DESIGN PRINCIPLES AND THREATS TO SUSTAINABLE ORGANIZATIONS THAT MANAGE COMMONS

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Design Principles of Sustainable Community-Governed Commons

Farmer organizations are responsible for the governance and management of a wide variety of common-pool resources (CPRs) including irrigation systems, pasture lands, community-owned forests, as well as their own "budgetary commons" involved in organizing a wide diversity of cooperative activities. All CPRs are jointly used by a community of individuals where one person's use subtracts from the amount available to others. It is typically difficult to exclude potential beneficiaries from gaining access to a CPR. A wide diversity of literature written during the past two decades focuses on how individuals organize themselves to manage diverse kinds of CPRs (see, e.g., Netting, 1981, 1993; Bromley et al., 1992; McCay and Acheson, 1987; Ostrom, 1990, 1992).

Many of these organizations can be considered robust in that the day-to-day operational rules have been devised and modified over time according to a set of collective-choice and constitutional-choice rules (Shepsle, 1989). In other words, these systems have been sustainable over very long periods of time. Most of the environments studied are complex, uncertain, and interdependent environments where individuals continuously faced substantial incentives to behave opportunistically. The puzzle that I addressed in *Governing the Commons* (1990) is how did the individuals using these systems sustain them over such long periods of time.

The specific rules-in-use found in robust organizations differ markedly from one case to the next. Given the great variation in specific rules-in-use, the sustainability of these organizations cannot be explained by the presence or absence of particular rules. Part of the explanation that can be offered for their sustainability is based on the fact that the particular rules do differ. By differing, the particular rules take into account specific attributes of the related physical systems, cultural views of the world, and the economic and political relationships that exist in the setting. Without different rules, users could not take advantage of the positive features of a local CPR or avoid potential pitfalls that could occur in one setting but not others.

A set of seven design principles appears to characterize most of the robust user-organized systems. An eighth principle characterizes the larger, more complex cases. A "design principle" is defined as a conception used consciously or unconsciously by those constituting and reconstituting a continuing association of individuals about a general organizing principle. Let us discuss each of these design principles.

Clearly Defined Boundaries

1. Individuals or households with rights to withdraw resource units from the CPR and the boundaries of the CPR itself are clearly defined.

Defining the boundaries of the CPR and of those authorized to use it can be thought of as a "first step" in organizing for collective action. So long as the boundaries of a resource and/or the individuals who can

use the resource are uncertain, no one knows what they are managing or for whom. Without defining the boundaries of a CPR and closing it to "outsiders," local users face the risk that any benefits they produce by their efforts will be reaped by others who do not contribute to these efforts. At the least, those who invest in a CPR may not receive as high a return as they expected. At the worst, the actions of others could destroy the resource itself. Thus, for any users to have a minimal interest in coordinating patterns of appropriation and provision, some set of users has to be able to exclude others from access and use rights. If there are substantial numbers of potential users and the demand for the resource units is high, the destructive potential of all users freely withdrawing from a CPR could lead to the destruction of a resource and of the organization that is trying to manage it.

Congruence between Appropriation and Provision Rules and Local Conditions

2. Use rules restricting time, place, technology, and/or quantity of resource units are related to local conditions and to provision rules requiring labor, materials, and/or money.

Unless the number of individuals authorized to use a CPR is so small that their use patterns do not adversely affect one another, at least some rules related to how much, when, and how different products can be harvested are usually designed by those using the resource. Well-tailored rules help to account for the perseverance of the CPRs themselves. Uniform rules established for an entire nation or large region of a nation can rarely take into account the specific attributes of a resource that are used in designing rules-in-use in a particular location.

In long-surviving irrigation systems, for example, subtly different rules are used in each system for assessing water fees used to pay for water guards and for maintenance activities, but in all instances those who receive the highest proportion of the water also pay approximately the highest proportion of the fees. No single set of rules defined for all irrigation systems in a region would satisfy the particular problems in managing each of these broadly similar, but distinctly different, systems (Tang, 1992; Lam, 1998).

