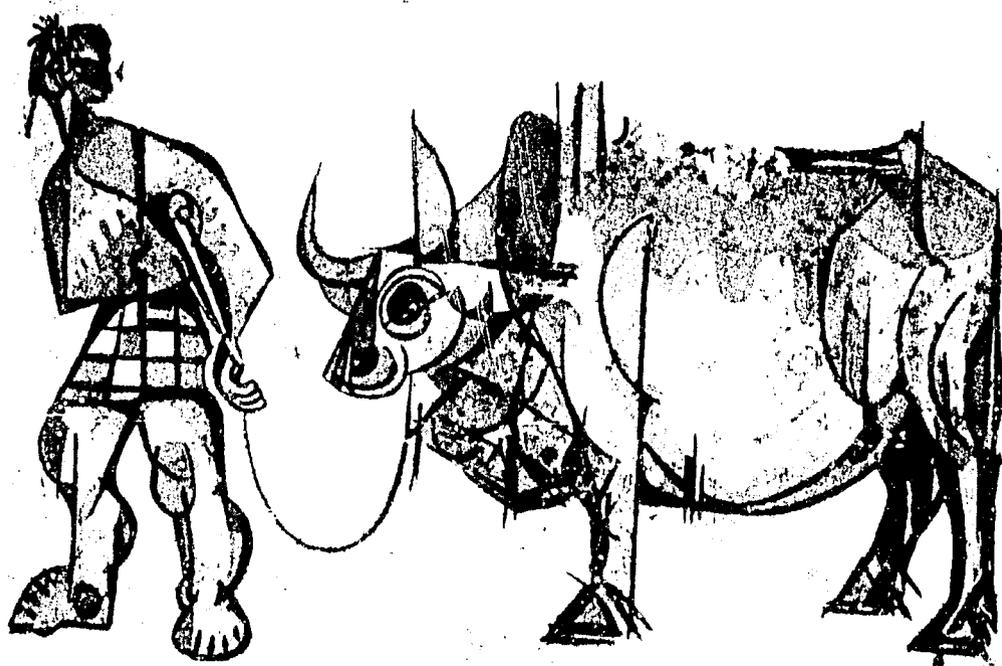


CORNELL UNIVERSITY

RURAL DEVELOPMENT COMMITTEE



Special Series on Local Institutional Development No. 2

**Local Institutional Development
for Natural Resource Management**

by

David Douglin

Peter Doan

Norman Uphoff

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SPECIAL SERIES ON LOCAL INSTITUTIONAL DEVELOPMENT -- No. 2

**LOCAL INSTITUTIONAL DEVELOPMENT
FOR NATURAL RESOURCE MANAGEMENT**

A report prepared by Peter Doan, David Douglin and Norman Uphoff for the Rural Development Committee, Cornell University, with support from the Office of Rural and Institutional Development, Bureau of Science and Technology, U. S. Agency for International Development

October 1984

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PREFACE TO SPECIAL SERIES ON LOCAL INSTITUTIONAL DEVELOPMENT

This series of reports presents the findings of a year-long study by our working group on Local Institutional Development (LID). It was sponsored by the Rural Development Committee at Cornell University and was funded by the Office of Rural and Institutional Development in USAID's Bureau of Science and Technology.

Our initial concern was whether local institutional development could be adequately provided for by approaching it on a sector-by-sector basis, or whether it represents something needing and warranting attention across sectors. As with most "either-or" questions, there turned out to be some merit in both views. Certain issues and provisions are particularly relevant for developing local institutional capacity for certain sectors. At the same time, individual sector-specific initiatives are likely to lead to neglect of more broadly-based capacities, which themselves are important for sector-specific kinds of LID.

Our analysis offers a firmer conceptual base for the often but ambiguously used terms "local" and "institution." It analyzes what kinds of LID are likely to be most appropriate for the different activities frequently initiated in rural areas. Finally, it examines how local institutional capacity can be strengthened by national and donor agency efforts.

Throughout the analysis, we draw on the experiences with LID which emerged from a review of the literature. Cases which proved particularly instructive are reported in annexes at the end of the reports. Not all readers will be interested in all the activity areas covered by our study, so we have organized the presentation of findings accordingly.

Five of the eight reports (Numbers 2 through 6) are sector-specific, and readers may have particular interest in just one or two of them. We trust that all readers will find the introductory report (Number 1) useful, as well as the observations and suggestions contained in the concluding reports (Numbers 7 and 8) which are relevant across sectors. The full series is listed on page ix.

In condensing our observations and conclusions into these reports, we have not been able to include all of the case material and literature references which were covered in our study. We now know how broad and complex is the subject of local institutional development. Our discussions in this series present only what appear to be the most tenable and salient conclusions. We plan to integrate these analyses into a

book-length presentation of the subject for readers wishing a single continuous treatment of LID.

Though this project involved an extensive literature search and review on our part, it must still be considered more exploratory than definitive. Few of the available materials addressed LID issues analytically or even very explicitly. We thus cannot and do not attempt to provide "recipes" for local institutional development. This is an initial mapping of some important terrain not previously surveyed systematically. We welcome any and all efforts by others to contribute to the understanding and practice of local institutional development by adding to a more thorough knowledge base.

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SPECIAL SERIES ON LOCAL INSTITUTIONAL DEVELOPMENT

- No. 1 ANALYZING OPTIONS FOR LOCAL INSTITUTIONAL DEVELOPMENT
Norman Uphoff
- No. 2 LOCAL INSTITUTIONAL DEVELOPMENT FOR NATURAL RESOURCE
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LOCAL INSTITUTIONAL DEVELOPMENT
Rebecca Miles Doan, Gregory Schmidt and Norman Uphoff

LOCAL INSTITUTIONAL DEVELOPMENT FOR NATURAL RESOURCE MANAGEMENT

1.0 ACTIVITIES IN NATURAL RESOURCE MANAGEMENT

While most people's immediate well-being in developing countries depends directly on their engagement in agriculture and other productive activity, no long-run development is possible without maintenance and sustainable exploitation of soil, water, forest and other primary assets. For such natural resource management, local institutions of various types and in various combinations are required.^{1/}

The basic natural resources to be managed are water and soil in conjunction with the plant and animal populations they support, technically referred to as biomass. Since both humans and animals depend on plant life more than it does on them, the system of vegetation associated with a particular soil-water-climate combination represents the biomass of dominant concern in natural resource management.

Water may be regarded as "first among equals" in that soil and biomass become inert without it. Fortunately, water is a renewable resource so long as soil and biomass are managed together with it in a stable, mutually supportive system. Soil, on the other hand, is renewable only in the very long run, through natural processes involving weather, water, plant and geological interactions. Yet soil can be maintained and even improved through management practices such as manuring, crop rotation, and physical control (e.g., terracing or contouring). Thus certain activities can maintain soil as well as water supply.

The biomass forms of special interest are trees, grasses and crops, (most of which are neither trees nor grasses). They are renewable as long as water and suitable soils are available (within tolerable climatic ranges). Soil is seldom "managed" by itself but rather in conjunction with some regime of trees, grasses or crops. In fact, most natural resource management, even if focused on just one of the resources, must involve the whole set of them.

There are five main kinds of natural resource management (NRM). Each has different local institutional requirements because of the way the resources and user/managers interact.

^{1/} In this analysis, we are dealing with renewable natural resources, since they are most significantly linked with agricultural and rural development. We will not be addressing management and exploitation of mineral resources, for example.

1. Forest management involves the utilization of tree and related plant and animal populations in ways that perpetuate the forest ecosystem. Fuel and fodder are major outputs of forest management, used as inputs in agriculture and domestic economies, along with forest products such as building materials (timber, thatch). If forest resources are handled properly, both quantity and quality of soil and water will also be maintained.

LDC governments and donor agencies are increasingly interested in what is called social forestry, where forest resources are managed by rural people through their community and other local institutions.

2. Rangeland management focusing on grasses is done where rainfall constraints favor livestock raising, and crop production is only minor and low-yielding. Grasses differ considerably from trees in their rate of growth and capacity for regeneration. This presents local and outside decision-makers with different time horizons for natural resource management. The sparseness of population means that local institutions have different dynamics and present special challenges to any program seeking to assist people in range areas (Dyson-Hudson and Dyson-Hudson, 1980).
3. Irrigation water management involves the acquisition and distribution of water for agriculture. It has more direct links to production than other NRM activities, but it shares crucial characteristics with them such as the need to regulate access to common property. Institutional issues also differ from those for agriculture because of certain ubiquitous tensions built into any irrigation system between upstream and downstream cultivators.
4. Watershed management aims at the maintenance of the water cycle through activities of forest and soil management.^{2/} Preventing soil erosion and preserving the biomass will reduce the likelihood of climatic changes such as reduced rainfall which may destabilize the ecosystem. Forest and grazing resources of a watershed area can be utilized so long as these activities do not disturb the water cycle.
5. Soil conservation could practically be called "cropland management" since it usually arises as a problem where crops, other than trees and grasses, continually extract soil nutrients and disturb the soil's structure. As noted already, good forest and range management includes soil conservation. The means for controlling erosion, restoring soil nutrients, and maintaining soil structure may be regarded as highly technical matters, but these require a strong local institutional base.^{3/}

^{2/} We are using the term "watershed" to refer to the catchment area, usually forested and hilly, where rainfall is collected and carried to the lowlands by streams and rivers. We are not using it with the "continental divide" meaning.

^{3/} This has been shown by the U.S. experience with soil conservation programs, documented by R. Morgan (1965). Examples from Jamaica are written up in Blustain (1982) and (1983). That soil cannot be "managed" apart from the growing of crops is seen from the conflicts that arose in the U.S. between the Soil Conservation Service and the various state agricultural extension services, both of which sought to get farmers to draw up complete farm plans (Morgan, 1965:124ff).

Natural resource management contributes directly to the profitability and sustainability of both agricultural and non-agricultural enterprises, and poor management can have consequences for rural infrastructure and human health. So NRM and the local institutions supporting it should not be regarded in isolation.

