

## Forests, Governance, and Sustainability: Common Property Theory and its Contributions

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**Abstract:** It would be no exaggeration to say that the study of forests as commons has been central to the development of scholarship on common property. Equally certainly, the interest in forests has generated a vast corpus of research outside the field of common property. The magnitude, variety, and depth of this body of research is an accurate reflection of the many different ways in which forests have been and continue to be central to human survival, livelihoods, and prosperity.

This paper reviews some of the central concerns and findings of writings on forests as they related to the theoretical ambitions of commons scholars, and to efforts to govern forests more sustainably and equitably. The review is especially important in the context of unfolding efforts to govern forests in new ways over the past two decades. But as important as the review is an assessment of the achievements of this literature, existing blind-spots, and potential new areas of exciting research and investigation. The review suggests specific areas in relation to methods, data, and theories of common property that will advance the field further.

### 1. Introduction

The study of forests as commons has been one of the central sources of stimulus to the development of scholarship on common property. Not only did some of the earliest contributions to the study of commons focus on forests,<sup>1</sup> the fact that forests

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<sup>1</sup> See, as examples, contributions in several edited volumes in the late 1980s and early 1990s that focused on forests (Berkes 1989, McCay and Acheson 1987, NRC 1986). Singh 1986 and Stanley 1991 are some other early contributions.

yield multiple products over which diverse stakeholders assert competing claims means that addressing governance problems in forests can be especially instructive for social-theoretical advancement (Jessup and Peluso 1986). Of course, intellectual traffic has proceeded in both directions. If scholars of common property have gained theoretically by examining how forests can be governed effectively, they have also offered much to those interested in forest governance (Arnold and Stewart 1991; Fernandes et al. 1988; Gibson et al. 2000; Peluso 1992; Sivaramkrishnan 1999).

In consonance with much research on other types of common-pool resources, scholars of forest-based commons also focus primarily on how variations in institutional arrangements shape resource-related outcomes. Some of their signal contributions to the work on commons, and to an understanding of collective action more generally, have concerned principles of institutional design (Ostrom 1999), the need for fit between institutions and their political-ecological context (Dietz et al. 2003; Ribot 1999), the nature of institutional mediation (Agrawal and Yadama 1997), the importance of local enforcement (Agrawal 2005; Gibson et al. 2005), possibilities of social resistance (Guha 1989; Peluso 1992), the necessity of broad-based participation in institutionalized governance (Ribot 2002), the relationship between indigenous peoples and forests (Rangan and Lane 2001), and the role of local variation in shaping resource-related outcomes (Agrawal and Chhatre 2006). Collectively, these contributions also constitute a remarkable step toward improving our understanding of how resources can be governed better.

In the next section, this paper outlines the domain of the research on forest-based commons by examining how ownership rights in relation to forests are broadly distributed in different parts of the world. Section three surveys some of the central concerns and findings of writings on the commons as they relate to forests. It examines theoretical and empirical contributions by keeping in mind that much of the research on forest-based commons contributes directly to an understanding of policy concerns related to forest governance. Examining the contributions of the research on forest-based commons helps identify the importance of property rights arrangements, local levels of use and management, and communal relationships that often frame local governance. Section four examines gaps related to data, theory, and methods in the study of forest-based commons. The conclusion outlines some pressing and exciting new areas for future research.

This paper is generally concerned with reviewing the commons literature that focuses on forests. In consequence, it pays relatively limited attention to scholarship that is neither about the commons, or which does not concern forests. Further, because the review is selective rather than scientifically exhaustive, it necessarily presents a selective picture of the research with which it is concerned, as indeed do all reviews.

## 2. Forests and common property

At some four billion hectares, forests cover nearly 30 percent of the global land area according to official statistics (FAO 2005). However, the total area of forests continues to decline. According to the most recent Global Forest Resources Assessment 13 million hectares of forests are being lost annually. But the rate of decline has slowed in more recent years (FAO 2005, p. xii). The only major region of the world with a net gain in forest area during the period 2000-05 is Asia (*ibid.*, p. xv). Most of the world's forests are owned by governments. But private and other forms of ownership are increasing, and governments often set aside areas for use by communities.

The importance of forests in relation to two of the most important global environmental threats – climate change, and biodiversity loss – is hard to overstate. They have long been recognized as the reservoir and source of much of the species biodiversity on the planet (Wilson 1988). They also store more carbon than does the atmosphere with 283 gigatonnes (Gt) in biomass alone. These statistics about forests are important to convey their immense significance for the survival of humanity as a species. But it is other benefits from forests that have been of greater interest to common property scholars – the immediate relevance of forests to the livelihoods of hundreds of millions of rural residents.<sup>2</sup> Forests play a significant role in the livelihoods of the rural poor in the context of competing claims from multiple parties. Institutional solutions to competing claims are always complex because of the simultaneous importance of forests for global conservation and local livelihoods. Such solutions are also provisional and subject to ongoing revisions as a result of demographic shifts, developmental processes, changes in landscapes, and political alliances among other variables. As Dietz et al. (2003, p. 1907) remark, ‘Successful commons governance requires that rules evolve’. The fascinating institutional interplay related to socio-ecological complexity and contextual change has helped generate a vast corpus of research on forests, both within and outside the field of common property.<sup>3</sup> The size, variety, and depth of this body of research is a reasonable reflection of the many different ways in which forests have been, and continue to be, central to human survival, livelihoods, and prosperity.

Table 1 lists the estimated area under major forms of tenure for the 30 countries in the developing world with the highest forest cover (Africa, Asia, and Latin America) and an additional six developed world nations with large areas under

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<sup>2</sup> Lynch and Talbott (1995) suggest that 447 million people may depend on forests in India, Indonesia, Nepal, the Philippines, Sri Lanka, and Thailand alone. White and Martin 2002 estimate a number closer to 500 million for the world. The World Resources Institute suggests that the figure may be about 350 million people for the world (WRI 2002). In contrast, the WWF-UK estimates the total number of forest-dependent people to be close to 1.2 billion (WWF 2002: 2).

<sup>3</sup> It is worth remembering in this context that most schools of environment at American universities today started out as schools of forestry for those interested in forest management.

forest cover (FAO 2005, White and Martin 2002). Collectively, these countries represent more than 80 percent of officially stated forests. Because the areas listed for different countries draw from official statistics between the years 2000 and 2005, the figures in table 1 are at best approximations – indeed, there are no accurate numbers in existence. The table indicates that a nontrivial area of forests is either under collective management through community-level institutions, or claimed as being owned by community-level actors.

