done	high
Futemma et al., 2002	done	done	partial	partial	not done	partial	partial	partial	not done	high
Gautam and Shikavoti, 2005	done	done	done	partial	done	partial	done	done	done	high

Study	Clarity of question	Researcher bias	RNR Description	Similarity of RNRs	Temporality	Confounding	Description of conditions	Outcome ascertainment	Other validity problems	Summary of risk of bias
Gibson et al., 2002	done	done	partial	partial	not done	partial	partial	partial	done	high
Haller and Merten, 2008	done	done	partial	partial	done	partial	done	done	done	high
Lele et al., 1998	done	done	partial	partial	done	partial	partial	done	done	high
McClanaham et al., 2010	done	partial	not done	unclear	unclear	partial	not done	done	done	high
McClanaham, 2010	done	done	partial	partial	done	partial	partial	done	not done	high
McClanaham et al., 1997	done	done	partial	partial	done	partial	partial	done	not done	high
Medina et al., 2009	done	done	partial	done	done	partial	done	done	done	moderate
Muller and Munroe., 2008	done	done	partial	partial	done	partial	partial	done	done	high
Nagendra, 2007	done	done	not done	unclear	done	done	partial	done	not done	high
Nagendra et al, 2008	done	done	partial	partial	done	partial	partial	done	done	high
Ortega-Huerta and Kral, 2007	done	done	partial	partial	not done	partial	partial	partial	not done	high
Peluso, 1992	done	partial	partial	done	done	partial	done	done	not done	high

Study	Clarity of question	Researcher bias	RNR Description	Similarity of RNRs	Temporality	Confounding	Description of conditions	Outcome ascertainment	Other validity problems	Summary of risk of bias
Robbins, 1998	done	done	partial	done	done	done	done	done	done	moderate
Satria et al, 2006	done	partial	partial	partial	done	not done	done	partial	not done	high
Saunders et al., 2010	done	done	partial	done	done	partial	done	done	done	moderate
Sheridan, 2004	done	done	partial	done	done	done	done	done	done	moderate
Southworth and Tucker, 2001	done	done	partial	partial	done	done	not done	done	done	high
Sultana and Thompson, 2007	done	done	done	partial	done	done	done	done	done	high
Thomas, 1996	done	done	partial	done	done	done	done	done	done	moderate
Tucker, 1999	done	done	partial	partial	done	done	done	done	done	high
Tucker et al., 2007	done	done	partial	partial	done	partial	done	done	done	high
Turyahabwe et al., 2008	done	done	partial	partial	unclear	not done	partial	done	done	high
Yang et al., 2009	done	done	partial	partial	done	partial	done	done	done	high

viii. Comparison of outcomes.

Key: *Outcome categories* - SUST=sustainability, PP=pro-poorness, PROF=profitability. *Outcome comparison* - superior outcomes showed by controlled access (control), common (comm) or private (priv) ownership; no diff=study reported no differences between regimes; mix=mixed outcomes under each regime type.

Study	Risk of bias	Open vs. Controlled access			Private vs. Common ownership			RNR type
		SUST	PP	PROF	SUST	PP	PROF	
Castello et al., 2009	moderate	control	control					fisheries
Cinner et al. 2006	high	control						fisheries
Cinner et al. 2007	high		mix					fisheries
Cudney-Bueno and Basurto, 2009	high	control						fisheries
den Hertog and Wiersum, 2000	high	control	control	control				forests
Ducourtieux et al., 2005	moderate				comm	no diff		forests
Edmonds, 2002	high	control						forests
Fernandez and Castilla, 1997	high	no diff						fisheries
Futemma et al., 2002	high		open					forests
Gautam and Shikavoti, 2005	high	control						forests
Gibson et al., 2002	high				comm			forests
Haller and Merten, 2008	high	control	control					fisheries
Lele et al., 1998	high	no diff						forests
McClanaham et al., 2010	high	control						fisheries
McClanaham, 2010	high	control		control				fisheries
McClanaham et al., 1997	high	control						fisheries
Medina et al., 2009	moderate				comm	no diff	priv	forests

Study	Risk of bias	Open vs. Controlled access			Private vs. Common ownership			RNR type
		SUST	PP	PROF	SUST	PP	PROF	
Muller and Munroe., 2008	high				comm			forests
Nagendra, 2007	high				priv			forests
Nagendra et al, 2008	high	control						forests
Ortega-Huerta and Kral, 2007	high				comm			forests
Peluso, 1992	high				comm	comm	comm	forests
Robbins, 1998	moderate				priv			forests
Satria et al, 2006	high				comm	comm		fisheries
Saunders et al., 2010	moderate	control						forests
Sheridan, 2004	moderate	control						forests
Southworth and Tucker, 2001	high				no diff			forests
Sultana and Thompson, 2007	high	control	mix					fisheries
Thomas, 1996	moderate		control					fisheries
Tucker, 1999	high				priv			forests
Tucker et al., 2007	high				mix			forests
Turyahabwe et al., 2008	high	control						forests
Yang et al., 2009	high					priv		forests

ix. Summary of data extraction - characteristics of included studies.

Table of characteristics of included studies

Study & methodology	Population & Setting	Access conditions	Reported results
Castello et al., 2009 additional evidence: Vianna et al., 2007 Vianna et al., 2004 Crampton et al., 2004 **Methods:** Quantitative and Qualitative **Design:** Before-after **Validity**: moderate risk ***Study question*** The study "assessed the extent to which the participation of the fishers improved the effectiveness of the [controlled access] management scheme."	**RNR:** fisheries **No**: 100 (fishers only, 2006) **Ethnicity**: non-indigenous people **Gender mix**: 71 male, 29 female **Poverty**: NR **Reliance on RNR**: High. Fishing is most important economic activity. **Country**: Brazil **Region**: Latin America **Income category**: UM	**Open access:** de facto conditions, despite regulations limiting size of fish and determining fishing season closure. Open access ceased in 1996 with creation of protected area. **Controlled access:** Extractive reserve ("Mamirauá") created in 1996, participatory management started in 1998 # **Withdrawal rights**: Two zones: one with no extraction allowed ("preservation zone") and another under regulated use ("sustainable use zone") # **Management rights**: Volunteer residents monitor and enforce rules.Leaders of fishers association determine an individual quota system – non-compliance results in loss of quota, which is transferred to compliant fishers. # **Exclusion rights**: Access strictly limited to residents in villages within the reserve area. # **Alienation rights:** individual quotas can be sold or transferred to relatives.	**SUSTAINABLE USE:** Increase in Pirarucu abundance after implementation of the participatory system in the reserve --- *Year: number of fish (Pirarucu: Arapaima spp.)* --- 1999 (3 years into controlled access): 2,507* 2006 (10 years into controlled access): 20,648* --- *full census: individual fish counted by researchers and fishers. *Most common length of fish caught* 1998: 110-120 cm 2001: 160-170cm **PRO-POORNESS:** Residents substituted outsiders in the trade of fish caught in the reserve area Proportion of commercial landings in the nearest urban centre --- *Type of boats: 1996 // 2002* --- Outsiders boats: 65% // 25% Resident boats: 20% // 45% --- Increase in income and purchase power. --- Mean annual family income and purchase power. *Indicators: 1994-95 // 1998-99 // 2000* --- no of families in the reserve area: 16 // 20 // 19 Mean annual family income (R$): 1,939 // 2,721 // 4,142 Cost of "cesta básica" (R$)**: 43.68 // 44.14 // 46.98 Purchase power***: 44 // 61 // 88 --- **Cesta básica = standard unit consisting of 31 items sufficient for the monthly consumption of a four member family. R$=Reais. *** no. of "cestas básicas" per family per year.

Study & methodology	Population & Setting	Access conditions	Reported results
Cinner et al. 2006 **Methods:** Quantitative and Qualitative **Design:** Concurrent ***Study question*** "(1) to examine whether and how periodic closures influence reef resources; (2) to examine how these systems may differ from conventional fisheries management and conservation models; and (3) to identify the social, economic, and cultural mechanisms that may influence the ability of communities to successfully manage their resources through periodic closures."	**RNR:** fisheries **No**: 730 people (Indonesia), 330 people (PNG) **Ethnicity**: nr **Gender mix**: nr **Poverty**: nr **Reliance on RNR**: Moderate to low. Fishing was not primary activity - 25% (Indonesia) or fewer than 10% (PNG) hh reported fishing as primary activity. **Country**: Indonesia and Papua New Guinea (PNG) **Region**: East Asia **Income category**: LM	**Open access** No limitations on access outside closure areas for hh belonging to the community. **Controlled access** Periodic reef closures based on customary rules. # **Withdrawal rights:** nr. # **Management rights:** Community leaders decide on closure, based on tradition ("taboo") . "Warnings" and fines for violation of closure in the Indonesian site, not reported for PNG. # **Exclusion rights:** exclusive access for residents in adjacent areas (PNG), not reported for Indonesia. # **Alienation rights:** nr	**SUSTAINABLE USE** <u>in controlled conditions:</u> # biomass and the average lengths of targeted fishes were greater (Biomass 25% - PNG, 37% - Indonesia) # mean trophic level greater in PNG, no difference in Indonesia. # giant clam density greater (PNG) # coral recruitment lower (PNG) # coral recent damage lower (PNG). --- Comparison inside and outside periodic closure areas --- Indicator: PNG In // Out // p value* | Indonesia In // Out // p value --- Target fish average size (cm): 11.1 // 8.9 // 0.001 | 10.3 // 8.9 // 0.02 Average fish trophic level (by weight): 2.7 // 2.5 // 0.001 | NS** Coral recruits (density per m2): 4.7 // 7.6 // 0.007 | NS Target fish biomass (kg/ha): 377.6 // 301.1 // 0.038 | 139.1 // 101.3 // 0.03 Discarded fishing gears (density/ha)***: NS | 2.9 // 79.8 // <0.05 Giant clams (density/ha)***: 410 // 0 // 0.01 | NS Damaged coral (% of live coral cover x 10-3)***: 0 // 1.1 // 0.01 | NS --- *ANOVA; ** NS=not significant; *** ANOVA assumptions not met, Mann-Whitney test applied instead

Study & methodology	Population & Setting	Access conditions	Reported results
Cinner et al. 2007 **Methods:** Quantitative and Qualitative **Design:** Concurrent ***Study question*** The study aimed to assess whether "communities with customary fisheries management have different socioeconomic characteristics (modernization, dependence on marine resources, distance to market, and population size) than communities that do not implement customary management[.]"	**RNR:** fisheries **No**: 506 people **Ethnicity**: nr **Gender mix**: nr **Poverty**: nr **Reliance on RNR**: Moderate to low. Fishing was not primary activity - 25% (Indonesia) or fewer than 10% (PNG) hh reported fishing as primary activity. **Country**: Papua New Guinea (PNG) **Region**: East Asia **Income category**: LM	**Open access** details not reported. **Controlled access** Periodic reef closures based on customary rules. # **Withdrawal rights** Complete ban on extraction for limited period, except one village (out of five study sites with controlled access) in which the ban applied only to specific gear (spear guns and net fishing). # **Management rights** nr # **Exclusion rights** nr # **Alienation rights** nr	**PRO-POORNESS:** Higher variability in the "level of modernization"* in open access conditions suggests "that wealth distribution in communities without closures may be more unequal." "Communities with customary fishing-ground closures had a significantly lower mean modernization score (–1.2, SE 0.2) than communities without closures (–0.9, SE 0.1) ($p > 0.001$)."** *Index based on " the presence or absence or type of seven of these items (vehicle, television, gas or electric stove, radio, and the type of walls, roof, and floor) for each household. Key informants in the pilot study also identified education and involvement in salaried employment [as variable to be added to the index]". **SE=standard error of mean; p value for ANOVA