2.0 LOCAL INSTITUTIONAL OPTIONS

The principal organizational options for mobilizing local efforts and responsibility for natural resource management are:

- ** local administration, agencies of government operating in a regulatory mode, setting policies and enforcing them by technical (and often political) criteria;
- ** local governments, responsible to the community but functioning within the state's formal-legal framework;
- ** membership organizations, often called user groups, dealing with resource and with associated productive activities in functionally specific ways to serve members' needs; sometimes operating as cooperatives by pooling members' economic resources;
- ** service organizations, operating on a not-for-profit basis to protect or regulate resource use; and
- ** private businesses, utilizing resources according to calculations of profitability over time and according to established business practices.

A parallel additional option which has "institutional" aspects but which operates outside organizational channels is:

- ** use-management, carried out by individuals and households according to community norms and personal understandings of limits and possibilities of resource exploitation (Roe and Fortmann, 1982).

Each of these offers advantages and disadvantages to be weighed in specific contexts for specific objectives of NRM. The administrative approach appears more favorable for achieving technically prescribed management levels and practices. But it is costly to carry out, it may not operate with sufficient information on local resource variations, and it may not be effective if lacking legitimacy from the communities

being served. Efforts to protect the forests in Nepal through only the Forestry Department, for example, have proved largely unsuccessful, whereas working in conjunction with local government bodies (panchayats) and membership groups (under the Small Farmer Development Program) has accomplished more beneficial results.^{4/}

The role for government agencies or branches of local administration (LA) such as the Agriculture or Forestry Ministry is greatest when there is conflict between users of a single resource who come from different localities or when there is a perceived lack of congruence between the costs and benefits of resource use. We see this in soil conservation (benefits may be much deferred while costs are immediate) or watershed management (downstream communities get most of the benefit of upstream communities' efforts).

Local administration may also be more appropriate where the preferred management practices are quite technical or complex. However, government staff may lack the detailed information on local resources and problems to be efficient or effective in implementing NRM programs. Such staff may also be unfavorably associated with restrictive government policies and thereby forfeit the legitimacy which if accorded by local people would gain their cooperation in carrying out NRM tasks at low cost (Temple, 1972).

The community management option is attractive because of the fact that local residents have both the most stake in and the most information about natural resources. However, there may not be any coherent community capacity to discharge management responsibilities, or stronger communities may take advantage of weaker neighboring communities (Roe and Fortmann, 1982; Acharya, 1984). Also, it is sometimes difficult to determine exactly who constitutes "the community" responsible for a given resource.

When there is a multiplicity of potentially conflicting uses of a resource in a single locality, elected local government (LG) is in the best position to work out satisfactory solutions, assuming two conditions. First, LG jurisdiction must be recognized by all parties. This may not be the case with large-scale commercial users of natural resources who can circumvent local decisions by going to higher governmental levels. Second, the interests of local elites should not dominate decision-making; otherwise NRM decisions will not be equitable, and they may not even be effective, if seen as unfair and thus not binding.

^{4/} See discussion in Annex, pages 40-41. The annexes are intended to give readers some concrete illustrations of experience and lessons that have informed our analysis.

User-groups are likely to be smaller management units, more homogeneous and having fewer problems of managing the organization itself. They are likely, however, to lack as much legitimacy and authority as LA or LG would have vis-a-vis other competing users when it comes to resolving conflicts. Also, they may be inclined to follow more extractive practices than advisable from a larger community or national perspective.

The utility of user groups for NRM depends very much on the nature of the resource and the users involved, as well as on the correspondence between costs and benefits. Irrigation groups are more effective as a rule than groups for soil conservation, and membership organizations while seldom appropriate for managing large watersheds may be able to protect smaller forests. User groups are more viable for NRM when members are homogeneous and concentrated.

Local service organizations are less often involved in natural resource management activities than LG or LA. However, we find in India, for example, a variety of non-governmental organizations that are involved in community forestry activity.^{5/}

Private businesses have clear incentives to undertake management practices that will produce more benefit than cost. In situations where resources are being managed for industrial use or for energy utilization, such as on large plantations, private companies may be more efficient in economic terms due to the need for intensive inputs over a relatively short time horizon (Palin, 1983).

But the benefits and costs considered by private operators are internal ones, and particularly for NRM, taking externalities into account is important when making decisions. Downstream water users or downhill agriculturalists may suffer serious losses from purely profit-oriented management upstream or uphill. Also, the way in which future benefits are "discounted" gives a strong here-and-now bias to calculations, undervaluing the productive needs and possibilities of future generations.

^{5/} These include the Ranchi Consortium for Community Forestry, the Silent Valley Movement, the Friends of Tree Club, and Himalaya Seva Sangh, which are involved in popularizing the need for preserving trees (Basu, 1983). While these organizations clearly exist to serve members in addition to other people in the community, to the extent they engage in information sharing and consciousness raising about the importance of NRM, they go beyond what we would categorize as local membership organizations, basically oriented to self-help. "Traditional" local service organizations involved in managing guthi and sacred forests in Nepal are documented in Acharya (1984:44-47).

Direct user-management is generally underestimated as an alternative because it is not organizationally based and thus is "institutional" only in the "invisible hand" sense that Knight has used the term.^{6/} The herder who limits grazing in forest areas to let seedlings grow undisturbed, or the farmer who fills up gulleys in his field as soon as they appear, is taking individual actions but is likely responding to cultural and social norms. Under such a system, individual action leads to collective benefit, where there is clear socio-cultural definition of the collective entity. The swidden system of shifting cultivation, for example, relies on unstated agreements among resource users on the length of fallow periods to prevent soil exhaustion (Grandstaff, 1978; Brush, 1983). Such responsibility is the least expensive and the most effective kind of NRM if the practices are technically correct. Unfortunately, this management mode is not very amenable to creation by policies, though it can definitely be undermined by government actions. Also, it is quite vulnerable when community norms and social structures come under outside pressure, for example, from the spread of commercialization or from population growth greatly increasing man-land ratios.

Much has been written about the "tragedy of the commons," where each individual resource user gains more than he loses by increasing his use of that resource, but if all increase their use the resource will be depleted and lost (G. Hardin, 1968). The contradiction between individual and collective interests has been presented most graphically for range management, describing the temptation of herders to overgraze pastureland, but the same logic applies to forest use or any common property.

There is currently some re-thinking of the "tragedy of the commons" logic, which assumes an independence of decision-making that is not empirically warranted and which ignores the extent to which institutions have been devised precisely to coordinate expectations and behavior in resource-maintaining ways (Runge, 1981 and 1984).

Because the implications of "common property" are so important for local institutions' capacity to manage natural resources, we consider them below in section 4.0. Here we only present use-management by individuals as a form of local institutional development (LID), which may complement or be an alternative to the kind of formal institutions we are focusing on in this study. "Traditional" organizations and roles, generally informal, stand behind most use-management, apportioning sanctions and rewards, so more is involved than just shared norms among users.

^{6/} See Report No. 1, page 9, footnote 14, on this point.

3.0 INTERACTIONS OF RESOURCE AND USER CHARACTERISTICS

As seen in section 1.0, the natural resources to be managed, even leaving aside those primarily used for non-agricultural purposes, are diverse. Though "water" is involved in both irrigation water management and watershed management, for example, different institutional arrangements are appropriate for each, because of the different ways users relate to the resource and to each other, within space and over time. An analysis of such differences is essential for evaluating and promoting LID for natural resource management.

3.1 CONSIDERING THE 'BOUNDEDNESS' OF RESOURCES AND USERS

What kinds of local institutions will be effective and sustainable for natural resource management depends on the nature of the resource to be managed and on the composition of the community of resource users (e.g., whether indeed they constitute a "community"). It is readily apparent that natural resource management tasks must be spatially conceived and carried out, and that use (management or exploitation) is a matter of human choice and action. To the extent that the resources and the relevant set of users are "bounded" -- delimited and identifiable -- the management tasks will be easier and more amenable to local institutional responsibility.

As shown on the next page, there are inherent differences among natural resources in terms of the "boundedness" of users and resources (though changes in technology can affect this). When considering the potential effectiveness of resource user-managers, one should examine the extent to which: (1) they constitute an identifiable and delimited set of persons, and (2) they have some established and effective authority structure, whose legitimacy is recognized and accepted. If there is in effect a "community" of user-managers, both criteria are satisfied. But in many NRM situations, the user-managers are an ill-defined set of persons, not a group or community, and they have no existing mechanisms for making and enforcing decisions.

Similarly, there can be variations in the resource to be managed (exploited and conserved). One should consider the extent to which the user managers know and can predict with confidence: (a) the amount and quality of the resource to be managed, and (b) its availability at a certain time and place. When the amount and availability of a resource is known for certain, the possibilities of effective management are greatly

increased, and more routinized institutions are possible. When there is less knowledge and predictability, there is still need for some kinds of institutions to reduce the resulting risk, but they must be looser and may be oriented more toward insurance and welfare functions than to optimizing productivity.

Institutions can be said to deal with two kinds of risk and uncertainty: (a) that arising from the behavior of others -- what they do and how that will affect one's own well-being, and (b) that arising from the vagaries and variability in the natural environment.^{7/}

These different characteristics of users and resources combine to present different contexts for natural resource management, ranging from known resources managed by a definite set of users to a situation where both the resource and the users are varying. These combinations are shown in the matrix below, with different kinds of resource management suggested as illustrations (rather than as typologies).

		<u>Natural resource is:</u>	
		(a) <u>Known and predictable</u>	(b) <u>Little known and unpredictable</u>
<u>User-managers are:</u>	(a) Identifiable and coherent group	(I) Irrigation water management	(II) Coastal fishing (done by fisherman groups)
	(b) Lacking group identity and structure	(III) Forest management	(IV) Range management

Not all irrigation water management will have the combined characteristics of (I), but the group of users and the resource are likely to be more identifiable and definite than for most other natural resources. The distinctions made here are suggested to throw light on the different LID problems faced for water management (I), social forestry (III), and range management (IV) because they vary along these dimensions.

^{7/} Runge argues that: "the incentive to develop political and economic institutions lies in the coordination of expectations. Institutions which successfully perform such coordination provide assurance in the face of uncertainty over the expected actions of others" (1984:155). An earlier article deals more extensively with the way institutions exist to cope with uncertainties arising from nature (Runge, 1981).