*Table 1: Ownership of Forest and Other Wooded Lands (2000/2005, in millions of hectares)*

Country name	Public		Private		Total
	Government administered	Community administered	Community/ Indigenous	Individual/ Firm	
<b>Africa</b>					
Angola#	59.7	0	0	0	59.7
Botswana#	33.4	3.0	8.4	2.3	47.2
Cameroon#	37.1	0	0	0	37.1
C. African R.#	33.0	0	0	0	33.0
DR Congo#	218.1	0	0	0	218.1
Gabon#	21.8	0	0	0	21.8
Mali#	29.5	0	0	0	29.5
Mozambique#	60.9	0	0	0	60.9
Nigeria#	20.0	0	0	0	20.0
South Africa#	24.0	0	0	7.5	31.5
Sudan*	40.6	0.8	0	0	41.4
Tanzania*	47.9	0.4	0	0	48.3
Zambia#	44.7	0	3.5	0	48.2
Total	670.8	4.2	11.9	9.8	696.7
<b>Asia</b>					
China*	58.2	0	70.3	0	128.5
India*	53.6	11.6	0	5.2	70.4
Indonesia#	97.8	0	0	0	97.8
Lao PDR#	20.5	0	0	0	20.5
Malaysia#	20.1	1.4	0	0	21.5
Myanmar#	45.1	0	0	0	45.1
PNG#	1.1	2.1	31.3	0	34.5
Total	296.4	15.1	101.4	5.2	418.5
<b>Latin America</b>					
Argentina#,*	71.5	0	0	22.2	93.7
Bolivia*	28.2	16.6	2.8	5.4	53.0
Brazil*	423.7	74.5	0	57.3	555.5

Chile#	7.4	0	0.6	21.6	29.6
Colombia#,*	54.6	0	24.5	0	79.1
Guyana#	12.3	5	1.8	0	19.1
Mexico#	44.2	27	14.5	0	85.7
Paraguay#	19.4	0	0	0	19.4
Peru#,*	59.8	8.4	22.5	0	90.7
Venezuela#	56.5	0	0	0	56.5
Total	777.6	106.5	66.7	106.5	1057.3
<b>Developed Countries</b>					
Australia#	118.5	1.5	0	44.6	164.6
Canada*	388.9	1.4	0	27.2	417.5
Japan*	10.5	0	0	14.6	25.1
Russian Fed.*	809.3	0	0	0	809.3
Sweden*	6.1	0	0	24.1	30.2
United States*	110.0	17.1	0	164.1	291.2
Total developed	1443.3	20.0	0	344.6	1737.9
Total developing	1744.8	125.8	180.0	121.5	2172.1
Total	3188.1	145.8	180.0	466.1	3910.0
Notes: # refers to FAO 2005, and * refers to White and Martin (2002).					

Before assessing the implications of the numbers in the table, a few qualifying statements are necessary. The figures almost certainly understate the area of land under communal arrangements. In several countries where the official statistics report the absence of any forest land under communal management of control – such as Cameroon, Mali, South Africa, Tanzania, and Zambia in Africa, and Indonesia and Lao PDR in Asia – we know that communities have at least the informal rights to administer significant areas of forests (Wily 2001). Case study evidence from these and other African countries demonstrates the presence of community-based governance in forests even if official agencies report a different story to international organizations. The data also conceals the story of logging concessions that many countries have given to private corporations. Again, case study evidence and national level reports from Cameroon, Central African Republic, Democratic Republic of Congo, Gabon, Indonesia, and Myanmar show the significant levels of logging being carried out in forests nominally under government control.<sup>4</sup> The numbers in the table under represent the impact of private/corporate and community-level actors in forests in the listed countries.

Despite potential inaccuracies, the figures also tell their own story. Even a cursory examination makes it clear that common property arrangements are far

<sup>4</sup> See White and Martin (2002, p. 9). Global Forest Watch has produced a number of reports making essentially the same point – see <http://www.globalforestwatch.org/english/about/publications.htm>, accessed on June 12, 2006.

more common, so to speak, in the developing rather than the developed world. The greater prevalence of forest commons in the developing world explains in part the geographic focus of much of the literature on forest-based commons (Haenn 2006; Maskey et al. 2006; Pagdee et al. 2006). When the proportion of forest area under the control of different actors is compared, government agencies own most of the world's forests: nearly 82 percent. Private and communal/indigenous tenure covers 11.9 and 8.3 percent respectively. But in the developing world, the position of communal and indigenous actors is far stronger. Private actors possess only about 5.6 percent in contrast to the 14.1 percent of forests characterized by communal tenure. But since half a billion people or more may be dependent on forests for their livelihoods, the total area communities own and control seems quite low. Ongoing trends in favor of greater access and control over forests by local communities are therefore a welcome step.

Table 2 presents information to show how claims and tenurial rights over forests have been changing since the 1990s.<sup>5</sup> Additionally, the set of countries for which information could be collected is smaller than that in table 1. Therefore, the area currently under community governance through legislation passed in the past two decades is likely higher than reported in the table.

*Table 2: Area of forests recognized as being under Community Management in the Developing World since 1985 and Major Reforms toward Decentralized Tenure*

Country	Area in Million Hectares		Year of Reform	Nature of Legal Reform
	Community Administration	Community Ownership		
Bolivia	16.6	2.8	1996	Ancestral rights of community groups have precedence over concessions; municipal governments gain control over forest lands; Indigenous groups have reserves over which they exercise governance rights.
Brazil	74.5	0.0	1988	Ancestral rights of indigenous groups and communities recognized
Colombia	0.0	24.5	1991	Framework for collective territorial rights of indigenous groups and Afro-Colombians

<sup>5</sup> The information in table 2 has been collected from several different sources, and therefore the numbers may not be strictly comparable across countries.

India	11.6	–	1989	Joint Forest Management with state forest agencies recognizing community governance
Indonesia	0.6	N/A	2000	Regulatory process for customary ownership and community concessions
Mozambique	?	N/A	1997	Titles for customary tenure available
Nepal	1.2	N/A	1996	Community forestry legislation to recognize governance rights
Philippines	N/A	N/A	1997	Constitution protects ancestral domain rights, 1997 Act recognizes indigenous tenure
Peru	8.4	22.5	1999	Rights of communities recognized by law
Sudan	0.8	N/A	N/A	
Tanzania	0.4	N/A	1999	Customary tenure available and protected
Uganda			2000	2000 draft under revision, strong program to promote devolution
Zambia			1995	Customary tenure recognized but titles not available
Total	114.1	49.8		
In addition, the following countries either have plans to recognize community rights to administer or manage forests, or already do so at least on paper: Botswana, Cameroon, CAR, Mali, Kenya, Senegal, Nigeria, Guatemala, Guyana, Mexico, Paraguay, Venezuela, Bhutan, Lao PDR, Malaysia, and Thailand.				
Sources: Agrawal (2004), ITTO 2005, White and Martin (2002), Wily (2001).				

The figures in the table show that the area of forests governed through common property institutions has increased substantially in the past two decades. Much of this shift has occurred because of new legislation and policy initiatives. Even if the potential area transferred to community-level management actions in the countries listed at the bottom of the table is just a few hundred thousand hectares per country, the total area transferred to a community tenure regime in the past 20 years may be as much as 200 million hectares (White and Martin 2002; ITTO 2005). The increasing area under community-oriented tenure regimes can be seen as an implicit admission by national or provincial level decision makers that local community actors can govern their resources quite effectively when they have the opportunity to do so.

Much of this increase in community control over forests should be viewed as part of a process of decentralization by national governments (Andersson et al. 2006; Brooks et al. 2006; Klepesis 2003; McCarthy 2004). Strictly speaking, what is being observed is less an increase in pure community ownership, rather more a spread of a new form of commons that is all about co-governance arrangements in which country governments are under pressure from a number of sources to extend rights to govern natural resources to a larger number of actors (Nygren 2005; Lemos and Agrawal 2006; Wittman and Geisler 2005). These pressures include increasing fiscal deficits, aid from international donors that is tied to some involvement of local actors, pressures from communities and indigenous groups for greater control over their lands, and some evidence that local actors have the capacity to protect and use forest resources sustainably and at lower costs than government agencies. The continuing increase in forest area controlled by local actors significantly increases the relevance of scholarly approaches that focus on institutional arrangements to shape user incentives and actions.