Study & methodology	Population & Setting	Access conditions	Reported results
Cudney-Bueno and Basurto, 2009 **Methods:** Quantitative and Qualitative **Design:** Before-after ***Study question*** "[Common-pool] resources need to be managed by the State or privatized to avoid overexploitation. Under this paradigm, the emergence and maintenance of effective community-based efforts that include costly and risky decisions as the establishment of marine reserves would not occur, particularly in recently organized fisheries. In this study, we question these assumptions and show that the realities of commons dilemmas can be complex and scale dependent."	**RNR:** fisheries **No**: 18 people (fishers only) **Ethnicity**: nr **Gender mix**: nr **Poverty**: nr **Reliance on RNR**: Moderate to low. Fishing was not primary activity - 25% (Indonesia) or fewer than 10% (PNG) hh reported fishing as primary activity. **Country**: Mexico **Region**: Latin America **Income category**: UM	**Open access** not reported **Controlled access** Marine reserves implemented in two coastal areas based on fishers cooperative # **Withdrawal rights** Snail fishing banned in June and July; fishing banned within reserves. # **Management rights** Members participated in administrative tasks and monitoring. Mandatory financial contribution to the cooperative. Occasional informal support from government in enforcement. # **Exclusion rights** Cooperative membership required for extraction in the reserve (not recognised outside the cooperative itself). # **Alienation rights** not reported	**SUSTAINABLE USE**: <u>Increase in density and weight of target molluscs after reserve implementation</u> # Higher density of target molluscs: "with relative densities of up to 160 individuals per 100 square metres that exceed any others reported for the Gulf of California[.]" After 2 year of reserve implementation densities of juvenile rock scallop increased "40.7% within coastal reserves and by 20.6% in fished areas." # Increase in average mass of molluscs: "Data from divers' catches of rock scallop showed an increase in average mass of 19.9% ($p<0.0001$*) in the two years since reserve establishment. Black murex increased by 74.74% in reserves ($p<0.001$) and by 35% in fishing areas ($p<0.001$)." *ANOVA

Study & methodology	Population & Setting	Access conditions	Reported results
den Hertog and Wiersum, 2000 **Methods:** Quantitative and Qualitative (only qualitative reported) **Design:** Concurrent ***Study question*** "[What are] the effects of different types of access to land and [what are the] social networks concerned with the collection and trade of timur in Nepal?" (p. 136)	**RNR:** forests **No**: 2100 people **Ethnicity**: nr **Gender mix**: nr **Poverty**: nr **Reliance on RNR**: High. "Approximately 70% of the total value of the NTFPs collected is attributed to timur" - NTFPs make up "40% of the average gross income" of households. **Country**: Nepal **Region**: South Asia **Income category**: Low	**Open access** Government forests ("sarkari ban") # **Withdrawal rights:** not specified. # **Management rights**: Forest Department issues licenses to traders (formally aimed at collectors). License and payment of "royalties" required prior to collection. # **Exclusion rights**: no exclusion at collectors level (except for license for traders) # **Alienation rights**: not reported **Controlled access** (1) <u>De facto common property - "hamro ban"</u> # **Withdrawal rights:** restriction on techniques and period of collection. # **Management rights**: Forest users group (FUG) decides on right allocation. Royalty payment may be required. Mutual tolerance between government and FUG. # **Exclusion rights**: access limited to FUG members. Bordering plots may claim access up to 18m inside the hamro ban. # **Alienation rights**: not reported (2) <u>De jure common property - community forests</u>. Rights same as for "hamro ban", but the village committee is "officially sanctioned" . Access limited to one member per household. **Private land** # **Exclusion rights**: allows non-owners to access and extract Timur after harvest. # **Management rights**: "biologically oriented" practices (e.g..: use of manure as fertilizer, pruning, regeneration)	**SUSTAINABLE USE**: <u>Management under controlled conditions was more efficient</u> "The control of collection techniques ensured a sustainable future supply[.]" - e.g.: management techniques result in "improved growth and stimulation of fruit production" which might result in extended use if it is considered that "farmers mention that the trees are mainly disseminated by birds, who like the fruits." **PRO-POORNESS:** <u>Controlled conditions secured land access to the poorest and overall equitable distribution of benefits.</u> "rules on timur harvesting in community and indigenous-managed forests allow equity in the distribution of resource benefits and efficiency in investment of labor as well as in maintenance of production." Post-harvest access in private land: "beneficial for marginal and landless farmers of a community." **PROFITABILITY** <u>Timur collection was more profitable under controlled conditions</u> "as a result of the harvesting rules, collection of timur in community forests is more efficient and yields are higher."

Study & methodology	Population & Setting	Access conditions	Reported results
Ducourtieux et al., 2005 **Methods:** Qualitative **Design:** Concurrent **Validity**: moderate risk ***Study question*** "we study whether [the land reform in Laos] is effective in addressing the issues of poverty alleviation and environment conservation. This is done, first, by analysing the aims and principles of the reform, and then by assessing its consequences through an examination of its implemention in different regions of Laos."	**RNR:** forests **No**: 800 people (farmers only) **Ethnicity**: Lao and Sino-Tibetan **Gender mix**: nr **Poverty**: nr **Reliance on RNR**: Moderate to high (Annual crops more important than forest products in common and private ownership regimes, while in the mixed common-private regime "75% of food resources come from shifting cultivation". **Country**: Lao PDR **Region**: East Asia **Income category**: Low	**Common ownership** # **Withdrawal rights**: no limits reported. # **Management rights**: shifting cultivation in decline, but still applied to steep slopes. # **Exclusion rights**: Family-based, first to clear the plot gains the right to land. # **Alienation rights**: inalienable, transfer only if inherited or handed over. **Private ownership** (1) <u>Private (with customary elements)</u> # **Withdrawal rights**: Land used according to government "maximum efficiency" guidelines (incentives for cash crops). # **Management rights**: Government "lack the means", so farmers register land by themselves (leads to under-reporting and conflict). Shifting cultivation prevails under "fictitious labels". # **Exclusion rights**: Relative to space available. Forest can be appropriated as in customary system. # **Alienation rights**: land plots can sold or rented. Logging rights can be sold by villages for funding facilities, and timber resulting from clearing for farming can also be sold . (2) <u>Mixed private-common ownership</u> # **Withdrawal rights**: no limits reported # **Management rights**: Village residents choose stretch of forest to be cleared annually, which is the area allocated to families for farming. # **Exclusion rights**: access to family only. # **Alienation rights**: plots divided up when inherited, if plot becomes too small, youngestmember may have to leave village.	**SUSTAINABLE USE** <u>Large-scale forest clearing in sensitive areas under common and private regimes, intensified after land reform.</u> *Common ownership*: "The limited size and mediocre quality of the legal reserve (where customary rights continue to prevail), as well as the insecure tenure of borrowed plots, force new families to clear areas on hilltops, in the protected forests." *Private ownership*: "forest areas have been reduced by 80 per cent since the 1950s." <u>Long fallow period and soil conservation under mixed regime</u> "[Constant emigration] protects soil fertility and maintains satisfactory production levels, at the cost of expelling part of the population to other zones[.] (!) Changed since 2000s with intensification of land allocation program (privatisation)– fallow area decreased (from an average of 21 ha per family to 7 ha) and periods are shorter (2-10 years, compared to 6-16 years before land allocation). **PRO-POORNESS** <u>Inequality in access to land and benefits under all regimes</u> *Common ownership*:"Successful farming families are almost entirely wealthy families who were already using mechanization before the reform. [For other farmers] the only way to survive in the current conditions of access to production means is to continue practising the much-criticized shifting cultivation, and to hire out their labour power to the richer families." *Private ownership*: "Each year, [recent migrant] landless farmers rent private fallow that they slash and burn. As a result of this insufficient and insecure access to land, they find themselves in an unstable food and economic situation." *Mixed ownership*: "Certain groups had advance access to information regarding legal decrees, which allowed them (as early as 1995) to anticipate the application of the decrees to their advantage, increasing the appropriation of village land reserves by these groups."

Study & methodology	Population & Setting	Access conditions	Reported results

Edmonds, 2002
 	
Methods:
Quantitative
 	
Design:
Concurrent
 	
Study question
 	
"In the cross-sectional (unconditional) mean, I find resource extraction to be 14% lower in areas with forest groups. However, forest groups are not randomly placed. Thus, in this paper, I discuss forest group formation […] and use this institutional detail in three distinct approaches to evaluate the robustness of this 14% difference."
	RNR: forests
	
	No: 21,540 (open access) + 37,542 (common ownership) people.
	
	Ethnicity: nr
	
	Gender mix: nr
	
	Poverty: nr
	
	Reliance on RNR: High (open access) and low (common ownership) where use of firewood is concerned (statistically significant).
	
	Country: Nepal
	
	Region: South Asia
	
	Income category: Low
		Open access
		Details not reported
		
		Common ownership
		Forest user groups (FUG): community-based forest management with government support and guidance.
		
		# **Withdrawal rights**: limited timber and NTFP extraction, details not reported. "Forest groups are also encouraged to plant additional forest cover."
		
		# **Management rights:** FUG can "ration access to the group's forest and tax anything removed from the forest." "Most groups receive funding and assistance to hire guards and build fences around the forestland, both of which make rationing and taxation enforceable."
		
		# Exclusion rights
		Not reported
		
		# Alienation rights
		Not reported
			SUSTAINABLE USE
			Common ownership (Forest User Groups - FUG) reduce household extraction of firewood from the forest.
			
			--- 	
			Indicator: With FUG (Standard Error - SE) // Without FUG (SE)
			--- 	
			Bharis* of firewood collected (mean): 98.18 (3.91) // 113.67 (6.71)
			--- 	
			
			*Measure of firewood collection: "a bhari is a basket that people carry on their backs usually supported by a brace on the head".
			
			The complexity of the analysis makes it impossible to meaningfully summarise all quantitative results. The study tests the empirical observation stated in the research question in several rounds of statistical tests and econometric modelling: descriptive variables are (1) tested (t test, shown above) and (2) modelled (both partially linear framework and non-parametric approaches), and (3) a comparison of resource extraction is made between sets of households adopting common ownership immediately before and after the household survey (modelled and tested with a linear regression framework). The tests and models gradually increase in complexity and repeatedly reject the hypotheses that other factors explain the reduced use of firewood.

Study & methodology	Population & Setting	Access conditions	Reported results

Fernandez and Castilla, 1997
 	
Methods:
Quantitative
 	
Design:
Concurrent
 	
Study question
 	
The study aims to investigate "the effect of the Management and Exploitation Area on the size structure and sex ratio of the Stone Crab population."
	RNR:fisheries
	
	No: nr.
	
	Ethnicity: nr
	
	Gender mix: nr
	
	Poverty: nr
	
	Reliance on RNR: High. The stone crab "is important resource for the Chilean artisanal fishery – third most important crab species exploited in Chile"
	
	Country: Chile
	
	Region: Latin America
	
	Income category: UM
		Open access
		Conditions apply to fishing grounds at least "60 min sailing time north or south of the landing harbor" at the "Management and Exploitation Area" (MEA). No further details reported.
		
