

Common Property

Readings and Resources for
Community-Based Natural
Resource Management
Researchers

Volume 6

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Table of Contents

- A. The Community-Based Natural Resource Management (CBNRM) Social Science Resource Kit**
- B. Readings on Common Property**
- C. Bibliography**
- D. Obtaining Documents Listed in the Bibliography**
- E. Websites and Electronic Information**

A. The CBNRM Social Science Resource Kit

What is the CBNRM Social Science Resource Kit? This kit is a reference tool to assist researchers funded through IDRC's Community Based Natural Resource Management (CBNRM) program in Asia to apply concepts, analytical approaches and research methods from the social sciences in their research.

What is the Format of the Kit? The kit is being delivered as a set of **resource books**, each dealing with a different key issue area related to CBNRM research. The topics/issue areas covered include: Gender; Community-Based Natural Resource Management; Participatory Research; Indigenous Knowledge; Institutional Analysis; Common Property; Conflict Management and Multi-Stakeholder Analysis; Resource Tenure; and Participatory Monitoring and Evaluation. Depending on feedback received from these materials, other topics or issues may be considered for coverage in future. In addition to the resource books, limited funds are being provided for IDRC project researchers to **purchase books** from an assembled list covering the above CBNRM-related topics. Further information on this has been sent separately to each project.

What is in the Resource Books? The resource books contain photocopies of selected readings excerpted from books, academic journals, field reports and training manuals. Depending on the subject, the readings include conceptual and methodological issues, research tools, and illustrative case studies. Each source book also includes an annotated bibliography, a list of references, and information on electronic (internet) resources. Instructions on how to use the Centre's literature search and document delivery services (free to IDRC-funded institutions) are also provided.

Readers will find that some of the material in each resource book is contradictory. The intent of the Kit is to expose researchers to a range of academic perspectives, rather than to choose only one view. This means that readers of this material will have to think about the different arguments presented and choose for themselves an interpretation of these concepts and methods which is sensible for their own research project. Readers should also note that the views expressed in the readings are those of the author(s) and do not necessarily represent those of IDRC.

Why Has the Resource Kit Been Prepared? The impetus for developing the kit stems from specific requests from IDRC research recipients for tools and resources to assist them in doing research for community-based natural resource management. For many of these researchers CBNRM is a new concept requiring analytical tools and

research methods that are quite different to those they had received through formal or other training. Researchers wanting to learn these new concepts and methods have been constrained by a lack of access to well-stocked libraries, relevant databases and internet sites.

The kit is also part of an effort by the CBNRM Program at IDRC to promote approaches to research that are participatory, action-oriented, multidisciplinary and grounded in local experience and local knowledge.

Who Should Use the Kit? If your research deals with Community-Based Natural Resource Management and is sponsored by IDRC, you should refer to the information in each volume to help you to undertake your research. IDRC-supported researchers will find that the concepts, tools and methods covered in these reference books will be used repeatedly in research reports, workshops, meetings, correspondence, and in evaluation of your work. You will also find it helpful to understand and apply these concepts if you submit future research proposals. The Kit will also be of wider interest and we hope that it can serve as a useful reference collection for researchers who otherwise would have difficulty getting access to this material.

How Were Readings Selected for the Resource Kit? The readings were selected from existing publications based on literature searches and consultations with academics and practitioners in the respective fields. From these sources the materials have been further selected for:

- ▶ readability/clarity of the writing
- ▶ suitability for an audience with limited English language skills
- ▶ suitability to the CBNRM project contexts
- ▶ emphasis on definition of terms and detailed explanation of concepts

IDRC-supported CBNRM researchers are working in over 11 countries in Asia representing a wide range of cultural and educational backgrounds. Many researchers do not read English as a first language and a majority have not had formal training in the Social Sciences. For these reasons an effort has been made to include materials that will be instructive and accessible both for newcomers to the topic and for those with a background in the subject area.

How Might the Resource Kit be Used? These resource books are only a starting point for researchers looking for information on a specific topic. The readings are meant to stimulate research questions and further inquiry. The research tools provided are intended as catalysts for adaptation and innovation of new site-specific tools, methods and analytical frameworks. The bibliographies will assist each project and researcher to pursue more targeted information beyond what is provided here.

Some specific actions you might take within your research team and/or institution to make more effective use of this material:

- ▶ identify specific topics which are most relevant to your research and assign responsibility to specific members of the team to review these materials. Take turns briefing other team members on what you have learned from each Kit volume.
- ▶ questions? Ask external project advisors or IDRC program staff if you have questions arising from your review of this material.
- ▶ organize training sessions using these reference materials together with local resource persons, designated team members, or other experts.
- ▶ translate the best articles for broader circulation.
- ▶ request reference materials or literature searches from the IDRC library.
- ▶ read some of the books in the bibliography to deepen your knowledge and learn other cases and examples. Books and articles which you have read and which are relevant to your own research can be cited, if appropriate, in your research proposals or reports.
- ▶ inform IDRC of any changes to your projects that have come about as a result of this material.
- ▶ discuss the contents of the readings within your research team and identify what adaptations you could make for the conditions of your project.

B. Readings on Common Property

This section includes photocopied readings on common property research as it relates to community-based natural resource management (CBNRM). A brief introduction to the topic and an overview of the readings is provided below, followed by the reference information for each selection. The readings themselves are numbered and marked with corresponding tabs for convenience.

I. Introduction

Property rights and use rights to natural resources have an enormous impact upon the management of natural resources. The rules and responsibilities attached to these rights, and the resulting incentives, or lack of incentives, to preserve the natural environment are key to sustainable community-based natural resource management. Researchers in this area must clearly understand the dynamics of property and use rights in a given community to be able to make useful recommendations.

The term “property” as used in CBNRM research does not refer to the natural resource itself, but to the social rules or institutions a community has in place to control access to and use of the resource. These institutions or “property regimes” can be one of four basic types: private, state, common or open-access. In practice, two or more of these regimes usually co-exist in any one situation, and these should be examined along with the use rights (*who* actually has the right to use *which parts* of a natural resource at *which times and seasons*). As well, researchers should be prepared to examine any other aspects of a culture—such as spiritual beliefs about nature—that may play an important role in shaping local property regimes.

In his article “The Tragedy of the Commons” written three decades ago, Hardin argued that the eventual fate of all resources held “in common” is over-exploitation because access is unrestricted and there is no incentive among individuals towards resource protection (Hardin, 1968). However, critics now assert that Hardin’s thesis does not properly distinguish the type of property regime susceptible to such a process, arguing that it applies not to “common property”, but to “open-access” regimes. Common property is now generally defined as a system where “the resource is held by an identifiable community of users who can exclude others and regulate use” (Berkes et al, 1989). Recent research has shown that, under such arrangements, local people can manage common resources in an effective, sustainable manner. Open-access, on the other hand, is characterized by an “absence of well-defined property rights” (Berkes et al, 1989) which can lead to people “free riding” and over-exploiting a resource.

Unfortunately, governments in particular have been slow to recognize this distinction, condemning all forms of communal resource use and moving to privatize or limit access to the commons. Too often, such misguided measures result in disastrous consequences for the poor, especially women, who rely heavily upon the commons for their livelihood.

This resource book provides a series of readings which treat the particulars of the "commons" (common property resources or common pool resources or common property regimes). The definitions of the latter may differ in details and along technical lines, but the 30 years of scholarly work on the subject is essentially concerned with discovering how, when and why common property situations create or maintain sustainable natural resource management. Literature on the subject has mushroomed in the last 15 years in particular. The International Association for the Study of Common Property (IASCP) was founded in 1989, boasts 2,000 individual and institutional members and has sponsored seven international conferences. It is the single largest source of material about common property and can be found on the World Wide Web at: www.indiana.edu/~iascp/index.html. IASCP has also compiled a three-volume bibliography entitled *Common Pool Resources and Collective Action* (see Section C of this manual for bibliographical information). These three volumes, along with an additional 9,000 citations, are included in IASCP's recently completed *Comprehensive Bibliography of Common Pool Resources*, a database which is available both from their website and on CD-ROM. For further information, contact Charlotte Hess, IASCP Information Officer, via e-mail at: hess@indiana.edu

II. An Overview of the Readings

The first reading, *Social Systems, Ecological Systems, and Property Rights* by Fikret Berkes, discusses how social systems and natural resource systems interact under different property regimes. The paper begins with a brief background discussion in which the author defines the four basic property regimes and summarizes the issues surrounding Hardin's "tragedy of the commons" thesis. In the next section, he discusses the classical and recent views of the link between natural and social systems, arguing that such a relationship is, in fact, made up of a three-way linkage between: natural capital; cultural capital; and human-made capital (p.88). He then uses a number of empirical cases to evaluate the four types of property rights regimes in terms of their ecological sustainability, concluding that there is no clear-cut verdict on which is best, except that open-access regimes are unsustainable in the long run. He concludes that any solutions to resource degradation must include a diversity of property rights regimes and institutions that can be adapted to particular circumstances.

The second reading, *The Benefits of the Commons*, by Berkes, Feeny, McCay and Acheson, is a three-page, classic introduction to definitions and characteristics of common property. Selected case studies support the authors' argument that ecological sustainability can be achieved under common-property resource management regimes.

The two articles which follow include a well-known framework for analysing the commons and an example of the framework applied to a case in India. *Analyzing the Commons: A Framework* by Ronald Oakerson presents a conceptual framework for collecting and analysing information about the commons. It outlines four types of attributes used to describe a commons, each of which is related to the others: (1) physical attributes of the resource and the technology used to harvest it; (2) the decision-making arrangements (organizations and rules) that govern relationships between users; (3) the resulting patterns of interaction among decision-makers; and (4) outcomes or consequences (p. 43). Oakerson states that the framework is "a bare-bones representation of the commons", which should not be taken as a complete model that includes all variables (ibid). Indeed, the framework he presents is still considered a classic, relatively useful tool, but it has been considerably adapted and elaborated by others since it first appeared in the mid-1980s¹. *The Management and Use of Common-Property Resources in Tamil Nadu, India* by P. Blaikie, J. Harriss and A. Pain is a straightforward application of Oakerson's framework to resource management in a state at the southeastern tip of India. The authors focus their analysis on land-based resources including fuel, fodder, grazing, construction material, green manure and forest products.

In *The Rudiments of a Theory of the Origins, Survival, and Performance of Common Property Institutions*, Elinor Ostrom attempts to develop a general theory of common pool resource management by blending her own views on how institutional arrangements affect the motivations and behaviors of individuals with important variables identified by other researchers. In the first section of the article, she makes an effort to refine the part of the Oakerson framework that deals with the technical and physical attributes of the resource by offering a definition of "common-pool resources" and contrasting them with other types of resources. The next section focuses on how "the tragedy of the commons" is avoided and the conditions under which resource users or "appropriators" are likely to act in a coordinated, rather than an independent, fashion. This leads, in turn, to a discussion of the conditions which may foster the destruction or degradation of the commons by appropriator organizations. In the final sections of the article, Ostrom establishes a list of key conditions for the survival and

¹ As examples, see Edwards, V.M. and N.A. Steins, 1998. "Developing an Analytical Framework for Multiple-Use Commons" or Van de Laar, A., 1990. "A Framework for the Analysis of Common Pool Natural Resources" in section C of this manual.

efficient performance of organizations managing common-pool resources, and concludes by discussing the types of policies that donors and governments need to adopt to be consistent with the evolving understanding of common property regimes.

In the following reading, *Fisheries Co-management: Key Conditions and Principles Drawn from Asian Experiences*, Pomeroy, Katon, Harkes and Genio discuss the results of their research aimed at discovering the general principles and conditions which facilitate fisheries co-management in Asia. The authors use Ostrom's key conditions for successful common pool resource management (see previous reading) as a foundation for the research, assessing their relevance in the context of this project and discussing the new conditions and principles they have identified through the course of their research. The paper concludes with a discussion of policy implications for fisheries co-management in Asia and worldwide.

In the reading, *Toward an Improved Management of Common Property in Tam Giang Lagoon, Vietnam*, Truong and Brzeski present preliminary research findings from a project which examines the management of aquatic resources under various kinds of tenure regimes in a densely-populated lagoon system of Vietnam. The issues covered include the nature of the resources, the technologies used to exploit these, related behaviour of fishers, arrangements for property rights associated with different exploitation and management strategies, and the effectiveness of informal and formal rules within the present management scheme (p.2). The paper provides readers with a good example to show how complicated property rights and tenure systems can be in a 'real world' setting. While the rest of this volume focuses on the principles and theories of common property, researchers will usually find there are no "pure" types of tenure, and local situations are highly dynamic. Readers could consider the specific issues identified by Truong and Brzeski in the context of the general characteristics of effective CPR systems and institutions at the local level, such as discussed in the Ostrom (reading #5) and Pomeroy et al (reading #6) papers.

In the eighth reading, *Village Irrigation in Laos: Traditional Patterns of Common Property Resource Management*, Ireson describes the traditional system by which lowland Lao villages manage water for paddy rice irrigation, and relates this system to selected models of common property management. He begins by briefly summarizing the shortcomings of conventional theoretical approaches to the study of the commons, arguing for an approach which is more sensitive to the effects of social context on decision-making for resource management. He criticizes Hardin's "tragedy of the commons" approach for assuming that "individuals act selfishly, that there is no communication among resource users, and that no social norms mediate their actions" (p. 543). A more useful model of analysis, he argues, is Runge's "Assurance Problem" model, which sees individual behavior as being motivated not only by self-interest but

by the degree of assurance a person has that others will cooperate. But neither of these models, according to Ireson, consider the impact of the wider social context on the decision to cooperate with or take advantage of one's neighbors. In the case of Lao villagers, "an individual's willingness to cooperate in village irrigation systems must be understood in the context of household interdependence, and strong norms of mutual support within the village" (p. 541). The author discusses both successful and unsuccessful Lao irrigation systems and compares these to the management of other local resources, in order to define some of the limits to effective common property management schemes.

In the final reading, *Common Property Resource Access by the Poor and Class Conflict in West Bengal*, Beck presents a case study of poor people's use of and access to common property resources (CPRs) in three villages of West Bengal. The article, according to Beck, has a dual purpose: "to show the enormous importance of CPRs to the poor in West Bengal, and to show how some of these CPRs are presently one axis of class conflict, and why class conflict over CPRs is likely to increase in the future" (p.3). The author argues that while access to CPRs is crucial for the survival of the rural poor, particularly for women, access is declining due to commercialization, scarcity and restricted access. He uses a discussion of CPR use by the poor in nineteenth century Britain as a reference point for understanding class conflict in contemporary India, and goes on to analyse CPR use in West Bengal and conflicts arising over access to these resources. He closes by outlining a typology of CPR use in West Bengal and discusses some implications for policy making and future research. This article is a particularly good reminder of the importance of social and gender analysis for CBNRM researchers.

In addition to the readings described above, readers are also encouraged to consult the following additional resources: A.J. Knudsen's *Living with the Commons: Local Institutions for Natural Resource Management*, for a state-of-the-art critical analysis of research on common property; and D.A. Messerschmidt's *Common Forest Resource Management: Annotated Bibliography of Asia, Africa and Latin America* for an excellent introduction to some of the literature on Common Forest Resource (CFR) Management from Asia, Africa and Latin America. (See Section C of this manual for bibliographical information and abstracts).

References

A copy of the full text of each of the following articles is included in this document. To find a reading, flip to the corresponding tab number. These materials have been reproduced with permission from the publishers or authors.

1. Berkes, F. 1996. **Social Systems, Ecological Systems, and Property Rights.** Chapter 5 in *Rights to Nature*. Susan Hanna et al (eds.). © Island Press, Washington, DC and Covelo, CA. Reprinted with permission from Island Press. For book information or ordering, 1-800-828-1302.
2. Berkes, F., D. Feeny, B.J. McCay and J.M. Acheson. 1989. **The Benefits of the Commons.** *Nature*, Vol. 340 13 July. pp. 91-93. Reprinted with permission from *Nature*, Macmillan Magazines Ltd.
3. Oakerson, R. 1992. **Analyzing the Commons: A Framework.** Chapter 3, pp. 41-59 in *Making the Commons Work: Theory, Practice, and Policy*. Bromley, Daniel et al. (eds). San Francisco: Institute for Contemporary Studies Press. Reprinted with permission from ICS Press.
4. Blaikie, P., John Harriss and Adam Pain. 1992. **The Management and Use of Common Property Resources in Tamil Nadu, India.** Chapter 11, pp. 247-264 in *Making the Commons Work: Theory, Practice, and Policy*. Bromley, Daniel et al. (eds). San Francisco: Institute for Contemporary Studies Press. Reprinted with permission from ICS Press.
5. Ostrom, E. 1992. **The Rudiments of a Theory of the Origins, Survival, and Performance of Common Property Institutions.** Chapter 13, pp. 293-318 in *Making the Commons Work: Theory, Practice, and Policy*. Bromley, Daniel et al. (eds). San Francisco: Institute for Contemporary Studies Press. Reprinted with permission from ICS Press.
6. Pomeroy, R.S., B.M. Katon, I. Harkes and E. Genio. 1999. **Fisheries Co-management: Key Conditions and Principles Drawn from Asian Experiences.** Chapter 10 "Key Conditions and Principles for Successful Fisheries Co-management" in *Fisheries Co-management in Asia: Lessons from Research and Experience*. International Center for Living Aquatic Resources Management, Manila, Philippines. Reprinted with permission from authors.

7. Tuyen, Truong Van and Veronika Brzeski. 1998. **Toward an Improved Management of Common Property in Tam Giang Lagoon, Vietnam.** Working Paper for the 7th International Association for the Study of Common Property (IASCP) Conference, Vancouver, Canada. Available on-line from the IASCP website at <http://www.indiana.edu/~iascp/iascp98.htm>
Reprinted with permission from authors.
8. Ireson, W.R. 1995. **Village Irrigation in Laos: Traditional Patterns of Common Property Resource Management.** Society and Natural Resources, Volume 8, pp. 541-558. Reprinted with permission from Taylor and Francis.
9. Beck, Tony. 1998. **Common Property Resource Access by the Poor and Class Conflict in West Bengal.** Ottawa, Canada: International Development Research Centre. Available on-line at http://www.idrc.ca/cbnrm/documents/publications/cpr_ar.htm
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CHAPTER 5

Social Systems, Ecological Systems, and Property Rights

FIKRET BERKES

Introduction

This chapter presents some perspectives on the linkage between social systems and natural systems, and reviews some aspects of the state of knowledge about how natural resource systems and social systems interact under different property-rights regimes, and how that interaction affects the performance of natural resource systems.

The property rights issue of concern here does not include industries, services, most agricultural land and mineral resources, but includes common-property (or common-pool) resources. Further, in the realm of commons, the focus here is not global commons (Dasgupta and Maler 1992; Keohane and Ostrom 1995), or regional commons such as the Baltic Basin or the Caribbean Sea, but mostly local commons managed under different property-rights regimes, which is the major literature base on the interface of natural and social systems. Many of the principles derived from the local commons are applicable to, or have parallels in, the international commons (Keohane and Ostrom 1995).

There are four sections in this chapter. The first presents some background discussion of common-property (common-pool) resources and Hardin's (1968) contention that individuals using resources jointly are helpless to organize and engage in collective action.

The second section discusses some classical and recent views of the interface of natural systems and social systems. The section argues that institutions are the key to analyzing the interface, and that the focus on property rights expands the scope of ecological economics to consider not a two-way linkage (natural systems-economic systems) but a three-way linkage incorporating social/institutional/cultural dimensions also. This three-way linkage may be character-

ized as natural-capital/cultural-capital/human-made-capital interaction (Berkes and Folke 1994a), whereby the importance of feedbacks in the linkages is emphasized.

The third and most detailed section includes a review of empirical cases. It shows that there is no clear-cut verdict on the performance of natural resource systems under different property-rights regimes, except that open-access is not viable in the long term.

The fourth and last section addresses the question of criteria of "success." It ends with the conclusion that there are no simple property-rights solutions. Needed are combinations of property-rights regimes and a diversity of property rights institutions that can be adapted for specific circumstances. The chapter is offered in the spirit of an overview with some key references, and not as an exhaustive analysis of the subject area.

Concepts, Parables, Regimes

Although there is variation in emphasis among scholars (e.g., McCay 1995), most discussions of common property are concerned with resource types which share two key characteristics: (i) exclusion or control of access of potential users is problematic, and (ii) each user is capable of subtracting from the welfare of all other users, that is, there is a jointness problem. On the basis of these two characteristics, some resources are referred to as common-property (or common-pool) resources, and defined as a class of resources for which exclusion is difficult and joint use involves subtractability (Berkes 1989; Feeny et al. 1990). This class of resources usually includes fish, wildlife, forests, grazing lands, irrigation, and groundwater. Most wildlands, parks, and public spaces also show characteristics of common-property, most agricultural land and mineral resources do not.

It has been known that resources that share the above characteristics tend to be susceptible to depletion and degradation. This commons dilemma has been referred to as "the tragedy of the commons" (Hardin 1968). Costanza (1987) has used the term "social trap" to refer more broadly to any circumstance in which the rational individual choice is inconsistent with the long-term interests of either the individual or society.

For natural scientists, by far the best known of the various formulations of the commons dilemma is the "tragedy of the commons," used by Hardin as a parable to explain overgrazing in a hypothetical medieval English commons. Each herdsman seeking individual gain wants to increase the size of his herd. But the commons is finite, and

sooner or later the total number of cattle will exceed the carrying capacity of the land. But it is in the rational self-interest of each herdsman to keep adding animals: his personal gain from adding one more animal (+1) outweighs his personal loss (a fraction of -1) from the damage done to the commons. However, since all herdsmen use the same logic, eventually they all lose. Hence, the overexploitation of the commons is an inevitable result, and a tragedy in the sense of ancient Greek tragedies according to Hardin, in which the characters know that the disaster is coming but are unable to do anything about it.

Hardin's (1968) notion that "freedom in the commons brings ruin to all" was taken quite literally, and accorded by some the status of scientific law. But many scholars knew that the case study would not hold up to historical scrutiny and that the generalization about commons was inappropriate (Feeny et al. 1990). Improving upon Hardin's analysis of the commons required, among others, an organizing framework of property-rights regimes applicable to common-property resources.

Briefly, following Ostrom (1990), Bromley (1992), and Feeny et al. (1990), common-property (common-pool) resources may be held in one of four basic property-rights regimes. *Open-access* is the absence of well-defined property rights. Access is free and open to all. *Private property* refers to the situation in which an individual or corporation has the right to exclude others and to regulate the use of the resource. *State property* or *state governance* means that rights to the resource are vested exclusively in government for controlling access and regulating use. *Communal property* or *common property* means that the resource is held by an identifiable community of users who can exclude others and regulate use. These four regimes are ideal, analytical types. In practice, resources tend to be held in overlapping combinations of them, and there is variation within each.

On the basis of empirical experience, we can hypothesize that three property-rights regimes—private property, state property, and communal property—can under some circumstances, lead to sustainable resource use. By contrast, there is general consensus that open-access is not compatible with sustainability. Hardin's herders, whose access to the resource was free and rulemaking appeared not to exist, were functioning in an open-access regime, not communal property. Hardin's confusion of open-access with common-property has been much discussed as a source of confusion in resource management policies as well (McCay and Acheson 1987; Bromley and Cernea 1989; Berkes 1989; Bromley 1992).

Privatization, advocated as a solution by many economists and others, is often not an option because, by definition, there is an exclusion problem with common-property resources. As Magrath (1989) put it, many of the resources in question are nonexclusive by nature, and not deemed appropriate for private ownership. This has made common-property resources generally difficult to deal with in conventional economic terms. The question of the appropriate property-rights regime is part of the current policy debate for this vast array of resources with exclusion and jointness problems. It is the recognition of these resources as a distinct category that has given rise to a large body of recent literature that cuts across disciplinary boundaries.

Different Views of the Interface

In the history of human ecology, a number of social scientists have attempted to formulate ways of approaching the interface between society and environment. Many of these take into account organization and technology as two key factors in the relationship. Park (1936), the founder of the Chicago school of human ecology, postulated that there was a “cultural superstructure” in human society (as opposed to other species) that imposed itself as an “instrument of direction and control” upon the environment. This cultural superstructure or social complex had three elements: population, artifact (technology), and custom and beliefs (culture). Interaction occurred between the social complex and the environment.

A similar view was expressed by another human ecologist, Duncan (1961), who argued that human societies were characterized by technology and organization. Thus, the link between the human population and environment was not a two-way interaction but rather a four-way interaction of the interdependent variables—population, organization, technology, and environment. The same four variables are also found in Hawley’s (1973) view of the ecosystem. His view differs from the others in considering organization and technology as a “lens” that mediates the relationship between a society and its natural environment.

Much of the common-property literature is consistent with classical human ecology in taking into account factors related to organization; there is less emphasis, however, on technology which tends to be treated as an external variable. Much of the common-property literature emphasizes institutions as mediating factors that govern the relationship between a society and the natural resources on which it depends (e.g., Ostrom 1990).

The literature in ecological economics, by contrast, is concerned more with the relationship between “natural capital” and “human-made capital,” almost to the exclusion of social factors including institutions (Jansson et al. 1994). Berkes and Folke (1994a) have argued that, in general terms, property-rights institutions are part of the cultural capital by which societies convert natural capital, that is, resources and ecological services, into human-made capital or the produced means of production. The term “cultural capital” refers to factors that provide human societies with the means and adaptations to deal with the natural environment and to actively modify it. Cultural capital includes what others have called “social capital” and “institutional capital.” It also includes how people view the natural world, values, and ethics, including religion, and culturally transmitted knowledge of the environment or indigenous knowledge (Gadgil et al. 1993).

Figure 5.1 presents a view of how the three kinds of capital may be interrelated. Natural capital is the basis for cultural capital. For example, property-rights institutions are closely related to the characteristics of the resources used by a society (Geertz 1963). In turn, attitudes and practices of a society regulate the exploitation of its natural capital (Freeman et al. 1991; Posey and Balee 1989). Thus, human-made capital is generated jointly by natural and cultural capital (Freeman et al. 1991; Posey and Balee 1989). Thus, human-made capital is generated jointly by natural and cultural

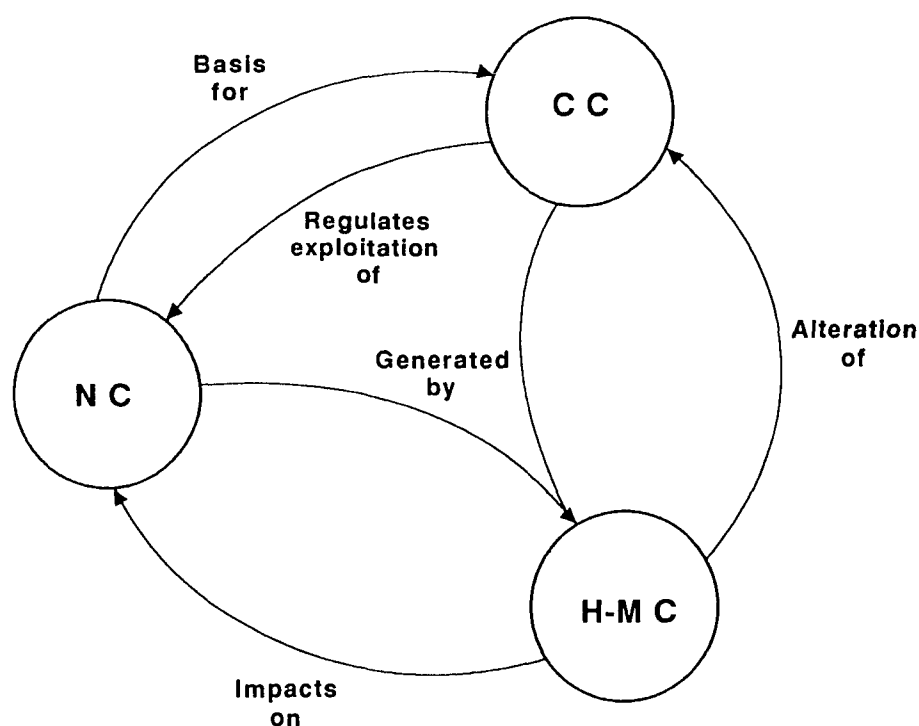


FIGURE 5.1. The main linkages among natural capital (NC), human-made capital (H-MC) and cultural capital (CC). *Source:* Berkes and Folke (1994a).

capital; the use of natural capital under a particular set of institutions, attitudes, and technology produces human-made capital. Human-made capital may, in turn, alter cultural capital; for example, technologies may mask a society's dependence on natural capital and provide a false sense of control over nature. Thus, cultural capital is closely linked to how natural capital will be used; technologies reflect cultural values, worldview, and institutions (Gadgil et al. 1993).

Within a framework of three-way interactions, how would the three capitals interact under different property-rights regimes? The short answer is that we do not know. There is no well developed literature in this area. However, some tentative hypotheses and speculations may be offered:

- New adaptations or a constant elaboration of cultural capital would be necessary to keep up with changes in human-made capital;
- The sustainable use of natural capital will be facilitated by those property-rights regimes capable of responding to feedback from natural capital;
- Ways of enhancing the turnover of information within the larger system will enhance the management of the ecological system; and
- Property-rights institutions must be flexible (rather than "brittle"), diverse, and capable of self-renewal, as Holling (1986) has defined for ecosystem resilience.

The notion of cultural capital, with all the informal and intangible dimensions that it embodies, no doubt complicates the more manageable ecology-economics dichotomy. But it is more consistent with the roots of human ecology and also serves to highlight systems, many of which are informal and thus largely "invisible" to conventional analyses. These informal systems, such as local common-property institutions and traditional knowledge systems, tend to be found more in the Third World than the industrial West, more in rural than in urban areas (e.g., Berkes 1989), and, one may speculate, more in female-dominated than in male-dominated activities. These are not areas in which conventional analyses are known to be strong!

Hardin's seminal "tragedy of the commons," with its group of medieval English herders locked in a downward spiral of resource degradation is a powerful metaphor. But it is not a very good characterization of what really happens in many commons cases; it assumes away institutions and feedbacks. Much of the commons literature suggests instead a "bucket brigade" metaphor. Given a resource man-

agement problem, a group of people will often organize themselves in a way that is similar to the formation of a bucket brigade to put out the fire in a rural community.

Figure 5.2 summarizes the two metaphors as simple feedback models of an integrated natural–social system. The major differences between the two models are in the stabilizing feedback loops that connect the social system and the natural system. For common-property resource use to be sustainable, there should be feedback informing the management institution about the state of the resource; there should also be feedback between the regime and the resource user. When these stabilizing feedbacks are absent (or assumed away) then one is left with a runaway positive feedback loop (a vicious circle), and such a system cannot be sustainable in the long term.

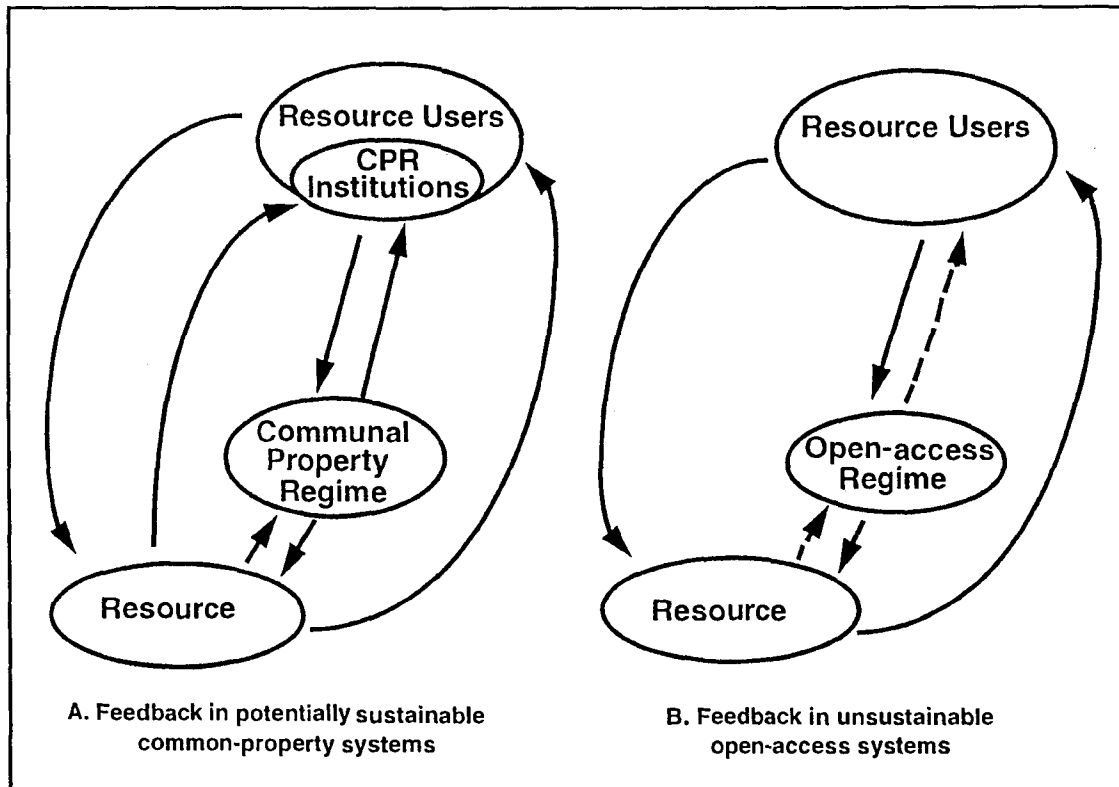


FIGURE 5.2. A systems view of the differences between common-property and open-access systems. Common-property systems have two-way feedbacks between the resource, the regime, and the institution. These linkages enable institutions (rules-in-use) to regulate resource use. In the case of open-access systems, however, there are no institutions to respond to signals from the resource and no negative feedback (stabilizing feedback) or rules to regulate resource use. The result is that open-access systems tend to turn into positive feedback loops (vicious circles) whereby resource depletion leads to more intensified use, which leads to more depletion.

Resource Use Under Different Property-Rights Regimes

The importance of these feedbacks may be seen by analyzing empirical cases. Feeny et al. (1990) evaluated the successes and failures of the four pure property-rights regimes, using the criterion of sustainability. Since the definition of common-property emphasizes two characteristics, exclusion and jointness, the evidence for the performance of the four regimes was assessed with respect to how well each met the following two fundamental challenges in the management of common-property resources: (a) the exclusion of other potential users, and (b) the regulation of joint use to ameliorate the problems associated with subtractability. The following sections are based on Feeny et al. (1990), updated to include some of the more recent literature.

Evidence on Exclusion

Open-Access

The evidence is in support of a general “tragedy of the commons” when resources are held as open-access. Examples are many and include the historic case of the depletion of the various whale stocks in the open ocean. Much of the older literature on the commons is replete with examples showing that if there is no exclusion in the use of scarce resources, depletion follows. However, if resources are abundant relative to needs, open-access and lack of exclusion are not necessarily problematic, at least in the short term. Related to this, the literature reveals an important point: in many cases, colonialists dismantled communal property regimes and institutions as a prelude to establishing colonial economies (e.g., Gadgil and Guha 1992). The “tragedy” occurred only after open-access conditions had been created by external factors, after the destruction of existing communal land-tenure and marine-tenure systems.

A number of cases involved the imposition of colonial rule, as in sub-Saharan Africa (Baxter and Hogg 1990), the Pacific Islands (Johannes 1978), India (Gadgil and Guha 1992), the Pacific Coast salmon rivers in the United States and Canada, and elsewhere (Berkes 1985). In a sense, open-access served well when it was deemed desirable that resources be made freely available for converting into economic wealth, and the local people who depended on them for their subsistence were eliminated from the allocation equation. The point is that the creation of wealth in colonial economies is not necessarily (or not usually) consistent with objectives of sustainable resource use.

Private Property

The establishment and enforcement of private property rights have often provided the institutional arrangement for successful exclusion in resources such as agricultural land—so much so that in the contemporary world (i.e., post-USSR, postprivatization China), private property is almost the exclusive way in which farmland is held. Tree-growing on privatized land may be an important mechanism for sustainability. For example, Holmgren et al. (1994) have found increasing tree biomass, mostly on private land, despite population growth in parts of Kenya. With some types of common-property resources, however, private property rights do not provide a sufficiently precise mechanism for solving the exclusion problem.

For example, in fisheries, the system known as individual transferable quotas (ITQs), holds much appeal to some because it enables market forces to direct the allocation of resources, presumably increasing economic efficiency. Under ITQ, each boat owner receives a share of the total allowable catch (a quota) which can be bought, sold, or leased. ITQs have revolutionized fishery management in the last decade or so, but there is also a downside: ITQs may allow a small number of individuals or companies to buy control over the fishery. Also, the quota approach does not work well when allowable catches cannot be forecast well ahead, when there is a mixed fishery and an incidental catch problem, or when the fishing units are small and there is an enforcement problem (Wilson et al. 1994; Weber 1995).

Enforcement problems exist with all types of property-rights regimes, including private property. Common-property resources, by definition, pose exclusion problems, and enforcement of private property may entail high transaction costs (or the cost of doing business). Well-recognized rights of medieval lords to fish and game were routinely violated by poachers. If the local people do not regard private property rights as legitimate, this may drive up the cost of enforcement.

Communal Property

Under communal-property regimes, “exclusion” means the ability to exclude people other than the members of a defined group. Evidence suggests that successful exclusion under communal-property is the rule rather than the exception, but stresses of population growth, technology change, and economic change may contribute to the breakdown of communal-property mechanisms for exclusion (Jodha

1985, 1992). The creation of open-access by external forces, as in colonialism, is particularly damaging. Examples include Amerindian community hunting lands in James Bay, eastern subarctic Canada—where the communal-property regime collapsed as a result of incursions by outsiders, at least twice over two centuries, and recovered with the reestablishment of exclusion by legislation (Berkes 1989).

One of the major conclusions from the literature is that legal recognition of communal resource-use rights, as in Japanese coastal fisheries, is key to the success of exclusion under communal-property regimes. This is true for a variety of resources from wildlife in Africa (IIED 1994) to mangrove forests in the Caribbean (Smith and Berkes 1993). In many parts of the world, however, there is no legal recognition of exclusion under communal property. Nevertheless, in many such cases, the exclusion of outsiders by local users has been informally enforced through such means as threats and surreptitious violence. A remarkable example is the persistence of community-based lobster fishing territories in Maine which are not recognized in government regulation and are technically illegal (Acheson 1988). The Maine lobster example is merely one of many, but it is a significant example because it comes from a country and culture in which the right of individual free-access is a deeply held belief.

State Property

The state-property regime serves an essential purpose in situations in which the general public good is involved, and other property-rights regimes cannot be relied upon to provide sufficient protection for the resource in question. An example is the conservation of watersheds for municipal drinking water supplies. However, for most resources, exclusion problems are not necessarily solved by declaring the resource to be state property, especially if the means of enforcement are lacking. For example, in the Caribbean island nation of St. Lucia, the protection of marine resources through the establishment of a marine park was successful only when the local community supported and helped enforce the boundaries (Smith and Berkes 1991).

Governance of resources by the state has in many cases been sufficient to provide for exclusion, as in national parks in many Western countries. African national parks are heavily guarded, which provides for exclusion for most purposes, but it has not stopped highly organized and motivated groups, such as rhino poachers. As with private property, the legitimacy of state property in the eyes of the local community is important for enforcement. The abrogation of traditional land and resource use rights of local communities in African

national parks translates into high transaction costs for exclusion (IIED 1994).

Nationalization of resources, once a popular approach in many postcolonial countries, has resulted in social dislocation and resource degradation (Baxter and Hogg 1990). In a move to curb deforestation, the government of Nepal nationalized forests in 1957, converting what were often communal forests into state property. But the result was the creation of *de facto* open-access. Villagers whose control of nearby forests had been removed, now viewed the state forest as an "ownerless" resource open to anyone's exploitation. Deforestation accelerated; in the face of worsening conditions, the government reversed its policy and began in 1976 to re-create communal-property rights (Messerschmidt 1993). One of the most pressing problems of former Eastern Bloc countries is how to handle the devolution of former state property (Meadows 1995).

Evidence on Regulation of Use and Users

Open-Access

Incentives for sustainable resource use are weak, if not absent, in open-access regimes. Under conditions in which demand exceeds the capacity of the resource to renew itself, and in which technology is available to exploit the resource at a high level, the evidence is that the regulation of use and users generally fails. Examples include the extinction or virtual extinction of the North American passenger pigeon and the bison.

However, in the context of the day, free and unregulated use of resources such as the bison initially made economic sense. To illustrate the individual rationality behind bison depletion, Hardin (1978) invokes the image of the American cowboy-hero Kit Carson shooting bison on the plains, taking only the tongue and leaving the rest. This is not economically irrational, if one considers that the game was then abundant but the hunter's time scarce.

Unregulated resource use, in general, is consistent with objectives of rapid economic growth, as reflected in "frontier economics" (Hardin 1978). If the social problem of traditional use rights is assumed away, the environmental problem only comes up when the resource is depleted. Can regulations be brought in before the resource disappears? Holling (1993) and others have pointed out that scale-dependent time-lags play an important role. In larger scale environmental and resource problems, society does not receive the signals fast enough to act effectively. In the historical case of bison, for example,

depletion occurred rapidly, before countervailing institutional arrangements or changing cultural values could prevent it.

Private Property

Privatization usually provides incentives to regulate resource use. If the owner has property rights in the resource and those rights are tradable, both the costs and benefits will accrue to the same owner and will be reflected in the market price of the resource, giving the owner the incentive to regulate resource use in a manner consistent with private objectives. These incentives may be consistent with private economic efficiency, but they are not necessarily consistent with biological conservation. Clark (1973) pointed out that whether incentives created by privatization are consistent with sustainability depends on a combination of the biological characteristics of the resource and the economic characteristics of the market. Suppose a California redwood tree planted for \$1 is worth \$14,000 at maturity, seemingly a good appreciation in value. But redwood trees may take 2000 years to reach a great size, giving an implied rate of return of less than 0.5 percent per year, well below the rates of return generally available. Thus, planting a redwood tree, or conserving an existing redwood forest, for the wood value does not make economic sense under a private-property regime, no matter how much ecological sense it makes.

Redwoods may be an extreme example, but Clark (1973) has generally shown for slow-growing and late-maturing species such as whales that it may be economically optimal to deplete the resource rather than to use it sustainably. Private-property rights permit the owner to regulate use to maximize the present value of the resource, and not necessarily to regulate use for sustainability.

Communal Property

There is abundant evidence on the ability of social groups to design a variety of mechanisms to regulate use among members. However, a number of conditions have to be satisfied before communal-property regimes can regulate use; Ostrom (1990, 1992) lists eight such design principles and McKean (1992) lists six. Of the various property-rights regimes, communal property provides the most diverse set of regulations and historically the oldest cases.

The medieval English commons, like many other historic commons, were often subject to comprehensive systems of regulation. Scott (1955), one of the earliest commons theorists, pointed out the existence of traditional use-rules such as stinting, which limited the

number of heads of animal each owner could graze on the village commons. Many scholars have noted that the commons operated over several hundred years in medieval England, and have questioned if a "tragedy" of the sort described by Hardin (1968) ever occurred widely. Communal-property systems with elaborate regulations are found in virtually every part of the globe and cover virtually all resource types (e.g., McCay and Acheson 1987; Bromley 1992).

Not all examples of successful regulation are historic or are based on long-standing tradition. In a study of several Turkish coastal fisheries, regulations for self-governance were found to have evolved in the order of one decade (Berkes 1992). In Alanya on the Mediterranean coast of Turkey, fishermen developed in the 1970s and the 1980s a system, based on the rotation of fishing sites used, to regulate use and solve the problem of escalating conflicts over prime harvesting areas. These design rules did not solve the problem of increasing numbers of boats but formed the basis for the diversification of fishermen into the developing tourism industry in the late 1980s (Berkes 1992).

State Property

State governance permits the formulation of appropriate regulations for resource use for all citizens, whether it deals with forests, water, or wildlife hunting. It also provides for the expression of public interest and for accountability, but does not necessarily ensure sustainable use. Decisionmakers do not often have the same time horizons and values as resource users, or as seen in the Great Lakes area, officials may adopt the interests of the most powerful user-groups (Regier et al. 1989).

One of the oft-mentioned problems of state-property regimes is the proliferation of regulations. Smith (1988) showed that the combinations of licenses, quotas, allocations, seasons, and trip limitations in the New England fishery added up to more than 100 regulations, leading not to sustainable resource use but widespread noncompliance! In contrast to North America and Europe, state governance of resources in many Third World countries is problematic, not because of the cost of enforcement, but because of the lack of enforcement capability of the state.

Sole reliance on state governance has been declining in recent decades; the failure of central planning in such countries as the former USSR is one reason for this. Public participation in the formulation of regulations in resource management has a long tradition in the West. More recently, resource users have been seeking and obtaining formal

powers to participate in the decisionmaking process, referred to as comanagement (e.g. Pinkerton 1989). Such state-level and local-level comanagement is also on the agenda in the Third World. Property rights of local communities are being reasserted within a state governance framework, in a diversity of areas and resource types, from hill forests of India (Gadgil and Guha 1992) to coastal fisheries in South-east Asia (Pomeroy 1994).

In conclusion, the evidence on exclusion shows that there are enforcement problems with all types of property-rights regimes, including private property. State-property regimes probably fare the worst in this regard. Communal-property regimes do not work well under stress from colonialism, population pressure, technology change, and transformation of subsistence economies to cash economies.

The evidence on the performance of different property-rights regimes in regulating use and users with respect to subtractability is also mixed. Under private property, sustainable use is feasible in many cases but not economically rational for resources which renew themselves very slowly, such as whales. Under communal property, success depends on the ability of users to forge appropriate institutions, which in turn depends on a number of other factors (Ostrom 1990; 1992). Solutions to both exclusion and subtractability problems are feasible under each of private, state, and communal-property regimes. However, no single property-rights regime is sufficient to guarantee the sustainable use of resources (Feeny et al. 1990; Knudsen 1995; McCay 1995).

These findings are generally consistent with Figure 5.2 which postulates the importance of institutions in mediating the relationship between society and environment. In the case of each of the three potentially workable property-rights regimes, success largely depends upon how well institutions are working. Thus, with many former Eastern Bloc and Third World countries, for example, inadequacy of government institutions largely accounts for resource management failure. Under communal-property regimes, success or failure again depends on institutions, in this case, informal constraints, such as norms of behavior, conventions, and codes of conduct. Institutions need not be defined as organizations but rather as systems of working rules (Ostrom 1990; North 1990).

The other point highlighted by Figure 5.2 is the question of feedbacks. Institutions fail to the extent that they are slow to respond to signals from the resource, a characteristic of large, monolithic, old, and "brittle" institutions (Holling 1993). There is accumulating evidence that institutions need to renew themselves and that resource

management crises may be useful in that regard (Gunderson et al. 1995). Institutions which are closer to the resource, flexible, diverse, and open to feedbacks from the environment, as is the case with some of communal-property and private-property regimes, stand a better chance of success. Wilson et al. (1994) have made the controversial argument that, in an environment of chaos and uncertainty, local fishery management systems, with their diversity and flexibility, are better adapted for long-term resource management than are government institutions, with their quantitative tools such as quotas.

Performance of Natural Resource Systems: An Outlook

Two major points have been identified for discussion from the ideas and studies reviewed in this chapter. The first pertains to the question of criteria in measuring performance, and the second is about the significance of the observed diversity in apparently successful resource management systems.

The question of the performance of natural resource systems under different property-rights regimes begs the question of criteria. As Knudsen (1995) pointed out, much of the common-property literature deals with supposed cases of “success” in a rather vague way, more by reiteration than by theory-building and hypothesis-testing. How can the “success” of natural resource use cases be assessed? Feeny et al. (1990) used ecological sustainability, wherein the resource in question was used without compromising the ability of future generations to meet their needs (WCED 1987). This is basically a criterion of resource use without depletion, as also used by Ostrom (1990), but it does not necessarily imply that resource use was optimal from either ecological or economic points of view. It does, however, have the advantage of being both human-centric and resource-centric, and not exclusively one or the other (Feeny et al. 1990).

There are, however, other criteria that can be used. In his widely used common-property analysis framework, Oakerson (1986) suggested two criteria—efficiency (defined as Pareto optimality whereby at least one person could be made better off and no one worse off) and equity (distributive justice). These criteria have been applied to a large number of case studies reported in two books by the National Research Council (1986) and by Bromley (1992). Alternative criteria, as proposed by some development specialists (Pomeroy 1994; Titi and Singh 1994), include empowerment (ability of people to control decisions affecting their lives) and livelihood security (ability of people to maintain their means of living).

Other authors have used various economic and institutional criteria to evaluate performance. These include Blomquist (1992) on Southern California groundwater, and Tang (1992) on a number of irrigation case studies. Chopra et al. (1990) and Chopra and Kadekodi (1991) analyzed the performance of participatory institutions in the management of common and private property resources in Northwestern India village communities. Stevenson (1991) examined the economic performance of private and communal property rights systems in Swiss alpine meadows. He found that in the more productive lower elevations, private property was more efficient. In the less productive higher elevations, remote areas unsuitable for private property because of higher management costs, communal property performed as efficiently as private property.

In contrast to these detailed studies of institutions and economic performance, there seem to be very few studies that focus on the performance of the natural resource itself under different property-rights regimes. Exceptions include Smith and Berkes (1991, 1993).

What is available in abundance, however, is a rich literature on local and traditional management systems. Perhaps the most striking feature of the case studies in the literature is the sheer diversity of property-rights institutions, especially in the older, historically rooted resource management systems, such as in the Swiss Alps (Netting 1981; Stevenson 1991). For example, there is a diverse array of arrangements from island group to island group in the reef and lagoon tenure systems of Oceania (Ruddle and Akimichi 1984; Freeman et al. 1991). Johannes (1978) found that "almost every basic fisheries conservation measure devised in the West was in use in the tropical Pacific centuries ago." The ancient wisdom of traditional management and the populist wisdom of contemporary community-based resource management systems are being rediscovered by the conservation and development community (Pye-Smith and Borrini Feyerabend 1994).

Compared with this diversity of conservation measures and common-property arrangements, resource management prescriptions of the West which have been replacing the traditional systems are rather bland and uniform in nature, such as quota management, as opposed to the diversity of time-tested controls in small-scale fisheries throughout the world (Wilson et al. 1994). Gadgil and Berkes (1991) and McNeely (1991), among others, have pointed out that scientific management has its roots in the utilitarian and exploitive world view that assumes that humans have dominion over nature and is best geared for the efficient utilization of resources as if they were limit-

less. The replacement of a diversity of local systems by a monolithic scientific management vision has in most cases not led to sustainable outcomes. There are many examples of natural resource depletion or degradation following the replacement of locally adapted, subtle, and complex common-property systems by government management or private property, especially in the Third World (McCay and Acheson 1987; Berkes 1989; Baxter and Hogg 1990; Bromley 1992).

Conventional resource management science, best geared for exploitive development ("business in liquidation") but not for sustainable use, is in need of fundamental rethinking. Based on the empirical evidence from the common-property literature, the range of changes might include those regarding world views and, more pertinent to the present subject, property rights and institutional arrangements. The evidence suggests that the task is to make institutions for resource use more diverse, not less; natural system–social system interactions more responsive to feedbacks; management systems more flexible and more accommodating of environmental perturbations and thus less "brittle." These may be treated as hypotheses and are in fact part of a research agenda (Berkes and Folke 1994b). Some of the more promising lines of inquiry are likely to involve the study of feedbacks, such as those between common property institutions and ecological systems.

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REFERENCES

- Acheson, J. M. 1988. *The Lobster Gangs of Maine*. University Press of New England, Hanover, NH, and London.
- Baxter, P. T. W. and R. Hogg, eds. 1990. *Property, Poverty and People: Creating Rights in Property and Problems of Pastoral Development*. Department of Social Anthropology and International Development Centre, University of Manchester, Manchester, UK.
- Berkes, F. 1985. Fishermen and the "tragedy of the commons." *Environmental Conservation* 12:199–206.
- Berkes, F., ed. 1989. *Common Property Resources: Ecology and Community-Based Sustainable Development*. Belhaven, London.

- Berkes, F. 1992. Success and failure in marine coastal fisheries of Turkey. Pages 161–182 in D. Bromley, ed. *Making the Commons Work*. Institute for Contemporary Studies Press, San Francisco.
- Berkes, F. and C. Folke. 1994a. Investing in cultural capital for the sustainable use of natural capital. Pages 128–149 in A.-M. Jansson, M. Hammer, C. Folke, and R. Costanza, eds. *Investing in Natural Capital*. Island Press, Washington, D.C.
- Berkes, F. and C. Folke. 1994b. *Linking Social and Ecological Systems for Resilience and Sustainability*. Beijer International Institute of Ecological Economics, Stockholm.
- Blomquist, W. 1992. *Dividing the Waters. Governing Groundwater in Southern California*. Institute for Contemporary Studies Press, San Francisco.
- Bromley, D. W., ed. 1992. *Making the Commons Work: Theory, Practice and Policy*. Institute for Contemporary Studies Press, San Francisco.
- Bromley, D. W. and M. M. Cernea. 1989. The management of common property natural resources. World Bank Discussion Paper No. 57.
- Chopra, K. and G. K. Kadekodi. 1991. Participatory institutions: The context of common and private property resources. *Environmental and Resource Economics* 1:353–372.
- Chopra, K., G. K. Kadekodi, and M. N. Murty. 1990. *Participatory Development, People and Common Property Resources*. Sage, New Delhi.
- Clark, C. W. 1973. The economics of overexploitation. *Science* 181:630–634.
- Costanza, R. 1987. Social traps and environmental policy. *BioScience* 37: 407–412.
- Dasgupta, P. and K.-G. Maler. 1992. *The Economics of Transnational Commons*. Clarendon, Oxford, UK.
- Duncan, O. D. 1961. From social system to ecosystem. *Sociological Inquiry* 31:140–149.
- Feeny, D., F. Berkes, B. J. McCay, and J. M. Acheson. 1990. The tragedy of the commons: Twenty-two years later. *Human Ecology* 18:1–19.
- Freeman, M. M. R., Y. Matsuda, and K. Ruddle, eds. 1991. Adaptive marine resource management systems in the Pacific. Special issue of *Resource Management and Optimization*, Vol. 8, No. 3/4.
- Gadgil, M. and F. Berkes. 1991. Traditional resource management systems. *Resource Management and Optimization* 8:127–141.
- Gadgil, M. and R. Guha. 1992. *This Fissured Land: An Ecological History of India*. Oxford University Press, New Delhi.
- Gadgil, M., F. Berkes, and C. Folke. 1993. Indigenous knowledge for biodiversity conservation. *Ambio* 22:151–156.
- Geertz, C. 1963. *Agricultural Involution*. University of California Press, Berkeley.
- Gunderson, L. H., C. S. Holling, and S. S. Light, eds. 1995. *Barriers and Bridges to the Renewal of Ecosystems and Institutions*. Columbia University Press, New York.

- Hardin, G. 1968. The tragedy of the commons. *Science* 162:1243-1248.
- Hardin, G. 1978. Political requirements for preserving our common heritage. Pages 310-317 in H.P. Brokaw, ed. *Wildlife and America*. Council on Environmental Quality, Washington, D.C.
- Hawley, A. H. 1973. Ecology and population. *Science* 179:1196-1201.
- Holling, C. S. 1986. The resilience of terrestrial ecosystems: Local surprise and global change. Pages 292-317 in W. C. Clark and R. E. Munn, eds. *Sustainable Development of the Biosphere*. Cambridge University Press, Cambridge, UK.
- Holling, C. S. 1993. Investing in research for sustainability. *Ecological Applications* 3:552-555.
- Holmgren, P., E. J. Masakha, and H. Sjöholm. 1994. Not all African land is being degraded. *Ambio* 23:390-395.
- IIED. 1994. *Whose Eden? An Overview of Community Approaches to Wildlife Management*. International Institute for Environment and Development, London.
- Jansson, A.-M., M. Hammer, C. Folke, and R. Costanza, eds. 1994. *Investing in Natural Capital*. Island Press, Washington, D.C.
- Jodha, N. S. 1985. Population growth and the decline of common property resources in Rajasthan, India. *Population and Development Review* 11:247-264.
- Jodha, N. S. 1992. Common property resources. A missing dimension of development strategies. World Bank Discussion Paper No. 169.
- Johannes, R. E. 1978. Traditional marine conservation methods in Oceania and their demise. *Annual Review of Ecology and Systematics* 9:349-364.
- Keohane, R. and E. Ostrom, eds. 1995. *Local Commons and Global Interdependence*. Sage, London.
- Knudsen, A. J. 1995. *Living with the Commons*. Chr. Michelsen Institute, Bergen.
- Magrath, W. 1989. The challenge of the commons. World Bank, Environment Department Working Paper No. 14.
- McCay, B. J. 1995. Common and private concerns. *Advances in Human Ecology* 4:89-116.
- McCay, B. J. and J. M. Acheson, eds. 1987. *The Question of the Commons. The Culture and Ecology of Communal Resources*. University of Arizona Press, Tucson.
- McKean, M. A. 1992. Success on the commons: A comparative examination of institutions for common property resource management. *Journal of Theoretical Politics* 4:247-281.
- McNeely, J. A. 1991. Common property resource management or government ownership: Improving the conservation of biological resources. *International Relations* 1991:211-225.
- Meadows, D. H. 1995. Privatization of land in the Baltics? *Surviving Together* (Spring 1995), 13-14.