At the same time, it also exposes the limited attention scholars of forest commons have paid to other forms of property through which forests are managed. Variations in forms of governance in vast areas of forest land under state control have attracted little interest from commons scholars, even if they recognize that these forests are an important source of livelihood to the poor (but see Bray et al. 2004; Fearnside 2003; Jepson et al. 2001; Nepstad et al. 2002). In many cases, those writing about such forms of governance do not consider themselves as writing about the commons.

Scholarship on forest commons has certainly in some instances examined how commons perform relative to other institutional arrangements in accomplishing desired social goals such as conservation, sustainability, and improvements in resource condition (Agrawal 1996; Arnold 1998; Netting 1976; Somanathan et al. 2005). Other scholars have pointed to the interdependence of different forms of property rights and institutional arrangements and thus implicitly questioned whether the terms private, common, and state denote distinct domains of governance or complementary systems that interpenetrate and are therefore better regarded as mixed forms (Antinori and Bray 2005; Bray et al. 2006; Grafton 2000). However, further comparative research pitting different systems of governance, and thereby attempting to identify their specific strengths under specific circumstances, would certainly be welcomed by scholars of forest commons.

### 3. Theoretical and policy contributions

In a very real sense, much of the theoretical work on common property related to forests has simultaneous and direct policy relevance. Therefore, instead of examining the theoretical and policy contributions of the scholarship on forest-based commons separately, this section focuses on the different groups of causal variables that shape the impact on forest conditions. To do so, it draws from Agrawal



(2001b) who surveys the scholarship on common property theory and identifies four clusters of variables that are relevant to successful governance of the commons: the characteristics of the resource system, the user group, the institutional arrangements, and the external environment.

This relatively general set of categories has been used in other analyses of forest governance and its relationship to forest conditions as well.<sup>6</sup> Essentially, any empirical effort to examine how governance-related variables (institutional arrangements) affect forest conditions must simultaneously take into account other potential factors that also have an influence over forest condition. These factors are conveniently classified into sociopolitical and economic variables (represented by ‘user group’), biophysical, and edaphic factors (represented by the cluster of variables classified as ‘resource system’ characteristics), and demographic, market, macropolitical, and other contextual factors (represented by the category of factors termed ‘external environment’).

In addition, the paper supplements the cluster of variables used by Agrawal (2001b) with insights from the comprehensive contribution of Dietz et al. (2003) on adaptive governance. They posit seven distinct requirements of adaptive governance in complex systems such as forest-based commons: availability of necessary information, ability to deal with conflict, compliance with rules, provision of technical, institutional, and physical infrastructure, and ability to adapt and change. These requirements, when interpreted in light of concrete empirical contexts, translate into a far larger number of variables – evident in the ensuing discussion that attempts to apply them to the literature on forest-based commons, especially when discussing institutional arrangements.

### 3.1. Characteristics of the resource system

Characteristics of a forest resource system fall under a broad set of biophysical variables.<sup>7</sup> They are the set of boundary conditions within which humanly devised rules of the game must be situated. Some of the most commonly cited resource characteristics relevant to effective governance of forest commons are size of the resource system, its boundaries, whether the resource is mobile, the extent to which resource units can be stored, rate and predictability of flow of benefits from

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<sup>6</sup> See, for example, the cross-country research effort through the International Forest Resources and Institutions Program, currently coordinated by the Workshop in Political Theory and Policy Analysis at Indiana University and the School of Natural Resources and Environment at the University of Michigan. For some research studies based on the IFRI program, see Gibson et al. (2000), and Gibson et al. (2005).

<sup>7</sup> Ostrom (2005) includes biophysical variables as one of the set of structuring conditions in her Institutional Analysis and Development framework. Following Ostrom’s earlier work, a number of commons scholars have also focused on how specific elements of the natural and ecological environment shape the likelihood of successful commons governance. Agrawal and Chhatre (2006) in a recent test of common property theory use a dataset on 95 forest governance institutions from Himachal Pradesh in India to highlight the importance of altitudinal variation in explaining variations in resource conditions.

the resource system, and ease of monitoring resource conditions. Institutional arrangements and technological changes may feasibly help alter some of the above features related to resource systems: size of the forest, its boundaries, and potentially, ease of monitoring. But other characteristics are likely to be either beyond human capacities to alter, or excessively costly to engineer.

Although research on deforestation and changes in forest condition has often paid close attention to the importance of biophysical variables such as soils, topography, fire, and pests (Geist and Lambin 2001, p. 14; Tole 2001), the scholarship on forest-based commons has been less attentive to the importance of such factors. Even when research on forest-based commons includes variables related to the biophysical environment in explaining resource conditions, its focus tends to remain on how property rights or socioeconomic and political variables shape outcomes (Gibson et al. 2002; Tucker 1999, but see Tucker et al. forthcoming 2007). Clearly, far more work to integrate the analysis of causal impact of biophysical, social, and institutional factors remains to be done (Agrawal and Chhahre 2006). Scholars of adaptive management have made important contributions in this regard, and scholars of forest commons can draw on their writings in many respects (Cumming et al. 2006; Janssen et al. 2006; Klooster 2002; Mutimukuru et al. 2006; Reed and McIlveen 2006). An interesting impact of such cross-disciplinary work is likely to be a broadening of the dimensions along which commons scholars assess institutional outcomes. For example, existing research on adaptive systems and complexity takes resilience and robustness of ecosystems as important dimensions along which to evaluate institutional effectiveness whereas scholars of forest commons more often focus on forest conditions, livelihoods, and equity related issues as measures by which to evaluate outcomes (Berkes 2004; Turner et al. 2003).

One biological aspect of forests that has received substantial attention by commons scholars is their ability to yield multiple products, which can often be harvested to yield significant economic benefits for users without having highly adverse effects on the forest itself. Scholars interested in issues of gender equity have discussed how non-wood forest products (NWFPs) are critical for the livelihood portfolios of households in much of the developing world. Those interested in valuation of tropical forests have similarly found that the net present value of a stream of benefits based on NWFPs is often higher than the value from clear felling the forest. A recent report from the FAO (2005) recognizes that NWFPs are one of the most important set of benefits forests provide at a global scale, one that is grossly undervalued. In highlighting the value of multiple benefits from forests, scholars of forest-based commons have thus helped address concerns about equity and livelihoods, as well as sustainable forest management.<sup>8</sup>

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<sup>8</sup> It is worth noting that a number of scholars question the extent to which non-wood forest products can be important in alleviating poverty, and are typically a form of safety net that is relevant mostly for the really poor (Arnold and Ruiz 2001; Neumann and Hirsch 2000; Wunder 2001).

### 3.2. Characteristics of users

In examining user group characteristics, scholars of commons have often used the literature on collective action as their starting point. As a result issues related to the size of the group, whether the boundaries of the group are clearly defined, the nature of heterogeneity among group members, extent of interdependence among them and their dependence on the resource, and whether the group possesses sufficient resources to meet the costs of initiating and maintaining collective action have been crucial variables to examine (Poteete and Ostrom 2004; Ostrom 1999; Agrawal and Goyal 2001). Despite the wealth of work on this set of issues however, the ways in which these variables influence the probability of collective action, and in turn the condition of forests, continues to be contested.