Collective-Choice Arrangements

3. Most individuals affected by operational rules can participate in modifying operational rules.

CPR institutions that use this principle are able to tailor better rules to local circumstances since the individuals who directly interact with one another and with the physical world can modify the rules over time so as to better fit them to the specific characteristic of their setting. Users who designed CPR institutions that are characterized by the first three principles—clearly defined boundaries, good-fitting rules, and user participation in collective choice—should be able to devise a good set of rules if they keep the costs of changing rules relatively low.

The presence of good rules, however, does not account for users following them. Nor, is the fact that the users themselves designed and initially agreed to the operational rules an adequate explanation for centuries of compliance by individuals who were not originally involved in the initial agreement. It is not even an adequate explanation for the continued commitment of those who were part of the initial agreement. Agreeing to follow rules when one first organizes is an easy "commitment" to make. Actually following rules after an organization has been established, when strong temptations are present, is the difficult accomplishment.

The problem of gaining compliance to rules—no matter what their origin—is frequently assumed away by analysts positing all-knowing and all-powerful *external* authorities that enforce agreements. In many long-enduring CPRs, no external authority has sufficient presence to play any role in the day-to-day enforcement of the rules-in-use. Thus, external enforcement cannot be used to explain high levels of compliance. In all of the long-enduring cases, active investments in monitoring and sanctioning activities are very apparent. These lead us to consider the fourth and fifth design principles.

Monitoring

4. Monitors, who actively audit CPR conditions and user behavior, are accountable to the users and/or are the users themselves.

Graduated Sanctions

5. Users who violate operational rules are likely to receive graduated sanctions (depending on the seriousness and context of the offense) from other users, from officials accountable to these users, or from both.

In long-enduring institutions, monitoring and sanctioning are undertaken primarily by the participants themselves. The initial sanctions used in these systems are also surprisingly low. Even though it is frequently presumed that participants will not spend the time and effort to monitor and sanction each other's performance, substantial evidence has been presented that they do both in these settings.

To explain the investment in monitoring and sanctioning activities that occurs in these robust, self-governing, CPR institutions, the term "quasi-voluntary compliance" used by Margaret Levi (1988: ch. 3) is very useful. She uses the term "quasi-voluntary compliance" to describe taxpayer behavior in regimes where most everyone pays taxes. Paying taxes is *voluntary* in the sense that individuals *choose* to comply in many situations where they are not being directly coerced. On the other hand, it is "quasi-voluntary because the noncompliant are subject to coercion—if they are caught" (Levi, 1988: 52). Levi stresses the *contingent* nature of a commitment to comply with rules that is possible in a repeated setting. Strategic actors are willing to comply with a set of rules, Levi argues, when they perceive that (1) the collective objective is achieved and (2) others also comply. In Levi's theory, enforcement is normally provided by an external ruler even though her theory does not preclude other enforcers.

To explain the high levels of commitment found in many sustainable community-governed CPRs, external enforcement is largely irreverent. External enforcers may not travel to remote rural areas frequently. CPR users create their own internal enforcement to (1) deter those who are tempted to break rules, and thereby (2) assure quasi-voluntary compilers that others also comply. The Chisasibi Cree, for example, have devised a complex set of entry and authority rules related to the coastal and islaurine fish stocks of James Bay as well as the beaver stock located in their defined hunting territory. Fikret Berkes (1987: 87) describes why these resource systems and the rules used to regulate them have survived and prospered for so long:

> Effective social mechanisms ensure adherence to rules which exist by virtue of mutual consent within the community. People who violate these rules suffer not only a loss of favour from the animals (important in the Cree ideology of hunting) but also social disgrace.

The costs of monitoring are kept relatively low in many long-enduring CPRs as a result of the rules-in-use. Rotation rules used in irrigation systems and in some inshore fisheries place the two actors most concerned with cheating in direct contact with one another. The irrigator who nears the end of a rotation turn would like to extend the time of his turn (and thus, the amount of water obtained). The next irrigator in the rotation system waits nearby for him to finish, and would even like to start early. The presence of the first irrigator deters the second from an early start, and the presence of the second irrigator deters the first from a late ending (Tang, 1992; Lam, 1998). Monitoring is a by-product of their own strong motivations to use their water rotation turn to the fullest extent.