- Messerschmidt, D. A. 1993. Common forest resource management. *Annotated Bibliography of Asia, Africa and Latin America*. FAO Community Forestry Note 11.
- National Research Council 1986. *Proceedings of the Conference on Common Property Resource Management*. National Academy Press, Washington, D.C.
- Netting, R. McC. 1981. *Balancing on an Alp*. Cambridge University Press, Cambridge, UK.
- North, D. C. 1990. *Institutions, Institutional Change, and Economic Performance*. Cambridge University Press, New York.
- Oakerson, R. J. 1986. A model for the analysis of common property problems. Pages 13–29 in *Proceedings of the Conference on Common Property Resources Management*. National Academy Press, Washington, D.C. (See also in Bromley 1992.)
- Ostrom, E. 1990. *Governing the Commons. The Evolution of Institutions for Collective Action*. Cambridge University Press, Cambridge, UK.
- Ostrom, E. 1992. *Crafting Institutions for Self-Governing Irrigation Systems*. Institute for Contemporary Studies Press, San Francisco.
- Park, R. E. 1936. Human ecology. *American Journal of Sociology* 42:1–15.
- Pinkerton, E., ed. 1989. *Cooperative Management of Local Fisheries*. University of British Columbia Press, Vancouver.
- Pomeroy, R. S., ed. 1994. *Community Management and Common Property of Coastal Fisheries in Asia and the Pacific*. ICLARM, Manila.
- Posey, D. A. and W. Balee, eds. 1989. Resource management in Amazonia: Indigenous and folk strategies. Special issue of *Advances in Economic Botany*, Vol. 7.
- Pye-Smith, C. and G. Borrini Feyerabend 1994. *The Wealth of Communities*. Earthscan, London.
- Regier, H. A., R. V. Mason, and F. Berkes 1989. Reforming the use of natural resources. Pages 110–126 in F. Berkes, ed. *Common Property Resources*. Belhaven, London.
- Ruddle, K. and T. Akimichi, eds. 1984. Maritime institutions in the Western Pacific. *Senri Ethnological Studies*, Vol. 17. National Museum of Ethnology, Osaka.
- Scott, A. D. 1955. The fishery: The objectives of sole ownership. *Journal of Political Economy* 63:116–124.
- Smith, A. H. and F. Berkes 1991. Solutions to the “tragedy of the commons”: Sea-urchin management in St. Lucia, West Indies. *Environmental Conservation* 18:131–136.
- Smith, A. H. and F. Berkes 1993. Community-based use of mangrove resources in St. Lucia. *International Journal of Environmental Studies* 43:123–131.
- Smith, M. E. 1988. Fisheries risk in modern context. *Maritime Anthropological Studies* 1:29–48.

- Stevenson, G. G. 1991. *Common Property Economics: A General Theory and Land Use Applications*. Cambridge University Press, Cambridge, UK.
- Tang, S. Y. 1992. *Institutions and Collective Action: Self-Governance in Irrigation*. Institute for Contemporary Studies Press, San Francisco.
- Titi, V. and N. Singh 1994. *Adaptive Strategies of the Poor in Arid and Semi-arid Lands: In Search of Sustainable Livelihoods*. International Institute of Sustainable Development, Winnipeg.
- WCED. 1987. *Our Common Future*. World Commission on Environment and Development/Oxford University Press, Oxford, UK.
- Weber, P. 1995. Protecting oceanic fisheries and jobs. Pages 21-37 in *State of the World 1995*. Earthscan, London.
- Wilson, J. A., J. M. Acheson, M. Metcalfe, and P. Kleban 1994. Chaos, complexity and communal management of fisheries. *Marine Policy* 18: 291-305.

The benefits of the commons

F. Berkes, D. Feeny, B.J. McCay and J.M. Acheson

Conventional wisdom holds that resources held in common will invariably be overexploited — the “tragedy of the commons”. A number of examples show that this is not necessarily so.

It has become a truism that resources held in common are vulnerable to over-exploitation. Twenty-one years ago, Hardin popularized this dilemma — calling it the “tragedy of the commons” — by the use of a metaphorical village common in which each herdsman “is locked into a system that compels him to increase his herd without limit”¹. Hardin argued that such problems have no technical solutions, and emphasized the need for government controls to limit “freedom in the commons [which] brings ruin to all”¹. Hardin and others² have subsequently pointed to privatization of common resources as another solution consistent with the analysis of many resource economists³.

It is usual to assume that resource degradation is inevitable unless common property is converted into private property or government regulations are instituted. The prevalence of this view is reflected by an article in *The Economist* of 10 December 1988 about fisheries, typically viewed as a common-property resource: “...it is possible to manage fisheries successfully”, the author asserts, “provided three facts are kept in mind”. Two of these are relevant here: “left to their own devices, fishermen will over-exploit stocks” and “to avoid disaster, managers must have effective hegemony over them”.

Nevertheless, research carried out in the 21 years since Hardin’s article often leads to conclusions that challenge this conventional wisdom. Such results are of interest to resource managers, applied natural and social scientists, policy-makers and development planners. Many case studies, including our own, show that success can be achieved in ways other than privatization or government control⁴⁻⁷. Communities dependent on common-property resources have adopted various institutional arrangements to manage those resources, with varying degrees of success in achieving sustainable use. We use ecological sustainability⁸ as a rough index of management success without necessarily implying resource use that is ecologically or economically optimal.

As a first step in the analysis, it is necessary to define the kind of resources under consideration. Common-property (or common-pool⁹) resources share two key characteristics. First, these are resources for which exclusion (or control of access) of potential users is problematic. The physical nature of the resource is such

that controlling the access of potential users is costly and, in some cases, virtually impossible. Migratory or fugitive resources such as fish and wildlife pose obvious difficulties. Similarly, ground water, range and forest lands, and global commons⁸ such as the high seas, the atmosphere and the geosynchronous orbit, pose problems of exclusion.

The second key characteristic of



Cree Amerindian fishermen of James Bay, seining river eddies for whitefish. The use of the resource is regulated under rules agreed upon by all — groups of fishermen wait their turn for the best sites during the short fishing season. (F. Berkes.)

common-property resources is subtractability; each user is capable of subtracting from the welfare of others. This characteristic creates a potential divergence between individual and collective economic rationality in joint use³. As one user continues to pump water from an aquifer, others experience increased pumping costs; as the number of fishing boats increases, the catch per unit of effort for each declines. On the basis of these two characteristics, we define common-property resources as a class of resources for which exclusion is difficult and joint use involves subtractability.

As a second step in the analysis, a taxonomy of property-rights regimes is needed⁹⁻¹¹. Common-property resources are held in one of four basic property-rights regimes. (1) Open access is the absence of well-defined property rights. Access is free and open to all, as with ocean fisheries of the past century. This is the regime implied in Hardin’s model. (2) Private property refers to the situation in which an individual or corporation has the

right to exclude others from using the resource and to regulate its use. (3) Under communal property, the resource is held by an identifiable community of users who can exclude others and regulate use. Some shellfish beds, range lands, forests, irrigation and ground water have been managed as communal property. (4) State property or state governance means that rights to the resource are vested

exclusively in government, which controls access and level of exploitation. Examples include crown lands and resources such as fish and wildlife held in public trust. These four categories are ideal, analytical types. In practice, resources are often held in overlapping combinations of these four regimes, and there is variation within each.

We now briefly summarize selected case studies. These studies show the workings of communal-property systems not recognized in Hardin’s model, as well as the limitations to the use of state governance in some situations.

Our first case concerns wildlife hunting territories in James Bay, Quebec, in northeastern Canada¹². Hunters in this subarctic area have traditionally used resources communally, as do many Amerindian groups, and have a rich heritage of customary laws to regulate hunting. Beaver is an important species both for food and, since the start of the fur trade in James Bay in 1670, for commerce. ▶

The beaver is vulnerable to depletion because colonies are easily spotted. A community-based hunting territory system, with senior hunters and their families acting as stewards of specific territories, at present ensures sustainable use. The beaver resource in James Bay, however, has not always been used sustainably. In the 1920s, a large influx of non-native trappers followed the new railroad into the area to take advantage of high fur prices. Amerindian communities lost control over their territories and all trappers, including natives, contributed to a "tragedy of the commons". Conservation laws were eventually enacted after 1930, when beaver populations were at an all-time low, and outsiders were banned from trapping in James Bay. Amerindian community and family territories were legally recognized and customary laws became enforceable, resulting in productive harvests after about 1950¹². The experience of the 1920s and 1930s is not unique. Periods of cut-throat rivalry among fur companies had led to non-sustainable use of resources twice before: in the mid-1700s and in 1825–29. Gradually, however, local control was restored and stocks recovered¹².

Our second and third cases deal with lobster and fish management on the east coast of the United States^{13,14} and show that communal territories exist even in societies that subscribe to the ideal of freedom in the commons. In the US tradition, marine resources belong to all citizens but are controlled by state governments as a public trust. Privatization of some marine resources such as shellfish beds is feasible but not always socially desirable or politically acceptable¹⁵. Government management is similarly difficult: limiting the number of licences is considered an infringement of citizens' rights. Even so some groups of users are able to restrict access and manage common-property resources.

The lobster resource is vulnerable to overharvesting, but lobster stocks in Maine have remained sustainable. Although some managers have for decades been predicting a resource collapse, the Maine lobster catch has been remarkably stable since 1947¹³. The state government establishes lobstering regulations but does not limit the number of licences. In practice, however, there is exclusion through a system of traditional fishing rights; to go lobster fishing at all, one has to be accepted by the community. Once accepted, a lobsterman is only allowed to fish in the territory held by that community. Interlopers are usually discouraged by surreptitious violence.

One cannot say if the resource could

have been used sustainably in the absence of such locally enforced exclusion and regulation. But we have compared the productivity of exclusively used territories with areas in which claims of adjacent communities overlap. We found that fishermen in the exclusive territories catch significantly more and larger lobsters with less overall effort¹³.

The third case, a trawl fishery in the New York Bight region, provides an alternative community-based solution to the commons dilemma¹⁴. The fishermen who belong to a cooperative specialize in the harvest of whiting. They have ready



Beaver hunters in north-eastern Canada (this one was sketched in 1891) used resources communally until the coming of the railroad in the 1920s brought an influx of 'outsiders'.

access to the best whiting grounds in the region, and often dominate the regional whiting market in the winter months.

The cooperative maintains relatively high prices for members through supply management; it limits entry into the local fishery and establishes catch quotas among members. Limited entry is achieved through a closed membership policy and the control of docking space, effectively excluding non-members from access to whiting grounds and markets. Quotas are based on the estimates of what the cooperative can sell to the regional market, and are achieved in ways that reward individual initiative but also discourage 'free-riding'. By contrast with government-imposed regulations, which are considered by fishermen to be inflexible and which in any case are ineffective because they do not address the fundamental problem of access, self-regulation through the cooperative is considered to be both flexible and effective in maintaining sustainable use¹⁴.

Forests in Thailand comprise our fourth case¹⁶. Traditionally the exploitation of high-value timber was regulated by local governments; the use of low-value timber

was essentially unregulated. The rapid commercial exploitation of teak in Thailand in the late nineteenth century led to the nationalization of all forests. State ownership fails to provide consistent enforcement, but it also serves to deny users the authority to manage local forests. Illegal logging, followed by further land clearing for cultivation, is widespread. Although much of this land is suitable for cultivation, there are few safeguards for conserving environmentally sensitive areas; this results in overall damage to land.

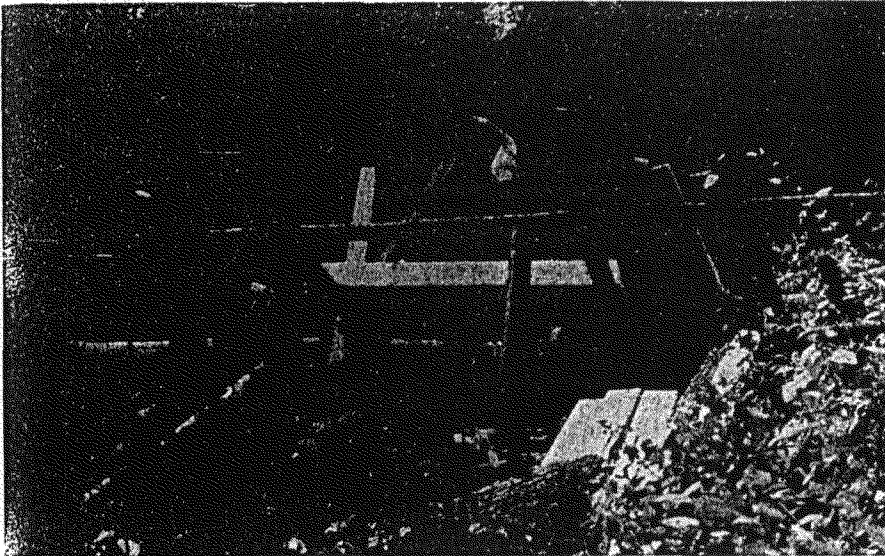
The lack of enforcement of state-forest property rights leading to accelerated degradation is not unique to Thailand. The nationalization of forests in Nepal (1957) and Niger (1935) produced a similar outcome¹⁷. In Nepal, the situation is being ameliorated by the re-creation of communal management at the local level¹⁸. Without effective control by government, nationalization has often converted traditional communal property into *de jure* state property but *de facto* open-access.

Having reviewed a few cases, we return to the tragedy of the commons model to explore its problems in relation to the findings. Hardin asks the reader to assume a pasture "open to all"¹. Each herdsman acts in an individually rational fashion by adding animals to the common pasture. For him, the private benefits of adding one more animal exceed the private cost. Because each herdsman does the same, the overall result is overgrazing and disastrous losses for all.

Hardin's model provides insight about the divergence between individual and collective rationality. But it fails to take into account the self-regulating capabilities of users. It assumes that the herdsmen are unable to limit access or institute rules to regulate use. Therefore, overexploitation is inevitable — unless privatization or government controls are imposed. These conclusions have been used as part of the justification for nationalization¹⁸, privatization of land resources¹⁹, and the widespread practice of top-down development planning that ignores local institutions^{4,6}. The social and ecological costs of these practices have often been tragic in their own right.

Recognition that users have the potential and, under some conditions, the motives and means to act collectively opens up other policy alternatives and provides questions about why some communal management systems fail and others succeed. The success or failure of common-property resource management has to do with the exclusion and regulation

Mary Evans



Robert Harding

Woodcutters near Bhratang, Nepal — nationalization of Nepal's forests led to over-exploitation, but the situation is now being improved by the re-creation of local communal management.

of joint use. Forest destruction in Thailand, for example, occurs because villagers do not own the forest and cannot exclude others. Local people therefore have little incentive to conserve and every incentive to cut down trees before someone else does¹⁶.

By contrast, in other examples — hunters in James Bay, lobstermen in Maine, trawlers in the New York Bight area, communal forest users in Nepal, and irrigation water users in South India²⁰ — groups are able to exclude other potential users and regulate their own joint use. They are therefore able to reap the benefits of their own restraint. Our examples are not isolated, but are consistent with a large body of literature on grazing lands²¹, forests²², water²³ and coastal marine resources²⁴, covering a wide range of regions and cultures throughout the world.

What accounts for the many exceptions to the predictions of the conventional theory? How can Hardin's model be improved to obtain a more comprehensive theory of common-property resource management? First, the Hardin model confuses common-property resources with open access — the absence of property rights. By equating common-property resources with open access, and then assuming that open access leads to overexploitation, the model falls into the trap of equating the commons with over-exploitation.

Second, the model assumes that the individual interest is unconstrained by existing institutional arrangements. In many communities, common-property resource users are compelled by social pressure to conform to carefully prescribed and enforced rules of conduct.

Third, the model assumes that resource users cannot cooperate toward their common interests. This is not necessarily so; under certain circumstances, voluntary

collective action is feasible²⁵, and sustainable outcomes are not unusual²⁶⁻²⁸.

More fundamentally, the model overlooks the role of institutions that provide for exclusion and regulation of use. Cultural and historical factors underlying such institutional arrangements are a key to the success of communal management of coastal marine resources in Japan and several Pacific-island nations²⁴, in addition to the cases we describe above.

Finally, the set of solutions offered by the model is too limited. Privatization or the imposition of government control are not the only viable policy options. In fact, the conventional reliance on these approaches is overly sanguine. By definition, common-property resources are ones for which exclusion is difficult and so privatization is often not feasible. Although dividing a commons and assigning individual property rights can increase efficiency under some circumstances, it might not in others. Similarly, state control

has worked in some cases, but the example of Thailand forests illustrates its potential for failure.

In general, we propose that successful approaches to the commons dilemma are found in complementary and compatible relationships between the resource, the technology for its exploitation, the property-rights regime and the larger set of institutional arrangements. We also propose that combinations of property-rights regimes may in many cases work better than any single regime. The success of local-level management, for example, often depends on its legitimization by central government; James Bay¹² and recent experience in Nepal¹⁸ are examples. Such nested relationships are also found in fisheries in Japan and Oceania²⁴. In some cases, cooperative management arrangements (co-management) are needed, involving the sharing of power between governments and local communities²⁶.

In sum, sustainable common-property resource management is not intrinsically associated with any particular property-rights regime. Successes and failures are found in private, state and communal-property systems. Recent research highlights the potential viability and continued relevance of communal-property regimes, nested systems and co-management. Studies after that of Hardin have shown the dangers of trying to explain resource use in complex socio-ecological systems with simple deterministic models. □

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1. Hardin, G. *Science* **162**, 1243–1248 (1968).
2. Hardin, G. & Baden, J. (eds) *Managing the Commons* (Freeman, San Francisco, 1977).
3. Gordon, J. S. *J. polit. Econ.* **62**, 124–142 (1954).
4. *Proc. NRC Conf. Common Property Resource Management* (National Academy, Washington, DC, 1986).
5. McCay, B. J. & Acheson, J. M. (eds) *The Question of the Commons: The Culture and Ecology of Communal Resources* (University of Arizona Press, Tucson, 1987).
6. Ostrom, V., Feeny, D. & Picht, H. (eds) *Rethinking Institutional Analysis and Development* (Institute for Contemporary Studies, San Francisco, 1988).
7. Berkes, F. (ed.) *Common Property Resources: Ecology and Community-Based Sustainable Development* (Belhaven, London, 1989).
8. World Commission on Environment and Development *Our Common Future* (Oxford University Press, 1987).
9. Ostrom, E. in *Proc. NRC Conf. Common Property Resource Management* 599–615 (National Academy, Washington, DC, 1986).
10. Bromley D. W. in *Proc. NRC Conf. Common Property Resource Management* 593–598 (National Academy, Washington, DC, 1986).
11. Bromley, D. W. *Economic Interests and Institutions* (Blackwell, Oxford, 1989).
12. Berkes, F. in *Common Property Resources: Ecology and Community-Based Sustainable Development* 70–78 (Belhaven, London, 1989).
13. Acheson, J. M. *The Lobster Gangs of Maine* (University Press of New England, 1988).
14. McCay, B. J. *Anthrop. Q.* **53**, 29–38 (1980).
15. McCay, B. J. in *The Question of the Commons: The Culture and Ecology of Communal Resources* 195–216 (University of Arizona Press, 1987).
16. Feeny, D. in *World Deforestation in the Twentieth Century* (Duke University Press, 1988).
17. Thomson, J. T., Feeny, D. H. & Oakerson, R. J. in *Proc. NRC Conf. Common Property Resource Management* 391–424 (National Academy, Washington, DC, 1986).
18. Arnold, J. E. M. & Campbell, J. G. in *Proc. NRC Conf. Common Property Resource Management* 425–454 (National Academy, Washington DC, 1986).
19. Peters, P. in *The Question of the Commons: The Culture and Ecology of Communal Resources* 171–194 (University of Arizona Press, 1987).
20. Wade, R. *Village Republics: Economic Conditions for Collective Action* (Cambridge University Press, 1987).
21. Netting, R. M. *Balancing on an Alp: Ecological Change and Continuity in a Swiss Mountain Community* (Cambridge University Press, 1981).
22. Fortmann, L. & Bruce, J. W. (eds) *Whose Trees? Proprietary Dimensions of Forestry* (Westview, Boulder, 1988).
23. Maass, A. & Anderson, R. L. ... *and the Desert Shall Rejoice* (MIT, Cambridge, 1978).
24. Ruddle, K. & Akimichi, T. (eds) *Maritime Institutions in the Western Pacific* (National Museum of Ethnology, Osaka, 1984).
25. Ostrom, E. in *Rethinking Institutional Analysis and Development* 101–139 (Institute for Contemporary Studies, San Francisco, 1988).
26. Pinkerton, E. (ed) *Co-operative Management of Local Fisheries* (University of British Columbia Press, 1989).



Analyzing the Commons: A Framework

Ronald J. Oakerson

My subject can be stated as a riddle: How are forests, fishing grounds, pastures, parks, groundwater supplies, and public highways all alike? Answer: Each one is typically a commons, a natural resource (or a durable facility of human design and construction) that is shared by a community of producers or consumers. The list of shared resources and facilities is both long and diverse. The commons can have a fixed location (like a woodlot) or it can occur as a "fugitive" resource (like fish and wildlife). The commons can be renewable (grasslands), or not (oil pools). Some cases (oceans, the atmosphere) are indivisible over large areas, so that they cannot feasibly be divided and organized as separate parcels of private property; other cases (small pastures) are organized as commons by social preference. While patterns of organization vary across continents and cultures, the key problem remains the same: how to coordinate use by numerous individuals in order to obtain an optimal rate of production or consumption overall.¹

The commons can be distinguished from both public goods and private goods, though it shares some attributes of each. Pure public goods can be used by any number of consumers because, like the light from a street lamp, such goods are consumed collectively. Although the street itself can become crowded, the rate of consumption of the lamplight is independent of the number of consumers and of the particular use individuals make of the good (walking, jogging, motoring, or dancing in the streets). By contrast, private goods are individually consumed; what one individual consumes is either used up or becomes (at least temporarily)

unavailable to others. Like pure public goods, the commons is shared, and unlike private goods, it either cannot be or is not (for any of a number of reasons) divided among separate consumers. Yet like the use of private goods, the use of the commons is characterized by individual consumers who appropriate a portion of the flow of benefits (farmers pump water, cows eat grass) and make that portion unavailable to others. In the case of a resource commons, individuals actually extract private goods from the resource. Unlike pure public goods, the commons cannot be shared without limit.

The commons is like a factory that produces, not a series of differentiated products, but a stream or pool of undifferentiated "product" from which individuals take a portion for their use—hence the term "common-pool resource," preferred by some analysts and equivalent to "the commons." Unlike what goes on in a factory, however, appropriation here affects production, or more precisely, the rate at which individuals appropriate affects the rate at which the resource can produce or replenish a supply. Without coordination, individuals may in the aggregate use too much too fast, causing the rate of production to fall. Sharing without collective consumption—the commons situation—requires restraint, which in turn depends on coordination among users. Otherwise, individuals continue to consume without regard to the diminishing marginal product of the commons as a whole.

Even if aggregate use is suboptimal, difficulties are often not noticed until there is some significant change in the pattern or level of use, and declining yields begin to reduce the size of the shares available to individuals. If a community of users is unable to work through existing arrangements to respond appropriately to changes, destructive competition or conflict may follow. Resource depletion (or degradation of facilities) results—the outcome characterized by Garrett Hardin (1968) as the "tragedy of the commons." In specific cases, the consequences may be soil erosion, overgrazing, diminishing fish harvests, disappearing species, shrinking forests, or impassable roads.

In this chapter, I present a conceptual framework that can be used to collect information about the commons and analyze it across a variety of resources and facilities. Such a framework must be specific enough to offer guidance in the field, yet general enough to permit application to widely variable situations. The trick is to develop concepts that identify key attributes shared broadly by the commons in its many manifestations and that take on different values from one circumstance to another. This allows a systematic approach to the study of a phenomenon that has great variation. Relationships among variables need to be specified in ways that allow one to diagnose what is wrong and why in particular situations. On such a basis, potential solutions can be offered.

Four Types of Attributes

The framework distinguishes four sets of attributes or variables that can be used to describe a commons: (1) the physical attributes of the specific resource or facility and the technology used to appropriate its yield; (2) the decision-making arrangements (organization and rules) that govern relationships among users, as well as relevant others; (3) the mutual choice of strategies and consequent patterns of interaction among decision makers; and (4) outcomes or consequences (V. Ostrom 1974, 55; Oakerson 1981, 81). Each set of attributes is related systematically to the others. The plan of discussion is, first, to introduce each of the four types of attributes and examine the relationships in the framework among them. I will then suggest ways of applying the framework for both diagnostic and prescriptive purposes, as well as for applying it iteratively to understand the impact of technological and institutional change and adaptation.

The framework is no more than a bare-bones representation of the commons in its essentials.² It is intended to identify four types of factors, related in specifiable, limited ways, that can be assumed always to operate with respect to the commons. It should not be construed as a fully specified causal model that includes all relevant variables and relationships in every case. Although not a model to feed data into and crank out predictions from, the framework is a heuristic tool for thinking through the logic of a situation and considering alternative possibilities. It can be elaborated in particular cases to whatever level of complexity and completeness may be desired.

Physical and Technical Attributes

Problems of the commons are rooted in constraints given in nature or inherent in available technology. The analytic interest in physical resource properties and technology stems mainly from three considerations: (1) the relative capacity of the resource base to support multiple users at the same time without one interfering with another or diminishing the aggregate level of benefit (the yield of a resource) available to the group; (2) the degree to which (or relative ease with which) the commons permits exclusion of individual users, limiting access to the resource or facility; and (3) the physical boundaries of the commons, which determine the minimal scale on which effective coordination can occur. Each of these concerns is addressed below by introducing a relevant economic concept.

Jointness. The concept of jointness was originally introduced to define a "pure public good" (Samuelson 1954). Jointness means that one person's use does not subtract from the use of others. The opposite case is one in

which a single individual fully consumes (and destroys) a good. As a variable, jointness refers to degrees of nonsubtractability (V. Ostrom and E. Ostrom 1978), that is, the degree to which more than a single consumer can make use of the same good. The idea ordinarily refers to simultaneous use, but can also include serial use. "Impure" public goods are those in which jointness is limited by congestion. Once a threshold is crossed, individual users begin to subtract from one another's beneficial use.

The idea of subtractability can be applied to the commons in two ways. First, any user of the commons subtracts from a flow of benefits; what one appropriates, whether gallons of water or blades of grass, is unavailable to others. Second, cumulative use by many individuals will eventually subtract from the total yield of the commons over time—from the rate at which a groundwater basin produces water or a pasture produces fodder. It is the second type of subtractability, which reduces the capacity of a resource to generate benefits, that gives rise to the distinctive problem of the commons. In this sense, the commons exhibits partial subtractability, and the threshold at which use becomes subtractive varies from one situation to another. Each individual user is potentially capable of subtracting from the welfare of other users; but, within limits, all users can derive benefits jointly.

The analysis of a commons, therefore, should specify as precisely as possible the "limiting conditions" that pertain to natural replenishment or maintenance of the resource. Physical limits established by nature or technology provide critical information for devising rules to maintain jointly beneficial use, such as grazing limits in a common pasture, trapping limits in a lobster, and weight limits on a highway. By having reference to such legal rules, it is possible to introduce a modified concept of jointness, so that one person's *lawful* use does not subtract from the *lawful* use of others (Oakerson 1981). Thus, resource sharing can be efficient even in the absence of collective consumption (that is, of physical nonsubtractability), provided that rules based on limiting conditions inherent in the nature of the resource are implemented.

Exclusion. The "exclusion principle," also used by economists to differentiate private goods from public goods (Musgrave 1959), ordinarily refers to the ability of sellers to exclude potential buyers from goods and services unless they pay a stipulated price. The concept can be broadened somewhat to include the question of access to any type of good, including the commons. The opposite of exclusion is complete openness—unlimited access. Although an organized commons need not be characterized by open access (Runge 1981), the commons always has an access-control problem to some degree. As a variable, the degree of exclusion (or access control) attainable depends on both the physical nature of a resource (or

design of a facility) and available technology. Historically, for example, open range was difficult and expensive to fence, but the development of barbed wire to a great extent overcame this limitation.

At this point in the analysis, one is interested not in an exclusion or nonexclusion policy, but rather in excludability, that is, the limiting conditions that apply to the possibility of exclusion as established by nature or technology. Two types of exclusion can be distinguished: (1) access may be fully regulated on an individual basis, or (2) it may be partially regulated and applied only to those outside the immediate community. This distinction is related to the potential exposure of the commons to increases in demand. Within a definite community of users, increases in aggregate demand derive mainly from expanded operations. If there is open access, however, increases in the number of users can also contribute to an increase in total demand on the resource.

Indivisibility. Is the commons divisible? Could the physical resource or facility feasibly be divided among private property holders? What would be the costs of doing so? If the commons is not divisible, what boundary conditions apply to its regulation? On what scale would regulation have to occur to be effective? The relative indivisibility of a commons is mainly a question of scale, determined by specifying the physical boundaries within which the commons cannot be divided without significantly impairing its management potential or production value.

Physical boundaries having to do with divisibility of the resource derive from nature or technology and should not be confused with legal boundaries, that is, boundaries imposed by rule. Consider the example of a groundwater basin. Groundwater occurs in underground aquifers that have fairly definite physical boundaries. The legal boundaries of a jurisdictional unit formed to deal with a groundwater problem may or may not correspond to the physical boundaries of the resource. Other types of the commons may have less definite physical boundaries; nonetheless, it still may be possible to assign geographic boundaries based on physical or technical attributes. The western range in the United States, for example, might superficially be viewed as a single resource; but variations in weather and soil conditions prompt the "division" or partitioning of the range into much smaller units for management purposes.

An analysis of the commons must posit some set of boundary conditions, even if the physical boundaries are somewhat ambiguous. If the boundaries chosen for the purposes of analysis are too small, then relevant aspects of the problem will be left outside; if the boundaries are too large, then multiple problems may be confounded. Although the precise boundary may be somewhat arbitrary, the relevant question is whether it lies within an acceptable range for the purpose of analysis.

In some cases, the resource is technically divisible into relatively small parcels, and the commons exists by human design alone without reference to natural or technological constraints. Still, there may be underlying economic or cultural reasons for the treatment of a divisible resource as a commons. Other parts of the analysis must take cognizance of these reasons as relevant to the design of decision-making arrangements, including the possibility of converting the commons to private property. There is nothing in this analytic framework, however, to suggest that divisibility necessarily implies that privatization is the wisest solution.

Decision-Making Arrangements

The second set of attributes in the framework consists of rules—those rules that structure individual and collective choices with respect to the commons as defined by the first set of attributes. These arrangements may also be thought of as “organizational” or “institutional.” The designation used here is intended to convey a very broad set of arrangements that are not confined to any single “organization” or “institution.” Daniel W. Bromley (1989) refers to “resource regimes.” In such regimes, several discrete institutions or organizations are generally implicated in the management or mismanagement of a commons.

In general, decision-making arrangements are defined by authority relationships that specify *who* decides *what* in relation to *whom*. In the discussion below, decision-making arrangements are sorted into three subsets: (1) “operational rules” that regulate use of the commons; (2) rules that establish “conditions of collective choice” within the group most immediately involved with the commons; and (3) “external arrangements,” those decision structures outside the immediate group that impinge on how the commons is organized and used. Operational rules are nested in collective-choice rules, which are nested in external arrangements. At least three different levels of analysis are possible with respect to the organization of the commons.

Operational rules. Various types of rules can serve to limit user behavior in the interest of maintaining the yield of the commons. Alternative patterns of use should be evaluated for the degree to which each subtracts from the flow of the resource. Some uses have the potential to drive other uses out, quickly exhaust the resource, or both. Such highly subtractive behavior may therefore be disallowed. Less subtractive patterns of use can also, cumulatively, diminish the yield of the commons. Limits may therefore be imposed on both duration and type of use, as well as on the amount of the resource flow that can be appropriated during a time period. If more than one use is made of a commons, operational rules

need to take into account the relationships among uses. Some types of use may be compatible; others, sharply conflicting. At times a commons is physically partitioned for different uses without being divided into separate parcels of property; the effect is to segregate users while retaining joint use. Use can also be time-partitioned, reflecting conditions of seasonality or potential congestion.

Conditions of collective choice. Operational rules derive from collective choices that are also rule-ordered. Rules that establish conditions of collective choice to allow a group of appropriators to manage their commons can be understood as a “common-property” arrangement. Individuals are no longer entirely free to decide for themselves how to make use of the commons, as in a private property arrangement, but participate in a process of collective choice that sets limits on individual use. In one degree or another, the rights of individual ownership give way to rights of common ownership. Common-property arrangements protect individual shares in the yield of the commons, and thus also provide an institutional foundation for protecting the total yield of the commons.

Four different relationships affect the conditions of collective choice: (1) the capacity of individuals to make decisions solely on the basis of personal discretion in matters of concern to others, perhaps preempting action by others or initiating an action that creates costs of opposition for others; (2) the availability of potential sources of remedy to individuals adversely affected by others; (3) the capacity of an affected population to relax the market rule of willing consent and make a collective decision binding on all relevant individuals; and (4) the presence of potential veto positions in any process of collective decision making—opportunities for any one individual or group to say no.

This portion of the analysis addresses a series of questions: Is coordination purely voluntary? If not, what proportion of the community must agree before a course of action may be adopted? If adopted, is the course of action enforceable? How are enforcement actions undertaken? In what forum can disputes be settled and on what legal grounds? To what extent are collective choice and enforcement dependent on the exercise of authority by more inclusive units of government? Are these more inclusive units local, regional, or national?

In a common-property arrangement, a limited set of individuals has use rights, but ownership is in some sense vested in the group, which thus acquires the power to regulate the commons and to exclude others.³ “Entry” and “exit” rules (for which see E. Ostrom 1986) are concerned with exclusion and seek to regulate access to the commons. In a broad sense, this set of rules includes qualifications for participation in a community of users (entry) and whether membership in an organization

of users is compulsory (exit); it thus affects conditions of collective choice. "Boundary" rules, closely related to entry and exit rules, determine the legal domain of a collective decision-making arrangement. Any organizational arrangement for governing a commons must stipulate a set of jurisdictional boundaries. These boundary rules, however, may or may not be congruent with the underlying boundary conditions determined by the technical and physical nature of the resource.

A number of variations in common-property arrangements can be found. Depending on the particular arrangement and its relationship with more inclusive legal arrangements in the larger community, common property may or may not include the ability of users to transfer ownership and thus derive a joint return on their investment. Alternatively, individuals may have private rights to make use of the commons, and thus to exclude others, but not have the power as a group to regulate the commons, except on the basis of willing consent. Such individuals may, however, be vested with rights that protect them from injury caused by others' use of the commons. Remedies may be available through such "third-party" arrangements as courts. Another possibility is the creation of some form of collective organization in addition to private property rights that endows the group with regulatory authority. This is another way of allowing a community of users to make collective choices, without the willing consent of each party, that establish limits on individual use. Common-property arrangements should be distinguished from general public or government ownership, which vests control of the commons in government agencies rather than in the communities directly affected.

External arrangements. Decision-making arrangements external to the community are also relevant in most cases, but the connection varies widely. Some external arrangements may be mainly constitutional, establishing the capability of the community of users to engage in local collective choice. For example, the State of California has enacted enabling legislation that allows private property owners to form special districts to manage groundwater supplies. At the other extreme, a community may be substantially dependent on external decision makers for the legislation and enforcement of operational rules, replacing common property arrangements with control by external officers. In this case, external arrangements are bureaucratic in nature, characterized by some combination of central rule making and field officer discretion. In addition, third-party arrangements may also be available externally to resolve disputes between users. Courts of law fall into this category, but so do such other arrangements as a bureaucratic hearing officer or a traditional local chief in areas with a tribal history. Finally, market arrangements external to the commons may be relevant in establishing economic parameters within

which management of the commons can be undertaken. If there were no market in land, for example, the effect on those who use common land for grazing or agriculture would be different from what it would be if land were also available on the private market.

Patterns of Interaction

Rules, as everyone is aware, do not guarantee the emergence of a particular pattern of behavior. Between rules and observed behaviors lie the unobserved mental calculations of individuals who make choices. Individuals choose strategies for relating to one another and to the commons. Patterns of interaction result directly from the mutual choice of strategies by the members of a group. Given the physical features of the commons and the characteristics of the relevant technology, on the one hand, as well as the decision-making arrangements available to govern its use, on the other, individuals make choices, from which there emerges some pattern of interaction.

Although individual choices can be understood in terms of a comparison of the costs and benefits of alternative actions, these economic concepts remain abstract until related to the particular circumstances of individuals. As experienced by individuals, a "cost" is any perceived *obstacle* to the choice of some alternative (Buchanan 1969). Conversely, a "benefit" is any perceived *inducement* to choose one alternative over another. Individual choices are conditioned by a mental image of obstacles and inducements in a relevant environment. The resulting incentives to act or not to act in various ways may be relatively strong or weak.

Important elements of individual behavior on the commons are interdependent (Runge 1981). How others are expected to behave creates obstacles and inducements for each individual. Several possible strategies are of interest. One is a free-rider strategy. When others propose a course of action, an individual says, "You go ahead, but I'm not interested." If the others do go ahead, the free-rider strategy is successful, at least in the short run. Whether a single free rider can undermine a collective effort depends on the subtractiveness of that individual's use of the commons. Alternatively, an individual may choose a cooperative strategy, continuing to contribute to a joint undertaking as long as others also continue. The mutual choice of cooperative strategies leads to a general pattern of reciprocity.

Reciprocity among group members has an interesting structure. Individuals contribute (through mutual action or mutual forbearance) to one another's welfare, but without an immediate quid pro quo as in exchange relationships (Oakerson 1988; Boulding 1972). On the commons, an individual must practice restraint when the beneficiaries of his or her

restraint consist mainly of others. At the same time, each individual draws the larger benefit, not from his or her own act of restraint, but from the restraint practiced by others. Individuals can agree to a pattern of mutual restraint, and mutually enforce such a pattern, but they cannot trade one act of restraint for another the way that individuals exchange commodities. The *quid pro quo* that regulates an exchange relationship is unavailable to regulate reciprocity. Yet only through a pattern of reciprocity can individuals realize the joint benefit of mutual restraint. Instead of a *quid pro quo*, reciprocity depends on mutual expectations of future positive performance. While exchange is based on *ex ante* conditions (that is, an exchange does not occur until certain conditions are met on both sides), reciprocity is subject to *ex post* conditions (that is, to conditions that are met following one's contribution to a joint undertaking), as individuals learn what to expect from one another. What is ordinarily called "collective action" can be understood as *n*-person reciprocity—the reciprocal interaction of individuals who jointly contribute to a common effort.

Free-riding behavior erodes reciprocity. Initially, one individual may choose not to contribute with the expectation that others will continue as before. The prospect of "riding free" on the contributions of others can be a substantial inducement. But, as we saw in Chapter 2, an even stronger obstacle to the choice of a cooperative strategy is a lack of assurance that others will do likewise. The organizational challenge is to sustain mutual choices of cooperative strategies among a sufficient number to sustain the yield of the commons.

Collective decision-making arrangements are designed to alter the structure of obstacles and inducements that individuals otherwise would face. However, any assignment of decision-making capabilities simply sets parameters within which individuals choose strategies. While cooperation and noncooperation among users are the first-order strategies of interest, there are also second-order strategies that affect first-order choices. Within the community of users, for example, successful collective action may depend on the degree to which individuals are willing and able to monitor one another's behavior in order to hold each other accountable to shared standards of conduct. If decision-making arrangements provide for the enforcement of rules and application of sanctions, then the choice of enforcement strategies by officials is often critical. A variety of decision makers, from bureaucrats to judges, may play a role.

If reciprocity erodes, and is ultimately abandoned, mutually destructive competition or conflict follows. Users of the commons may try to drive one another out to preclude mutually subtractive use. Or they may engage in a competitive race to exploit the commons without regard to an optimal rate of use. At this stage, the relevant second-order strategies may include concealment, deceit, intimidation, threats, and violence. Range

wars observed in the settlement of the western United States are illustrative.

Outcomes

Patterns of interaction produce physical outcomes subject to human evaluation. To supply information for this fourth set of attributes in the framework, the analyst is required to (1) stipulate the use of evaluative criteria and (2) search for consequences that affect users of the commons (and others involved) in accordance with these criteria. The study of consequences is necessarily value laden. To distinguish relevant consequences, the analyst must draw on evaluative criteria such as, most commonly, conceptions of efficiency and equity. But these abstractions have to be converted into operational measures of value in order to be used to appraise specific outcomes.

Considerations of efficiency in the use of commons have to do with the overall rate of use. Technical and physical attributes of the commons indicate some optimal rate. Aggregate overuse, such as placing too many animals on a common pasture or withdrawing too much water from a groundwater basin, eventually reduces the total yield, leaving each user with a smaller share. Accelerating overuse can deplete resources or destroy facilities, leaving everyone with a zero share. Inefficiency is also present, however, if the resource or facility is underutilized: a closed commons can be inefficient, just as can an open commons. A plan of regulation should be evaluated in terms of the value of uses foregone compared to the value of uses retained.

To conclude that there is inefficiency in the use of the commons, in principle one can apply the test of Pareto optimality: If at least one person could be made better off, and no one worse off, by a modification in the use of the commons, then present outcomes are inefficient; conversely, the proposed change is efficient. Often, however, it is not possible to do the precise technical and economic calculations necessary to determine whether aggregate use of the commons is optimal (that is, whether no further improvement is possible). Less information is needed to determine whether the current resource yield is being maintained with a given level of extraction than whether the current yield could be economically increased. Furthermore, some degree of suboptimal use may actually be efficient when the costs of obtaining collective action are taken into account. An emphasis can be placed on identifying Pareto-efficient changes, that is, improvements in efficiency, rather than on identifying a Pareto-optimal condition from which no further improvement is possible. Information requirements—and perhaps the costs of obtaining collective

action—are somewhat reduced by seeking amelioration rather than optimization per se.

Inefficiency on the commons is apt to be closely associated with inequity. The basic equity issue is distributive, not redistributive: Are individuals getting a reasonable and fair return on their contribution to a collective undertaking that regulates behavior? The presence of inequities may lead to the collapse of reciprocity, resulting in less efficient use. Equity problems are apt to be aggravated by asymmetries among users, which create opportunities for some to benefit at others' expense. This, in turn, can lead to costly conflict where all parties lose. Such situations may still admit of Pareto-efficient change. In any event, Pareto-efficient changes satisfy a minimal standard of fairness: they do no harm. Measuring equity, however, is even more difficult than measuring efficiency, often compelling a reliance on rough-and-ready indicators, such as whether most members of the commons community seem to be relatively satisfied with existing arrangements. Other questions that arise from considerations of equity include the possibility of arbitrary exclusion from the commons, and selective enforcement of rules. Corruption and abuse of authority may also contribute to inequities.

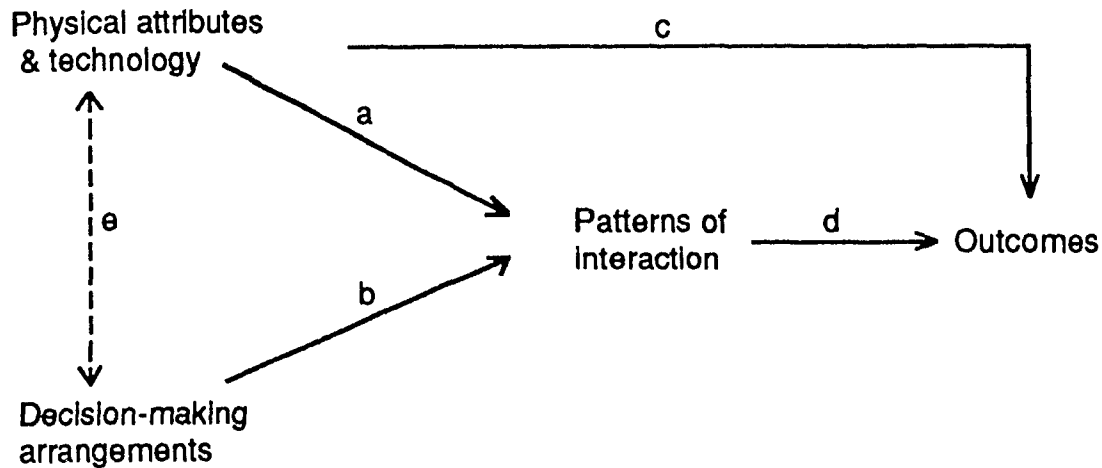
Relationships

All instances of the commons have characteristics that can be sorted among the four types of attributes considered above: (1) physical attributes and technology, (2) decision-making arrangements, (3) patterns of interaction, and (4) outcomes. The purpose of dissecting the commons in this manner is to examine relationships among these four bundles of variables. Having collected and sorted the data, these relationships become the principal focus of study.

Figure 3.1 depicts the framework, showing how each set of attributes relates to the others. Both physical and technological attributes of the commons and the decision-making arrangements affect patterns of interaction, which combine with physical and technological attributes to produce outcomes. Solid lines *a* and *b* represent weak causal connections, weak in the sense that individual behavior is constrained, but not determined, by either the physical world or by rules. Solid lines *c* and *d* represent stronger causal relationships because human discretion is not involved as a dependent variable.

The technical and physical characteristics of the commons affect outcomes in two ways. One path leads through patterns of interaction. The other affects outcomes directly, independently of human choice. Physical and technological attributes are “hard” constraints. If ignored in

FIGURE 3.1
A Framework for Analyzing the Commons



SOURCE: Author.

the process of choice, physical and technical constraints still affect outcomes. Decision-making arrangements, on the other hand, have no effect on outcomes independently of human choice and interaction. Institutions are “soft” constraints, made operative only through human knowledge, choice, and action. Rules exist in the realm of language, whether written or unwritten. Decision-making arrangements, therefore, need to be comprehended as commonly understood and applied by the relevant community of decision makers.

A good example that highlights the way in which the physical nature of a resource affects individual strategies and social interaction is found in the case of Maine inshore lobster fisheries (Acheson 1975; Wilson 1977). Unlike schooling fish, the sedentary lobster inhabits small inshore areas. Thus, the fishing area is easily accessible and can be monitored daily by the community of fishermen. Lobster traps are marked by each fisherman in distinctive colors, so small communities of fishermen can define and monitor exclusive fishing areas. Fishermen from outside the community may lose their gear, but within the community mutual forbearance allows “locals” to leave their gear safely. This pattern of interaction allows the community to control access to the commons. Decision-making arrangements within the community are entirely voluntary. Those outside the community have no effective recourse to gain access. The physical nature of the resource sets the relatively small set of boundaries that defines each inshore area and makes it possible to exclude individual fishermen. Joint

use is feasible as long as fishermen are willing to act with mutual forbearance.

The use of public roads for hauling coal from mine to rail in eastern Kentucky (Oakerson 1981) provides an example that highlights how the distribution of decision-making capabilities between local officials and (in this case) state officials can affect the mutual choice of strategies. Although usually considered public goods when they are publicly provided, roads have the characteristics of the commons once provision has been made. Organizing the joint use and maintenance of roads is like organizing the use of a groundwater supply or any other commons. In the case of roads, excessive use includes hauling loads that exceed the weight-bearing capacity of the road surface and base. Rural highway development, provision, and maintenance in Kentucky is largely a state government responsibility; but the application of criminal sanctions against violators of state-prescribed weight limits is in the hands of locally elected judges in each county. Local judges have allowed coal haulers and mine operators to sustain noncompliant, free-rider strategies, hauling loads that often destroy state highways. The efforts of the state highway department to induce cooperation from local judges by withholding maintenance from all coalfield highways in eastern Kentucky proved not to be a politically feasible strategy because ordinary users were affected jointly with coal haulers. State highway officials, nevertheless, were able to reduce maintenance efforts on selected coal-haul routes as an economy measure. This strategy sometimes induced limited maintenance of public roads by mine operators, but did not affect the basic choice of strategy by coal haulers to carry overweight loads. The overall result was a system of public coal-haul roads subject to a combination of overuse and undermaintenance.

To use the framework as a diagnostic tool, an analyst works *backward* through the relationships. Initial inquiry focuses on outcomes: What is happening to the commons and to its community of users? Are individuals investing more and obtaining less from the commons? Are yields declining as effort is increasing? If so, the next question is *why*. A first-order answer can be obtained by examining patterns of interaction among resource users. Are members of the community competing with one another to maximize their individual "take" from the commons? Are there asymmetries among users that allow some to "raid" the resource and then move on? The inquiry cannot stop, however, with patterns of interaction. The question of why recurs. Second-order answers depend on how physical and technical properties of the commons, together with decision-making arrangements, jointly affect patterns of interaction. What constraints and opportunities are inherent in the physical nature of the

resource and the technology available to appropriate its yield? What opportunities do the operational rules attempt to foreclose? What are the incentives of users to comply with, and of officials to enforce, operational rules? Do collective-choice rules allow the consideration of alternative operational rules? Do external arrangements allow for modifying the rules that define conditions of collective choice?

Outcomes disclose the *effect* of a difficulty that is manifested behaviorally in patterns of interaction. The *source* of the difficulty, however, lies in a lack of congruence between the first two sets of attributes: a mismatch between the technical and physical nature of a commons and the decision-making arrangements used to govern its use. This is the relationship labeled *e* in Figure 3.1. The dashed line is used to represent a noncausal association that exists, if at all, by human design. The lack of a good “fit” between these two elements in the framework creates the potential for a perverse structure of incentives—obstacles and inducements—leading individuals into counterproductive patterns of interaction that generate undesirable outcomes.

Incongruence between the first two sets of attributes—between the physical world and the institutional world—may first show itself in a lack of fit between operational rules and the corresponding technical and physical attributes of the commons. Use rules should closely match the limiting conditions that bear on maintaining the yield of the commons; entry and exit rules must be related to excludability, that is, to the limiting conditions of exclusion; boundary rules ought to reflect those limiting conditions that bear on the appropriate geographic domain of regulation. If efforts to adapt operational rules to technical and physical attributes have failed, and there is a general understanding in the relevant community of the relationships between attributes of the commons and specific operational rules, the problem may lie with the rules that define conditions of collective choice. Further, if efforts to adjust the conditions of collective choice in the community have failed, the difficulty may lie with external arrangements.

Having diagnosed problematic conditions by working backward through the framework, one can turn to questions of design: how to modify patterns of interaction by adjusting decision-making arrangements to better fit the particular nature of the commons. Design requires an analyst to work prospectively, forward through the framework. What do key features of the technical and physical attributes require of operational rules and conditions of collective choice? What adjustments might be made in external decision-making arrangements? How would these institutional changes affect the structure of incentives that face decision makers? What choice of strategies, and resultant patterns of interaction,

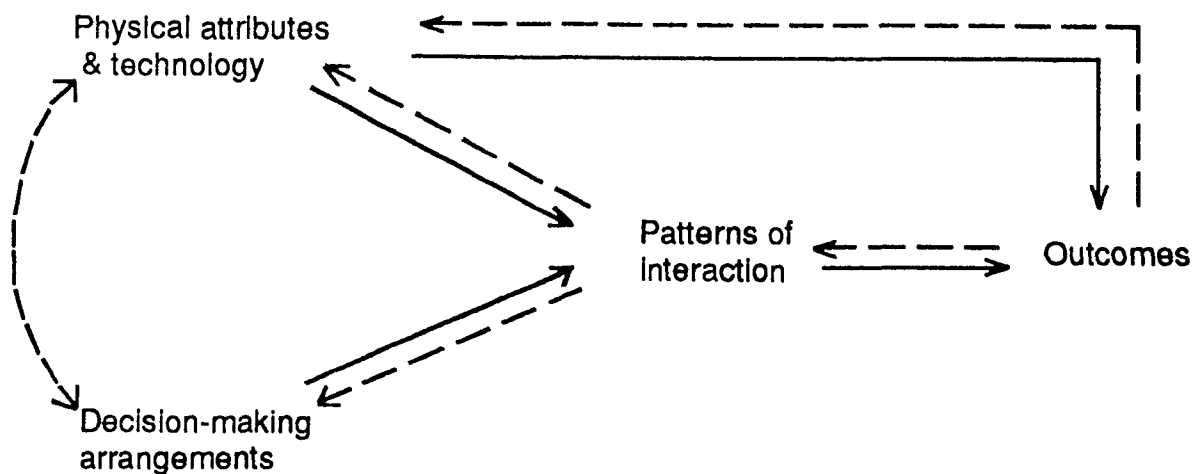
would the analyst anticipate? How would anticipated patterns of interaction affect users of the commons and others?

Dynamic Applications

In the short-run analysis undertaken for a diagnostic purpose, both the physical-technical attributes of the commons and decision-making arrangements are assumed to be unchanging. A prescriptive or long-run analysis, however, must allow for change in both sets of variables. One way to introduce a longer time horizon into the analysis is to apply the framework iteratively. The framework is used to record and describe changes at successive points in time. This approach treats institutional change as exogenous; the aim is simply to understand how a series of changes in technology or decision-making arrangements affects patterns of interaction and outcomes. Viewing change as exogenous, however, does not help to explain how change comes about. The effort to understand institutional change raises new issues. What incentives promote investment in technology? What opportunities are present for learning the consequences of actions?

In order to aid in understanding institutional change, the framework can be modified by adding a set of long-term relationships, shown by the broken lines in Figure 3.2.⁴ Outcomes can affect patterns of interaction insofar as a process of learning occurs, causing individuals to modify their strategies. Instead of continuing to produce outcomes on the basis of

FIGURE 3.2
A Dynamic Framework



SOURCE: Author.

decision-making arrangements as given, individuals may attempt to modify those arrangements to produce better outcomes. Similarly, individuals may invest in technological innovation that would change the technical and physical attributes of the commons. The latter may also change over time as an indirect result of strategies pursued in securing outcomes; this is easily seen if prevailing patterns of interaction result eventually in the destruction of a resource.

Conclusion

The purpose of the framework presented here is to aid in the collection and assimilation of case-by-case analyses. The ability to observe regularities across many different cases depends on the use of a consistent framework. Some method is needed to array information into meaningful sets in order to examine relevant relationships in a particular case. Use of a consistent method by a community of scholars enhances the comparability of separate case studies. As scholars use and apply a framework, and share ideas, the framework, too, becomes the subject of change—elaboration or modification—in view of experience.

This book is a first step in that direction. The framework was adopted by the Panel on Common Property Resource Management, organized by the Board on Science and Technology for International Development (BOSTID) at the National Research Council, and used to organize the presentation of twenty case studies at an international conference held at Annapolis, Maryland, in 1985 (National Research Council 1986). The cases in the present volume, selected from those presented at the Annapolis conference, represent applications of the framework from which one might learn something about its limits and possibilities, as well as something about the commons. Others have used the framework, or a related version, in studies undertaken since the conference (Blaikie and Brookfield 1987; Tang 1992).

A great deal more work remains to be done. It is important that the collection of cases begun in Annapolis go forward in ways that permit systematic comparisons. There is much more to be learned about the varieties of collective decision-making arrangements, or resource regimes, developed by communities that depend on the commons in one or another form, and, especially, about how these arrangements are nested within the larger set of social and political arrangements found in all societies. Whether communities are to continue managing their commons successfully, or learn how to succeed if they have failed, depends on the base of knowledge we can build.

NOTES

I would like to thank fellow members of the Panel on Common Property Resource Management, National Research Council, as well as the other participants in the Annapolis conference, for the many rounds of discussions and criticism—and editorial work—that contributed to the development and application of the framework presented in this chapter. The conference and its resultant volumes have been products of an extraordinary team effort from start to finish. I am also grateful to Robert Netting, Vincent Ostrom, and Susan Wynne for their helpful comments on one or more drafts. For remaining imperfections, I am fully responsible.

1. It is important to keep distinct the natural production process of the resource system and the production process in which individual users of the commons may be engaged. The product or yield of the commons—grass, water, timber—is often used in the production of a commodity—milk, electric power, lumber. The commodity producers are resource consumers. Sometimes production occurs actually *on* the commons (as with rangelands) and sometimes not (as with groundwater).

2. The generic framework, without specific application to the commons, has been developed in a more elaborate way by Kiser and E. Ostrom (1982).

3. Hardin's "tragedy of the commons" (1968) occurs in a context of unrestricted access and thus may or may not apply to a commons, but it does not in general apply to a common-property arrangement.

4. Since the Annapolis conference I have concluded that a multilevel framework is a better way to represent dynamic relationships, as opposed to the recursive framework shown in Figure 3.2. At least three levels of analysis are needed. First, an operational level of analysis views operational rules as the relevant decision-making arrangements, considers interactions among resource users, and evaluates welfare outcomes. This level is nested within a second level of analysis that treats operational rules as an intermediate outcome and collective choice rules as the relevant decision-making arrangement. Both levels are nested within a third level, this one treating collective-choice rules as an intermediate outcome and more inclusive or external institutions as relevant decision-making arrangements. Institutional change at one level is an outcome of patterns of interaction at another level. (For a related discussion, see Kiser and E. Ostrom 1982.)

REFERENCES

- Acheson, J. M. 1975. "The Lobster Fiefs: Economic and Ecological Effects of Territoriality in the Maine Lobster Industry." *Human Ecology* 3:183–207.
- Blaikie, Piers, and Harold Brookfield. 1987. "Common Property Resources and Degradation Worldwide." In *Land Degradation and Society*, ed. Piers Blaikie and Harold Brookfield, 186–95. London and New York: Methuen.