The nature of disputes is clear when one examines the role of group size (Agrawal and Goyal 2001; Ostrom 1999), but especially evident in relation to group heterogeneity. It can fairly be argued that most resources are managed by groups divided along multiple axes, among them ethnicity, gender, religion, wealth, and caste (Agrawal and Gibson 1999). Different dimensions of social versus political versus economic heterogeneity have potentially differing impacts on resource governance (Baland and Platteau 1999, p. 773; Bowles and Gintis 1998: 4). These difficulties in knowing which dimensions of heterogeneity are relevant in a given context and, for what reasons, are compounded by difficulties in generating measures of heterogeneity that capture its many different dimensions and their potentially divergent effects on resource governance outcomes. The divergent conclusions of a large number of empirical studies suggest that similar kinds of group heterogeneities may produce different effects under different circumstances (Adhikari and Lovett 2006; Neupane 2003)

Recognizing the important and unclear effects of heterogeneity on the governance of the commons, Baland and Platteau (1996) provide an initial attempt to classify them into three types: in endowments, interests, and identities. They hypothesize that heterogeneities of endowments have a positive effect on resource management, whereas heterogeneities of identity and interests create obstacles to collective action.<sup>9</sup> However, their effort needs further analysis and discussion. The categories into which they classify heterogeneities are not mutually exclusive. For example, heterogeneities of interests or identities may lead to different types of economic specialization and different levels of endowments, which could in turn lead to mutually beneficial exchange. Nor is it clear that heterogeneities in identities and interests are necessarily obstacles to collective action. Other scholars have distinguished between the role of heterogeneity in assisting the emergence of collective action, but hindering its maintenance. Finally, Poteete and Ostrom (2004) suggest that it is difficult to identify direct relationships between hetero-

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<sup>9</sup> Their point about heterogeneities of endowments enhancing the possibilities of collective action draws from Olson (1965) and Hardin (1982) which provide strong theoretical justifications about why heterogeneous groups with a small number of extremely well off individuals may be able to overcome the problem of collective action if it is in their strong interest to provide a collective good.

geneities and resource governance outcomes because the effects of heterogeneities are mediated by institutions, and relatively little research on the subject has attempted to identify the independent and mediating effects of institutions. Their argument is an important extension of earlier suggestions that institutions mediate the effects of contextual variables such as population, markets, and other socio-economic factors on resource conditions. But despite the increasing amount of work on group level heterogeneities and inequalities, both theoretical and empirical evidence on the subject is highly ambiguous.<sup>10</sup> It is possible to ensure effective resource governance even in groups that have high heterogeneities in interest through coercive enforcement of conservationist rules (Jodha 1986; Peluso 1993, but see also Libecap 1989).

However, the impact of intragroup heterogeneities on distribution of benefits from forests may be more amenable to definition (Adhikari 2005). Significant research on forest-based commons suggests that the economically and politically better-off group members are often likely to gain a larger share of benefits from a resource (Agrawal 2001a). This is not to say that intragroup inequalities are a result of collective action; rather, it is simply to point out that inequalities within a group are not necessarily reduced because group members are willing to cooperate toward a collective goal when there are high levels of existing inequalities.

A related user group characteristic over which there has been significant research concerns poverty. Poverty directly relates to the ability of users to generate the necessary resources and capacity to protect and regulate common pool resources. But precisely what this truism means for the success of institutionalized protection and allocation of resource-based benefits is still not certain. Does poverty lead to a greater reliance on the commons (Jodha 1986) and therefore incentives for their conservation or for higher levels of harvesting and degradation, or do increasing levels of wealth, at least initially, lead to greater degradation of commons? These are questions whose answers are not certain. Similarly, there is at least some divergence of views over whether the poor benefit more from the commons in comparison to those who are better off. However, one major contribution of scholars of forest-based commons on this issue has been to highlight the importance of equity concerns and poverty issues in the regulation and use of commons.

In summary, whether the relationship between different measures of successful governance of forest commons, and group characteristics such as size, heterogeneity, interdependence, dependence on forests, and poverty is negative, positive, or curvilinear seems subject to a range of other contextual and mediating factors, not all of which are clearly understood (Agrawal 2001b). Broadly speak-

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<sup>10</sup> As illustration, see Baland and Platteau (1999), Engel et al. (2006), Kanbur (1992), McPeak (2003), and Quiggin (1993) for conflicting assessments based on theoretical modeling, and Adhikari and Lovett (2006), Molinas (1998), Varughese and Ostrom (2001) as empirical examples that illustrate similar disputes about the effects of heterogeneity.

ing, smaller, interdependent, more homogeneous, and relatively well off groups that are dependent on their resources and do not suffer sudden shocks in their demands upon the resource are more likely to be successful in creating institutions that help regulate forest commons more effectively. But the effects of these variables in specific conditions can vary.

The theoretical work related to inequalities and heterogeneities by commons scholars has an important bearing on how specific forms of social heterogeneities such as those related to gender, indigeneity, ethnicity, class, and income affect outcomes. The politics of gender and indigeneity has been especially prominent in this regard in the contributions of scholars of forest commons (Freudenberger et al. 1997; Holt 2005, Larsen 2003).

### **3.3. Characteristics of institutional arrangements**

Institutions and how their variations influence forest conditions are the intense focus of research by scholars of forest-based commons from the very beginnings of research on the commons. This research has thus led to many generalizations that help clarify our understanding of the effects of rules on user incentives and behavior. Rules that are easy to understand and enforce, locally devised, take into account differences in types of violations, help deal with conflicts, and help hold users and officials accountable are most likely to lead to effective governance. These basic insights, of which several had been asserted in case studies of the commons for long, were stated systematically by McKean (1992) and Ostrom (1990) and more recently by Dietz et al. (2003, p. 1910). Much of this conventional wisdom on the nature of effective local institutions has also been confirmed by the contributions of researchers on forest commons.

Although institutional features-related findings of forest-commons scholars are highly policy relevant, their adoption – quite apart from the politics that shape all policy making and implementation – needs additional translation work that has yet to be undertaken. Consider an example. It may appear that statements such as ‘rules should be locally created and enforced’ are quite transparent. But what they mean in terms of practical implementation in concrete contexts is in fact quite open to interpretation because of instabilities in the meanings of every operant word in the phrase: rule, local, creation, and enforcement.

The import of the insight lies in the recognition that: a) local users and their organizations have comparative if not absolute advantage when it comes to knowing about the resource, other users, and environmental conditions, and b) local users are best equipped to use this knowledge to create institutional arrangements more suited to governing forests effectively. But even if one accepts the point that those with better knowledge about the resource will use it to promote more sustainable and equitable outcomes, ‘rules should be locally created and enforced’ remains quite abstract without clarification about types of rules, meaning of local and the basis of qualification as local, how rules should be created and provisions made

to change them, and forms of enforcement. Ostrom (2005) suggests that there may be literally hundreds of thousands of different rule combinations from which decision makers can choose. Polity interpretation of seemingly clear and concrete recommendations runs headlong into this plethora of local rule diversity.

In many situations, some kinds of rules may be better designed by those not at the local level. But what local means in this context is also contested (Raffles 1999). Local can be defined in terms of birth, residency, contiguity of location, degree of dependence on the resource, contributions to the creation of a local institution, and so forth. The organizations or set of decision-makers charged with creating and modifying rules may be elected (through a variety of rules), nominated or appointed (by many potential authorities), and may adopt rules in many different ways as well. Enforcement comes in many varieties, raising questions about who should enforce, how strictly, for what remuneration, and who will monitor the enforcer. The economy of expression in findings related to institutions is thus a function of heroic abstraction from the context that theoretical knowledge of the commons takes for granted.