		Controlled access
		MEA
		
		# **Withdrawal rights**: total ban on "diving activities on a coastal area of 57ha of sea bottom". Ban implemented effectively in one study site (El Quisco), with only three exceptional lifts for mollusc ("Loco") fishing since 1991. Fishers in the other study site (Las Cruces) "do not comply with fisheries restrictions for the MEA" as in El Quisco.
		
		# No details reported on management, exclusion or alienation rights.
			SUSTAINABLE USE
			
			<u>Crab population features showed no differences between open controlled access conditions</u> - including no differences between controlled access sites with contrasting levels of enforcement.
			
			Crab size distributions
			--- 	
			Location: mean open access (SD) // management area (SD)
			--- 	
			El Quisco: 112.3 (10.1) // 113.5 (8.3)
			Las cruces: 108.2 (10.4) // 108.1 (11.7)
			--- 	
			Differences not statistically significant (p=0.18, Kruskall-Wallis)
			
			Lack of statistically significant differences applied to both sexes. Females were predominant in both conditions (above 90% across all sizes):
			--- 	
			Location: proportion of females - open access // management area
			--- 	
			El quisco: 94% // 90.6%
			Las cruces: 77% // 83%
			--- 	

Study & methodology	Population & Setting	Access conditions	Reported results
Futemma et al., 2002 **Methods:** Quantitative and qualitative **Design:** Before-after **Study question** The study investigates "the features of nonparticipants , in addition to participants, to explore the factors that cause individuals to refrain from contributing in collective action." Authors "also analyze the features of the managed ecosystem and investigate ecological and economic attributes of other closely related ecological ecosystems to explore their interrelationships."	**RNR:** forests **No**: 200 people in33 households (study site total population). 11 households (common ownership) and 11 households (private ownership) – 11 households landless, not included in the study. **Ethnicity**: participants reported as "non-indian natives". **Gender mix**: nr **Poverty**: nr **Reliance on RNR**: Moderate to High. Livestock is most profitable activity, but NTFP and timber also important. **Country**: Brazil **Region**: Latin America **Income category**: UM	**Open access, later Common ownership** Floodplain, originally privately owned, but de facto open access. # **Withdrawal rights and management rights:** not reported. **# Exclusion rights** *under open access access:* "local residents" allowed "free access to its products". *under common ownership*: access limited to one third of the community from the upland area which bought the land in 1993 (via "collective action"). # **Alienation rights:** not reported **Private ownership** Upland area where land rights allocated to head of households by the government in 1987 after decades of informal settlement and conflict with large-scale cattle ranching. # **Withdrawal rights and management rights**: not reported. # **Exclusion rights**: Original settlers gain land title: "Family units and single males older than 18 years of age". # **Alienation rights**: informal transfers only.	**PRO-POORNESS** # More local people were able to benefit from forest ressurces during the period under open access. People who participate in common ownership are limited in number, better off than those who do not participate, and benefit more from commonly owned resources than others. --- Access to funds: Common // Private ownership --- Farm credit: 82% // 18% Pension*: 64% // 27 % --- *paid to at least one household member. Participation: Common ownership: 45% of households have leaders**. Private ownership: No households had leaders. ** "collective action leaders": an individual or group of individuals who assume leading roles within the community in the decision-making process of the group's political agenda.

Study & methodology	Population & Setting	Access conditions	Reported results
Gautam and Shikavoti, 2005 **Methods:** Quantitative and qualitative **Design:** Concurrent ***Study question*** "The study attempts to address […] what roles the local institutions play in determining condition of a forest, and how to evaluate the institutional robustness of a local forest governance system."	**RNR:** forests **No**: 1288 households (open access) and 264 households (controlled access) **Ethnicity**: nr **Gender mix**: nr **Poverty**: nr **Reliance on RNR**: High. "villagers rely on forest for subsistence." **Country**: Nepal **Region**: South Asia **Income category**: Low	**Open access** <u>State ownership and control, but de facto open access</u>. # **Withdrawal rights:** Local authority banned timber or NTFP extraction. # **Management rights:** Local authority (LA) formally regulates access. Weak monitoring and enforcement – despite the use of guards and direct monitoring by LA leaders. **# Exclusion rights**: no effective exclusion. there is no clear definition of "legitimate user". # **Alienation rights:** not reported **Controlled access** <u>Community-based management (Forest users group - FUG)</u> # **Withdrawal rights**: Rotational harvesting of six areas according management plan # **Management rights**: FUG devised management plan with support from government. Guards hired by the FUG and members themselves monitor the harvest. # **Exclusion rights**: Access to residents only, includes "membership fee" # **Alienation rights**: not reported	**SUSTAINABLE USE** <u>Lack of controlled management led to worse forest conditions</u> # "complete absence of trees in 12.5% of the sample plots, and [wide variation of] tree density across the plots. # higher number of saplings may be related to "increased opening of the forest canopy" and history of low degradation. <u>Effective management under controlled access</u> # "substantially higher" per unit basal area and density of trees. # similar species richness suggest that the common ownership management has resulted in recovery from high degradation in the 1960s. ---------- Indicator: Open access // Common ownership ---------- Average basal area of trees (m2/ha): 7.5 // 11.6 Average density of trees (stems/ha): 403 // 491 Average density of saplings (stems/ha): 3140 // 1321 Species richness*: 74 // 68 ---------- *total number of plant species recorded in the forest

Study & methodology	Population & Setting	Access conditions	Reported results
Gibson et al., 2002 **Methods:** Quantitative and qualitative **Design:** Concurrent **Study question** "We argue that de jure (or formal) property rights do not predict the conditions of forests well. We do so by examining the property rights, institutions, and resource conditions of five forests in eastern Guatemala: two forests located on private property and three on common property."	**RNR:** forests **No**: 2,837 people (households contiguous to common ownership sites) and 2,095 people (households contiguous to common ownership sites). **Ethnicity**: nr **Gender mix**: nr **Poverty**: nr **Reliance on RNR**: High. Intense use of timber, NTFPs and dependence on watershed protection by forest reserve. **Country**: Guatemala **Region**: Latin America **Income category**: Low	**Common ownership** 3 sites: Las Cebollas, divided in protected forest area (PFLC) and unprotected (UFLC), and Tesoro (T). **# Withdrawal rights** PFLC: individual family plots for crops; common areas for timber, pasture and NTFP. UFLC: no limits. T: "recent" limits on firewood and timber # **Management rights** PFLC:monitoring of use and boundaries by family members UFLC: none. T: "recently" implemented # **Exclusion rights** PFLC: only de facto exclusion based on boundaries respected by local residents UFLC and T: no exclusion **# Alienation rights** there is no de jure title, state remains owner **Private ownership** 2 sites: Finca San José (FSJ) and Finca Tachoche (FT). # **Withdrawal rights** FSJ and FT: no access, except for firewood **# Management rights** FSJ, forestry plan officially recognised but not implemented, land dedicated to pasture for cattle. FT official plan officially recognised and implemented, allocation of land per use (forestry and coffee plantation) **# Exclusion rights**: present and enforced by owners # **Alienation rights**: not reported	**SUSTAINABLE USE** # Common ownership (PFLC) has higher tree density than UFLC and T, similar to private forests. UFLC "performs worse than any other area". Differences statistically significant at $p<0.05$ (t test) --- indicators: *Common* - UFLC // PFLC // T || *Private* - FSJ // FT --- tree density (no of stems/plot): 0.03 // 0.07 // 0.03 || 0.04 // 0.03 tree basal area (mean no/plot): 16.4 // 33.8 // 23.16 || 22.62 // 22.7 --- **PRO-POORNESS** <u>Common ownership regime as means to conserve forest resources and services to alleviate poverty</u> "As the past in both communal areas demonstrates, households placed little value on protecting forests because they were more abundant. In the context of largely poor households seeking to make a livelihood on the land, forests were perceived as relatively unimportant and plentiful. This no doubt captures the views of the current residents of Las Cebollas [UFLC] about their community forest." "The perceived gains to protecting the protective forest for water management, however, encouraged a group of families in Las Cebollas [PFLC] to assume the costs of creating institutions to manage their forests so as to protect a watershed for an irrigation project."

Study & methodology	Population & Setting	Access conditions	Reported results
Haller and Merten, 2008 **Methods:** Quantitative and Qualitative **Design:** Before-after **Study question** "We investigate the development of fishery institutions in the Kafue Flats of Zambia from precolonial times onwards. We then address the current situation of a de facto open access constellation as a consequence of institutional change."	**RNR**: fisheries **No**: 400 households **Ethnicity**: Batwa hunters & fishermen, Ila/Balundwe agropastoralists, Lozi & Bemba migrant fishermen from W&N Zambia. **Gender mix**: NR **Poverty**: NR **Reliance on RNR**: NR **Country**: Zambia **Region**: Africa **Income category**: Low	Change over time from controlled to open access **Controlled access** (1) Ila and Balundwe (tributaries) # **Withdrawal rights**: based on "spiritual ownership", "gender-specific rules - men fished with spears, women with baskets" # **Management rights**: spirits gave the "village leader" rights to use and supervise use, he appointed monitors who controlled tributary sections. **# Exclusion rights**: fisheries open to all (local and outsiders), special places for women to fish, Open access suspended "after water stopped flowing", only resumed after ritual. # **Alienation rights**: NR (2) Batwa (main river) **Rights system based on spiritual practices**. Only Exclusion rights reported (forbidden access to "breeding grounds for bream" in the rainy season, otherwise open access). **Open access** Law of 1974, statutory amendments 1986 (not implemented effectively, de facto open access conditions) # **Withdrawal rights**: "nets with mesh sizes no smaller than 76 mm" # **Management rights**: State only Monitoring "de facto ceased" in 2000s # **Exclusion rights**: license mandatory for commercial fisheries # **Alienation rights**: NR	**SUSTAINABLE USE** Catch size. "Local people reported catches have dropped between 25–50% the last 5 years at the individual level" Further E & W "the catches in the last 5 years were said to have gone down between 50–75%" Catch composition "varieties have changed (e.g., the red breasted bream is no longer common), and that the size of the bream (tilapia and oreochromis) declined." **PRO-POORNESS** Inequality. "indigenous Batwa, who have become a minority, were particularly affected by the developments in the fisheries. Their numbers fell from 6,500 to about 1,000 people, and in one of the most important settlements, Nyimba, […] they account for only one-fifth of the population." Women got "marginalized": men started to use basket (one exclusive women's gear), with impact on food security of poorer families **PROFITABILITY** Not comparable (lack of data under controlled access)

Study & methodology	Population & Setting	Access conditions	Reported results
Lele et al., 1998 **Methods:** Quantitative **Design:** Concurrent ***Study question*** The study aims to "understand the condition of the forests and its relationship with forest rights regimes and other village-level socioeconmic variables[.]"	**RNR:** forests **No**: 66 villages. **Ethnicity**: nr **Gender mix**: nr **Poverty**: nr **Reliance on RNR**: High. Intense extraction of timber and NTFP. **Country**: India **Region**: South Asia **Income category**: LM	**Open access** # **Withdrawal rights:** Access to timber (*Soppinabetta* species) and NTFP, also grazing area for livestock. # No details reported on management, exclusion or alienation rights. **Controlled access** Reserve forests (RF): state owned protected areas. *Soppinabetta* sp. Plantation (P): fully private areas. # **Withdrawal rights** RF: Timber (Soppinabetta species, less intense) and NTFP, also grazing area for livestock. P: Timber (exclusively Soppinabetta species). # No details reported on management, exclusion or alienation rights.	The proportion of "degraded" land is not significantly different in open access and private regimes. Also , changes in open access areas are "from closed canopy to open canopy tree-grass combinations", which may result in "increase in socially useful biomass" (grazing area). --- Land cover as % of total area* --- Land type: Private // Open access // State reserve --- Degraded scrub plus grassland: 18 // 18 // 10 Forest plantation plus clear-felled: 1 // 7 // 21 Forested area – total cover: 48 // 59 // 65 Forested area – high density only: 5 // 22 // 45 --- *only data outside the 100 buffer zone. See "further info" 4c below for details. Regression analysis of property regimes and four independent variables: population, livestock, area under arecanut (orchards), and area of cropland did not find statistically significant correlations.