Soil conservation resembles (I) but has very different cost and benefit patterns as discussed in 3.2. Watershed management has characteristics of (II), (III) and (IV), and is therefore more complex analytically and also operationally more difficult.

The implications of such analysis for local institutional development to support each kind of natural resource management will be considered in section 5.0. Here we make only general comparative observations. To the extent that the resource and the users are well known and identifiable, local institutions become more viable. Conversely, when the resource is more uncertain and the set of users ill-defined, higher level institutions have a greater role to play in NRM.

Where the resource and the users are more definite, local membership organizations of resource users are particularly appropriate. In keeping with this analysis, it is no accident that the most and the best examples of user associations for NRM are found in the area of irrigation water management.^{8/} There can be and are year-to-year fluctuations in water supply, but the technology of irrigation compensates for such variability better than is possible with precipitation in rainfed areas. Adjustments in supply can be made among a fixed set of water users known to each other. Herders have the advantage of more mobility in seeking alternate grazing resources when rainfall is not forthcoming at the time and place expected. But this brings them into contact, and likely conflict, with persons beyond their immediate social setting.

This is to say that user groups can be more stable and effective for irrigation than for range management, and that some higher-level and authoritative decision-making is desirable to deal with the membership and resource ambiguities of the latter. It is not to say that user groups are unnecessary for range management. As discussed in 5.3, they usually need to be part of the LiD complex for range management. But the structure of their relationships with each other is different (less fixed) than with irrigation, where users are geographically delimited and the resource to be shared can be more precisely distributed.

With forest management, the resource is geographically fixed and "bounded," but the persons having access to it are not so limited or limitable as with irrigation water. User associations are harder to form and maintain on a voluntary basis. Some

^{8/} In our study of local organizations world wide, we found that water user associations had somewhat higher performance scores on average than other kinds of LOs (Esman and Uphoff, 1984). The performance of indigenous WUAs such as the subaks in Indonesia and the zanjeras in the Philippines are discussed below.

authoritative and inclusive body such as local government becomes more relevant in the situation where the resource is more bounded than the set of users. Possibly local agents of the national government will be needed to balance and control claims to use such a resource. We will consider such institutional alternatives for each NRM area more explicitly in section 5.0.

3.2 CONSIDERING THE DISTRIBUTION OF COSTS AND BENEFITS

The benefits from natural resource management accrue differently over time and space, as do the costs. There are also significant differences in how tangible or perceptible the benefits and costs are respectively, and whether the costs and benefits are borne by the same persons. Such considerations affect the feasibility of LID alternatives. We have identified four dimensions along which the natural resources to be managed can vary with respect to the users or potential users involved.

1. Temporal Dimension
 - a. Benefits accrue immediately or very soon
 - b. Benefits accrue after a long time
2. Spatial Dimension
 - a. Benefits accrue locally
 - b. Benefits accrue remotely
3. Tangibility
 - a. Benefits are quite evident
 - b. Benefits are relatively hard to identify
4. Distribution
 - a. Benefits accrue to the same persons who bear the costs of management
 - b. Benefits accrue to different persons who bear the costs of management

This analysis presumes that managing natural resources always has some cost, either direct investment of labor or funds or abstaining from some present use to

preserve the resource over time. One could expect local institutions to be most effective in natural resource management where NRM benefits accrue quickly (1a), locally (2a), visibly (3a) and to those who bear the cost (4a). In such circumstances, it clearly "pays" for individuals and groups to take responsibility for a resource. The opposite circumstances could make LID for natural resource management almost impossible, where the benefits are delayed (1b), remote (2b), hard to identify (3b) and do not accrue to the investor of effort, money and forgone use (4b).

One of the reasons why irrigation water management is more readily handled through membership organizations than soil conservation is that the benefits are quick as well as local. The farmer who invests in soil conservation may not easily see the benefits, and indeed the benefits of stopping runoff and flooding accrue to others, not just at lower elevations but in future generations. To be sure, if land tenure is secure and the farmer is confident that those future generations will be his own children and grandchildren, investment in soil conservation or tree planting will be more attractive.

There can be significant differences within a resource type. Gully erosion may elicit collective action to prevent it, whereas sheet erosion can go unnoticed and unchecked. Villagers may undertake forest management when they find no more trees suitable for building materials, whereas the increments in time it takes to gather enough firewood may not be marked enough to elicit community action.

The lack of coincidence between benefits and costs is often a major factor affecting social forestry. In parts of Malawi, for example, women do the firewood gathering but men make all decisions about planting trees. Unless women are included in influential roles in the local government bodies or any local organizations dealing with forestry, community decisions about forest management will be "sub-optimal." This gives reason for a greater LA role.

Also in parts of Malawi, where men settle after marriage in their wife's village, the rights of tree ownership remain with the women and their families, whereas the planting of trees is traditionally assigned to males. This introduces a further asymmetry between benefits and costs which inhibits local responsibility for social forestry (Kafumba, 1983; Hoskins, 1979).

One of the reasons why we find more vigorous and successful local management and institutions dealing with irrigation is the fact that good water management produces quick and evident benefits to those who undertake those activities. Watershed management, on the other hand, has quite the opposite profile of benefits, even though both sets of activities deal with the same natural resource, water. Because the benefits

of watershed management are usually remote in time and space, there is usually more need for a government role if such management is to be undertaken strenuously. These considerations of benefit and cost profiles, which vary according to the resource, will condition the applicability of LID options.

3.3 CHARACTERISTICS OF THE RESOURCE

The nature of the resource being managed will affect how desirable certain institutional options are. We would highlight the effects of three different characteristics: renewability, seasonality, and the way the resource is perceived by the public.

Renewability. The length of time required for a natural resource to be renewed may vary from several months to several centuries or longer. Grasses on a range may revive after a few weeks of rain, while the vegetation of a forest can take from 20 to 100 years depending on the species. Indeed, tropical rainforests can take 400 years to become fully matured (Guppy, 1984). Soils can take even longer for renewal and in some cases if severely eroded, they may be virtually non-renewable, especially if the loss of biomass affects the water cycle.

The less renewable a resource is, the more risk there is that poor management will have drastic consequences, and the more reason one can offer for some form of central government involvement. Degradation of vital resources such as soils may cause long-lasting problems and have a dire effect on future generations. While forests are more renewable than the soils in which they grow, the pool of genetic material they represent may not be renewable or replicable once destroyed (Oldfield, 1981).

Thus forest maintenance frequently requires institutional options with a longer time horizon and more sustained commitment than may be assurable with certain local institutions, especially if the imperceptibility of deterioration and an asymmetry between benefits and costs make such institutions less promising for NRM, as discussed in section 3.2. Range management, in contrast, can be left to local institutions with less risk.

To be sure, careful balancing between utilization and conservation is needed for range management, since over-grazing can lead to soil degradation which substantially lengthens the cycle of regrowth. This concern may justify a central institutional role,

or a role for LA in preference to other local institutions. But within some limits, responsibility for range management can be more confidently devolved to user groups or local governments, taking care to align the distribution of costs and benefits (3.2) as much as possible to give better NRM incentives at the local level.

Seasonality. This is another factor of great importance for NRM. Problems of soil erosion and the need for irrigation management of course will be increased by climatic extremes, but the kinds of local institutions that are suitable for NRM tasks can be affected by seasonality. The flow of local institutional activity is affected by variations in the agricultural seasons (Fortmann, 1982). To the extent that activities need to be carried out year round at the same level, or need to be continued during the time of peak demand for agricultural labor, the role of LA will be enhanced.^{9/}

Whatever kinds of local institutions are charged with NRM responsibilities under conditions of high seasonality, they will need to operate with more flexibility and informality than usually found in government operations. Our own research in Botswana, for example, found it was quite unreasonable to expect user groups set up to maintain and operate small catchment dams for watering livestock to function on a year-round basis when seasonal fluctuations made the need for and supply of the dams' water highly variable. Other research in the Philippines and Indonesia has found governments too often expecting irrigation water user associations to operate the same way in the wet season when water is abundant as in the dry season when it is scarce (Robinson, 1982; Duewel, 1984). If LA and LG institutions find it too difficult to adapt to seasonal variations, their functions should be handled by local organizations, cooperatives or private businesses.

Perceptions of Resources. Apart from their physical characteristics, resources are perceived by users in certain ways. There may not be much ambiguity about seasonal variation, but how users regard the "renewability" of a resource will affect

^{9/} A social forestry project in the Tahoua Department of central Niger found that during the time when its activities required the most involvement from villagers, they had to be busy attending their own fields. Given the unpredictability of when and where the rains would fall, when they did begin, everyone rushed to get field crops planted. They were thus unwilling or unable to assist the Forestry Department personnel in planting operations, which had to be started at this very time if the seedlings were to become established. It was thus impossible under these circumstances to make the project as "participatory" as intended (Brechin and West, 1982:84).

their willingness to invest in its maintenance. In particular, it is important to consider whether potential managers of a resource perceive it as a "public" or as a "private" resource, to be managed for collective or for individual benefit.

In most African countries surface water in ponds or from rivers is seen as accessible to anybody, whereas groundwater is regarded as the property of whoever pumps it up. The legitimacy of local groups' controlling access to water will be affected by such beliefs. If they are unable to exclude anybody from use, they have little incentive to invest their resources in development or protection of the resource (Roe and Fortmann, 1982).

The usual norm is that if individuals or groups (or the state) have invested in improving a resource, whether land, water or forest, they have established a right to the benefits thereof, whereas any unimproved resource should be accessible to others. If legal norms have been introduced, a property claim can be made through cash and paper transactions, but these are not visible, in contrast to labor and other investments which can be seen.

The development of private enterprise institutions at the local level depends in part on having people accord legitimacy to formal-legal rights of ownership. Some private ownership is recognized in virtually all societies, but businesses as such may not be an effective vehicle for development, in the area of natural resource management, unless there are widely shared perceptions that private owners have a right to exclude others from access to that resource.

3.4 CHARACTERISTICS OF THE USERS

We have already discussed the characteristic of local resource users which has the most bearing on local NRM capabilities -- the extent to which they have identifiable boundaries and some recognized authority structure (section 3.1). Several others are also important.