- Boulding, Kenneth E. 1972. "The Household as Achilles' Heel." *Journal of Consumer Affairs* 6:111–19.
- Bromley, Daniel W. 1989. "Property Relations and Economic Development: The Other Land Reform." *World Development* 17 (6):867–77.
- Buchanan, James M. 1969. *Cost and Choice*. Chicago: Markham.
- Hardin, Garrett. 1968. "The Tragedy of the Commons." *Science* 162:1243–48.
- Kiser, Larry L., and Elinor Ostrom. 1982. "The Three Worlds of Action: A Metatheoretical Synthesis of Institutional Approaches." In *Strategies of Political Inquiry*, ed. Elinor Ostrom, 179–222. Beverly Hills: Sage.
- Musgrave, Richard A. 1959. *The Theory of Public Finance: A Study in Public Economy*. New York: McGraw-Hill.
- National Research Council. 1986. *Proceedings of the Conference on Common Property Resource Management*. Washington, D.C.: National Academy Press.
- Oakerson, Ronald J. 1981. "Erosion of Public Goods: The Case of Coal-Haul Roads in Eastern Kentucky." In *Research in Public Policy Analysis and Management*, vol. 2, ed. John P. Crecine, 73–102. Greenwich, Conn.: JAI Press.
- . 1988. "Reciprocity: A Bottom-Up View of Political Development." In *Rethinking Institutional Analysis and Development: Issues, Alternatives, and Choices*, ed. Vincent Ostrom, David Feeny, and Hartmut Picht, 141–58. San Francisco: ICS Press.
- Ostrom, Elinor. 1986. "An Agenda for the Study of Institutions." *Public Choice* 48: 3–25.
- Ostrom, Vincent. 1974. *The Intellectual Crisis in American Public Administration*. Rev. ed. University, Ala.: University of Alabama Press.
- Ostrom, Vincent, and Elinor Ostrom. 1978. "Public Goods and Public Choices." In *Alternatives for Delivering Public Services*, ed. E. S. Savas, 7–49. Boulder, Colo.: Westview Press.
- Runge, C. Ford. 1981. "Common Property Externalities: Isolation, Assurance, and Resource Depletion in a Traditional Grazing Context." *American Journal of Agricultural Economics* 63:595–606.
- Samuelson, Paul A. 1954. "The Pure Theory of Public Expenditure." *Review of Economics and Statistics* 36:357–59.
- Tang, Shui Yan. 1992. *Institutions and Collective Action: Self-Governance in Irrigation*. San Francisco: ICS Press.
- Wilson, James A. 1977. "A Test of the Tragedy of the Commons." In *Managing the Commons*, ed. Garrett Hardin and John Baden, 96–111. San Francisco: Freeman.



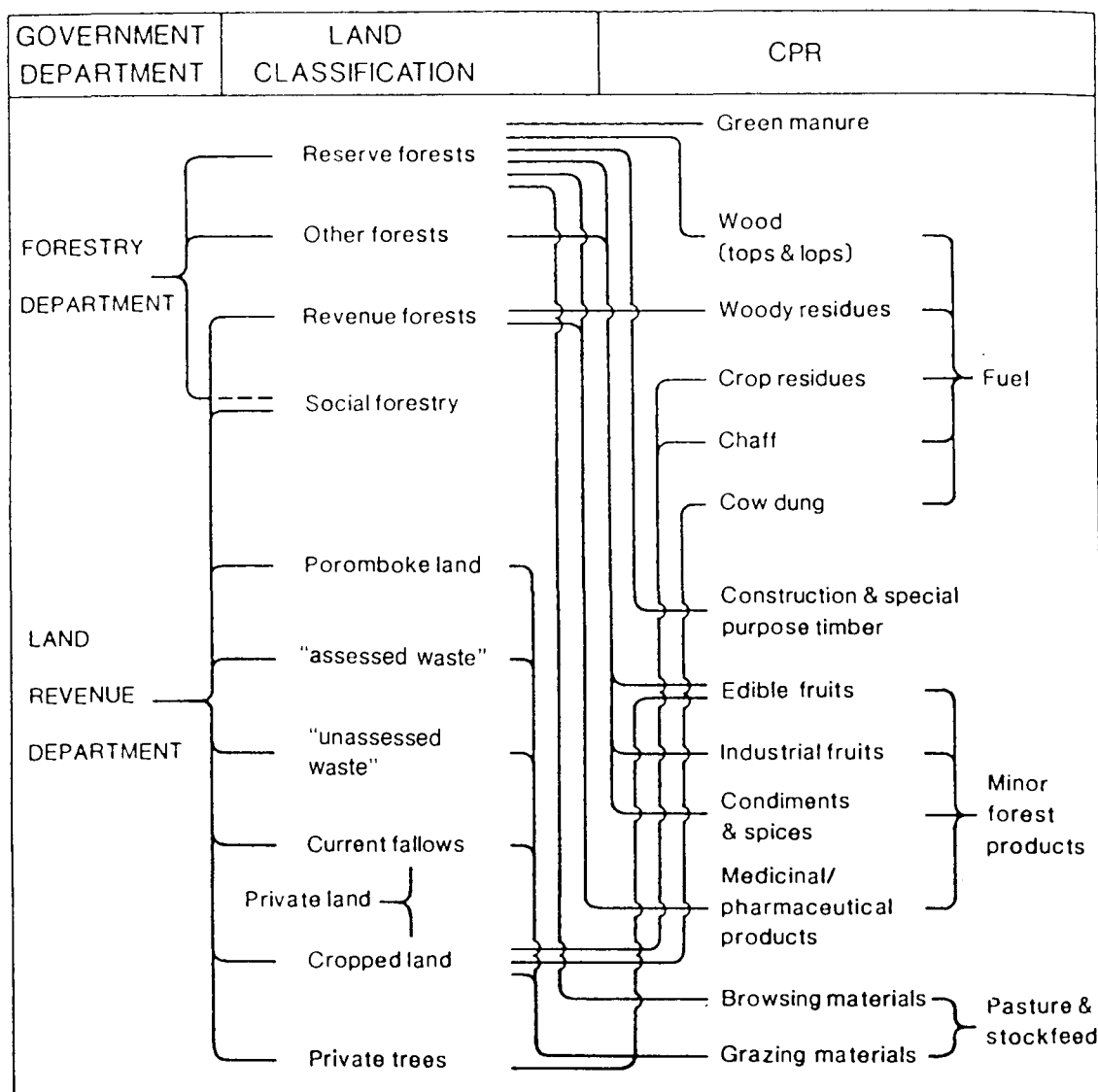
The Management and Use of Common-Property Resources in Tamil Nadu, India

*Piers Blaikie, John Harriss,
and Adam Pain*

Tamil Nadu is the state at the southeastern tip of the Indian peninsula. It is traversed from the higher west to the coast by several major river valleys where the cultivation of irrigated rice predominates. The intervening plateaus also have some irrigated agriculture, dependent upon water stored in surface reservoirs and groundwater, as well as dry cultivation of millets, sorghum, pulses, and oilseeds. Both the valleys and the plateaus have been relatively intensively cultivated over a long historical period. Common-property resources play some part in agricultural systems throughout the state, the most important of them being surface water and groundwater for irrigation. These have been the object of some other recent studies, however, and our research has been focused rather upon land-based resources: principally fuel, fodder, and grazing, but also construction timber, green manure, and a variety of minor forest products with domestic, craft, or sometimes industrial uses.

All of these products may be obtained, subject to environmental conditions, from one or another of the types of publicly owned land that are defined as such by the systems of land and forest administration, and sometimes also from private land (see Figure 11.1). The system of land administration has its roots in the precolonial period but was further developed as a major instrument of British rule, with the objective of maximizing the appropriation of land revenue. Thus the "commons" of Tamil Nadu are now those lands defined under this system as: (1) *poromboke*, or "lands incapable of cultivation or set apart for public or communal purposes" (including, sometimes, public grazing lands), which are not

FIGURE 11.1
Common-Property Resources (CPRs) Mentioned in This Chapter



generally liable for revenue; (2) "waste," which may be either "assessed waste" (that is, "cultivable lands which have been left uncultivated, lands relinquished by cultivators, and lands bought in by government in revenue sales"), or "unassessed waste" (that is, "lands to which no classification or assessment has been assigned because they are considered unfit for cultivation");¹ and (3) areas designated under the terms of the forest act as either "reserve forests" or "revenue forests."

Poromboke and assessed and unassessed waste land fall within village boundaries and are nominally "village lands," while forests are usually

outside village limits. None of the lands covered by these official categories should be encroached upon for settlement or cultivation; if they are, then official penalties may be applied. Fuel, fodder, and other products available on *poromboke* and waste lands may be freely collected, except in the case of designated trees or bushes (such as palmyra palms or tamarind trees), the rights to which are in the control of the local administration and are usually auctioned annually. These products may also be available from designated forests, in which case rights to collect or cut are under the control of the forest department of the state government. In addition, fuel and fodder may sometimes be obtained quite freely from private land, where there are generally accepted common rights, for example, to dig up the stumps and roots of harvested plants for fuel, to graze animals after harvest, or to cut grass from field edges.

There is a problem in clearly labeling the various resources available and the exact property rights attached to each. *Poromboke* and waste land, for example, are designated as village land and, as such, would seem to be land on which the resources are common property. In many cases, however, *poromboke* and waste land are used by persons outside the village too, particularly when they are in large tracts or abut roads or other settlements, in which case they are "open-access" resources. But in the majority of cases, users of the *poromboke* and waste lands close by a village tend to be the villagers themselves. Also, within any one territory, a variety of property rights are attached to specific resources, as Figure 11.1 makes plain. A sandalwood tree in a reserved forest, for example, is treated as state property, while the grass around it is a common-property resource for which users pay the state. Thus the unambiguous label is threatened by "illegal" use. At what point does poaching turn state property into an open-access resource?

Official data on the areas of land covered by these official categories give us a measure, though an imprecise one, of the availability of commons in different parts of the state, and of the extent to which they are being depleted. The official land utilization data, shown in Table 11.1, give

TABLE 11.1
Changes in Land-Use Patterns Relevant to Common-Property
Resources, Tamil Nadu, 1961–1962, 1969–1970, and 1981–1982
(percentage of geographical area)

Year	Forest			Culturable waste			Permanent pasture		
	61/62	69/70	81/82	61/62	69/70	81/82	61/62	69/70	81/82
Percentage	14.5	15.5	15.6	5.3	4.1	2.6	2.8	1.7	1.2

SOURCE: Government of Tamil Nadu, Ministry of Agriculture, *Season and Crop Reports*.

only an imprecise measure because the categories employed may lump together both public and private land. It is fair to assume, however, that the major share of the areas of "forest," "culturable waste" (the sum of assessed and unassessed waste), and "permanent pasture" shown in the data is under public ownership, and that any changes in extent that are recorded are likely to include changes in this "public" area. These figures suggest, then, that while the forest area has remained constant over the last twenty-one years, the areas of culturable waste and of permanent pasture have undergone a general, steady decline.

Field investigations at the village level show that there is a good deal of diversity in the importance of common-property resources (CPRs) in the economy. But it seems that we may broadly distinguish in terms of both area and potential benefits between "CPR-limited" and "CPR-dependent" villages. In villages in areas of old, established, and quite intensive cultivation, CPRs may in fact be of rather marginal importance, where there is no frontier of "waste" land that can be encroached upon for cultivation—apart perhaps from limited areas of tank foreshores (gently sloping land at the edge of an irrigation tank, exposed during the dry season). Cattle are largely stall-fed with crop residues and even purchased feeds, and grazing on public or common lands is of secondary importance; fuel includes dung cakes made from the manure of privately owned cattle, thorn bush twigs cut on privately owned land, and even purchased firewood (only very poor people collect fuel on *poromboke* land). Soil fertility depends upon purchased inorganic fertilizers, and even organic manures are purchased from outside; few, if any, minor products supply food or raw materials, apart from the roots of some cacti that are famine food. These can be termed CPR-limited villages.

In contrast with these circumstances are those of villages in more marginal environments such as the hilly areas of Dharmapuri and Salem districts and in the western areas of the state. Here, a "frontier" of waste still exists and offers livelihood possibilities even for poor people. Fuel and fodder are extensively obtained from the commons by all classes of people, and soil fertility may be closely bound up with the numbers of livestock that can be maintained. These CPR-dependent villages are often situated in the west of the state, where forest still covers a significant percentage of the land area.

Physical and Technical Attributes

Tamil Nadu has a wide range of vegetative formations reflecting a diversity of rainfall patterns. This vegetation provides the productive base for CPRs. Although the area of natural vegetation has decreased both

quantitatively and qualitatively, the government of Tamil Nadu had listed 1,219 species in the area in 1983, the majority of which are used for one purpose or another (for a detailed list, see Blaikie, Harriss, and Pain 1985).

The physical and technical qualities of these CPRs can be considered in terms of their jointness of supply, excludability, and indivisibility (see Oakerson in Chapter 3 of this book). We will discuss them under the two broad headings of timber and fuel, on the one hand, and grazing resources, on the other (although for many purposes there is no need to distinguish between them). With regard to jointness of supply of these CPRs, clearly they all can be used by a number of people simultaneously, and that use can subtract from the per capita benefit. There are important methodological issues here, however, since use is not necessarily harmful to productivity. There is evidence, in fact, that under certain circumstances limited degradation of, for example, climax to secondary vegetation can actually lead to enhancement of productivity. Indeed, continued use of many biological resources is the key to sustained productivity.

Data on the production and productivity of CPRs is very scarce. Livestock, for example, obtain fodder supplies from crop residues, grazing on village common lands (*poromboke* and tank foreshores) and from browsing in reserved forests. The relative importance of these various sources is quite variable over space and time, and the intensification of rice production has evidently alleviated problems of fodder supply in some areas. Nevertheless, fodder and browse resources from forests constitute a major source of supply for cattle in western Tamil Nadu, but (as with fuel species) data on natural browse species, on actual and potential productivity, and on carrying capacity of browse areas are almost entirely absent. Thus, precise statements on actual or potential supply and benefits cannot be made. If we knew the sustainable yield of browse species, we could make a determination of what the grazing limits could be. In that case, however, one would have to accept a trade-off between fodder and fuel supplies, since maximizing the one would reduce production of the other.

The excludability of CPRs is an issue that is constantly at the center of contradiction between the rural population and government departments. It is physically feasible to fence off forests, but also very expensive. It is estimated that fencing social forestry plantations doubles the costs of establishment (Karnataka State Forestry Department, pers. comm. 1985). In addition, fences are difficult to guard and are easily cut. It is extremely difficult to guard and to exclude users from small forests entirely surrounded by rural populations. For *poromboke* land and other major grazing resources, exclusion of nonlocals (those from outside the village) might be quite easy through recognition. In practice, however, little effort is made to exclude outsiders from village *poromboke*. If a village decided to stint on the *poromboke* land, it would be fairly easy for people to identify free riders

although not necessarily to exclude them, since effective exclusion is a matter of political power as well as of the physical characteristics of the CPR itself. This point underlines the difficulty of clearly labeling the type of property rights attached to each resource.

There is another aspect of excludability that depends upon the location of the CPR in relation to potential users. The friction of distance derives from relative location and not from the technical attributes of the CPR, but it is an important aspect. Development of the road system even to the remote parts of Tamil Nadu has opened up many forest products to commercial pressures. Pappanaickenpatti (a village in Salem district) has developed a substantial local export industry in green manure for paddy and in curry leaves from the curry leaf plant (*Murraya koenigi*); the former is transported to the Salem district, the latter to the markets of Madras over 100 miles away. The new road to the village laid in the last decade has made this business possible, and has made most CPRs in Tamil Nadu accessible to commercial exploitation.

The physical attributes to CPRs in Tamil Nadu can be summarized, therefore, as broadly accessible and nonexcludable, subject to relatively high subtractibility and divisibility, and with a clear set of boundaries.

Decision-Making Arrangements

Decision-making arrangements regulating the use of CPRs in Tamil Nadu have these characteristics: first, the development of institutions for collective choice within the groups involved with these commons is very restricted indeed; second, there is extensive bureaucratic control under rules that are partial and often unclear, and that leave a great deal to the discretion of field officers in matters of enforcement; and third, following from these features, the arrangements are highly susceptible to manipulation by those with local power.

Conditions of Collective Choice

Few local institutions regulate choices over the use of CPRs in Tamil Nadu. In some instances, purely local, community-level councils, committees, or informal groups, such as those described by R. Chambers (1977), in North Arcot district, act to regulate surface irrigation. A tradition of *kudimaramut*, or locally organized collective work in the maintenance of irrigation structures, can also be found to a limited extent in some parts (Harriss 1982, 72–76). But these instances are exceptional and they relate to irrigation water. We know of no such institutions or arrangements for

the management of the resources of *poromboke* and designated waste lands or of forests.

Tamil Nadu, like other Indian states, has a history of local institutions (*panchayats*) with juridical powers (for the resolution of disputes) and executive authority (for decisions over certain matters in the public realm, such as temple affairs and village religious ceremonies). (We refer here to village and caste *panchayats* rather than to the officially constituted *panchayat*, the lowest level of organization in the system of democratic local government adopted in India in the 1950s and 1960s.) The *panchayats* still exist (see Harriss 1982, 227–33), but there is little, if any, evidence that they have been instruments for the management of resources such as waste land and forest, at least over the last 200 years. They may be used, however, to resolve disputes such as those arising from quarrels over grazing.

The effectiveness of such local dispute resolution and decision making depends upon local power structures, in which the dominance that is exercised by a particular caste group and the capacity of that caste group for taking collective action, are factors of crucial importance. In circumstances where dominance is disputed among different groups or where the dominant caste group is itself divided by strong factional rivalries, collective action may be compromised. G. Djurfeldt and S. Lindberg (1975, 125) record an instance of effective action by locally dominant cultivators to prevent encroachment on *poromboke* lands used for grazing, while P. Hill (1982, 131) documents a case in which common grazing lands have been encroached upon by richer households. What happens to common lands in a particular village area is likely to depend upon the specific interests and politics of richer and more powerful people. Such effective choice as exists with regard to CPRs in the highly stratified rural society of Tamil Nadu is unlikely to involve the entire village population. It will involve the richer, more powerful households and will usually reflect their interests. The mass of rural people may or may not derive some benefit from their action.²

The official *panchayats* have assumed some responsibility for the management of some CPRs. Palmyra and tamarind trees, growing on tank bunds (containing banks) or at roadsides, thorn bushes used as fuel, and certain green manure plants all are treated as public property. Rights to the use of these plants were handed over to the village *panchayats*, which in turn auctioned them and put the money earned into *panchayat* funds. Though the village *panchayats* have been in abeyance in Tamil Nadu since 1975, it is still said by villagers and by officials that the *panchayat* controls the use of these resources. At present, in practice, use rights are auctioned by a local official and the proceeds go into official coffers. It is significant, though, that the *panchayat* should still be referred to: there is a strong belief

in the power and endurance of popular institutions of local self-government even when these institutions no longer exist. This belief perhaps helps to legitimate state interventions. Under both the village *panchayats* and the current arrangements, there is evidence that relatively wealthy or powerful people have been able to obtain rights to CPR produce at very low rates in auctions, and to sell this produce for a substantial profit.

In sum, the use of CPRs consisting of fuel, fodder, and other produce from *poromboke*, waste, and forest lands is subject to a high degree of personal discretion—and individuals are generally able to act on the basis of personal discretion in matters of common concern. This discretion, however, is limited mainly by bureaucratically enforced controls that can be manipulated, to one degree or another, by each individual who encounters them. Fieldwork showed a number of corroborated accounts of bribery: bribes are considered necessary when users want to gain access to resources to which the state has laid claim, or when they need to extricate themselves from the consequences of being caught. There were reported to be considerable variations between individual officials at all levels, however, as well as between the way in which the administration operated at the village, district, and state levels.

Individuals adversely affected by others may turn to local, unofficial *panchayats* to adjudicate disputes, or they may find remedies through the law and the local bureaucracy. All these institutions are susceptible to influence by those holding local power. In any event, the extent to which collective decisions are taken at all is very restricted, and both this and the degree to which such decisions are binding depend upon the local power structure, especially on the politics of the dominant caste. Powerful individuals both in the village and in the bureaucracy have extensive powers of veto.

Operational Rules

In circumstances such as those just described, the operational rules affecting CPR use exist on two levels. On the one hand, bureaucratic rules regulate access to and use of *poromboke* and waste lands and their products; these are enforced by the revenue department while rules regarding officially designated forests are enforced by the forest department. The former include a scale of fines that should be levied in cases of cultivation of *poromboke*; the latter, such rules as giving rights to collect fallen wood, but not to cut standing trees.

On the other hand, informal rules arise from the nature of the local power structure and the interactions of people with the bureaucracy. Thus

the revenue and forest departments are empowered to enforce rules that, in principle, prevent partitioning of CPRs and establish strong boundary lines. Local officials of the revenue department should prevent encroachment upon the *poromboke* lands and regulate the use of designated waste, while forest officers should control access to the forests. In practice, these rules can be bent systematically in favor of the relatively rich and powerful, for whom the fines imposed by the bureaucracy or the bribes paid to local officials for turning a blind eye on infringements may be treated as acceptable "costs of production." For the officials concerned, on the other hand, these payments are part of a kind of bureaucratic rent.

External Arrangements

Our account thus far has emphasized the crucial importance of external arrangements in decision making over CPRs in Tamil Nadu. The commons is actually defined by bureaucratic categorization of land as *poromboke*, or as "waste," or as "forest" (which is then really "state" land and not local "commons"); its boundaries are defined bureaucratically and may or may not correspond to a division based upon vegetational zoning. Rules about access and use are laid down in the standing orders of the departments concerned.

The arrangements in force are mainly bureaucratic, with both highly centralized rule making and, in practice, a great deal of discretion for field officers, given the extreme difficulty of supervising their activity very closely. Petty corruption is endemic. But there are also arrangements at other levels, as, for example, with the recent establishment of village social forestry committees that supposedly encourage participation in the management of social forestry plantations. These committees have only been in existence for a few years, and it is still difficult to assess their impact. The limited information we have suggests that they are often "paper" organizations characterized by indifference and ignorance on the part of the majority of their members. There is no reason to suppose that they will be any more effective as instruments of participation and collective decision making than are the village *panchayats*. Their power to make rules is seriously limited. The forestry department can and does coerce villagers to accept social forestry projects on their foreshores (Centre for Research, Extension and IRD 1984). The village-level social forestry worker is responsible to the forestry department and not the village; the department selects the species to be planted and the dates when cutting is permitted, and the produce is auctioned off at its wish. Thus the villagers cannot choose who will use the CPRs or decide upon how the products will be used.

Conclusion

In this sphere, as in others in south Indian villages, it seems that the long-standing attempt by the state to exercise close supervision over land use has actively discouraged collective choice and action at the local level (on this in general, see Washbrook 1976). Utilization of CPRs such as fodder and fuel is in principle extensively controlled by the local officials of several government departments. In practice, the system is subject to manipulation by those with local power and generally works in their favor.

Patterns of Interaction

The foregoing account of decision-making arrangements for the management of CPRs implies that the consequent patterns of interaction are of two types: those between people and the state with its various functionaries; and those among people who themselves use the CPRs in the village. Since collective choice in the management of CPRs has been reduced to a minimum, the dominant set of interactions concerns the direct users and the state or, more specifically, the state land revenue and forestry departments.

Although these two sets of interactions are distinct, they are often closely related in the way CPRs are actually used. Any group of would-be users of CPRs is heterogeneous in its economic, social, and political resources. Users usually compete for CPRs, and competition among individual households for CPRs is encouraged by the lack of institutions at the local level (or any other level) to manage the commons in a cooperative way. Each household thus competes against the others and against the state, and in this interaction the notion of access is crucial.

Access to CPRs has many dimensions. It implies that the would-be user has sufficient labor to use the resource (this is particularly important for fuel collection and grazing). It also implies that the potential user has spatial proximity to the resource and either the funds to purchase access from state officials (the payment of bureaucratic rent) or sufficient political power and coercion to gain access without paying. Such power usually is the result of land ownership and facilitates dealing with official regulations over CPRs and with other competing households who are also direct users of the CPR. Thus, the users' access position largely determines their choice of strategy to obtain CPRs, and therefore the pattern of interactions among users themselves, and between users and the state.

The first and most common interaction between users and the state is the "legitimate" use of CPRs. This involves the removal of dead wood from both revenue and reserved forests, which is permitted for certain forests

by official regulations. In addition, tribal peoples are given special dispensation to graze sheep and cattle (but not goats) in reserved forests. Others pay grazing fees, and there is no restriction on the number of cattle to be grazed. Stock may graze on waste and *poromboke* lands. As we shall see in the next section, the outcome of legitimate use of CPRs alone (leaving aside the "illegitimate" use to be discussed below) has led to extreme pressure on some CPRs, notably grazing land and in some places fuel and construction timber (on the situation in India generally with regard to this point, refer to Government of India 1984). It is not the central contention of this chapter that the illegal use of CPRs is necessarily the main culprit in the physical decline of many of them, although illegal action certainly is an additional use of CPRs and, as such, contributes to their overuse. Illegal use also highlights the contradiction between would-be users and the state (which makes most of the rules).

Patterns of interaction involving illegal use of CPRs are of two major types: (1) instances when the illegal use constitutes overuse or overextraction by an individual of a common resource over and above the limits set by the state; and (2) cases when the illegal use involves a theft of state property (such as sandalwood). The two major resources that are most often overextracted are fuelwood and grazing land for goats, both of which are found on revenue and reserved forests. Those who collect fodder and fuelwood are frequently caught by forest guards; if the wood they have collected is found to have been cut green, the guards will impound their sickles. A fine of Rs. 5 is common in such circumstances.

The case of theft of state property of timbers (such as sandalwood) is of a different order, since it is so valuable (up to about U.S. \$10 per kilo of grade one timber) that it has long since ceased to be a CPR; rather, it is a much-prized commodity to which the state has laid claim. A few private individuals, often backed by considerable capital and equipment, do mount raids on these trees. The revenue collected by the forest department from this source is so much greater than from all others in certain forest divisions in western Tamil Nadu that much of the resources of staff and transport are committed to protect and harvest sandalwood. This undoubtedly diverts personnel from guarding less valuable resources such as small wood for fuel and species used for construction purposes.

Bamboo is not such a severe case, although it is valuable enough commercially to provide the forest department with considerable revenue. It is also used by local artisans for weaving winnowing fans and mats, so that forest guards often fine artisans not only at the site but also when they attempt to sell the finished product at the market.

It is difficult to assess how much of the fines levied by forest guards finds its way to the official revenues of the department, and how much is appropriated by employees as "bureaucratic rent." But widely corroborated

accounts of bribery abound. Villagers informally arrange an annual bribe to local forest guards to facilitate the grazing of goats, for example, by a capitation "fee" of about Rs. 5 per goat-owning family (which in one village provided a sum of some Rs. 600, or U.S. \$50, handed over annually). Similarly, artisans using bamboo arrange an annual bribe. In one village, the collection of green manure from the more productive reserve forests attracts a standardized charge of Rs. 80 of which Rs. 36 is an unreceipted fine to forest guards. The forest guards (and perhaps forest rangers, too) have an informal organization for dividing this rent among themselves and for collecting it in a variety of ways. One tribal village, well endowed with reserve forest, has forest guards who arrive two or three times a year with a truck, make a spot check on fuelwood stocks of households, and confiscate and remove any timber that they believe was cut green. The value of a truckload is estimated to be at least Rs. 1,000.

The other main type of interaction between state and user is the privatization of CPRs through encroachment. Successful encroachment on *poromboke* and other common lands (such as uncultivated waste lands) depends upon the access position of the individual encroacher, with regard both to other villagers and to the bureaucracy of the land revenue department. Individuals of widely differing access positions encroach upon *poromboke* land. Landless and near-landless households are perhaps the most numerous, but their position is threatened by powerful "big-men" and speculators from outside the village who employ strong-arm tactics to evict less powerful people. Sometimes, indeed, they use the law to have them removed and then evade the law themselves through bribery to take over the land and register it in their own names. Such was the case in Pappanaikenpatti, where the village *munsif* (headman) had evicted tribal encroachers from land to which he subsequently gained title right (*patta*). There is therefore a long-drawn-out process of de facto occupation of *poromboke* land, including annual fines for illegal privatization that may go on for many years, and finally change of revenue classification to *patta* land. Revenue records, then, inevitably lag behind the true extent of encroachment. Encroachment clearly has been going on for a very long time, so that opportunities for further encroachment are generally limited. Local revenue records show that most of the encroachment takes place on land designated as *poromboke*, cultivable waste, permanent pastures, and other grazing lands, and only to a very limited extent on land under the jurisdiction of the forest department.

Turning to the interactions among individuals in the use of CPRs, it will by now be plain that there is very little cooperation in the management of commons that have been taken over by the state. Competition rather than free riding is the dominant relationship in CPR use. The

intensity of competition among users is a function of the supply of CPRs and the demand for them, on the one hand, and of the lack of legitimacy of the rules governing the resources, on the other. The state makes the rules but enforces them arbitrarily (from the local users' point of view), so that their legitimacy is low.

To summarize the principal patterns of interaction: the chief actors are users and state functionaries, backed by the law that, in official terms, clearly demarcates and sanctions categories of rights and restrictions. The arena of local management and interaction is thereby drastically limited, and is characterized by individualistic patterns of use and competition among users who have differing qualifications for gaining access.

Outcomes

Political Economy

The outcomes of the political economy of Tamil Nadu can be summarized in seven major points as shown in the following discussion.

It will already be clear that the state has taken control of virtually all lands on which common-property resources are to be found. The social forestry program, as it is currently conceived, is merely an extension of the state's control and a further restriction upon the use of common-property resources. At the local level, too, no institutions take a major part in managing these resources. In sum:

1. *The state seeks to regulate most CPRs in Tamil Nadu.*

The outcome of CPR management in Tamil Nadu cannot be analyzed properly without reference to changes in the ownership and productivity of private-property resources (PPRs). Here there has been a steady reduction in the average size of landholdings, and a considerable degree of differentiation among rural households has existed for a long time. Some farmers have managed to increase both the size and productivity of their farms; others have been reduced to the status of either landless laborers or submarginal farmers and have been pushed onto the economic fringes of cultivation. Their situation sometimes finds spatial expression in that they illegally squat on *poromboke* land and barren wastes, and may be forced to cut and sell firewood to eke out a living. These people are also marginalized in the sense that they cannot usually invest in productive assets and so tend to lose land to more adventurous, unscrupulous, and wealthy people. For the most part, encroachment on CPRs is the result of population pressure within a society with a highly skewed distribution of power. The exception is encroached-on land that is irrigable and attracts

speculative purchase by wealthier people. Greatly increased pressure on CPRs has led to rising costs to users whose travel and collective time have increased; users may also be paying more for bribes and fines.

Other changes in PPRs also affect the use of CPRs, these come about as a result of irrigation. When an extra one or two crops a year are produced, crop residues for feeding livestock and for fuel are more plentiful. In Tamil Nadu, the double-cropped area has generally increased, especially as a result of the expansion of groundwater irrigation (see the data in Kurien 1980). At the same time, paddy cultivation may create a demand for green manure, which is usually obtained from forests where these are accessible. Thus:

2. *Marginalization of poorer rural people has led to increased use of CPRs and encroachment on them through illegal squatting.*

3. *Increases in irrigated area have tended to ease the shortage of pastures on common land, but may also have increased the demand for green manure, particularly near forests.*

In the areas of Tamil Nadu that were studied, there is a notable exception to an encroachment pattern that seems widespread throughout India, namely, the unauthorized collection of fuelwood. There is little evidence of a serious shortage of fuel in Tamil Nadu. There are at least three reasons for this. First, there are a fair number of woody residues from tree crops (for example palmyra and coconut palm), and annual crops (such as cotton, cassava, and sorghum) that are not readily recyclable through the agricultural system via composting, but that are still suitable for burning as fuel. Second, there is not an appreciable cold season (as in central or northern India). Third, opportunistic thorn bushes (such as various species of *Lantana*) grow rapidly and freely on *poromboke* land on roadsides, tank foreshores, and elsewhere, and provide an adequate source of fuel in many areas. In eastern districts, *Prosopis juliflora* provides fuel, since it is rarely browsed by goats, and it both coppices well and grows fast. This finding is different from that of N. S. Jodha (1987), who found quite acute shortages of fuel in the drier areas of western India, where dung is burned as a substitute for wood. In Tamil Nadu, dung is burned in areas far from any available forest but not universally. Thus, we may summarize our fourth outcome:

4. *There is not yet a widespread nor severe shortage of combustible fuel.*

Increased pressure on grazing is undoubtedly severe, however, and is reflected in reduced numbers of livestock (see Table 11.2). The views of individual owners of cattle, buffalo, and small stock also support this view. The extension of government-sponsored social forestry onto tank foreshores clearly exacerbates the pressure on remaining land. Thus:

5. *There is severe pressure on grazing land, and this is partly associated with a decline in the numbers of cattle.*

TABLE 11.2
Changes in Livestock Population, Tamil Nadu, 1961–1982

	1961	1974	1982	% change 1961–1982
Buffalo	2,594,271	2,853,252	3,212,224	+ 23
Bovines	13,420,174	10,572,378	10,365,500	– 23
Sheep	7,159,956	6,392,821	5,536,514	– 23
Goats	3,428,847	3,954,477	5,246,192	+ 53
Total	26,603,248	23,772,928	24,360,430	– 8

SOURCE: Government of India, *Census of India*, 1961, 1971, 1982 (provisional).

Other forest products both for commercial exploitation and for subsistence have also become scarce or unavailable altogether. Exploitation of those that have commercial possibilities (such as gall nuts and curry leaves) has increasingly been organized by contractors who have successfully bid for the rights sold by the forestry or the land revenue department. Medicinal herbs, wild roots, honey, and relishes have long since disappeared from both the forests and the minds of those who use the forest (curry leaves are the one exception here). Thus:

6. *Most minor forest products have ceased to be CPRs, either because they have been overused to the point of extinction or because they have been commercialized and taken out of the realm of CPRs for local use.*

Turning now to the overall extent of land on which CPRs are or were exploited, we can see from Table 11.1 that encroachment onto *poromboke* land and unassessed and assessed waste land has reduced the area of common land to a very small proportion of the whole. While the remaining *poromboke* and waste land is dwarfed by land held in reserve and revenue forests, it remains the only land that could conceivably be managed by a committee of users. Thus:

7. *The area of village lands from which CPRs are obtained has been diminishing over a long period, and has left very little common land under the control of the village.*

Environment

It is difficult to be precise about the efficiency of use of CPRs in Tamil Nadu because of the general dearth of accurate physical information on their potential and actual levels of productivity. Further, if one considers the interactions among different CPR products, such as browse or grazing and fuel, obtained from the same common lands, data on how productivity of the one will affect productivity of the other do not exist.

Statements of biological efficiency that concern themselves solely with aggregate productivity or vegetative material are meaningless without recourse to exact information on human needs and on whether in fact fuel or grazing products are or should be more significant. This is not to suggest, of course, that there is no compatibility of use among different CPR products. But one must recognize the limitations of simply using physical data in a vacuum.

Verbal reports and some physical evidence do suggest that overall usage rates of CPRs has led to a depletion of resources. Productivity has actually increased in one case where tank foreshores were planted with *Acacia nilotica* (babul) under social forestry schemes; this has not necessarily enhanced common benefits, however.

There are differences among villages in the higher west of Tamil Nadu and those on the eastern plain. The Kalrayan Hills in Salem district surrounding the village of Pappanaickenpatti still support a diversity of flora in a well-structured community, which hardly indicates severe environmental pressure (see the detailed analysis in Blaikie, Harriss, and Pain 1985). In the neighboring district of Dharmapuri on the common lands of Arakasanahalli, this vegetation cover is largely gone and the lands are covered by the opportunistic *Lantana* species and thickets of heavily coppiced *Albizia amara*. But despite the fact that the vegetation is degraded, the village does not suffer from problems of fuel supply. On the other hand, in Dusi, a predominantly paddy village in North Arcot district, the remaining 21.56 acres of common grazing lands support no standing timber, and although there is full grass cover, the species composition is such that productivity is low and little benefit is derived by anyone using these lands for grazing. But the fuel situation in Dusi has actually improved over the last decade with the spread of the thorn bush *P. juliflora*, and the village is almost self-sufficient in its fuel requirements.

In general, production from village grazing lands is minimal, but this has probably been the case for some decades. There is no doubt that many of the forests and their various products are degraded or exploited beyond their natural rate of sustainability, and the overexploitation of bamboo has been well documented.

Livelihoods

CPRs are of varying importance as sources of food, fodder, fuel, manure, and minor products; these products, in turn, are the basis for livelihoods in villages in different parts of Tamil Nadu (see our earlier remarks on "CPR-limited" and "CPR-dependent" villages). The bureaucratic regulation of CPRs is of particular concern in CPR-dependent villages, for this

regulation is often subject to manipulation by local power to the disadvantage of poorer people.

But in both CPR-dependent and CPR-limited village economies, CPRs present livelihood opportunities that are either not pursued or that are inefficiently pursued from the point of view of poor people's welfare. In the latter category, we would include the current use of tank beds and foreshores for so-called social forestry projects; there is often no benefit at all to local people and particularly none to the rural poor, given that they find neither employment nor resources of use to them in the social forestry plantations. In the former category, we would include the possible uses of marginal lands (classified as waste) for forestry conducted by poor people for their own benefit.

Clearly, the mobilization of opportunities like these is subject to difficulties that should not be underestimated. These are circumstances in which the powerful and wealthy have been able to take advantage systematically of the confusing layering of rights and enforcement, so that considerable inequalities in access to common resources has resulted. Any fresh interventions by the state are likely to be susceptible to manipulation by local power holders. The point is that opportunities for the production of livelihoods do still exist, and that the means for exploring them are not available under the current system of management by a bureaucracy imbued with an ethic of regulation and control.

NOTES

The research on which this chapter is based was essentially of an exploration kind. The authors undertook field research together in the state of Tamil Nadu in September 1984, when they collected secondary data and made studies of six villages, three of them in an area of intensive irrigated agriculture in the North Arcot district. Thereafter, Adam Pain undertook an additional six weeks of field work, including some ecological analysis, in the same villages.

1. These definitions are quoted from Sundararaja 1933.

2. Wade (1988) makes this point with regard to some villages in Andhra Pradesh that display an unusual degree of corporateness. The councils in these villages, with their common funds—used to pay the field guards and common irrigators whom they employ—are essentially institutions of the dominant Reddy caste community. It may be that in this case low-caste, landless people do derive benefits from the existence of these institutions because of the higher levels of economic activity that they are instrumental in bringing about. But poor and low-ranking people are not participants in the institutions. Wade's study describes institutions concerned with collective choice that are certainly unusual in India,

and his account in the end emphasizes just how exceptional the circumstances are that seem to explain the existence of corporate activity in this case.

REFERENCES

- Blaikie, P., J. Harriss, and A. Pain. 1985. *Public Policy and the Utilization of Common Property Resources in Tamil Nadu, India*. A report for Economic and Social Committee for Overseas Research (ESCOR). Norwich, England. Overseas Development Administration, School of Development Studies, University of East Anglia.
- Blaikie, P. M., and H. C. Brookfield, eds. 1987. *Land Degradation and Society*. London: Methuen.
- Centre for Research, Extension and IRD. 1984. *People and Social Forestry: Case Studies in Cooperation and Conflict*. Gandhigram, Maduari district, Tamil Nadu, India: Gandhigram Rural Institute.
- Chambers, R. 1977. "Men and Water: The Organization and Operation of Irrigation." In *Green Revolution?*, ed. B. H. Farmer, 340–63. London: Macmillan.
- Djurfeldt, G., and S. Lindberg. 1975. *Behind Poverty: The Social Formation in a Tamil Village*. London: Curzon Press.
- Farmer, B. H., ed. 1977. *Green Revolution?* London: Macmillan.
- Government of India. 1984. *Report of the Review Committee on Rights and Access to Forest Areas*. New Delhi: Government of India.
- Government of Tamil Nadu. 1983. *List of More Common Plants of Tamil Nadu and Their Uses*. Madras: Statistics and Planning Cell, Office of the Chief Conservator of Forests.
- Harriss, J. 1982. *Capitalism and Peasant Farming: Agrarian Structure and Ideology in Northern Tamil Nadu*. Bombay: Oxford University Press.
- Hill, P. 1982. *Dry Grain Farming Families*. Cambridge: Cambridge University Press.
- Jodha, N. S. 1987. "Common Property Resources and Environmental Decline in Western India." In *Land Degradation and Society*, ed. P. M. Blaikie and H. C. Brookfield. London: Methuen.
- Kurien, C. T. 1980. "Dynamics of Rural Transformation: A Case Study of Tamil Nadu." *Economics and Political Weekly* 15:365–90.
- Sundararaja, I. 1933. *Land Tenures of the Madras Presidency*. Madras: The Law Press.
- Wade, R. 1988. *Village Republics: Economic Conditions for Collective Action in South India*. Cambridge: Cambridge University Press.
- Washbrook, D. 1976. *The Emergence of Provincial Politics: The Madras Presidency, 1870–1920*. Cambridge: Cambridge University Press.



13

The Rudiments of a Theory of the Origins, Survival, and Performance of Common-Property Institutions

Elinor Ostrom

In the opening paragraphs of this book, Dan Bromley reminds us that there is “no such thing as a common property *resource*; there are only resources controlled and managed as common property, or as state property, or as private property” (Chapter 1). Bromley (*ibid.*) stresses the confusion created when “resources over which *no property rights* have been recognized” are casually referred to as “common-property resources” rather than as “open-access” resources (compare Ciriacy-Wantrup and Bishop 1975). A clear prediction can be made in situations where no one has a property right related to the flow of benefits from a resource. If the benefits are greater than the costs of obtaining them, open-access resources will be overexploited and may well be destroyed. When property rights exist—whether private property, state property, or common property—overexploitation and destruction depend on how well the property-rights regime copes with problems of allocating the costs and benefits of managing and governing a particular resource. In other words, property rights defining who has access, how much can be harvested, who can manage, and how rights are transferred are a necessary but not sufficient condition for avoiding overexploitation of a resource (see Schlager and E. Ostrom 1992).

The authors of the empirical chapters in this book have heeded Bromley’s advice. They have not presumed that all resources used jointly by multiple individuals are open-access resources. Instead, they have

attempted to explore how decision-making arrangements—to use the general concept of Ronald J. Oakerson's framework—affect “who decides what in relation to whom” (Oakerson in Chapter 3). This effort to describe the decision-making arrangements that are operational, rather than presuming the absence of any authority relationships, has produced a rich set of cases describing successful indigenous, resource-management regimes as well as less successful ones.

The effort summarized in this book has brought together the work of anthropologists, biologists, economists, ecologists, political scientists, sociologists, and members of other disciplines. Anyone committed to interdisciplinary scholarship knows how difficult communication is when members of just two disciplines attempt to combine their skills. When members of more than half a dozen attempt to learn from each other, the problems of communication and cumulation are several orders of magnitude greater.

The success of this difficult enterprise is largely attributable to the goodwill and the substantial knowledge, skills, and hard work of the participants. A major contributing factor, in addition, has been the conceptual generality and organization brought to this effort by the framework presented by Oakerson in Chapter 3. By identifying a common set of concepts and how these are thought to be related, Oakerson helped authors focus on the same set of conceptual variables and their relationships when they presented their empirical case studies. Without this common framework, it is hard to imagine how any cumulation could have been derived from this effort. By the time of the Annapolis conference, the case authors had already participated in workshops where they discussed the framework and its significance for organizing their case materials; they had also distributed their papers in advance of the conference (see Feeny 1986). It was thus possible to aim for and achieve a higher level of theoretical synthesis.

At the conference, I attempted to note and discuss with participants any propositions made concerning particular variables that could be associated with the establishment of coordinated or organized strategies for managing common-pool resources. This chapter represents my effort to draw on these inductive hypotheses as the foundation for the development of a more general theory. Given my own background, it is not surprising to find that the type of theory I present has a close family resemblance to the work of political economists interested in the effect of institutional arrangements (see, for example, Bates 1983; Brennan and Buchanan 1985; Buchanan and Tullock 1962; North 1981; V. Ostrom 1987; V. Ostrom, Feeny, and Picht 1988; Williamson 1985). This chapter is, however, a blend of my own efforts to understand how institutional arrangements affect individuals' incentives and behavior as well as the

variables that the case authors identified as being important now that they had organized their analyses using a common framework.

The next section of this chapter is an effort to refine the part of the Oakerson framework that refers to the technical and physical attributes of the resource. Most of the resources discussed by case authors are common-pool resources. If one is to understand how various types of decision-making arrangements affect patterns of interactions and outcomes, it is important to ascertain in what ways common-pool resources resemble other types of “difficult” environments—such as public goods—and in what ways these environments are different.

The third section focuses on how “the tragedy of the commons” is avoided in many of the cases presented in this volume. Since those who harvest from common-pool resources—the appropriators—organize themselves in at least a minimal way in all cases where common-property institutions are associated with successful management, the next question explored is how to explain the origin of appropriator organizations. The broad conceptual categories of the framework are now broken into their component parts and related theoretically. This leads to a discussion of the conditions that may serve to prevent the emergence of some form of organization where the tragedy of the commons is not avoided. The last two theoretical sections develop propositions related to the survival and performance of organizations for governing and managing common-pool resources.

The conclusion of this chapter is in two parts. First, a brief review is presented of recent efforts to refine, extend, and test this theory. Second, I give a summary of the type of policies that donors and governments of developing countries could adopt that is consistent with this initial theory.

Common-Pool Resources

To understand the opportunities and constraints that individuals using a property-rights regime face, one also needs to distinguish among types of resources. Common-pool resources (CPRs) are natural or man-made resources sufficiently large that it is costly to exclude users from obtaining subtractable resource-units. Two criteria are used to define a CPR: (1) the cost of achieving physical exclusion from the resource; and (2) the presence of subtractable resource-units (Gardner, E. Ostrom, and Walker 1990).

For relatively small CPRs, a single family or small production unit may be technically able to enclose the entire resource and exclude others at a low cost. For large and amorphous resources, such as ocean fisheries or the radio spectrum, it is extremely difficult, both technically and

economically, to exclude potential beneficiaries from obtaining benefits from them. The cost of exclusion is affected by the size and type of the resource system's natural boundaries and the technology available to enclose them (fences, markers, electronic passwords and decoders, and so on). Entry and exit rules also affect the operational patterns of exclusion, but they must be tailored to the particular attributes of specific types of resources within a cultural and historical setting.

The definition of a CPR distinguishes between the *flow of resource-units* and the *resource system* producing the flow (Blomquist and E. Ostrom 1985). "Resource-units" are what individuals produce or appropriate from a resource system. Examples of resource-units include: fish harvested from a fishery, the animals fed on a grazing plot, and wood or other usable plants harvested from a forest. Subtractability is a characteristic of the resource-unit appropriated from a CPR. The fish harvested by one boat are not there for someone else. Jointness of use is, however, a characteristic of the "resource system." More than a single boat can harvest fish simultaneously on the same fishing grounds. More than one family production unit can graze animals on a commons, or harvest a variety of forest products from a forest.

Failure to make this distinction between the subtractability of the resource-units and the jointness of the resource system has contributed to past confusion about the attributes of common-pool resources. Common-pool resources and collective (or public) goods share one major attribute and differ in regard to a second. The relatively high cost of achieving physical exclusion is an attribute of both collective goods and CPRs. The theoretical literature focusing specifically on the problem of free riders is relevant to the analysis of both collective goods and CPRs because the problem of free riding stems entirely from the difficulties of excluding beneficiaries from resources.

Collective goods and CPRs differ, however, in regard to jointness of consumption. Consumption units of collective goods are consumed without subtracting from the quantity available to others, while consumption units of CPRs are consumed subtractively. The "crowding effect" or "overuse" problem of CPRs does not occur in regard to the use of such collective goods as a weather forecast or national defense.

The subtractability of the resource-unit leads to the possibility of approaching the limit of the number of resource-units produced by a CPR. When the CPR is a man-made structure, such as a bridge, approaching the limit of the number of vehicles that can simultaneously use the bridge leads to congestion. When the CPR is a biological resource, such as a fishery or a forest area, approaching the limit of resource-units increases the costs of harvesting for all but may also destroy the resource. If the human demands made on a CPR are considerably lower than the quantity

of resource units available, many individuals can simultaneously use the CPR without adversely affecting each other or the long-run yield.

How Is the Tragedy Avoided?

If a relatively large number of individuals make high demands on a single CPR, do not communicate with one another, and act independently taking only their own expected return into account, the “tragedy of the commons” (G. Hardin 1968) is likely to occur. The “tragedy” may take the simple form of overexploitation or the more complex form of destruction. Many of the cases in this book illustrate situations in which individuals *do* talk with one another about the long-run condition of their shared resource and take account of one another’s actions when deciding on their own. If we are to move beyond the work of Hardin, we need to begin to specify the conditions that are conducive to the emergence of coordinated, rather than independent, actions by the individual users of a CPR.

In the following discussion, the set of individuals who withdraw resource-units from a CPR will be referred to as the “appropriators” of a CPR (Plott and Meyer 1975). Appropriators may live in or near by a CPR or far away and travel to the resource to harvest resource-units. They may remain latent and unorganized, or they may begin to discuss their problems with one another, recognize some commonly accepted rules for who has access to the CPR under what conditions, and develop some mechanisms for conflict resolution about it. The forum for discussion and decision may be a local gathering place, a village council, or any other place where the users of the same CPR congregate from time to time to discuss their common problems.

Because organizational arrangements frequently emerge from the patterns of behavior that are informally agreed upon over long periods of time, it is difficult to determine when user groups are latent and when they are organized. The following definition of an appropriator organization (AO) provides demarcation criteria. A set of appropriators is considered to be organized whenever it shares common understandings about:

- who is and is not a member
- the type of access to a CPR conveyed by membership or other grounds for such rights (the rights, duties, liberties, and exposures of different individuals, for example)
- how decisions will be made that affect the development of coordinated strategies for appropriating from or providing for a CPR
- how conflicts over these patterns will be resolved

AOs vary from relatively informal, meeting occasionally for appropriators to discuss how their individual strategies affect one another, to formal organizations with written rules clearly specifying mutual rights and duties and procedures for making binding decisions on all members. An AO could be a village governed by local oligarchs or by open democratic processes. An AO may also be a unit of local government where members of the local community select their own representatives and pass discretionary legislation about the use of the CPR and other matters.¹ But a unit of local government that is primarily an administrative district of a central government is not included within the meaning of the term "appropriator organization."

When an AO is created by individuals who are able to make sustained claims to exclude others from access and appropriation from their resource in external courts and administrative bodies, the organization is more stable. Examples of AOs organized by appropriators with less than full ownership rights are illustrated, however, in situations such as those described by John Cordell and Margaret McKean in Chapter 8 of this book. Many of these AOs have been rather ingenious in their efforts to control the CPRs on which their members' livelihood depends. Given the external legal orders in which they find themselves, they are exposed to greater uncertainty than if they could gain proprietorship rights in those external forums.

Examples of long-run success in managing CPRs subject to high levels of use, such as the Japanese villages described by McKean in Chapter 4, involve the establishment of an AO meeting the criteria stated above (see E. Ostrom 1990). This leads me to conjecture that the development of an AO is a second necessary *but not sufficient* condition for avoiding the tragedy of the commons through the actions of local appropriators themselves.²

Given the importance of AOs, we need to examine the factors associated with the emergence of some form of organization. It is obvious from the cases in this book that organizations do not always emerge whenever they are needed. Three of the five fishing villages studied by Fikret Berkes, for example, did not have an AO (see Chapter 7). Many of the neighboring villages to the one described by Robert Wade (Chapter 9) did not have an AO either. Consequently, we need to examine the conditions that are conducive to the emergence of such an organization. At the Annapolis conference several participants helped to identify a set of variables that appeared to affect the likelihood of the origin of one or more AOs related to a common-pool resource.³ These variables relate to attributes of the CPR, to the relationships between use and supply, and to attributes of the appropriators. The variables discussed at the Annapolis conference are reproduced in Table 13.1.

TABLE 13.1

Variables Mentioned by Case Authors as Being Associated with the Emergence of Appropriator Organizations

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- A. Variables Related to the Resource
1. *Size*. The boundaries of the CPR are sufficiently small, given the transportation and communication technology available, that appropriators can develop accurate knowledge of external boundaries and internal microenvironments.
 2. *Clear-cut boundaries*. The boundaries of the CPR are sufficiently distinct that appropriators can develop accurate knowledge of the external boundaries.
 3. *Indicators of CPR conditions*. Reliable indicators of the condition of the CPR can be obtained as a result of regular use.
- B. Variables Related to the Relationship between Demand and Supply
1. *Scarcity*. The amount of resource-units extracted from the CPR is sufficiently high that users are aware that their withdrawal patterns are interdependent.
 2. *Asset structure*. The legal claims that some members of a group can sustain are sufficiently large that they are motivated to pay a major share of the initial organizational costs of creating or restructuring an organization.
- C. Variables Related to the Appropriators
1. *Size*. The number of appropriators is sufficiently small that the costs of communication and decision making are relatively low.
 2. *Residence*. Appropriators permanently reside near or "in" the CPR.
 3. *Degree of Homogeneity*. Appropriators are not strongly divided by:
 - (a) natural boundaries
 - (b) different, conflictual use patterns
 - (c) different perceptions of the risks of long-term extraction from the CPR
 - (d) cultural antagonisms
 - (e) substantially different exposures to risk (as upstream differ from downstream users).
 4. *Existing organization*. The appropriators have some prior experience with at least minimal levels of organization through:
 - (a) the presence of a general purpose organizational structure, such as a village council or a cooperative organization
 - (b) the presence of a specialized organizational structure related to this resource without prior management responsibilities, such as a boating club
 - (c) the presence of nearby organizations that have helped others to solve similar CPR management problems.
 5. *Ownership status*. The rights that appropriators have to access, use, and potentially, to the exclusion of others, are sustainable and certain.
 6. *Degree of centralization*. The appropriators are not prevented from exercising local initiative by a centralized government.
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NOTE: CPR stands for "common-pool resource."

SOURCE: Author.

Toward the Rudiments of a Theory of the Origins of Appropriator Organizations

This is a long list of variables. Many of them do play an important role in specific cases, but such a list is too unwieldy to allow for further theory development and testing. To develop a theory of the emergence of some form of user organization, we need to develop a smaller set of key variables.

In this effort, we can also draw on previous theoretical work related to the theory of constitutional choice.⁴ An AO can be conceptualized as a small polity constituted by appropriators for the purpose of gaining a joint benefit (the regulation of the CPR). A central assumption of the theory of constitutional choice is that the costs of decision making involved in arriving at a set of coordinated strategies for the members of a collectivity are greater than the costs of decision making involved when each and every person is free to adopt his or her own independent strategy. In deciding whether or not to create a new polity—in our case a new AO—it is presumed necessary for individuals to examine not only the expected benefits to be derived from the coordinated strategies of the collectivity, but also the expected costs in time and resources devoted to decision making and the expected, potential deprivations imposed on individuals by the polity itself.

A general proposition of the theory of constitutional choice is that a group of individuals will constitute a new polity when the perceived benefits to be gained from the enterprise are greater than the total estimated decision-making costs of the enterprise using a particular set of rules (Buchanan and Tullock 1962). By thinking in a more general fashion about the list of variables shown in Table 13.1, the same general proposition can be made regarding the emergence of an AO. AOs do not emerge unless the perceived benefits of organization exceed the perceived cost of organization.

If a CPR is a valuable resource worth the costs of managing it, the *perception* that benefits exceed costs is more likely to arise when participants have relatively full and accurate information about: (1) the physical structure of a resource, (2) the past actions of other appropriators, (3) the relationship of demand to yield, (4) the benefits and costs of various actions and outcomes impinging on different individuals and firms, and (5) the likelihood that other participants will keep promises. The specific variables in Table 13.1 can be viewed as variables that enhance the information that individuals possess about both the benefits and the costs of constituting a new organization. With this view of how these variables are important to the emergence of AOs, we can now make the following more general propositions:

Individuals will tend to switch from independent strategies for exploiting a CPR to more costly, coordinated strategies when they share a common understanding that:

1. Continuance of their independent strategies will seriously harm an important resource for their survival.
2. Coordinated strategies exist that effectively reduce the risk of serious harm to the CPR.
3. Most of the other appropriators from the CPR can be counted on to change strategies if they promise to do so.
4. The cost of decision making about future coordinated strategies is less than the benefits to be derived from the adoption of coordinated strategies.

Let us now discuss how these general propositions are related to the specific variables in Table 13.1.

Common Understanding of the Problem

Whether appropriators share a common understanding that continuing independent strategies will seriously harm a resource important for their survival depends on the size and performance of the resource itself and on their own actions. Drawing on Table 13.1, we can say that if the resource is relatively small (A1), the boundaries are easy to determine (A2), and reliable indicators of its conditions are present (A3), appropriators can begin to develop a consistent understanding of the amount and value of the yield of the CPR. Users need relatively good information about the amount of the yield or reliable and sensitive indicators about the condition of the CPR. How fast this type of information is obtained and synthesized depends heavily on the type of resource involved and the level of scientific knowledge used (Gilles and Jamtgaard 1981).

If appropriators live in a small community (C1) near to the CPR (C2), they will have a relatively accurate picture of each other's withdrawal practices.⁵ Further, open communication about the problems they face, as well as about potential solutions, is enhanced when users live in a small community. This is consistent with a major finding from the research of scholars who have constructed commons laboratory experiments on commons situations. When communication is unconstrained in laboratory CPRs, participants are far more likely to devise joint strategies that achieve higher joint outcomes than when communication is constrained (see Wilson 1985; E. Ostrom and Walker 1991; and the review of laboratory experimentation by Feeny in Chapter 12 of this book).