Study & methodology	Population & Setting	Access conditions	Reported results
McClanaham et al., 2010 **Methods:** Quantitative **Design:** Concurrent ***Study question*** The study aimed to assess "the effect of fishing and closures on Kenyan coral reef fish communities and the ability of fisheries-dependent methods to describe the status of these fisheries and ecosystem are evaluated".	**RNR**: fisheries **No**: NR **Ethnicity**: NR **Gender mix**: NR **Poverty**: NR **Reliance on RNR**: NR **Country**: Kenya **Region**: Africa **Income category**: Low	**Controlled access** The Kenyan [Marine National Parks] have been protected from all forms of extractive exploitation since before 1978. **Open access** "Fishing ground sites are heavily fished with effort larger than 4 fishers/km^2/day.* # Rights not reported in detail for either regime. *McClanahan. et al., 2008.	**SUSTAINABLE USE** <u>Higher number of species under controlled access</u>. "The numbers of species encountered in visual transects for the same depths and habitat in fisheries closures were usually twice those of fishing grounds, and consistently higher for target species as reflected in cumulative species relationships." <u>Controlled access</u> Comparison of ecological indicators between methods --- Indicator: Traps // Hook and Line // Visual transects --- species diversity (D*): 0.75 // 0.46 // 0.95 Number of species**: ~75 // 30 // ~130 --- <u>Open access</u> Comparison of ecological indicators between methods --- Indicator: Traps // Hook and Line // Visual transects --- species diversity (D): 0.82 // 0.83 // 0.94 Number of species: ~100 // 73 // ~90 --- *D= Simpson's diversity index **"~" indicates values estimated from charts of cumulative number of species *vs.* cumulative number of individuals.

Study & methodology	Population & Setting	Access conditions	Reported results

McClanaham, 2010
 	
Methods:
Quantitative
 	
Design:
Concurrent and before-after
 	
Study question
 	
The study focus is "on fishing revenue, quantity of catch by price category, cost of different artisanal fishing methods, and profits produced by gear restrictions and fishery closures. I examined trends in prices by their taxonomic or commodity price groupings and by the relation of body length to price to estimate the profits to fishers under gear restrictions, gear and area restrictions, and no restrictions."
	RNR: fisheries
	
	No: 397 fishers
	
	Ethnicity: Digo
	
	Gender mix: NR
	
	Poverty: NR
	
	Reliance on RNR: High. "Traditional fishing communities."
	
	Country: Kenya
	
	Region: Africa
	
	Income category: Low
		Open access
		Single area with weak or no management (3 sites - North Coast, NC).
		
		# Withdrawal rights
		landing sites 1–10 km from an area closed to fishing. No restrictions on gear - seine nets were dominant.
		
		# Management rights, Exclusion rights and Alienation rights: not reported
		
		Controlled access
		Two areas:
		Intensely managed area, ("Kennyata Beach", KB)
		Moderately managed area, ("South coast", SC)
		
		# **Withdrawal rights**:
		KB: 6 square km area closed to fishing: small-mesh seine nets prohibited in 2001.
		SC: 6 landing sites more than 30 km far from "an area closed to fishing". "Most seine nets prohibited in 2001"; all eliminated by 2004.
		
		# Management rights, Exclusion rights and Alienation rights: not reported
			SUSTAINABLE USE
			
			"closures combined with gear restrictions can increase profits. Profits increased because under gear restrictions and area closures larger fish were caught and larger fish fetched higher per weight prices."
			
			CPUE (kg/person/day)
			--- 	
			KB and SC : increased 20% after the elimination of the beach seines.
			--- 	
			CPUE before // after
			KC: 3.2 (SE 0.3) // 3.8 (0.2)
			SC: 3.0 (SE 0.2) // 3.7 (0.2)
			NC: na*** // 2.0 (0.1)
			--- 	
			
			Comparison of mean fish length (cm) per catch category before and after gear restrictions and between management (regime type)
			--- 	
			Fish catch category: KC // SC // NC || p value before-after // regime type
			--- 	
			Goatfish: 18.59 (0.74) // 18.82 (1.15) // 12.81 (0.89) || <0.02 // <0.0002
			Parrotfish: 19.10 (0.51) // 17.99 (0.96) // 14.42 (0.58) || <0.02 // <0.0002
			Rabbitfish: 19.39 (0.97) // 17.61 (0.96) // 15.18 (1.53) || <0.32 // <0.08
			Rest of catch: 18.52 (0.97) // 17.73 (0.42) // 16.70 (1.62) || <0.21 // <0.46
			Scavengers: 15.69 (0.38) // 15.71 (0.96) // 14.05 (0.86) || <0.01 // <0.05
			--- 	
			
			"Rest of the catch"="Fishes in this category are a mix of coral reef species, are of low monetary value, and are considered "trash fish" in some fisheries." (p.7)

Study & methodology	Population & Setting	Access conditions	Reported results

			McClanaham 2010 continued
			PROFITABILITY
			
			# Per capita revenue increased 60–67% after gear restriction.
			Fisher revenue in KB and SC was 135% and 41 higher than NC (“control sites”) after the beach-seine elimination.
			# “Net per area income increased 85% in KB after the gear restriction was implemented, but there was no change in fishing effort.”
			
			--- 	
			Revenue* per capita before [1996-2001] // after [2002-2007]
			--- 	
			KC: 224 (41)** // 374 (30)
			SC: 191 (12) // 306 (19)
			NC: na*** // 159 (11)
			--- 	
			*Ksh/person/day. Ksh=kenyan shillings (US$1 = ~75 Kenya shillings)
			** Standard error (valid for all values in brackets); *** na=data not available
			
			Comparison of mean prices per catch category and net income before and after gear restrictions and between management (regime)
			--- 	
			Fish catch category: KC // SC // NC || p value before-after // regime
			--- 	
			Goatfish: 112 (9.70) // 84 (5.61) 78 // (12.4) || <0.0008 // <0.004
			Parrotfish: 77 (5.48) // 84 (5.61) // 55 (7.35) || <0.0004 // <0.0002
			Rabbitfish: 112 (9.70) // 84 (5.61) // 78 (12.41) || <0.0008 // <0.004
			Rest of catch: 68 (3.74) // 59 (7.84) // 58 (11.22) || <0.005 // <0.72
			Scavengers: 112 (9.70) // 84 (5.61) // 78 (12.41) || <0.0008 // <0.004
			--- 	
			--- 	
			Regime type : Before // After 2001 [fishing effort* || Net income**]
			--- 	
			KB: 7.2 // 7.3 || 5,504 // 10,200
			SC: 12.9 //10.1 || 9,302 //12,024
			NC: na*** // 16.5 || na // 10,251
			--- 	

Study & methodology	Population & Setting	Access conditions	Reported results
McClanaham et al., 1997 **Methods:** Quantitative and qualitative **Design:** Concurrent ***Study question*** The study "investigates the relationship between community-imposed restrictions and its effect on fisheries yields and the ecology of the reefs adjacent the landings."	**RNR**: fisheries **No**: 397 fishers **Ethnicity**: Digo **Gender mix**: NR **Poverty**: NR **Reliance on RNR**: High. "Traditional fishing communities." **Country**: Kenya **Region**: Africa **Income category**: Low	**Open access** Customary rules (**without restriction** on pull seine). 3 sites. **# Withdrawal rights** No fishing allowed in sacred spots (Mzimu), and in days devoted to special yearly rituals (sadaka) # **Management rights** Elders set rules based on religious beliefs and tradition. Catch decline may also trigger elders to restrict the fisheries. # Exclusion rights and Alienation rights: not reported **Controlled access** Customary rules (**with restriction** on pull seine) # **Withdrawal rights**: As in the other access conditions, except for restriction on landings from pull seine. # Management rights, Exclusion rights and Alienation rights: not reported	**SUSTAINABLE USE** **# Catch per unit of effort** **Open access** Mean catch /area/man (kg/ha/year)=10.6; 14.4; 12.2* *values for each of the three sites **Controlled access** Mean catch /area/man (kg/ha/year)=17.5 (!) Higher total catch per area per fisher than any other site (p=0.00016, ANOVA) **# State of the coral reef system** Comparison of 8 variables did not find statistically significant differences between conditions of access. Neither did the comparison of sea-urchin density (indicator of degraded reef), fish weight estimates, predation rates or number of fish species.

Study & methodology	Population & Setting	Access conditions	Reported results
Medina et al., 2009 **Methods:** Quantitative **Design:** Concurrent **Validity**: moderate risk ***Study question*** The study assesses: (1) the main approaches to timber extraction by communities; (2) the Timber harvesting systems and the implications of such systems; and (3) the direct and indirect benefits derived by communities from the different approaches. (p. 409)	**RNR**: forests **No**: 51 people (active users, private) 116 people (active users, common ownership) **Ethnicity**: Shipibo-Conibo (Peru), no specific ethinic groups in the sites in Brazil and Bolivia. **Gender mix**: NR **Poverty**: NR **Reliance on RNR**: High. All communities s depend on forest resources from timber to export (Bolivia), to rubber tappers , indigenous people and farmers (Brazil and Peru). **Country**: Bolivia, Brazil and Peru **Region**: Latin America **Income category**: Lower and Upper middle income	**Common ownership** <u>Community-based forestry</u> # **Withdrawal rights**: Rotation cycles and yearly "management units" - cycles varied from 10 to 25 years. Logging restricted to mature trees. # **Management rights**: Management plan defined in conjunction with NGOs and government agencies, with clear aim of reducing impact of logging. Trade, organisational and marketing activities also determined via CFM, with intense external support or intervention. # **Exclusion rights**: unclear – mention of cooperatives. # **Alienation rights**: not reported **Private ownership** <u>Private-community partnership</u> # **Withdrawal rights**: Companies determine species and number of trees to be harvested according to maximum market value. Extraction limited to 2 - 3 years, with ~2/3 harvest in the first year. # **Management rights**: Companies determine logging techniques and managed employees responsible for the work. Management plan authorised by government agency, with one single exception in Bolivia. # **Exclusion rights**: Communities excluded, except when unskilled labour was required. # **Alienation rights**: Rights bought by logging companies from communities	**SUSTAINABLE USE** **Management outcomes** --- Indicators for each of the 4 sites (BO, BR1, BR2, PE) and **average** --- **Common ownership:** --- Forest area under regime:(ha): 3600 // 1000 //750 // 436 // **1446** m^3 exploited per ha: 8.33 // 6.18 // 15.00 // 1.09 // **7.65** Proportion of the area exploited (%): 5 // 10 // 4 // 5.28 // **6.07** Number of species exploited: 10 // 16 // 7 // 4 // **9** --- **Private ownership** --- Forest area under regime:(ha): 200 // 800 // 1700 // 600 // **825** m^3 exploited per ha: 9.50 // 7.88 // 25.29 // 12.00 // **13.67** Proportion of the area exploited (%): 50 // 100 // 100 // 50 // **75** Number of species exploited: 12 // 3 // 7 // 4 // **7** --- **PRO-POORNESS** **Indirect benefits of the regime** (as perceived by communities) **Common ownership:** training / access to transport / land tenure **Private ownership:** access to roads and vehicles / jobs and loans **PROFITABILITY** --- Indicators for each of the 4 sites (BO, BR1, BR2, PE) and **average** --- **Common ownership** --- Income per m^3* (US$): 5.00 // 12.00 // 19.95 // 13.33 // **12.57** Income/day /person** (US$): 2.18 // 24.72 // 6.65 // 1.2 // **8.69** --- **Private ownership** Income per m^3 (US$): 2.01 // 2.27 // 0.23 // 0.22 // **1.18** Income/day /person (US$): 17.40 // 38.08 // 47.60 // 9.47 // **28.14** *gross income; **net income: cost of management activities discounted.