### **3.4. Nature of the external environment**

Variables related to the external environment can also be seen as constituting the context within which the objects of interest for forest commons scholars – the configuration of common property arrangement, common pool resource, and user group – are located. Demographic, cultural, technological, market-related factors, the nature of state agencies, and the level of involvement of other actors and forces such as NGOs and international aid flows are issues to which those interested in deforestation have been more attentive than scholars of forest commons, but which are extremely important structuring variables in relation to the units of analysis that are the central concerns of research on the common.

It would be fair to say that existing research on the commons has begun to address these environmental or contextual variables in the past few years. But to the extent these factors have received attention among scholars of forest commons they have often been identified as less important than institutional factors. The result is an intriguing disjuncture in the research findings of those interested in explaining deforestation vs condition of forest-based commons. Thus population levels and changes and market pressures are seen by most scholars of deforestation to be critically important causal factors (Young 1994). In contrast, those focusing on forests as commonpool resources have often arrived at conclusions in which roads and population pressures are relatively less important an explanation of resource conditions. The inconsistency between the findings of these two groups of scholars may well have to do with differences in their levels of analysis, regional focus, and/or use of cross-sectional versus time-series data.

This inconsistency also suggests that there may be productive avenues of dialog between the research of those who focus on markets and market institutions

and demographic shifts as critical influences on commons governance, and those who focus primarily on community institutions (Bray et al. 2006; Brown 2000; Clark 2004; Goeschl and Iglori 2006; Power 2006). It is important especially to underline the importance of market institutions in shaping what happens to forests as new arenas of exchange in relation to carbon and watershed services take shape (Taylor 2005). Similarly, demographic and broader economic shifts have been taken by a number of scholars as harbingers of forest transitions where processes leading to deforestation have begun to yield to greater areas under forests in some countries and regions (Kauppi et al. 2006; Victor and Ausubel 2000).

Analogous to market articulation is the question of technological means available to use and harvest the commons. Emergence of technological innovations that transform the cost-benefit ratios of harvesting benefits from commons are likely to undermine the sustainability of institutions needed to govern them as well as the resources themselves. Indeed, technological changes are capable of disrupting not just the extent to which existing mechanisms of coordination around mobility, storage, and exchange can continue to serve their members, but the very nature of the political and economic calculation that goes into inventing and defining common property. Under many situations, state officials have become closely involved in the privatization of commons and the selling of products resources previously held under common property arrangements (Rangarajan 1996; Sivaramakrishnan 1999; Skaria 1999).

Of course, the current landscape of tenure transformations is far more complex, to say the least. The state may always have been central in determining the changing areas of forests available to communities as the ultimate guarantor of property rights arrangements (Peluso and Vandergeest 2001). But in the past two decades, an increasing number of governments has decentralized control over diverse natural resources to local user groups. These shifts make questions about the reasons behind such loosening of control and the effects of differences in organization of authority across levels of governance extremely important. The work on forest-policies related decentralization has begun to explore these issues, either by focusing on decentralization of forest management (Agrawal and Ostrom 2001) or by examining the role of resource management-related laws and national policies (Lynch and Talbott 1995). But more systematic examination clearly remains to be done. It is only by integrating central policy concerns with the theoretical issues, which have been the major focus of research on forest commons, that the scholarship on forest commons will gain greater visibility and interest.

#### 4. Directions for future research

If recent general reviews of writings on deforestation have been forced to recognize the critically important role of institutions and policies (Geist and Lambin 2001; Kaimowitz and Angelson 1998), interventions by scholars of commons and community forests are responsible in no small measure. Indeed, the review of

scholarship on forest commons demonstrates its close association with the development of the field of common property itself. However, the discussion also hints at a number of areas in which far more work remains to be done. For example, Dietz et al. (2003, p. 1908) show that different institutional configuration of private ownership, communal tenure, and government control are each compatible with improvements, declines, and stability in forest conditions. This central finding hints at the importance of context, but we still need to track down how context matters to commons governance in complex social situations.

In addition, there are other important sites of knowledge production which need significantly greater attention to improve what we know about successful governance, use, and conservation of forests. The discussion below focuses on gaps in knowledge about forest-based commons along three different dimensions: data, theory, and methods. These three interrelated and interdependent domains constitute the three legs on which scientific knowledge rests. Admittedly it does so always in a provisional and unstable fashion as befits a three-legged stool. But that is surely the character of all scientific advancement.

#### **4.1. Data related to forest-based commons**

There are of two types data-related gaps in the study of forest-based commons. The first relates to its conventional focus on forest-related institutions. Thus, a persistent and general complaint by scholars of commons concerns the absence of reliable cross-sectional and longitudinal datasets on governance strategies at the local level. New research, especially by scholars associated with the International Forestry Resources and Institutions (IFRI) Program, but also by CIFOR and WRI is beginning to address this data gap along several different dimensions. The work by IFRI scholars is focused directly on data on local institutions, their variations, and changes over time. The work of CIFOR-researchers is harder to categorize because of its variety, but is relatively more focused on the role of variables related to the external environment in deforestation. Research by scholars associated with WRI has been very useful in advancing the understanding of forest-policy related decentralization initiatives, particularly in African countries.

But there are other areas in which knowledge about forest-based commons remains quite poor. A critical such arena is simply descriptive: we have very little knowledge even about the area under common property regimes in different countries. The tables in this review are built on the basis of relatively scattered sources of information and can make no pretense to accuracy. Indeed, the state of knowledge even within national contexts is poor. The state of affairs is well described by the strategy that the recent global Forest Resource Assessment adopted. It located all community-based tenure under the category 'other'!

In addition to the lack of knowledge about the spatial distribution of area under communal tenure and institutional variation within this broad category, we also know far too little in the aggregate – either at the national or at the global level –



about most of the sources of influence that may have produced such variation, or the potential effects of such variations. For this reason, more data on this theme is critical to the advancement of the field in general to situate case-based research as well as for statistically oriented studies of forest-based commons.

Finally, there are many specific areas in which scholars of forest commons can vastly improve the scope of their substantive contributions by drawing on scholarship that may not go under the name of commons, but has very similar concerns and investigative foci. There is substantial literature, as this review has pointed out, on indigenous peoples and forests, importance of markets and market institutions on local and extra-local forest-related outcomes, and interactions between biophysical and social-institutional variables where forest-related outcomes are concerned. These literatures provide important avenues for commons scholars to broaden the scope of their investigations, enrich their substantive concerns, and increase the impact of their contributions.

#### **4.2. Theories of forest-based commons governance**

Current research on forest-based commons can be advanced substantially if researchers distinguish clearly among the major outcomes that commons institutions shape. This survey does not distinguish among such outcomes as sustainability of resource use, equity in allocation of benefits, management efficiency, resilience of resource systems, or conservation effectiveness because the literature itself does not carefully distinguish among these multiple outcome dimensions. In an abstract sense it is easy to recognize that these different outcomes may either be associated positively or negatively, depending on the context, and range of focus. In some situations, a focus on enhancing institutional or resource system resilience may be feasible, and go together well with improvements in equitable allocation of benefits from the commons. But where the social context itself is extremely inequitable, a focus on improving equity may undermine institutional resilience. Similarly, an exclusive focus on maximizing equity may not only undermine performance along the dimension of resilience, but also other performance dimensions. However, we do not know if it actually does so.