As users come to recognize through communication that demands are close to or are exceeding the yield (B1), then one can expect that they will share an understanding that continuance of their independent strategies

will seriously harm the CPR. This recognition is not sufficient for a change from individual to coordinated strategies. The users must also place a high value on the CPR itself in terms of their own economic and social survival.

Common Understanding of Alternatives for Coordination

Appropriators must be able to conceptualize the possibility of alternative strategies that might avoid this harm. The capacity to think about alternative coordinated strategies is affected by the prior experience that users have had with other forms of local organization (C4a and C4b in Table 13.1), knowledge about the experiences of other groups trying to solve similar problems (C4c), the certainty of their own status as owners (C5), and a capacity to take local initiative (C6). One would expect appropriators with little or no common experience with or knowledge of successful efforts to achieve coordinated strategies to have greater difficulties in developing strategies to manage a CPR.

Common Perception of Mutual Trust and Reciprocity

Participants need assurance that if they change to more costly, coordinated strategies, others will do likewise. This is the central argument in the work of Oakerson (Chapter 3; Oakerson 1988) and C. Ford Runge (Chapter 2; Runge 1981, 1984), who stress how important the assurance of mutual promise keeping is in solving CPR problems. Given the structure of the commons dilemma as it is frequently modeled, this is the problem that each individual must be assured that he or she will not be the "sucker" who adopts the most costly coordinated strategies (that is, cooperates) while others yield to their "temptation" not to cooperate and continue their own practices. Assurance may also be obtained through reliance on formal police, formal surveillance and investigations, and formal courts. Use of formal legal methods to gain assurance is costly, however, and appropriators can reduce the costs of assurance dramatically if they are willing to develop relationships of trust and reciprocity among themselves (R. McKean 1975).

Mutual trust has been conceptualized as an asset that individuals build over time by engaging in mutually beneficial transactions that cannot be consummated in an immediate quid pro quo exchange (see Breton and Wintrobe 1982; see also Posner 1980). Perceptions concerning the likelihood that other users will follow an agreed-upon coordinated strategy are affected by all of the factors related to the group (C1, C2, C3a,

C3b, C3c, C3d, C3e) and to prior experience with local organization (C4a, C4b, and C4c).

*Common Perceptions That Decision-Making Costs
Do Not Exceed Benefits*

Users would also need to share an expectation that the costs of future decision making about coordinated strategies will not exceed the benefits to be derived from the use of coordinated strategies. Expectations about decision-making costs are affected by all of the characteristics of a group and by its prior experience of and knowledge about organizational arrangements. Almost all theories of organization posit that decision-making costs rise with the size of the group making decisions (C1 in Table 13.1). One would expect that the greater the homogeneity of the group, the lower the costs of arriving at decisions. Decision-making costs are also lowered if some individuals are willing and able to undertake entrepreneurial efforts to get organized or to persuade an existing organization to include the CPR within its frame of interest (Olson 1965).

When the Tragedy Is Not Avoided

By focusing on the conditions necessary for the emergence of coordinated strategies to use a CPR, the four propositions developed above also help to explain why so many CPRs have been destroyed or are suffering severe problems of degradation. One can reverse the direction of the propositions in the following shortened version:

Appropriators will continue independent strategies for exploiting a CPR unless they share a common understanding and perception of: (1) the nature of the problem, (2) the alternatives for coordination available to them, (3) the likelihood of mutual trust and reciprocity, and (4) expected decision-making costs as being less than the benefits to be derived.

Given this statement of the problem, one understands why individuals continue independent strategies for exploiting many CPRs. Unless creative efforts are expended to create large-scale user-group organizations, independent, exploitative strategies are a dominant strategy for all participants. Problems of controlling ocean fisheries, migratory wildlife, and international air pollution are several orders of difficulty greater than localized common-pool problems such as managing grazing lands, irrigation projects, inshore fisheries, and the like.

The general principles involved in solving large-scale CPR problems are similar to those involved in dealing with smaller resource systems. The processes of gaining a common understanding and devising workable coordinated strategies are, however, far more difficult and costly for large-scale common-pool problems. Institutional designs relying on nested structures of smaller organizations within larger organizations are most likely needed (see Coward 1980; Bendor and Mookerjee 1985). The development of such structures, when the resource crosses jurisdictional boundaries (or, even worse, exists outside all jurisdictional boundaries), is costly and difficult.

On the Survival of Appropriator Organizations

The creation of an organization and the development of coordinated strategies for using a common-pool resource are no guarantee that an organization can survive over time. Many efforts to achieve coordinated strategies have collapsed after a few years. Initial perceptions of the nature of the problem, the alternatives for coordination, the likelihood of mutual trust, and the costs of decision making may be altered by experience. Is it possible to posit the variables that may be conducive to the survival of an AO, once it has emerged through the slow accretion of common understandings or has been consciously designed by individuals trying to solve a specific problem? I think it is.

Six general propositions can be stated as a means of summarizing the more specific variables discussed at the Annapolis conference.

An appropriator organization is more likely to survive if:

1. The organization devises a small set of simple rules related to access and use patterns agreed to by appropriators.
2. The enforcement of these rules is shared by all appropriators, supplemented by some "official" observers and enforcers.
3. The organization is constituted with internally adaptive mechanisms.
4. The appropriators from the CPR are able to sustain legal claims as owners of the CPR.
5. The organization is nested in a set of larger organizations in which it is perceived as legitimate.
6. The organization is not subjected to rapid exogenous change.

Let us discuss each of these propositions in turn.

A Small Set of Simple Rules

The development of a small set of simple rules agreed to by appropriators has many survival advantages. The key advantage is that participants can remember the rules and transmit them to new participants over time. The constraints that social systems use to structure behavior—rules, that is—are constraints only to the extent that humans can understand what is and is not allowed and can transmit this information over time (see V. Ostrom 1980, 1985; E. Ostrom 1986). To the extent that rules are backed up by physical constraints (for example, fences or governing devices on motors), it is easier for individuals to follow a rule without actually knowing it and to be sure that behavior is in conformance with rules. Most rules, however, are constraints only in so far as humans learn them, follow them almost automatically, tell others about them, and know when others are or are not following them.

The fewer the rules used to organize activities (relative to the complexity of the activities), the more likely that individuals can understand, remember, and follow them. Further, the fewer and less ambiguous the rules are, the higher will be the agreement among all participants about what is and what is not an infraction. At the Annapolis conference we discussed the multiple functions of the simple rule “You must live locally to use this system.”⁶ Following this rule

- is easy because the rule is extremely easy to learn, remember, and transmit
- enhances the local knowledge that appropriators have about the resource
- enhances the possibility for reciprocity and trust among participants because they have a higher probability of knowing one another and engaging in other transactions
- reduces decision-making costs about who can or cannot use the system
- reduces enforcement costs since a stranger will be obvious to most participants

An unchanging rule that a grazing commons will be open for use between the same dates every year (and closed otherwise) is a low-cost rule for coordinating the behavior of large numbers of appropriators who may live miles apart during much of a year (see Gilles, Hammoudi and Mahdi in Chapter 10 of this book). Assigning a single individual in a residential community the responsibility for announcing the dates for opening and closing of a commons is, as McKean points out in Chapter 4,

a more flexible and equally clear rule of access, but may be difficult to use when appropriators live far apart without modern modes of communication.

Dual Enforcement

That the rules of an AO are enforced by the appropriators themselves backed up by some "official" enforcers also appears to be an important condition for survival. The long-serving village institutions described by McKean in this volume illustrate this clearly. One or two participants simply forgetting to follow the rule without anyone saying anything can be the beginning of the end. Once some participants unconsciously (or consciously) forget to follow the rules, and no one says or does anything to them, others observe the lack of sanctions and are less inclined to follow the rules themselves.

Dual enforcement is a mutually reinforcing process. No AO can hire enough guards to see all the boundaries of a CPR and all of the activities of users. Users are the effective "public eyes" (Jacobs 1961) that cover more of the territory than official guards could ever see. If users know, understand, and have agreed to a simple set of rules, and if they use social sanctions against one another for rule infractions of various kinds, there is a higher probability that a rule infraction will not go unnoticed and unsanctioned. Further, if social sanctions are backed up by official guards, this helps everyone remember the rules and gives the social sanctions more weight.

Internally Adaptive Mechanisms

Two aspects of adaptability were discussed at Annapolis. The first had to do with the capacity of an AO to use multiple decision rules and to relate these to different types of problems. Many conference participants articulated a need for at least three types of authority rules that would

- create a *position for a single individual* who is authorized to make decisions for the AO related to important and rapidly changing conditions
- create a *council* (either representative or a full assembly) where major problems can be discussed, general rules formulated (particularly those related to distribution and problems of equity), and penalties assessed
- rely on *broad consensus and/or formal rules* requiring extraordinary majorities for deciding on actions that may involve considerable sacrifice or penalties

This implies that even though AO rules should be as simple and as few as possible, the governance structure of an organization should be relatively complex if it is to survive over a long time period.

The second aspect of adaptability has to do with the capacity of an AO to change its own structure over time. An organization that can change its own rules regarding membership, access to and use of the CPR, collection of information, and the incentives and sanctions to be used, has a higher probability of being able to survive in a changing environment than one that must continue to use the same rules for internal organization over time. This aspect of adaptability is closely related to what W. Ross Ashby (1956) has referred to as "ultrastability."

Ownership

For survival, participants at the Annapolis conference argued that those who are the users of a CPR should also be its owners. While cases such as the one described by Cordell and McKean illustrate instances where individuals with few claims to property rights have developed rather ingenious ways to manage a CPR, the same cases also illustrate the marginal character of these AOs. While the swamp fishermen view each other as "coowners" of the resource, outsiders perceive them as having no legal claims to it. Conflicts among residential users can be worked out *within* their own de facto legal framework. Conflicts between residential users and "outsiders" cannot be worked out locally and must be settled within a de jure legal system. In Chapter 1, Bromley stresses the problems involved when only de facto ownership is exercised by participants.

Nesting of an AO in a Larger System

A fifth proposition has to do with the nesting of an AO within a set of larger organizations and authorities for dealing with problems beyond the boundaries of the AO. This is particularly critical when the CPR itself is large and AOs are organized around subparts. Thus, if those on a tertiary channel of a large irrigation system organize an AO to keep their channels clear and to regulate the opening of valves, they also need to be able to communicate effectively with the operators of the headwaters from time to time (see Uphoff 1985, 1986).

Nesting of organizational arrangements in federated structures of various kinds may also enable participants to cope with holdout problems more effectively in *large* groups. Once an AO grows large, informal sanctioning among members becomes more difficult. Building a larger organization from smaller units, however, enables participants to monitor

and impose informal sanctions on each other within a smaller organization. If a member organization begins to lag behind, on the other hand, the larger organization can stimulate conformance.

Even when a particular AO is effectively organized to deal with the internal problems of a CPR, many events from outside the system can affect the CPR's operation. Local appropriators need mechanisms for effective communication with larger organizations to cope with these problems. External organizations or authorities can provide essential inputs to the decision making undertaken at the AO level. Examples include scientific information, capital fund-raising, modern technological training (where this is really needed), and supplemental conflict resolution mechanisms (available when the AO cannot resolve its own conflicts successfully).

Lack of Simultaneous Exogenous Changes

An AO is more likely to survive over time if it is fortunate enough not to have to cope with many, simultaneous changes in such key exogenous variables as population, technology, number of appropriators, external demands, and relationship to central authorities. As Bromley points out in Chapter 1, all large changes in exogenous variables threaten the capacity of individuals to learn about the change fast enough to make adaptive responses. The faster and greater the amount of the change, the higher the probability that an AO cannot respond rapidly enough.

Is Survival Sufficient?

Simple survival of an AO is not a sufficient condition for effective performance.⁷ The survival of an AO over a long time leads one to presume that the AO is doing something well. The key question is *what* is it doing well? For some AOs, the answer may be that the *only* thing they are doing well is surviving. Unless AOs are in highly competitive environments that tend to eliminate the inefficient and inequitable ones, we cannot presume that those that survive are performing well. If AOs were firms in a highly competitive market, the theory of market processes would enable us to infer that survivors use efficient, long-term strategies—even though the survivors may not have selected these strategies consciously (Alchian 1950).

Some AOs have extraordinary powers not available to private firms in a competitive market. These powers enable such AOs to survive even though performing poorly. AOs that can enforce membership and contributions to collective actions (for example, if they have public powers to

coerce and sanction) can survive even when most of their members do not evaluate them as performing efficiently or equitably. It is even possible for a long-surviving AO to generate more costs than benefits. The latter can occur when membership is coerced and the costs of exit are high. Many AOs organized in the public sector can coerce membership, and exit may involve extraordinary costs. Consequently, it is especially important not to presume that surviving local governments automatically perform well.

AOs established and maintained primarily through voluntary agreement and operating over a long time period without full governmental powers are most likely to generate more benefits than they impose costs. It is hard to imagine how strictly voluntary AOs could survive unless net benefits are positive. In a strictly voluntary association, members can leave the AO at any point they perceive costs of participation to exceed benefits. Yet a positive benefit-cost ratio is not equivalent to high performance.

What Is Good Performance for an AO?

Oakerson's framework (see Chapter 3) includes two criteria that could be used to evaluate the outcomes of user interactions related to the CPR: efficiency and equity. The first aspect of efficiency mentioned by Oakerson is whether appropriators have achieved an *optimal rate of use*. A less rigorous efficiency criterion is that appropriators are not exceeding the sustainable yield. A second aspect of efficiency has to do with the difference between the *benefits* resulting from the operation of an AO and the *decision-making* and *potential deprivation costs* of the AO. A minimal efficiency criterion is that this difference is positive. A comparative efficiency criterion can be used to explore whether the difference between the benefits and costs of an AO in one setting is as large or larger than that of another AO in a similar setting. Two questions are involved in using the criterion of equity: (1) Is the distribution of the costs roughly similar to the distribution of benefits? (2) Are there patterns of redistribution that appropriators wish to achieve at this level of organization?

At the Annapolis meetings several conditions—in addition to those identified as conducive to emergence and to survival—were found to enhance the performance of AOs in governing and managing CPRs. One set of conditions is concerned with the “match” of the membership of the AO and that of the appropriators. A second involves the relationship between the incidence of benefits and the incidence of costs derived from the operation of the AO. A third factor is the knowledge generated by appropriators about the CPR and about user preferences, benefits, and costs. While these might possibly be stated in propositional form, my

understanding of what is involved is not yet sufficient for me to do so, and I will simply discuss each of these conditions in turn.

The Match of Membership of the AO and the Appropriators

A key factor that affects the long-run performance of organizational arrangements is whether organizations can be established and maintained whose boundaries are roughly coterminous with those of the CPR and its appropriators. This is definitely not easy to accomplish in natural settings.⁸ Most communities are simultaneously concerned with many types of problems. The boundaries most relevant for managing a particular CPR may not be the same as those most relevant for managing another CPR or some types of pure collective goods. Even if we assume a considerable amount of discretion in establishing AOs, it is unlikely that the boundaries of any private or public AO will exactly match those of a particular resource system. In governmental systems, where jurisdictional boundaries are firmly established from the center and citizens are discouraged from establishing local organizations with quasi-public powers, the likelihood of even a rough match between the most relevant organizational arrangement and the CPR is low.

Mismatches can take two forms. The first form involves the case where an AO is *considerably larger* than the CPR in territory or number of appropriators. A possible outcome of this mismatch is total indifference by the larger unit to the problems of regulating the CPR. In the eventuality that appropriators were effectively represented in a democratic process in the larger unit, poor performance could still be predicted. Individuals living outside the boundaries of the CPR would have little or no information about what was happening in the CPR and would certainly not want to pay taxes to support its activities.

A second type of mismatch would occur if the organization attempting to regulate the CPR were *substantially smaller* than the CPR in territory or number of appropriators. If an AO could gain the cooperation of only a small subset of those actually using a CPR, this small subset would be the only one contributing to the regulatory program. Those who did not cooperate by changing their withdrawal patterns or through contributions to support investments in the CPR would gain substantially without contributing their fair share. If the number of noncooperators were large, those who initially might be willing to cooperate might not be willing to cooperate over the long run. While a mismatch of the first type is likely to result in an *overinvestment* in collective activities and projects, a mismatch of the second type is likely to result in an *underinvestment*. We must be careful, however, to examine *operational* patterns of relationships before

presuming a mismatch. While no single, formal organizational unit may exist with similar boundaries, informal arrangements among organizations may enable appropriators to develop effective, informal organizational arrangements that roughly match the boundaries of a CPR.

The Relationship between the Incidence of Benefits and Costs

A second consideration is how rules distribute costs and benefits. Many of the simple rules adopted as a means of long-term survival are not optimal rules in the sense of maximal efficiency. J. Roumasset (1985), for example, points out that the simple rule used on many long-surviving irrigation systems of allocating water based on the amount of land owned can lead to inefficiency. If the system is large, the cost of getting water to parcels at the end of the system is much higher than getting it to those at the head of the system. The rule allocating water has to be looked at, however, in relation to the rule requiring labor or other inputs. When farmers are required to invest substantial quantities of their own labor to maintain irrigation systems, rules relating the amount of labor required to the amount of water received are relatively typical (Tang 1992). Thus a rule that is inefficient when used to allocate water on a system where no inputs are required, may be quite efficient when used to allocate water on a system where substantial inputs are required based on the same formula as water allocations (see also Bromley, Taylor, and Parker 1980 for a discussion of equitable distributions).

The Type of Knowledge Generated

It is conceivable that individuals might organize an AO that survived for some time without detailed information about the characteristics of the CPR and use patterns. It is inconceivable, however, that such an AO could perform efficiently or equitably without such information. Without detailed knowledge about the yield patterns of the CPR, rules that reduce the quantity of use-units that participants are allowed to withdraw may be more or less stringent than needed to manage the CPR efficiently. Even when appropriators are able to obtain relatively reliable information about the characteristics of their CPR, they may not obtain valid information about the actual use patterns of various appropriators over time. Appropriators are not motivated to reveal the full extent of their use since such information may lead others to try to limit their activities. Unless the CPR is small and easy to understand, and each user can easily monitor the use patterns of others, obtaining accurate information is far from a trivial problem.

Some of the technical knowledge needed about the physical structure of a CPR may be provided by larger public or private agencies that provide experts to map the CPR and describe its yield patterns. A key question, however, is whether this information is made available to the appropriators themselves or only to central agencies who are not involved in the day-to-day operation of the CPR system. It is a common practice of donor agencies to make technical reports to the bureaus of central governments and not to the appropriators themselves. Institutional arrangements used in developed countries, such as those of a "watermaster" associated with equity courts, provide technical information about the CPR and about use patterns to all participants (see Blomquist and E. Ostrom 1985), but such arrangements are used infrequently in the developing world.

Conflict can be an important feedback mechanism for the participants in an AO about how past efforts (or projected future efforts) affect the interests and behaviors of different participants. AOs vary in the extent to which they use conflict creatively for gaining information about problems perceived by different participants. If conflict is suppressed, key information about the effects of past actions is lost. If conflict is encouraged, valuable resources are spent in potentially harmful disputes. Thus, the development of effective conflict resolution mechanisms within an AO is also an important aspect of its capacity to achieve efficient and equitable performance.

Conclusion

The rudiments of a theory of the origins, survival, and performance of organizations to manage common-pool resources have now been presented. The theory represents an effort to integrate the findings of specific case authors and the speculations made at the Annapolis conference, where the chapters of this book were intensively discussed, with a broad political-economic approach to the study of institutions. Since the first draft of this chapter was circulated, a number of important books have been or will soon be published that contain still further empirical support for the propositions of the theory just sketched (Ascher and Healy 1990; Berkes 1989; Fortmann and Bruce 1988; Marshak 1987; McCay and Acheson 1987; E. Ostrom, 1990; E. Ostrom, Gardner, and Walker n.d.; V. Ostrom, Feeny, and Picht 1988; Pinkerton 1989; Wade 1986). A major bibliography has also been published (Martin 1992). In all of the cases described in these works, overexploitation of common-pool resources occurred when open access prevailed either because no set of individuals had property rights or because state property was treated as open-access

property. Appropriator organizations were able in many instances—but not all—to manage CPRs effectively. Where AOs failed to develop, did not survive, or performed inadequately, it would appear that one or more of the variables identified above was responsible.

Obviously, much more work is needed to make this rudimentary theory more rigorous and to test its implications precisely rather than generally. Many scholars are engaged in this effort as an International Association for the Study of Common Property has now been established (its first international meeting was scheduled for the fall of 1990 at Duke University and the second for the fall of 1991 at the University of Manitoba). In several works published at about the same time, some of the propositions presented above were developed by a more formal method or given a more precise empirical test (see Gardner and E. Ostrom 1991; Weissing and E. Ostrom 1991; Walker, Gardner, and E. Ostrom 1991; Tang 1992; E. Ostrom 1990, 1992). It is an exciting time to be participating in an evolving interdisciplinary effort to understand how institutional arrangements affect the capacity of individuals to engage in self-governance and self-management of common-pool resources.

These theoretical and empirical efforts translate into policy proposals. At the Annapolis conference, for example, participants strongly articulated a view of the type of policies that donors and governments of developing countries should adopt to be consistent with our evolving understanding. The participants recommended to donors and policymakers in developing countries that they abandon current presumptions that local rules and customs were lacking for most common-pool resource systems. Instead, the participants urged that the burden of proof should rest with donors and policymakers to demonstrate the absence of local customs and rules before intervening to impose external ones. The advice in a nutshell was:

1. If a people have lived in close relationship with a relatively small common-pool resource system over a long period of time, they have probably evolved some system to limit and regulate use patterns.
2. Before one imposes new rules on local systems, inquiries should be made to determine if some rules and customs do not already exist.
3. If some customs and rules do exist, study these carefully in order to understand how they affect use patterns over time.
4. Propose new rules only after you have convinced yourself that either no rules and customs exist, or the rules and customs that do exist are not effective in achieving regulation or produce substantial inefficiency, inequity, or both; and you are thoroughly familiar with the configuration

of institutions in existence that may affect how new rules operate in practice.

5. Maintaining and enforcing new rules depends upon people finding those rules to be an acceptable way of ordering their relationships with one another as a community.
6. New rules cannot vary dramatically from the existing repertoire of rules in use or they will exist only on paper and not in the minds of those who must understand the rules to make them work.

We can hope that this message will be heard.

NOTES

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1. See Bromley, Taylor, and Parker 1980 for a review of literature about irrigation associations in many different third world countries. Most irrigation associations would be covered by the concept of an appropriator organization.

2. The first necessary but not sufficient condition for avoiding the tragedy of the commons is the establishment of property rights limiting who can use, how much can be withdrawn, who can manage, and how rights are transferred.

3. The variables listed in Table 13.1 were mentioned by participants as being important as either enhancing or hindering efforts to achieve organized coordination of some sort. None of them were identified as necessary and sufficient conditions either for *or* against the emergence of an AO. Cultural divisions are not, for example, a sufficient condition for not achieving organization. Many successful AOs include membership that crosses ethnic and linguistic barriers. On the other hand, when individuals from cultural traditions that are deeply suspicious of and antagonistic to one another try to solve CPR problems, they have more to overcome in developing mutual trust than when a set of individuals all come from the same cultural background (see discussion in Bromley, Taylor, and Parker 1980).

4. See Buchanan and Tullock 1962 for an important general theory of constitutional choice and V. Ostrom and E. Ostrom 1977 and E. Ostrom 1989 for earlier efforts to apply the theory of constitutional choice to the analysis of CPRs (see also V. Ostrom 1982, 1986; Roumasset 1985).

5. See Berkes and Kışlalioğlu 1989 for an analysis of the relative efficiency and equity of small-scale fisheries and a summary of literature on the evolution of community-based resource management systems.

6. Several of the cases in this book use this rule including those by McKean (Chapter 4), Campbell and Godoy (Chapter 5), Berkes (Chapter 7), Cordell and McKean (Chapter 8), and Wade (Chapter 9).

7. Several recent analyses have stressed the importance of *not* equating survival and optimality (see, for example, Binger and Hoffman 1989; March and Olsen 1989).

8. I do wish to stress that there are many forms of organization that accomplish this rough correspondence. Wade (1986) has shown how local organization based on a *village* structure in India is able to encompass most of the affected irrigators even though the organization is not based on the irrigation channel.

REFERENCES

- Advisory Commission on Intergovernmental Relations. 1987. *The Organization of Local Public Economies*. Washington, D.C.: The Commission. (Written by Ronald J. Oakerson.)
- Alchian, Armen A. 1950. "Uncertainty, Evolution, and Economic Theory." *Journal of Political Economy* 58 (June):211–21.
- Ascher, William, and Robert Healy. 1990. *Natural Resource Policymaking: A Framework for Developing Countries*. Durham, N.C.: Duke University Press.
- Ashby, W. Ross. 1956. *An Introduction to Cybernetics*. New York: Wiley.
- Bates, Robert H. 1983. *Essays on the Political Economy of Rural Africa*. London: Cambridge University Press.
- Bendor, Jonathan and Dilip Mookherjee. 1985. "Institutional Structure and the Logic of Ongoing Collective Action." Working paper, School of Business, Stanford University, Stanford, Calif.
- Berkes, Fikret. 1989. *Common Property Resources, Ecology and Community-Based Sustainable Development*. London: Belhaven Press.
- Berkes, Fikret, and Mina Kışlalioğlu. 1989. "A Comparative Study of Yield, Investment and Energy Use in Small-Scale Fisheries: Some Considerations for Resource Planning." *Fisheries Research* 7:207–24.
- Binger, Brian R., and Elizabeth Hoffman. 1989. "Institutional Persistence and Change: The Question of Efficiency." *Journal of Institutional and Theoretical Economics* 145:67–85.
- Blomquist, William, and Elinor Ostrom. 1985. "Institutional Capacity and the Resolution of a Commons Dilemma." *Policy Studies Review* 5 (2):383–93.
- Brennan, Geoffrey, and James Buchanan. 1985. *The Reason of Rules*. Cambridge: Cambridge University Press.
- Breton, Albert, and Ronald Wintrobe. 1982. *The Logic of Bureaucratic Conduct*. Cambridge: Cambridge University Press.

- Bromley, Daniel W. 1984. "Property Rights and Economic Incentives in Resource and Environmental Systems." Agricultural Economics Staff Paper Series, no. 231. Department of Agricultural Economics, University of Wisconsin, Madison.
- Bromley, Daniel W., Donald C. Taylor, and Donald E. Parker. 1980. "Water Reform and Economic Development: Institutional Aspects of Water Management in the Developing Countries." *Economic Development and Cultural Change* 28 (2):365–87.
- Buchanan, James, and Gordon Tullock. 1962. *The Calculus of Consent*. Ann Arbor: University of Michigan Press.
- Ciriacy-Wantrup, S. V., and Richard C. Bishop. 1975. "'Common Property' as a Concept in Natural Resource Policy." *Natural Resources Journal* 15:713–27.
- Coward, E. W., Jr. 1980. *Irrigation and Agricultural Development in Asia: Perspectives from Social Sciences*. Ithaca, N.Y.: Cornell University Press.
- Feeny, David H. 1986. "Conference on Common Property Resource Management: An Introduction." In National Research Council, *Proceedings of the Conference on Common Property Resource Management*, 7–11. Washington, D.C.: National Academy Press.
- Fortmann, Louise, and John W. Bruce, eds. 1988. *Whose Trees? Proprietary Dimensions of Forestry*. Boulder, Colo.: Westview Press.
- Gardner, Roy, and Elinor Ostrom. 1991. "Rules and Games." *Public Choice* 70 (2):121–49.
- Gardner, Roy, Elinor Ostrom, and James Walker. 1990. "The Nature of Common-Pool Resource Problems." *Rationality and Society* 2:335–58.
- Gilles, Jere L., and Keith Jamtgaard. 1981. "Overgrazing in Pastoral Areas: The Commons Reconsidered." *Sociologia Ruralis* 21 (Sept.):129–41.
- Hardin, Garrett. 1968. "The Tragedy of the Commons." *Science* 162 (Dec.):1343–48.
- Hardin, Russell. 1982. *Collective Action*. Baltimore: The Johns Hopkins University Press.
- Holt, Sidney J., and Lee M. Talbot. 1978. *New Principles for the Conservation of Wild Living Resources*. Wildlife Monographs no. 59. Washington, D.C.: Wildlife Society.
- Jacobs, Jane. 1961. *The Death and Life of Great American Cities*. New York: Random House.
- Kiser, Larry L., and Elinor Ostrom. 1982. "The Three Worlds of Action. A Meta-Theoretical Synthesis of Institutional Approaches." In *Strategies of Political Inquiry*, ed. E. Ostrom, 179–222. Beverly Hills, Calif.: Sage.
- March, James G., and Johan P. Olsen. 1989. *Rediscovering Institutions: The Organizational Basis of Politics*. New York: Free Press.
- Marshak, Patricia. 1987. "Uncommon History." In *Uncommon Property: The Fishing and Fish Processing Industries in British Columbia*, ed. Patricia Marshak, Neil Guppy, and John McMullan, 353–59. Toronto: Methuen.
- Martin, Fenton. 1992. *Common Pool Resources and Collective Action: A Bibliography*. Vol. 2. Bloomington: Indiana University, Workshop in Political Theory and Policy Analysis.

- McCay, Bonnie J., and James M. Acheson. 1987. *The Question of the Commons: The Culture and Ecology of Communal Resources*. Tucson: University of Arizona Press.
- McKean, Roland. 1975. "Economics of Trust, Altruism, and Corporate Responsibility." In *Altruism, Morality, and Economic Theory*, ed. Edmund S. Phelps, 29–44. New York: Russell Sage Foundation.
- North, Douglass C. 1981. *Structure and Change in Economic History*. New York: Norton.
- Oakerson, Ronald J. 1988. "Reciprocity: A Bottom-Up View of Political Development." In *Rethinking Institutional Analysis and Development: Issues, Alternatives, and Choices*, ed. Vincent Ostrom, David Feeny, and Hartmut Picht, 408–35. San Francisco, Calif.: ICS Press.
- Olson, Mancur. 1965. *The Logic of Collective Action*. Cambridge, Mass.: Harvard University Press.
- Ostrom, Elinor. 1986. "An Agenda for the Study of Institutions." *Public Choice* 48: 3–25.
- . 1989. "Microconstitutional Change in a Multiconstitutional Political System." *Rationality and Society* 1 (1):11–50.
- . 1990. *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge: Cambridge University Press.
- . 1992. *Crafting Institutions for Self-Governing Irrigation Systems*. San Francisco: ICS Press.
- Ostrom, Elinor, and James Walker. 1991. "Communication in a Commons: Cooperation Without External Enforcement." In *Laboratory Research in Political Economy*, ed. Thomas R. Palfrey, 287–322. Ann Arbor: University of Michigan Press.
- Ostrom, Elinor, Roy Gardner, and James Walker. n.d. *Rules, Games, and Common-Pool Resources*. Ann Arbor: University of Michigan Press, forthcoming.
- Ostrom, Vincent. 1980. "Artisanship and Artifact." *Public Administration Review* 40 (4):309–17.
- . 1982. "A Forgotten Tradition: The Constitutional Level of Analysis." In *Missing Elements in Political Inquiry: Logic and Levels of Analysis*, ed. Judith A. Gillespie and Dina A. Zinnes, 237–52. Beverly Hills, Calif.: Sage.
- . 1985. "The Constitution of Order in Human Societies: Conceptualizing the Nature and Magnitude of the Task in Institutional Analysis and Development." Paper presented at International Political Science Association meetings, July 15–20, Paris.
- . 1986. "Constitutional Considerations with Particular Reference to Federal Systems." In *Guidance, Control and Evaluation in the Public Sector*, ed. F. X. Kaufmann, G. Majone, and V. Ostrom, 111–25. Berlin and New York: de Gruyter.
- . 1987. *The Political Theory of a Compound Republic: Designing the American Experiment*. Rev. ed. Lincoln: University of Nebraska Press.
- Ostrom, Vincent, David Feeny, and Hartmut Picht, eds. 1988. *Rethinking Institutional Analysis and Development: Issues, Alternatives, and Choices*. San Francisco: ICS Press.

- Ostrom, Vincent, and Elinor Ostrom. 1977. "A Theory for Institutional Analysis of Common Pool Problems." In *Managing the Commons*, ed. Garrett Hardin and John Baden, 157–72. San Francisco, Calif.: Freeman.
- Pinkerton, Evelyn, ed. 1989. *Co-operative Management of Local Fisheries: New Directions for Improved Management and Community Development*. Vancouver: University of British Columbia Press.
- Plott, Charles R., and Robert A. Meyer. 1975. "The Technology of Public Goods, Externalities, and the Exclusion Principle." In *Economic Analysis of Environmental Problems*, ed. E. S. Mills, 65–94. New York: Columbia University Press.
- Posner, Richard A. 1980. "A Theory of Primitive Society with Special Reference to Law." *Journal of Law and Economics* 23 (April):1–54.
- Roumasset, James. 1985. "Constitutional Choice for Common Property Management: The Case of Irrigation Associations." Paper prepared for National Academy of Sciences Workshop on Common Property Resource Management in Developing Countries, April 21–26, in Annapolis, Maryland.
- Runge, C. Ford. 1981. "Common Property Externalities: Isolation, Assurance, and Resource Depletion in a Traditional Grazing Context." *American Journal of Agricultural Economics* 63 (Nov.):595–606.
- . 1984. "Strategic Interdependence in Models of Property Rights." *American Journal of Agricultural Economics* 66 (Dec.):807–13.
- Schlager, Edella, and Elinor Ostrom. 1992. "Property-Rights Regimes and Natural Resources: A Conceptual Analysis." *Land Economics*, August.
- Shepsle, Kenneth, and Barry Weingast. 1984. "Legislative Politics and Budget Outcomes." In *Federal Budget Policy in the 1980s*, ed. G. Mills and J. Palmer, 343–67. Washington, D.C.: Urban Institute Press.
- Tang, Shui Yan. 1992. *Institutions and Collective Action: Self-Governance in Irrigation*. San Francisco: ICS Press.
- Uphoff, Norman. 1985. "People's Participation in Water Management: Gal Oya, Sri Lanka." In *Public Participation in Development Planning and Management*, ed. J. C. Garcia-Zamor, 131–78. Boulder, Colo.: Westview Press.
- . 1986. *Getting the Process Right: Improving Irrigation Water Management with Farmer Participation*. Boulder, Colo.: Westview Press.
- Wade, Robert. 1986. *Peasants and Politics*. Cambridge: Cambridge University Press.
- Walker, James, Roy Gardner, and Elinor Ostrom. 1991. "Rent Dissipation and Balanced Deviation Disequilibrium in Common Pool Resources: Experimental Evidence." In *Game Equilibrium Models II: Methods, Morals, and Markets*, ed. Reinhard Selten, 337–67. Berlin: Springer-Verlag.
- Weissing, Franz, and Elinor Ostrom. 1991. "Irrigation Institutions and the Games Irrigators Play: Rule Enforcement without Guards." In *Game Equilibrium Models II: Methods, Morals, and Markets*, ed. Reinhard Selten, 188–262. Berlin: Springer-Verlag.
- Williamson, Oliver E. 1985. *The Economic Institutions of Capitalism: Firms, Markets, Relational Contracting*. New York: Free Press.
- Wilson, Rick K. 1985. "Constraints on Social Dilemmas: An Institutional Approach." *Annals of Operational Research* 2:183–200.

Fisheries Co-management: Key Conditions and Principles Drawn from Asian Experiences

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INTRODUCTION

In 1994, the International Center for Living Aquatic Resources Management (ICLARM) in Manila, Philippines and the Institute for Fisheries Management (IFM) at the North Sea Centre, Hirtshals, Denmark in collaboration with national research partners (NARS) in several Asian and African countries initiated the Fisheries Co-management research project. The collaboration between ICLARM, IFM and NARS was based on a mutual interest to gain practical experience in research in fisheries co-management, to demonstrate its applicability as a sustainable, equitable and efficient management strategy, and to develop models for use and adoption by governments, fisheries communities, NGOs and others. The first phase of the project ends in 1998 and a second phase is planned.

The project strategy is to conduct research in a variety of aquatic resource systems and countries around the world. The selection of several different aquatic resource systems and countries of the world to implement the project is to determine if fisheries co-management can be a viable management strategy under varying conditions (political, social, cultural, economic, biophysical, technological). The overall purpose of the project is to determine the prospects for successful implementation of fisheries co-management strategies. The project will not advocate or promote fisheries co-management, but systematically and comparatively document and assess models and processes of co-management at national government and community levels and their results and impacts. General principles and conditions which facilitate successful implementation of fisheries co-management will be identified.

It is this last sentence which is the subject of this paper. The purpose of this paper is to present results of the research; specifically, key principles and conditions, which facilitate the successful implementation of co-management as, identified through the project's research activities in Asia. These research results represent just one set of results from the various activities of the project.

The paper will begin with a discussion of the strategy and data sources used in the research. As a foundation for the research, the project utilized key conditions for successful common pool resources institutions as identified by Ostrom (1990, 1992). These will be revisited in the second section and assessed in light of their applicability for fisheries co-management in Asia. New conditions and principles identified through the research will be discussed in section three. The paper will conclude with policy implications for fisheries co-management in Asia and worldwide.

RESEARCH STRATEGY AND DATA SOURCES

The research activities of the fisheries co-management project are conducted through three components: (1) comparative case studies of fisheries co-management; (2) country research; and (3) information exchange. The first component, comparative case studies, makes use of secondary data sources such as project reports, research reports, NGO reports, scientific journal articles and other published materials, to gain insights into approaches, processes, performance, results and impacts of co-management at both national government and community levels. The second component, country research, makes use of a variety of research activities, including historical reviews of co-management experiences, case study analysis, impact evaluations of co-management arrangements, hypothesis testing of advantages or benefits of co-management, government legal, institutional and policy analysis, pilot sites, and workshops, to evaluate and document the approaches, institutional arrangements, performance, and legal and policy factors affecting implementation of fisheries co-management. The country research is conducted in collaboration with NARS partners. The third component, information exchange, is a networking and training activity among and between the research partners.

The research project makes use of a comparative analytical approach, relying on a common research strategy and research framework for use in each partner-country and resource system, in order to integrate and improve the understanding and implementation of co-management strategies. The institutional analysis research framework provides for a structured approach to examining and documenting the origin, current status, operation and performance of fisheries co-management arrangements (for more information on the institutional analysis research framework see ICLARM and IFM 1996).

Data for this paper comes from research undertaken by ICLARM staff and NARS partners in the Philippines, Vietnam, Thailand, Malaysia, Indonesia, and Bangladesh over the last five years. Over twenty-five individual research projects and activities have been undertaken during the life of the project. This paper is a synthesis of some of the findings from this body of research. Individual research papers and reports will be referenced in the discussion below.

Each of the six Asian countries in which research activities were undertaken are implementing fisheries co-management to varying degrees (Pomeroy et al. 1996; Ahmed et al. 1997). Of the six countries, within the Philippines there is the most experience with co-management and community-based management of coastal resources. The Philippines also has the strongest policies and laws supporting co-management in the Local Government Code of 1991, the new Fisheries Code, and the national Development Plan. The new Thailand constitution and national

development plan strongly support community-based management initiatives. The Master Plan for Fisheries Development to the year 2010 in Vietnam and the policies of the Ministry of Fisheries supports participatory approaches to resource management and local user-rights. The Malaysian Department of Fisheries is developing a new fisheries policy, which will endorse co-management arrangements. In Bangladesh, the government and non-governmental organizations are jointly promoting sustainable use of openwater fisheries resources through the active participation of users in management. The program has sought to empower fishing communities to become co-managers of these fisheries. In Indonesia, the national development plan endorses more active participation of fishers in economic development. In addition, there is increasing support by local governments and NGOs to revitalize traditional resource management systems through co-management arrangements.

REVISITING ELINOR OSTROM'S KEY CONDITIONS

As mentioned above, this project made use of key conditions for successful common pool resource institutions developed by Elinor Ostrom (1990, 1992) as working hypotheses for the research. The analysis of co-management falls in the area of common property theory (Pomeroy and Berkes 1997). These 11 key conditions, described in Pomeroy and Williams (1994), served as the starting point for analyzing the emergence and institutional sustainability of co-management arrangements. Each of these conditions will now be reexamined based on the knowledge and experience gained from this research project in Asia. The importance of each condition to the successful implementation of fisheries co-management will be scored based on a scale of high, medium and low. A score of high indicates that the condition was found to exist and be critically important for success in a majority of cases in Asia. A score of medium indicates that the condition was found to exist and be important for success in a few cases. A score of low indicates that the condition was not found to be important for success.

1. Clearly defined boundaries. The boundaries of the area to be managed should be distinct so that the fishers can have accurate knowledge of them. The boundaries should be based on an ecosystem that fishers can easily observe and understand. It should also be of a size that allows for management with available technology. The research found that boundaries were of high importance to successful implementation of co-management. In Bangladesh, the Oxbow Lakes were of a size that could be easily managed and monitored by the fishers (Khan and Apu 1998). In San Salvador Island and Malalison Island, Philippines, the marine sanctuary had boundaries identified with buoys to inform outsiders of its existence and to allow fisher organization members to more easily monitor the area (Katon, Pomeroy and Salamanca 1997; Baticados and Agbayani 1998).
2. Membership is clearly defined. The individual fishers or households with rights to fish in the bounded fishing area and participate in area management should be clearly defined. The numbers of fishers or households should not be too large so as to restrict effective communication and decision-making. The research found that clearly defined membership was of high importance to successful implementation of co-management. In Bangladesh, membership in the lake fisheries teams of the Oxbow Lakes was clearly defined to include

those fishers living around the lake (Khan and Apu 1998).

3. Group cohesion. The fisher group or organization permanently resides near the area to be managed. There is a high degree of homogeneity, in terms of kinship, ethnicity, religion or fishing gear type, among the group. The research found that group cohesion, especially in terms of group homogeneity, was of medium importance to successful implementation of co-management. In the Oxbow Lakes of Bangladesh, Muslim and Hindu fishers were able to work together on the lake fisheries teams (Khan and Apu 1998). In the Philippines, successful co-management projects occurred in both socio-economically and culturally homogeneous and heterogeneous communities (Pomeroy et. al. 1996). This is not to downplay the importance of this condition, for there were many communities in Vietnam, Thailand, Indonesia and the Philippines where successful implementation of co-management was dependent on the high level of socio-economic and cultural homogeneity of the community.
4. Existing organization. The fishers have some prior experience with traditional community-based systems and with organizations, where they are representative of all resource users and stakeholders interested in fisheries management. The research found that this condition was of medium importance to successful implementation of co-management. While it was useful for fishers to have had some prior experience with traditional resource management systems and with organizing for collective action, it was not necessary for success. There were many cases in the Philippines, Thailand and Bangladesh where co-management was successful despite the fact that fishers had no previous experience with organizing or resource management (Katon et. al. 1997; Katon et. al. 1998; Masae 1998; Khan and Apu 1998).
5. Benefits exceed costs. Individuals have an expectation that the benefits to be derived from participation in and compliance with community-based management will exceed the costs of investments in such activities. This condition was found to be of high importance for success of co-management. In the Philippines, NGOs spend a great deal of time in "social preparation"; that is, educating the fishers about the benefits and costs of co-management and the economic implications of choosing among different management and development strategies (Foltz, Pomeroy and Barber 1996; van Mulekom 1998).
6. Participation by those affected. Most individuals affected by the management arrangements are included in the group that makes and can change the arrangements. The same people that collect information on the fisheries make decisions about management arrangements. This condition was found to be of high importance for the successful implementation of co-management. In the Oxbow Lakes of Bangladesh, the lakes fisheries teams allowed all members to have equal voting rights in making management decisions (Khan and Apu 1998). In San Salvador Island and Malalison Island, Philippines, all members of the fisher organization were involved in making and changing the rules (Katon, Pomeroy and Salamanca 1997; Baticados and Agbayani 1998).
7. Management rules enforced. The management rules are simple. Monitoring and enforcement are able to be effected and shared by all fishers. The research found that enforcement of

management rules was of high importance for success of co-management. In San Salvador Island, Philippines, the fishers shared responsibility for guarding the marine sanctuary which led to high levels of enforcement of rules (Katon, Pomeroy and Salamanca 1997).

8. Legal rights to organize. The fisher group or organization has the legal right to organize and make arrangements related to its needs. There is enabling legislation from the government defining and clarifying local responsibility and authority. This condition was found to be of medium importance for successful implementation of co-management. In the Philippines, for example, NGOs assisted in organizing fishers to take responsibility for resource management before there was any formal legislation from the government. The responsibility and authority of local fisher organizations for resource management in the Philippines has now been formally clarified under the Local Government Code of 1991. In Thailand a similar situation exists in that fishers have been organized for co-management without any legal right from the government. The new Thailand constitution supports the right for fishers to organize. In both cases while no legal right to organize exists, the government does not stop fishers from organizing.
9. Cooperation and leadership at community level. There is an incentive and willingness on the part of fishers to actively participate, with time, effort and money, in fisheries management. There is an individual or core group who takes responsibility for the management process. The research found that this condition was of high importance for successful implementation of co-management. In the Philippines, a research project evaluating the impacts of community-based management projects concluded that communities where fishers had positive levels of cultural values and attitudes toward collective action were consistently related to perceptions of positive change and were more successful (Pomeroy et. al. 1996). In all cases examined it was found that strong local leadership was critical for success.
10. Decentralization and delegation of authority. The government has established formal policy and/or laws for decentralization of administrative functions and delegation of management responsibility and/or authority to local government and local group organization levels. This condition was found to be of medium and low importance for successful implementation of co-management. Throughout the Asian region, co-management has been successfully implemented without the formal policy support of government. Only recently have governments, the Philippines and Thailand being notable cases, developed and implemented policies for decentralization and delegation of authority to local fishers organizations for resource management. It should be noted that the existence of formal policies and laws for decentralization does increase the chances of success for co-management (Katon et. al. 1997; Katon et. al 1998; Baticados and Agbayani 1998).
11. Coordination between government and community. A coordinating body is established, external to the local group or organization and with representation from the fisher group or organization and government, to monitor the local management arrangements, resolve conflicts, and reinforce local rule enforcement. This condition was found to be of medium and low importance for the successful implementation of co-management. In some cases such a

formal coordinating body does exist, such as the San Miguel Bay Management Authority in San Miguel Bay, Philippines (Pomeroy and Pido 1995), but it is not common. In other cases, coordination between the government and community is informal. This is done primarily through dialogues, meetings and consultations.

A reexamination of Ostrom's eleven key conditions for successful common pool resource institutions based on knowledge and experience gained on fisheries co-management in Asia has found that six of the eleven conditions were of high importance for the successful implementation of fisheries co-management.

CONDITIONS AND PRINCIPLES FOR SUCCESSFUL CO-MANAGEMENT

Through the research activities a number of conditions and principles, which facilitate the successful implementation of fisheries co-management, were identified. Some of these conditions and principles are already known, while others are new and innovative.

1. Individual incentive structure. The success of co-management hinges directly on an incentive structure (economic, social, political) that induces various individuals to participate. Such individuals may include a resource user, a resource stakeholder, or a politician. The co-management process often involves giving up individual short-term benefits for real and perceived longer-term benefits. Often, the costs are high in terms of lost income or voluntary labor. For a poor fisher with a family to feed, the incentive structure to support and participate in co-management must be clear and large. Risk is involved for the individual in changing management strategy. The individual must understand and agree to the co-management arrangements. Individuals must recognize an incentive for co-management before the process begins (i.e., the recognition of a resource depletion problem and the need for action to deal with it) and/or need information to further develop their understanding and recognition of the incentive. This incentive may start as simply as hope for a better tomorrow, but usually "matures" as the individual gains more information and as the process develops over time. It is often easier and faster to implement co-management arrangements where the resource user recognizes an incentive for participation on their own and undertakes action rather than when an incentive is presented by an external agent. One method to measure that an incentive structure for participation and action does exist in a community is when the community members invest their own resources (labor, money) in the project.

Different incentives appeal to different individuals. For an individual resource user, the incentive may be economic, primarily in terms of higher income, food availability or protection of livelihoods. It may also be social, in the form of higher prestige among peers or legitimate access to coastal resources (Segura-Ybanez 1996; Katon et. al. 1997; Baticados and Agbayani 1998). Co-management arrangements that offer an improvement in these areas are likely to be appealing. Economic incentives are also important to resource stakeholders, such as fish traders and processors, who are directly dependent on a steady supply of fish products for their livelihood. For resort owners, dive tour operators and managers of tourist-related businesses, the preservation of coastal ecosystems and the maintenance of clean coastal waters

are vital because these have a direct bearing on the earnings they derive from those who patronize their businesses.

Other resource stakeholders may be motivated by different incentives. The concern for stable ecosystems, food security for present and future generations, improved living conditions, and equitable property rights often underlie the motivation of development advocates, change agents, and individual members of resource management councils. The reduction of conflicts and the streamlining of plans and policies through co-management arrangements may motivate government administrators, planners and policy-makers to support co-management.

For politicians, the incentive to support co-management may be rooted in the desire to be recognized for their achievements in governance and resource management. Such achievements strengthen their capacity to win more votes from a broader base of constituents and improve their chances of being re-elected to positions of power and influence.

2. Recognition of resource management problems. The recognition of resource management problems may take the form of a progressive decrease in fish catch, disappearance of valuable species, declining mangrove stands, and existence of resource use conflicts. An impetus is needed to propel co-management forward (Pomeroy and Berkes 1997). In successful cases of co-management in the Philippines, awareness of resource-related problems prompted stakeholders to enter into collective action, particularly in communities that are heavily dependent on coastal resources and are vulnerable to non-sustainable resource uses (Katon et. al. 1997; Katon et. al. 1998; Baticados and Agbayani 1998). This is largely due to the threats to survival, economic livelihood, and food security that deteriorating resource conditions bring about.

One of the major reasons for failure of certain community-based management projects in the Philippines is lack of problem recognition by resource users. This may sound like a simple issue but due to the top-down approach of many co-management projects, the resource users are really not active but passive recipients of project interventions. The project objectives are conceptualized outside the community and without true community participation. As such, the resource users may not fully recognize the problem in the same way as the external change agent. The resource user may also work with the project only for what they can get out of it, not fully participating for long term success. Of course, this is not always the situation. In some cases, the resource users recognize that there is a problem and take the initiative for action themselves.

3. Leadership. Local leadership is a critical and necessary condition for success of co-management. Local leaders set an example for others to follow, set out courses of action, and provide energy and direction for the co-management process. While a community may have leaders, they may not be the correct or appropriate leaders for co-management. Local elite may be the traditional leaders in a community, but they may not be the appropriate leaders for a resource conservation and management effort. Leaders may need to be drawn or developed from the ranks of resource users. These individuals may be more acceptable and respected by

their peers. In Bangladesh, the local leaders of the baors were identified and elected by the fishers. Leaders' term of office were limited so as to give others the chance to gain leadership skills and to reduce the possibility of corruption (Khan and Apu 1998). Reliance on one individual as a leader can be a problem. In certain Philippine cases, projects failed when the leader died, left political office, or left the area because there was no one to take the leader's place (Katon et.al. 1998). The external change agent must not act as leaders because the community will become dependent upon them. The community must develop local leadership itself. Training and education efforts must strive to build and develop leadership skills among a variety of individuals in the community so that the co-management activity does not become dependent on any one person.

Core group formation is strategic in identifying and developing leaders (Buhat 1994). The members of the core group may be drawn from committed individuals who consistently participate in co-management activities and who share a concern for sustainable resource management. Core groups normally take responsibility for the initial implementation of co-management strategies. From their ranks, capable leaders often emerge to guide present and future undertakings. Documented experiences affirm that locally recruited and trained leaders, both formal and informal, are a potent force in mobilizing residents for collective endeavors, spearheading awareness campaigns and outreach efforts, and motivating stakeholders to take action (Pomeroy et. al. 1996; Katon et. al. 1997).

4. Stakeholder involvement. Partners in co-management need to recognize that the stakeholder community is broader than the local resource user community. Stakeholders are defined as institutions, social groups and individuals that possess a specific, direct and significant stake in the resource and area (IUCN 1996). Stakeholders include, but are not limited to, local resource users, resource users from other communities who are dependent on the same resource, traders and business people, government agencies responsible for resource management, and advocates of resource management. A well-balanced representation of stakeholders tends to facilitate a politically neutral process. The process of involving stakeholders is time consuming, but may be expected to lead to more acceptable and sustainable arrangements. There should be clearly identified benefits and costs to all stakeholders, both short- and long-term, to participating as a partner in co-management. It should be recognized that coastal communities are not homogeneous and that there are different viewpoints among the stakeholders. Reaching a consensus on issues can be difficult even in small communities. Issues may need to be addressed on both a community-wide and a resource or species or gear specific basis (Baticados and Agbayani 1998).

Many co-management projects have failed because the target audience of the project was only the fishers. The projects failed to consider and/or include the other resource stakeholders in the process. In the Philippines, for example, early community-based management projects focused their activities only on fishers. While this proved useful for the fishers, it often alienated other stakeholders, such as fish traders with whom the fishers had a credit-marketing relationship. Through this relationship the fish traders could often control the actions of the fishers. The alienation of the fish traders led them to coerce the fishers to less actively support

the project and this led to eventual breakdown of the organizational and institutional arrangements made under the community-based management project (Carlos and Pomeroy 1996).

For a co-management arrangement to work, it is essential for partners to have a good understanding of each others' positions, needs and apprehensions. The conduct of informal consultations at the outset helps create interest in common issues and allows stakeholders to express their views on alternative management options. Establishing rapport with stakeholders from an early stage is important. This is facilitated by: meeting with leaders of stakeholder groups; showing a genuine interest in local issues; explaining the reasons for touching base with a wide group of people and groups; ensuring that the host community understands the reasons for talking to other stakeholders; and clarifying unrealistic assumptions expressed by community members.

5. Empowerment. The marginalization of coastal communities has led to the problems of poverty and resource degradation. Addressing marginalization would require empowerment or the actual transfer of economic and political power from a few to the impoverished majority. By transferring the access and control of resources from a few to the community at large, the community is gradually empowered in the economic realm. Simultaneously, political empowerment ensues as community management and control over the resource are effectively operationalized (Addun and Muzones 1997).

Individual and community empowerment is a central element of co-management. Empowerment is concerned with capability-building of individuals and community in order for them to have greater social awareness, to gain greater autonomy over decision-making, to gain greater self-reliance, and in establishing a balance in community power relations. Empowerment covers a range of actions including enhancing community access to services and infrastructure, ensuring community participation, developing critical consciousness or consciousness raising of the people, and gaining control over the utilization and management of natural resources. Empowerment can be considered as an individual and a community desire to change something. Empowerment is undertaken at individual and community levels. Individual empowerment leads to community empowerment. The empowerment process must be balanced since it may have differential impacts on the community leading to not a balance of power but simply a redistribution of power elites. There is a tendency for rural power structures to gain control over resources. Co-management can be easily hijacked by the local elite. Empowerment reduces social stratification and allows groups in the community to work on a more equal level with the local elite.

Individual and collective empowerment is enhanced by education and training efforts that raise the level of knowledge of those involved in the co-management process. Empowerment is only functional if it is based on the socio-cultural and political context of the community. The co-management process needs to adopt a gender-balanced perspective, and must acknowledge the position of women. Women should be given the opportunity to develop themselves and actively participate in the co-management process (Foltz et. al. 1996).

6. Trust between partners. No co-management arrangement can survive unless a relationship of trust and mutual respect is developed and maintained between the partners. The establishment of trust between partners usually takes a long time to develop and takes concerted effort by the partners. There is some risk involved by the partners in participating in co-management. Fishers usually have a low level of trust with government, for example. Trust will require the development of good communication channels and open and ongoing dialogue. Meeting objectives and mutually agreed targets enhances trust. These actions reduce risk and stimulate partner cohesion which will have a positive effect on building trust. This can be started in the early stages of the co-management process and strengthened over time. In the Oxbow Lakes of Bangladesh, trust was developed among the fishers by upholding the rules. Those individuals who consistently disobeyed the rules were dismissed from the fisher organization (Khan and Apu 1998).
7. Property rights over the resource. Property rights, either individual or collective, should address the legal ownership of the resource and define the mechanisms (economic, administrative, collective) and the structures required for allocating use rights to optimize use and ensure conservation of resources, and the means and procedures for enforcement. The case studies in the Philippines show that when user rights are specified and secure (such as with a mangrove certificate of stewardship contract), there is a change in the behavior and attitude of the fisher toward conservation and a much greater chance that the intervention will be maintained. Without legally supported property rights, resource users have no standing to enforce their claim over the resource against outsiders. In addition, the case studies show that government support through laws, funding and enforcement is crucial to sustain the intervention. In most cases, local initiatives require active collaboration with government to enforce user rights (Pomeroy et. al. 1996). Local interventions were sustained where property rights existed, were clear and were enforced (Pomeroy et. al. 1996).
8. Local political support. The cooperation of the local government and the local political "power structure" is necessary to support and participate in the co-management arrangements. As discussed above, there must be an incentive for the local politicians to support co-management. There must be political willingness to share the benefits, costs, responsibility and authority for co-management. Co-management will not flourish if the local "power structure" is opposed in any way to the arrangements. The case studies in the Philippines show this quite clearly. In those communities where the local political "power structure" was not included in the process or was opposed to the project for some reason, the community-based management interventions failed to be sustained after the project ended (Pomeroy et. al. 1996).