Study & methodology	Population & Setting	Access conditions	Reported results

Muller and Munroe, 2008
 	
Methods:
Quantitative and Qualitative
 	
Design:
Before-after
 	
Study question
 	
"In this article, we present a multiscale, spatial-temporal framework to examine the local outcomes of the postsocialist transition on land cover in southeastern Albania between 1988 and 2003. Our empirical focus is the abandonment of cropland and forest clearing." (p. 856)
	RNR: forest
	
	No: 425 villages
	
	Ethnicity: NR
	
	Gender mix: NR
	
	Poverty: estimates for 2001* for the districts in the study area:
	Librazhd = 37% ,
	Gramsh = 35%,
	Pogradec=31%,
	Elbasan=29%
	(% below the national poverty line of US$411 per capita per year. - World Bank, 2003)
	
	Reliance on RNR: High Likely in all sites, - reported as "dependence on firewood in the absence of other fuel sources."
	
	Country: Albania
	
	Region: Europe
	
	Income category: UM
		<u>Since transition from socialist regime (1998-1991) until 1996</u>
		
		"Common" ownership
		Individual – family rights, with community-based allocation and without transferability.
		
		# **Withdrawal rights**: nr
		# **Management rights:** "Village-level land distribution councils were formed to allocate plots, often in distant locations within the village territory".
		# Exclusion rights: "intended to redistribute all collectivized land to former members of the cooperatives on an equal per capita basis. Other rural residents who were not members of the cooperatives were also awarded land but in smaller quantities".
		# **Alienation rights:** legal basis established, but not allowed until 1995.
		
		<u>after 1996 until 2003</u>
		
		"Private" ownership
		De jure private regime, but with low level of transfers and elements of open-access.
		
		Rights not reported in detail – see also pro-poorness outcomes in "reported results".
			SUSTAINABLE USE
			Total forest cover (stable forest less forest clearing plus regrowth) **was unchanged between periods** – with differences in extraction:
			
			# <u>pre-1988 until 1996</u>: Forest-cover loss was more likely "at lower slopes, lower elevations, farther from national roads, but closer to the dwellings, in villages where cropland was more fragmented[.]"
			# <u>post-1996 until 2003</u>: "Forest-cover loss [was] concentrated far from the national roads, in areas with better access to district capitals."
			
			--- 	
			Estimated coefficient of binary logit model and p values
			--- 	
			Indicators: pre-1988 until 1996 // post-1996 until 2003
			--- 	
			Spatial lag slope (degrees): –0.026 (0.033*) // –0.017 (0.299)
			Spatial lag elevation (100 m): –0.002 (0.006*) // –0.001 (0.142)
			Distance to national road (km): 0.115 (0.004*) // 0.323 (0.000*)
			Distance to dwellings (km): 0.620 (0.001*) // –0.074 (0.709)
			Cost distance to district capital: 0.001 (0.263) // –0.003 (0.037*)
			--- 	
			*p=<0.05
			
			PRO-POORNESS
			Forest "clearing pattern"
			# <u>pre-1988 until 1996</u>: subsistence-oriented extraction at more remote locations.
			<u># post-1996 until 2003</u>: commercially oriented clearing closer to the major market centers.
			
			"[the] state of anarchy after the collapse of the pyramid schemes [in the post 1996 period] may have led an open-access state that caused sharp increases in forest loss and much forest extraction close to roads, indicating that illegal sales and exports of timber may have been an important strategy for rural households in that period."

Study & methodology	Population & Setting	Access conditions	Reported results
Nagendra, 2007 **Methods:** Quantitative and Qualitative **Design:** Before-after ***Study question*** "This article draws on a dataset from Nepal to conduct an examination of the factors that are significantly associated with forest change[.] The range of biophysical and ecological contexts, diversity of tenure arrangements, and number of user groups provide us with sufficient variation to be able to examine a range of contexts."	**RNR:** forests **No**: 12 communities (open access) and 43 communities (controlled access) **Ethnicity**: nr **Gender mix**: nr **Poverty**: nr **Reliance on RNR**: High. Likely for all regimes - reported for private ownership :"users had the smallest group size and depended the most on the forest[.]" **Country**: Nepal **Region**: South Asia **Income category**: Low	**Open access** "[Consists of] national forests, which are managed by the government forest department in principle, but in practice are often used as open- access forests that may occasionally be monitored by forest guards." **Controlled access** **Private** ("leasehold forest") **and common ownership** ("community forest") . Rights not reported in detail	**SUSTAINABLE USE** **Intensity of use/techniques** # "[open access] users almost never use new technologies." # "community forest users are more apt to adopt new technologies to reduce pressure on the forest". # "Leasehold forest users tend to limit usage of their forests by harvesting forest products from other communal or government forests [and] also engage in more planting compared [to the other two groups]" **Forest change** "Tenure regimes were significantly associated with forest change." (P<0.000; One-way ANOVA) Analysis considerd 3 levels of change*: [deforestatrion]-[no change]-[reforestation] # Open access users had the least positive impact, (below "no change" level - including the upper limit of confidence level at 95%.- maximum deforestation. # Leaseholder users had "achieved [the most] substantial increases in forest density [of all regimes]"- (maximum reforestation. # Community forest users "had a positive impact" (above "no change" level, including the lower limit of confidence interval at 95%) - intermediate reforestation. *"Users were asked to provide an assessment of changes in tree, bush, and ground-cover density over the past 5 years. Information on all three variables was combined to produce a composite three-point index that evaluates whether forest density has increased, stayed the same, or decreased over time."

Study & methodology	Population & Setting	Access conditions	Reported results
Nagendra et al, 2008 **Methods:** Quantitative and Qualitative **Design:** Concurrent ***Study question*** "Our overarching objective to understand how different ownership regimes and policy environments have impacted the extent and spatial pattern of forest cover change. Specifically, we approach this by comparing the extent of forest clearing and regrowth, and differences in spatial patterns of forest fragmentation under conditions of state protection, community protection, co-management and open access in our study landscape.."	**RNR:** forests **No**: nr **Ethnicity**: nr **Gender mix**: nr **Poverty**: nr **Reliance on RNR**: High. Likely, as reported quoting other sources: "Hundreds of families living in villages located around the [controlled access areas] depend on these forests to a significant degree. (Nepal and Weber 1994)" **Country**: Nepal **Region**: South Asia **Income category**: Low	**Open access** "Surrounding landscape" (SL): mixture of "some open access areas" and "private land holdings" on the border of protected areas. Private areas are "strongly protected and surveyed". Rights not reported in detail. **Controlled access** (1) Protected areas (CNP/PWR) (2) Co-management areas (BZ) (3) Community forestry user groups (CF) # **Withdrawal rights** CF: users are able to "sell and distribute products including forest timber"** BZ and CF: not reported # **Management rights** CNP/PWR: "government owned and managed" BZ: "a form of co-management between the state and communities"* CF: users "conserve and manage these forests". # **Exclusion rights and Alienation rights** not reported *(Nepal 2002; Nagendra et al. 2004) **(Shreshtha 1998)	**SUSTAINABLE USE** **# Percentage of area occupied by different land cover change categories across management zones** **Open access** stable forest area: SL = 23% stable non-forest area: SL = 43% area degraded: SL = 10% **Controlled access** stable forest area: CF = 59%; CNP/PWR = 38% stable non-forest area: CF = 2%; CNP/PWR = 20% area degraded: BZ = 20%; CF = 9%; CNP/PWR = 21% **# Patterns of landscape and forest fragmentation*** **Open access:** "largest patches of stable non-forest", and "highest overall patch density". **Controlled access:** CF = "largest patches of stable forest"; BZ and CF= "lowest overall patch density". *differences and trends statistically significant at $p<0.01$ or $p<0.05$ (one-tailed Mann–Whitney). **PRO-POORNESS** **Unequal access to benefits**: "substantial variability between user groups, with the [co-management forests (BZ)] located closer to the park main entrance receiving greater revenues from tourist visits" (both CF and other BZ unable to profit from tourism).

Study & methodology	Population & Setting	Access conditions	Reported results
Ortega-Huerta and Kral, 2007 **Methods:** Qualitative **Design:** Concurrent ***Study question*** "(1) Are there significant differences in landscape patterning and the levels of biodiversity, i.e., species richness of birds and mammals, among the different types and sizes of land ownership? and (2) How are such potential differences revealed by grouping community-based vs. private land ownership types".	**RNR:** forest **No**: nr **Ethnicity**: nr **Gender mix**: nr **Poverty**: nr **Reliance on RNR**: nr **Country**: Mexico **Region**: Latin America **Income category**: UM	**Common ownership** "Community-based" mixed regimes, with varying levels of government ownership or control within each category. # Ejido # Nuevo Centro de Población = NCP # Comunidad = COM Rights not reported in detail, except for definition of Ejido, quoting other sources: "mix of various types of land ownership - state, corporative, communal, and private (Bartra 1993)" **Private ownership** Private regimes, with differences in terms of size, history and administration. # Pequeña Propiedad = PEQ # Propiedad Privada = PP # Colonia = COL Rights not reported in detail, except for **management rights**: COL - regulated by the state, and e**xclusion rights**: COL - "shows collective organisation" similar to Ejido (SRA, 1993)"	**SUSTAINABLE USE** Study looked at sites in 3 regions ("physiographic provinces") for regime comparison: Costa del Golfo, Llanuras Occidentales and Sierras (details on different ecosystems not reported). **Percentage of natural vegetation** (PNV) ---------- Region: PNV in community-based regimes // in private regimes ---------- Costa del Golfo: 25% // 23% Llanuras Occidentales: 83% // 64% Sierras: 68% // 63% ---------- # Findings suggest that differences were significant only for the Llanuras Occidentales region – only case where range of PNV values for community and private regimes did not overlap (*values not reported, direct examination of results in box-plot charts*). **Mammal diversity** (% of area for number of species interval) ---------- Area: Ejido // NCP // COM || PP // COL ---------- Costa del Golfo: 21% // 1% // 21% || 3% // 2% [above 25 spp]* Llanuras Occ.: 33% // 17% // na** || 7% // 28% [for 16–20 spp] Sierras: 23% // 7% // 3% || 0% // 3% [for >25 spp] ---------- *highest species richness interval, ** na=not available