Interdependence. To the extent that resource users are dependent on one another for their livelihood and even survival, the incentives for making local institutions operate successfully are greater. Farmers managing irrigation water need to take the decisions, interests and actions of each other into account in a way that persons living and working in watershed areas do not, for example. This consideration adds to the

reasons given in section 3.2 why we should expect local institutions to be stronger for water management than for watershed management.

Interdependence is more evident to range user-managers than to their counterparts user-managing forest resources, perhaps because the availability and adequacy of water is so dominant a concern. Spoiling or exhausting a water point has dire consequences for others, and there are various means of retaliation that can deter irresponsible behavior, more readily than with abuse of forests.

Certain techniques of natural resource management, such as for soil conservation, may create or require interdependence. If bench terraces are constructed on a hillside, there must be cooperation in constructing toe drains and waterways to carry away the runoff; otherwise one farmer will be dumping water onto another farmer's field and increasing erosion there. Use of grass stripping or strip cropping, on the other hand, retards runoff more evenly and can be used independently of what others do. Some kind of local institutional action by LA, LG or membership organizations will be needed for terrace methods of soil conservation, whereas individual efforts are sufficient for the latter technologies.

Interdependence can be created by organizational design, to establish incentives for more efficient or equitable institutional performance. We note that in the Philippines, the zanjera irrigation organizations give their officers plots of land at the tail end of their command area as compensation for their services. As the productivity of these plots depends on the amount of water reaching them, officers have more reason to ensure sufficient flow throughout the system (Siy, 1982).^{10/}

Homogeneity. The tasks of local institutions in natural resource management are greatly simplified when users are homogeneous, as fewer conflicting interests are likely to be at stake. The most significant kind of heterogeneity arises from multiple uses of the resource. Range management projects, for example, commonly run into problems when some of the land is (or can be) used for crop production. This was seen in an Upper Volta project where pastoralist and agricultural families were to be members of a single local organization (Gooch, 1979). Similarly, when the water in irrigation projects must serve competing or conflicting purposes, membership organizations are less likely to be successful.

There is no assurance that local governments will be able to allocate and regulate the resource in an optimal way if such organizations would have difficulty due to

^{10/} Traditional irrigation systems in Sri Lanka used a similar incentive system, according to Leach (1961).

internal conflicts. When valued resources are at stake, the incentive for one set of users to predominate is great, so some involvement by local administration, representing the central government, may be needed to preserve a balance of interests. The LG role will be to provide a legitimate forum for bargaining, to turn zero-sum conflicts into positive-sum situations through accommodations and side-payments, such as adjustments in water allocation schedules and compensation for forgone shares of water.

Conflict over natural resource use is less likely to the extent that the users see themselves as unified by kinship, occupation or on some other basis. Where such identifications are varied, one would expect a greater role for LA or LG as more able to reach decisions if there is deadlock or to enforce compromise solutions if there is disagreement. One limitation is that compliance with decisions and regulations can be difficult to achieve through coercive means in developing countries. Thus the process of consultation and consensus may be needed even (or especially) where heterogeneity makes natural resource management a complicated undertaking. User involvement in discussing, planning and implementing NRM is possible through various kinds of channels. Where heterogeneity is substantial, having a process of consultation may be more important than the channel through which it is conducted.

"Tradition". One should not presume that resource users living in "traditional" social settings are necessarily able and willing to manage forests, soil and water productively, equitably and without conflict. We did find in our review of the literature, however, that in communities where "traditional" roles and norms are relatively intact, the capacity of local institutions of all kinds to manage natural resources appears greater (e.g., Acharya, 1984; Siy, 1982). Diminished capacity at the local level to sustain resource productivity often goes along with the decline in "traditional" institutions exemplified by chiefs and councils of elders (Roe and Fortmann, 1982).

Opinions differ on how strong and useful such institutions are in the contemporary world. One can find traditional roles resilient in some places and atrophied in others. We would not make any generalizations other than to say that where they exist and are not biased markedly in favor of privileged interests, traditional institutions should be engaged, where such "cooptation" will not itself detract from their effectiveness. To introduce "modern" institutions that compete with "traditional" ones seems unlikely to be successful. Local institutional development should build as much as possible on

existing roles and relationships that support NRM, as discussed in Section 3.1 of Report No. 7. To the degree that these can allocate and regulate the use of forest, soil and water resources, they are themselves "natural resources" of some value.

4.0 CONSIDERATION OF 'COMMON PROPERTY'

Local institutional development for natural resource management must often deal with issues arising from "common" ownership of property. When resources are privately owned, their management is left to individuals who can themselves weigh the benefits and costs of exploitation, now and in the future, and act accordingly. On the other hand, when forest, water and other resources are held in common, individuals have incentives to exploit the resource for private gain at co-holders' expense in what has come to be known as "the tragedy of the commons."^{11/}

Privatization of resources is often recommended to avert overuse, but this solution can introduce its own problems according to the nature of the resource, for example, when rangeland gets uneven and variable rainfall. If a herder has access only to a fixed area, in a year when sufficient rain does not fall there, his herd will starve if he cannot move it to other more fortunate areas. The mobility of pastoralists is a strategy dictated by the vagaries of weather in a resource-scarce and vulnerable environment (Gilles and Jamtgaard, 1981; also Sandford, 1983).

Where individual decisions would culminate in undesirable outcomes, some form of collective action is needed. The question is whether it will be voluntary or coerced, and whether it can be generated within the community of users or must be imposed from "above." The analysis of collective action by Olson (1965) suggests that the "free rider" problem makes voluntary cooperation unlikely. Individuals who are able to get the benefits of group action without bearing any of the costs of creating this "good" are likely to do so if they are "rational." According to Olson, "free ridership" can be limited only if the group is very small so that any individuals taking advantage of others

^{11/} Garrett Hardin (1968) has described analytically a situation where herders are grazing cattle on common pastureland. If an individual increases his herd, this decreases the total amount of forage available. But each herder's loss when divided among all herders including the individual is small, perhaps imperceptible, and much less than the benefit he derives from grazing more cattle. So he has an incentive -- as do all other herders -- to increase the size of herds until the commons are destroyed by over-grazing. As Sandford (1983:118-127) points out, however, this is a deductive, not an empirical account of collective behavior.

can be readily observed and controlled by social sanctions, or if the benefits of group action can be withheld from non-contributors.

Resource users themselves have been thought to be incapable of managing "common" natural resources because the rational self-interested behavior which gives rise to the "tragedy" of the commons also leads to "free riding," which undermines the cooperation among users which could avert a "tragedy." Why should one bear the costs of maintaining an institution for resource management if one can get the benefits therefrom without paying for them? If one's neighbors protect the village forest, this creates more firewood for one to take surreptitiously.

The most common response to such problems is for the state to introduce into this situation its agents, whose decisions regulating resource use are backed by coercion if necessary to ensure compliance. Such coercion must have at least the tacit consent of the majority of users to be effective, but the source and control of coercion rests with persons who are largely external to the community of users. Such a pattern of LID would rely on local administration for resource management.

Yet we find empirically that government agency options for natural resource management are of limited effectiveness by themselves. They face difficulties in mobilizing the information and legitimacy needed for efficient enforcement and cannot mobilize social supports and sanctions which affect resource-using behavior most directly. The private ownership option appears to have advantages where it matches the costs and benefits of resource management in the same person, but this is not easily accomplished because of the spatial and temporal distribution of costs or benefits.^{12/}

Private management of forests, for example, may lead to overcutting if current market prices for fuel and timber are attractive, contributing to soil erosion and attendant environmental deterioration elsewhere.^{13/} Soil conservation measures may lag because the value of the land to future generations is underestimated. Privatization of rangeland was seen in Botswana as a solution to its degradation, yet the

^{12/} See section 3.2 above. Perhaps this is why overgrazing is reported also under private ownership regimes. Gilles and Jamtgaard (1981:131-133) and Sandford (1983:119-120) find no consistent evidence that overgrazing is a worse problem on common than on private rangelands.

^{13/} Fife (1977) has suggested two situations in which private ownership would lead to resource abuse: if alternative low risk investment alternatives encourage a rapid exploitation of the resource to earn profits to invest in them, or if holdings were too small to provide an adequate standard of living, and users feel forced to run the risk of resource deterioration.

implementation of such a policy proved to have undesirable equity effects without demonstrable ecological benefits compared to communal management (Dekure and Dyson-Hudson, 1983).

There is now in the literature considerable rethinking of the "tragedy of the commons" thesis. Empirically there is more "collective action" than one would predict according to Olson (1965), R. Hardin (1971) or G. Hardin (1973). Such theories are inconsistent with their own premise of rationality, since anyone who decides to "free-ride" or to "defect" (in a prisoner's dilemma type of situation) is unjustifiably assuming that he is the only rational actor, that the others who are to create the collective good he expects to enjoy are not likewise rational (Kimber, 1981).

Such an assumption is not only arrogant; it is itself irrational. If one assumes, more reasonably, that others are as rational as oneself, one's utility is maximized by making a contribution in good faith to the collective good to be produced, so long as one values the good itself more than the cost of contributing one's required or expected share. As long as (enough) others do the same, it pays to be cooperative (Popkin, 1981).

Such behavior is consistent with the general maximizing strategy of cooperation which Axelrod (1984) has derived from computerized game-theoretic research. Runge suggests, with specific regard to natural resource management, that cooperation can be reinforced by dealing with "the assurance problem." One major function of institutions is to mitigate this problem by coordinating people's expectations of what others will do. He cites experimental evidence that the level of voluntary contributions is far from zero even in large groups (1984:172-175).^{13/}

R. Hardin in more recent work (1982) emphasizes the role of sanctions and conventions in controlling individual behavior. These usually derive from the norms and roles associated with institutions. An analysis by Erickson-Blomquist and Ostrom (1984) on how institutions can control environmental crises suggests that collective action to stem the deterioration of a resource can be triggered by a combination of information and discussion. Critical components of such a strategy are the ability to identify all

^{13/} Kimber suggests with evident irony that rational self-interest in joining organizations is not based only on discrete individual benefits. "There is surely something absurd in the idea that...the Council for the Protection of Rural England is really organized, not to protect rural England, but to provide wine and cheese parties for its members" (1981:196). If members join for selective rather than collective benefits, why do not organizations undertake to provide only the former?

users and to establish clear boundaries within which management will occur.^{14/} Other conditions are the possibility of on-going discussion among users about the common problem and alternative courses of action, plus effective monitoring of participants' behavior so as to reduce incentives to "defect."