Resource users may lack the confidence and political skills to effectively interact with political officials. It will take time to break down these barriers to allow for partnership. In the Philippines, some fisher organizations take a "no political alliance" policy and build informal ties with all political parties in a community to "spread the bet" and protect themselves from political change (van Mulekom 1998).

9. Capability building. Co-management often requires a conscious effort to develop and strengthen the capability of the partners for collective action, cooperation, power sharing, dialogue, leadership and sustainable resource management. Coastal villagers may not always have a tradition of collective action. Functioning organizations of resource users may not be in place. Moreover, the range of skills and knowledge required to address the complex dimensions of resource management may not be adequate. In these cases, capability building is a must.

To reverse the effects of destructive fishing practices, change non-sustainable practices, or provide viable alternatives; people must learn new management skills and new technologies. Partners need to be equipped with knowledge, skills and attitudes to prepare them to carry out new tasks and meet future challenges (Pomeroy et. al. 1996). Capability building must address not only technical and managerial dimensions but also attitudes and behavioral patterns. Training and education may include leadership, situation analysis and problem-solving, consensus building, value reorientation, technology application, livelihood and enterprise management, conflict management, advocacy, facilitation, networking, ecological and socioeconomic monitoring and evaluation, and legal/para-legal, among others. In the Philippines and other Asian countries, the experience affirms that capability building strengthens the confidence and sense of empowerment of resource users and partners. Providing opportunities to visit communities with successful resource management projects also helps create the enthusiasm and the motivation to embark on similar activities in their own community (Katon et. al. 1997). Capability building, moreover, enables local residents to sustain resource management interventions and pursue new initiatives.

10. Organizations. Co-management requires the existence of legitimate organizations that have a clearly defined membership. These organizations must have the legal right to exist and to make arrangements related to their needs. The organization must be allowed to be autonomous from government and political pressure. They are vital channels for representing resource users and stakeholders, asserting property rights and rules, and influencing the direction of policies and decision-making. The organization will need to be recognized as legitimate by the community members, resource users and stakeholders to be able to carry out its mandate. The organization should also represent the majority of resource users in the community.

In the Philippines, the formal recognition by the government of the role of resource users and non-governmental organizations as valuable partners in development confers legitimacy to the establishment of co-management organizations and favors the pursuit of co-management arrangements. Peoples' organizations and NGOs are formally allowed to enter into partnerships with local government units on a broad range of concerns, such as promotion of ecological balance, local enterprise development, delivery of basic services, capability building, and enhancement of the economic and social well-being of the people (Katon et. al. 1997). The more successful community-based co-management projects in the Philippines were those where organizing is not a prerequisite, but rather the community organization evolves after the people recognize the need for it (Sandalo 1994).

11. Conflict management. Arbitration and resolution of disputes are imperative when conflicts arise over co-management and institutional arrangements. If resource users are to follow rules, a mechanism for discussing and resolving conflicts and infractions is a must. There is a need for a forum for resource users to debate and resolve conflicts and to appeal decisions. Conflict management should be conducted at the local level where solutions can be found quickly. It is often useful to have a mediator who can objectively assess and propose solutions to the conflict. While the government can act as an outside mediator for local conflicts and as an appeal body, heavy reliance on the government to resolve conflicts is not good. Co-management thrives in a situation where forums and appeal bodies are available for deliberation and conflict resolution. The Philippine and Bangladesh experiences show that conflict management tends to be less problematic when the resource users are involved in rule formulation and enforcement and when sanctions are imposed on the rule violators (Katon et.al. 1997; Katon et. al. 1998; Khan and Apu 1998).
12. External agents. Co-management often needs change agents from the outside to expedite the process. These external agents assist in defining the problem; provide independent advice, ideas and expertise; guide joint problem solving and decision-making; initiate management plans; and advocate appropriate policies. The external agent should be objective and serve a catalytic role in the development process. The external agent should not directly interfere or influence the process, but may make suggestions or provide information on how to proceed in the process or with a policy. Documented experiences underscore the role of external agents in setting in place a process of discovery and social learning. These catalysts open the eyes of resource users, stakeholders and partner organizations to pressing issues, urge them to search for appropriate solutions, and challenge them to take collective action (Katon et. al. 1997; Katon et. al. 1998; Baticados and Agbayani 1998). Change agents may come from NGOs, academic institutions, project teams and other groups. The external agent should have a temporary relationship with the co-management process, serving their particular function and then phasing out.

In the Philippines and other Asian countries, it is not unusual for coastal communities to be aware of deteriorating resource conditions. However, these communities normally need assistance from external agents in carrying out a thorough situation analysis and digging deeper into the root causes of problems. External agents fill a special role in terms of drawing out insights with a participatory style of facilitation, processing the insights, and guiding the community in reaching its goals. Their willingness to spend long hours in the community to work with local people, ability to focus on community objectives, and their linkages with donors and other supportive organizations are among the factors which favor their catalytic role.

However, the recruitment of external agents, such as NGOs, may not always be ideal in establishing co-management. The staff may be young and may not readily be accepted by traditional societies. Some of them may have ideological views on development that may not be acceptable to the community or the government. Others may be reluctant to involve the

government and the business community even though they are stakeholders in resource management. They may also lack funds to finance continuing operations.

13. Clear objectives from a well-defined set of issues. The clarity and simplicity of objectives helps steer the direction of co-management. Partners need to understand and agree on the issues to be addressed, know what must be achieved, where the activities are headed, and why. Clear objectives developed from a well-defined set of issues are essential to success. Those involved in the co-management process must see and agree that the issues are important to their daily existence. The co-management process may involve multiple objectives and multiple implementation strategies. These should be prioritized, and linked where possible.

Fundamental to co-management are a common understanding of the situation, comprehension of the root causes of the problems and the issues, and an agreement on appropriate solutions to identified problems. The fishery tends to be better managed when resource users, stakeholders, and partner organizations have a good grasp of why they are managing the resource and what results are envisaged (Katon et.al 1997).

14. Effective communication. Providing forums for discussion are fundamental to co-management. A process must be developed to understand needs and expectations of all partners. In some cases, needs and expectations may not be straightforward. Values held by different groups, including cultural, religious and traditional beliefs, must be respected. Public discussions that encourage a free and non-threatening exchange of information foster effective communication. Dialogues need to clarify an understanding of needs, expected roles, extent of responsibility sharing among partners, and expected benefits and costs in the short-term and long-term, among others (Baticados and Agbayani 1998).
15. Political and social stability. The absence of internal disruptions rooted in political, social and economic factors is a condition for successful co-management. The partners in co-management must be unhampered by grave threats to life, property and livelihood. Where sporadic conflicts exist or where peace and order is disrupted for prolonged periods, tension and uncertainty adversely affect the potential for co-management (Carlos and Pomeroy 1996). In a similar sense, where a political or economic system is in a state of change, people are unwilling or unable to make commitments to co-management arrangements. In Cambodia, for example, people are reluctant to organize due to the negative experience with organizing during the period of Khmer Rouge control of the country.
16. Networking and advocacy. Networking is the bringing together of information and expertise in support of co-management. The development of a network of community organizations is a powerful tool for implementing co-management. Networking of communities involved in similar resource management issues provides opportunities to learn from others, deepen insights into actual experiences, and inspire new initiatives at other sites (Katon et. al. 1997; Baticados and Agbayani 1998).

Networks may take many forms: alliances of support groups, organizations of stakeholders,

and federations of resource users. They may be formal or informal. Networking is closely associated with the establishment of four types of linkages: 1) with other communities and projects involved in similar co-management initiatives; 2) with sources of power and influence; 3) with NGOs and business groups; and 4) with donors and government agencies.

Networking is closely associated with advocacy. Advocacy argues the case for a particular course of action or situation. It is the political struggle for the recognition of property rights at various levels (Addun and Muzones 1997). At the local level, it involves a campaign directed at resource users and stakeholders, formal and informal organizations, and local seats of decision-making. At the national level, it involves working towards a federation of fishers through networking, as well as pushing for relevant policy and legislative reform. If the co-management arrangement is to withstand competing demands that have negative repercussions on fisheries, advocacy is imperative. Advocacy, however, must be consistent with the culture in which it is used.

17. Enabling policies and legislation. Co-management cannot work effectively in a vacuum where there are no supportive policies and legislation. If co-management initiatives are to be successful, basic issues of government policy to establish supportive legislation, rights and authority structures must be addressed. Policies and legislation need to spell out jurisdiction and control, provide legitimacy to property rights and decision-making arrangements, and clarify the rights and responsibilities of partners. The legal process formalizes rights and rules and legitimizes local participation in co-management arrangements.

If supportive legislation and policies are in place, partners tend to have less difficulty in asserting their rights and roles, particularly if the judicial system is fair and objective. The legal basis for the resource users' participation in resource management is vital and must address fundamental concerns, which include: 1) who has the right to use the resource; 2) who owns the resource; and 3) what is the legal framework for implementing co-management arrangements. The arrangements may be undermined in the absence of a legal basis. The role of the government in establishing conditions for co-management is crucial, particularly in the creation of legitimacy and accountability for institutional arrangements and the delineation of power-sharing and decision-making.

In the Philippines, the enactment of the Local Government Code of 1991 (LGC) ushered in the formal devolution of powers and responsibilities from the central government to the local government units and peoples' organizations. The changed administrative arrangements resulting from the LGC have created a supportive environment for co-management to prosper (Katon et. al. 1997). A structural power shift placed coastal local governments at the forefront of resource management (Katon et. al. 1998). At the local level, the passage of complementary ordinances and the integration of sustainable resource management in local policies and plans have further enhanced co-management efforts.

18. Provision of financial resources/budget. Co-management requires financial resources to support the process. Funds need to be available to support various operations and facilities

related to planning, implementation, coordination, monitoring, and enforcement, among others. Funding, especially sufficient, timely and sustained funding, constitutes a critical element to the sustainability of co-management efforts (Segura-Ybanez 1996). In many instances, resource user organizations are unable to continue existing programs or start new ones due to limited financial resources that members can raise on their own. Often co-management projects which are initiated and funded from outside sources fail when the project finishes due to the inability of the partners to fund the activities. Funds also need to be made available on a timely basis to sustain and maintain interventions. The co-management arrangements must be supported and accepted so that partners will be confident enough in the process to invest their own funds and time. Co-management must be designed from the start with a secure internal budget source. Too much dependence on external sources will impact upon sustainability of the arrangements (Carlos and Pomeroy 1996).

19. Government agency support. Effective links between government agencies like fisheries departments, local fisheries service, research institutions, extension service, and environmental agencies enhance co-management arrangements. Government agencies need to be capable and willing to partner, support and interact with other stakeholders in the co-management process. Government agencies should be shielded from short-term political pressures to maintain power sharing in the co-management arrangement.

The government agencies provide assistance and services (administrative, technical and financial) to support the local organizations and co-management arrangements. The cooperation of the government must always be stimulated, solicited and nurtured, as without this support the co-management arrangements may have difficulty being implemented (Calumpang 1996).

Government agencies can serve to oversee local arrangements and deal with abuses of local authority, conflict management, appeal mechanism, and applying regulatory standards. Government fisheries administrators may be reluctant to share power with fishers. They may fear infringement by local resource users and their representatives upon what they consider their professional and scientific turf. The authority, responsibility and functions of government agencies should be specified in the co-management contractual agreement.

20. Fit with existing and traditional social and cultural institutions and structures of the community. New management plans and efforts should be based on (sometimes diverse) local social and cultural institutions and structures and contribute to strengthening or revitalizing these institutions and structures. The needs and expectations of the community may not always be straightforward due to the social and cultural value system.

In many coastal communities, there exists traditional or informal systems of resource management. These systems have often worked well at meeting management objectives of the community and at achieving ecological sustainability, social equity and economic efficiency. Co-management can be based on these traditional or informal systems such as in Indonesia (Nikijuluw 1996) or on strong family or community relationships such as in Thailand (Masae 1998). Local indigenous knowledge of ecological processes is an important cultural resource

that can guide and sustain co-management. Reluctance to acknowledge and utilize local knowledge can act as a severe constraint in the development of viable resource management strategies.

21. Partner sense of ownership of the co-management process. Active participation of partners is directly related to their sense of ownership and commitment to the co-management arrangements. Partners involved in co-management need to feel that the process not only benefits them, but that they have a strong sense of participation in, commitment to and ownership of the process. External agents working to plan and implement the co-management arrangements must allow the partners to recognize themselves as the owners and directors of the process. Early and continuous participation of partners in planning and implementation of co-management is related to success (Pomeroy et. al. 1996). It allows partners to demonstrate their commitment to the process. Not only does this type of involvement serve to adapt activities to local needs, but partners also gain a better understanding of the problems involved in implementation and a greater sense of empowerment and confidence. Objectives need to be developed jointly by the partners and external change agents.
22. Effective enforcement. Vigorous, fair and sustained law enforcement requires the participation of all partners. Enforcement can be carried out separately by an enforcement unit, or in collaboration between local informal or traditional enforcers (church, senior fishers, local leaders) and formal enforcers (police, coast guard). Local enforcement efforts may need to be backed up by government enforcement bodies to ensure objectivity. It may be necessary to have government law enforcement agencies involved in dealing with outsiders in order to have better cooperation.

The motivation to comply with regulations depends upon rational decisions where the expected benefits of violating the rules are measured against the risk of getting apprehended and fined. It is also linked to socio-cultural mechanisms that regulate behavior (fear of ancestral spirits, social exclusion, moral obligation). A key variable for determining compliance is the individual perspective of the fairness and appropriateness of the law and its institutions (Kuperan et. al. 1996). The willingness to comply is linked to the perceived legitimacy of the authorities charged with implementing the regulations. Local enforcers (bantay dagat in the Philippines, kewang in Indonesia) can be very effective provided they are formally legitimized. Rules should be simple so those affected by them can easily understand and comply. There needs to be good communication between the enforcement unit and the resource user group.

23. Partnerships and contractual agreements. The joint undertaking of co-management by a combination of organizations and groups has obvious advantages in increasing the financial, administrative and technical resources necessary for effective implementation. In addition, inter-agency linkages can promote co-management. It also leads to a stronger foundation for the co-management initiative which can be sustained beyond the implementation period. Partnerships must grow out of a mutual sense of commitment (Segura-Ybanez 1996). Adequate coordination, communication and consultation are necessary, especially with

multiple partners. It is important to have clarification about each other's role, goals, purpose, operation, style and limitations (Carlos and Pomeroy 1996). The process of clarification must take place through equitable dialogue and partnerships.

There is a downside to having too many organizations involved; that is, coordination can become very problematic at the management level. Staff of organizations with different ideological backgrounds or organizational mandates may not always be able to work together even with their common institutional objectives (Bissdorf 1996). When the actions of collaborating partners are not synchronized and consistent, resource users see too many role "players" and this may lead to misconceptions and wrong expectations, and eventually hamper success. Thus, an appropriate operational structure should always be developed based on the needs of co-management arrangement so that coordination between partners will be effective without being too costly to the structure.

To develop mutual understanding between the partners and to strengthen compliance with the co-management arrangements, it is useful to have a written contract of the co-management agreement. This contractual agreement, developed jointly by the partners, would specify the aims, role, function, authority, responsibility, financial, conflict management mechanisms, and rights, among other requirements, between the partners in the co-management arrangement. Partners may initially enter into an informal working agreement as they develop the co-management arrangements and find out about each other, but this agreement must be supported later by a formal contract to be used during the implementation process. A clear understanding of the long-term goals of power-sharing is established in which the differing interests and needs of the partners are reconciled. There should be flexibility in the agreement so that changing arrangements and relationships over time can be accommodated.

24. **Overlap of interests.** Co-management is most likely to be successful where there are significant overlapping interests among the partners, where the partners are affected in similar ways by the arrangements, and where there will be no big winners or losers (Mitchell 1995). It is a prerequisite to have a clear sharing system, and a mechanism for recirculating back into the communities some of the wealth generated by co-management arrangements (Thompson and Shelly 1997).
25. **Flexibility.** Co-management arrangements should be flexible enough so that management has the ability to change plans in response to new problems and opportunities (Yap 1996; Calumpang 1996). A flexible approach towards the development and formalization of the rules and regulations should be adopted recognizing the cultural and traditional patterns of utilization of resources in the community. There should be flexibility to cope with the unexpected, e.g. failure of communication and coordination, unplanned decisions. Unexpected reactions to rules can develop as they are implemented. If the rules and rules making system are too rigid and incapable of adapting to change, resource users will not comply with the rules.
26. **Appropriate scale.** Scale is fundamental in most co-management initiatives. The scale for co-

management arrangements should be that appropriate to the area's ecology, people and level of management. This includes the size of the physical area to be managed and how many members should be included in an organization so that it is representative but not too large as to be unworkable. Decisions on physical scale include not only the boundaries of the area to be managed but should management be conducted on a species or ecosystem level. The scale of the management unit should be appropriate to human resources and the ecology of the area. The boundaries should be based on an ecosystem that the resource users can easily observe and understand. In terms of members, it is observed that small groups are more manageable than larger groups (Cimagala 1996). In co-management where are great number of people are involved, it is wise to divide them into smaller groups to facilitate and enhance supervision, control and management. In general, a limited scale (both in terms of membership and jurisdiction) will support participatory democracy and therefore enhance co-management given that the management structure has appropriate stature and power to initiate the process. Expansion of scale is easier once initial activities succeed and are sustained, that is, start small and simple and show results early (Buhat 1994).

27. Coordinating body. Adequate coordination is particularly important when several partners are involved or when more than one intervention is taking place in a single area (Foltz et. al. 1996). An independent body with representatives from the different partners can function to systemize the co-management arrangements. The aim is to facilitate quick and efficient decision-making, conflict resolution, planning and cooperation. The coordinating body can serve to manage "turf" issues between partners or government agencies. Poor coordination can lead to confusion, unnecessary duplication of efforts, or even activities at cross-purposes or in conflict (Foltz et. al. 1996). An appropriate operational structure should always be developed based on the needs of the co-management arrangements so that coordination between partners will be effective. The coordinator of the process must be experienced in interest-based planning. It is very important to establish at the very beginning the actual mode of coordination. The coordinating body can act as an appeal body for those who question decisions made by local management and enforcement bodies.

In the Philippines, the creation of fisheries and aquatic resources management councils at the village level act to coordinate, give guidance and bring consensus in planning, implementation and enforcement. The members of the management councils include resource users, NGOs, the private sector, and local government (Fellizar et. al. 1997).

28. Social preparation and value formation. The inability to sustain co-management may be partly linked to the insufficient time allocated to the social preparation phase of the process and to rapport building and value formation in the community. Social preparation should always proceed technical and material interventions. Cutting corners during the social preparation phase to yield to pressures to produce material accomplishments is likely to weaken the foundation for self-reliance in the community. Good social preparation is manifested in positive attitudes toward collective action and in the readiness of community members to take on responsibility for resource management and decision-making (Pomeroy et. al. 1996).

POLICY IMPLICATIONS FOR FISHERIES CO-MANAGEMENT

The conditions discussed in the section above are those, which have been identified from Asian experience for the successful implementation of community-based co-management. These conditions are meant to serve as a guide in the planning and implementation of co-management.

The conditions must be viewed in the distinct political, biological, cultural, technological, social and economic context of the Asian region and the individual countries. We need to bear in mind the role these unique characteristics play in shaping the process and implementation of co-management in Asia. They are different than in Western societies and reflect the so-called "Asian values". Resource management systems must be viewed in the context of the complex interactions of these characteristics that have shaped past and present situations and that have a capacity for influencing the future. These characteristics include the small-scale, subsistence based fisheries, the local community traditions, the social and political structures, the political and economic restructuring that is occurring in the region, and the need for food security.

Some of the conditions can be met by means internal to the community, while others require external assistance. The number and variety of conditions illustrates that the planning and implementation of co-management must be conducted at several levels. These levels include the individual (i.e., individual incentive structure, recognition of resource management problem); the stakeholder (i.e., stakeholder involvement, local political support); the community (i.e., fit with existing and traditional social and cultural institutions and structures of the community); the partners (i.e., partnerships, contractual agreements between parties, coordinating body); the government (i.e., government agency support, enabling policies and legislation); the external agent; and the overall process (i.e., effective communication, networking and advocacy, leadership, organization, financial resources).

None of the conditions exist in isolation, but each supports and links to another to make the complex process and arrangements for co-management work. In addition, all of the parties (resource users, stakeholders, external agents, government) have different but mutually supportive roles to play in co-management. The role of government in co-management is often associated with the passage of enabling policies and legislation, vigilant and effective enforcement, arbitration of disputes among partners when these cannot be resolved by the parties themselves, provision of financial and technical assistance to sustain co-management activities, and promotion of a stable political and social environment. The role of the external agent involves initiating a process of discovery and social learning, guiding problem solving, building local capabilities, and advocating appropriate policies. Resource users and stakeholders are largely responsible for the day-to-day management of resources, participation in consultations, design of appropriate resource management measures, and assistance in monitoring and law enforcement. The fulfillment of these complementary roles is crucial to the operation and sustainability of co-management.

Implementation is often a balancing act to meet these conditions as timing and linkages in the co-management process and arrangements are important. For example, developing trust between partners is associated with effective communication and come before the development of

contractual agreements between partners. The recognition of resource management problems is associated with the development of clear objectives from a set of well-defined issues.

REFERENCES

- Addun, R. and D. Muzones. 1997. Community-based coastal resource management: Tambuyog's experience in the Philippines. In G. Claridge and B. O'Callaghan (eds), *Proceedings of the international conference on wetlands and development at Kuala Lumpur*, 219-230. Wetlands International.
- Ahmed, M., A.D. Capistrano, and M. Hossain. 1997. Experience of partnership models for the co-management of Bangladesh fisheries. *Fisheries Management and Ecology* 4: 233-248.
- Baticados, D. and R. Agbayani. 1998. Case study of institutional arrangements in the fisheries co-management of Malalison, Island, Central Philippines, 22-94. Iloilo: Southeast Asian Fisheries Development Center.
- Bissdorf, H.G. 1996. The Banica River Watershed Development Project: NGO-PO-GO Partnership. In C. Foltz, R.S. Pomeroy and C. Barber (eds), *Proceedings of the Visayas-wide conference on community-based coastal resources management and co-management*, 76-77. Fisheries Co-management Research Project Working Paper No. 4. Manila: International Center for Living Aquatic Resources Management (ICLARM).
- Buhat, D. 1994. Community-based coral reef and fisheries management, San Salvador Island, Philippines. In White, A., L. Hale, Y. Renard, and L. Cortesi (eds), *Collaborative and community-based management of coral reefs*, 33-49. Connecticut: Kumarian Press.
- Calumpong, H. 1996. Landscape approach to coastal management in Bais Bay, Negros Oriental. In C. Foltz, R.S. Pomeroy and C. Barber (eds.), *Proceedings of the Visayas-wide conference on community-based coastal resources management and co-management*, 50-57. Fisheries Co-management Research Project Working Paper No. 4. Manila: ICLARM.
- Carlos, M. and R.S. Pomeroy. 1996. A review and evaluation of CBCRM projects in the Philippines: 1984-1994, 1-101. Fisheries Co-management Research Project Research Report No. 6. Manila: ICLARM
- Cimagala, C.T. 1996. Wildlife protection and conservation: the Tahong-Tahong experience. In C. Foltz, R.S. Pomeroy and C. Barber (eds.), *Proceedings of the Visayas-wide conference on community-based coastal resources management and co-management*, 29-33. Fisheries Co-

- management Research Project Working Paper No. 4. Manila: ICLARM.
- Claridge, G. and B. O'Callaghan (eds). 1997. Proceedings of the international conference on wetlands and development at Kuala Lumpur, 25-92. Wetlands International.
- Fellizar, F.P., R.G. Bernardo and A.P.H. Stuart. 1997. Analysis of policies and policy instruments relevant to the management of fisheries/aquatic resources with emphasis on local level issues and concerns. Los Banos: Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA).
- Foltz, C., R.S. Pomeroy and C. Barber (eds.). 1996. Proceedings of the Visayas-wide conference on community-based coastal resources management and co-management, 1-115. Fisheries Co-management Research Project Working Paper No. 4. Manila: ICLARM.
- International Center for Living Aquatic Resources Management (ICLARM) and Institute of Fisheries Management (IFM). 1996. Analysis of fisheries co-management arrangements: a research framework, 1-28. Fisheries Co-management Research Project Working Paper No. 1. Manila: ICLARM.
- IUCN. 1996. Collaborative management of protected areas: tailoring the approach to the context, 6-11. Gland, Switzerland: Social Policy Group of the IUCN.
- Katon, B., R. Pomeroy, and A. Salamanca. 1997. The marine conservation project for San Salvador: a case study of fisheries co-management in the Philippines, 10-95. Fisheries Co-management Research Project Working Paper No. 23. Manila: ICLARM.
- Katon, B., R. Pomeroy, M. Ring and L. Garces. 1998. Mangrove rehabilitation and coastal resource management of Mabini-Candijay: a case study of fisheries co-management arrangements in Cogtong Bay, Philippines, 20-147. Fisheries Co-management Research Project Working Paper No. 33. Manila: ICLARM.
- Khan, M.S. and N.A. Apu. 1998. Fisheries co-management in the Oxbow lakes of Bangladesh, 1-61. Chittagong: Chittagong University.
- Kuperan, K. N. Mustapha, I. Susilowati, and C. Ticao. 1997. Enforcement and compliance with fisheries regulations in Malaysia, Indonesia and the Philippines. Fisheries Co-management Research Project Research Report No. 5. 1-38. Manila: ICLARM.
- Masae, A. 1998. An analysis of fisheries co-management arrangements: the case of Ban Laem Makham, Sikao District, Trang Province, South Thailand. Paper presented at the Asian Regional Workshop on Fisheries Co-management, Phuket, Thailand.
- Mitchell, D.A. 1995. Management of the intertidal clam resource. A British Columbia experiment in limited entry and local participation. School of Public Administration, University of

Victoria.

Mitchell, D.A. 1995. Co-operative management: can we get the incentives right? Presentation to the Maritime Awards Society of Canada. University of Victoria.

Mulekom van, L. 1998. Capacity and opportunity building in a small-scale fisherfolk community for community-based coastal resources management: a community development approach to CB-CRM (draft paper).

Nikijiluw, V. 1996. Co-management of coastal resources in Bali Island, Indonesia. Fisheries Co-management Research Project Working Paper No. 7, 1-18. Research Institute for Marine Fisheries and ICLARM.

Ostrom, E. 1990. Governing the commons: the evolution of institutions for collective action. Cambridge: Cambridge University Press.

Ostrom, E. 1992. Crafting institutions for self-governing irrigation systems. San Francisco: Institute for Contemporary Studies Press.

Pinkerton, E. (ed.). 1989. Co-operative management of local fisheries: new directions for improved management and community development, 3-33. Vancouver: University of British Columbia.

Pomeroy, R.S. and M. Williams. 1994. Fisheries co-management and small-scale fisheries: a policy brief, 1-15. Manila: ICLARM.

Pomeroy, R.S. and M. Pido. 1995. Initiatives towards fisheries co-management in the Philippines: the case of San Miguel Bay. *Marine Policy* 19(3): 199-211.

Pomeroy, R., R. Pollnac, C. Predo and B. Katon. 1996. Impact evaluation of community-based coastal resource management projects in the Philippines, 38-282. Fisheries Co-management Research Project Research Report No. 3. Manila: ICLARM.

Pomeroy, R.S. and M. Carlos. 1997. CBCRM projects in the Philippines: a review and evaluation of programs and projects, 1984-1994. *Marine Policy* 21(2): 1-19.

Pomeroy, R. and F. Berkes. 1997. Two to tango: the role of government in fisheries co-management. *Marine Policy* 21 (5): 465-480.

Sandalo, R.M. 1994. Community-based coastal resources management: the Palawan experience. In R.S. Pomeroy (ed.), *Community management and common property of coastal fisheries in Asia and the Pacific: concepts, methods and experiences*, 165-181. Manila: ICLARM.

Segura-Ybanez, M. 1996. Sustainability of community-based resource management in the Central

- Visayas Regional Project-Phase I. In C. Foltz, R.S. Pomeroy, and C. Barber (eds), *Proceedings of the Visayas-wide conference on community-based coastal resources management and fisheries co-management*, 84-92. Fisheries Co-management Research Project Working Paper No. 4. Manila: ICLARM.
- Thompson, P.M. and A.B. Shelly. 1997. Community-based management of Hamil Beel, Bangladesh. Paper presented at the Asian Regional Workshop on Fisheries Co-management, Phuket, Thailand, 21-23 October 1997.
- White, A., L. Hale, Y. Renard and L. Cortesi (eds). 1994. Collaborative and Community-Based Management of Coral Reefs, 107-120. Connecticut: Kumarian Press, Inc.
- Yap, N. 1996. Community organizing in Leyte: the Labrador experience. In C. Foltz, R.S. Pomeroy and C. Barber (eds.), *Proceedings of the Visayas-wide conference on community-based coastal resources management and fisheries co-management*, 70-74. Fisheries Co-management Research Project Working Paper No. 4. Manila: ICLARM.

**WORKING PAPER FOR 7TH IASCP CONFERENCE
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**_ *Title of the paper:* TOWARD AN IMPROVED MANAGEMENT OF
COMMON PROPERTY IN TAM GIANG LAGOON,
VIETNAM**

ABSTRACT

Tam Giang lagoon in Vietnam provides sources of living directly or indirectly to about 300,000 inhabitants living around the lagoon in 236 villages within 31 communes. The high population density and high growth rate puts more and more pressure on the resources, particularly increasing overexploitation. The lagoon system is very complex because not only human activities are diverse and intensive but also natural environment displays very high heterogeneity. The marine, inland conditions, the river estuaries, seasonal fluctuation and high range in salinity, and different soil property all combine to form the complex ecosystems. There are difficulties to manage such complex systems for sustainable use.

In 1994, a project "Management of Biological Resources of Tam Giang Lagoon" funded by CIDA/IDRC was developed by a group of Canadian and Vietnamese researchers from Hue region. Research activities, started in 1995, had the objectives to understand the aquatic environment, exploitation, use and the present management of the resources. Participatory data collection was to form the basis on which to build a sustainable management strategy of Tam Giang resources. The research was also to address methodological issues on local participation and community-based activities.

First efforts made by the projects were to involve resource users in the research activities and raise their awareness about resource problems and conflicts in management. The project collected data to serve as a basis from which to establish community-based management of biological resources in the lagoon. The main project activities were to use a participatory research approach with interdisciplinary perspectives in studying the ecological and human systems. Human efforts, which increase competitive ability to exploit lagoon resources, result in conflicts not only among local groups but also between management strategies. Realizing the conflicts is very important to perceive difficulties and challenges in further expanding community-based activities for management of communal resources.

This paper provides information extracted from preliminary research findings to help understand the unique system and highlight issues regarding management of common property in the lagoon. The issues raised include nature of resources, technologies used to exploit these, human behaviour, arrangements for property rights associated with different management strategies, and efficiency and effects of informal and formal rules within the present management.

BACKGROUND

The Tam Giang lagoon, one of the biggest in Asia, is located in ThuaThien Hue province, Vietnam. Its area is about 22,000 ha with a length of 70 km along the coast. About 300,000 inhabitants live around the lagoon in 236 villages from 31 communes and earn their livelihood by directly or indirectly exploiting natural resources in and around the lagoon. There are difficulties to manage such a complex system for sustainable use.

The project "Management of Biological Resources in Tam Giang Lagoon" was developed in 1994 by a group of Canadian and Vietnamese researchers from Hue University of Science (HUS), Hue University of Agriculture and Forestry (HUAF), Dept. of Fisheries of Thua Thien-Hue Province (DoF), Provincial Department of Science, Technology and Environment, Nha Trang Oceanography Institute, Southeast Asian Research Institute and Hai Phong Institute of Oceanography. The project outline was approved by the International Development Research Centre (IDRC, Canada) and the Vietnam Sustainable Economic Development agency (VISED - an IDRC-CIDA Joint Aid Programme for Vietnam) in 1995. It started in July 1995 with a Participatory Rural Appraisal (PRA) training course and exercise in Phu Tan commune. In October 1995, three interdisciplinary research teams were formed to conduct research in three research sites selected.

PARTICIPATORY RESEARCH AND FINDINGS

First efforts of the research projects were to involve resource users in the research activities and raise their awareness about resource problems and conflicts in management. The project collected data to serve as basis from which to establish community-based management of biological resources in the lagoon. The main project activities were to approach participatory research with interdisciplinary perspectives in data collection toward an improved management of biological resources.

The lagoon as a natural complex ecosystem

The lagoon is long (70km) with an uneven width (from 500m at its narrowest to more than 3 km at its widest), and situated with its length parallel to the coast in a northwest to southeast direction. It is influenced by both marine and inland conditions, moreover the effects are not the same among different locations. The lagoon has two openings to the sea: the main one (Thuan An) is located at the mid-length of the lagoon while the smaller one (Tu Hien) is located at the southeastern end. The two openings in combination with three rivers flowing into lagoon bring different marine and freshwater effects into different locations, especially resulting in a wide range in salinity. The Tam

Giang lagoon, though referred to by that name, is actually composed of a system of lagoon basins, from north to south referred to as: Tam Giang Lagoon, Sam-An-Truyen Lagoon, Ha Trung Lagoon, Thuy Tu lagoon and Cau Hai Lagoon. The northern basin (Tam Giang) is characterized with a dominant freshwater period and a short brackish water period, while Sam-An-Truyen near Thuan An is saline for most of the year.

Fluctuations in lagoon water salinity, in combination with high heterogeneity of surrounding land which is characterized with high range of soil texture, properties, fertility and salinity, create a foundation for complexity. Highly diverse and dynamic fluctuations in aquatic species composition and populations also provide difficulties for those who want to understand the system. For management purposes it takes considerably long time to understand this system. Local indigenous knowledge of the lagoon system, as well as the scientific knowledge acquired from research activities, are limited and not updated to reflect the many changes that are currently taking place.

Participatory research on aquatic resources

An assessment of aquatic species exploitation was conducted in three selected areas representing the central (Sam-An-Truyen), the northern (Tam Giang basin - Quang Thai commune), and the southern (Cau Hai - Vinh Ha commune) parts of the lagoon. This was to address the project objectives and also to provide chances for local participation. Different groups exploiting aquatic lagoon resources were identified as coming from the farming community, fishing community, and fishing-farming community. Fishing and farming-fishing households who are better off have access to farming land and/or fishing grounds by purchasing fishing gears and the rights to fix the gear. The poor households don't have exclusive access to water area - they fish on common grounds using mobile gears such as dragnet, pushnet, motorized dragnet, eel and freshwater macrophyte rakes, and collecting clams by hand.

Aquatic species in the lagoon were identified from 3 ecological groups: freshwater, brackish water and marine water. Seasonal presence of species depends on salinity of lagoon water, especially marine species. Although seasonal and spatial variations of species composition in fishers' catches are high, the main exploited species (in terms of volume) in most of the lagoon are goby, grassfish and grunt fish - all bottom species. The availability of bottom species indicates a diversity and abundance of food in the lagoon bottom layer which is rich in nutrients - a typical feature of such an estuary. Observation also shows an interaction between bottom vegetation cover with distribution, spawning, feeding and growth of aquatic species and birds (which feed on fish and shrimp), creating a diverse ecosystem in the estuary. Through PRA, field trips, observation and interviews, aquatic species composition, production by season and by gears, main exploited species and seasonal presence have been identified and determined. Freshwater macrophyte was found to be an important resource as green manure and mulch for rice seedlings and cash crops and as feed for pigs.

There are 13 main types of gears operated in Tam Giang lagoon, of which fixed gears (such as fish corral, bottom net and fixed lift net) take up large fishing grounds. Density of gears including fixed and mobile is high, it can be described in fisher's word "no space and also no need to set more gears because the fish have no way to escape". For an example, in a farm-fishing village, Trung Lang of Quang Thai commune (Tam Giang basin), with a total 104 households (18 fixed gear fishing families, 21 mobile gear families; and 65 mixed farming-fishing families) and with 1,000 hectares of lagoon area, there are 327 fishing gears of 7 different types operating. The majority of gears are mobile: pushnets (30.27%); dragnets (21.10%); and eel rakes (15.62%). Fixed gears are fewer: Fish corrals (18.04%) and fish aggregating devices (FAD - 4.59%). Both mobile and fixed gears are operated in the lagoon day and night with an average density of 2 boats and 2 mobile gears in 10 ha water area (excluding freshwater macrophytes harvesters, gillnets and noise device).

A year of research on 8 types of gears shows that most gears are intended to catch multiple species. There are also gears for single species catch such as eel rake, hook and line (with specific species), however these may also catch other species as by products. The number of species caught varies by gear type, location, and season. The number of exploited species is higher in Sam-An-Truyen lagoon (80 spp.) and lower in Quang Thai (42 spp.) and Vinh Ha commune (Cau Hai - 48 spp.). The number of species exploited is higher in the dry season (May, June and July at more than 50 species) and lower in the rainy season (December and January at about 30 species). Number of species exploited by each gear is as follows: fish corral (69 spp.), bottom net (45 spp.), fixed lift net (33 spp.), and motorized dragnet (31 spp.). The number of species caught by mobile gears is lower: pushnet (15 spp.), dragnet (9 spp.), hook and line (9 spp.), and gillnet (6 spp.).

The average daily catch per fish corral unit recorded in Quang Thai is 2.44 kg. Total average daily catch by family operating fixed gears (including for household consumption) is 3.47 kg of which fish is higher (45.53 % by weight) than shrimp (16.43%). Average daily catch by mobile gear fishers is 6.19 kg per household composed largely of small fish (44.36%). In groups of fishers operating both mobile and fixed gears, daily catch is higher at 14.51 kg per household which is composed of 42.7% by weight of caridina (a freshwater Atyidae or small crustacean) and 38.6% of fish.

Lagoon as Common property with different access rights

Customary folk tradition, supported by continuing practices, maintains that surface water bodies such as the lagoon are open access areas. However, management bodies and local people have varied views about access rights to the biological resources of the lagoon. Persistent confusion is due partly to the nature of the mobile and biologically dynamic resources, but a contributing factor has been the historical context, which saw all kinds of traditional access rights subsumed in the period of State collectivization. Collectivization of agricultural land use rights was relatively clear, but rights to the

lagoon resources were also collectivized to some extent. Since the economic reforms in Vietnam in the late 1980's, even this limited collectivization has weakened, leaving a somewhat confused and contradictory access regime to the heavily-used resources of the lagoon. Awareness of these problems is only slowly growing.

Under present land use and tenure policies in Vietnam, only primary agricultural land is allocated to individual farming households for long term use via transferable leasehold titles referred to as long-term land use rights. In practice, not all agricultural land is transferred to households, and degraded, abandoned or shared-use lands remain legally under the jurisdiction of the government. Similarly, the lagoon water areas are not formally allocated by title, and can be argued to be public property under the management of the State.

These common territory or areas in the project research sites consist of all lagoon, submersions around lagoon either abandoned or for fishing or for aquaculture, as well as unproductive lands such as coastal sand dunes, abandoned and forested sandy lands, and non-distributed agricultural land. All these public areas are titled to mainly the local government at the commune level (the lowest in the government structure) and sometimes to state enterprises. Individual farmers or fishers or groups can get access to the public areas for use by winning a contract from the titled authority or owners (i.e. by lease). Most of these leases are short-term instruments. The government encourages the development of unused lands by offering a 3-year tax free benefit for new leases.

Effects on lagoon management

The present ownership of the areas provides fundamentals for management of biological resources which can be simply categorized into aquatic resources (such as fish species diversity, stock), agriculture (crop and genetic diversity), and aquaculture (high value species and natural feed sources).

Agricultural land is presently assigned to the family unit which can decide whether to use the land for agriculture or aquaculture (in the case of coastal land) and what crops or species to plant or culture. This is in contrast with the previous system of cooperatives where all decisions were made by the cooperative (i.e. the state) and only a small portion of land (the family garden) was controlled by the family (referred to as the "5% land").

Though all land is officially still owned by the state, it is still traditionally accepted that "Land is private but water is public" (meaning ownership rights to aquatic resources cannot be alienated). On this basis formal and informal rules regarding aquatic resource exploitation have been developed. Some of the traditional rules are still in effect within the current formal management system. The local people exploit lagoon resources following both the official management and traditional rules. It is very difficult to distinguish effects resulting from official management or traditional rules.

However an example regarding fishing in the lagoon can be simplified to help understand the complex effects.

In all fishing communities around the lagoon there are two types of fishers corresponding to two types of fishing gears: fixed (also referred as "Dai Nghe" -big business- such as fish corral and bottom net) and mobile gears (also referred as "Tieu Nghe" -small business - such as manual push net and drag net). These fishers have different access to and control over the public lagoon resources. The fixed gear fishers represent individuals or families who have had long-standing access to these resources and have invested in construction and maintenance of their fishing gears for many years. The existence of the gear itself (including those structures clearly visible above the water) indicate that the fishing ground is already occupied, and these fishers have exclusive rights to harvest from this area. Although exclusive rights are limited with time, seasons, and activities, the location of the gear becomes essentially privately allocated. The fixed gear fishers collectively control access rights for fixed gear over the entire lagoon territory to limit the number of fixed gears. The transfer of a fixed gear ground from one owner to another must not only be officially recognized but also must be informally accepted by the local fishers; and, although each fixed fishing ground is officially assigned to one individual, the fixed gear fishers in one area often choose to rotate their grounds to ensure equitable distribution of resources. These long-standing rights have become acceptable to the local government within whose boundaries the gear is located, and the local government enumerates the fixed gears to collect tax from their owners.

During the feudal times, lagoon fishing grounds were auctioned off annually by the adjacent village authorities. The fixed gear fishers eventually succeeded in getting local authorities to assign exclusive rights (through written or oral statements) and introduce tax collection to replace the auction price. To increase their control and protect their benefits, fixed gear fishers formed a group and requested equal taxation and rights among themselves. Fixed gear fishers who did not register to pay tax were vulnerable to losing their rights when a conflict occurred, i.e. when another fisher interfered or claimed a right to the same area.

The present government has accepted those rights and charges a tax based on the fixed gears which were present in the lagoon at the time it reviewed its management strategy (after liberation in 1975). Fixed gears were registered at all locations around the lagoon over a period of about 4 years - 1976 to 1980. Although the district governments were assumably responsible for registration, they were assisted by commune governments to organize the activity and provide relative information. Fishers were invited to meeting in each village for the registration. This event was concurrent to the formation of cooperatives i.e. agricultural groups, fixed gear fishing groups, and other fishing group. At present, the application of taxes to agricultural land and fixed gear grounds can be seen as evidence of authority.

In Quang Thai, fixed gear areas were initially arranged among the registered fishers and preliminarily approved by the commune government. Final official approval was done by the district authority associated with taxation. Normally the commune government reviews the situation annually (under the district direction) to re-arrange the location of fixed gears and also to accept new applications from fishers, although sometimes, when no conflicts and/or no new applications are made, 2 or more years can elapse before a review. A meeting of all fixed gear fishers (in practice sometimes only key villagers) is then organized to consider new applications for fixed gear location and to make decisions concerning other matters. Based on the results of the meeting, the commune government makes recommendations to the district for official approval.

In principle, under the official management regime, mobile gear fishers can fish anywhere within the local territory, however they must not impede potential benefits to the fixed gear fishers or others using traditional fishing practices. For example, fixed gear fishers informally prohibit any fishing activity at the opening of their fish corrals during periods when tides or currents are most favourable for capturing fish. Mobile gear fishing areas are open to any fishers with priority informally allocated to whomever sets their gear first - ie. Rather than compete intensively, mobile fishers will rather choose an unoccupied area to set their gear. In fact, mobile gear fishers do not limit their activities to their own communal boundaries but fish in lagoon areas outside their territories. They may not even be aware of the communal boundaries.

Human use of lagoon resources

Population growth puts more and more pressure on the lagoon resources. There are about 300,000 residents earning some or all of their livelihood by directly or indirectly exploiting biological resources in and around the lagoon. Under the National Program for Family Planning, the commune government monitors annual population growth rate within its location. In the three communes (or research sites) the responsible officers confirmed that annual population growth rates of fishing communities were higher than 2%, while those of farming were lower than 2%.

Together with pressure on lagoon resources used for local critical needs, urban and long distance market demands have direct effects on exploitation. The pressures of international export markets are more recent, since the Vietnamese economic liberalization policies ("doi moi") introduced in 1986, and are growing in strength, particularly in the past several years. Improvement in access to urban and international markets (a result of government economic policy liberalization) and investment in the processing and freezing industry provided incentives to increase catches, especially those of exportable resources such as crabs, shrimps and high valued fishes. In Thua Thien Hue province total capacity of this industry (state and private) for marine and lagoon produce is 6,000 tonnes per year excluding small household businesses which provide services for long distance marketing of aquatic produce.

In order to increase their competitive ability to exploit lagoon resources, people have developed different strategies. These strategies frequently result in unsustainable exploitation of fisheries or destruction of fish habitat. For example, in the past local materials were used exclusively in the production of fishing gear, but starting in 1985 these materials were rapidly replaced by industrial products (e.g. polyethylene nets). With the availability of various mesh sizes, fishers competed with each other to use smaller and smaller mesh sizes, harvesting juvenile fish before reproductive age and diminishing stock sizes. When mesh sizes could not get smaller, some fishers adopted electric fishing. The fishers use portable batteries, prods and high voltage transformers to shock the fish for catch. In spite of this technique being officially banned, because of the indiscriminate mortality caused to non-target species and its danger to users, it remains relatively popular. The introduction of motorized vessels, in the late 1960s, also increased competition and exploitation of resources.

These innovations, though they make considerable contributions to increasing catches, have resulted in reductions in the size of species at catch and in the stock of many species. Particularly high-value species have become almost extinct in some parts of the lagoon. In Quang Thai, exportable species (e.g. greasybacked shrimp, eels, local carp and rabbitfish), which were harvested in the lagoon three years ago, are no longer caught. Their disappearance might also have been influenced by anthropogenic changes to the environment (see conflict sections).

Another strategy adopted by resource users is to apply for exclusive rights to land or lagoon area for fixed fishing gears, net enclosures, or aquaculture ponds. There are both informal and formal rules for making these arrangements through community and government channels. Exclusive rights may result in negative impacts on the lagoon aquatic resources and also result in conflicts among the local people because the access to resources is reduced. There are two aspects associated with the present property rights assignment that support the above argument: (1) Over-exploitation can be expected because the owner must increase economic returns to cover investment costs and taxes; and (2) Because of the government's support of aquaculture development, these rights will result in parcelling the lagoon into small privatized sections disrupting the lagoon's natural ecology. These practices will potentially degrade both natural habitats and populations of lagoon aquatic resources, especially aquatic species.

Aquaculture Development as a critical strategy

Though exclusive rights of lagoon areas are normally not government practice, aquaculture development has become a priority of the provincial government. With no restrictions or limitations regarding places or areas for aquaculture development, it has reached beyond sustainable limits in Sam-An-Truyen lagoon which also has the highest density of fishing activities. A boom in aquaculture in the lagoon in recent years indicates that considerable exclusive rights have been assigned. At present, the provincial authorities plan to increase the area under aquaculture by 15 to 20 % annually

without considering its impact. The process of privatization of lagoon area will result in serious impacts by reducing fish stocks and fishing grounds. Both reductions will force fishers to increase fishing effort in terms of efficiency of gear, time spent fishing and the number of family members, in turn, reducing resources even further.

Aquaculture in Tam Giang lagoon developed later than in other areas of Vietnam. It was initiated in 1987, by the state company which built a dike to enclose 100 ha of ponds for seaweed culture. In the early 1990s, aquaculture expanded rapidly with an annual increase, in the years 1991 to 1995, of 30% on average. In 1996 and 1997, this rate decreased to 15-20 % per year with less pond construction and increases in net enclosures. It is still too soon to determine the long term impacts of aquaculture, moreover there have been very few efforts to address this problem. Due to the relatively high initial economic returns, managers and local authorities are loathe to ask too many questions.

At present, aquatic resources cultured include seaweed, shrimp, crab and fish. Most of the species used are native to the lagoon. A high diversity of aquaculture pond systems have been developed with following dimensions: earth pond and net enclosure; mono-species culture and polyculture; and extensive, improved extensive and semi-intensive culture. The water areas under culture are under different types of ownership: state enterprise, commune ventures, private ventures (derived from the rights for long term use), and open access areas claimed or occupied by individuals.

The state enterprise ownership is managed officially by the provincial government to favour development of state economic sectors. Communal ownership enables the commune level government to control areas with a potential for aquaculture. Private ownership is derived from the conversion (with flooding) of official household-controlled agricultural land (eg. rice fields) into ponds. Open access areas are occupied by individuals when they enlarge their fishing grounds and replace fixed gears by net enclosures. In this way, fixed gear fishers develop aquaculture in their fishing grounds even though the rights are very restricted and enforced, mainly by traditional rules.

Although the water area rights are different among aquaculture systems there is no differentiation in operations and management. These include both individual households and community groups. Not all coastal communities can have access to potential aquaculture areas. Only individuals or groups, who are wealthy and enterprising are able to win contracts for water area use.

Conflicts

Due to weaknesses of the present management in dealing with the above complex systems and practices, conflicts among strategies and among user groups are becoming more and more critical.

Socially, among these groups conflicts occur as a result of a lack of respect among groups because of differences in customs, traditions and life styles. The conflicts among user groups consist of:

Mobile fishers vs. Fixed fishers

In general, water area and aquatic species are considered open access for all fishers. However, fixed gear fishers have rights (though limited) to their own fishing grounds. Mobile gear fishers have very limited rights to fish (limited by time and specific location) in those grounds. Unequal shares to fishing grounds lead to unequal benefits among fishing groups which results in conflicts. Other conflicts occur among fishers because of use of illegal gears (e.g. Electric fishing) by certain groups and also because of gear efficiency (e.g. Fixed gear fishers claim that mobile fishers use small mesh sizes that overexploit resources).

Farming groups vs. fishing groups

Different groups living around the lagoon have access to different natural resources. The farmers want to fish but in return, refuse to share their land with the fishers who want to practice farming. The fishers want to have land holding and, as well, compete to gain a higher share of fishing grounds and water area for aquaculture. This problem is also related to high population increases, i.e. the land and lagoon area remain constant while the number of farmers and fishers exploiting these areas is constantly increasing. In other words, high unemployment results in increasing competition for resources.

Settled groups vs. Sampan groups (people are living on boats in the lagoon)

For a long time, there have been people living on boats in the lagoon and in the rivers. Although they are not part of a racial minority, their lifestyle, after many generations, have given them unique characteristics. With their boats, they are mobile and earn their living by fishing however the decrease in natural fish resources have also degraded their livelihoods. In 1985, an unexpected typhoon killed many sampan people living on the lagoon. Poverty and threats from natural disasters are forcing them to abandon their lifestyle and attempt settling on land. The government encourages and supports them to settle on land but do not provide appropriate land nor assistance because farmers and fishers, already settled, do not want to lose land nor increase their crowded population. Attempts at settlement have resulted in conflicts between sampan people and existing communities.

These conflicts among different user groups are somewhat different from conflicts among strategies in management of the lagoon resources, as user groups and management strategies overlap. Researchers identified some of these distinctions and made efforts to describe strategic conflicts for the benefit of local officials and resource users who might not have recognized or perceived conflicts in this way before. Strategic conflicts consist of:

Aquaculture vs. Fishery

Privatization of water area for aquaculture (ponds and net enclosures) has reduced the public area available for fishing. This has caused some serious conflicts including damage to aquaculture structures by fishers.

Agriculture vs. Aquaculture

In Phu Tan, the conversion of marginal rice lands into aquaculture and the construction of ponds required the destruction of a dike which protected agricultural lands from saline intrusions. Though adjacent rice fields were thought to be protected by an embankment formed by the main road, saline intrusion did affect them.

Agriculture vs. Fishery

In the northern part of the lagoon, salinity fluctuation has decreased. This is correlated to a decrease in the diversity of aquatic species. Physical modification of the lagoon, by the construction of a dyke to improve agriculture, may have affected circulation of seawater and nutrients. The villagers claim that before Cua Lat dike was rebuilt to prevent salt water from leeching into the nearby rice fields, salinity in the lagoon area was higher. Fish catches were higher and some exportable species such as tiger prawn were still available. At present these species are no longer caught.

Other participatory action research

Along with studies on aquatic resources and fishing activities, research on other aspects regarding management and livelihood are being conducted. These include monitoring the impact of aquaculture development; a study on freshwater plant resources in Quang Thai to understand its harvest and use, standing stock, regeneration, and habitat. Other activities included participatory research on improving agricultural productivity involving different local groups such as women raising pigs using local resources as feed, individual farming households planting peanuts to diversify cropping patterns and improve soil fertility, and individual and community planting trees to improve water retention of soil. Social studies have focussed on a historical perspective of formal and informal rules and management of lagoon resources, and on building people's capacity for community-based management through a community-imposed ban on electric fishing in Quang Thai.

Engaging Local Government in community-based management: lessons from an electric fishing ban

The first intervention in management dealt with a ban on destructive and illegal gear practices to protect communal property (lagoon resources). On first contact with the community, the villagers identified, as their major management issue, the practice of electric-shock fishing by community members and outsiders within their territorial waters. Facilitated by the project researchers, this problem was clarified and potential solutions developed by the community which organized to

establish a self-management committee. By taking the initiative and using the credibility of the research project to design interventions, the community was able to convince the commune government to support them in their efforts to enforce a ban on electric fishing. This ban was seen as the first success by the community in the management of their own common property. This specific situation provided lessons and helped highlight challenges in expanding the research.

Establishment of improved management of communal resources is complicated and also creates conflicts. Therefore, besides improvements in community support and participation, government at different levels should be involved to ensure the effectiveness, legitimacy and sustainability of management actions proposed by user groups. In Vietnam, particularly at the first stage of establishing community-based aquatic resource management, involvement of local government is crucial for success. The ban of electric fishing was initiated under conditions which made the activity easier to implement including the following:

- 1) The ban was supported by government law and, especially, the provincial government was making efforts to enforce the ban throughout the province. Therefore the commune government strongly supported the activity in both dealing with the violators and in providing the local guards and protecting them when threats were made against them.
- 2) As most the electric fishers were from outside the implementing fishing community, the ban was mainly against outsiders resulting in equal benefits for most local fishers, or at least few of the local fishers suffered losses as a result of the ban. Therefore it was easier for the villagers to organize themselves and contribute to the activity.

CONCLUSIONS

The above lessons also help highlight the most difficult challenge, which is to deal with existing conflicts. It is difficult to plan well and implement the research activities aimed at solving conflict in the system. The researchers, even though aware of the conflicts, lack the knowledge, skills and experiences required to help communities to manage conflicts and to change attitudes and behaviour. The resource users may understand the conflicts but they may not implement any changes because these would result in losses to their livelihoods.

Another lesson was in regard to the chance of success of community-based activities. The establishment of community-based management is possible if the initiative is appropriate. A small scale, specific activity which equally benefits all villagers is a very useful first application. The project gained some positive results in a small community of less than 100 households. Our experience in

communal resource management has been gained through several small separate activities (e.g. ban of electric fishing, use of peanuts and inter-cropping to diversify farm output, and tree planting) which were not integrated into one large or generalized formula / system but rather arose in response to local opportunities and constraints, through a participatory approach.

Further expansion of participatory research activities for management of communal resources may encounter the following difficulties:

- Local government support will likely decrease if the regulation to be enforced is not a government law but based on local rules. Improvement in a community's responsibility and confidence is crucial.
- Future activities may result in losses not only to outsiders but also some community members. The benefit resulting from the activities may not be equal for all involved - some will gain more and others might lose - at least in direct and immediate benefits. Consensus and support among villagers might decrease. It is very important to identify people responsible and capable of leadership and to select strategies capable of relative rapid success.
- In conditions where there is less responsibility assumed by the local government and less support from part of a community, effective solutions to deal with threats made by uncooperating fishers (locals and outsiders) should be identified as a prerequisite to any further expansion of activities.

REFERENCES

- Alcala, A.C. and F.J. Vande Vusse. 1994. The Role of Government in Coastal Resources Management, pp. 12-19 In R.S. Pomeroy (ed.) Community Management and Common Property of Coastal Fisheries in Asia and Pacific: Concepts, Methods and Experiences ICLARM Conf. Proc. 45, 189pp.
- Berkes, F. 1994. Property Rights and Coastal Fisheries, pp. 51-62 In R.S. Pomeroy (ed.) Community Management and Common Property of Coastal Fisheries in Asia and Pacific: Concepts, Methods and Experiences ICLARM Conf. Proc. 45, 189pp.
- Feeny, D. 1994. Frameworks for Understanding Resource Management on the Commons, pp. 20-33 In R.S. Pomeroy (ed.) Community Management and Common Property of Coastal Fisheries in Asia and Pacific: Concepts, Methods and Experiences ICLARM Conf. Proc. 45, 189pp.
- Mathew, S. 1991. Traditional Systems of Fisheries Management in Pulicat Lake, Tamil Nadu, India; Food and Agriculture Organization of the United Nations, Rome, October 1991
- Pomeroy, R.S. (Ed.) 1994. Community Management and Common Property of Coastal Fisheries in Asia and Pacific: Concepts, Methods and Experiences ICLARM Conf. Proc. 45, 189pp.