Similarly, although new data can help to shed light on the governance of forest-based commons, urgent theoretical development is equally necessary. There are entire new domains in which theoretical contributions are needed to improve what we know about governance, and through which studies of forest-based commons can substantially advance the social science. I focus on two for the purpose of illustration: the relationship between institutions and identities and cross-level analysis of the effectiveness of governance arrangements.

The ways in which new institutions and social relations generate worldviews among individuals subjected to them has been a concern of major social-science scholars ever since the founding of the social sciences. In relation to forest governance, the question is basic. Do different institutions of governance have dif-

ferent effects on the way people view forests and the environment? The effects of different ways of thinking about forest use, conservation, and management among those subject to governance are likely central to the possibility of effective governance (Agrawal 2005). However, the vast investigative energies of scholars of forest-based commons have scarcely attended to this fundamental question about the relationship between institutions of governance and identities of actors. To review the research on forest-based commons is to infer that there may be no such relationship. But such an inference would be no more than a reflection of the absence of theoretical lenses that permit the imagining of this possibility and subsequently the collection of data to investigate it. Pursuing this question theoretically would be a major contribution to nearly all the disciplines of the social sciences because each of them is interested in the relationship between institutions and identities, even if the language used to talk about this relationship varies across disciplines: i.e. rules and preferences, subjectivities and norms, and perceptions and practices. Institutions are not just the product of existing preferences – they are also in important ways the generators of new preferences.

The second issue is much more squarely within the sights of those interested in forest-based commons, but still needs more careful theoretical development. How do processes at multiple social and institutional levels interact with each other to generate outcomes relevant to forest governance? Significant progress on the issue is hobbled by slow development of theoretical approaches that can take advantage of existing data at multiple levels. Scholars of commons need a better understanding of the conditions under which macro-level processes structure what happens at the local level and conversely, when local processes and outcomes overwhelm the structuring role of more macro-level processes.

### **4.3. The search for appropriate methods**

The conventional strategy of case-based research and comparative case analysis, which has been so central to forest-commons research, is likely to retain an important position given the nationally and locally specific interests of many of those who work on the commons. Surely, case-based methods can also be used to good effect in the analysis of data across levels of analysis and to fill many of the gaps identified in this review. But to use new data in light of new theoretical frameworks and models effectively, it will also be necessary for scholars of forest-based commons to take recourse to new methods and methodological approaches. One can already witness the upsurge in research that takes advantage of large amounts of data to deploy more advanced statistical techniques than had been true for much of the 1980s and 1990s.

Some possibilities in this direction are signaled by such fields of exciting theoretical development as complex systems research and agent-based models. Others may lie in more advanced statistical models that can take advantage of the nested

nature of data, or incorporate spatial features of the data more explicitly into the analysis. Other methodological innovations are likely to prove useful even with the kind of research and data that are currently available. One example of such innovation may be through a meta-analysis of existing case studies. Given the extraordinary richness of case-based work on forest commons, new analytical methods to compare findings from cases can prove extremely useful.

## 5. Conclusion

This review has suggested that the scholarly work on forest-based commons has helped greatly to identify the institutional factors that help lead to sustainable resource governance. However, the extent to which it has successfully found visibility in relation to global concerns about deforestation and the relationship between forests and livelihoods remains an open question (but see Nepstad et al. 2006). For example, in the most recent *Global Forest Resources Assessment* (FAO 2005), there is little discussion of the research on commons, or of the importance of institutions and property rights in shaping forest-related outcomes. Despite the significant proportion of forests that are governed under communal or community-based arrangements, the assessment fails to include a single reference from the field of commons. Similarly, there is little mention of work by commons scholars in one of the most widely read recent publications on poverty and development (Sachs 2005). Despite the common knowledge about the extent to which poor households rely on commons, especially forest commons for significant aspects of their livelihoods, those focusing primarily on poverty have remained inattentive to the contributions of commons scholars.

Such a disjuncture – between the focus of research that has hitherto guided scholars of forest-based commons and the pressing questions related to forests and their fate and livelihoods – is in part a result of the continuing and nearly single-minded concentration of commons scholarship on institutions and property rights. Future research by scholars of forest-based commons needs therefore to incorporate more explicitly issues related to the role of biophysical factors and additional dimensions of institutional effectiveness, the relationship between research and policy effectiveness, the relationship between various levels of analysis, and the extent to which corruption and violence may undermine the sustainability of resource governance. Scholars of forest commons need also to integrate their research more insistently with substantive concerns about indigeneity and indigenous peoples, concrete forms of social heterogeneities and inequalities, effectiveness of international aid, and local livelihoods and poverty.

But even apart from these new issues, which may be profitably incorporated into the scholarship on forest commons, there are avenues of research that can be explored with advances in the domains of new data, theories, and methods. This review has argued that through such advances, scholarship on the commons will build necessary bridges to other research questions than those focused on varia-

tions in property regimes, and which are also central to advancing the social sciences and enhancing policy effectiveness.

### Literature cited

- Adhikari, B. 2005 Poverty, property rights and collective action: Understanding the distributive aspects of common property resource management. *Environment and Development Economics* 10:1-25,
- Adhikari, B. and J. Lovett. 2006 Institutions and collective action: Does heterogeneity matter in community-based resource management? *Journal of Development Studies* 42(3):426-45,
- Agrawal, A. 1996. The Community versus the Market and the State. *Journal of Agricultural and Environmental Ethics* 9(1):1-15.
- Agrawal, A. 2001a State formation in community spaces? Decentralization of control over forests in the Kumaon Himalaya, India. *Journal of Asian Studies* 60(1):1-32,
- Agrawal, A. 2001b Common property institutions and sustainable governance of resources. *World Development* 29(10):1649-72,
- Agrawal, A. 2004. Decentralization of resource policies in the developing world, 1980-2005. Papers presented at the CHAOS-Cambridge University Press seminar series at University of Washington, Seattle, June.
- Agrawal, A. 2005 *Environmentality: Technologies of Government and the Making of Subjects*. Durham, NC, Duke University Press,
- Agrawal, A. and A. Chhatre. 2006 Explaining success on the commons: Community forest governance in the Indian Himalaya. *World Development* 23(1):149-66,
- Agrawal, A. and C. Gibson. 1999. Enchantment and disenchantment: The role of community in natural resource conservation. *World Development* 27(4):629-49.
- Agrawal, A. and S. Goyal. 2001. Group size and collective action: Third-party monitoring in common-pool resources. *Comparative Political Studies* 34(1):63-93.
- Agrawal, A. and E. Ostrom. 2001. Collective Action, Property Rights and Decentralization in Resource Use in India and Nepal. *Politics and Society* 29(4):485-514.
- Agrawal, A. and G. Yadama. 1997. How do social institutions mediate market and population pressures on resources? Forest Panchayats in Kumaon India. *Development and Change* 28: 435-65.
- Andersson K. P, C.C. Gibson and F. Lehoucq. 2006. Municipal politics and forest governance: Comparative analysis of decentralization in Bolivia and Guatemala. *World Development* 34(3): 576-95.
- Antinori, C. and D. B. Bray. 2005. Community Forest Enterprises as Entrepreneurial Firms: Economic and Institutional Perspectives from Mexico. *World Development* 33(9): 1529-43.