The costs and benefits of monitoring a set of rules are not independent of the particular set of rules adopted. Nor are they uniform in all CPR settings. When users design at least some of their own rules, they can learn from experience to craft enforceable rather than unenforceable rules. This means paying attention to the costs of monitoring and enforcing, as well as the benefits that those who monitor and enforce the rules obtain.

A frequently unrecognized "private" benefit of monitoring in settings where information is costly is obtaining the information necessary to adopt a contingent strategy. If a user who monitors finds someone who has violated a rule, the benefits of this discovery are shared by all using the CPR, as well as providing the discoverer a signal about compliance rates. If the monitor does *not* find a violator, it has previously been presumed that private costs are involved without any benefit to the individual or the group. If information is not freely available about compliance rates, then an individual who monitors obtains valuable information from monitoring.

By monitoring the behavior of others, the user-monitor learns about the level of quasi-voluntary compliance in the CPR. If no one is discovered breaking rules, the user-monitor learns that others comply and no one is being taken for a sucker. It is then safe for the user-monitor to continue to follow a strategy of quasi-voluntary compliance. If the user-monitor discovers rule infractions, it is possible to learn about the particular circumstances surrounding the infraction, to participate in deciding the appropriate level of sanctioning, and then to decide about continued compliance or not. If a user-monitor finds an offender, who normally follows rules but happens to face a severe problem, the experience confirms what everyone already knows. There will always be times and places where those who are basically committed to following a set of rules succumb to strong temptations to break them.

A real threat to the continuance of quasi-voluntary compliance can occur, however, if a user-monitor discovers individuals who break the rules repeatedly. If this occurs, one would expect the user-monitor to escalate the sanctions imposed in an effort to halt future rule breaking by such offenders and any others who might start to follow suit. In any case, the user-monitor has up-to-date information about compliance and sanctioning behavior on which to make future decisions about personal compliance.

Let us also look at the situation through the eyes of someone who breaks the rules and is discovered by a local guard (who will eventually tell everyone) or another user (who also is likely to tell everyone). Being apprehended by a local monitor when the temptation to break the rules becomes too great has three results: (1) it stops the infraction from continuing and may return contraband harvest to others; (2) it conveys information to the offender that someone else in a similar situation is likely to be caught, thus increasing confidence in the level of quasi-voluntary compliance; and (3) a punishment in the form of a fine plus loss of reputation for reliability is imposed.

The fourth and fifth design principles—monitoring and graduated sanctions—thus take their place as part of the configuration of principles that work together to enable users to constitute and reconstitute robust CPR institutions. Let me summarize my argument to this point. When CPR users design their own operational rules (Design Principle 3) to be enforced by individuals who are local users or accountable to them (Design Principle 4) using graduated sanctions (Design Principle 5) that define who has rights to withdraw from the CPR (Design Principle 1) and that effectively restrict appropriation activities given local conditions (Design Principle 2), the commitment and monitoring problem are solved in an interrelated manner. Individuals who think a set of rules will be effective in producing higher joint benefits and that monitoring (including their own) will protect them against being a sucker, are willing to make a contingent self-commitment of the following type: I commit myself to follow the set of rules we have devised in all instances except dire emergencies if the rest of those affected make a similar commitment and act accordingly. Once users have made contingent self-commitments, they are then motivated to monitor other people's behavior, at least from time to time, in order to assure themselves that others are following the rules most of the time. Contingent self-commitments and mutual monitoring reinforce one another especially in CPRs where rules tend to reduce monitoring costs.

Conflict-Resolution Mechanisms

6. Users and their officials have rapid access to low-cost, local arenas to resolve conflict among users or between users and officials.

In field settings, applying rules always involves discretion and can frequently lead to conflict. Even such a simple rule as "Each irrigator must send one individual for one day to help clean the irrigation canals before the rainy season begins" can be interpreted quite differently by different individuals. Who is or is not an "individual" according to this rule? Does sending a child below 10 or an adult above 70 to do heavy physical work meet this rule? Is working for four hours or six hours a "day" of work? Does cleaning the canal immediately next to one's own farm qualify for this community obligation? For individuals who are seeking ways to slide past or subvert rules, there are always ways that they can "interpret" the rule so that they can argue they meet it while subverting the intent. Even individuals who intend to follow the spirit of a rule can make errors. What happens if someone forgets about labor day and does not show? Or, what happens if the only able-bodied worker is sick, or unavoidably in another location?