Study & methodology	Population & Setting	Access conditions	Reported results
Peluso, 1992 **Methods:** Qualitative **Design:** Before-after ***Study Question*** "In this study I explore the customary village, state, and emerging de facto forms of ironwood management, particularly rights to harvest and trade the wood."	**RNR:** forest **No**: estimate only - "[Until 1986] villagers occupied a longhouse with 31 apartments (one or more nuclear families to an apartment)[.] In 1990, only 11 apartments remained in the longhouse." **Ethnicity**: Dayak Galik **Gender mix**: nr **Poverty**: nr **Reliance on RNR**: High. Livelihoods based on mix of agriculture and forest use. **Country**: Indonesia **Region**: East Asia **Income category**: LM	**Common ownership** Customary law ("hukum adat") # **Withdrawal rights**: Multiple use (see reliance on RNR 1m above). Special rules and constraints for "difficult-to-renew forest products". # **Management rights:** Sanctions include fines and sponsoring of rituals. "Fear of the shame (malu)" was the most powerful deterrent to would-be rule breakers. # **Exclusion rights**: Access and use shared at village level only - unless private claims are made (see below). Outsiders access possible with payment of "tax" to the village or owner(s): 20% of the harvested product. # **Alienation rights:** Transfer possible via inheritance (see above) and rights to trees could be sold. **Private ownership** Private lease (PL) and Cooperative (C) # **Withdrawal rights: PL**: Selective logging system -"only individuals of certain species and size are cut." **C**: 3 categories of access – (1) NTFP collection; (2) logging, maximum 100 ha; (3) collection of dead wood for fuel. # **Management rights: PL**: State issues territorial concessions. Compensation paid to villagers in cases of damage to common resources by commercial logging. **C**: permits held by traders, who regulated extraction. # **Exclusion rights: P**: access to lease holders only. **C**: access to cooperative members only. (both implied, not specified in the study.) # **Alienation rights: P**: information on leasetransfer not reported. **C**: not reported	**SUSTAINABLE USE** **Common ownership** – sustainable management practices: "Subsistence-based claims, the custom of [inheriting] ironwood lumber, and even the occasional manufacture of shingles to sell placed minimal demands on the local supply [of ironwood]." **Private ownership** - mismanagement "[Most village men rushed into the village's perimeter forest and painted their names on as many trees they could, regardless of their size and the needs of all village households." **PRO-POORNESS** **Common ownership** - equity " [Ironwood management was based] on a local sense of what was "rightful distribution" of access and ownership, [benefiting] old people and [households] with few or no young able bodied men[.] A limited set of users was not to monopolize the supply available." **Private ownership** - Loss of "social capital" By 1990 village leaders started to be appointed by the government: "When the community [...] experienced a crisis of authority and solidarity. Virtually overnight, villagers began to apply only [the] private aspects of [control of] access and rights to ironwood trees." **Private ownership** - Inequality "This rapidity of institutional change, spurred by the use of chainsaws, worked against the needs of some villagers and to the advantage of others[:] Old and weak (ill or handicapped) villagers could not handle a chainsaw and were often deprived of their rights[.]" **PROFITABILITY** **Private ownership** - Increased costs and losses: Villagers did not benefit from new tenure and labour arrangements for logging which emerged with the institutional change (see above) – e.g. bore "all transaction costs" in cases of cancelled deals and lacked capitalto buy or rent trucks, pay for access to roads or for fuel for chainsaws.

Study & methodology	Population & Setting	Access conditions	Reported results
Robbins, 1998 **Methods:** Qualitative **Design:** Concurrent ***Study Question*** "This study examines the direct links between institutional forms and their environmental effects"	**RNR:** forest **No**: 28 villages **Ethnicity**: not reported, Relevant information on caste division: raika and sindhi specialise in and dominate herding; rajputs and brahmins are elites. **Gender mix**: nr **Poverty**: nr **Reliance on RNR**: High. "Agropastoralism, long fallow dryland farming and herding dominate in the region" and " bulk of rural households" are "small or middle-sized" landholders. **Country**: India **Region**: South Asia **Income category**: LM	**Common ownership** (1) Community-based management ("Gocher", **G**): village committee control (2) Sacred forest ("Oran, **O**) # **Withdrawal rights** **O**:tree cutting very restricted, practically only indirect use (eg. animal feeding) allowed. # **Management rights** **G**: Village committee restricts tree cutting **O**: Control exercised by the community itself, with both religious and secular mechanisms. # **Exclusion rights** and **Alienation rights**: not reported **Private and state ownership** Private (**P**): private land available for grazing ("community fallow") State (**S**): forest reserves # **Withdrawal rights** **P**: land closed during rainy season for harvest of perennial grass, otherwise "open to the entire community". **S**:"mainly exogenous" trees planted for timber. # **Management rights** **P**: owner can "directly reprise" violation of rainy season closure. Village committee can punish owners who do not allow access after harvest (opening under "forced social obligation") **S**: forests are "fenced and guarded" under "central authority" control lasting up to five years. # **Exclusion rights:** P: small-scale herders allowed access, not large-scale ones. # **Alienation rights:** not reported	**SUSTAINABLE USE** **Changes to tree cover and condition of pasture** **G**: "Higher level of cutting, increased sparseness in standing tree cover, [heavy grazing and predominance of unpalatable annual plant species.] **P**: no restriction on tree growth during rainy season and nitrogen input in soil by grazing animals in the dry season. **Institutions and ground cover** # community-controlled areas have lowest ground cover and tree frequency of all regimes (except tree frequency where Oran # Private). # private and state-controlled areas have highest ground cover (both for shrubs, low-lying trees and perennial grasses) and tree frequency. --- Indicator: **G**ocher / **O**ran || **P**rivate / **S**tate --- total ground cover: 51.09 / 59.50 || **76.77** / **75.24** perennial grass cover: 2.80 / 14.86 || **20.38** / **19.99** tree frequency: 15.00 / 56.67 || 45.45 / **77.50** --- **Land use and ground cover** (by main land use - forest or pasture) # community-controlled areas have lower values for all indicator , except for perennial grass cover) # private and state-controlled areas have higher values for all indicator All statistically significant at $p<0.01$* (beta coefficient). **Predominant plant groups** **G**: annual herbs and grasses / **O**: no exogenous species; several species exclusive to sacred forests, specially some endangered elsewhere. **P**: perennial grasses (more valuable as pasture) / **S**: exogenous species **PRO-POORNESS** **Gender imbalance in management *vs.* Benefits to women** **Common (G)**: Women do not participate in decision-making (resulting in low compliance with rules). **State** (**S)**: jobs in planting and maintenance of nurseries and trees "often go women", particularly from lower castes.

Study & methodology	Population & Setting	Access conditions	Reported results
Satria et al, 2006 **Methods:** Qualitative **Design:** Concurrent **Study question** "How is the interaction among [fishers, pearl industry and government] regarding property rights in marine resources? Is there a way out to deal with the tragedy of property rights that so often inevitably occurs?"	**RNR:** fisheries **No**: nr **Ethnicity**: nr **Gender mix**: nr **Poverty**: nr **Reliance on RNR**: nr **Country**: Indonesia **Region**: East Asia **Income category**: LM	**Common ownership** # **Withdrawal rights:** Selective ban on gear (beach and purse seine).Complete ban on blast and poison fishing. Minimum distance from coast for purse seine (1km) # **Management rights:** All enforced by fishers. Fines in kind for use of banned gear (catch confiscation); For blast and poison fishing, penalties in three levels: first incidence – non-compliant fisher taken to authorities and fined, second – boat and gear burned, third – receive "physical sanctions". # **Exclusion rights:** Access restricted to village residents – outsiders may operate (details on access not reported). # **Alienation rights:** Reported as absent. **Private ownership** # **Withdrawal rights**: "pearl culture" # **Management rights**: Local authority (LA) issues licenses, which includes determining the location of pearl-culture sites. LA also charges "retribution" and "management" fees from industry. Industry informally committed to consulting with fishers on site allocation. # **Exclusion rights:** Site only accessible to industry, including prohibition of other uses such as fishing (changed after operation started, to mediate conflicts). # **Alienation rights :** Informal transfer ofsites is possible.	**SUSTAINABLE USE** **Common ownership** - <u>Effective measures to control use and protect fish stock</u> Rules in place and strictly enforced to prevent destructive fishing and unsustainable techniques. **PRO-POORNESS** **Common ownership** - <u>Access to fisheries by local residents secured</u> Collective action guarantees benefits from fisheries, including ability for self-organisation in order to obtain compensation (financial and material) for loss of access to industry - in one case, resulting in 10% share in the pearl harvest profits.

Study & methodology	Population & Setting	Access conditions	Reported results
Saunders et al., 2010 **Methods:** Qualitative **Design:** Before-after **Validity**: moderate risk **Study question** Study aims to "describe and reflect upon the change in institutions that has influenced the environmental conditions of the Kisakasaka Mangrove Forest in Zanzibar, Tanzania."	**RNR:** forests **No**: 750 people (total site population) 30 people interviewed **Ethnicity**: nr **Gender mix**: 6 men and 10 women selected for semi-structured interviews), also 5 informants of "mixed gender" **Poverty**: quoted other sources: "average 'income' per household in the Kisakasaka Village [was] $1524 (or US$ 438 per capita) per annum." (Contini et al, 2001) **Reliance on RNR**: High. "The forest and coastal marine resources contribute significantly to livelihoods." **Country**: Tanzania **Region**: Africa **Income category**: Low	**Controlled access** From 1996 to 2001 – Community-based Natural Resource Management (CBNRM) # **Withdrawal rights** Mangrove divided in "conservation areas" and "use areas", with a 5-year rotation. Limit on extraction: "50 charcoal palm leaf baskets per person per month, firewood and mangrove wood for local use." **# Management rights** "Village conservation committee" (KCC) developed management plan, with government agency and NGO. KCC responsible for monitoring, enforcement and administration of revenue. # **Exclusion rights** Outsiders " allowed only under certain conditions and subject to an entrance fee and permit". # **Alienation rights** Not reported **Open access** Post-2001 – CBNRM ends, control reverts to state, but conditions are *de facto* open access.	**SUSTAINABLE USE** Forest cover --- Year: forest clear-cut % of total area --- Open access || CBNRM || Open access --- 1984: 14% || 1998: 26% || 2005: 32% 1989: 16% || 2001: 28% 1994: 22% 0.8% / year || 0.7%/yr || 1%/yr There was no clear change in rate of increase in clear cutting per year with controlled access (no statistical tests performed) --- Qualitative interviews suggested that the controlled access CBNRM was initially effective in regulating cutting, but became less so towards the end of its term. Reasons suggested were problems with its political affiliations, lack of transparency in dealing with funds and perks conferred by management positions. --- **Controlled access** - Effective implementation of management plan # "satellite images [during the period in which KCC was active] show rotational cutting and regeneration in the use zones." # visual comparison of satellite images [between 1994–2001. shows] that some cutting has occurred in conservation areas, but it does not appear to have been extensive." **Open access** # clear-cut areas increased over the years. # "mangroves have been intensively (lack of regrowth) and extensively (greater area with less forest cover) cut since the demise of the CBNRM in 2001".