Village Irrigation in Laos: Traditional Patterns of Common Property Resource Management

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Many lowland Lao villages manage traditional paddy rice irrigation systems constructed of local materials. The process of securing agreement to construct such a system, as well as the patterns of mobilizing farmers for operations and maintenance, illustrate the relevance of the Assurance Problem model for understanding collective behavior in managing common property resources. Household cooperation and compliance with irrigation system rules is not isolated behavior, but must be understood in the context of village norms of mutual assistance, social support, and decision-making by consensus. Comparing Lao patterns of regulating access to other natural resources with successful and unsuccessful irrigation systems suggests the limits of successful common property management, and the situations in which it is likely to occur.

Keywords common property, commons, cooperation, irrigation, Laos, mutual assistance, natural resource, resource management, village

Rural society in Laos has been characterized by relatively independent villages and subsistence agricultural production, even as late as the mid-1980s. In such a situation, farming households are highly dependent on the local natural resource base and affected by the vagaries of weather. Families are supported against calamities due to poor harvests or illness by cooperative social institutions in the village. Related customs and institutions facilitate the management of some common property resources for the well-being of the village residents. This article describes the means by which villages manage water for paddy rice irrigation, and relates those means to selected models of common property management. Traditional Lao irrigation institutions demonstrate that the "Assurance Problem" model of collective behavior is applicable to common property management, and particularly that individuals' willingness to cooperate in village irrigation systems must be understood in the context of household interdependence and strong norms of mutual support within the village. Examples where Lao irrigation systems are poorly managed identify the limits of village institutions for shaping individual behavior. Comparison of irrigation with Lao utilization of other natural resources also suggests the characteristics of natural resources that can be managed effectively by indigenous village institutions.

Village Economy and Landholding

Defeated by Siam, colonized and neglected by the French, and disrupted by 30 years of war, Laos has had little opportunity in the last two centuries to develop either a national identity or the political and physical infrastructure common to most other nations. The

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population is ethnically diverse, with over 38 distinct groups; the majority lowland Lao comprise barely 51% of the total. Even today, travel is difficult or arduous to the many villages more than several kilometers distant from the few all-weather roads; the size of Oregon, Laos has less than 3,000 km of paved road, and most other routes are impassible to vehicles during the rainy season.

Under these historical circumstances, internal trade has been limited. Governments have had little ability to tax (or control) the farmers, and villages have been dependent on their own resources and local institutions for economic well-being and social control. Individual household production strategies have been strongly oriented toward subsistence agriculture, with minor barter trade within villages or between nearby villages. Studies done in the 1960s and early 1970s on villages in the Vientiane plain, the most developed region of the country, describe a solidary village society with shallow social and economic stratification, minimal contact with urban centers or government institutions, and limited trade with the market center of Vientiane (Condominas, 1962; Taillard, 1974, 1977, 1979).¹ With the victory of the communist forces in 1975, the new government began efforts to forge a national administration and sense of identity (Ireson, 1988), but an ill-advised cooperativization campaign combined with ineffective state takeover of most marketing activities and institutions forced most villages back to a barter economy in response to the economic collapse of the first post-war years (Evans, 1990).

Farming in Laos is practiced according to two main regimes, swidden (slash and burn) farming and paddy rice farming. The main swidden crop is rice, but significant areas of corn are also grown. Paddy fields covered 323,000 ha in 1991, compared with 234,000 ha of swidden rice (State Statistical Centre, 1992). Most upland ethnic groups farm by swiddening, but significant numbers of lowland Lao are also swidden farmers. Swidden fields are not owned, but held in temporary usufruct according to long-standing customs that prevail across all ethnic groups. These customs for the most part avoid conflict over land use, but cannot be said to *manage* this common resource in a sustainable manner. As Laos is sparsely populated (18 persons/km²), it has been possible until recently for some swiddening populations to exhaust the soil in one area, then abandon it and move to another.²

Virtually all paddy fields are farmed by lowland Lao ethnic groups. Prior to the present communist government, the king in principle had superior rights to all land, but a system of private land ownership of rice paddies was recognized, based on custom and local agreement regarding field boundaries. No system of surveyed boundaries or formal titles has ever been in effect. In general, land was relatively evenly distributed among lowland Lao, and no land-owning class was present in any ethnic group (Evans, 1988, 1990). Most upland ethnic groups could clear enough swidden for their regular subsistence needs, subject to the vagaries of weather. Under the current regime, the state replaced the king as the ultimate landowner, and private property was theoretically abolished. More recently, private ownership of development and use rights has been reinstated, and for the most part pre-revolutionary claims are once again recognized. The government has begun to issue certificates of land ownership, but without any cadastral survey or other legal description of the property boundaries. Aside from privately owned paddy fields and house plots, lowland Lao living in sedentary villages have several important common resources: rivers or streams suitable for irrigation of paddy fields; riverain or lake fisheries; undeveloped grazing lands; and forest resources for firewood, house construction, and hunting and gathering of wild foods. I will focus in this article on the management of irrigation resources in lowland Lao villages, as this is the most developed case of common property management. Similar management patterns for the most part have not been developed for other resources, for reasons that will be discussed later.

Cooperation or the 'Tragedy of the Commons'?

One major problem in managing any common property resource is regulating access to that resource among the members of the community. The so-called "tragedy of the commons," popularized by Hardin (1968), provides a model explaining how individuals motivated by economic rational self-interest will choose behaviors that, when followed by all, inevitably lead to the destruction of a common resource and a negative result for each participant. He and others have concluded that either (a) an outside authority to impose rules of resource allocation or (b) privatization of the resource is necessary to prevent the degradation of common resources (Ehrenfeld, 1972; Ophuls, 1977; Smith, 1981; Welch, 1983).

Olson (1965), in another classic formulation, questions under what conditions individuals will contribute their resources to develop or achieve a common goal. He also concludes pessimistically that free-riding behavior will predominate unless there are external forces that constrain individuals to cooperate.

Many authors have criticized the commons tragedy model, particularly with regard to its assumptions about the nature of common resources and the social context of human behavior. While Hardin's model assumes totally open access to the resource (a nonexclusive resource), communal and state property must also be distinguished (Bromley, 1992; Godwin & Shepard, 1979). Equally important, Hardin assumes individuals act selfishly, that there is no communication among the resource users, and that no social norms mediate their actions. McCay and Acheson (1987), Ostrom (1990), and others argue that social context is crucial to understanding or predicting individual behavior, and that institutions that can effectively manage common property resources must vary with local social or cultural conditions. We will see below how social norms of Lao village life reinforce cooperative behavior.

Looking at examples of irrigation systems around the world, it is easy to find support for Hardin's and Olson's views. Farmers who steal water, who don't contribute their labor to required maintenance efforts, who resist paying water assessments, or who intentionally damage canals or water control structures for their personal benefit are well represented in the literature. Thus, to cite only a few examples, Wade (1982) describes patterns of institutionalized corruption among irrigation officials in India, and Lowdermilk (1990) and Ireson (1991) report systematic extralegal actions of Pakistani farmers to increase their control over water. Indeed one of the central issues of debate among irrigation developers is how to improve farmer cooperation in irrigation management (compare Parlin & Lusk, 1988; Uphoff, 1986).

Yet there are also many examples of effective and efficient local management of irrigation and other common property resources. The Balinese *subak* system (Geertz & Geertz, 1975), northern Thai "people's irrigation systems" (Abha, 1982; Uraiwan, 1983), and some southern Indian canal systems (Wade, 1987, 1988b) all indicate that under certain circumstances villagers are willing, without the imposition of external constraints, to cooperate in constructing, operating, and maintaining irrigation systems of quite remarkable complexity. As will be seen, the Lao situation is also an example of village cooperation for resource sharing. What then are the factors that avoid individual self-interest leading to resource degradation?

In a series of articles, Runge (1981, 1984, 1986) develops a model of behavior that counters the commons tragedy model. He argues that Hardin's and Olson's approaches are fundamentally described by a "Prisoner's Dilemma" decision model that neglects the fact that decisions are frequently made in a social context, rather than in isolation. While

individuals are self-interested, according to Runge their actions can be better understood by an "Assurance Problem" model, which predicts behavior on the basis of individuals' *expectations* of others' behavior, as well as their evaluation of the payoff from different choices. Thus, if social institutions can provide a context where potential cooperators have adequate assurance that others will also contribute to the activity under consideration, and if the transaction or organizational costs of providing this assurance are not excessive, then it becomes in the individual's interest to contribute rather than to free-ride (see also Ostrom, 1990).

A key factor is the existence of social institutions that allow people to predict that others will cooperate in the management of a resource, or contribute to a joint project. Runge also notes (1986) that in many "less developed" countries the use of local institutions to regulate behavior may involve fewer transaction costs than the reliance on external (and more formal) enforcement or adjudication of rights such as advocated by Hardin, Ophuls, and others. Wade's comparative analysis of several Asian irrigation systems (1988a) is interesting in this regard. He concludes that in large irrigation schemes some level of authority of the (state) irrigation staff is essential, but that farmers must also trust the staff to be technically competent and impartial in the administration of operating rules. That is, even in irrigation systems relying on complex bureaucracies for formalized water management, the cooperation of individual water users depends on their belief that the technical staff, as well as other farmers, will contribute to the common good. Wade suggests that this trust is affected by the overall scarcity of water in the system, as well as aspects of the technology and organizational structure (1987, 1988a). In Laos, it appears that indigenous irrigation systems normally do not grow beyond a size (irrigated area) that can be supplied regularly by the water resource and technology available.

Neither of the above models consider the decision to cooperate or free-ride outside the immediate payback situation analyzed. But in many situations, and particularly in traditional societies, a choice to cooperate with or take advantage of one's neighbors cannot be separated from the daily interactions of village life. As will be shown below, irrigation is only one strand of the web of social relationships linking Lao villagers; thus, decisions regarding irrigation behavior are made in light of their effect on a family's social status. I have also argued elsewhere (Ireson, 1992) that the institutional context of a society is an important variable. In a society where villages are normally beset by factionalism and conflict, trust in others' cooperation will be much less likely than in societies where villagers are more solidary and cooperate in other spheres of activity. The Lao case is again a particularly relevant example.

Patterns of Cooperation in Lao Villages

Virtually all observers of lowland Lao social organization have commented on the sense of common identity seen at the village level (Barber, 1979; Condominas, 1962, 1975; Taillard, 1974, 1979, 1989). While villages are not without conflict, they are typically governed by consensus. The headman or president has few coercive resources, and acts more to summarize the sense of a village meeting than as a decision maker who imposes his will on the community. Villagers see themselves as distinct from urban dwellers, and each village is aware of its identity as distinct from neighboring villages. This separate identity is symbolized in a number of ways, notably in an annual ceremony of offering to the village protective spirit, and/or in festivals sponsored by or associated with the village Buddhist pagoda. While villages may differ substantially in wealth, economic stratification within any single village has until recent years been moderate. Geographic mobility

is low: Most residents of a village (unless it is newly founded by migrants) have been born there or have in-married from a nearby village.

There are numerous and regular instances of mutual assistance and cooperation among village households.³ In farming activities, labor exchange is common during periods of intense work such as when the rice crop is transplanted or harvested. In these exchanges, a day's work is counted the same regardless of the task or whether done by a man or woman. If the adults are ill, a household can expect free assistance from neighbors and kin to complete critical farming tasks, with no need to make an immediate return. Building a new house prompts an invitation to most, if not all, village households to assist in the first day's heavy work, and to share in a meal. Families who have experienced a poor harvest can borrow rice from other families without interest until the next harvest. Better-off families without enough workers may provide room and board for youths from poorer families during the rice-growing season, and send them home after harvest with hundreds of kilograms of rice for their families' use.

At the village level, cooperation for Buddhist festivals or construction and repair of the local pagoda is organized by the village headman or a committee of elders. Decisions are made at meetings attended by representatives of all village households. Fixed allocations are not established, because contributions to the pagoda or to monks is a matter of Buddhist merit, and thus of individual choice. But it is a rare household that would not contribute materials, labor, or cash, according to its ability.

Secular cooperation is seen in the construction of village schools or access roads. These activities occur infrequently (though a single project may continue over several years), but one general pattern of decision making and resource mobilization is practiced in nearly all lowland Lao villages. At the request of one or more respected villagers, the village headman convenes a village meeting to discuss the proposal. Once agreement is reached, an equal per-family assessment for materials is decided upon, and a committee is selected to collect funds or materials, and to administer the project. Project leaders are usually men, but families may be represented by women. Labor inputs are also agreed upon and mobilized in a manner that equalizes the contribution of each household and conforms to local gender and work norms.

Because villages must be self-sufficient, and individual households are primarily involved in subsistence agricultural production, the mutual support available from kin and fellow villagers is crucial during times of adversity. Serious illness, death, and irregular harvests occur as commonly in village Laos as in other agrarian societies. Lacking a labor market, cash savings, or a state social welfare system, the ability to call on one's neighbors is an important insurance against disaster. In this sense, Lao villages exemplify the moral economy described by Scott (1976) and others. But it is important to note that a household's "right" to assistance from others is dependent on its good standing in the eyes of the village (Ireson, 1992). A family that does not contribute to temple or community projects, or does not repay its obligations for mutual assistance in farming activities, will find itself shunned, and eventually will be unable to mobilize assistance either for ordinary labor exchange or in the case of a calamity.

Powerful social mechanisms therefore exist for insuring the participation of most if not all families in village and interhousehold cooperative activities. Villagers tend to overlook or discount *occasional* noncooperation by others as being caused by illness or pressing family affairs, events that by tradition allow one to be excused from community or exchange work. Whether the absence was caused by such circumstances or not (and they are frequently legitimate excuses), such an evaluation allows the village to maintain its self-image as cooperative and solidary, and thereby reinforces the norm of cooperative behavior.

Traditional Irrigation Management

Many lowland Lao villages construct simple diversion dams and canal systems to irrigate their paddy fields. These traditional structures can be built wherever there are small streams in the vicinity of the rice paddies, and at a sufficient elevation to command the fields by gravity flow. The physical components and operating patterns of northern Lao irrigation groups have been described in some detail by Taillard (1972) and Ireson (1993). Between 1984 and 1990 I had the opportunity to investigate a number of irrigation systems in Laos, including sites in Oudomsay, Xieng Khouang, Luang Prabang, and Vientiane provinces, and between 1988 and 1991 was regularly engaged in irrigation development in a half dozen villages in Vientiane province. Most systems Taillard studied involved groups of families within a single village, but considerably smaller than the entire village. Most of the groups I worked with included most families in a village, and were organized at the village level, though a few families may not have owned land in the command area.

Traditional irrigation systems in northern Laos all possess a number of common characteristics that are adaptive to the physical setting and agricultural conditions of the region. Water is captured by means of small diversion dams placed across streams that are tributaries to larger rivers. Dams on these rivers are beyond traditional construction capabilities. Instead the tributary streams, which seldom exceed 15 m in width, are dammed using a variety of techniques ranging from simple piles of large stones to complex brushwood structures described by Taillard. These weirs are technically simple to construct, but impermanent and labor intensive. While stone weirs may require only minor repair on a yearly basis, the more numerous brushwood weirs need major reconstruction yearly, and significant repair after periods of heavy rainfall. Thus, farmers must frequently contribute their labor for periods ranging from a day to several days during the rice growing season, if they are to keep the system in operation.

The weirs cannot raise water more than a meter or so, so their use is restricted to situations where the stream is not far below the level of the rice paddies. All traditional weirs are permeable, and incapable of diverting the entire stream flow; this fact has important implications for water management and sharing with other diversion systems on the same stream, as water flowing through a weir is always available to downstream users, even in the usual absence of formal water-sharing arrangements between villages or irrigation groups.

Water diverted by the weir is carried through a system of canals to the rice paddies. The main canal intakes are never gated, as farmers usually attempt to divert as much water as possible to the fields. Main canals can extend for several kilometers, but generally are less than 1.5 km in length. Water is proportioned among branch canals either by limiting the width of the canal itself, or by constructing simple restricting gates from brushwood or planks to limit the water entering a branch canal. Water is continuously supplied to all canals simultaneously, so long as the supply is adequate.

The allocation and distribution⁴ of water, as well as repair of weirs and other structures, is usually under the guidance of an irrigation system leader, often called the *hua naa faai*, or "dam headman." Farmers who receive water from the system join together yearly before the rains begin to carry out needed reconstruction, repairs, and canal cleaning, and can be called during the season whenever major repairs are necessary. In most villages, aside from a single meeting before the monsoon to plan the needed work, there are no other formal activities involving all water users, and there may well be no organization or recognition of a formal "Water Users Group" or "Irrigators' Association." Water distribution and repair of minor canals is usually accomplished by the farmers who share a common secondary or tertiary canal, according to overall principles agreed upon

by all farmers in the system. Only if there are disputes would operational issues be brought to the dam headman or the village committee.

Laos presently has no laws regarding water rights or water use, and in virtually all cases the legitimacy of the irrigation group derives from tacit recognition by the village or subdistrict government. In single-village irrigation systems, the irrigation group is likely to be identical with or subsumed as one function of the village administration or agricultural cooperative. A few traditional multi-village systems exist, and those that are well managed have developed organizations that cut across village lines.

A number of management tasks related to water use, operation of control structures, and organization must be met in any irrigation system. Traditional northern Lao village irrigation systems carry them out as follows. Water is allocated proportional to land area and usually distributed by means of proportioning outlets. Water division points are usually calibrated roughly at the start of a season, and not adjusted for changing water needs other than to keep them in repair. Canal maintenance varies greatly among villages. Some farmers keep main and branch canals in impeccable condition, but more commonly canal cross-sections deteriorate over the years, and grass and brush are cleared only once a year. Both men and women may participate in clearing, but women are seldom involved in water distribution above the on-farm level.

In general, the organization of Lao irrigation groups is quite informal and of limited scope. Farming households receiving irrigation are expected to contribute labor and local materials whenever necessary for repairs and maintenance. Once the annual repairs are completed, little or no adjustment of the irrigation network is expected during the growing season. In most irrigation groups the leaders receive no pay or compensation for their work; when they do it is usually in the form of rice contributed by the members, or exemption from labor contributions. No regular water charges are levied, and only in very unusual circumstances are farmers expected to make any monetary contribution to the operation and maintenance.

Administration is likewise simple. Irrigation leaders, when they are not already village leaders, tend to be informally selected and hold office for indefinite terms. Other than an annual meeting prior to the rainy season, regular meetings of the water users do not usually take place; however, meetings to organize emergency repairs or to establish a rotation schedule during dry weather can be called by the leaders at any time. Written agreements governing the operation of the system and members' responsibilities are unknown, and most groups keep no written records. Finally, conflict resolution in well-managed systems is usually accomplished informally by discussion and consultation with the village administrative committee or council of elders. Because there are no written rules governing irrigation in any traditional system, villages must rely on memory of agreements made at meetings, social consensus, and internal solidarity to support decisions by the irrigation head and/or village committee. The conditions supporting such consensus are described below. Villages that are factionalized, or in which irrigation-specific agreements have not been achieved prior to commencing construction, are unlikely to be able to manage the water resource effectively.

Conditions Supporting Irrigation Cooperation

Initial Construction

In attempting to explain why many Lao villages are successful in operating community irrigation systems, we should consider the social conditions necessary for initial construc-

tion of a weir and canals separately from the conditions necessary for continued management and maintenance of a system. Irrigation water is a "fugitive" resource (Ciriacy-Wantrup & Bishop, 1975) that, until it is captured in a canal system, is available to anyone for the taking. When a group of farmers is considering construction of a new weir and canal system, no agreement for cooperation will have been made. Constructing an irrigation system normally requires more materials and labor than a small group of families can provide; thus, a certain critical number of participants will be necessary for the system to be built at all. Until at least that number of families agree to cooperate, no one will receive any benefits. While no other irrigation association may exist in a village, the social norms regarding cooperation among kin, neighbors and fellow villagers provide a framework and concrete examples of successful joint action in the past. Thus, the people know that cooperation is possible. Runge (1986) proposes that in most situations of cooperation the payoff to any one actor can be diagrammed as in Figure 1. The payoff to the actor (the vertical axis) increases as the number of other actors choosing to contribute to the activity (the horizontal axis) increases, whether the first actor contributes or not. If the first actor contributes, his/her return is line C; if he or she chooses to free-ride or defect, the return is line D. There is no dominant individual strategy: Beyond a certain level of cooperation, the return from contributing exceeds the return from free-riding. Thus, a stable equilibrium occurs where it is in the short-run interests of each actor to contribute to the group, *assuming he or she expects most other actors to contribute as well*.

With regard to constructing new irrigation systems, the situation is actually better diagrammed as in Figure 2. There is a threshold of group participation below which a system cannot be built, no benefits are received, and contributing to construction attempts is simply wasted effort. Above this threshold there is a sharp increase in benefits, which continues to rise as more actors participate. In many situations an irrigators' group can exclude noncontributors from access to water, particularly if distribution canals have not yet been dug; this clearly brings water under a common-pool management regime rather than open-access. In such a case, not participating yields zero benefit regardless of whether the system is built or not (line D), and if the threshold number can be attained, it is to each actor's benefit to contribute. Should it be impossible to exclude noncontributors from water access, however (that is, water remains under open-access rules) curve D would rise above curve C to the right of the threshold, and free-riding would become ra-

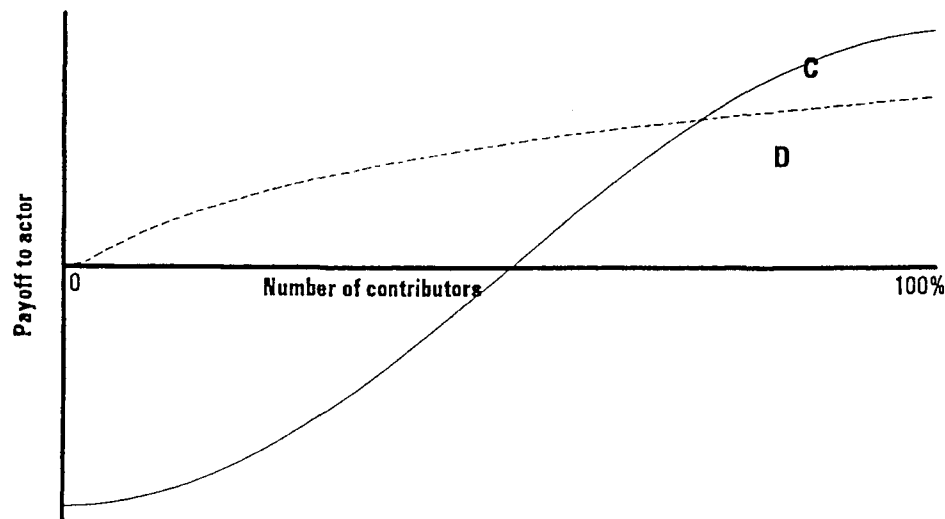


Figure 1. General Payoff Model according to Runge (1986).

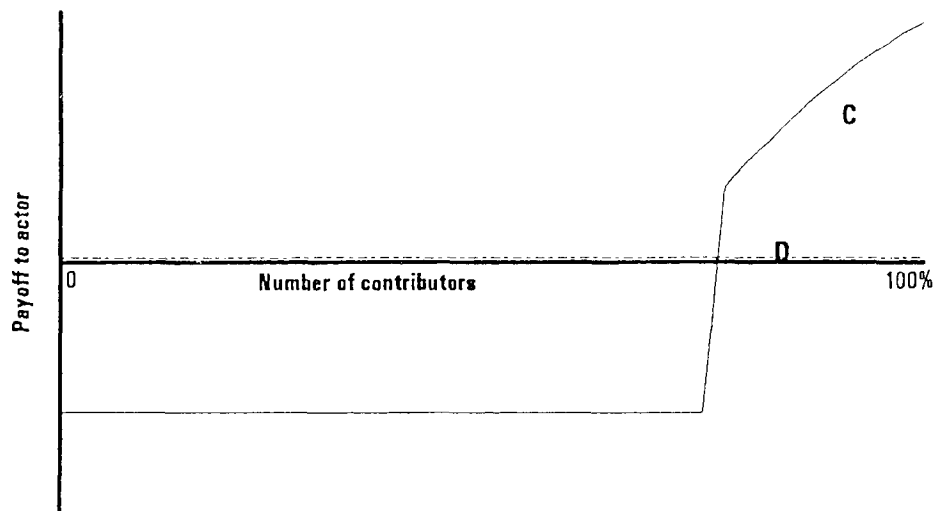


Figure 2. Initial construction of irrigation system.

tional behavior. This has implications for the design and construction of new irrigation systems that will be discussed below.

This model corresponds closely to the actual process at the village level. A proposal for a new irrigation system is discussed in a series of meetings of the families who could potentially benefit from it. Options regarding design, location of structures, future water distribution rules, contributions of materials and labor, etc., are discussed until there is consensus among all participants. Only at this point is work begun; individuals are not asked to contribute until there is assurance that (1) all other members of the group will cooperate and (2) there are enough resources committed to carry out the project. In other words, collective action is not attempted until an institutional framework to manage and support that action over time has been established. In sharp contrast to the Prisoner's Dilemma model, there is communication and negotiation among the actors prior to making a choice to contribute or defect.

Continuing Operations

Once the irrigation system is constructed and in use, the dynamics of participation change to those diagrammed in Figure 3. So long as most members of the group cooperate, the system can be maintained in good condition, adequate water is available to the farm of any member, and benefits to a cooperating actor are high. But benefits drop off quickly as free-riding increases, because of damage to the physical structures and unequal or inefficient water distribution. Below a certain level of cooperation, the system ceases to function at all.⁵ If the group is able to effectively implement sanctions against free-riders (fines or restrictions of water), curve D1 represents the return to a single noncontributing actor and as long as the actor expects enough other group members to contribute, he or she would also be better off to contribute. If sanctions cannot be imposed, however, curve D2 indicates that defection would be the dominant strategy, reflecting the benefits of free-riding on an otherwise well-functioning system.

Free-riding is not common in traditional Lao irrigation, however, because several aspects of irrigation practice serve to reinforce cooperation and the assurance that others will continue to contribute to the overall group. First, while all the water users are responsible for the initial construction and periodic repair of the weir and main canals, the con-

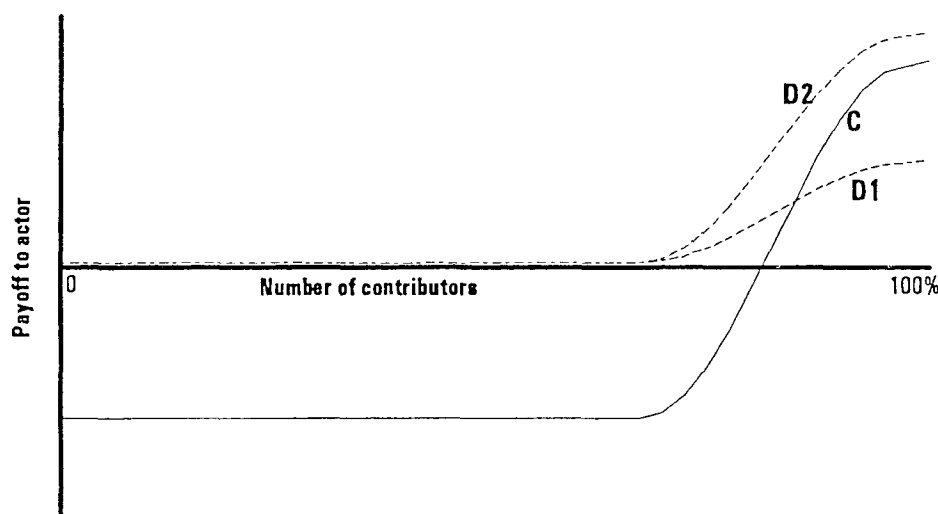


Figure 3. Continuing operation and maintenance of irrigation system.

struction, maintenance, and water management of minor canals is commonly performed by the farmers using those canals directly. Thus, the relevant groups are smaller and the participants may be kin. They are in frequent face-to-face contact not only regarding irrigation, but may also exchange labor on farming tasks as well. The larger group (seldom over 60 households to begin with) thus consists of a number of small groups that informally monitor each other's behavior, as well as frequently supporting each other in farming activities.

Secondly, because of the impermanence of the various structures, irrigators are frequently called upon during the growing season to repair the weir or canals. Each such instance reaffirms the continued existence and importance of the group, and the willingness of its members to contribute to the whole. The incremental costs of coordination and of maintaining these physical structures and the social institution are usually rather low. Except after a major flood, repairs typically require no more than gathering stones or cutting bamboo or small trees, plus a day or two of labor, something any family can afford. Contributions are not so great as to discourage participation. The technology is simple and easily understood, so that specialists are neither needed nor paid to supervise construction or repair tasks. Transaction costs of maintaining the organization are also quite low: Group leaders are normally unpaid, and aside from attending a few meetings each year, the average farmer has no other responsibilities.

Finally, irrigation groups allow a certain flexibility in scheduling the contributions of individual members. Illness is always an accepted excuse for not participating on a day scheduled for community work. And except for emergency repairs to a broken weir or breached canal, a family that has other pressing work can frequently complete their share of a job a day or two later; the other farmers simply leave them a section of canal to clear, for example. Materials required for regular repairs are announced a week or two in advance, allowing time for a family to procure them within the schedule of its other activities. In the infrequent cases when a group needs cash to purchase materials or hire machinery, it is accepted that families who do not have the necessary funds can borrow money interest-free from other group members for a short time. The result of these "understandings" is that outright nonparticipation is extremely rare. Some farmers take advantage of the flexible rules from time to time, but so long as it is infrequent or of a minor nature, the slack is institutionally ignored. Perhaps more importantly, the flexible

rules allow all members to continue to believe that group members are cooperating. The *image* of cooperation is as important as the cooperation itself, as each participant continues to receive the assurance that he or she will not be taken advantage of by the others.

Other important aspects of the village social context reinforce cooperation on irrigation. As was noted earlier, in many irrigation systems the members comprise the majority of farm households in a village. In such situations a family's behavior regarding irrigation is not easily separable from its behavior or reputation in general village life. Because villages have until recently been self-sufficient (many still are), the indigenous institutions promoting cooperation and interdependence among households (agricultural labor exchange, mutual assistance in household activities, villagewide projects) are still strong and important to the life chances of rural families. The decision to contribute or free-ride in an irrigation group is therefore made in the context of overall social relations in the village, rather than as an isolated economic choice. Even if the irrigators' group has no formal or overt sanctions for water stealing or absence from group work, farmers who take advantage of their neighbors will be subject to the informal but effective censure possible through village gossip or withdrawal of aid in times of need. Cooperation in irrigation tasks thus is integrated into the general expectations of mutuality and cooperation that are characteristic of lowland Lao villages; violation of irrigation rules can lead to loss of standing in other social arenas. Irrigation leaders who serve without pay for many years are presumably motivated in part by their increased social standing. While the responsibilities of the position are not onerous, they commonly receive no tangible benefit in terms of preferential water access or additional labor for their farm.

Multivillage irrigators' groups pose a somewhat different problem. Traditional Lao irrigation systems are small, and I know of no site where farmers from more than three villages jointly manage a single weir. While individual farming households are still subject to the behavioral constraints not to cheat on others in their own village, there is sometimes a tendency for farmers of one village to attempt to take advantage of those in another. Labor contributions are quite visible and thus free-riding is infrequent, even in multivillage systems. Water use (and excess diversion) is less easily monitored, however, especially in the absence of measuring structures or ditch tenders. Thus, there is more temptation to cheat on this matter than on others. This tendency is greatly reduced, however, when landholdings of one village are not contiguous but rather intermixed with those of the other. In general, multivillage irrigation groups must insure that the leadership committee adequately represents all villages, and that there are somewhat more explicit rules and sanctions regarding water division, labor contribution, and sanctions for noncompliance than is necessary in single-village groups.

Breakdowns in Cooperation

Not all Lao village irrigation systems work well, however, and it is instructive to attempt to analyze the reasons for breakdowns in cooperation. Comparison of village irrigation with usually larger state-sponsored schemes also suggests some of the conditions under which collective management of a resource is possible. First it should be noted that some tension and conflict exist in most Lao irrigation systems, primarily regarding water distribution, but that it is managed within acceptable levels by the leadership. The close scrutiny under which people in small villages live, together with the general solidarity that exists at some level in most Lao villages, make it difficult for an individual to take much more than his or her share of water without being noticed. A complaint to the dam headman or a committee member prompts a joint walk to the fields and arbitration of the

proper sizing of the turnout or division point. As long as the village leadership is respected, this resolves the incident. Difficulties arise, however, when social or economic differentiation in the village increases, when an existing irrigation group attempts to incorporate new members, or when external resources from the state affect the timing and/or level of joint commitment needed to operate a system.

If village stratification increases, some families may feel they no longer need to depend on village assistance, and thus can ignore social conventions. As a woman from Sayabouri province explained, "Some wealthy people, they aren't afraid [of illness or other problems. They think], 'We still have our family. We have several houses, . . . that's enough. Our family is wealthy and doesn't have to depend on the villagers.'" Other families with political connections beyond the village may feel immune from local enforcement. Or as the Lao economy gradually diversifies and integrates into the global market economy, some farmers may develop additional income sources beyond agriculture, and be willing to risk village displeasure in pursuit of activities seen as more profitable. In these circumstances, the benefits of avoiding labor contribution or taking a greater share of water may be evaluated as greater than the loss of respect or potential assistance, particularly if the village has no strong institutional sanctions to impose against irrigation free-riders, or is unable to impose them against a locally influential family. Some well-managed village systems impose a monetary fine for labor avoidance equal to the local daily wage rate, in an effort to raise the opportunity costs of shirking.

A second set of problems may arise if farmers attempt to expand the area of an irrigation system, and thereby include more families. Sometimes expansion is in response to local needs, and on other occasions is prompted by the possibility of assistance from the government or an aid organization to improve the weir and canal network. In such situations a means of incorporating new members into the group must be found. Original members of the group may have years of cooperative experience, and have invested much effort and materials in building and maintaining the original irrigation system. Thus, they may look on the newcomers as second-class members unless an explicit means of compensating the original builders and incorporating the new members into the enlarged management group is developed. Combining two or more existing small irrigation groups into a single system served by an improved, permanent weir is another problematic situation. In either case, outsider technicians often ignore the farmers' need to develop their own consensus about the expansion, including the location of irrigated areas and canal alignments. Weir and canal designs provided from "outside" may not allow participants to exclude noncontributors, thus supporting free-riding behavior from the outset. Government interventions may also cause what had been a community-managed resource to be perceived as a state-managed resource, undercutting the motivation of participants as well as the legitimacy of local irrigation institutions.

When canals are designed by outsiders based on "purely technical" criteria, and/or when the timetable for construction of a project is rushed, the community may not be able to promote or sanction cooperation by all beneficiaries during construction, because it has not had time to develop an internal consensus regarding construction contributions and/or eventual operations and maintenance. As noted earlier, assuring the commitment of all members at the outset facilitates later operation and maintenance activities. But if the community has not developed an adequate consensus prior to the expansion, some farmers may feel they can ignore the group's rules regarding water division or labor contribution, or the irrigators' group may become factionalized; in such a case the confidence that each member must have in the cooperative behavior of the others is weakened, and joint management of the resource breaks down.

Provision of outside aid may also significantly change the calculus diagrammed in Figure 2. If aid resources allow a system to be constructed or enlarged with the commitment of only a small proportion of the beneficiaries, the near unanimity needed for insuring compliance, expectation of others' compliance, and enforcement of sanctions (specific or diffuse) will not have developed, thus placing the long-run operation of the system in doubt unless the state is prepared to take over day-to-day management responsibilities.

A similar analysis can also be applied to the construction of wholly new irrigation systems whenever significant extracommunity resources are available. Though there may be a clear desire on the part of farmers to capture and distribute irrigation water, the impact of outside advisors and funding frequently impedes the community consensus-building process. One institutional response to these difficulties has been to utilize community organizers to support the development of formal, village-based irrigators' groups (see for example, Manor et al., 1990).

Management of Other Resources

As noted earlier, lowland Lao villagers use other natural resources but do not manage them with nearly the same level of control as irrigation water. These resources include river and pond fisheries, wild animals and plants in the forests, undeveloped grazing land for livestock, and timber. Under conditions of low population density, household production for use, and simple harvesting technologies, human extraction of these resources was for the most part self-limiting, and they were commonly treated as open-access resources, available to anyone who wished to make the effort to fish, gather wild plants, or hand-fell and saw timber for a house. Lack of reliable roads or mechanized transportation limited the geographical area members of a village could exploit. Some villages prohibited the clearing of forest for swidden farming in sensitive locations (ridge tops, small watersheds, or along watercourses) to protect the village water supply.

Within the last three or four decades, however, increased population in some areas, together with access to "improved" harvest technologies (for example, military carbines for hunting, use of explosives or grenades for fishing, chainsaws for logging) have increased the rate of exploitation of some resources to the point where villagers comment on relative scarcity compared to prior times. Rather than limit individual extraction practices, villages have attempted to claim and delineate exclusive "resource extraction areas," often by meeting and negotiating with neighboring villages to decide on a division of the undeveloped lands between them. Under such agreements, timber and other commercially valuable forest products such as rattan and aromatic woods may not be harvested by people from outside the village. Hunting and gathering of household foods are seldom restricted by these agreements, but in any case are usually carried out near one's own village. The national government has in recent years prohibited the hunting of large game (deer, tigers, bears, etc.), though compliance is quite uneven.

The impact of commercial extraction is not effectively addressed by such agreements, however. Unless district government authorities can be persuaded to acknowledge intervillage agreements, there is no guarantee that a logging concession might not be granted in a forest that a village considers to be its own. Administrative rules promulgated since 1986 regulate logging for individual house construction, and a new decree on forest management provides a framework (at least in theory) for recognizing villages' claims to manage their own forest lands.

Only with regard to fishing do Lao villagers exercise any restraint on extraction rates. Natural ponds, small lakes, and streams are normally open to fishing by anyone at

all times. (Artificial fish ponds and the fish found or stocked in rice paddies are private property.) Recognizing that overfishing can both reduce ultimate yields and prevent any fish from growing to reasonable size, some villages establish closed seasons for some ponds or sections of river. On the day fishing is reopened, literally everyone will come with nets, traps, and baskets to attempt to fully harvest the pond. Any catch in excess of a day's consumption will be salted or pickled for later use. Most villages also forbid the use of explosives because of their severe damage to fish stocks.

In general, then, lowland Lao regulation of natural resources is directed toward claiming a geographically defined portion of the resource for exclusive use by one's own village, but not limiting the extraction rates of village households. This pattern further emphasizes the relevance of the village community as a social unit, within which formal behavioral restrictions need not be imposed. Except for declining game populations, most other resources still appear plentiful to the villagers, and harvest restrictions have not been necessary so long as outsiders can be prevented from entering the commons. However, since the early 1980s some villagers have observed that these resources are dwindling, and may need new frameworks for management or control. Commodification of heretofore subsistence resources, penetration of logging companies and other actors, and rapid population growth are disrupting the historical balance between extraction and regeneration. In this context, one must question whether villages will be willing and able to develop local institutions to regulate the sustainable use of newly scarce resources. Their ability to do so also depends greatly on the national and provincial governments' willingness to recognize traditional claims to local natural resources.

Given the numerous examples of successful management of irrigation systems, why do Lao not cooperate to manage other resources? Or conversely, given the lack of joint management of other resources, how can they organize and run complex irrigation systems? I believe two characteristics of the resource and its use help clarify the differences in management. Hunting, gathering, felling timber, sawing boards, and fishing are all activities that can be carried out successfully by an individual or a very small group. They are not confined to a single location, but by their nature are practiced in different places often out of sight of other members of the community. Thus, they require no cooperation for success and are not easily regulated. In the framework of the assurance problem model, benefits begin even with only a single actor. Because the resource is not perceived as "scarce," there is little or no distinction between the benefits a cooperator or noncooperator receives. Nor is there any mechanism to insure that others are in fact cooperating with joint management rules. Villagers in fact often hunt, gather, or cut lumber in cooperating groups, but there are no rules limiting what they harvest.

Irrigation systems, on the other hand, require the combined labor of many people to construct and maintain, and one's use of irrigation water takes place at a specific location in view of other water users. Thus, irrigation requires cooperation and is more subject to regulation by one's peers. Examples of very small irrigation systems, built and run by one to five households, indicate that Lao culture has no imperative toward large-scale organizations so long as a smaller group has the ability to accomplish the task.

Lacking substantial pressure on natural resources, lowland Lao have until recently not needed any system for regulating scarcity. In the future, villages will become more and more integrated into a wider national and regional economy, and village institutions will likely be inadequate to this task unless granted legitimacy by the government. In such a case, effective common management of heretofore open-access resources may be obstructed by state claims and regulations that do not recognize traditional village norms of resource extraction.

Conclusions

The patterns of cooperation for irrigation management described here for Lao villages indicate that effective and egalitarian management of common resources can occur in the absence of either external enforcement agencies, privatization, or strong internal sanctions by the cooperating group. Cooperative management of common-pool resources is not inevitable, but neither is it difficult or rare. The Assurance Problem model provides a valid framework for understanding the process of cooperation: Individuals will participate in the joint management of a resource so long as institutions provide them with the expectation that others will also cooperate. If such institutions are absent or break down, individuals may choose selfish or free-riding behavior, leading to inefficient water use and/or the deterioration of the irrigation system. However, one must go beyond the assurance problem to consider the social context of decisions; institutions may be linked in such a way that the choice whether to contribute or to free-ride affects not only the immediate issue, but the actor's more general status and chances in the society. Even if institutions supporting cooperation exist, joint management will not occur if the characteristics of the resource or the extraction technology do not provide a noticeable advantage to the group as opposed to individual extraction. If Hardin's common pasture required a tall, impenetrable fence to protect the cattle from marauding tigers, individual stocking decisions might well be regulated by the group of users.

A number of factors combine to facilitate cooperative management of irrigation water in Laos. While some are specifically related to the organization of irrigation institutions, others derive from aspects of general village social organization: Lowland Lao villages are historically self-sufficient, and have developed a number of institutions whereby families cooperate with one another. Within any one village, there is relatively little stratification, so that farmers feel they are all more or less in the same boat, rather than being resentful or suspicious of villagers from different classes. Decision-making on village affairs is nearly always accomplished by consensus.

Specific aspects of Lao irrigation practice also facilitate cooperation: The dynamic of building a new weir and canal system requires that participants come to an agreement regarding participation and cooperation before any joint work can begin, thus providing a foundation for continuing cooperation. Water is generally plentiful in most systems during at least part of every year, providing positive reinforcement of the benefits of cooperation that may last through periods of water shortage. Farmers must provide frequent but low-cost inputs of labor and materials for system repairs, thereby regularly reinforcing the village cooperative ethic and validating the continuing expectation that everyone will cooperate. This frequent reconfirmation of the group's continuation, together with the existence of smaller groups of farmers who interact daily to operate and maintain the minor irrigation channels, helps maintain the image of cooperation for mutual benefit, and thus the continuing assurance that cooperative behavior will not be taken advantage of.

Additionally, traditional Lao irrigation systems are technically simple and user operated, requiring no outside technical specialists. They are relatively inexpensive to construct and maintain, and the costs of administration or coordination of the group are measured in a few meetings per year, plus several days' work by the group leaders. Management thus takes place entirely within the village (or villages) using the water, and does not need to rely on external authority or resources. Irrigation is also but one of several village institutions that reinforce each other in terms of fostering compliance with group decisions and village norms. Rule-breaking regarding water use affects a person's general standing in the village as well as among the other irrigators.

Breakdowns in cooperative water management seem to occur most frequently when an irrigators' group attempts to combine farmers from several villages, when new members are added to an existing system, when provision of outside resources lowers the threshold of cooperation needed for system construction, or when economic stratification and social differentiation provide possibilities for some farmers to leave traditional village support networks. Overlapping interests related to the geographical location of the water resource, together with mutual obligations among the participants in other areas of farming and village life, help strengthen cooperation. When these factors are combined with elements of Lao irrigation practice that keep the costs of joint management low, and that require a certain level of group commitment before a joint action is undertaken, the frequent occurrence of functional Lao irrigation groups can be understood.

Notes

1. Kemp (1989, 1991) argues that the idealized isolated, solidary village did not exist in historical central Thailand and other neighboring areas. But regardless of the validity of his thesis for the Chao Phraya basin, the geographical and ethnographic evidence for Laos confirms the importance of villages as a social unit.

2. Increased commercial logging pressure on timber resources, as well as related government restrictions on clearing primary or old regrown forest, now significantly limit the ability of swiddening groups to claim and clear new farming areas (Ireson & Ireson, 1991; Phouy & van der Heide, 1989). Current logging practices are no more a sustainable management strategy than traditional swidden farming, and may lead to even more rapid destruction of Lao forests.

3. The discussion of traditional forms of village cooperation that follows draws on the author's 7 years' residence and development work in Laos, as well as on data collected from interviews with Lao refugees to the United States and partly reported in Ireson (1992).

4. Following Uphoff (1986), I distinguish between allocation (the rules used to proportion water among users) and distribution (the process of actually dividing the physical resource).

5. An important distinction must be made between village-owned and state-owned irrigation systems. In state-owned or -supported systems, some benefits are still received even when the rate of free-riding by water users is extremely high, because of management or operating support provided from the government. Thus, the system does not collapse, although water distribution may be extremely inefficient and characterized by great inequity. Village-owned irrigation systems do not have the dubious benefit of this external support.

References

- Abha, S. 1982. *A comparative study of traditional irrigation systems in two communities of northern Thailand*. Bangkok: Chulalongkorn University Social Research Institute.
- Barber, M. J. P. 1979. Migrants and modernization—A study of change in Lao society. Ph.D. dissertation. University of Hull, UK.
- Bromley, D. 1992. The commons, common property, and environmental policy. *Environmental and Resource Economics* 2(1):1–17.
- Ciriacy-Wantrup, S. V., and R. C. Bishop. 1975. "Common property" as a concept in natural resources policy. *National Resources Journal* 15(October):713–727.
- Condominas, G. 1962. *Essai sur la société rurale Lao de la région de Vientiane*. Vientiane: Commissariat des Affaires Rurales.
- Condominas, G. 1975. Phiban cults in rural Laos. In *Change and persistence in Thai society*, eds. G. W. Skinner and A. T. Kirsch, pp. 252–277. Ithaca, NY: Cornell University Press.
- Ehrenfeld, D. 1972. *Conserving life on Earth*. New York: Oxford University Press.
- Evans, G. 1988. "Rich peasants" and cooperatives in socialist Laos. *Journal of Anthropological Research* 44(3):229–250.

- Evans, G. 1990. *Lao peasants under socialism*. New Haven, CT: Yale University Press.
- Geertz, H., and C. Geertz. 1975. *Kinship in Bali*. Chicago: University of Chicago Press.
- Godwin, R. K., and W. B. Shepard. 1979. Forcing squares, triangles and ellipses into a circular paradigm: The use of the commons dilemma in examining the allocation of common resources. *Western Political Quarterly* 32(3):265–277.
- Hardin, G. 1968. The tragedy of the commons. *Science* 162:1243–1248.
- Ireson, C., and W. R. Ireson. 1991. Ethnicity and development in Laos. *Asian Survey* 31(10):920–937.
- Ireson, W. R. 1988. Laos: Building a nation under socialism. *Indochina Issues* 79:1–7.
- Ireson, W. R. 1991. Farmer participation in irrigation management: Limited roles in Pakistan. In *Farmer participation and irrigation organization*, eds. B. W. Parlin and M. W. Lusk. Boulder, CO: Westview Press.
- Ireson, W. R. 1992. Peasant farmers and community norms: Agricultural labor exchange in Laos. *Peasant Studies* 19(2):67–92.
- Ireson, W. R. 1993. Gestion de l'irrigation villageoise ou nord du Laos: Formes traditionnelles et formes modernes. *Géographie et cultures* 5:21–44.
- Kemp, J. 1989. Peasants and cities: The cultural and social image of the Thai peasant village community. *Sojourn* 4(1):6–19.
- Kemp, J. 1991. The dialectics of village and state in modern Thailand. *Journal of Southeast Asian Studies* 22(2):312–326.
- Lowdermilk, M. K. 1990. Irrigation water control and anarchy. In *Social, economic and institutional issues in Third World water management*, eds. R. K. Sampath and R. A. Young, pp. 155–173. Boulder, CO: Westview Press.
- Manor, S., S. Patamatamkul, and M. Olin, eds. 1990. *Role of social organizers in assisting farmer-managed irrigation systems*. Colombo, Sri Lanka: International Irrigation Management Institute.
- McCay, B. J., and J. M. Acheson. 1987. Human ecology of the commons. In *The question of the commons*, eds. B. J. McCay and J. M. Acheson, pp. 1–34. Tucson: University of Arizona Press.
- Olson, M. 1965. *The logic of collective action: Public goods and the theory of groups*. Cambridge, MA: Harvard University Press.
- Ophuls, W. 1977. *Ecology and the politics of scarcity*. San Francisco: W. H. Freeman.
- Ostrom, E. 1990. *Governing the commons*. Cambridge: Cambridge University Press.
- Parlin, B. W., and M. W. Lusk. 1988. International irrigation development: Factors affecting project success. *Society and Natural Resources* 1(2):131–144.
- Phouy, V., and J. van der Heide. 1989. Discussion paper on land use in forestry. Vientiane: Tropical Forestry Action Plan (mimeo).
- Runge, C. F. 1984. Institutions and the free rider: The assurance problem in collective action. *Journal of Politics* 46(1):154–181.
- Runge, C. F. 1986. Common property and collective action in economic development. *World Development* 14(5):623–635.
- Runge, C. F. 1981. Common property externalities: Isolation, assurance, and resource depletion in a traditional grazing context. *American Journal of Agricultural Economics* 63(4):595–606.
- Scott, J. C. 1976. *The moral economy of the peasant: Rebellion and subsistence in Southeast Asia*. New Haven, CT: Yale University Press.
- Smith, R. J. 1981. Resolving the tragedy of the commons by creating private property rights in wildlife. *CATO Journal* 1(2):439–468.
- State Statistical Centre. 1992. *Basic statistics about the socio-economic development in the Lao P.D.R.* Vientiane: Ministry of Economy Planning and Finance.
- Taillard, C. 1972. L'irrigation dans le nord du Laos: L'exemple du bassin de la Nam Song à Vang Vieng. *Etudes de géographie tropicale offerts à Pierre Gourou*. Paris: Mouton.
- Taillard, C. 1974. Essai sur la bi-polarisation autour du vat et de l'école des villages Laos de la plaine de Vientiane. *Asie du Sudest et Monde Insulaisien* 5(3):91–104.
- Taillard, C. 1977. Le village Lao de la région de Vientiane—un pouvoir local face au pouvoir étatique. *L'Homme* 17(2–3):71–100.

- Taillard, C. 1979. Le dualisme urbain-rural au Laos et la recuperation de l'ideologie traditionnelle. *Asie du Sud-est et monde insulindien* 10:41–56.
- Taillard, C. 1989. *Le Laos—Stratégies d'un état-tampon*. Montpellier: Reclus.
- Uphoff, N. 1986. *Improving international irrigation management with farmer participation: Getting the process right*. Boulder, CO: Westview Press.
- Uraiwan, T.K.Y. 1983. Resource mobilization in traditional irrigation systems of northern Thailand. Ph.D. dissertation, Cornell University, Ithaca, NY.
- Wade, R. 1982. The system of political and administrative corruption: Canal irrigation in south India. *Journal of Development Studies* 18(3):287–328.
- Wade, R. 1987. The management of common property resources: Collective action as an alternative to privatization or state regulation. *Cambridge Journal of Economics* 11(2):95–106.
- Wade, R. 1988a. The management of irrigation systems: How to evoke trust and avoid prisoners' dilemma. *World Development* 16(4):489–500.
- Wade, R. 1988b. *Village republics: Economic conditions for collective action in south India*. Cambridge: Cambridge University Press.
- Welch, W. P. 1983. The political feasibility of full ownership property rights: The cases of pollution and fisheries. *Policy Sciences* 16(2):165–180.

Common Property Resource Access by the Poor and Class Conflict in West Bengal

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Abstract: Analysis of common property resource (CPR) use in India has neglected important spatial and socio-political areas. Geographically, little attention has been given to CPRs in eastern India, despite their great importance to the poor in this region. Socio-politically, researchers have ignored the way in which CPRs are an axis of class conflict, and why such conflict over CPRs is likely to increase in the future. This article explores these issues from a case study of poor people's use of and access to CPRs in three villages of West Bengal, using historical studies of resource use in nineteenth century Britain as a reference point.

Introduction

Some attention has been paid recently to indigenous resource management systems and use of common property resources (CPRs) in India. Much of this literature has focussed on three areas:

1. the historical decline in availability of CPRs and the depletion of the natural resource base, often involving state appropriation of formerly common resources or their increased commercialization;
2. access to CPRs by socio-economic group or class, including differential access by women and men; and
3. management systems for CPR use (for a literature review, see OFI, 1991).

Geographically, most literature on CPR use in India has focussed on the arid, semi-arid, hill and forest fringe regions of the country. Little literature has discussed CPRs in West Bengal, and has done so mainly in the context of forests or social forestry programmes (e.g. Singh and Bhattacharjee 1991; Shah 1987; an exception is Nesmith [1990] who analyzes both social forestry and other natural resource use in West Bengal). Jodha [1990] has pointed out that CPR use is under-studied given its importance to the rural economy and the poor. This is particularly so in the case of West Bengal. Part of the reason for the lack of attention to CPRs in West

Bengal has been an alternative focus, as in other parts of India, on formal aspects of agricultural development. A further contributing factor to this lack of attention is that West Bengal does not have the relatively large areas of common land that are found in other less densely populated regions of India. For example, an estimate of private as opposed to common land gives an all-India figure of 64% private land and 36% common land, but for the district of Murshidabad in West Bengal, an estimate of 98% private land and 2% common land [Agarwal and Narain 1989: 41]. Given this lack of common land, do CPRs exist at all in West Bengal?

The main argument made in this article will be that access to natural resources in West Bengal that are in a sense common are literally of vital importance to the poor, and particularly poor women. In addition, access to these resources is declining as CPRs are increasingly commercialized or becoming more scarce, or as access to these resources is restricted. In other words the article will focus on an area that, as will be shown, the rural poor see as crucial. The importance of this focus lies in the fact that one of the central reasons why rural development has not been more successful in India is because planners have not taken into account what is important to the poor.

Before setting out the argument of the paper in more detail, it will be necessary to pause for a moment and consider how CPR use can be defined in the West Bengal context. In general, four types of land ownership and use are distinguished. The first is private property which refers to '...the situation in which an individual or corporation has the right to exclude others from using the resource and to regulate its use.' The second is open access, which is the '....absence of well-defined property rights.' The third is state ownership, with access to the resource determined by the state. The fourth is communal property, where '....the resource is held by an identifiable community of users who can exclude others and regulate use.' [Berkes et al 1989: 91].

Recent literature on CPR use has been concerned with overturning Hardin's well known thesis concerning the 'tragedy of the commons' (that is, common property resources are likely to be depleted or destroyed, as individual users have no incentive to maintain them, and should therefore be privatized). Critics of Hardin have stressed that he has confused open access types of common land use and CPR management, that is definitions two and four above [see OFI 1991; Berkes 1989; Wade 1988; Runge 1986]. The writing of these critics has been useful in that it has demonstrated, contrary to Hardin's thesis, that communal management systems remain resilient in the Indian and other contexts. However, this focus on communal management has tended to ignore an element of CPR use that has been historically important and is likely to become more important in areas of a similar agro-economic nature to West Bengal where access to CPRs by the poor is declining. This is class conflict over CPRs. The four part typology set out by Berkes et al above has no category for such conflict, nor has the literature on CPRs discussed it. Class conflict has been ignored for much the same reason that the eastern region of India has been ignored in the CPR literature. This is because writers on CPR use have tended to focus on management of CPRs by communities that share resources in a relatively equitable fashion (i.e. hill and forest fringe villages) and where class conflict may not be as apparent as in eastern

India. The literature on these hill and tribal regions has therefore focussed to a greater extent on state-peasant relations, and expropriation of village resources and CPR land by the state [e.g. Blaikie 1985; Guha 1985]. In addition, writers on CPR access have not tended to focus on the viewpoint of the poor, and it is from this viewpoint that conflict concerning CPR access is likely to be most important and noticeable.

This article will deal with access to CPRs by the rural poor rather than with management of CPRs. In West Bengal access to many village resources is not clearly defined legally but depends on a process of negotiation, bargaining or conflict between poor and rich, and on a system of customary rights. While some resources are open access (for example stubble left after harvesting or wild foods that grow in drainage ditches), other important CPRs (such as gleaned grains or fallen fruits) should be defined as products that are found mainly on private land controlled by richer villagers, and to which the poor have customarily negotiated access. It is this latter resource use system that is likely to become more dominant, for reasons discussed below. While from the perspective of the rich these latter resources may be privately owned, from the perspective of the poor these resources are common in that the poor have attempted to maintain a right of access to them. To define these resources as private property misses an important point, as how a village resource is defined will depend on whose perspective is being considered.

This article therefore has a dual purpose - to show the enormous importance of CPRs to the poor in West Bengal, and to show how some of these CPRs are presently one axis of class conflict, and why class conflict over CPRs is likely to increase in the future. The article is organised as follows. As the field of class conflict is essentially a new focus as far as CPR use in India is concerned, the article will first elucidate a theoretical framework that can structure discussion of such conflict. It therefore first considers CPR use by the poor in nineteenth century Britain, asking what can be learnt from study of this period in terms of class conflict over CPRs in contemporary India. Next it analyzes CPR use by the very poor, and conflict over their access to selected CPRs, in three villages of two contrasting agro-ecological regions in West Bengal, discussing briefly the effects of the policies of the Left Front government as far as CPR use is concerned. Lastly it outlines a typology of CPR use in West Bengal, and discusses some of the implications of the research findings for future research and policy making.