If individuals are going to follow rules over a long period of time, some mechanism for discussing and resolving what is or is not a rule infraction is quite necessary to the continuance of rule conformance itself. If some individuals are allowed to free ride by sending less valuable workers to a required labor day, others will consider themselves to be suckers if they send their strongest workers who could be used to produce private goods rather than communal benefits. Over time, only children and old people will be sent to do work that requires strong adults and the system breaks down. If individuals who make an honest mistake or face personal problems that prevent them from following a rule cannot find mechanisms to make up their lack of performance in an acceptable way, rules can be viewed as unfair and conformance rates decline.

While the presence of conflict-resolution mechanisms does not guarantee that users are able to maintain enduring institutions, it is difficult to imagine how any complex system of rules could be maintained over time without such mechanisms. In the cases described above, these mechanisms are sometimes quite informal and those who are selected as leaders are also the basic resolvers of conflict.

Minimal Recognition of Rights to Organize

7. The rights of users to devise their own institutions are not challenged by external governmental authorities.

Users frequently devise their own rules without having created formal, governmental jurisdictions for this purpose. In many inshore fisheries, for example, local fishers devise extensive rules defining who can use a fishing ground and what kind of equipment can be used. So long as external governmental officials give at least minimal recognition to the legitimacy of such rules, the fishers themselves may be able to enforce the rules themselves. But if external governmental officials presume that only they can make authority rules, then it is difficult for local users to sustain a rule-governed CPR over the long run. At any point when someone wishes to break the rules created by the fishers, they can go to the external government and get local rules overturned.

Nested Enterprises

8. Appropriation, provision, monitoring, enforcement, conflict resolution, and governance activities are organized in multiple layers of nested enterprises.

In larger systems, it is quite difficult to devise rules that are well matched to all aspects of the provision and use of that system at one level of organization. The rules appropriate for allocating water among major branches of an irrigation system, for example, may not be appropriate for allocating water among farmers along a single distributory channel. Consequently, among long-enduring self-governed CPRs, smaller-scale organizations tend to be nested in ever larger organizations. It is not at all unusual to find a larger, farmer-governed irrigation system, for example, with five layers of organization, each with its own distinct set of rules.

Threats to Sustainable Community-Governed Commons

The study of community governed and managed commons provides evidence of immense diversity of physical settings and institutional rules relatively well matched to the local setting. It is important to recognize, however, that not all community-governed CPRs cope effectively with the array of problems they face over time. Some efforts at self-governance fail before resource users even get organized. Others fail within a few years. Others survive for long periods of time but are destroyed as a result of a variety of conditions. One source of failure occurs when institutions are not characterized by many of the design principles. Earlier studies have shown that small-scale CPRs that are characterized by only a small number of these design principles are more likely to fail than those characterized by a larger number of them (Ostrom, 1990; Morrow and Watts Hull, 1996).

However, even institutions that are characterized by the design principles fail. Thus, we need to spéculate about other threats to community governance that arise from observations in the field, theoretical conjectures, and empirical findings of scholars studying farmer organizations. Below is a list of eight threats to sustainable community governance of small-scale CPRs that I have come across in different contexts.

1. Blueprint thinking.

2. Overreliance on simple voting rules as the primary decision mechanism for making all collective choices.

3. Rapid changes in technology, human, animal, or plant populations, in factor availability, in substitution of relative importance of monetary transactions, in heterogeneity of participants.

4. Transmission failures from one generation to the next of the operational principles on which community governance is based.

5. Turning to external sources of help too frequently.

6. International aid that does not take account of indigenous knowledge and institutions.

7. Corruption and other forms of opportunistic behavior.

8. Lack of large-scale institutional arrangements related to reliable information collection, aggregation, and dissemination; fair and low-cost conflict-resolution mechanisms; educational and extension facilities; and facilities for helping when natural disasters or other major problems occur at a local level.