Such findings and rethinking concerning collective action suggest that there is more of a role for membership organizations in natural resource management than indicated by previous theory. Some development of government agencies' capacity is invariably important as a backup to voluntary controls. But there appears to be considerable potential for other local institutions too, such as local government and user groups, provided that they have responsibilities consistent with the kind of analysis concerning "boundedness" and distribution of costs and benefits which was presented in section 3.1 and 3.2.

In some situations and for some resources it will make sense for private local institutions to take on certain NRM responsibilities. Judicious experimentation with this mode of LID is appropriate where resource management problems are evident and an analysis of incentives and constraints points to privatization. At the same time, it should not be assumed that "common property" means all potential users have "open access" to the resource. There are well-known if not necessarily formal rules governing access in most common property situations (Runge, 1981; Gilles and Jamtgaard, 1981; Sandford, 1983).^{15/} These lead to institutionalized "use-management" which is non-organizational (or quasi-organizational), following the distinction between organizations and institutions elaborated in our first report (section 5.0). A strategy of institutional development of practical necessity will focus on developing organizations with explicit roles and rules, but to acquire the legitimation needed for institutional effectiveness, some foundation in non-organizational institutions is important.

^{14/} That their analysis independently focused on the same elements we emphasized in 3.1 above suggests the utility of cross-national as well as cross-resource analyses of natural resource management. Their analysis was prompted by the study of a classic water use conflict in Southern California, while our concern with "boundaries" came from comparing Rural Development Committee experience in irrigation management in Sri Lanka with range management in Botswana.

^{15/} Such traditional rules are documented in a study of local forest and pasture management in Nepal by one of our working group members (Acharya, 1984). These rules have become informally part of the management strategy of "modern" local institutions like panchayat and user groups. One of the most intriguing studies of management of common pastures, dating back to at least the 13th century without deterioration of the resource base, is by Netting (1976).

5.0 IMPLICATIONS FOR LOCAL INSTITUTIONAL DEVELOPMENT

When planning support of local institutional development in the natural resource management area, the preceding lines of analysis give guidance by assessing how factors such as "boundedness" and the distribution of benefits and costs of resource management can affect the viability of different kinds of local institutions.

5.1 IRRIGATION WATER MANAGEMENT

Our discussion of local institutions for managing irrigation water will be relatively brief since they are probably the most common and best documented.^{16/} In particular, water user membership organizations built around a common interest in acquiring and sharing water and in maintaining the system and resolving conflicts are quite feasible. Many observers of irrigation management have been impressed with the efficiency and stability of "indigenous" local organizations such as the subaks on the island of Bali in Indonesia (Geertz, 1967; Birkelbach, 1973) and the zanjeras in the Ilocos region of the Philippines (Lewis, 1971; Siy, 1982). Less well-known are similar organizations in South America, in Peru (Mitchell, 1976; Isbeil, 1978) and Ecuador (Cornick, 1982), for example. Contemporary analogues have been introduced in the Philippines by the National Irrigation Administration there (F. Korten, 1982) and in Sri Lanka by the Agrarian Research and Training Institute (Uphoff, 1984).

Irrigation management invariably confronts the problem that farmers upstream have locational advantage over those who are downstream and this creates at least the potential for continual conflict. Water users at the head of the channel or at the head of the system are in a better position to get water than those at the tail-end, and are less dependent on proper maintenance of the channel or system. However, this problem of conflicting interests also gives impetus to users to organize and cooperate, to assure at least some water for all and to prevent violence. The same farmers along a channel who have conflicting interests over the supply they receive if water is scarce, have a common interest in guaranteeing that supply or in expanding it. So, fortunately, the

^{16/} Also, a more extended state-of-the-art analysis has been done on farmer organization and participation for water management by a sub-group (Uphoff, Meinzen-Dick and St. Julien, 1984).

centrifugal forces of competition over water are at least somewhat counterbalanced by centripetal pulls toward cooperation.

One limitation on membership organizations as channels for irrigation management is that the water may be used for other purposes besides irrigation. Very often a water source is used also by women for domestic water supply, though their needs and interests are not represented in what are commonly all-male associations of "water users."^{17/} Where other users such as operators of water-driven mills or power turbines, or makers of beer, paper or other products, or river transporters or fishermen are also dependent on the water supply, conflicts may make local organizations of irrigators less effective (Pitt-Rivers, 1961).

In such a situation, local government institutions with broader jurisdiction become more viable, though if the competing users are outside the community, local government may itself be unable to resolve the conflicts, and local administrative agencies will become more relevant if they have the necessary authority to deal with the problems.^{18/} For local administration to handle irrigation management tasks, some degree of decentralization of authority is needed.

Local government can be a preferred LID option where virtually all households within its jurisdiction are involved directly in irrigated agriculture. Then water management can legitimately and effectively be dealt with as a concern of the whole community. One advantage of the LG alternative is that conflicts between agricultural and domestic users of water can be better resolved than through membership organizations of irrigators, that is, if women's interests are effectively represented in LG deliberations.

We have found that irrigation water management at the local level is most often handled through user groups. But there are good examples of "traditional" local government institutions handling irrigation management in Indonesia (Dewel, 1984), Mexico (Lees, 1973) and Northern Pakistan (Bhatty, 1979). So we know that this is a feasible local institutional alternative.

^{17/} The term, "water user association," widely used by donor agencies to designate local irrigation organizations is often a misnomer, because it ignores non-irrigation water users.

^{18/} In a Chilean community reported in the Annex (page 37), mining interests outside the local government jurisdiction were preempting the water supply and thus undercutting the irrigation associations managing water. The fact that control over the associations and over irrigation had been preempted by the national irrigation bureaucracy meant that local solutions and accommodations could not be worked out (Lynch, 1978).

The best comparative study of the development of local institutions for water management is by Maass and Anderson (1978). In Spain they found effective local government systems handling water management, with well-established water courts enforcing an elaborately-evolved water law, with widespread understanding and participation. The evolution of these local institutions occurred over many centuries and was backed by timely and strong support from higher levels of government. In the U.S., irrigation management was handled by user associations rather than by local government bodies. But the associations were given legal recognition and sanctions, so that they operated effectively in a quasi-governmental manner.

Only if the size of irrigated holdings is quite large do private businesses and institutions become particularly useful for water management. With small holdings, there is great interdependence among water users for acquisition, allocation, distribution and maintenance, making public sector or membership institutions preferable.

There is a long history which supports reliance on user groups or local government institutions backed by technical and financial resources provided through local administration such as the staff of a Department of Irrigation. Even (or especially) large-scale irrigation cannot be managed on the ground by national institutions without strong local institutional capabilities. Moreover, it is simply beyond the capacity of national administration to play much of a role in small-scale irrigation systems, where user associations or local governments are clearly the most effective institutions for management (Coward, 1984).

5.2 SOCIAL FORESTRY

The term social forestry has been introduced to distinguish a new approach to the management of trees which is different from the technically and commercially directed development which previously prevailed. It dealt only with trees on a large scale, in monocrop operations, and without involvement of the people who lived in and around the forests.

In social forestry, trees are to be managed in association with other plants and also animals, often in small or fragmented areas, for multiple uses and not necessarily for market sales, largely by the people living nearby and primarily for their benefit. This is quite a departure from conventional approaches which have sometimes appeared to regard people as enemies rather than as partners in forest management.

Forest management in the past has too often been undertaken through national institutions (forestry departments or corporations) with no more local institutional development than assigning a few technicians and many forest guards to look after the trees. The case literature, however, is virtually unanimous on the need for associating local people closely with any forest management effort, and there is considerable agreement on the most promising local institutional arrangements.

In contrast to irrigation management, where user associations are generally preferred over local governments, in forest management the preference is reversed. This is not surprising, in light of the analysis in section 3.1 above. "Users" of forest resources are an ill-defined group though the resources themselves are readily identifiable and delimitable. Persons in the immediate area draw on forests for fuelwood, animal fodder, construction materials, minor forest products, and recreation, but "outsiders" may also use them for the same purposes plus grazing and commercial exploitation.

One cannot confidently rely on membership organizations to enlist all users, with their conflicting objectives, in a single voluntary association. More "authoritative" institutions are usually required to regulate outside as well as local resource use and to mobilize people's time and funds for improving the forest resource base. Because benefits are more deferred than with improvements in irrigation management, some compulsion may be needed for protecting and upgrading forests.

These considerations make local government a more effective local institution for forest management, usually in combination with some "reoriented" units of local administration.^{19/} This combination can give technical guidance to decisions that are enforced for outsiders as well as local residents.

Forestry management more than most forms of natural resource management requires what West (1983) calls "collective adoption." This is to say that it depends on the cooperation of the poorer strata in rural areas as well as richer ones. The rural poor, who are less likely to join organizations, can undercut most management schemes. They are also very sensitive to equity considerations and are unlikely to comply voluntarily with schemes they regard as unfair. Of course, the rich may also seek to circumvent resource regulations for the sake of short-run benefits (Durham, 1977; Acharya, 1984).

^{19/} Why units of the bureaucracy may need to be "reoriented" to work with rural people in a more cooperative way is discussed in Korten and Uphoff (1981). Their analysis of "bureaucratic reorientation" was prompted by their working with technicians and administrators for irrigation management and social forestry.

Although LGs are often dominated by richer elements of the community, they are more likely than government agencies to produce a consensus on a resource management regime that is broadly acceptable as fair and binding. The broader the participation in decision-making and the less biased the resulting decisions, the more likely they are to have voluntary compliance. If compliance could be readily required and compelled, administrative approaches would be more feasible. But we find them largely ineffective when dealing with scattered activities over a great area.

We already referred to experience with forest management in Nepal, where the government took away local responsibility in 1957. One of the keys to enlisting local governments' acceptance of responsibility after 1977, when the forest law was changed, was that the panchayat be given clear responsibility for the resources and that all or most of the immediate benefits from improved management accrue to the community.