- Arnold, J. E. M. 1998. *Managing Forests as Common Property*. FAO Forestry Paper 136. Rome: FAO.
- Arnold, J.E.M. and W.C. Stewart. 1991. *Common Property Resource Management in India*. Oxford, UK: Oxford Forestry Institute, University of Oxford.
- Arnold, J.E.M. and M.R. Ruiz. 2001. Can Non-Timber Forest Products Match Tropical Forest Conservation and Development Objectives? *Ecological Economics* 39:437-47
- Baland, J. and J.P. Platteau. 1996. *Halting Degradation of Natural Resources: Is There a Role for Rural Communities?* Oxford: Clarendon Press.
- Baland, J. and J.P. Platteau. 1999. The ambiguous impact of inequality on local resource management. *World Development* 27(5): 773–88.
- Berkes, F. (ed). 1989. *Common Property Resources: Ecology and Community-Based Sustainable Development*. London: Belhaven Press.
- Berkes, F. 2004. Rethinking community based conservation. *Conservation Biology* 18(3): 621-30.
- Bowles, S. and H. Gintis. 1998. Effective Redistribution: New Rules of Markets, States, and Communities. In *Recasting Egalitarianism: New Rules for Communities, States, and Markets*, Eric Olin Wright, ed., pp. 3-71. Verso: London.
- Bray, D.B., E.A. Ellis, N. Armijo Canto and C.T. Beck 2004. The institutional drivers of sustainable landscapes: A case study of the ‘Mayan Zone’ in Quintana Roo, Mexico. *Land Use Policy* 21: 333-46.
- Bray, D.B., C. Antinori, and J.M. Torres-Rojo. 2006. The Mexican model of community forest management: The role of agrarian policy, forest policy and entrepreneurial organization. *Forest Policy and Economics* 8(4): 470-84.
- Brooks, J.S., M.A. Franzen, C.M. Holmes, M.N. Grote, and M. Borgerhoff Mulder. 2006. Testing hypotheses for the success of different conservation strategies. *Conservation Biology* 20(5): 1528-38.
- Brown, G.M. 2000. Renewable natural resource management and use without markets. *Journal of Economic Literature* 38(4): 875-914.
- Clark, J. 2004. Forest policy for sustainable commodity wood production: an examination drawing on the Australian experience. *Ecological Economics* 50(3-4): 219-32.
- Cumming, G.S., D.H.M. Cumming, and C.L. Redman. 2006. Scale mismatches in social-ecological systems: Causes, consequences, and solutions. *Ecology and Society* 11 (1).
- Dietz, T., E. Ostrom, and P. Stern. 2003. The struggle to govern the commons. *Science* 302: 1907-12.
- Engel, S., R. Lopez, and C. Palmer. 2006. Community-industry contracting over natural resource use in a context of weak property rights: The case of Indonesia. *Environmental and Resource Economics* 33: 73-93.
- Fearnside, P.M. 2003. Deforestation Control in Mato Grosso: A New Model for Slowing the Loss of Brazil’s Amazon Forest. *Ambio* 32(5): 343–45

- Fernandes, W., G. Menon, and P. Viegas. 1988. *Forests, Environment, and Tribal Economy*. New Delhi: Indian Social Institute.
- Food and Agriculture Organization (FAO). 2005. *Global Forest Resources Assessment*. Rome: Food and Agriculture Research Organization.
- Freudenberger, M. S., J. A. Carney and A. R. Lebbie. 1997 Resiliency and change in common property regimes in West Africa: The case of the tongo in the Gambia, Guinea, and Sierra Leone. *Society and Natural Resources* 10(4): 383-402.
- Geist, H.J. and E.F. Lambin. 2001. *What Drives Tropical Deforestation?* University of Louvain. Louvain la Neuve: Land use and Land Cover International Project.
- Gibson, C., M.A. McKean, and E. Ostrom (eds). 2000. *People and Forests: Communities, Institutions, and Governance*. Cambridge: MIT Press.
- Gibson, C.C., F.E. Lehoucq, and J.T. Williams. 2002. Does privatization protect natural resources? Property rights and forests in Guatemala. *Social Science Quarterly* 83(1, March): 206-25.
- Gibson, C., E. Ostrom, and J.T. Williams. 2005. Local enforcement and better forests. *World Development* 33(2): 273-84.
- Goeschl, T. and D.C. Iglori. 2006. Property rights for biodiversity conservation and development: Extractive reserves in the Brazilian Amazon. *Development and Change* 37(2): 427-51.
- Grafton, R. Quentin. 2000. Governance of the Commons: A Role for the State? *Land Economics* 76(4): 504-17
- Guha, R. 1989. *The Unquiet Woods: Ecological Change and Peasant Resistance in the Himalaya*. New Delhi: Oxford University Press.
- Haenn, N. 2006. The changing and enduring ejido: A state and regional examination of Mexico's land tenure counter-reforms. *Land Use Policy* 23(2, April): 136-46.
- Hardin, R. 1982. *Collective Action*. Baltimore, MD: Johns Hopkins University Press.
- Holt, F.L. 2005. The Catch-22 of conservation: Indigenous peoples, biologists, and cultural change. *Human Ecology* 33(2): 199-215.
- International Tropical Timber Organization (ITTO). 2005. *Status of Tropical Forest Management*. ITTO Technical Series N. 24, Yokohama, Japan: ITTO
- Jessup, T.C., and N.L. Peluso. 1986. Minor forest products as common property resources in East Kalimantan, Indonesia. In *Proceedings of the Conference on Common Property Resource Management*, National Research Council, pp. 501-31. Washington DC: National Academy Press.
- Kaimowitz, D. and A. Angelson. 1998. *Economic Models of Tropical Deforestation: A Review*. Bogor: CIFOR.
- Kanbur, R. 1992. Heterogeneity, distribution and cooperation in common property resource management. Washington, DC: The World Bank.

- Kauppi, P.E, J.H. Ausubel, J. Fang, A.S. Mather, R. A. Sedjo, and P. E. Waggoner. 2006. Returning forests analyzed with the forest identity. *Proceedings of the National Academy of Sciences* 103: 17574-79
- Klooster, D.J. 2002. Toward adaptive community forest management: Integrating local forest knowledge with scientific forestry. *Economic Geography* 78(1): 43-70.
- Larsen, S.C. 2003. Promoting Aboriginal territoriality through interethnic alliances: The case of the Cheslatta T'en in Northern British Columbia. *Human Organization* 62(1): 74-84.
- Lemos, M.C. and A. Agrawal. 2006. Environmental governance. *Annual Review of Environment and Resources* 31: 297-325.
- Libecap, G. 1989. Distributional issues in contracting for property rights. *Journal of Institutional and Theoretical Economics* 145:6-24.
- Lynch, O.J. and K. Talbott. 1995. *Balancing Acts: Community-Based Forest Management and National Law in Asia and the Pacific*. Washington DC: World Resources Institute.
- Maskey, V., T.G. Gebremedhin, and T.J. Dalton. 2006. Social and cultural determinants of collective management of community forests in Nepal. *Journal of Forest Economics* 11(4): 261-74.
- McCay, B.J., and J. Acheson (eds) 1987. *The Question of the Commons: The Culture and Ecology of Communal Resources*. Tucson: University of Arizona Press.
- McKean, M. 1992. Success on the commons: A comparative examination of institutions for common property resource management. *Journal of Theoretical Politics* 4(3): 247-81.
- McPeak, J.G. 2003. Analyzing and addressing localized degradation in the commons. *Land Economics* 79(4, November): 515-36.
- Molinas, J.R. 1998. The impact of inequality, gender, external assistance, and social capital on local level cooperation. *World Development* 26(3): 413-31.
- Mutumukuru, T.W. Kozanayi and R. Nyirenda. 2006. Catalyzing collaborative monitoring processes in joint forest management situations: The Mafungautsi forest case, Zimbabwe. *Society and Natural Resources* 19(3): 209-24
- National Research Council (NRC). 1986. *Proceedings of the Conference on Common Property Resource Management*. Washington DC: National Academy Press.
- Nepstad, D., D. McGrath, A. Alencar, A.C. Barros, G. Carvalho, M. Santilli, M. del C. Vera Diaz. 2002. Frontier governance in Amazonia. *Science* 295: 629-31.
- Nepstad, D., S. Schwartzman, B. Bamberger, M. Santilli, D. Ray, P. Schleisinger, P. Lefebvre, A. Alencar, E. Prinz, G. Fiske, and A. Rolla. 2006. Inhibition of Amazon deforestation and fire by parks and indigenous lands. *Conservation Biology* 20:65-73