Let us briefly discuss each of these.

Blueprint Thinking

Blueprint thinking occurs whenever policymakers, donors, citizens, or scholars propose uniform solutions to a wide variety of problems that are clustered under a single name based on one or more successful exemplars. David Korten (1980) called this the "blueprint approach" and made a devastating critique of its prevalence in development work at the end of the 1970s. As Korten describes it:

> Researchers are supposed to provide data from pilot projects and other studies which will allow the planners to choose the most effective project design for achieving a given development outcome and to reduce it to a blueprint for implementation. Administrators of the implementing organization are supposed to execute the project plan faithfully, much as a contractor would follow construction blueprints, specifications, and schedules. An evaluation researcher is supposed to measure actual changes in the target population and report actual versus planned changes to the planner at the end of the project cycle so that the blueprints can be revised (1980: 496).

Korten's critique is just as relevant in the next century as it was two decades ago.

Even advocates of community governance fall into the trap of blueprint thinking. Whenever a policy is adopted that calls for the creation of large numbers of farmer organizations in a short period of time, there is a potential threat of blueprint thinking. Nirmal Sengupta, for example, describes the efforts of the Sone Command Area Development Agency in India to defend itself against questions raised in 1978 by policymakers as to why one part of its objectives was not being met—"that pertaining to the formation of irrigation associations" (Sengupta, 1991: 242-43). The Agency then turned to "the Cooperative Department to frame model bylaws for the irrigation-specific cooperatives called Chak Societies" (ibid.: 243). The model bylaws contained 42 major clauses and several minor clauses, but failed to address how

irrigation cooperatives might be similar to or different from cooperatives established for other purposes. In the next year, 22 Chak Societies were initiated in the Sone Command area. But, few of them performed in the way that policymakers thought they should, and the whole idea of registering irrigation associations using the model bylaws was dropped. The only way to get a large number of organizations set up in a hurry is to have an organizational charter and constitution written for all units. Then, one can simply call meetings and have people sign up. Such efforts result in large numbers of paper organizations and little else.

Overreliance on Simple Voting Rules

Closely related to blueprint thinking is the presumption that certain voting rules—either simple majority or unanimity—are the only rules that should be used in making collective decisions. The problem that users face is gaining general understanding of and agreement to a set of rules—not simply having a short discussion and a pro forma vote. The extensive theoretical and empirical studies growing out of social choice theory have demonstrated repeatedly that if the members of a community are strongly divided on an issue, it is extremely unusual to find any rule that enables them to achieve a final decision that is stable and can be considered to reflect the preferences of those affected. Substituting a simple majority vote for a series of long discussions and extensive efforts to come close to a consensus before making decisions that commit a self-governing community, may lead to those in leadership positions simply arranging agendas so that they win in the short run. But as soon as rules are seen as being imposed by a majority vote rather than being generally agreed upon, the costs of monitoring and enforcement are much higher. The group has lost quasi-voluntary compliance and must invest more heavily in enforcement to gain compliance.

Similarly, reliance on unanimity prior to major changes may also challenge the long-term viability of a self-governing society. Once formal unanimity is adopted, only one person needs to hold out to delay decisions or impose high costs on most everyone else. The adaptability of a self-governed system may be too rapid if only simple majority votes are relied upon and too slow if only unanimity is used.

Rapid Exogenous Changes

All rapid changes in technology; in human, animal, or plant populations; in factor availability; in substitution of relative importance of monetary transactions; or in the heterogeneity of participants are a threat to the continuance of any self-organized system, whether it is a firm in a competitive market or a community-governed CPR. Individuals who have adapted an effective way of coping with a particular technological, economic, or social environment may be able to adjust to slow changes in one or several variables if substantial feedback is provided about the consequences of these changes for the long-term sustainability of the resource and/or the set of institutions used for governing that resource. They may even be able to adjust to changes in these variables that occur at a moderate rate. The faster that key variables change and the more variables that change at the same time, the more demanding is the problem of adaptation to new circumstances. These kinds of threats are difficult for all organizations. Those that rely to a greater extent on quasi-voluntary compliance are, however, more threatened than those that are able to coerce contributions (Bromley and Chapagain, 1984; Goodland, Ledec, and Webb, 1989).