This matches the conclusion of a World Bank study on social forestry in Pakistan: involvement of locally elected bodies at the village level can become an effective institutional arrangement for small social forestry schemes provided that the government's forest land is allocated to the elected bodies (Cernea, 1980). This was found to be effective in a USAID-supported reforestation project in Senegal (Weber, 1981; see Annex, page 39). An analysis of Sri Lankan experience by Moore and Wickramasinghe (1978) similarly concluded that for effective environmental management, responsibility should be given to formal village-based institutions with proper governmental backing.

The question of who benefits has to be addressed clearly if rural people are expected to take responsibility for managing trees productively over time. In Niger, the government enacted a National Forestry Code which named 15 "protected" species that rural people were not allowed to cut without government permission. Understandably, rural people in Niger have been reluctant to participate in programs to plant "protected" species in windbreaks and woodlots (Thompson, 1982).^{20/}

One reason why rural people may require relatively unqualified control over forest resources before they will commit their own time and effort to forest management is that the benefits from planting and protecting trees, compared to other activities, are relatively long-run. To the extent that use rights are limited or ambiguous, the prospects that rural people will actually realize benefits are accordingly diminished.

^{20/} Readers can imagine the difficulties a peasant would have in meeting a forestry official to get a license to cut a protected tree, with no assurance of getting the approval even if the tree was on his own land.

Simply adding local government responsibilities to administratively conceived and implemented social forestry programs is not the answer. There needs to be an effective sharing of responsibility with the community having control over the forested land and its benefits. If this preserves forests, reduces soil erosion and protects the water cycle, there are obvious national gains as well. Such an arrangement was the key to the success of the Chautara experiment in Nepal that helped to reverse that country's forest policy (see Annex, page 40). It was lacking in the social forestry activities in the Indian state of Gujerat, which earlier attracted considerable attention and World Bank funding. The community components of the program could not be sustained for lack of effective devolution to local government bodies.^{21/}

If other local institutions are too weak and unpromising to build a social forestry program on the basis of collective action, local administration becomes the main channel for activity in programs directed to households, which we are considering as "sub-local" institutions (see section 6.0 of Report No. 1). This approach has been reportedly successful in the Gujerat situation, though more in agro-forestry than in a social forestry mode. Cernea (1980) has suggested that household woodlots will have advantages over community woodlots

where capacity of the village for collective action is meager; where the interdependence required by community schemes cannot be immediately elicited and not everyone can be counted on to contribute his share of the work; and/or where community woodlots are ill-suited in the local ecological context to serve as a vehicle for reforestation powered by local people.

We note that cooperatives do not figure significantly among local institutional options for social forestry. One might think that pooling private forest holdings and then exploiting and preserving them jointly would offer some advantages. But we found only two references to cooperative social forestry, in Guatemala (Barnes et al., 1982:43-44) and in the Northwest Frontier Province of Pakistan (Cernea, 1980:31).

^{21/} The program which was implemented through the district forestry department had three components: (1) farm forestry by individual households, (2) community woodlots under the panchayats, and (3) string plantations along roadsides, planted and maintained by the department. The first and third components fared satisfactorily, but the second was a failure, with only 7% of the target achieved. Given the history of constraints on panchayats, most villagers did not expect any benefits from the panchayat forests and thus these received no local support (Spears, 1982).

Easily the best example of social forestry carried out by local institutions was in South Korea, where Village Forest Associations have responsibility for over 2 million acres of local forests. These associations, which have features both of local government and membership organization, were started by central government initiative after 1961, but they built on pre-existing informal forest management groups at the village level. Although sometimes coercive at the start, they have reportedly become genuinely popular programs (Eckholm, 1979; Ahn, 1978; FAO, 1982; see Annex, pages 41-42).

The forms of local institutions for forestry management may change and evolve. One of the most noted successes has grown out of the Chipko movement in India, which mobilized tribal people in the state of Uttar Pradesh to protect their forest resources (see Annex, page 42). What started out as a cooperative to gain income for poor people became for a time a political movement, where people clung bodily to trees threatened with cutting by outside commercial interests. After their dramatic efforts had forced the government to accept a policy of forest conservation, Chipko took up its own guarding and planting of forest areas, completing a progression from economics, to politics, to ecology. Because the area's population is so homogeneous, the local organization operates practically like a local government.

The differences in local institutional possibilities and profiles between forestry and irrigation management are instructive for both areas of developing planning. We have discussed LID for social forestry at more length here because it has received less systematic attention so far and is increasingly of concern to LDC governments and donor agencies. Because the participation of local people in managing forest resources is so crucial to success, LID is of great urgency.

5.3 RANGE MANAGEMENT

Managing rangeland differs from other NRM activities in several ways. First, as indicated in 3.1 above, the resource user-managers, who are mostly pastoralists, represent a mobile, unbounded population, the opposite of fixed canal irrigation water users. Second, the resource itself is highly variable in time and space (Sandford, 1983:33-36, 49-51). Third, the land tenure institutions tend toward "common property" because of climatic variation. These differences have important implications for LID.

Because the user-managers of rangeland resources are highly mobile does not mean that they have little social organization. There is clear consensus in the literature that most pastoralist societies have strong social organization at the lower levels, though little hierarchical structure of authority (Hoben, 1976; Horowitz, 1979; Dyson-Hudson and Dyson-Hudson, 1980).

In traditional range management, as much as possible there was consultation among the interested parties, with accommodation and consensus being sought, since zero-sum decision-making could lead to one party's demise. However, because many decisions had to be made in isolation from others or without being able to get all parties together, traditional systems often had executive roles that were accorded considerable authority. For example, in earlier times in Botswana, there was in each locality a grazing superintendent (modisa) who represented the paramount chief for allocating grazing rights and handling disputes (Wynne, 1981).

It appears that traditional authority structures are generally in decline in pastoralist societies, though they retain considerable residual influence. Unfortunately for LID, there is no assurance that "modern" institutions will inherit any lapsed "traditional" authority. There is no necessary zero-sum relation, since the total amount of authority available for regulating range use can decline when chiefly or other indigenous roles lose their potency (Roe and Fortmann, 1981; Brown et al., 1982).

Most reviews of range management experience suggest that accommodating any modern local institutions to traditional roles and practices is advisable. The latter remain important in most pastoralist communities and can lend legitimacy to the modern institutions. Indeed, without such legitimacy from the public concerned, they will not be "institutions" but only organizations with which people cooperate (or not) as they see fit.

The mobility of pastoralists is induced by the inherent variability of the resources they need to exploit. Most pastoral activity occurs in marginal areas where water is the key constraint. Where there is ample supply of water, grasses can renew themselves quickly, barring other factors such as extreme range degradation or erosion. Pastoralists and their herds follow the grasses and accessible water supply which rainfall and underground sources provide throughout the annual ecological cycle.

The resource being managed most directly is grass and other flora by the "management" of livestock -- cattle, camels, goats and other animals. But the crucial resource in such management is water. Persons living in arid and semi-arid environments may seek to produce some arable crops, and thus they are often farmers

as well as herders. But they cannot survive on crops alone in these regions given the vagaries and insufficiency of rainfall.

The land ownership pattern in these areas naturally responds to these ecological and climatic variations. Private ownership of land is rare, except in oases or other prized locations, because there is no value in land itself unless it has water, and rainfall varies from year to year, in terms of quantity and location. Communal ownership of land thus is the most common tenure form in arid and semi-arid areas. However, this does not mean that livestock are necessarily owned in common. In fact, they are usually held by individuals or households.

Analytically, there are four alternative situations in which LID for range management might be undertaken:

<u>Pasture Ownership</u>	<u>Livestock Ownership</u>	
	<u>Private</u>	<u>Communal</u>
Private	(I) U.S. ranches, often promoted by LDC govts. favoring sedentarization	(II) Uncommon, could occur with cooperative steer fattening
Communal	(III) Most common situation in pastoral areas of LDCs	(IV) Current Mongolian collectives; Chinese ranching communes; Israeli kibbutzim

Range management tasks are simplest in (I) because costs and benefits are "internalized" and can be compared over time. It requires little local institutional development because the household is carrying out all NRM activities on its own. But this form of land and livestock tenure is feasible only where individuals can privately own large areas of land so as to preserve opportunities for mobility of their herds. This institutional form has been advocated as a means of controlling "overgrazing" and of averting "the tragedy of the commons."^{22/} The evidence that private ownership leads to better range management, however, is not conclusive (see section 4.0), and giving some individuals or households exclusive rights to large land areas is very controversial on equity grounds.

^{22/} The concept of "overgrazing" is itself being questioned now (Gillis and Jamtgaard, 1981). Sandford (1983) in his review of the literature finds little empirical support for claims about "desertification": or about "stocking rates" exceeding the "carrying capacity" of rangeland areas.

The most frequent situation, private stock grazed on common land, is ecologically motivated. Overstocking and abuse of rangeland resources can and does occur, but there is increasing evidence that "the tragedy of the commons" (not restricted to range management but best exemplified in range areas) is exaggerated (Runge, 1981; Sandford, 1983). Herders in the highlands of Bolivia had definite controls on grazing (LeBaron et al., 1979), as did the Sherpa in Nepal (Fuerer-Haimendorf, 1972).^{23/} The issue for local institutional development is how best to manage a combination of public land and private livestock.

The situation of communal livestock and private grazing land (II) is possible but highly unusual. Where it occurs, the private owners of land can limit access to pasture through mechanisms such as pricing. The purely communal situation (IV) is similar to (I), except that many more persons are involved in decision-making. In our literature review, we found collective pooling of livestock grazing common land only where national policies dictated this. Even in Mongolia, there is decentralized allocation of land to units within the collective which operate quite similarly to groups of households within traditional pastoral systems (Humphrey, 1978).

There is certainly much cooperative behavior among herders in traditional systems, but they keep their ownership of herds separate just as they control land as common property (Horowitz, 1979). This makes decentralized exploitation of available resources easier, and given the importance of attention to animal health, private ownership of livestock probably encourages more careful husbandry.

Because of the relative unboundedness of rangeland resources there is a larger role for local administration than in water or forest management, provided that it can be both mobile and flexible, the two essential requirements for any range management strategy. These are, unfortunately, not common features of most administrative institutions. One would have to achieve considerable bureaucratic reorientation for this to occur.