- Netting, R. McC. 1976. What Alpine peasants have in common? Observations on communal tenure in a Swiss village. *Human Ecology* 4(2): 135-46.
- Neumann, R.P. and E. Hirsch 2000. Commercialization of Non-Timber Forest Products: Review and Analysis of Research. Bogor, Indonesia, Center for International Forestry Research.
- Neupane, H. 2003. Contested impact of community forestry on equity: Some evidence from Nepal. *Journal of Forest and Livelihood* 2(2): 55-61.
- Nygren, A. 2005. Community-based forest management within the context of institutional decentralization in Honduras. *World Development* 33(4): 639-55.
- Olson, M. 1965. *The Logic of Collective Action: Public Goods and the Theory of Groups* Cambridge: Harvard University Press.
- Ostrom, E. 1990. *Governing the Commons*. New York: Cambridge University Press.
- Ostrom, E. 1999. Self Governance and Forest Resources. Occasional Paper No. 20, Center for International Forestry Research, Bogor, Indonesia. <http://www.cgiar.org/cifor>.
- Ostrom, E. 2005. *Understanding Institutional Diversity*. Princeton, NJ: Princeton University Press.
- Pagdee, A., Y.S. Kim, and P.J. Daugherty. 2006. What makes community forest management successful: A meta-study from community forests throughout the world. *Society and Natural Resources* 19(1, January): 33-52.
- Peluso, N.L. 1992. *Rich Forests, Poor People*. Berkeley: University of California Press.
- Peluso, N.L. 1993. Coercing Conservation: The politics of state resource control. *Global Environmental Change* 3(2):199 – 218
- Peluso, N.L. and P. Vandergeest. 2001. Genealogies of the political forest and customary rights in Indonesia. *Journal of Asian Studies* 60(3): 761-812.
- Power, T.M. 2006. Public timber supply, market adjustments, and local economies: Economic assumptions of the northwest forest plan. *Conservation Biology* 20(2): 341-50.
- Poteete, A. and E. Ostrom. 2004. Heterogeneity, group size, and collective action: The role of institutions in forest management. *Development and Change* 35(3): 435-61.
- Quiggin, J. 1993. Common Property, Equality, and Development. *World Development* 21(7): 1123–38.
- Raffles, H. 1999. 'Local theory': Nature and the making of an Amazonian place. *Cultural Anthropology* 14(3): 323-60.
- Rangan, H., and M. Lane. 2001. Indigenous peoples and forest management: Comparative analysis of institutional approaches in Australia and India. *Society and Natural Resources* 14(2): 145-60.
- Rangarajan, M. 1996. *Fencing the Forest: Conservation and Ecological Change in India's Central Provinces, 1860-1914*. New Delhi: Oxford University Press.



- Reed, M.G. and K. McIlveen. 2006. Toward a pluralistic civic science?: Assessing community forestry. *Society and Natural Resources* 19(7): 591-607.
- Ribot, J.C. 1999. Decentralization, participation, and accountability in Sahelian forestry: Legal instruments of political-administrative control. *Africa* 69(1):23-65.
- Ribot, J. 2002. Democratic decentralization of natural resources: Institutionalizing popular participation. Working Paper, Washington: World Resources Institute.
- Sachs, J. 2005. *The End of Poverty*. New York: Penguin.
- Sivaramakrishnan, K. 1999. *Modern Forests: Statemaking and Environmental Change in Colonial Eastern India*. Stanford: Stanford University Press.
- Singh, C. 1986. Common Property and Common Poverty: India, Forests, Forest Dwellers, and the Law.
- Skaria, A. 1999. *Hybrid Histories: Forests, Frontiers, and Wildness in Western India*. New Delhi: Oxford University Press.
- Somanathan, E., R. Prabhakar, and Bhupendra Singh Mehta. 2005. Does decentralization work? Forest conservation in the Indian Himalayas. Discussion Paper 05-04. New Delhi: Indian Statistical Institute.
- Stanley, D.L. 1991. Communal forest management: The Honduran resin tappers. *Development and Change* 22(4, October): 757-79.
- Taylor, P.L. 2005. A Fair Trade approach to community forest certification? A framework for discussion. *Journal of Rural Studies* 21(4): 433-47.
- Tole, L. 2001. Jamaica's disappearing forests: Physical and human aspects. *Environmental management* 28(4): 455-67.
- Tucker, C.M. 1999. Private versus common property forests: Forest conditions and tenure in a Honduran community. *Human Ecology* 27(2, June): 201-30.
- Tucker, C.M., J.C. Randolph, and E.J. Castellenos. Forthcoming (2007). Institutions, biophysical factors, and history: An integrative analysis of private and common property forests in Guatemala and Honduras. *Human Ecology*.
- Turner, N.J., I.J. Davidson-Hunt, and M.O'Flaherty. 2003. Living on the edge: Ecological and cultural edges as sources of diversity for social-ecological resilience. *Human Ecology* 31(3): 439-61.
- Varughese, G. and E. Ostrom. 2001. The contested role of heterogeneity in collective action: Some evidence from community forestry in Nepal. *World Development* 29(5, May): 747-65.
- Victor, D.G. and J.H. Ausubel. 2000. Restoring the forests. *Foreign Affairs* 79: 127-44.
- White, A. and A. Martin. 2002. *Who Owns the World's Forests? Forest Tenure and Public Forests in Transition*. Washington DC: Forest Trends and Center for International Environmental Law.
- Wilson, E.O. (ed.) 1988. *Biodiversity*. Washington, D.C., National Academy Press.

- Wily, L.A. 2001. Reconstructing the African commons. *Africa Today* 48(1, Spring): 77-99
- Wittman, H. and C. Geisler. 2005. Negotiating locality: Decentralization and communal forest management in the Guatemalan highlands. *Human Organization* 64(1): 62-74.
- World Resources Institute (WRI). 2002. *World Resources*. Washington DC: World Resources Institute.
- World Wide Fund for Nature (WWF). 2002. *Forests for Life: Working to Protect, Manage, and Restore the World's Forests*. Gland: World Wide Fund for Nature.
- Wunder, S. 2001. Poverty Alleviation and Tropical Forests-What Scope for Synergies? *World Development* 29:1617-33.
- Young, K.R. 1994. Roads and the environmental degradation of tropical montane forests. *Conservation Biology* 8(4):972-76.