Transmission Failures

Rapid change of population or culture may lead to a circumstance in which the general principles involved in the design of effective community-governed institutions are not transmitted from one generation to another. When individuals substitute rote reliance on formal rules for an understanding of why particular formal rules are used, they can make arguments for how to interpret the formal rules that undercut the viability of community organization. Relating this back to voting rules, for example, the charter or constitution of a community organization may specify that simple majority rule will be used in making decisions about future projects and how the costs and benefits of these projects will be divided. If the founders of such an organization recognize the importance of gaining general agreement, they will rarely push forward on a large project that is supported by only a minimal winning coalition. In such an instance, there are almost as many community members in opposition as those who support the project. But, if over time, the principle of gaining general agreement to future projects prior to implementation is not conveyed and accepted by those who later take on leadership responsibilities, then decisions receiving only minimal support may be pushed forward. Leaders of communities who rely on minimal winning coalitions for too many decisions may find themselves having to rely on patronage, coercion, or corruption to keep themselves in power rather than on a foundation of general agreement.

Similarly, if those who are required to devote particular resources or refrain from particular actions, see these "rules" as obstacles to be overcome, rather than as the written representation of general underlying principles of organization, they may push for interpretations of rules that lead to their general weakening. If each household tries to find every legal way to minimize the amount of labor contributed to the maintenance of a farmer-governed irrigation system, for example, eventually the cumulative effect is an insufficient maintenance effort and the unraveling of the contingent contributions of all. If one family tries to make a favorable interpretation of how much labor they should contribute, given the land they own, others come to know that this family is interpreting rules in a manner that is highly favorable to them. Others, who would be favored by such an interpretation, begin to use it as well. The total quantity of labor contributed declines. Unless there is a community discussion about the underlying principles that can be used in interpreting rules, practices may evolve that cannot be sustained over time. Then, the danger exists that the unraveling continues unabated until the community organization falls apart.

Turning to External Sources of Help Too Frequently

A threat to long-term sustainability can be the availability of funds from external authorities or donors that appear to be "easy money." These can undercut the capabilities of a local institution to sustain itself over time. This is particularly salient in regard to farmer-governed irrigation systems. Monetary resources for constructing, operating, and maintaining irrigation systems are frequently contributed by the taxpayers of the nation in which the irrigation system is located or the taxpayers of those nations providing economic assistance funds. When these funds are used, the financial connection between supply and use is nonexistent. Whether the resources so mobilized are directly invested in the construction and operation of irrigation systems or are diverted for individual use by politicians or contractors depends on the professionalism of those involved and on active efforts to monitor and sanction diversions of resources. When the farmers themselves are involved in the construction and operation of irrigation systems, they provide low-cost monitoring of how resources for these activities are used. This is lost when the users are not involved in construction or operation. Expensive auditing systems are then needed, but are rarely supplied. Consequently, a considerable portion of the mobilized resources is diverted to purposes other than those for which it was intended.

Further, the design of projects is oriented more toward capturing the approval of those who fund new construction than toward providing systems that solve the problems facing present and future users. To convince politicians that large chunks of a national budget should be devoted to the construction of irrigation projects, planners attempt to design projects that are "politically attractive." This means that politicians who support such expenditures can claim that the voters' funds are being used to invest in projects that will greatly expand the amount of food available and lower the cost of living.

International Aid that Ignores Indigenous Knowledge and Institutions

To convince external funding agencies that major irrigation projects should be funded through loans or grants, the evaluative criteria used by these agencies in selecting projects has to play a prominent role in the design of projects. Projects designed by engineers, who lack experience as farmers or training as institutional analysts, are frequently oriented toward winning political support or international funding. This orientation does not lead to the construction of projects that serve most users (i.e., small-scale farmers) effectively or encourage the investment of users in their long-term sustenance. Inefficiencies occur at almost every stage. At the same time, this inefficient process leads to the construction of projects that generate substantial profits for large landholders and strong political support for a government.