In any range management strategy, to allow for mobility and flexibility of decision-making, the household or more commonly an informal group of households will have to be the basic operational unit. The services of the local administration should be directed to supporting its productivity and security. It will be helpful to have some established connection among households or groups to provide channels for negotiation

^{23/} Until the government preempted their community responsibilities for resource management, the Sherpa annually appointed "guardians" to enforce rules governing grazing and collect fines.

over resource access and movement of livestock. But such arrangements are likely to be informal and not rigorously institutionalized.

One form of membership organization which can be useful in range environments deals with the provision of water, which is essential for exploiting either grazing or agricultural possibilities. One difficulty in organizing local efforts to provide water is that any new rights may be at variance with traditional rights, as discovered in Botswana when the Ministry of Agriculture delegated management responsibility for the small catchment dams it was building to groups of users. Such groups lacked clear authority to enforce their regulation of use vis-a-vis non-members (see Annex, pages 43-44).

There have been numerous experiments with group ranches, which represent a local organization or cooperative option in local institutional development. By and large, these have not been very successful, for example, in Kenya (Doherty, 1979), Tanzania (Hoben, 1976), Botswana (Odell and Odell, 1980) or Upper Volta (Gooch, 1979). The reasons for their failure appear to be many, but chief among them are: (1) the bureaucratic way in which they have been carried out, (2) underlying antagonism between the government and the pastoralists as the former sought to change the latter's way of life, and (3) the misleading concept of "carrying capacity" which guided much of the planning and implementation. The introduction of rather formal organizations to do what can be managed by pastoralists themselves on an informal basis seems to be an inappropriate mode of LID.

There is some suggestion that market mechanisms can be useful in regulating herd size (Range Management Center, 1981). But pastoral economies are usually at most semi-monetized and there are security as well as status values inherent in livestock. It is not surprising therefore that our literature review did not find price incentives for herders to be a reliable basis for resource management.

In summary, the role of government and its local administration appears significant in range management, though it cannot be effective if exercised coercively (Hoben, 1976). Mobility and self-sufficiency are essential features of pastoralism, and thus government agencies will have to be highly mobile and accommodating. It will need, for example, to find ways to make its veterinary, marketing and other services more accessible than at present (D. Sandford, 1981). Forms of local organization that are consistent with traditional modes of inter-household cooperation can facilitate government interaction with herders and their families. This is an area in which experimentation is going on (Wall, 1983), and it may yet prove effective if appropriate

approaches can be developed. So far, state interventions have a poor record, and much more systematic work remains to be done before a reliable IID knowledge base for range management can be said to exist.

5.4 WATERSHED MANAGEMENT AND SOIL CONSERVATION

While these two activities represent conceptually distinct kinds of natural resource management, in practice they are closely linked. Soil conservation measures are most urgent on steep slopes with erodible soils and heavy rainfall patterns. Watershed management requires protection or restoration of forest resources in conjunction with better water and soil management practices, usually in hilly areas that capture rainfall. Watersheds are typically less densely populated because they cannot support any significant agriculture. Raising livestock is important, so many of the IID considerations of the previous section apply in watershed management. The population in these areas is often culturally and economically out of the national "mainstream." Not surprisingly, one of the few detailed studies we found of watershed management dealt with a marginal tribal area in the Indian state of Gujarat (Jayaraman, 1980).

Local institutional development alternatives are limited in such areas. Both local administration and local government are likely to be very weak. Other modern forms of organization may not be much stronger, though indigenous organizations can be quite effective. The household is the basic unit of activity.

Conservation efforts are more likely to succeed if combined with other activities like supply of production inputs, development of transportation facilities and provision of social services, as in the World Bank-financed Northern Agricultural Development Project in Thailand (Spears, 1982). For this to produce the intended results, however, there needs to be considerable local-level coordination, as Meyers (1981) concluded from his study of watershed development in the Machakos District of Kenya.

The earlier approach to watershed development was similar to that in forestry, to concentrate efforts on formal tree plantations. This emphasized the role of LA and bypassed or ignored LG and LOs. The thinking now is to promote agro-forestry within sustainable limits, giving people in the area some better means of livelihood, or to rely more on natural regeneration (Spears, 1982). The first approach requires much more IID than the plantation method, and the latter less, though cooperation of area residents is required for either to succeed.

Reducing livestock pressure on watershed vegetation is often an important part of the management strategy. This may be done by introducing effective marketing systems as was done in Kenya during the 1960s, or livestock exchange programs to get farmers to trade in surplus animals for improved breeds, as done in the Kandi Watershed Project in India (Spears, 1982). The first may be accomplished by private agencies but the latter must be handled by government agencies, possibly with LG or membership organization support.

It makes sense for administrative agencies operating in watershed programs to work closely with local governments where they exist. A recent watershed management project in Indonesia was planned in an area where LG was strong enough to have sustained large-scale conservation efforts. However, the project was based instead on a newly-created Regional Watershed Authority which has encountered many difficulties of coordinating LA work and eliciting local cooperation.^{24/} Joint catchment area committees set up as part of the Erosion Control Programme in the Indian state of Gujerat included local government (panchayat) leaders. But they could not be very effective because of the reluctance of officials working in separate agencies to coordinate their own programs or to delegate budget authority to the panchayat level (Jayaraman, 1980; see Annex, pages 45-46).

The membership organization approach is less salient than in other NRM areas, unless a substantial subsidy element is provided by government. For many of the reasons sketched in 3.0 above, soil conservation and watershed management offer weaker incentives to resource users for collective action: the community of users is ambiguous; benefits are deferred and may not appear (or be) congruent with the costs of management; changes in resource status are often hard to recognize and there is often less perceived interdependence of resource users. Actually, there may be considerable interdependence even when it is not obvious because soil conservation is usually a problem where farmers cultivate on steep slopes. If holdings are small, their actions will affect each other. But the LID implications of this type of interdependence are less important.

Experience in the U.S. suggests that membership organizations of farmers are necessary for effective soil conservation programs even when holdings are large. Agreed-upon plans for the area, supplemented by specific plans for each farm, are needed to get significant results (R. Morgan, 1965). Communication between

^{24/} Personal communication from B. Dwight Knight during LID workshop held at Cornell, April 27-28, 1984.

government experts and resource managers is also facilitated by user organization. Local staff of technical departments have a crucial role to play, but they are likely to work better with farmers if feeling accountable to them as well as to their agency. A supporting and legitimating role for local government is also appropriate as found by the U.S. Soil Conservation Service.

In an integrated watershed development project in Jamaica, emphasizing soil conservation measures, it was decided to engage farmers' cooperation through specially-created Development Committees.^{25/} However, the technology recommended -- constructing bench terraces -- did not require cooperation among farmers (though runoff had to be coordinated or other farmers' fields would be more badly eroded than before). As no particular technical purpose was served by the organizations, they did not "take root" (Blustain, 1982).

This underscores the need for any membership organization to be viewed by members as necessary and beneficial. This is of course a requirement for gaining compliance with soil conservation and resource management practices generally. The introduction of bench terraces in the Uluguru Land Use Scheme in Tanzania was a failure because it provided no demonstrable benefits to farmers or to the community as a whole.^{26/} Certainly the technology must be appropriate and advantageous at the micro-level to have a beneficial impact at the macro-level.

There is definitely a crucial role for the national government in both soil conservation and watershed management. It is difficult to implement soil conservation programs even with good technology because the structure of benefits is not very compelling, unless or until erosion problems become serious, when they are often hard to control and reverse. Implementation of new technologies and channeling of subsidies

^{25/} There was an option of working through the existing local branches of the long-established Jamaica Agricultural Society, but the project leadership decided in favor of setting up new committees (Goldsmith and Blustain, 1980). In order to call farmers together, however, to elect committee members the project staff had to work through the JAS branches. The committees, not surprisingly, were made up mostly of JAS leaders, and within a few years, the project staff came around to regarding the committees as JAS bodies. This illustrates the difficulties, and often the futility of trying to introduce new local organizations where others already exist.

^{26/} Indeed, the technology introduced (bench terracing) was itself destructive of soil structure and fertility under the soil conditions of the Uluguru region. So non-cooperation by farmers was a kind of soil conservation. In fact, in parts of the region farmers were using an indigenous form of ladder terracing which did provide short-run benefits, showing that farmers would adopt appropriate conservation measures (Temple, 1972).

will usually require some elaboration of local institutional arrangements to get the job done.

In dealing with watershed management, the reality is that it must usually be attempted in areas where resources of all kinds are stretched thinnest. Some consolation may be taken in the finding of the World Bank's forestry advisor, based on experience in Nepal, that response from the farmers has been better in remote areas where there has traditionally been more reliance on indigenous institutions and less central government direction (Spears, 1982). This is a situation in which LID may not be easy, but it is relatively more promising.^{27/}

5.5 CONCLUDING COMMENTS

Particularly when dealing with local institutions for watershed management and soil conservation, but also for range management and social forestry, we find that they are often weakest where they are needed most. Those responsible for irrigation water management may not function perfectly, but they are likely to be more satisfactory than in the other areas.

Often we find central governments taking on a still greater share of the burden of NRM planning and implementation. But in large part the predominant role of national institutions is predicated on the weakness of local institutions. We are faced with a chicken-egg conundrum: which came first, weak local institutions or a predominant central role? Certainly from a present vantage point, the lack of strong local institutions is directly related to the preemption of functions and financial resources by the center. So a major issue now is how to redress the current imbalance where the center creates a larger burden for itself by its preeminence.

The importance of local institutional development for natural resource management should be so evident that it is not in question. Rather, the question is what kinds and combinations of local institutions will be most supportive of NRM, recognizing that different natural resource problems make different local institutions

^{27/} Spears' conclusion is consistent with our finding based on statistical analysis of 150 local organization cases worldwide. We found LO performance not adversely affected, and possibly even somewhat positively correlated, with unfavorable environments such as represented by mountainous terrain and poor infrastructure (Esman and Uphoff, 1984:106-112).

more or less appropriate. The same can be said for different settings such as represented by communal rather than private land tenure institutions.