The Moral Economy and CPRs in Nineteenth Century Britain

Aspects of class conflict over natural resources may repeat themselves in different times and at different places. What lessons do the study of CPRs in industrializing Europe hold for the student of resource use in contemporary India? It is of interest here that one of Marx's first newspaper articles, and the subject that may have first drawn his attention to socio-economic problems, followed a debate in the Rhenish Parliament concerning restrictions to be placed on the poor on the gathering of wood. As McLellan notes [1977: 20-21]: "A more stringent law on thefts of timber had been proposed. The gathering of dead wood had traditionally been unrestricted, but scarcities were caused by the agrarian crisis of the 1820s and the growing needs of industry. The situation was getting out of hand: five sixths of all prosecutions in Prussia dealt with wood, and the proportion was even higher in the Rhineland... Marx's general view is that the state should defend customary law against the rapacity of the rich."

The problem Marx found in Rhineland was the classic one of the decline of a 'moral economy'. The customary rights of the poor, in this case the right to collect wood from common land, was being denied because of the needs of industry (and by implication the needs of the state). This is an issue also taken up by British historians considering changes in Britain during the same period as that commented on by Marx. For these historians, struggle over customary rights, which included access to common property resources on common land that was being enclosed, was one axis of class struggle. E.P. Thompson analyzes this subject in some detail in *The Making of the English Working Class*, particularly in the chapter on field labourers in the 1820s and 1830s [1986: 239]:

Copyhold and even vaguer customary family tenancies (which carried common rights) might prove to be invalid at law although they were endorsed by the collective memory of the community. Those petty rights of the villagers, such as gleaning, access to fuel, and the tethering of stock in the lanes or on the stubble, which are irrelevant to the historian of economic growth, might be of crucial importance to the subsistence of the poor...if one looks at the scene again from the standpoint of the villager, one finds a dense cluster of claims and usages, which stretch from the common to the market-place and which, taken together, made up the economic and cultural universe of the rural poor.

Thompson links this 'dense cluster of claims and usages' to a particular ideology held by the poor, a form of radical moral economy, an ideology that insisted that these rights and claims of the poor be met, and which opposed the prevailing elite ideology of the time, which attempted to deny such claims. In this sense physical disputes over access to village resources, which were manifested in poaching or other encroachments on to the lands of the ruling classes, were inextricably linked to the ideological dispute between poor and rich as to how society should distribute resources. As will be shown below, areas such as gleaning, access to fuel and the tethering of stock on the stubble are as important to the poor in contemporary Bengal as they were to the poor in eighteenth and nineteenth century Britain.

It would however be ahistorical to suggest that this dense cluster of claims and usages Thompson outlines broke down at any one point of time. As Thompson himself makes clear in his book on the Black Act of 1723, conflict over forest resources and claim and counter claim by the poor and the nobility had been "the condition of forest life for centuries." [Thompson 1990: 31].

Let us consider in a little more detail one area of historical importance to the poor that will be discussed in the case study villages from West Bengal - gleaning. An essay by Morgan on the place of harvesters in nineteenth century village life discusses in detail the practice of gleaning by the poor [Morgan 1982: 27-72]. Morgan shows how class conflict manifested itself in disputes between labourers and farmers over gleaning. Morgan argues that gleaning was "...the clearest expression of the psychological advantage which the village labourer and his family enjoyed [over the farmer] in the few brief weeks of harvest." [ibid : 61].

Morgan elucidates the nature of this conflict:

Gleaning was a universal practice in the corn-growing counties of nineteenth-century England, despite the fact that farmers and landowners, at different times, had attempted to put it down, or to bring it under tighter control. It was an ancient common right, embodied in the Mosaic Law, that harvest gleanings should be left 'unto the poor and the strangers'. It continued to be practised at a time when many other common rights were under attack. In 1787 the right to glean 'indefinitely' by 'poor, necessitous, and indigent persons' had been denied on the grounds that it was 'inconsistent with the nature of property', 'destructive of the peace and good order of society', and 'amounting to a general vagrancy'. This judgement was reinforced and re-stated in more comprehensive terms a year later by Lord Loughborough, the Lord Chief Justice, and two of his fellow judges.... But rights so deeply rooted in the needs and practices of the local communities could not be extinguished on the mere say-so of a High Court judge....'[ibid: 56].

Here was a classic dispute between 'property' on the one hand, supported by the state in the form of its courts, and common rights on the other. This dispute involved 'infringements' or 'encroachments' from both sides, infringements by the poor onto private property, and attempts at infringements of common rights by the rich; an example of the latter is that while farmers could not prohibit gleaning, they attempted to restrict it, by limiting the privilege to those who had worked for them in the harvest (ibid: 57-8).

What is the relevance of the above discussion to the present state of affairs in West Bengal? As has been noted by at least one author [Humphries 1990], and despite important differences between the two societies, the situation concerning resource use in industrializing Britain and many parts of the contemporary so-called developing world are similar. Both societies are founded upon unequal property rights, a situation supported by the state. In both societies CPRs make up an important and at times crucial part of poor households' income, and access to certain CPRs is a source of conflict over 'traditional' rights that can be seen to fit into a wider social conflict between poor and rich. In addition, in both societies, gathering of CPRs is mainly the responsibility of women and children, whereas land is owned by men. One might therefore expect patterns of class and gender conflict over common resources in nineteenth century Britain to be repeated in contemporary West Bengal. Here lies the importance of the comparison between the two societies.

One crucial step that Marxist and other historians have made concerning common resources is to attempt to understand the importance of CPRs to the poor, and how the poor contributed to the maintenance of systems that ensured their access to these resources. This approach is valuable for the student of poverty in contemporary India, because understanding the perspective and abilities of the poor will in turn help in an understanding of poor people's strengths, how they gain access to resources, and how these strengths can be built upon. In contrast, most studies of

poverty alleviation programmes have focussed on how the poor have been persistently denied access to the benefits of such programmes. In other words, these studies have focussed on poor people's weaknesses and their inability to claim rural resources rather than any strengths they may have in this area. But it is precisely the area of poor people's strengths that has been the main subject of study for Marxist historians re-writing British social history.

The Study Villages and Methodology

Let us now turn to the study villages in West Bengal. The analysis of CPR use was part of a larger study of survival strategies and resilience of poorest households carried out in two different agro-ecological zones of West Bengal. Population and land types in the three villages are given in Table 1. The first of these villages, Fonogram, was a Muslim village of about one hundred and forty households located in an alluvial tract in north 24 Parganas District, about 40 kms north east of Calcutta. The other two, Bithigram and Keshipur, were adjacent villages located in semi-lateritic central Midnapore District. Bithigram, a mixed tribal (Lodha) and Hindu (Mahato) village, had a population of ninety seven households, while Keshipur, a Hindu (Mahato) village, had fifty seven households and a large minority of scheduled caste (Challuck) households. The two study areas were chosen for purposes of agro-ecological contrast, and the villages for their socio-economic representativeness and to include Muslim, tribal and scheduled caste households.

Taking into account their different agro-ecological settings, the three villages were representative of the agrarian economy in the moribund delta of West Bengal. That is, the villages were mainly agricultural, and village resources, particularly land and livestock, were largely controlled by a fairly small but consolidated group of 'middle' peasant households who also maintained local political power. For example, the wealthiest 20% of households in each of the three villages controlled about 45-50% of village land. This group of middle peasants co-existed with a larger group of 'poor to marginal' and landless households which made up the majority of the village populations, but controlled marginal resources. The landless or near landless, for example, made up about 40% of the population in each of the villages.

Local ecology differed in the two study areas. Fonogram was located in a more densely populated but also more fertile setting where vegetation was luxuriant, especially during the monsoon period. In the semi-lateritic locale of Bithigram and Keshipur vegetation was sparse, with large tracts of danga or high poor quality land on which it was only possible to grow an occasional aus crop. The Midnapore study villages were located in a transitional zone between the more alluvial east of the District and the lateritic west, so about half of the villagers' land was aman paddy land, and the other half was danga. The lack of natural local bio-mass was partly compensated for by two factors. The first was the existence of sal (*Shorea robusta*) forests fairly close to the villages which the poorer villagers still drew upon, even though the forests were of poor quality. The second was the West Bengal Government's social forestry programme, which had been instigated in the area in 1981, and under which villagers had planted relatively large numbers of eucalyptus trees, mainly on danga land. The eucalyptus groves were a source of fuel for select households. In both Fonogram and Bithigram recent agricultural development, in

particular the growing of a new paddy crop in the winter season, meant that land that much land was no longer available for common use such as grazing or gathering of wild foods.

For the purpose of the research sixty poorest households were selected on a proportional basis from the three villages for discussion on their priorities and how they survived in times of stress. It was decided before the research began that the research focus should be on issues that were important to respondents, and the research therefore differed from much work on CPRs in India in that it concentrated on poor people's views concerning CPRs. About half of the respondents from the sixty households were women, one quarter men and one quarter a mix of married couples, or couples and other family members. There were in total sixteen female headed households (all headed by widows) among the sixty households chosen. In Bithigram and Keshipur respondents came almost exclusively from tribal and scheduled caste households respectively. It was not surprising that one of the main subjects that respondents were interested in discussing was CPRs, given that it is women, who made up the majority of respondents, who are the main gatherers of CPRs.

CPR Use in the Study Villages

Although most rural Indian households make use of CPRs, collection of CPRs is more important the poorer a household becomes [Jodha 1986]. The discussion below will highlight the importance of CPRs to the poorest, focussing on gleaning, gathering of fuel, and gathering of other uncultivated products, discussing inter-class conflicts where relevant.

Gleaning

Paddy grains that fell during harvesting were collected by poorest household members after the aman harvest in all three study villages, but access and type of gleaning differed. Respondents were asked who gleaned, when they did so, how much they gleaned, and whether this activity was subject to any restrictions.

In Fonogram twenty out of the twenty five respondents reported gleaning whenever there was time, and that it was an activity carried out mainly by children. In the other five households there were either no children or respondents were out at work all day and unable to glean. The amount gathered was partly dependent on the overall yield of the crop. Respondents' replies were therefore coloured by consecutive poor aman harvests in Fonogram; floods during aman in 1986-87 for example meant that very little grain was available for gleaning.

The amounts collected varied depending on household make up and who had time to glean. Respondents reported that on average children went out for an hour a day in the 15 to 30 days when the crop was harvested and collected in total between 10 and 15 kgs. of paddy. The average collected by the eleven households who gave clear estimates was 13 kgs. during one aman season. The highest estimate was 25 kgs. for the season. These amounts can be favourably compared to the 2-3 kgs. of wheat received from the government as relief by most respondent households after the 1986-87 floods, the comparison showing that poor people's own efforts were likely to provide more resources than government relief.

Three of the twenty gleaning respondents said bitterly that farmers sometimes refused access to their fields, access they saw as a right (a point made in informal discussions with other poor non-respondent household members). As one poorest woman put it: "If the crop is good the rich let us in, if not they don't."

In Bithigram eighteen of the nineteen respondents reported gleaning. Gleaning was usually carried out by women and children. Up to 5 kgs could be gathered in a day by one person (the equivalent of wages for two days for a female agricultural labourer). For the gleaning 'season', total estimates varied between 15 and 80 kgs. Only one respondent reported restrictions on gleaning. She said that she was only allowed to glean on the land of the farmer whose paddy she harvested (a restriction similar to that found in nineteenth century Britain). Otherwise respondents said that they could glean as they wished.

Seven Lodha (tribal) respondents also reported another form of gathering of paddy grains - from rat holes. Rats made deep, long holes under the narrow auls (partitions) between the fields. One respondent estimated that ten rats could store a maximum of 100 kgs. of grain in a single hole. The Lodhas dug up these holes, killed the rats, and took the grain. This work was very hard, which limited the numbers of those who could take part, and took a whole day. The average amount collected in a day's work by two men was about 6-7 kgs., although sometimes no grain was collected. Snakes were also a potential danger.

Unlike gleaning, collection from rat holes was an activity that benefitted both farmers and collectors. Farmers benefitted because rats were cleared from their fields, and the collectors benefitted from receipt of grain, as well as obtaining the rats which they killed and ate. Lodhas wishing to undertake this activity had to request permission from the field owner to do so, which was usually granted. This activity can therefore be labeled one of negotiated mutual benefit rather than one of conflict.

Grain collected by gleaning and collection from rat holes made a substantial contribution to poorest households' subsistence in Bithigram. One household reported gathering a total of 100 kgs. of grain a season in this way. Respondents who gave clear estimates of the amount of grain collected in one season gained an average of 29 kgs. per household for gleaned grain and 32 kgs. for grain collected from rat holes, in total the equivalent to wages from about twenty days of male agricultural labour.

It was in Keshipur, a village just a couple of kilometres from Bithigram, that most restrictions were faced concerning gleaning. Only one of the respondents reported gleaning, and this was a respondent whose household owned land on which paddy was grown. None of the other households gleaned because no farming household permitted access to their land. As one respondent said indignantly and typically: "No one lets us glean from their land, people glean from their own land. They never let us go and glean." Another put it this way: "We are not allowed to glean. They won't let poor people glean." This division of the village into 'them' and 'us' by poorest respondents, which was common to all three study villages, was a clear

expression of class conflict manifesting itself over access to resources. There was also, implicit in the respondents' comments, a belief that poor people should be allowed to glean from the fields of their rich neighbours.

Each of the three villages had therefore developed different regulations concerning gleaning. In Fonogram it was permitted with some restrictions, in Bithigram allowed with more or less no restrictions or encouraged (particularly collection of grain from rat holes), and in Keshipur it was not permitted. An explanation of the different regulations is given below.

The author also noted in Birbhum District (outside the study areas) a pre-harvest collection of grain known locally as *jhora*. This involved the removal of unripened stands of unwanted paddy from a farmer's fields by poor people. This took place for example where there were poor quality stands that the farmer wanted to remove so that the seed stock for the following year could be kept pure. The poor person collecting the grain had to ask the farmer's permission to remove these stands, as the collector might damage the crop surrounding that to be collected. This is another example of negotiation for mutual benefit between the landless and landowners over resources on the owner's land.

Gleaning can be seen as an activity that expresses poor and usually landless people's symbolic claims on the land. While the poor saw gleaning as a customary right, the owner of the land on which gleaning was to take place in some cases found such gathering as an infringement of ownership. There is therefore a direct parallel here with the case of gleaning in nineteenth century Britain.

Why was it that Lodhas in Bithigram were able to gain almost unrestricted access to their employers' fields, while the neighbouring scheduled caste households in Keshipur, who were equally poor, could not gain similar access? The answer lies in intra-village dynamics and state politics. The Lodhas as a separate ethnic group partly defined their own identity in opposition to the Hindu Mahatots who controlled most of the village resources. For example, the separate Lodha para or section of the village was set at some distance from the rest of the village. The Lodhas formed a strong ethnic group which gained strength from its coherence. They bargained vigorously with their employers over wage levels every transplanting and harvesting season, as well as over other rights. This ethnic coherence had a history, founded in the oppression and exploitation of the colonial and post-colonial periods, an exploitation justified in the colonial period by labeling the Lodhas as a criminal tribe (for a history of the Lodhas, see Bhowmick 1963). This hand of the Lodhas was strengthened by the reforms and policies of the Left Front Government in West Bengal. Since the Left Front came to power in 1977, violence against the Lodhas by the police and caste Hindus, which in the past had been extreme, had decreased dramatically. The formerly landless Lodhas also received small portions of land under the government land reform programme. While this land was often *danga* and of poor quality, gaining it did increase the sense of self respect among the Lodha households. They were also encouraged by local CPM officials to bargain for higher wages. This ability of the Lodhas to organize was in sharp contrast to the situation in Keshipur and Fonogram, where the poorer

households formed much less of a cohesive group, and were sometimes related to wealthier villagers, and where Left Front activity had been much less apparent.

How important is gleaning to the poor of the Bengal region? A number of studies have commented on its occurrence. Sengupta [1978: 7] has noted of landless labourer families in Birbhum District:

Immediately after the harvest, the children of their families would rush to the fields and collect handfuls of grains that are left on the fields. Each landless family could collect 30 to 40 kgs. in the process. Santal (tribal) children are adept in collecting grains from rat holes where rats would store their day's collection.

Cain [1977: 219] mentions gleaning and the opening of rat holes as an activity carried out by children in a Bangladesh study village, and Howes [1985: 41] notes for his study village, also in Bangladesh, that: '...children from poor households, and the occasional widow, search for rat holes from which small quantities of grain may be retrieved.' The collection from rat holes mentioned here is probably not on the scale found in Bithigram. Siddiqui [1982: 358] also mentions children, old men and women gleaning, and collecting up to 1 kg. of grain a day each, from a village in Bangladesh. Begum [1985: 235] has noted differences in gleaning, from a four village study in Bangladesh, between Comilla District, where gleaning was the source of nearly 20% of female labour earnings, and Modhupur District, where it made no contribution to female earnings; this regional difference can apparently be accounted for by differences in rice varieties grown. It would appear from these individual case studies that gleaning remains a widespread practice in the region of importance to the poor. None of the studies, however, discuss restrictions placed on the poor concerning this practice.

Collection of Fuel

More attention has been paid to the importance of the collection of fuel by poor rural households throughout South Asia than to gleaning (for a review of literature on India, see OFI 1991; and various other studies discussed below). The author discussed with respondents who gathered fuel, where it was gathered from, how much was sufficient to meet household need, if there was increasing difficulty getting fuel, and if collection was seasonal.

The situation concerning fuel was similar in each of the study villages. Respondent households met nearly all of their dry season fuel requirements through CPRs. This was mainly in the form of fallen leaves and gobar (cow dung), but twigs, crop residues and any other burnable materials were also gathered. These materials were gathered from homesteads, fields, paths and ponds and wherever else they were available. For example, in Fonogram materials were gathered from the graveyard that was allowed to overgrow and where everyone was permitted to collect dry wood and leaves, and from a nearby large garden owned by an absentee landlord. Gathering was done almost exclusively by women and children. Again the similarity to early nineteenth century Britain can be noted (see Humphries 1990).

A common remark in the villages was that one person could gather enough leaves or gobar in a morning (about 3 hours) to last for two days. A juri of gobar (about 8-10 kgs. wet or 3-4 kgs. dry) or a basta of leaves (about 5 kgs.) was considered sufficient to last for a day's cooking. Two respondents in Fonogram whose household members did not gather fuel were unable to do so in one case because both of the members (two widows) were out all day at work, and in the other because both of the parents worked and the children were too small to gather. These households spent 1-2 rupees a day on jute sticks or low grade coal.

All respondents in the three villages noted that it was not possible to gather fuel during the monsoon season, a seasonal dimension of rural poverty that does not seem to have been often noted (but see Jodha 1986: 1174, and Briscoe 1979). Gathering was not possible because leaves did not fall in this season, and cattle were kept in the homestead to protect both them and the paddy crop during the monsoon season. It was not the rich, who were the main owners of the cattle in the three villages that lost out here, as they still obtained dung from stall-fed cattle; rather, it was the poor who lost access to a vital resource. Poorer households were forced to store guti (dried cow dung made into cakes) gathered in the dry season, and also used jute sticks which were stored around the homestead or in the eaves of the roof of the house, for use during the monsoon. Making of guti was women's work. Labourers cutting and retting jute often received jute sticks, which were used as fuel, as part of their payment. Many of the respondent households reported purchasing of coal during the rainy season, and on average households spent one rupee a day on coal. It seemed likely that the new HYV boro paddy crop that was being grown in Fonogram and Bithigram would mean cattle being grazed in the village fields less during the boro season, which would further harm the poor who would not be able to either graze their cattle or gather cow dung during this season.

Respondents in the three villages also noted that collection of fuel was becoming progressively more difficult, which meant that households were occasionally having to buy small sacks of guti. As one Fonogram woman put it:

If we don't collect wood or leaves how will we cook? If there isn't any fuel we have to cut down on the amount we eat and buy a sack of guti that costs 10 or 12 rupees. We can't get any cow dung as cows aren't allowed out into the fields. There aren't any mango gardens in Fonogram, we have to cut wet wood and dry it. Wood is getting more and more scarce, and things will get worse.

This scarcity caused problems in particular for women and children, who were the main gatherers of fuel, but also increased stress on the household as a whole, as it had to divert money to buying fuel which had formerly been gathered for free. A similar decline in the natural resource base has been noted throughout India (for an overview, see Agarwal 1989a and b).

Despite the increasing scarcity, respondents in Fonogram or Keshipur did not mention restriction of access to fuel, as its collection was a traditional and unspoken 'right'. In Bithigram some restrictions did occur. The relative lack of bio-mass surrounding Bithigram was partly

compensated for by the government sponsored social forestry programme. Collection of fuel had been made much easier, as the eucalyptus groves planted under the programme were within easy walking distance from the villages. However, access to these groves was not assured. The percentage of poorest households which had planted trees was lower than for the whole village (42% as against 54%). Eight of the nineteen poorest respondents had planted trees. As might be expected, it was two households that had not planted trees that reported restricted access to this resource. Those other villagers who had not planted but were able to gather leaves had to negotiate this use in an informal manner with their fellow villagers. A study by Nesmith [1991] of the West Bengal Government social forestry programme in three villages near to those discussed here, examines in detail how the access of poor women to eucalyptus groves was restricted on a widespread basis. It was therefore not only declining resources, but also restricted access in some cases to these resources that meant the poor lost out.

Comments from wealthier Mahatos in Bithigram suggested that trees were a source of village class conflict. The Mahatos claimed that the Lodhas broke branches from eucalyptus trees owned by them, and on occasion stole trees. Who committed such thefts was often not substantiated, but was bound up with the class friction that existed between Lodhas and Mahatos, and also in keeping with the Lodhas having formerly been a 'criminal' tribe. It was still possible to hear comments from Mahatos about the Lodhas such as: "They have always been thieves and always will be." 'Theft' in this case was closely tied to specific definitions of property rights. The author also came across one example in Fonogram of a landless labourer cutting down the trees of one of the wealthiest villagers over night in revenge for what the labourer viewed as maltreatment. The importance of trees as savings for the poor has only recently been realized (see Chambers and Leach 1989). Research also needs to be carried out on how trees are a source of class conflict.

The findings presented here as to the importance of the natural resource base to poor people for fuel is supported by evidence from studies throughout the Bengal region. Rohner and Chaki-Sirkar [1988: 29-33], Warrier [1987: 26, 28] and Mayoux [1982: 168] report very similar findings from Purulia, Midnapore and Birbhum Districts of West Bengal. Howes and Jabbar [1986: 23] also mention that women and children spent 2-3 hours every day gathering fuel from a four location study in Mymensingh District, Bangladesh. Jodha's [1986] finding that poor households in 21 districts of seven states of dry western and southern India met 66-84% of their fuel requirements from CPRs is mirrored in the material from case study villages presented here.

'Wild' Foods and Other Common Property Resource Uses

'Wild' foods means here those foods consumed but not cultivated by poorest households. These were generally gathered from the sides of paths, ponds, swamps, and the 'jungle' or over grown areas that were found in patches around the villages and accessible forests. The author discussed with respondents questions about wild foods similar to those concerning fuel. In Fonogram 23 out of 25 respondents said that they gathered wild foods as a way of getting by in times of stress, and such foods were eaten regularly particularly during the monsoon season, when agricultural

employment was limited, and the price of rice was highest. Gathering was done whenever and wherever possible, a point stressed by several respondents. Some of the foods, for example kochu (probably *Colocasia indica*) stalks, were eaten all year.

During the four months of the rainy season (approximately June to September), when agricultural employment was limited, respondents said that one person could gather or catch daily one or part combinations of the following:

- 200 grams to 3 kgs. of various kinds of fish, e.g. puti (*Barbus sophora*), pekal (*Clarius batrachus*). The market price of these fish varied from 4-15 rupees a kg.;
- 200 grams of prawns (market price 30 rupees a kg.);
- 500 grams of jute leaves (not sold in the market);
- 1-2 kgs. of kochu stalk (not sold in the market);
- 5 kgs. of watercress (market price 2 rupees a kg.);
- 500 grams of shojne (a kind of horseradish, market price 8 rupees a kg.).

A number of authors [Crow 1984: 1756; Greenough 1982: 231; Currey 1981: 128; Rahaman 1981: 137] report the consumption of kochu by poor families in famine conditions in Bangladesh and Bengal. This plant was at the beginning of this century grown as a field crop (O' Malley 1914: 118 refers to it as kochu yam), but has since then been 'relegated' to a wild food in 24 Parganas.

There were limits to the amount of certain kinds of wild leaves that could be eaten because of their detrimental effect on the digestive system if consumed too often. Fried neem (*margosa*) leaves were also eaten. Figs were eaten all year round; however, figs were now being sold in the market when previously they had only been consumed within the village. On one point all respondents agreed, that the wild foods available locally were continuing to decline as more land was put to agricultural use, and the wild foods were either marketed or more villagers tried to collect them. The following comment was representative: "Ten years back all of the foods mentioned were found locally all around but now it's difficult to get them. We have to go a long way to get them now, going out in the morning and coming back at 4-5 in the evening."

Within Bithigram it was Lodha household members who made most use of wild foods. Wild foods were also more important to them than to the poorest in the other villages, signifying a cultural difference and the traditional importance of 'minor' forest products to tribals. Figure 1 gives the average amount of individual items that could be gathered in a day by one adult, although some, such as the monitor lizard and the tubers, could only be caught or dug up occasionally. The Figure also gives the monthly market price of bought rice for purposes of

comparison. Figure 1 shows that most of the foods were gathered in the pre-aman harvest period when seasonal factors combined to the disadvantage of the poorest, and the price of rice was highest.

Fish could be caught throughout the year, in ponds or the local canal. Every household except for one reported fishing, and Figure 1 gives a representative amount caught each day. Usually half of what was caught was eaten by the household and half sold. In the summer crabs sat in pools of water and were easy to collect. Local Santhal women sold red ant eggs which were used to catch fish at 25 paisa for 3-4 grams. Fishing was done mainly by men. Molluscs were available in large quantities on the sides of ponds.

Mohua (*Madhuka latifolia* or *Bassia latifolia*) had in the past been in plentiful supply but was now difficult to find in any large quantity. As one respondent said: "Before we used to get a lot more from the jungle, but the jotedars cut it all down, so not so much is available." Liquor was produced from it. The fruit was also boiled and eaten with spices like meat. The flower was dried in the sun, broken on a dheki, mixed with chira (flattened rice) or fried rice and made into a round sweet.

Various tubers and potatoes were dug up from the local forests by children, women and men, but were also becoming increasingly scarce. Some of these tubers were estimated to be 3-4 feet underground, so that it took a whole day to dig them out. Most respondents carried out this kind of collection. One respondent said that when rice was very scarce equivalent weights of khudro (a gourd, possibly *Coccinia cordifolia*) and rice were exchanged between farmers and Lodhas, which meant that the Lodhas received "much less than the market price." Honey could also be found "if you looked hard enough for it."

Hares, rabbits, tortoises and pigeons, cranes and other birds were also caught in the dry season. Hunting was done by men and children from most households. The monitor lizard, or goshap as it was known locally, the skin and meat of which was sold within Bithigram, was reported as common by O' Malley in the early 1900s [1911: 15]. O' Malley also noted a variety of wildlife in western Midnapore including deer and wild pig. He suggested (ibid.) that 'aboriginal tribes' were 'destroying indiscriminately' game, including partridges, quail, geese and ducks, a remark that reveals the colonial administrator's ignorance of the importance of such game to the subsistence of local tribals.

In Keshipur much less use was made of wild foods by poorest households. The main wild foods eaten were various kinds of fish, which were caught mainly in the rainy season, along with crabs and shrimp. Noteh shakh (a kind of spinach) was also gathered locally.

Keshipur respondents did make use of another CPR. In seven of the sixteen respondent households women went to the 'protected' local forests to gather sal leaves for plate-making, which were then sold to shops in town. These women said that they had to avoid the Forest Department guards who would stop them if they tried enter the forests, but continued to go regularly to the forests. The main period when it was possible to collect the leaves was in the

spring. Fallen leaves were gathered, carried home, dried, and sewn together with small twigs from the neem (Margosa) tree. These plates were sold in the market by the women themselves (who had to walk the 10 kms. there and back) on Sundays. For about 3-4 days work up to 10 rupees could be earned. The following comments from a female respondent were representative:

I go to get sal leaves from eight to three. I can only get a few leaves - do you think there are any leaves left in the forest? Before I could go and gather leaves all day long. We used to make plates with many more leaves than we can now. I go during the week, when I can, and sell the leaves on Sunday. I make about 6-8 rupees a week doing this, women who are a bit younger make a bit more.

This access by women from the Keshipur households can be contrasted to a lack of similar access by women from Lodha households from Bithigram. Women from Lodha households in Bithigram made it clear that they did not go to gather sal leaves as the Forest Department guards would beat them if they tried to do so. This lack of access was linked to two factors. The first was that tribals were often perceived by the Forest Department as destroyers of the forest, and as the Lodha's ethnic identity was obvious from their appearance it is probable that the forest guards not only stopped them entering the forest but also harassed them if they tried to do so. Secondly, the label with which the Lodhas had been branded by the colonial authorities - a criminal tribe - had remained until the present day, which meant that they remained a target for present day authorities, despite the efforts of the West Bengal government. The ethnic coherence noted above in relation to access to farmers' land for gleaning was of little use outside of the village when individual Lodha women were faced with threats from local forests guards.

Not mentioned above but collected in all three villages was fruit which fell from trees (especially mangoes in the summer, plums, and tamarind); these were collected in particular by children. However, respondents reported that these formerly free fruits were being increasingly sold in the market by the owners of the trees, hence increasing their scarcity. This increasing commoditization of formerly wild foods also meant increasing restrictions on the poor.

In Fonogram children from poorest households also collected snails to feed to poultry. Date palm leaves were left on the side of ponds with most of the leaf submerged, and the snails crawling onto the leaves could be gathered easily. Snails were also found all over the paddy fields after the monsoon rains. Poorest households also grazed their livestock either on fallow fields, on the aul dividing fields, or in ditches and by the sides of ponds, for four to six months of the year. One Fonogram household member said that in the rainy season up to 30 kgs. of grass could be collected from auls. In the Midnapore villages where livestock were more important to the village economies, much of the danga or higher infertile land was used for grazing, some of it all year round. All of these unspoken rights of the poor were under pressure from commercialization, and land increasingly being put to agricultural use, both modern day forms of the enclosure that cut off these rights in industrializing Britain.

The Value of CPRs to the Poor

E.P. Thompson was quoted above as referring to "....gleaning, access to fuel, and the tethering of stock in the lanes or on the stubble (making up)a dense cluster of claims and usages" which were of crucial importance to the subsistence of the poor. It has been demonstrated above that in contemporary West Bengal similar claims and usages are equally important to the subsistence of the modern poor. How much are these claims and usages worth in monetary terms?

Lodha respondents in Bithigram estimated that they gained the equivalent of 400 rupees a month from all CPR activities; they included in this figure the opportunity cost involved in gathering CPRs, as well as the market value of the CPRs themselves. Using this calculation, CPR activities provided more income per year for them than the six months agricultural wage labour they earned in an average year. A more conservative estimate of the value of CPRs from across the three villages, excluding the opportunity cost, would be 50-100 rupees worth of rice gleaned a year, 1 rupee a day worth of fuel gathered, and 1-2 rupees of wild food gathered a day. This gives a figure of between 780 and 1195 rupees a year. Given that on average total household income from all formal sources (including market transactions) for a respondent household was some 4,000 rupees a year, collection of CPRs was worth between approximately 19% and 29% per cent of the household's income. This accords roughly with Jodha's survey from western and central India which concluded [1990: A66]: 'CPR products collection is an important source of employment and income, especially during the period when other opportunities are non-existent. Furthermore, CPR income....accounts for 14 to 23 per cent of household income from all other sources in the study villages'. It is unfortunate, given this importance of CPRs to the poor in West Bengal, that the literature on CPRs has largely ignored the State.

Conclusions

It is possible to draw three inter-related conclusions from the data presented above. Firstly, despite the lack of local 'common' land found in other parts of India, CPRs in West Bengal are vital to the subsistence of poorest households in two quite different agro-ecological regions, and CPR related activities take up a substantial part of poor people's, and particularly children and women's, time. An informal economy operates within the village, run mainly by women, that is largely invisible to economists and planners (or, as Thompson put it, the 'historian of economic growth'), but vital from the perspective of the poor. It is perhaps because it is mainly the work of women and important to the poor that CPR use appears to have been largely ignored by policy makers, who are generally out of tune with the perspective of such groups.

Secondly, the most important CPRs for the poor in the densely populated deltaic regions of West Bengal and Bangladesh are not the grazing lands so important in western and south western India but plants, fuel, fish and gleaned grains, even though grazing lands remain somewhat more important in semi-lateritic Midnapore than in north 24 Parganas. Access to CPRs is decreasing in both of the study regions because of increasing agricultural development, commoditization of formerly open access natural resources, and increases in the numbers dependent on CPRs. The

situation in the study regions would appear to fit within a wider pattern throughout India. The declining access to CPRs in West Bengal is likely to have a grave effect on the quality of life of the poor. Protecting the 'invisible' CPRs in West Bengal may prove more difficult than protecting the more visible grazing lands in other parts of India.

Thirdly, class conflict over CPR access has been largely ignored, mainly because, once again, the perspective of the poor is usually not taken into account when CPRs are discussed. Conflict over this access takes its place in the overall class friction, struggle or bargaining between poor and rich over the distribution of village resources and village ideology. From the above analysis it is possible to divide CPR access in West Bengal into two types; firstly CPRs such as fuel or wild foods that are at present gathered for the most part without restrictions but on which restrictions are likely in the future because of increasing scarcity and commoditization; and secondly CPRs such as gleaned grains and minor forest products the access of certain groups to which is presently restricted, and on which restrictions are likely to increase as well. Further agricultural development and commoditization of the economy, making further 'encroachment' into what the poor see as common rights, is also likely to increase class conflict over access to CPRs in West Bengal.

The discussion above also shows that an analysis of CPR use based on availability or type, or on differential access by different classes, may be simplistic. For example, in the two adjacent villages of Bithigram and Keshipur one group of the poorest were enthusiastic gleaners and the others were not permitted access to post-harvest fields, while the same two groups faced an opposite situation when it came to the collection of sal leaves. Respondents in each of the villages were angry that their access to these resources was restricted by the rich or the government, and declining in front of their eyes. Their anger was an expression of the denial by landowners to their traditional 'right' to such free produce, an anger that is similar to that expressed by the poor in nineteenth century Britain, facing much the same circumstances. This anger was both an expression of the denial of common rights and a way of persuading the rich that such rights should be maintained. Access to CPRs not only contributed substantially to household subsistence, but also meant less dependence on the rich for loans or other kinds of support. The combination of class and patriarchal structures meant that it was poorest women who faced restrictions and antagonism while trying to gain access to CPRs, and these petty restrictions were integral to their experience of poverty and lack of power. Again, this is a pattern repeated from industrializing Britain.

Much debate on class has ignored what is important to poor people in terms of class conflict. This is a subject on which there is much to learn from Marxist analyses of nineteenth century British history which have concentrated on class and natural resource use from the viewpoint of the poor, as well as trying to understand the strengths of the poor. Outsiders formulating anti-poverty programmes today can learn from poor villagers how they bargain, negotiate or struggle for local resources, and support these indigenous attempts to share village resources more equally by building on poor people's strengths and abilities. From this perspective, the poor will be considered active participants in the making of their societies, rather than as passive

recipients of government or elite charity. If development schemes and government programmes are to support poor people in their struggles against the worst excesses of market reforms, which are likely to become more prevalent in India in the 1990s, they should understand the history of restrictions on access to village resources. In this context, supporting poor people's organizations, such as that among the Lodhas of Bithigram, may be the best way of helping to defend the unspoken customary rights of the poor against what Marx termed the 'rapacity of the rich'. Policies such as land redistribution or building agricultural labourer unions are also likely to increase the bargaining power of the poor in other areas that are crucial to their subsistence, such as access to CPRs. It is noteworthy that the Left Front Government had been successful in supporting poor people's struggles in only one of the three study villages, and in a village where the poor had already taken considerable steps towards self-organization.

Bibliography

Agarwal, A. and Narain, S. (1989): *Towards Green Villages: A Strategy for Environmentally-Sound and Participatory Rural Development*. Delhi, Centre for Science and Environment.

Agarwal, B. (1989a): *Social Security and the Family in Rural India*. LSE, University of London, Development Economics Research Programme, paper no. 21

Agarwal, B. (1989b): *Rural Women, Poverty and Natural Resources: Sustenance, Sustainability and Struggle for Change*. *Economic and Political Weekly* 24 (43), WS46-65

Bandyopadhyay, S. and D. Von Eschen (1988) *Villager Failure to Co-operate: Som Evidence From West Bengal, India*. In D. Attwood, D. and B. S. Baviskar (Eds.), *Who Shares? Co-operatives and Rural Development*. Delhi: Oxford University Press, 112-145.

Beck, T. (1991): *Power and poverty: survival of the poorest in three villages of West Bengal, India*. PhD., University of London (published as *The Experience of Poverty: fighting for respect and resources in village India*, London: Intermediate Technology Press, 1994).

Begum, A. (1985): *Women and technology in rice processing in Bangladesh*. In *Women in Rice Farming* Gower, IRRI, 221-241

Berkes, F. (1989)(ed): *Common Property Resources: Ecology and Community-Based Sustainable Development* London, UK, Bellhaven.

Berkes, F. et al (1989): *The benefits of the commons*. *Nature* 340 (13), 91-93

Bhagavan, M. and Giriappa, S. (1987): *Class Character of Rural Energy Crisis: Case of Karnataka*. *Economic and Political Weekly* 22 (26), A-57 - A-69

- Bhowmick, P. (1963): The Lodhas of West Bengal. A Socio-Economic Study Calcutta, Punthi Pustak.
- Blaikie, P. (1985): The Political Economy of Soil Erosion in Developing Countries London, Longman
- Briscoe, J. (1979): Energy use and social structure in a Bangladesh village. *Population and Development Review* (12), 615-641
- Cain, M. (1977): The economic activities of children in a village in Bangladesh. *Population and Development Review* 3 (3), 201-228
- Chambers, R. and Leach, M. (1989): Trees as Savings and Security for the Rural Poor. *World Development* 17 (3), 329-342
- Chambers, R. Saxena, N.C. and Shah, S. (1989): To the hands of the poor. Water and Trees London, Intermediate Technology Publications
- Crow, B. (1984): Warning of famine in Bangladesh. *Economic and Political Weekly* 19(40), 1754-58
- Currey, B. (1981): The famine syndrome: its definition for relief and rehabilitation. In Robson, J. (ed.) *Famine, Its Causes, Effects and Management*. London, Gordon and Breach, 123-134
- Dasgupta, M. (1987): Informal Security Mechanisms and Population Retention in Rural India. *Economic Development and Cultural Change* 36 (1), 101-120
- Davis, M. (1983): Rank and rivalry: The politics of inequality in rural West Bengal Cambridge, Cambridge University Press
- Greenough, P. (1982): Prosperity and Misery in Modern Bengal: The Famine of 1943-1944 New York, Oxford University Press
- Guha, R. (1985): Forestry and Social Protest in British Kumaun, c. 1893-1921. In Guha, R. (ed.) *Subaltern Studies IV: Writings on South Asian History and Society* New Delhi, Oxford University Press
- Hossain, M. (1987): The assault that failed: A profile of absolute poverty in six villages of Bangladesh Geneva, UNRISD
- Howes, M. (1985): Whose Water? An Investigation of the Consequences of Alternative Approaches to the Small-Scale Irrigation in Bangladesh Dhaka, BIDS

- Howes, M. and Jabbar, M. (1986): Rural fuel shortages in Bangladesh: the evidence from four villages. IDS Discussion Paper 213, University of Sussex
- Jeffery, R., Jeffery, P. and Lyon, A. (1989): Taking Dung-Work Seriously: Women's Work and Rural Development in North India. *Economic and Political Weekly* 24 (17), 32-36
- Jodha, N.S. (1990): Rural Common Property Resources: Contributions and Crisis. *Economic and Political Weekly* 25 (26), A65-A78
- Jodha, N.S. (1986): Common Property Resources and Rural Poor in Dry Regions of India. *Economic and Political Weekly* 21 (27), 1169-1181
- Kelly, K. (1985): Agricultural revolution in a third world economy. A nineteenth century Indian case study Delhi, Discovery
- Kohli, A., (1987): The state and poverty in India Cambridge: Cambridge University Press,
- Leakey, C. (1986): Biomass, Man and Seasonality in the Tropics. In *Seasonality and Poverty*. IDS Bulletin 17 (3), 36-43
- Malhotra, K.C. and Gadgil, M. (1988): Coping with uncertainty in food supply: case studies among the pastoral and non-pastoral nomads of western India. In De Garine, I. and Harrison, G. (eds.) *Coping with Uncertainty in Food Supply* Oxford, Oxford Science Publications, Clarendon, 379-404
- Mayoux, L. (1982): Women's work and economic power in the family: A study of two villages in West Bengal. PhD, University of Cambridge, unpublished
- McLellan, D. (1977): Karl Marx: Selected Writings Oxford, Oxford University Press
- Morgan, D.H. (1982): The place of harvesters in nineteenth-century village life. In Samuel (ed.), 27-72
- Morris, B. (1982): *Forest Traders. A Socio-Economic Study of the Hill Pandaram* New Jersey, Athlone Press
- Nesmith, C. A. (1991): Gender, Trees and Fuel: Social Forestry in West Bengal, India. *Human Organization* 50 (4): 337-348
- Nesmith, C. A. (1990): People and trees: gender relations and participation in social forestry in West Bengal, India. PhD, University of Cambridge, unpublished
- O'Malley, L.S.S. (1914): *Bengal District Gazetteers: 24 Parganas Calcutta*, Bengal Secretariat Book Depot

- O'Malley, L.S.S. (1911): Bengal District Gazetteers: Midnapore Calcutta, Bengal Secretariat Book Depot
- OFI (1991) Arnold, J. and Stewart, W. Common Property Resource Management in India. Oxford Forestry Institute, University of Oxford, Tropical Forestry Papers 24
- Rahaman, M. (1981): The causes and effects of famine in the rural population. In Robson, J. (ed.) *Famine: its causes and management* London, Gordon and Breach, 135-138
- Rohner, R. and Chaki-Sircar, M. (1988): *Women and Children in a Bengali Village* Hanover, University Press of New England
- Runge, C.F. (1986): Common Property and Collective Action in Economic Development. *World Development* 14 (5), 623-635
- Sadeque, S. (1990): Capture fisheries and other common property resources in the flood plains of Bangladesh. Paper presented at the 2nd workshop of European Network of Bangladesh Studies, Bath, U.K.
- Samuel, R. (ed.)(1982, 1st ed. 1975): *Village Life and Labour* London, Routledge and Kegan Paul
- Scott, J.C. (1985): *Weapons of the weak: Everyday forms of peasant resistance in Southeast Asia*. New Haven, Yale University Press
- Sengupta, S. with Ghosh, M. G. (1978): State intervention in the vulnerable food economy of India and the problem of the rural poor. Paper for workshop on problems of public distribution of foodgrain in Eastern India, mimeo
- Shah, T. (1987): Gains from Social Forestry: Lessons from West Bengal. Paper given at a workshop on 'Commons, Wastelands, Trees and the Poor: Finding the Right Fit', IDS, University of Sussex, U.K.
- Siddiqui, K. (1982): The political economy of rural poverty in Bangladesh Dhaka, National Institute of Local Government
- Singh, K. and Bhattacharjee (1991): Privatization of Common Pool Resources of Land: A Case Study in West Bengal. Institute of Rural Management Anand IRMA Case Study 6
- Thompson, E.P. (1990): *Whigs and Hunters. The origins of the Black Act* Harmondsworth, Penguin

Thompson, E.P. (1986, 1st ed. 1963): The making of the English working class Harmondsworth, Penguin

Tindall, H.D. (1983): Vegetables in the Tropics London, Macmillan

Wade, R. : Village Republics: Economic conditions for collective action in south India
Cambridge, Cambridge University Press

Warrier, S. (1987): Daughter Disfavour, Women, Work and Autonomy in Rural West Bengal.
Paper for Differential Female Health Care Workshop, Dhaka, mimeo

Webster, N.(1989): Agrarian Relations in Burdwan District, West Bengal. From the Economics
of the Green Revolution to the Politics of Panchayati Raj Copenhagen: Centre for Development
Research, Working Paper 89.2

C. Bibliography

This section provides a list of selected annotated/abstracted references related to the study of common property that might be of interest to CBNRM researchers. The source of the annotation follows each entry. See p. C-31 for the full references to Leblanc, Messerschmidt, and Tepper's annotated bibliographies, from which many abstracts were taken.

IASCP Bibliographies:

Hess, Charlotte. 1996. **Common Pool Resources and Collective Action: A Bibliography**. Volume 3. Bloomington, Indiana. International Association for the Study of Common Property (IASCP). Indiana University, Workshop in Political Theory and Policy Analysis.

Martin, Fenton. 1993. **Common Pool Resources and Collective Action: A Bibliography**. Volume 2. Bloomington, Indiana. International Association for the Study of Common Property (IASCP). Indiana University, Workshop in Political Theory and Policy Analysis.

Martin, Fenton. 1989. **Common Pool Resources and Collective Action: A Bibliography**. Volume 1. Bloomington, Indiana. International Association for the Study of Common Property (IASCP). Indiana University, Workshop in Political Theory and Policy Analysis.

Note: These three volumes, along with an additional 9,000 citations, are included in IASCP's recently completed *Comprehensive Bibliography of Common Pool Resources*, a database which is available both on CD-ROM and from their website at <http://www.indiana.edu/~iascp/aboutcprbib.html>

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1. Acharya, H.P. 1989. **Jirel Property Arrangements and the Management of Forest Resources in Highland Nepal**. Development Anthropology Network 7(2):16-25. Institute for Development Anthropology. Binghamton, USA.

Abstract: The author examines the major aspects of property arrangements in and around the Jiri river valley in Dolakha District and the impact of these arrangements on forest and pasture management. In Jiri, property rights to wood and fodder are very complex and cannot be well comprehended by lumping them grossly as 'forests' and 'pastures', or as 'communal', 'private' or 'state property'. Not only are additional forms of ownership (e.g. joint and cooperative) widespread but rights differ according to the

particular resource, kinship, residence, purpose, previous use and season. The author describes the influence of government rules and acts, the joint ownership system and usufruct rights, symbolic methods of protection, the management of conflicts, property arrangements in the neighbourhood and some policy implications. Even with increased external pressures, the Jirel people have maintained a balance between the use of wood and its sustainable availability in the forest. The diversified and differentiated property arrangements practised by the Jirel people have positive effects on use, availability, distribution and conflicts associated with forest and pasture resources and should be supported and strengthened. (Messerschmidt et al, 1993)

2. Acheson, J.M. 1988. **The Lobster Gangs of Maine**. University Press of New England, Hanover, and London.

Notes: A classic work, in which an anthropologist describes the working world of lobstermen in Maine, focusing on how local resource management schemes have contributed to the overall sustainability of the local lobster fishing industry over the past several decades. In the US, marine resources belong to all citizens but are controlled by state governments as a public trust. Government has found it difficult, however, to control access to common property marine resources such as the lobster fishery. Nevertheless, some local groups of users are able to restrict access on their own, relying on a system of traditional fishing rights in which lobster fishermen must be accepted by the community in order to gain the right to fish. Once accepted, a lobsterman is only allowed to fish in the territory held by the community, and interlopers are usually discouraged through violence. The author found that lobstermen fishing in these exclusive territories caught more and better-sized lobsters with less work than those fishing in less-protected areas.

3. Adger, W. Neil; Kelly, Mick; Ninh, Nguyen Huu; Thanh, Ngo Cam. 1997. **Property Rights and The Social Incidence of Mangrove Conversion in Vietnam**. Centre for Social and Economic Research on the Global Environment. CSERGE Working Paper GEC 97-21. London, UK.

Abstract: The distribution of economic benefits from wetlands is fundamentally determined by ownership and control of resources, and hence the property rights and institutional setting of analysis is critical in determining the ecological sustainability of management practices. In the last decade it has been recognized that wetlands, in common with many coastal resources can, given certain circumstances, be sustainably managed under common property regimes. Conversion to private or state property does not necessarily enhance sustainability, and in fact often precipitates the incentives for unsustainable management. This occurs when the conversion process changes the parameters of common property management such as the location of beneficiaries; the equitable distribution of benefits; and the reliance on the sustainable

resource within the livelihood system. The paper discusses the significance of the recent advances in the understanding of common property resource management in the context of external changes in management, for example through state appropriation or privatization. Inequality and the diversity of income sources from private and communally managed resources are important factors in determining whether transactions costs can be reduced and hence whether common property resources can be effectively managed. A case study is presented to examine whether privatization of common property resources impacts on equality within the general population of resource users and non-users, and the impact of changes in equality on the common property resource management. This is centered on mangrove conversion for private agriculture and aquaculture in Quang Ninh Province, northern Vietnam. Land conversion creates a diversity of impacts and livelihood strategies. The results focus on the impact of changing state, private and communal property rights on the identified stakeholders. An appraisal of the incidence of costs and benefits of conversion is undertaken, demonstrating that state intervention for efficiency objectives can only be justified if both the environmental externalities and the distributional consequences of conversion are ignored. (authors)

4. Agarwal, Bina. 1997. **Editorial: Re-Sounding the Alert - Gender Resources and Community Action.** World Development. Vol. 25(9):1373-1380.

Abstract: The author argues that despite a call over the past two decades for a more gender-sensitive approach to development analysis, gender continues to be viewed as a "special interest" issue whose incorporation into projects and programs has been piecemeal at best. She offers an examination of two major resource-related issues—community participation in resource management and the allotment of land under agrarian reform schemes—to show how women continue to be virtually excluded from new strategies for community development. She asserts that biases which favour males still persist when it comes to deciding who gets what resources, who participates in what, and who has the decision-making powers over communal resources. (author adapted)

5. Agrawal, A. 1997. **Forest Management Under Common Property Regimes in the Kumaon Himalaya.** In *People and Participation in Sustainable Development*. G. Shivakoti et al (eds.). Proceedings of an International Conference held at the Institute of Agriculture and Animal Science, Rampur, Chitwan, Nepal, 17-21 March 1996. Bloomington, Indiana and Rampur, Chitwan.

Abstract: This paper explores local level forest use and management in the Kumaon Himalaya. It seeks to situate the ongoing research on forest resource use in the Kumaon Himalaya in the context of a larger conversation on common property use and management in mountain regions. More specifically, it examines why it is necessary to

look at communities as relevant units of social organization for understanding resource use; the need to analyze the effects on resource use of stratification and differences within communities; and the importance of subjecting concepts such as "community", "local", and "indigenous" to further reflection and refinement. (author)

6. Anderson, E.N. 1990. **Religious Representation of Common Property Management**. Paper presented at First Conference of the International Association for the Study of Common Property (IASCP). Duke University, Durham, NC.

Notes: Scientists and economists have consistently undervalued the power that religion can play in promoting patterns of resource conservation. Even adopting the most parochial definition of religion possible, many examples of conservation based in religious principles are available. In China large groves of trees have been preserved because of the spirits that inhabit them. Religion taps our most base emotional concerns for society, safety and autonomy while simultaneously coding ecological information in a manner that is easy to retrieve. Clearly, religion alone is an insufficient force of preservation. History has shown that strong material needs, ideologies such as communism and capitalism, and modernization have all overwhelmed the influence of religion. In addition, religion itself has been changed over time so it no longer contains the ecological focus it once had. Today religion can still play an important role in motivating individuals with good intentions to act. One of the greatest forces humans possess are emotions. Emotions in fact are often strong enough to override any semblance of rationality. Religion has the responsibility of tapping and controlling these emotions for the purpose of resource conservation. (Tepper, 1991)

7. Arnold, J.E.M., and Stewart, W.C. 1989. **Common Property Resource Management in India**. Tropical Forestry Papers No. 24. Oxford Forestry Institute, University of Oxford, Department of Plant Sciences.

Abstract: The authors review the state-of-knowledge regarding CPRM in India, based on published and unpublished sources and discussions with researchers. In the 19th century, up to two-thirds of the land in India was under community control, but privatization and government appropriation have reduced this share. Many traditional and indigenous forms of CPRM have weakened or collapsed. The condition of remaining CPRs, factors influencing the value of CPRs, institutional requisites for CPRM and some promising approaches are reviewed. The authors conclude that, despite the erosion of CPRs and CPRM regimes, they still play a very important role in agricultural systems and in the livelihoods of the poor. In order to make progress towards sustainable CPRM it will be necessary to give high priority to correcting policy, legal anomalies and weaknesses which undermine CPRM arrangements or which encourage further privatization. (Messerschmidt et al, 1993)

8. Ascher, William. 1995. **Communities and Sustainable Forestry in Developing Countries**. San Francisco: ICS Press.

Notes: Who has the right to exploit forest products? Why have reforestation efforts fallen short? As the pressure on forest resources increases, so does the importance of answering these questions. Through case studies and design principles, Ascher demonstrates that local users are the most appropriate managers of forest resources because they have a vested interest in the forest's long-term sustainability. (publisher)

9. Attwater, Roger. 1997. **Process, Property and Patrons: Land Reform in Upland Thai Catchments**. Gatekeeper Series No. SA69. International Institute for Environment and Development.

Abstract: This paper presents a case study of an upland catchment in Thailand which is currently undergoing land reform. It describes how soft systems methodology can identify and stimulate collaborative property arrangements between villagers, government agencies and commercial interests. A number of collaborative actions have developed as a result, and include local collective management of a water supply; partnerships relating to elements of conservation and production within the local agroecosystems; and socially legitimate patronage to support formal protocols of land reform. The success of these collaborative arrangements lies partly in the fact that entitlements and management were developed within existing social and bureaucratic conventions. (author)

10. Baker, J. Mark. 1997. **Common Property Resource Theory and the *Kuhl* Irrigation Systems of Himachal Pradesh, India**. Human Organization, Vol. 56, No. 2.

Abstract: This article analyses the differential stresses of increasing nonfarm employment on 39 gravity flow irrigation systems (*kuhls*) in Himachal Pradesh, India. By fragmenting common dependence on agriculture, increasing nonfarm employment has created stresses within *kuhl* regimes which manifest as declining participation, increased conflict, and the declining legitimacy of customary rules and authority structures. However, these effects are not evenly distributed across all *kuhl* regimes. To explain how and why some *kuhl* regimes have persisted without changing, why most have transformed and endure, and why a few have collapsed and are now managed by the state irrigation department, the author uses insights from current theories of common property resource systems to guide the development of an inductively derived explanatory framework. The author demonstrates how the relative degree of differentiation of the regime members and the extent of members' reliance on *kuhl* water interact to influence the degree and nature of stress on *kuhl* regimes resulting

from nonfarm employment, the nature of the regime's response to stress, and the efficacy of the responses. The framework accounts for the temporal and spatial variation of *kuhl* regimes in their degree of role specialization and organizational formalization, and the extent of state involvement in *kuhl* management. (publisher)

11. Baland, Jean-Marie and Platteau, Jean-Philippe. 1994. **Should Common Property Resources be Privatized? A Re-Examination of the Tragedy of the Commons**. Cahiers de la Faculté des Sciences Economiques et Sociales, No. 143. Faculté des Sciences Economiques et Sociales, Facultés Universitaire Notre-Dame de la Paix, Namur, Belgium.
12. Baland, Jean-Marie and Platteau, Jean-Philippe. 1996. **Halting Degradation of Natural Resources: Is there a Role for Rural Communities?** Oxford: Food and Agriculture Organization and Clarendon Press.

Abstract: The book is in two parts. Part I deals with the analytical propositions of economic theory, and game theory in particular, while Part II reviews lessons learned from several decades of socio-anthropological, empirical research on local-level natural resource management. The authors are motivated by the twofold conviction that too many economic theorists have ignored the findings of empirical research and "therefore remain unable to make a valid judgement on the empirical relevance of their analytical propositions" (p.1), while applied researchers often fail to draw on theory in order to more precisely specify the problem and more rigorously formulate hypotheses to be tested. The basic premise of the book is to bridge this gap between theoretical and empirical research in the study of natural resource management, and to take stock of their combined achievements to date. This book is an attempt to bridge the gap between the enormous amount of empirical literature documenting efforts at managing local-level resources and the quickly growing body of theoretical knowledge dealing with natural resource management. By building a unifying framework, the authors aim to better define the conditions of success or failure of various forms of resource management at the village level. Contrary to a common view, according to which mismanagement of such resources is to be ascribed to direct users falling prey to "the tragedy of the commons", they convincingly argue that there are other important potential explanations, such as lack of awareness about ecological effects of human activities, poverty and heavy discounting of future income streams, uncertainty over future property rights and prices of natural products, and availability of more attractive income opportunities. Moreover, even when mismanagement practices obviously result from strategic interactions among users, many anthropological writings have pointed at crucial aspects that are bypassed by the characterization in terms of the classical Prisoner's Dilemma. (Review in *The Journal of Development Studies*. Vol. 33, No.6. Oxford University Press.)