Processes that encourage looking to external sources of funding make it difficult to build upon indigenous knowledge and institutions. A central part of the message in asking for external funds is that what has been accomplished locally has failed and massive external technical knowledge and funds are needed to achieve "development." In some cases, no recognition is made at all of prior institutional arrangements. This has three adverse consequences: (1) property rights that resource users had slowly achieved under earlier regimes are swept away, (2) those who have lost prior investments are less willing to venture, and (3) a general downgrading of the status of indigenous knowledge and institutions.

Corruption and Other Forms of Opportunistic Behavior

All types of opportunistic behavior are encouraged, rather than discouraged, by (1) the availability of massive funds to subsidize the construction and operation of large-scale irrigation projects and (2) the willingness (or even eagerness) of national leaders to subsidize water as a major input into agricultural production. Corrupt exchanges between officials and private contractors are a notorious and widespread form of opportunism; corrupt payments by farmers to irrigation officials are less well-known, but probably no less widespread. Free riding on the part of those receiving benefits and the lack of trust between farmers and officials, as well as among farmers, are also endemic. Further, the potential rents that can be derived from free irrigation water by large-scale landowners stimulate efforts to influence public decision making as to where projects should be located and how they should be financed. Politicians, for their part, win political support by strategic decisions concerning who will receive or continue to receive artificially created economic rents.

Robert Bates explains many of the characteristics of African agricultural policies by arguing that major "inefficiencies persist *because* they are politically useful; economic inefficiencies afford governments means of retaining political power" (1987: 128). Part of Bates's argument relates to the artificial control exercised over the prices paid for agricultural products, a topic that is not addressed in this study. The other part of Bates's argument relates to the artificial lowering of input prices.

> When they lower the price of inputs, private sources furnish lesser quantities, users demand greater quantities, and the result is excess demand. One consequence is that the inputs acquire new value; the administratively created shortage creates an economic premium for those who acquire them. Another is that, at the mandated price, the market cannot allocate the inputs; they are in short supply. Rather than being allocated through a pricing system, they must be rationed. Those in charge of the regulated market thereby acquire the capacity to exercise discretion and to confer the resources upon those whose favor they desire. . . .
>
> Public programs which distribute farm credit, tractor-hire services, seeds, and fertilizers, and which bestow access to government managed irrigation schemes and public land, thus become instruments of political organization in the countryside of Africa (1987: 130).

Thus, there is an added dimension to rent seeking in many developing countries. The losses that the general consumer and taxpayer accrue from rent-seeking activities are one dimension. The second aspect of rent seeking in highly centralized economies is the acquisition of resources needed to accumulate and retain political power. All forms of opportunistic behavior, therefore, are exacerbated in an environment in which an abundance of funds is available for the construction of new and frequently large-scale irrigation projects that provide subsidized water. This is exactly the political and financial milieux that irrigation suppliers have faced during the past 40 years in most developing countries. Developed countries have made vast amounts of money available to developing countries through bilateral and multilateral loans and aid agreements.

Lack of Large-Scale Supportive Institutions

While smaller-scale, community-governed resource institutions may be far more effective in achieving many aspects of sustainable development than centralized governments, the absence of supportive, large-scale institutional arrangements may be just as much a threat to long-term sustenance as the presence of preemptive large-scale governmental agencies. Obtaining reliable information about the effects of different uses of resource systems and resource conditions is an activity that is essential to long-term sustainability. If all local communities were to have to develop all of their own scientific information about the physical settings in which they were located, few would have the resources to accomplish this.

Let me use the example of the important role that the U.S. Geological Survey has played in the development of more effective, local groundwater institutions in some parts of the U.S. What is important to stress is that the Geological Survey does not construct engineering works or do anything other than obtain and disseminate accurate information about hydrologic and geologic structures within the U.S. When a local set of water users wants to obtain better information about a local groundwater basin, they can contract with the Geological Survey to conduct an intensive study in their area. Water producers would pay a portion of the cost of such a survey; the Geological Survey would pay the other portion. The information contained in such a survey is then public information available to all interested parties. The Geological Survey employs a highly professional staff who rely on the most recent scientific techniques for determining the structure and condition of groundwater basins. Local water producers obtain the very best available information from an agency that is not trying to push any particular future project that the agency is interested in conducting. Many countries, such as India, that do have large and sometimes dominating state agencies, do *not* have agencies that provide public access to high quality information about resource conditions and consequences. Recent efforts to open up groundwater exploration in India may lead to the massive destruction of groundwater basins rather than a firm basis for long-term growth.