Study & methodology	Population & Setting	Access conditions	Reported results
Sheridan, 2004 **Methods:** Qualitative **Design:** Before-after **Validity**: moderate risk *Study question* The study "[delineates] the changing political ecology of Usangi Division in the North Pare Mountains from Tanzania's independence in 1961 to the arrival of European conservation and development programs in 1988."	**RNR:** forest **No**: 750 people (total site population) 30 people interviewed **Ethnicity**: nr **Gender mix**: women's role in the regime transformation is focus of the analysis. Women also figure as informants. **Poverty**: nr **Reliance on RNR**: High. Particularly for indirect benefits of the forest, such as watershed protection. **Country**: Tanzania **Region**: Africa **Income category**: Low	Controlled access # **1936-1938**: colonial laws give chiefs authority to set rules of RNR use and enforce them. # **1945-1961**: population growth and rising living standards but also inequality – by 1961 "56% the arable land was held by just 13.5% of the population." ## male migration for labour elsewhere changed land use patterns – based on women's labour, more fragmented plots and use of new crops. **Open access** #**1962-1963**: Tanzania became independent. The "Tanganyika African National Union (TANU) replaces chiefs as authority in commons management. Period characterised drought and famine. # **1967**: "Ujamaa" socialist policies carried out land reform and reallocation of people. Government took over "nearly all social institutions [except for] religious institutions, [and was unable] to manage them effectively. Overall result were "economic stagnation,political centralization and a clear-eyed cynicism." # **1972-75**: intensification of agriculture to mitigate famine - "agriculture as a matter of life and death". # **1982**: new local authorities created: "by-laws of 1984 empowered the council to ban cultivation, grazing animals an cutting trees in designated conservation areas. These area were the same as those the chiefs had controlled - riverbanks, springs, forests and steep slopes."	**SUSTAINABLE USE** **Controlled access - 1936-1938**: though "weak and unstable [colonial arrangements had] one ecologically functional feature: it prevented farmers from abusing common property resources during a period of rapid social change." **1945-1961**: "social inequality did not lead to environmental degradation precisely because the colonial chiefs' patronage of the commons conserved sensitive areas." **Open access - 1962 – 1967**: # Swamp areas encroached - "Throughout North Pare women began to grow crops in the swamps, springs an riverbanks that had been protected under the 1938 Water Conservation Rules." # Sacred forests encroached: "Even the Mshitu wa Kena, the largest and most sacred of the five initiation forests in Usangi, suffered. In the months just before and after independence, farmers reduced its acreage by 25 to 40 per cent." # Irrigation system disturbed by consequences of land-use change (e.g. clearing of river banks; loss of river flow control by the swamp, etc.) . **1967** # "continuing encroachment of former conservation areas, state coercion and legal muddles." **1975 onwards** # Further watershed degradation by agricultural use. # Decline of the irrigation system: "Maintenance of the irrigation systems became increasingly inconsistent after 1967 because their status as kin group property made them seem like politically incorrect colonial relics." # Further encroachment of sacred forests - "The Mshitu wa Kena initiation forest, for example, lost another quarter of its colonial-era area (of approximately 21 hectares)".

Study & methodology	Population & Setting	Access conditions	Reported results
Southworth and Tucker, 2001 **Methods:** Quantitative and qualitative **Design:** Concurrent ***Study question*** "This study incorporates remote sensing for mapping change but also integrates […] institutional data to interpret the forest change trends[.] The study focuses on a major section of the county of La Campa, [Honduras]. La Campa has traditionally left forests under communal management, but pressures for privatization have led to the creation of private forests on more accessible portions of communal lands."	**RNR:** forest **No**: 113 households **Ethnicity**: nr **Gender mix**: nr **Poverty**: nr **Reliance on RNR**: High. "Timber represents the most important natural resource [in the region]." "Households depend heavily on firewood from communal forests for cooking." **Country**: Honduras **Region**: Latin America **Income category**: LM	Rights not reported in detail. Exceptions are: (1) evidence of **management rights** in the report of effectiveness of a logging ban instituted by the county since1967: **Common ownership** "Illegal logging is not a notable activity given that the communities in the study area monitor forests and sanction all illegal logging." **Private ownership** "People strongly support the logging ban[.] Even private forest owners have complied with the ban." (2) evidence of **withdrawal rights** in the report dependence on forest resources: **Common ownership** "La Campa households depend heavily on firewood from communal forests for cooking. Some private forest owners gather firewood from communal forests to reduce exploitation of their own land. Households also use forests to graze livestock, harvest timber for construction and fences, and collect mushrooms and medicinal plants (Tucker 1996)"	**SUSTAINABLE USE** **Forest cover** # "Communal forests involve larger areas and on average present smaller dbh and shorter trees." # "Private forests cover a smaller area, but on average they present greater tree species diversity, larger tree dbh, and greater tree height." # "The 1997 forest fieldwork, designed to collect comparable data in private and communal forests, did not find these differences to be statistically significant (Tucker 1999)" ---------- Change in forest cover 1987-1996* ---------- Cover type : Private / communal ---------- deforested: 9% / 5.5% reforested 12.5% / 13% ---------- * values not reported in the text. Estimated from chart. **Forest characteristics** ---------- Indicator: Private / Communal ---------- Total estimated area of forests in study area (ha): 25.2 / 812.5 Total plots sampled: 21 / 58 Mean tree dbh (cm): 17.7 / 15.6 Mean tree height (m): 11.3 / 10.0 Projected tree species/ha: 11.1/ 9.3 Projected tree stems/ha: 376 / 472 ----------

Study & methodology	Population & Setting	Access conditions	Reported results
Sultana and Thompson, 2007 **Methods:** Quantitative and qualitative **Design:** Concurrent ***Study question*** "In this paper we examine the extent that community-based management has changed the livelihoods of fishers in three Bangladeshi fisheries that differ in their physical–biological, social, and property rights characteristics."	**RNR:** fisheries **No**: 2,466 households (open access), 1,337 households (controlled access) **Ethnicity**: nr **Gender mix**: nr **Poverty**: "Income and human poverty indicators some 35–47% of the population were poor in 2000 (GPRB, 2005). The incidence of poverty in households dependent on natural resources is much higher than the overall national average. (BBS, 2002)." **Reliance on RNR**: Moderate to high. Proportion of household which fish for income in the study sites: 17% (open access), 15-32% (controlled access) **Country**: Bangladesh **Region**: South Asia **Income category**: Low	"**Open access**" Leased area, mixed regime common ownership and open access (Ashurar Beel, AB) # **Withdrawal rights:** "Permanent fish sanctuary of 8 ha, closed season, gear restrictions, no private fish aggregating device" # **Management rights:** Village management committee set rules by consensus # **Exclusion rights:** "Subsistence fishing by non-members permitted." # **Alienation rights:** not reported **Controlled access** (1) Lease area *, common ownership (Hamil Beel, HB) (2) private area, mixed regime common and private ownership. (Goakhola Hatiara Beel, GB) **# Withdrawal rights** HB: Stock carp, closed season, GB: "No fishing in winter in sanctuary ditches (kuas), closed season" **# Management rights** HB and GB: village management committee set rules by consensus **# Exclusion rights** HB: Exclude non-members, but "participants allow some of their poor neighbors to fish for food, but not during the closed season" GB: as in AB **# Alienation rights** not reported	**SUSTAINABLE USE** **# Changes in catch and CPUE:** overall trend is decline in AB and increase in GB. --- Year: % change in catch – Catch survey // Household survey [AB || GB] --- 1999: 16 // 39 || −3 // 43 2000:−17 // −49 || 16 // 0 2001: −34 // −22 || 160 // −47* --- *GB: the direction of change is reversed between the two surveys. One reason is that the household survey data [did not cover the very large catch reported in the last 4 months of 2001]." --- Year: Catch per unit of effort (kg/gear/day) [AB || GB] --- 1997: 2.6 || 2.1 1998: 3.0 || 3.4 1999: 2.7 || 2.1 2000: 1.9 || 2.5 2001: 1.6 || 5.0 --- **PRO-POORNESS** **# Fish consumption** (kg/household/month, average**) AB: ~3kg || HB: ~3kg // GB: ~6-8kg*** **data not reported in the text. Estimated from chart. *** Higher fish consumption in GB: "reflects the food preferences of this Hindu community, the access for all to catch fish for subsistence, improved management, and availability of farmed fish" **# Inequality – local elite capture:** AB – "Low. Resource too dispersed and large to easily control"; HB - "High, Resource is profitable, but fishers have maintained exclusive rights for many years; GB - "Low. Resource is not concentrated or highly profitable".

Study & methodology	Population & Setting	Access conditions	Reported results
Thomas, 1996 **Methods:** Qualitative **Design:** Concurrent **Validity**: moderate risk Study question "the paper seeks an answer to the question as to why different property regimes are found in different places."	**RNR:** fisheries **No**: 27 villages, 15-40 fishermen **Ethnicity**: Bede (majority), Hausa, Mangawa and Fulani. (p. 294) **Gender mix**: nr **Poverty**: nr **Reliance on RNR**: High. "for many villages fishing is still the most important activity, particularly in terms of cash incomes." **Country**: Nigeria **Region**: Africa **Income category**: LM	**Common ownership** # **Withdrawal rights**: one-week long "seasons" applied in some lakes # **Management rights:** Village head issues informal permits. Also collects a fee in kind (one third of the catch) of all fishers, and distribute or sell it for the community. Fee in cash is collected in some lakes, part for local authority part for a community fund. # **Exclusion rights:** Fishers from villages "under the [same] jurisdiction" may have access ("be invited"). # **Alienation rights:** not reported **Open access: Effective during the height of the floods** # **Withdrawal rights:** limit only on basket traps targeting migratory fish. # **Management rights:** Open access ceases "as soon as […] a water body loses its connections with the floodplain or river ." **Private ownership** (3 sites) # **Withdrawal rights:** site and gear related - (1) basket traps targeting migratory fish., (2) bank fish traps (3) specific day/gear combinations determined by settlers. # **Management rights:** (1) managed by Bede fishers (2)fishing is done in farmland, farmer manages permissions. (3) original settler determines season and charge fees in cash. # **Exclusion rights:** (1) Bede hold exclusive rights based on customs. (2) (3) farmer and settlers hold exclusive rights. # **Alienation rights:** (1) rights may be transferred as loans or rented and sold (rare). Results in excluding migrants from ownership. (2) not transferable.	**PRO-POORNESS** **Common ownership and Open access** - Adaptation to risk # "Mobility and resource sharing is now necessary for the survival of families dependent on fishing for their livelihoods in most years (not just drought years) as there are now very few villages that have a year-round fishery within their territory." **Common ownership and Open access** - Equity The common ownership rules allow for migrants to fish so long as they pay a tariff (which supports those who cannot fish and a community fund), all those using fishing rights pay such a tariff to support the community, this acts as an insurance policy so that in difficult years all those wishing to fish can do so in other areas if their own are not available – works to redistribute resources through the community and ensure survival in poor years. "Setting a time for community fishing rather than allowing individuals to fish as and when they please (open access) allows everyone an opportunity to benefit from a resource that is not just more restricted geographically, but which can potentially provide "rich pickings" with very little effort." "The practice of collecting revenue from fishermen and distributing it amongst nonfisher folk in the community reflects a widely-held opinion that the ponds belong to the community and that their benefits should extend beyond the people who fish them." "Fishermen from […] from outside the floodplain, may come to fish. In all the villages in the survey, fishermen said that provided seasonal immigrant abided by village rules, they would not be refused permission o fish [.]"