13. Baland, Jean-Marie and Platteau, Jean-Philippe. 1997. **Wealth Inequality and Efficiency in the Commons: The Unregulated Case.** Oxford Economic Papers 49: 451-482.
14. Beck, Tony and Cathy Nesmith. 1999. **Building on poor people's capacities: the case of common property resources in India and West Africa.** Paper presented at a World Bank Conference on "Poverty, environment, growth linkages" Washington DC, 24-25th March 1999

Abstract: This paper examines the relation between poor women and men and common property resources (cprs) from a number of different perspectives. It identifies cprs as a crucial element of poor people's coping and adaptive strategies, and locates poor people's use of cprs within a wider focus on sustainable livelihoods, which argues that development initiatives need to build on poor people's assets and strengths. It considers evidence from India and West Africa with a particular focus on poverty reduction, equity, gender and management issues. The paper discusses the potential of different policy and project interventions in terms of their likely support of poor people's access to cprs. And it offers suggestions for future research on poor people and cprs. Development agencies and governments which have re-focused their attention on poverty in recent years will find that cprs provide an entry point to understanding poor people's perceptions of poverty and for building on poor people's capacities. (authors)

15. Berkes, F. 1986. **Local-level Management and the Commons Problem: A Comparative Study of Turkish Coastal Fisheries.** Marine Policy 10:215-229.
16. Berkes, Fikret. 1989. **Common Property Resources: Ecology and Community-Based Sustainable Development.** London: Belhaven Press.

Notes: This is a classic, wide-ranging survey of the role and importance of natural resources held in common ownership and the issues raised by their conservation as a key element of sustainable economic development. Theoretical problems and case studies are presented by several authors. (Messerschmidt et al, 1993)

Contents: 1- Introduction and Overview. PART 1 PERSPECTIVES ON THE COMMONS DEBATE: 2- Institutional Arrangements for Management of Rural Resources: Common Property Regimes; 3- Natural Resources: Access, Rights-to-Use and Management; 4- The Evolution of Appropriate Resource Management Systems; 5- Cooperation from the Perspective of Human Ecology. PART 2 CRITIQUE OF CONVENTIONAL RESOURCE MANAGEMENT SCIENCE: 6- Graphs and Gaffs: A Cautionary Tale in the Common Property Resources Debate; 7- Reforming the Use of Natural Resources; 8- Multi-Jurisdictional Resources: Testing a Typology for Problem

Structuring; 9- Meeting Environmental Concerns Caused by Common Property Mismanagement in Economic Development Projects. PART 3 SINGLE RESOURCE CASE STUDIES: 10- Solving the Common Property Dilemma: Village Fisheries Rights in Japanese Coastal Waters; 11- The Evolution of Mexico's Spiny Lobster Fishery; 12- Where Have All the Exploiters Gone? Co-management of the Maine Lobster Industry; 13- Water as Common Property: The Case of Irrigation Water Rights in the Philippines. PART 4 MULTIPLE-RESOURCE CASES AND INTEGRATED DEVELOPMENT: 14- On the Diversification of Common Property Resource Use by Indian Society; 15- Changes Taking Place in Common Property Resource Management in the Inland Niger Delta of Mali; 16- Traditional Resource Management in the Melanesian South Pacific: A Development Dilemma.

17. Blaikie, Piers M., and Brookfield, Harold C. 1987. **Common Property Resources and Degradation World-Wide.** In Blaikie, P., and Brookfield, H. (eds.), *Land Degradation and Society*. Pp. 186-196. London: Methuen.

Abstract: The authors describe how and why CPRs are particularly vulnerable to degradation. The paper provides a definition of CPRs and describes a framework which links resources to management. Social interaction between users and outcomes in terms of maintenance or degradation of resources, relations between private and common lands and the role of the state are discussed. Changes in CPR decision-making and management are analysed as well. (Messerschmidt et al, 1993)

18. Blair, Harry W. 1996. **Democracy, Equity and Common Property Resource Management in the Indian Subcontinent.** *Development and Change*, Vol. 27: 475-499.

Abstract: This article addresses the relationship between democracy, equity and common property resource management in South Asia, both at the national and at the local level. Its substantive focus is largely on forests, and its geographical concentration mostly on India, although other sectors (primarily water) and areas (Nepal and Bangladesh) are also included. The article opens by looking at Garrett Hardin's (1968) three strategies to preserve the commons. It finds that democratic politics is compatible with both privatization and centralization as conserving strategies (although not necessarily successful). With the third approach—local control—democracy has at best a problematic relationship, for where governmental units are the relevant actors, there tends to be more interest in consuming than in conserving or preserving resources at the local level. Local users groups, however, do much better at common property resource management, because they can restrict membership and thus avoid free riders, and they can establish a close linkage in their members' minds between benefits and costs of participating in group discipline to maintain the resource. (author)

19. Blomquist, William; Schlager, Edella; Tang, S.Y. 1991. **All CPRs are not Created Equal: Two Important Physical Characteristics and their Relation to the Resolution of Commons Dilemmas.** Paper presented at the Meeting of the International Association for the Study of Common Property (IASCP) Conference. University of Manitoba, Winnipeg, MN. Canada, 26-30 September.

Abstract: Policy prescriptions offered in the now-voluminous literature on common-pool resources (CPRs) frequently focus upon the strategic situation of resource users, paying relatively less attention (or none at all) to the characteristics of the common-pool resources themselves. In short, most contributions to the policy literature presume that all CPRs are alike. Based on our reconsideration of the strategic situations users face, and our empirical observation of three kinds of CPRs—fisheries, irrigation systems, and groundwater basins—we conclude that two physical characteristics of CPRs have vital implications for the likelihood of successful resolution of difficulties over resource use, and for the types of resolutions users develop. Those physical characteristics are the degree of stationarity of flow units and the existence of storage capacity. Speaking generally, fisheries are CPRs with fugitive flow units and without storage capacity, irrigation systems have fugitive flow units but possible availability of storage, and groundwater basins have relatively stationary flow units and storage capacity. Using comparisons among these types of CPRs, we analyze the effects of these physical characteristics upon the prospects for the emergence of successful cooperation in resource use. (authors)

20. Bromley, D.W. 1986. **On Common Property Regimes.** A paper presented at the ICIMOD/EARP/AKRSP workshop on Institutional Development for Local Management of Rural Resources, Gilgit, Pakistan. International Centre for Integrated Mountain Development, Kathmandu, Nepal.

Abstract: The author establishes the basic terms and concepts essential for discussing CPRM systems. For collective goods, those provided by groups for their own benefit, management systems require not only appropriate institutional arrangements (property rights) but also organizational arrangements (group management structures) which, together, create the common property regimes. The functions of CPR regimes are discussed, including defining who is a member of the group and how decisions are made. Four criteria for success of CPR regimes are recognized: (1) the degree to which views on outcomes and equity are shared by members; (2) the amount of effort expended to achieve compliance; (3) the capacity to cope collectively with unexpected perturbations in the short run; and (4) the capacity to adjust to new scarcities, problems and priorities over the long run. (Messerschmidt et al, 1993)

21. Bromley, D. W., and Cernea, M.M. 1989. **The Management of Common Property Natural Resources: Some Conceptual and Operational Fallacies.** World Bank Discussion Paper No. 57. Washington, DC.
22. Bromley, D. W. 1990. **The Commons, Property and Common Property Regimes.** Paper presented at the First International Association for the Study of Common Property (IASCP) Conference, Durham, NC.

Notes: Scholars and policy makers alike have repeatedly confused and misused the terms *commons*, *common property* and *common property resources*. Properly defined, *property* is not an object, but a benefit stream that defines an individual in relation to something of value. *Common property* refers simply to one of several existing authority structures that utilize a resource. The author describes the four main authority regimes used to control property rights to natural resources: state property, individual property, common property, and open access. He concludes that common property regimes are widely used and often successful methods of using common resources. Often, problems attributed to common property are, in fact, open access situations and should be treated as such. (adapted from Tepper, 1991)

23. Bromley, Daniel W., et al. (eds.). 1992. **Making the Commons Work: Theory, Practice, and Policy.** San Francisco: ICS Press.

Notes: This volume demonstrates the ability of disparate communities to use common property effectively and sustainably, without the need for privatization or state intervention. First, the concepts underlying the collective management of common property are introduced. Then case studies from around the world demonstrate how collective systems function under diverse conditions with reasonable success. Implications for further research and for effective policy formulation are also explored. (Leblanc, 1994)

Contents: PART 1 COMMON PROPERTY AS AN INSTITUTION: 1. The Commons, Property, and Common-Property Regimes; 2. Common Property and Collective Action in Economic Development; 3. Analysing the Commons: A Framework. PART 2 CASE STUDIES OF COMMON PROPERTY REGIMES: 4. Management of Traditional Commons Lands (*Iriaichi*) in Japan; 5. Commonfield Agriculture: The Andes and Medieval England Compared; 6. Institutional Dynamics: The Evolution and Dissolution of Common-Property Resource Management; 7. Success and Failure in Marine Coastal Fisheries of Turkey; 8. Sea Tenure in Bahia, Brazil; 9. Common-Property Resource Management in South Indian Villages; 10. Oukaïmedene, Morocco: A High Mountain *Agdal*; 11. The Management and Use of Common-Property Resources in Tamil Nadu, India. PART 3 TOWARD A THEORY OF THE COMMONS: 12. Where Do We Go

From Here? Implications for the Research Agenda; 13. The Rudiments of a Theory of the Origins, Survival, and Performance of Common-Property Institutions.

24. Brox, O. 1990. **The Common Property Theory: Epistemological Status and Analytical Utility.** Human Organization Vol. 49:3.

Notes: The common property theorem expounded originally by Hardin and a few others has caused an enormous and divisive argument among academics. Economists hold fast to the mathematical and logical reality of CPT while social scientists and anthropologists dismiss it as an invalidated hypothesis. The tremendous amount of literature today shows that while Hardin et al. did not provide a complete and irrevocable idea, it cannot be dismissed out of hand. In order to resolve some of the present debate and provide grounds for helpful discussion an epistemological analysis is required of CPT. The results indicate that while it is not a truth, it can be an important analytical tool. It should be used to ask questions and open our eyes to factors we have not seen before. A presentation of work in North Norway illustrates how this is possible. A possible risk to consider is the theory also works to blind an individual to possible benefits of the commons. Results of the case study indicate that the problems of the commons are (a) how to maintain open access; (b) keep the aggregate level of exploitation down; and (c) avoid dissipation of the resource rent through zero-sum competition. (Tepper, 1991)

25. Buck, S.J. 1989. **Multi-Jurisdictional Resource: Testing a Typology for Problem-Structuring.** In Berkes, F., (ed.) *Common Property Resources: Ecology and Community-Based Sustainable Development*. London: Belhaven Press.

Abstract: Marine fisheries are a common property resource with special biological characteristics: they are both renewable and fugitive, with habitats that range from freshwater rivers to the high seas. Because of these biological characteristics, marine fisheries must be managed in multiple and often antagonistic political jurisdictions. To clarify the management options peculiar to fisheries resources, a typology of common property resources is developed. The components of the typology are the nature of the resource (fugitive-renewable); the migratory pattern of the fishery (unshared stock, shared stock, highly migratory, anadromous, or high seas); the property right in the fishery (non-transferable or transferable, non-exclusive or exclusive); and the scale of the user pool (traditional, localized, regional, national or multinational). The typology is then applied to Chesapeake Bay fisheries as a demonstration of its usefulness in examining institutional arrangements in fisheries management. (Tepper, 1991)

26. Burger, Joanna and Gochfeld, Michael. 1998. **The Tragedy of the Commons: Thirty Years Later.** Environment, Vol. 40 (10):4-27.

27. Cernea, Michael M. 1981. **Land Tenure Systems and Social Implications of Forestry Development Programs**. World Bank Staff Working Paper 452. Washington, DC.

Notes: The author describes a World Bank project in Pakistan in which, despite assumptions to the contrary, community control of the project land had over time been supplanted by individual wealthy families who now controlled the land and therefore were the project beneficiaries. The project is a clear warning about the necessity of determining the *de facto* as well as the *de jure* status of land. (editors)

28. Ciriacy-Wantrup, Siegfried V., and Bishop, Richard C. 1975. **Common Property as a Concept on Natural Resource Policy**. *Natural Resources Journal* 15: 713-727.

Abstract: Institutions based on the concept of 'common property' have played socially-beneficial roles in natural resource management from economic pre-history up to the present. These same institutions promise help in solving pressing resource problems in both the developed and developing countries. This classic article discusses the policy implications of common property in the solution of natural resource policy problems. The article reviews common property as a social institution, the social framework of common property institutions and the commons in economic history. (Messerschmidt et al, 1993)

29. Cleary, Mark; Eaton, Peter. 1996. **Tradition and Reform. Land Tenure and Rural Development in South-East Asia**. Oxford University Press.

Notes: The majority of the population of South-east Asia depends on the land for its living. Land is held in a multitude of different ways--through tribal custom, as individual owner-occupier units, through plantations. In many parts of the region landlessness is a major social and political issue. Using a wide range of case studies, this book examines the different landholding systems of the region and argues that a combination of traditional and reformed tenure systems offers the best prospects for improving the welfare of the rural population. (publisher)

30. Dove, M.R. and Rao, A.L. 1986. **Common Property Resource Management in Pakistan: Garrett Hardin in the Junglat**. Environment and Policy Institute (EAPI) Discussion Paper. East-West Center. University of Hawaii. Honolulu, USA.

Abstract: Hardin's "tragedy of the commons" is analysed in the context of three case studies from South Asia. The analysis suggests that Hardin's argument is incorrect

since, in Bromley's terms, it applied to open access resources, not common property. The authors describe two social forestry projects in Pakistan and suggest that utilizing existing, traditional but still powerful local institutions provides possible solutions to the problems of creating new institutional arrangements. Three case studies in traditional CPRM are given: (1) an analysis of livestock and rangeland management in Baluchistan, Pakistan; (2) an analysis of livestock systems in Rajasthan, India; and, (3) a study of tribal tenure in Swat, Pakistan. These cases demonstrate the capacity of CPR systems to promote sustainable use of environmental resources when supported by strong, traditional tribal sanctions. When traditional institutional arrangements are removed, people abandon the balanced use of natural resources. (Messerschmidt et al, 1993)

31. Edwards, Victoria M., and Steins, Nathalie A. 1998. **Developing an Analytical Framework for Multiple-Use Commons**. *Journal of Theoretical Politics* 10(3): 347-383.

Abstract: Much of the work on common-pool resources has tended to focus on 'single-use' commons, where the resource system is used for extraction of a single 'use' unit. However, as traditional commons evolve, research that explains the persistence of common-pool resources with multiple ownership, use and management structures will become increasingly relevant. This paper extends the analytical framework put forward by Oakerson (1992), for application to multiple-use common-pools, where multiple types of use are made of the resource system. Four components are introduced: (1) multiple-use analysis of physical and technical attributes; (2) multilevel analysis of decision-making arrangements; (3) social characteristics of the broad user community; and (4) analysis of contextual factors. The multiple-use framework facilitates the understanding of multiple-use commons in a chosen time period and institutional change over time. The example of the New Forest commons in England is used to explain the operation of the framework in a field setting. (authors)

32. Farrington, John and Boyd, Charlotte. 1997. **Scaling up the Participatory Management of Common Pool Resources**. *Development Policy Review* Vol. 15(4):371-391. Overseas Development Institute.

Abstract : The article first briefly reviews 'new ecology' arguments that resource degradation is not occurring. Second, it scans the range of agro-ecological contexts in which natural resource (NR) rehabilitation is being attempted; it then briefly examines the economic and social gains typically achievable from NR rehabilitation. Third, it turns to specific questions of the role of livestock and related inputs and outputs in the more intensive management of the interface between CPR and private agricultural resources. Fourth, before focusing on lessons for scaling up in one of these contexts (micro-watersheds), it examines why concepts of joint action and participation have

been—and are likely to remain—central to NR rehabilitation. Fifth, it examines a case from India in which preconditions for scaling up of participatory approaches were identified at the outset of a major donor-funded programme and activities modified in the light of experience in trying to meet these preconditions. Sixth, it briefly compares the scaling-up approach pursued by the Indian case study with a comparable case in Kenya, and with UK-supported micro-watershed rehabilitation in India. (authors)

33. Feeny, David; Berkes, Fikret; McCay, Bonnie J.; and Acheson, James M. 1989. **The Tragedy of the Commons: Twenty-Two Years Later.** Human Ecology Vol. 18(1):1-19.

Notes: Most public opinion of common property is formed by Hardin's theory "The tragedy of the commons". This economic theory suggests that people will automatically degrade any resource that is not state- or privately-owned. Today the viability of common property resources is being reconsidered. CPR is defined as (1) any resource in which exclusion of other individuals is hard; and (2) a situation in which use by one person detracts from what is available for others. Four property regimes are analysed for their ability to exclude others and regulate use. Open access regimes fulfil Hardin's prophesy of exploitation beyond a sustainable level. However, state, private and communal ownership are all capable of excluding non-members and regulating use (as supported by case studies). Common property resources are more complex than originally envisioned. They depend on decision-making arrangements, patterns of interaction, physical attributes and property rights regimes. (Tepper, 1991)

34. Ford Foundation. 1998. **Forestry for Sustainable Rural Development.** A Review of Ford Foundation-Supported Community Forestry Programs in Asia. New York: Ford Foundation.

Notes: The community forestry programs reviewed in this report represent 15 years of experience in six Asian countries that contain more than half the world's population. In recent years the Ford Foundation's largest commitments in Asia have been for programs focused on the nexus between rural poverty and resources. These programs have sought to improve the incomes and welfare of poor rural households through more productive, participatory, sustainable, and equitable management of land, water, and forest resources. Common to these programs have been efforts to give rural households secure access to natural resources; to help the responsible government units—forest departments, irrigation agencies, and fisheries bureaus—redefine their role as facilitators of development rather than the "doers" of development; and to empower local communities to play a more effective role in resource management. These Asian community forestry programs represent a rich mine of experience from which to draw lessons, identify future challenges, and guide priorities in the worldwide search for a path to sustainable development. (publisher)

Contents: PART 1 OVERVIEW: 1. Approaches the Ford Foundation Has Supported in the Field of Community Forestry in Asia. PART 2 THE ELEMENTS OF COMMUNITY FORESTRY: 2. Access and Rights to Forest Products and Land for Local People; 3. Community-Based Organizations for Forest Management; 4. Multiple-Use Management of the Forest Resource; 5. Institutional Change and New Collaborative Relationships; 6. Nongovernmental Organizations and Research Institutions: Their Roles; 7. The Development and Application of New Social Science Methodologies in Community Forestry. PART 3 CONCLUSION: 8. Important Lessons; Key Challenges; The Path to Sustainable Development.

35. Fortmann, Louise; and Bruce, John W. (eds.). 1988. **Whose Trees? Proprietary Dimensions of Forestry**. Boulder, CO, USA: Westview Press.

Notes: This derives from work at the Land Tenure Centre (University of Wisconsin, Madison, USA) and ICRAF (Nairobi, Kenya) to identify, review and annotate the literature on rights in trees and land with trees and the impact of those rights on planting and conservation of trees. The book begins with an essay on why tree and land tenure matter and concludes with a discussion of the "daily struggle" for rights in trees and land with trees. In Chapters 2-8, the authors provide excerpts and whole works from 39 sources worldwide. Each piece begins with a short annotation. The topics are: tree tenure; tree and tenure interactions; communities and trees; tenure and deforestation; tenure and afforestation; the gender division of tenure; and the state and the forest. (Messerschmidt et al, 1993)

36. Gadgil, M. 1989. **On the Diversification of Common-Property Resource Use by Indian Society**. In Berkes, F. (ed.). *Common Property Resources: Ecology and Community-Based Sustainable Development*. London: Belhaven Press.

Notes: The different endogamous groups of Indian caste society have so diversified their patterns of resource use that many specialized resources—such as palm leaves for mat weaving—were, and often still are, the monopoly of one particular group in any given locality. Other more commonly used resources, such as fuelwood, were controlled by small multi-caste village communities in which the different caste groups were linked to each other in a web of reciprocity. This organization had favoured sustainable use of common property resources under communal management by Indian society until the colonial conquest. British rule led to disruption of communal organization and converted communally-managed resources into open-access resources. These have subsequently been used in an exhaustive fashion. However, pockets of good resource management under communal control have persisted and are now serving as models for the reassertion of such communal control. It is hoped that this would contribute significantly towards bringing about a sustainable use of the country's natural resource base. (Tepper, 1991)

37. Ganjanapan, Anan. 1996. **State Conservation Policy and the Complexity of Local Control of Forest Land in Northern Thailand.** A paper prepared for the sixth International Association for the Study of Common Property (IASCP) Conference at the University of California, Berkeley, June 5-8.

Abstract: This paper focuses on the contradictions of state policies on forest conservation in several watershed areas of Northern Thailand. It analyzes the state's inability to deal with local complexity, especially overlapping access to forest land and resources. The paper also addresses the local response to these policies. (author)

38. Gordon, H. Scott. 1954. **The Economic Theory of a Common-Property Resource: The Fishery.** *Journal of Political Economy* 62: 124-142.
39. Hanna, Susan and Munasinghe, Mohan. (eds.). 1995. **Property Rights and the Environment.** The Beijer International Institute of Ecological Economics and The World Bank. Stockholm and Washington, DC.
40. Hanna, Susan; Folke, Carl; Mäler, Karl-Göran. (eds.). 1996. **Rights to Nature: Ecological, Economic, Cultural, and Political Principles of Institutions for the Environment.** Washington, DC: Island Press.

Notes: This book is about the human use of nature. More specifically, it is about the systems of rights, rules, and responsibilities that guide and control the human use of the natural environment. The chapters in this book comprise products of the research program "Property Rights and the Performance of Natural Resource Systems" conducted at the Beijer International Institute of Ecological Economics in Sweden. Its goal is to further the scientific understanding of ways humans relate to their natural environments through the structure, function, and context of property-rights regimes. The papers that were the foundation for the chapters in this book were originally written to provide background to participants in the Beijer Institute's research program on the different dimensions of property rights and the environment: the interface between social and ecological systems; the structure and formation of property rights; culture and economic development; and property rights at different scales. The book is therefore divided into four sections reflecting these same categories. (editors)

Contents: 1. Property Rights and the Natural Environment. PART I THE INTERFACE BETWEEN SOCIAL AND ECOLOGICAL SYSTEMS: 2. The Structure and Function of Ecological Systems in Relation to Property Rights Regimes; 3. Human Use of the Natural Environment: An Overview of Social and Economic Dimensions; 4. Dynamics of (Dis) harmony in Ecological and Social Systems; 5. Social Systems, Ecological Systems, and Property Rights. PART II THE STRUCTURE AND FORMATION OF

PROPERTY RIGHTS: 6. Common and Private Concerns; 7. The Formation of Property Rights; 8. The Economics of Control and the Cost of Property Rights.

PART III CULTURE, ECONOMIC DEVELOPMENT AND PROPERTY RIGHTS:

9. Culture and Property Rights; 10. Property Rights and Development.

PART IV PROPERTY RIGHTS AT DIFFERENT SCALES: 11. Common-Property Regimes as a Solution to Problems of Scale and Linkage; 12. Rights, Rules, and Resources in International Society; 13. Building Property Rights for Transboundary Resources.

41. Hardin, Garrett. 1968. **The Tragedy of the Commons**. Science, Vol. 162: 1243-1248.

Notes: This classic article by Hardin outlines his theory of The Tragedy of the Commons and its relation to population growth. In today's society we rely on technology to solve our problems. Unfortunately, there exists a series of problems which cannot be solved by technology—population growth serving as a prime example. It appears impossible that man will reach the optimum level of growth and automatically stop. Equally unlikely is that pleas to conscience or feelings of guilt will alleviate the problems. The reason for population growth can be paralleled in cause and result in an open field for grazing. A shepherd will always add one more sheep to commonly-owned fields because his benefit is greater than his personal cost, which is divided among all users. Therefore, everyone is locked into a system of over-exploitation for personal gain. A similar scenario explains the growing problem of pollution. Since temperance is difficult to legislate, it appears private or public ownership is the only alternative. The existing welfare state means that parents can have the full benefits of having children and share the cost with the rest of society. This will automatically lead to a population above what is desirable. We must adopt policies of mutually agreed upon coercion to inhibit people's fecundity. (Tepper, 1991)

42. Hardin, G. and Baden, J. (eds.). 1977. **Managing the Commons**. San Francisco, CA, USA: Freeman and Co.

Notes: An anthology of readings that explore the implications of Hardin's "tragedy of the commons". The 'commons' are the world's common resources; the 'tragedy'—the 'remorseless inherent logic'—is that it is clearly to an individual's advantage to exploit a common resource as thoroughly as possible. The first two parts (*Discovering the Commons*, and *The Growing Awareness*) trace the development of the concept of the commons, especially with respect to increasing population pressure. The third part (*Grappling with the Commons*) focuses on ways in which the potentially destructive cultural norm of independence of individual action, regarded as the 'cause' of the tragedy, may be changed to promote continued human welfare and survival. Most examples refer to commons in the United States. (Messerschmidt et al, 1993)

43. Hardin, Garrett. 1991. **The Tragedy of the Unmanaged Commons: Population and the Disguises of Providence**, in Andelson, R.V. (Ed.). *Commons Without Tragedy*. Savage, MD: Barnes and Noble.
44. Hviding, Edward and Graham Baines. 1992. **Fisheries Management in the Pacific: Tradition and the Challenges of Development in Marovo, Solomon Islands**. Discussion Paper. United Nations Research Institute for Social Development.

Abstract: This paper examines a case of traditional fisheries-related resource management; a case in which local people, from a basis of traditional, 'common property' control over the seas and its resources, handle a multitude of development issues. Presenting first some important issues relating to people's role in fisheries management and to the 'common property' debate, the authors then describe a traditional system for management of land and sea resources in a Pacific Islands society - that of Marovo Lagoon, Solomon Islands. Emphasis is given to fisheries resources, with a view to explaining in practical terms how the customary marine tenure system operates under the social, political, economic and ecological circumstances of change arising from development pressures. Against this background, assessments are made of the viability of this traditional fisheries management system under present conditions of centralized political control and of both external and internal pressures for large-scale resource development enterprises. (Leblanc, 1994)

45. Jodha, Narpat S. 1987. **The Degradation of Common Property Resources: a Case of the Degradation of Common Property Resources in India**. In Blaikie, P. and Brookfield H. (eds.) *Land Degradation and Society*. Pp. 196-207. London, UK: Methuen.

Abstract: The problem of land degradation is particularly severe in rural CPRs, which constitute a significant proportion of total land resources in the semi-arid regions. The author describes the situation in Rajasthan, where control over CPRs was exercised through a landlord who could impose charges on access and produce. A land reform conducted in the early 1950s removed this system of control, encouraging over-exploitation and depletion. There is no private cost of using CPRs anymore and, consequently, CPRs have declined. This resulted in soil erosion and redistribution of land resources, ultimately disadvantaging the poor. (Messerschmidt et al, 1993)

46. Jodha, Narpat. S. 1995. **Common Property Resources and the Dynamics of Rural Poverty in India's Dry Regions**. *Unasylva* 180. Vol.46: 23-29.

Notes: This article considers common property resources in dry regions of India. It is based on a study covering 80 villages in 20 districts of six states. The article first presents village-level evidence regarding the dependence of poor households on

common property resources, a second section comments on their decline and causal factors, while the final section examines public interventions involving rural poor and common property resources. (author)

47. Kaul, Minoti Chakravarty. 1996. **Common Lands and Customary Law: Institutional Change in North India over the Past Two Centuries.** Oxford: Oxford University Press.

Abstract: This book seeks to dispel the notion that communally-held resources are necessarily open to private exploitation and misuse. It argues that customary law and institutions of property rights were devised by village communities to check the misuse of common property resources. (publisher)

48. Keohane, Robert O. and Ostrom, Elinor (eds.). 1994. **Local Commons and Global Interdependence: Heterogeneity and Cooperation in Two Domains.** London: Sage Publications.

Notes: This volume offers a synthesis of what is known about very large and very small common-pool resources. Individuals using commons at the global or local level may find themselves in a similar situation. At an international level, states cannot appeal to authoritative hierarchies to enforce agreements they make to cooperate with one another. In some small-scale settings, participants may be just as helpless in calling on distant public officials to monitor and enforce their agreements. Scholars have independently discovered self-organizing regimes which rely on implicit or explicit principles, norms, rules and procedures rather than the command and control of a central authority. The contributors discuss the possibilities and dangers of scaling up and scaling down. They explore the impact of the number of actors and the degree of heterogeneity among actors on the likelihood of cooperative behaviour. (editors)

49. Knudsen, A.J. 1995. **Living with the Commons: Local Institutions for Natural Resource Management.** Chr. Michelsen Institute. Bergen, Norway.

Abstract: Garrett Hardin's essay "The Tragedy of the Commons" has for almost three decades stimulated research on common property regimes. This report provides an overview of this research and reviews a selection of empirical and theoretical contributions to the "commons" debate. Despite the hectic research activity, the report is critical of the tendency to reproduce well-worn arguments instead of questioning them. In order to progress beyond a rebuttal of Hardin, the report calls for an interdisciplinary approach to the study of common property regimes and advocates an analytical focus on local institutions. In particular, the report discusses those circumstances under which local institutions represent an alternative to state

management of renewable natural resources. The three themes which have been selected for closer study are coastal fisheries, rangelands management and forestry management. Regionally, case studies from Africa and Asia have been preferred over material from the rest of the world. (author).

50. Kundstadter, P. 1988. **Hill People of Northern Thailand**. In Denslow, J. S. and Padoch, C. (eds.). *People of the Tropical Rain Forest*. Berkeley and Los Angeles, USA: University of California Press.

Abstract: The author provides a description of traditional swidden-fallow cultivation management by ethnic Lua farmers. Swidden lands were traditionally considered as common village property and swiddens were reallocated as necessary by village religious leaders. Cutting, burning and planting swiddens was traditionally controlled by the chief priest of the village who was paid a nominal tribute for the right to cultivate. Several rules and regulations were set in order to manage the area properly, according to custom. The traditional system has broken down, however, due to several reasons: (1) increasing immigration of neighbouring Karen peoples; (2) new national laws stating that all forested highlands belong to the state; and (3) the advent of Christianity. The authority of traditional leaders has eroded, and traditional claims on land and usufruct rights are no longer recognized. (Messerschmidt et al, 1993)

51. Lynch, Owen J. 1994. **Securing Community-Based Tenurial Rights in the Tropical Forests of Asia: An Overview of Current and Prospective Strategies**. Issues in Development. World Resources Institute's Center for International Development & Environment. Washington, DC.

Notes: The growing crises spawned by tropical deforestation require innovative, comprehensive, and cost-efficient responses. Even these responses will fail in many areas unless the tenurial rights, claims, and potentials of forest dwellers—particularly long-term occupants reliant on community-based tenurial systems—are addressed. The challenges are daunting but the spectre of tropical deforestation requires that governments face them now. (author)

52. Lynch, Owen J. 1998. **Law, Pluralism and the Promotion of Sustainable Community-Based Forest Management**. *Unasylva* 194. Vol. 49: 52-56.

Notes: Paper describes how enacting innovative and equitable laws and policies concerning community-based forest management can help local forest-dependent communities ensure that their interests are fairly considered in forest planning and management decisions. (author)

53. Mansberger, J.R. 1991. **Keeping the Covenant: Preservation of Sacred Forests in Nepal**. PhD dissertation. Geography Department, University of Hawaii, Manoa, USA.

Abstract: This work deals with the place of tenure and rights to sacred forests and groves in the context of religion and society. The author addresses management issues, as well as ownership and condition of the resource. He also gives recommendations concerning their current and future preservation. The collective management situation regarding sacred forests is ambiguous and tenuous but there is scope and hope for improvement based on local concern for this form of common resource. Their preservation is urgent. (Messerschmidt et al, 1993)

54. McCay, Bonnie J. 1996. **Common and Private Concerns**. Chapter 6 in *Rights to Nature: Ecological, Economic, Cultural, and Political Principles of Institutions for the Environment*. Hanna, Susan; Folke, Carl; Mailer, Karl-Goran. (eds.). pp. 111-125. Washington, DC: Island Press.

Notes: Author discusses a number of concepts related to property-rights regimes, clarifying their meaning and raising issues that contribute to the further development of theory related to property rights and the environmental resource base. (editors)

55. McCay, B.J., and Acheson, J.M. (eds.). 1987. **The Question of the Commons: The Culture and Ecology of Communal Resources**. Tucson, USA: University of Arizona Press.

Notes: This collection of original essays is an anthropological and ecological approach to the theory, the controversies surrounding it, and the phenomenon of 'the commons'. The chapters are grouped into three separate sections. The first, 'Conservation and the Commons', brings ethnographic, ecological, and historical studies of hunter-gatherers and fishermen in the subarctic, the Amazon, Papua New Guinea and the United States to bear on the topics of what conservation is, how it can be measured, and how it is related to common and other property rights. Chapters in the second section, 'Specifying the Commons', address issues of community and the commons, sharing recognition that common property is a social institution. Included in this section are studies of farming, pastoral, and marine communal institutions in Indonesia, Ireland, Spain, Ethiopia, Botswana and the United States. The last section, 'The State and the Commons', includes an economic analysis of public policy concerning fisheries management and three chapters that explore interrelationships among government agencies, local communities, and user groups in commercial fisheries of Malaysia, Iceland and Canada. (Leblanc, 1994)

56. McGinnis, Michael and Ostrom, Elinor. (eds.). 1996. **Design Principles for Local and Global Commons**. In Young, Oran R. (ed.) *The International Political Economy and International Institutions, Vol. II*. Pp. 465-493. Cheltenham, UK: Edward Elgar.
57. McGranahan, Gordon. 1991. **Fuelwood, Subsistence Foraging, and the Decline of Common Property**. *World Development*, Vol. 19, No. 10: 1275-1287.

Abstract: Ideally, common property can adapt to particularities in the social and physical environment to create environmentally sustainable regimes. In practice, common fuelwood foraging has been subject to numerous problems intimately linked to the historically changing role of common property. Schematic histories of fuelwood and forests in Europe and Java illustrate how common property systems have been undermined, and the different implications their dissolution can have. Both cases indicate that fuelwood problems may be best interpreted within the rubric of subsistence foraging and the decline of common property, rather than that of energy shortage and tree mismanagement. (author)

58. McKean, Margaret A. 1992. **Success on the Commons: A Comparative Examination of Institutions for Common Property Resource Management**. *Journal of Theoretical Politics* 4: 247-282.
59. McKean, Margaret A. and Ostrom, Elinor. 1995. **Common Property Regimes in the Forest: Just a Relic from the Past?** *Unasylva* 180. Vol. 46: 3-15.
- Notes:* An examination of the current and future potential of common property regimes in the conservation and sustainable use of forest resources. (authors)
60. McKean, Margaret A. 1996. **Common Property: What Is It, What Is It Good For, and What Makes It Work?** Working Paper. Forests, Trees and People Programme, Phase II. Food and Agriculture Organization of the United Nations. Rome, Italy.
61. Mearns, Robin. 1996. **Community, Collective Action and Common Grazing: The Case of Post-Socialist Mongolia**. *Journal of Development Studies* 32: 297-339.

Abstract: This article applies collective-action and transaction-cost theory to the theoretical debate around the management of common property regimes (CPRs), with supporting evidence from recent empirical research in Mongolian pastoralism. Rather than treating CPR management as an activity in isolation, as much of the existing

literature tends to do, this study examines the use of common grazing in the context of other aspects of pastoral livelihoods. The more a given group of herders find reason to cooperate with each other across a range of activities, it is argued, the more likely it is that they will also overcome the transaction costs involved in controlling the use of the commons. The empirical analysis finds that incentives for cooperation were weakened under agricultural collectivisation (1950s-1980s), with possible adverse consequences for the commons. Decollectivisation from the early 1990s has seen the re-emergence of autonomous cooperation among herders, accompanied by changes in intra-community dynamics, which together suggest contradictory trends for the future management of common grazing. (author)

62. Meinzen-Dick, Ruth S.; Brown, L.R.; Feldstein, H. Sims; Quisumbing, A.R. 1997. **Gender and Property Rights: Overview.** *World Development*, Vol. 25(8):1299-1302.

Notes: The papers in this special section are the outcome of a conference on Gender and Property Rights. Over 170 people in 29 countries participated in the conference. This overview paper introduces the individual papers, and provides some background on the inception and dynamics of the e-mail conference. (authors)

63. Messerschmidt, D.A. 1986. **People and Resources in Nepal: Customary Resource Management Systems of the Upper Kali Gandaki.** In *Proceedings of the Conference on Common Property Resource Management*, April 1985. Washington, DC: National Academy Press.

Abstract: The author presents data and an analysis of traditional resource management systems located in two districts along the Upper Kali Gandaki River watershed in north central Nepal. Examples of both local forest and irrigation management systems are given. After this, the common property issues are analyzed according to the Oakerson framework. Physical and technical attributes, the decision-making arrangements, the patterns of interaction and the outcomes of the Nepali CPRM systems are discussed. It is concluded that cultural diversity and diversity of form, function, meaning and use provide a key to understanding how and why common property management systems survive and thrive in the world. (Messerschmidt et al, 1993)

64. Messerschmidt, D.A. et al. 1993. **Common Forest Resource Management: Annotated Bibliography of Asia, Africa and Latin America.** Food and Agriculture Organization of the United Nations (FAO). Rome, Italy.

Notes: The purpose of this annotated bibliography is to introduce some of the literature on Common Forest Resource (CFR) Management from Asia, Africa and Latin America. The publication begins with a general introduction to the study of common property

resources as it relates to the field of forestry, and follows with separate sections dealing with a particular geographic zone, each with an introduction discussing local systems of resource management, key issues, and an annotated bibliography of relevant literature. The present resource book borrows extensively from this volume.

65. National Research Council (ed).1986. **Proceedings of the Conference on Common Property Resource Management**, April 1985. Washington, DC: National Academy Press.

Notes: This work represents one of the earliest edited collections of material on common property.

Contents: PART ONE BACKGROUND: 1. The Common Property Challenge (Bromley); 2. Conference on Common Property: An Introduction (Feeny); 3. A Model for the Analysis of Common Property Problems (Oakerson); 4. Common Property and Collective Action in Economic Development (Runge). PART TWO CASE STUDIES: FISH AND WILDLIFE RESOURCES- 5. Marine Inshore Fishery Management in Turkey (Berkes); 6. Sea Tenure in Bahia, Brazil (Cordell and McKean); 7. Overfishing and Conflict in a Traditional Fishery: San Miguel Bay, Philippines (Cruz); 8. A Social Dilemma in a Less Developed Country: The Massacre of the African Elephant in Zaire (Kisangani). WATER RESOURCES- 9. Common Property Management of Water in Botswana (Fortmann and Roe); 10. Private Rights and Collective Management of Water in a High Atlas Berber Tribe (Mahdi); 11. Canal Irrigation in Egypt: Common Property Management (Hunt); 12. Tank Irrigation in India: An Example of Common Property Resource Management (Easter and Palanisami); 13. Common Property Resource Management in South Indian Villages (Wade). RANGE AND PASTURELAND RESOURCES- 14. Management of Common Grazing Lands: Tamahdite, Morocco (Artz, Norton and O'Rourke); 15. Oukaïmedene, Morocco: A High Mountain *Agdal* (Gilles, Hammoudi and Mahdi); 16. Socioecology of Stress: Why Do Common Property Resource Management Projects Fail? (Gupta). AGRICULTURE LAND RESOURCES- 17. Commonfield Agriculture: The Andes and Medieval England Compared (Campbell and Godoy); 18. Information Problems Involved in Partitioning the Commons for Cultivation in Botswana (Wynne). FOREST AND BUSHLAND RESOURCES- 9. Institutional Dynamics: The Evolution and Dissolution of Common Property Resource Management (Thomson, Feeny and Oakerson); 20. Collective Management of Hill Forests in Nepal: The Community Forestry Development Project (Arnold and Campbell); 21. People and Resources in Nepal: Customary Resource Management Systems of the Upper Kali Gandaki (Messerschmidt); 22. The Management and Use of Common Property Resources in Tamil Nadu, India (Blaikie, Harris and Pain); 23. Minor Forest Products as Common Property Resources in East Kalimantan, Indonesia (Jessup and Peluso); 24. Management of Traditional Common Lands: *Iriaichi* in Japan (McKean). PART THREE CONCLUSIONS: 25. Closing Comments at the Conference on Common Property Resource Management (Bromley);

26. Issues of Definition and Theory: Some Conclusions and Hypotheses (Ostrom); 27. Concluding Statement (Peters).

66. Ostrom, Elinor. 1990. **Governing the Commons: The Evolution of Institutions for Collective Action**. New York: Cambridge University Press.

Abstract: The governance of natural resources used by many individuals in common is an issue of increasing concern to policy analysts. Both state control and privatization of resources have been advocated, but neither the state nor the market have been uniformly successful in solving common pool resource problems. After critiquing the foundations of policy analysis as applied to natural resources, Elinor Ostrom here provides a unique body of empirical data to explore conditions under which common pool resource problems have been satisfactorily or unsatisfactorily solved. Dr. Ostrom first describes three models most frequently used as the foundation for recommending state or market solutions. She then outlines theoretical and empirical alternatives to these models in order to illustrate the diversity of possible solutions. In the following chapters she uses institutional analysis to examine different ways—both successful and unsuccessful—of governing the commons. In contrast to the proposition of the tragedy of the commons argument, common pool problems sometimes are solved by voluntary organizations rather than by a coercive state. Among the cases considered are communal tenure in meadows and forests, irrigation communities and other water rights, and fisheries. (publisher)

67. Ostrom, Elinor; Gardner, Roy; and Walker, James M. 1994. **Rules, Games, and Common-Pool Resources**. Ann Arbor, MI: University of Michigan Press.

Notes: Explores ways that the tragedy of the commons can be avoided by people who use common-property resources. Contributors include Elinor Ostrom, Roy Gardner, James Walker, Arun Agrawal, William Blomquist, Edella Schlager, and Shui Yan Tang. (publisher)

Contents: PART 1: THEORETICAL BACKGROUND- 1. Rules, Games and Common-Pool Resource Problems; 2. Institutional Analysis and Common Pool Resources; 3. Games Appropriators Play; 4. Rules and Games. PART 2: EXPERIMENTAL DESIGN- 5. CPR Baseline Appropriation Experiments; 6. Probabilistic Destruction of the CPR; 7. Communication in the Commons; 8. Sanctioning and Communication Institutions; 9. Regularities from the Laboratory and Possible Explanations. PART 3: FIELD STUDIES- 10. Institutions and Performance in Irrigation Systems; 11. Fishers' Institutional Responses to Common-Pool Resource Dilemmas; 12. Rules, Rule-Making, and Rule Breaking: Examining the Fit Between Rule Systems and Resource Use; 13. Changing Rules, Changing Games: Evidence from Groundwater Systems in Southern California; 14. Regularities from the Field and Possible Explanations. PART 4: CONCLUSION- 15. Cooperation and Social Capital.

68. Poffenberger, Mark (ed). 1990. **Keepers of the Forests: Land Management Alternatives in Southeast Asia.** West Hartford: Kumarian Press.

Notes: This volume provides in-depth, historical case studies of forest management as well as tools and techniques for participatory management and community empowerment through social forestry. Case studies from Thailand, the Philippines, Java, and Irian Java are included. (Ford Foundation)

69. Poffenberger, Mark (ed). 1996. **Communities and Forest Management: a Report of the IUCN Working Group on Community Involvement in Forest Management.** Washington, DC: IUCN. The World Conservation Union.

Notes: This report from the IUCN Working Group to the Inter-governmental Panel on Forests of the Commission on Sustainable Development gives an overview of global forest management transitions and includes five case studies from developed and developing countries. The report also lists recommendations on long-term strategies for supporting community involvement in the management of forests. (Ford Foundation)

70. Pomeroy, R.S. (ed.). 1994. **Community Management and Common Property of Coastal Fisheries in Asia and the Pacific: Concepts, Methods and Experiences.** International Center for Living Aquatic Resources Management (ICLARM). Workshop, Philippines. 21-23 June. 1993.

Abstract: Researchers in the social sciences are at the forefront of the urgent search for better ways of managing fisheries resources. The papers in the present volume contain a significant record of the search: they examine the concepts of community management and common property in coastal fisheries; and look at how community management operates in a range of past and present fisheries systems in Asia and the Pacific. (editor)

71. Rocheleau, Dianne E. 1985. **Women, Trees, and Tenure: Implications for Agroforestry.** Paper presented at an International Workshop on Tenure Issues in Agroforestry. Nairobi, Kenya, 27-31 May.

Notes: The author raises three important points regarding women's access to trees: the difference between customary and statutory law; the difference between *de jure* and *de facto* rights; and the spatial distribution of women's rights. National legislation and policies dealing explicitly with women's rights to trees and tree products is needed. (editors)

72. Rose, Carol M. 1994. **Property and Persuasion.** Boulder, CO: Westview Press.

73. Ruddle, Kenneth, and Johannes, E. (eds.). 1985. **The Traditional Knowledge and Management of Coastal Systems in Asia and the Pacific**. Jakarta: UNESCO.
74. Ruddle, Kenneth. 1994. **A Guide to the Literature on Traditional Community-Based Fishery Management in the Asia-Pacific Tropics**. Rome, Italy: Food and Agriculture Organization of the United Nations.
75. Schlager, Edella. 1994. **Fishers' Institutional Responses to Common-Pool Resource Dilemmas**. In Ostrom, Elinor; Gardner, Roy; and Walker, James M. (eds.) *Rules, Games and Common-Pool Resources*. Pp. 247-265. Ann Arbor (MI): University of Michigan Press.

Notes: Author provides an overview of the type of institutional arrangements that fishers using inshore fishing grounds around the world have developed. (editors)

76. Scott, A.D. 1955. **The Fishery: The Objectives of Sole Ownership**. *Journal of Political Economy* 63: 116-124.
77. Singh, Chatrapati. 1986. **Common Property and Common Poverty: India's Forests, Forest Dwellers, and the Law**. Oxford: Oxford University Press.

Abstract: In this publication, the author considers the exact legal position concerning the current rights of forest dwellers in India and ascertains what can be done for them in future legislation. The subject is discussed in the following sections: property and poverty, forest and people, rights in common, civil rights, economic rights, eminent domain, occupancy rights, public purpose, compensation, the basis for equality, the way to equality and national interest. Most rural Indians depend on CPRs for their energy and housing needs, the dependency being the greatest in tribal areas. One conclusion is that the Indian Forest Lands Acts should be repealed and that new acts should be created, in order to reach a point of equal distribution and use of natural resources. (Messerschmidt et al, 1993)

78. Singh, Katar. 1994. **Managing Common Pool Resources: Principles and Case Studies**. New Delhi: Oxford University Press.

Abstract: Common Pool Resources (CPRs) or natural resources used by people in common constitute a significant proportion of the earth's total endowment. Most of these resources are over-exploited and then neglected. This unique work combines theoretical and empirical approaches to CPR development and management in India. It addresses basic concepts, the role of CPRs, theoretical models for analyzing CPR problems, alternative CPR management systems, instruments of CPR policy, and decision-making tools and techniques. Next, case studies of different forms of CPR

management from various parts of India are examined. They indicate that success can be achieved under various management systems, and there is no single best system appropriate for all situations and all times. Lastly, Katar Singh synthesizes the insights gained from an analysis of the basic concepts of CPRs and analytical lessons and conclusions drawn from the case studies into a coherent and environmentally sound policy for development and management of CPRs. (publisher)

79. Tang, Shui Yan. 1992. **Institutions and Collective Action: Self-Governance in Irrigation**. San Francisco: ICS Press.

Notes: Tang evaluates the best conditions and relationship with government for self-governing irrigation systems. The book is an effort to provide answers to the following questions: What institutional arrangements can effectively help in the governance of such natural resources as inshore fisheries, grazing land, and water systems? Is direct management by national governments the most effective way of governing these resources? In what circumstances can local, self-governing organizations effectively ensure the long-term economic viability of these resources? What factors affect the performance of these self-governing organizations? In what ways does government intervention affect the functioning of these organizations? The book is based on the cumulative work of scholars who study the performance of diverse institutional arrangements and on an empirical analysis of the governance arrangements for one type of resource: irrigation systems. (Leblanc, 1994).

80. Thwaites, Rik; de Lacy, Terry; Hong, Li Yong; Hua, Lieu Xian. 1998. **Property Rights, Social Change, and Grassland Degradation in Xilingol Biosphere Reserve, Inner Mongolia, China**. *Society and Natural Resources* 11(4):319-338.

Abstract: Dramatic economic growth and policy reform in China have resulted in great changes in resource use patterns. Pastoral areas in the north and northwest are among the area affected by these changes, with grassland degradation identified as a major and increasing problem. We report here on a study undertaken in Xilingol Biosphere Reserve, Inner Mongolia (focused on Baiinxile Farm) where socioeconomic factors, including property rights reforms and open access to grazing land, have combined to promote unsustainable exploitation of the grassland resource by local herders. The study shows that, although biosphere reserves aim to establish sustainable development at a landscape scale, the current property rights regime in Baiinxile Farm associated with social change is driving local resource users toward greater degradation of the grasslands. The opportunity exists to build on existing village-level institutions to develop a participatory communal resource management system to help protect the grassland's biodiversity and productivity. (authors)

81. UNESCO. 1991. **Managing our Common Resources**. Nature and Resources, Vol. 27, No. 4.

Notes: This issue of *Nature and Resources* contains six papers from the Second Annual Conference on Common Property held in Winnipeg, Canada in September 1991. Papers include: Introduction (E. Ostrom); 1. Institutional challenges for community-based management in the Caribbean (Y. Renard); 2. Age, gender and class in the scramble for Maasailand (N. Kipuri); 3. Tenure rights and exclusion in the Philippines (B. Malayang) ; 4. Legislation for livestock on public lands in Algeria (S. Bédrani); 5. Privatization of the sea for seaweed production in Chile (L. Cereceda and G. Wormald); 6. The rehabilitation of forest land in Nepal (M. Karki).

82. Van de Laar, A. 1990. **A Framework for the Analysis of Common Pool Natural Resources**. ISS Working Paper Series No. 77. Institute of Social Studies. The Hague, Netherlands.

Abstract: The author tackles the issue of property rights regimes in the context of common pool situations. He reviews the literature on CPR management and rights, examining the technical and physical attributes, decision-making arrangements, patterns of interaction and outcomes. His proposed new analytical framework is an attempt to expand on earlier models (particularly the Ostrom model) and to make it relevant to real life situations and useful to professionals from a variety of disciplines. (Messerschmidt et al, 1993)

83. Wade, Robert. 1994. **Village Republics: Economic Conditions for Collective Action in South India**. San Francisco: ICS Press.

Notes: This classic study of village economies in Andhra Pradesh demonstrates that privatization and state regulation are not the only alternatives for conserving and effectively using common property resources in rural societies. (publisher)

84. Walters, J.S. 1994. **Coastal Common Property Regimes in Southeast Asia**. In Borgese, E.M., Ginsburg, N. and Morgan, J.R. (eds.) *Ocean Yearbook II*. Pp. 304-327. Chicago: University of Chicago Press.

85. Weinstock, J.A. and Vergara, N.T. 1987. **Land or Plants: Agricultural Tenure in Agroforestry Systems**. *Economic Botany* 41(2):312-322.

Abstract: In order to understand traditional agricultural systems, especially where agroforestry is practised or its introduction has been proposed, it is necessary to distinguish between rights to land and rights to plants. In this article, rights to land

versus rights to plants are viewed in the agricultural systems in Borneo, Indonesia and in Papua New Guinea. Conflicts between local traditional and government policy are discussed. Although villagers used the forest as a common resource, the traditional patterns of ownership and management at the local level have changed. The Luangans of Borneo have developed an ecologically stable and economically viable agroforestry technology because their concept of absolute private ownership of plants meshes well with shared user rights over the land. In Papua New Guinea, clan members who recognize absolute private ownership of plants want to perpetuate communal ownership of their land resources. It is concluded that agroforestry and reforestation as strategies to enhance productivity and sustainability may not readily be applied here. (Messerschmidt et al, 1993)

Source of Abstracts

Leblanc, L. 1994. **Collective Management, by Communities, of Aquatic Resources: Guide to Research Resources (draft)**. International Development Research Centre, Ottawa, Canada.

Messerschmidt, D.A. et al. 1993. **Common Forest Resource Management: Annotated Bibliography of Asia, Africa and Latin America**. Food and Agriculture Organization of the United Nations (FAO). Rome, Italy. Annotations reprinted with permission from the Food and Agriculture Organization of the United Nations (FAO).

Tepper, J.D. 1991. **Annotated Bibliography of Literature on: Common Property Resources**. International Development Research Centre, Ottawa, Canada.

D. Obtaining Documents Listed in the Bibliography

IDRC Document Delivery Service

The IDRC library offers a document delivery service to all Centre-funded projects. Any project staff member may request, from the IDRC library, copies of journal articles or excerpts from books free of charge. The IDRC library will send these documents to the project via regular mail. Please note that whole books cannot be copied or loaned and only one copy of any journal article can be provided per project.

Procedure

Send a request via e-mail, fax or regular mail (address below) to Marjorie Whelan. The request must include a minimum of information in order to be processed.

For a Journal Article please include: Author, Title, Date, Journal Name, Volume, Issue and Pages.

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As well, you will need to identify the name and number of your IDRC project and your institution. In order to simplify this process an order form has been attached below. You may wish to print this off and use it when ordering by fax or regular mail or complete it in electronic format and attach it to an e-mail message.

Please note that as an IDRC project recipient you are entitled to this service for any journal article or book chapter that you wish—not just those listed in the resource kit.

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[illegible]

E. Websites and Electronic Information

This section presents key websites and mailing-lists related to common property and CBNRM that offer useful resources for researchers.

1. International Association for the Study of Common Property (IASCP)

<http://www.indiana.edu/~iascp/>

The International Association for the Study of Common Property (IASCP), founded in 1989, is a nonprofit Association devoted to understanding and improving institutions for the management of environmental resources that are (or could be) held or used collectively by communities in developing or developed countries. The website is the single largest source of material about common property on the Internet, and includes IASCP's mission statement, announcements by IASCP members, conferences, and a brief description of IASCP's quarterly publication *The Common Property Resource Digest* which features articles, the CPR Forum (commentaries and responses on CPR issues), Book Reviews, Bibliographies, Announcements, and Letters to the Editor. The Digest is available to members only and is not available on-line. The site also features the CPR Virtual Library of Common Pool Resources, an excellent resource available to both members and non-members which contains searchable bibliographies, conference abstracts, a listing of CPR-related articles and books available for free on-line, and useful links. Links are grouped under the following categories: general CPR resources; agricultural commons; fishery resources; forestry resources; global commons; grazing areas; land tenure and use; nontraditional CPRs; social organization theory; water resources and irrigation; and wildlife resources. For further information send an e-mail to iascp@indiana.edu

2. Private and Common Property Rights- by Elinor Ostrom

<http://encyclo.findlaw.com/lit/2000art.htm>

An excellent on-line paper by Elinor Ostrom in which she discusses the subject of common property and some of the misunderstandings associated with it.

Abstract: The relative advantages of private property and common property for the efficiency, equity, and sustainability of natural resource use patterns have been debated in legal and economic literatures for several centuries. The debate has been clouded by a troika of confusions that relate to the difference between (1) common property and open-access regimes; (2) common-pool resources and common property regimes; and (3) a resource system and the flow of resource units. A property right is an enforceable authority to undertake particular actions in specific domains. The rights of access, withdrawal, management, exclusion, and alienation can be separately



assigned to different individuals as well as being viewed as a cumulative scale moving from the minimal right of access through possessing full ownership rights. All of these rights may be held by single individuals or by collectives. Some attributes of common-pool resources are conducive to the use of communal proprietorship or ownership and others are conducive to individual rights to withdrawal, management, exclusion, and alienation. Many of the lessons learned from the operation of communal property regimes related to natural resource systems are theoretically relevant to the understanding of a wide diversity of property regimes that are extensively used in modern societies. (author)

3. COMMONS Discussion Group

IASCP has set up a listserv for the discussion of commons issues. The intent of the listserv is to continue the rich discussions many had at the 1996 IASCP conference in Berkeley. IASCP is particularly interested in issues of global (rather than national or regional) concern, and in fostering the exchange of views across disciplines and resource types. The hosts would like to try to keep this list focused on interdisciplinary discussions of commons issues.

HOW TO SUBSCRIBE: Send message to mailserv@aesop.rutgers.edu
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To send a message to the list, send to: commons@aesop.rutgers.edu
For more information, contact: Doug Wilson, Rutgers University, dwilson@aesop.rutgers.edu

4. Fishfolk: A Fisheries Social Science Discussion Group

Fishfolk is hosted by the MIT Sea Grant College Program, which is committed to the sustainable use of coastal and marine resources. The discussion group is devoted to fisheries issues of relevance to social scientists, fishermen, biologists, managers, government officials, conservation group members, attorneys, and other academics. In some cases, individual members are in positions of authority or serve as experts consulted by decision-makers. Discussions on the network provide unparalleled opportunity for crossing traditional barriers among the different groups who consider themselves "stakeholders" in the fisheries. Through these discussions, members also communicate lessons learned in one part of the globe that can help instruct others, and aid in sustaining the world's fisheries. Anyone on the list can send a message about topics of interest to the group. Job or publication announcements and research or reference questions are welcome. Please do not send messages to the group that are of interest to only certain individuals.

HOW TO SUBSCRIBE: Send an email to LISTSERV@MITVMA.MIT.EDU
Leave subject line blank. In the body of the message type:
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