Similarly, the lack of a low-cost, fair method for resolving those conflicts that spill out beyond the bounds of a local community is also a threat to long-run sustainability. All groups face internal conflicts or inter-group conflicts that can destroy the fundamental trust and reciprocity on which so much effective governance is based. If the only kinds of conflict-resolution mechanisms available are either so costly or so biased that most self-governed CPRs cannot make use of them, these conflicts can themselves destroy even very robust institutional arrangements.

Coping Methods for Dealing with Threats to Sustainability

There are no surefire mechanisms for addressing all of the above threats. There are three methods that I would like to mention because they are not frequently seen as being important ways of increasing the effectiveness of self-governed institutions. They are: (1) the creation of associations of community-governed entities, (2) comparative institutional research that provides a more effective knowledge base about design and operating principles, and (3) developing more effective high school and college courses on local governance.

Creating Associations of Community-Governance Entities

Those who think local participation is important in the process of developing sustainable resources and more effective governance of resources are frequently committed to doing a good deal of "community organization." All too frequently, this type of organization is conceptualized as fostering a large number of community groups at the same level. If community organization is fostered by NGOs who then provide staff assistance and some external resources, the organizations may flourish so long as the NGOs remain interested, but wither on the vine when the NGOs turn to other types of projects. A technique that draws on our knowledge of how self-governed institutions operate is helping to create associations of community organizations. As discussed above, most large-scale, user-governed resource institutions are composed of several layers of nested organizations.

When community organizations are brought together in federations, they can provide one another some of the backup that NGOs provide to single-layer community organizations. While no single community-governed organization may be able to fund information collection that is unbiased and of real value to the organization, a federation of such organizations may be able to amass the funds to do so. Simply having a newsletter that shares information about what has worked and why it has worked in some settings helps others learn from each others' trial-and-error methods. Having an annual meeting that brings people together to discuss their common problems and ways of tackling them greatly expands that repertoire of techniques for coping with threats that any one group can muster on its own. Such organizations can also encourage farmer-to-farmer training efforts that have proved to be highly successful in enhancing farmer-governed irrigation systems in Nepal.[1]

Rigorous Comparative Institutional Research

In addition to the type of exchange of information that those involved in self-governing entities can undertake on their own, it is important to find ways of undertaking rigorous, over-time comparative research that controls for the many confounding variables that simultaneously affect performance. In the field of medicine, folk medicine has frequently been based on unknown foundations that turned out to be

relatively sound. But some folk medicine continued for centuries, doing more harm to patients than good. The commons that are governed by users and the institutions they use are complex and sometimes difficult to understand. It is important to blend knowledge and information obtained in many different ways as we try to build a more effective knowledge base about what works and why.

Developing Better Curricula on Local Governance

Western textbooks on governance used to focus as much on local as national governance arrangements, but this is changing rapidly. During the past half-century, introductory textbooks on American government, for example, have moved from a 50 to 50 split between national and local government, to a 95 to 5 split. The textbooks used in the West have strongly influenced the textbooks used in developing countries. Many textbooks on governance in Latin American countries do not consider anything beyond the national government and pay very little attention to the importance of civic societies in rural areas. Consequently, many citizens learn nothing in high school and college about how local communities can govern themselves effectively or about the threats to local self-governance. Nor, do they learn about the incredible ingenuity of many farmer organizations. Instead, a presumption is made that governance is what is done in national capitals, and what goes on in rural areas is outmoded if not completely useless. Thus, the last recommendation that I will make at this juncture is to bring more materials on self-governing communities into the curriculum that is offered in high school, in professional schools, and in colleges.

Note

1. See Yoder, 1991; Pradhan and Yoder, 1989; and Water and Energy Commission Secretariat, 1990, for descriptions of a highly innovative and successful program of assisting farmers in designing their *own* institutional rules rather than imposing a set of model bylaws on them.

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