Study & methodology	Population & Setting	Access conditions	Reported results
Tucker, 1999 **Methods:** Quantitative and Qualitative **Design:** Concurrent ***Study question*** "This study presents a comparison [of the the relative merits of private versus common property arrangements] within a Honduran municipio (similar to a county) where private and common property forests lie adjacent to each other, and the residents depend on forests for Žrewood and other resources."	**RNR:** forest **No**: 30 households **Ethnicity**: Descendants of Lenca Indians **Gender mix**: nr **Poverty**: nr **Reliance on RNR**: Moderate to High. Forest land is appropriated for agricultural use – most depend on it for subsistence. Standing forest still key resource: "Potters require large quantities of dry pinewood to temper their wares; they depend on common property forests for their supply. Income from pottery sales helps women to pay for children's school fees, health care, and supplemental food supplies." **Country**: Honduras **Region**: Latin America **Income category**: LM	**Common ownership** # **Withdrawal rights** County residents have right to harvest forest for household consumption or for sale for other residents. Since 1987: Ban on logging, resin tapping, and sales of forest products outside the county - Specific permission for pine logging, with fees paid to community; chainsaws not allowed. # **Management rights**: not reported # **Exclusion rights:** Access to county residents only. # **Alienation rights**: rights can be sold and inherited. **Private ownership** # **Withdrawal rights:** Extraction of timber and sales outside the county are allowed. No restrictions on pine loggin; chainsaws allowed. # **Management rights:** Usually single owner, but rights shared by household members. # **Exclusion rights:** Owners only, but limited access is possible. # **Alienation rights:** transfer possible, tendency is to rights to remain with household members (p. 214-218)	**SUSTAINABLE USE** **# Forest characteristics** Mean values per type of tenure* --- Indicator: Common (n=20) / Private (n=21) / t-test p value --- Saplings per plot (2.5–10 cm DBH): 1.0 / 2.8 / 0.094 Basal area (all species, DBH 10 cm): 9.8 / 13.9 / 0.096 Distance from nearest road: 1532 / 747 / 0.000 Distance from nearest house: 1371 / 968 / 0.082 --- *Only indicators where there is statistically significant differences at p<0.10 or smaller. **# Soil depth and composition** <u>No significant differences between tenure types</u>. Except for pH and magnesium. Magnesium was more concentrated in the private forest soils, and common forest soils were more alkaline (pH>5.0)" (Mg p=0.020; pH p=0.018, both Mann-Whitney test). " The effects of forest Žfires may be a factor."(p.212) **# Fire damage** **Common ownership:** in 90% of plots surveyed "People who grazed livestock in common forests reported that fires resulted in better grass cover[.]" **Private ownership:** in 50% of plots surveyed "All of the private owners reported that they had taken measures, such as clearing fire lanes, to prevent the spread of forest fires ontotheir land"

Study & methodology	Population & Setting	Access conditions	Reported results

Tucker et al., 2007
 	
Methods:
Quantitative and Qualitative
 	
Design:
Concurrent
 	
Study question
 	
"[We] examine the interrelationships and associations among biophysical characteristics, forest conditions, and institutional arrangements. We first explore relationships among underlying biophysical factors and forest conditions. Then we evaluate whether stronger institutional arrangements relate to certain biophysical factors and overall better forest conditions. Subsequently we investigate associations among property rights, institutional strength, and biophysical factors."
	RNR: forest
	
	No: 30 households
	
	Ethnicity: Guatemala: predominant group was ladinos, includes indigenous ancestry of the Ch'orti' Mayan group.
	Honduras: Lenca Indian descent.
	
	Gender mix: nr
	
	Poverty: nr
	
	Reliance on RNR: High. Extraction of firewood and timber, and use of pasture for livestock.
	
	Country: Honduras and Guatemala
	
	Region: Latin America
	
	Income category: LM
		Common ownership (6 sites)
		C1: Las Cebollas Community Forest
		C2: Las Cebollas Protective Reserve
		C3: Tesoro Community Forest
		S: La Campa Communal Forest
		Coop: Resin Tappers' Zone
		C4: Nueva Esperanzita
		
		# **Withdrawal rights**
		C1 extraction of firewood and timber, and use of pasture for livestock. C2: no timber extraction, hunting allowed. Fires banned. C3: coffee, livestock,,firewood and timber for local use. S: firewood and timber for local use only, pasture. Coop: resin, pasture for livestock, firewood. C4: livestock and firewood (no logging)
		# **Management rights**
		C1: Indigenous community has the right to develop a management plan (not implemented). C2: residents carry out monitoring and enforcement of rules. C3: monitoring by residents. S: local authority issues permits and charge fees for access. Monitoring by residents (unclear). Coop: external management plan. C4: residents enforce rules, fines charged from outsiders.
		# Exclusion rights: Access to residents only
		# **Alienation rights:** not reported
		
		Continues overleaf
			SUSTAINABLE USE
			
			Comparison of property rights and forest conditions
			--- 	
			Indicator: Private mean (SE; n) // Common mean (SE; n) // Significance*
			--- 	
			Institutional strength: 8.57 (0.083; 98) // 4.26 (0.192; 132) // 0.000
			Elevation (m): 1,117 (20.47; 98) // 1,279 (22.84; 132) // 0.000
			Erosion proportion: 0.011 (0.002; 98) // 0.3047 (.0176; 132) // 0.000
			Livestock proportion: 0.3055 (0.036; 98) // 0.5147 (0.023; 132) // 0.000
			Forest condition index: 2.27 (0.028; 98) // 1.72 (0.045; 132) // 0.000
			--- 	
			
			No significant difference found between private and common regarding Carbon, Nitrogen and Phosphorus concentration in the forest soil.
			
			*SE: standard error, Significance: p value for t-test
			
			Institutional strength **see overleaf*
			<u># Common ownership</u>
			Strong: C2
			Intermediate: C3, C4
			Weak: C1, S, Coop
			
			<u># Private ownership</u>: All sites ranked as "Strong": P1, P2, P3
			
			Forest conditions
			<u># Private ownership</u>:
			Good: P1, P2
			Somewhat degraded: P3
			
			<u># Common ownership:</u>
			Very Good : C2
			Good: C3
			Somewhat degraded: C1, C4
			Degraded: S, Coop

Study & methodology	Population & Setting	Access conditions	Reported results
		Tucker et al., 2007 (Continued) **Private ownership** (3 sites) P1: Finca San José P2: Finca Tachoche P3: La Campa Private Forests # **Withdrawal rights:** P1: coffee, livestock, and timber “in limited quantities”. P2: coffee and timber P3: primarily livestock **# Management rights:** P1 and P2: Monitoring done by employees and owners (P2 includes armed guards). P3: monitoring by owners. local authority rules ban timber sales. # **Exclusion rights:** P1: Use limited to owners, but employees and nearby residents allowed to collect firewood. P2: access to owners only, strictly enforced. # **Alienation rights:** implied in the long duration of regime in each site.	* Categories based on index calculation. Institutional strength rank: Recognition of rights (0=Minimal, 1=Some, 2=High); Demarcation of boundaries (0=No, 1=Incomplete, 2=Complete); Rules limit harvesting (0=No, 1=Yes); Effective monitoring (0=None-Rare, 1=Intermittent, 2=Consistent); Rule enforcement (0=None–Rare, 1=Intermittent, 2=Consistent). Sites were ranked according to the sum of values in each criteria: Strong (7–9), Intermediate (4–6) and Weak (1–3).

Study & methodology	Population & Setting	Access conditions	Reported results
Turyahabwe et al., 2008 **Methods:** Quantitative and qualitative **Design:** Concurrent ***Study question*** **"**the objective of this study is to assess the effect of forest tenure and associated physical, socioeconomic and institutional factors on the effectiveness of National Forest Authority (NFA), local governments and the private sector to regulate forest resource use and maintain the condition of forests[.]"	**RNR**: forest **No**: 4792 (total population in the 4 sites under common and state ownership); 610 (total population in the 2 sites under private ownership) **Ethnicity**: NR **Gender mix**: NR **Poverty**: NR **Reliance on RNR**: High. Community dependent on timber and NTFP. **Country**: Uganda **Region**: Africa **Income category**: Low	**Open access** Forest under local (L) and central (C) government authority, but conditions are *de facto* open access. **# Withdrawal rights**: No timber logging legally allowed, NTFP use allowed # **Management rights**: Local government (L) or Central government (C) have full management rights. # **Exclusion rights**: no access legally allowed. # **Alienation rights**: not reported **Private ownership** # Withdrawal rights: not reported # **Management rights**: decisions made at family-level; extraction requires permission by District Forest Officers. Family members and paid "informers" monitor the forest # Exclusion rights and Alienation rights: not reported	**SUSTAINABLE USE** **Forest condition** Indicator: Private // Open access (L) // Open access (C) // p value* --- seedling stem density per ha:43,709 // 28,225 // 27,461 // 0.000 tree dbh per plt (cm): 25.00 // 21.71 // 19.95 // 0.000 Tree basal area (m2 per ha): 24.304 // 16.00 // 16.65 // 0.003 --- *ANOVA (!) No statistically significant differences found for sapling and tree stem density, sapling dbh per plot **Tree abundance and distribution:** number of species Open access (L): 94 Open access (C):130 Private: 89

Study & methodology	Population & Setting	Access conditions	Reported results
Yang et al., 2009 **Methods:** Quantitative **Design:** Concurrent ***Study question*** The study has 3 key questions: "(1) What variations in management strategy exist? (2) Under what conditions are certain management strategies developed, and which factors shape the development of different strategies? and (3) What are the outcomes of each management strategy?**"**	**RNR:** forest **No**: 65 households, 8 communities **Ethnicity**: 5 communities Tibetan agro-pastoralists; 1 community Naxi and 2 communities Han Chinese (mainly agriculturalists) and Yi.. **Gender mix**: nr **Poverty**: nr **Reliance on RNR**: High. "In Yunnan province [broad study site location] income from matsutake generates more revenue than all other agricultural exports and NTFPs, amounting to US$44 million of matsutake exports in 2005 (Yang et al. 2008)." **Country**: China **Region**: East Asia **Income category**: LM	**Common ownership** # **Withdrawal rights**: rules on time and methods of extraction, site-specific. # **Management rights**: Community-based decisions on management practices, including monitoring and enforcement, with external support. # **Exclusion rights**: Outsiders excluded (more common), but also access to non-residents allowed by lease of rights, or even open access conditiosn (unusual) # **Alienation rights**: Lease of rights possible, but no usual. **Private ownership** (2 site-specific regimes) # **Withdrawal rights:** (1) and (2): rights to forests and matsutake collection. # **Management rights:** (1) decisions and actions taken by household owners. (2) village committee determines plot location and size and leases the harvesting rights. # **Exclusion rights:** (1) access limited to hh owners (village residents). (2) both hh residents and non-resident contractors. # **Alienation rights**: (1) only individual hh hold the right of access and extraction, and (2) rights can be leased to individual hh, groups of hh or outsiders.	**SUSTAINABLE USE** **Common ownership -** lower income per capita – even with high yields. **Private ownership -** higher income per capita. *with weak enforcement* ---------- NTFP Harvesting/capita/year (kg)*: common (1) 30, (2) 21.1, (3) 3.9, (4) 2.8 ---------- NTFP income/capita/year (Yuan*): common (1) 1490, (2) 1480, (3) 572, (4) 738 ---------- ---------- *with strong enforcement* ---------- NTFP Harvesting/capita/year (kg)*: common (5) 22.2, (6) 2.8 || private (7) 20, (8) 6.7 ---------- NTFP income/capita/year (Yuan)*: common (5) 829, (6) 422 || private (7) 3300, (8) 2796 ---------- # all differences statistically significant p<0.05, Chi-square test. **Common ownership** - Lower quality mushroom**: small proportion of high-grade matsutake (median = ~18-20%) and large proportion of "baby" size (median = ~30%) **Private ownership** - Higher quality mushroom*: large,proportion of high-grade matsutake (median = ~50% and smaller proportion of "baby" size (median = ~8%) **Common ownership -** Fewer pickers per family (median = ~2-3) worked longer hours (median = ~9-11 hours per day). **Private ownership -** More pickers per family (median = 4, minimum 3) worked fewer hours (median = 5 hours per day, minimum =~7). * values for all 8 study sites - site number as in original text between brackets. **Median values not reported in the text, estimated from chart.