Because the empirical base of knowledge is still far from systematic or theoretically informed, our contribution here is mainly in providing a framework for identifying and assessing alternatives. We have, of course, presented what conclusions we think have support in the case material at hand.

As seen from the recent publication dates of most of the analyses we could review, this is an area of inquiry which is acquiring form as well as substance in recent years. It is informed by and yet also challenges some of the most interesting theory to gain currency in the social and behavioral sciences, such as Olson (1965) and G. Hardin (1968). The empirical and conceptual underpinnings for more comprehensive understanding of local institutional development for natural resource management need to be addressed by the interdisciplinary efforts of many researchers and practitioners.

ANNEX

To share with readers some of the most instructive LID experiences, positive and negative, that we have found in our review of the literature, we are presenting capsule descriptions of some of these experiences in this annex. Readers are referred to the referenced sources for fuller accounts.

IRRIGATION WATER MANAGEMENT

CHILE: San Pedro de Atacama

Irrigated agriculture in the high desert plain where San Pedro de Atacama is located in northern Chile (10,000 feet above sea level, less than 100 mm. of rainfall annually) goes back at least to 500 A.D. We know that by 1000 A.D., a society based on a complex system of irrigation existed, and in Inca times, the population was 20,000, more than at present.

As mining was developed upstream from San Pedro, and as its water claims were substantial and uncontrollable by farmers, their investment in agriculture lagged, and the area reverted largely to subsistence cultivation. Locally elected associations manage the distribution of irrigation water at canal level and at the area level, but they are now under official control of the national irrigation bureaucracy since it lined some of the canals in San Pedro in the mid-1960s.

The agricultural system is languishing because the national administration is not very responsive or flexible. Some delegation of authority to the local administration would help to resolve uncertainty about conflicting uses of water and encourage farmers to undertake more active water management. The present system allows the local associations to set delivery schedules, but no major changes can be made. Farmers cannot reach the productive potential of even their current technology, let alone what could be done with construction of storage tanks, because of the rigid pattern of operation that has been imposed (Lynch, 1978).

LESSONS: Local institutions to be effective need to encompass the interests of all the relevant actors and to be able to reach authoritative decisions. This applies to local administration as much as to local government or local organizations. The provision of technology such as irrigation will not reach its productive potential without appropriate local institutional support.

PAKISTAN: Daudzai, Northwest Frontier Province

The system of water management at Daudzai was developed by local residents over centuries. Water rights, responsibilities and rules for distributing water were codified in the early 16th century. A complex system of rotational irrigation with schedules specified in units of time per tarih (half acre) is operated by farmers, who also clean and operate all channels.

All members of the village participate in discussions, but the village elders who are in effect the local government make all decisions. Chowkidars are appointed from and paid by the community to supervise water deliveries on its behalf. The government irrigation department provides assistance in managing conflicts when these cannot be handled by the elders and in constructing and operating some control structures that the community has difficulty handling (Bhatty, 1979).

LESSONS: Local communities have considerable capacity to deal with the technical and organizational tasks of water management, though their performance can be usefully augmented by technical staff of the government (LA). Where the whole community relies on irrigation, its management can be undertaken by local government (LG). When traditional institutions are functioning well, it is advisable to work with them, making accommodations in government procedures if necessary.

MEXICO: State of Oaxaca

Water management committees on Oaxaca, where the practice of canal irrigation goes back more than a thousand years, have been operating as part of the village government (LG) there. The great diversity of ways in which different villages manage their irrigation water is quite impressive, as is their effectiveness in this task.

Lees (1973) in her study of 23 communities found no simple direct relationship between the irrigation technology used and the social organization utilizing it. Rather "the form of water use management emerges from the social structure of the society where it is found." Unfortunately, where these old irrigation systems have been upgraded by the government, the role of local government in water management is abridged, as it was given no legal sanction by the national government.

LESSONS: Again, local technical and organizational capacity is impressive. There are many different ways of organizing decision-making, resource mobilization, communication and conflict management at the local level. National government would do well to accept and work with such diversity, including granting the necessary legal recognition for such local organizations, if it wants to capitalize on such indigenous social infrastructure.

PHILIPPINES: Zanjera Irrigation Organizations

Among the most sophisticated indigenous irrigation organizations in Southeast Asia are the zanjera schemes in the province of Ilocos Norte. Although each base organization is separate, there are numerous federations which jointly operate diversion dams and common main canals. Members contribute labor and materials to the construction and maintenance of the systems in proportion to the amount of land they cultivate under it.

Land shares, called atars, are often divided into several separate parcels to ensure that the benefits of location are shared equally. At the tail of each system, a section of land is set aside for the organization's elected leader which serves as compensation for his duties, but also gives him an incentive to ensure that water gets all the way to the lower reaches.

One indication of the resource mobilizing capacity of the zanjeras is the report that one zanjera federation made up of nine organizations mobilized nearly 16,000 person-days of labor from members for maintenance and other work, without monetary compensation (Siy, 1982).

In 1980, the Japanese aid agency in conjunction with the National Irrigation Administration undertook to install a 10,000 hectare irrigation project. It completely ignored the existence of the zanjeras and cut its canals across nearly all existing channels. The organizational integrity of the zanjeras would have been destroyed by such intervention confounding all the carefully worked out rights and responsibilities. Only ten months after construction did the project staff begin to reconsider their project design to take zanjeras into account.

LESSONS: The zanjeras represent a form of elaborate "social infrastructure" to make irrigation more efficient and beneficial. To ignore them represented a form of "disinvestment" by the Philippine government (and the donor agency). Fortunately this top-down approach to construction, ignoring what was already in place, was revised (Visayas, 1982). Water users have an interest in achieving both productivity and equity. Donor agencies should assess existing local institutional capacity before introducing new development programs, to determine how best to relate to local organizations and LG where they are operating effectively.

SOCIAL FORESTRY

SENEGAL: AFRICARE Reforestation Project

The Senegal Forest Service through this project works with Rural Community Councils. The Forest Service provides implements, tractors, seedlings, transportation, etc. and the community through its local government contributes labor to planting trees. The division of responsibility is such that the Forest Service continues to oversee the plantation, but the Council can decide independently what to do with the wood. Income generated from the sale of wood is to go into the Council's fund for rural development, to be used according to its own priorities.

Maintenance of the planted area is the responsibility of the Council. But when at one point the villagers could not keep up with the weeds, the Forest Service moved in with tractors and disks to help out. Due to the efficient cooperation and co-management between the Service and Council, almost double the targeted area was planted without additional funds. However, a local nursery could not be planted due to a shortage of water and Service field agents (Weber, 1981).

LESSONS: Such small-scale and locally-managed reforestation programs are less costly, higher yielding and more successful than the large-scale, government-sponsored industrial plantations in Senegal, according to the evaluation by Weber (1981). This collaboration is possible if technical assistance, material, equipment and funds are provided by the administration, and if the local government in return for contributing labor enjoys the economic benefits of the project.

NEPAL: Chautara Division Forestry Development

Deforestation is a serious problem in many areas of the Nepal hills. Previously, communities were responsible for local forest through their traditional local government (panchayats). In 1957, the government vested ownership and control of all forest areas in its Forestry Department, because it regarded local management as inadequate. (Later the rule was relaxed to permit private or community development of small planted forestry areas, 3 acres in the hills and 8 acres in the plains.) However, this approach to forest conservation proved largely ineffective.

The Divisional Forest Officer (LA) at Chautara decided to reinstitute community responsibility on an experimental basis. Working with the assistance of the Nepal-Australian Forestry Project and involving local panchayat leaders in the planning, the DFO got the government to declare the area a fuelwood deficit area so that export of fuelwood to other places could be banned.

The cooperating panchayats were authorized to make use of the forests in their areas. These actions made the local people believe that the forest was now their property and responsibility to be used for their own benefit. This motivation made them protect the existing forest and plant and care for new trees (without the expense of putting up costly wire fencing). People kept their livestock out of the planted area and the forest quickly regenerated. This program became the basis for a new national effort at community-based reforestation, beginning in 1977, when the government restored communities' right to own and manage their forests (Campbell, 1979).

NEPAL: Nuwakot Small Farmer Groups

In Nuwakot District as elsewhere, after the government took over responsibility for all forests, the run on the trees by the local villagers, in the words of a former Joint Secretary in the Ministry of Local Development, turned entire hillsides "into an unsightly ochre-red spectacle, but also causing the villagers themselves a great deal of hardship in finding fuel and fodder supply." (Shrestha, 1980:89)

The small farmer groups in Nuwakot District, established under the Small Farmer Development Program sponsored by FAO, have in some places branched out into forestry. In one location, the groups in nine contiguous wards (subdivisions of the panchayat) undertook to reforest their area, by employing six local persons as watchmen to prevent all trespassing while the area was allowed to regenerate. The watchmen were paid 120 rupees a month from funds collected by the panchayat from the people in the nine wards. When it was found out that the money collected did not always reach the watchmen, responsibility was decentralized still further to the ward representatives who supervised the collection of contributions from local households and paid the watchmen directly.

Shrestha says: "The forest continues to be protected and it is growing luxuriantly. The watchmen continue to be interested because they think that it is their own forest. In addition, their efforts are massively supplemented by those of the individual households themselves who, because of their emotional and material involvement in the maintenance of the forest, do not stand for anybody trespassing on it.

"In one of its meetings last year (1979), the village assembly reaffirmed its continued interest in protection of the forest, decided to increase the number of watchmen where necessary, and resolved to request the government to desist from putting a barbed wire fence around the forest, suspecting that such an act on the part of the government might alienate them from their right over it."

LESSONS: We would cite Shrestha's own conclusions: "This example of forest development not only demonstrates that the villagers, given the opportunity, have the capability to plan and implement their own development programs, mobilize their own resources, and manage the project on a continuing basis, but also that the areas of development intervention by the government have to be judiciously identified so that they do not bring about any negative effects on the local initiative." (Shrestha, 1980:90)

NEPAL: Madan Pokhara Panchayat

This village panchayat has been cited as one of the most successful examples of community-based forest management in the hills of Nepal since national policy gave local people more responsibility for the forest resources in their environment. Village leaders enforce rules for forest protection but also help meet local needs for wood by designating several days each year when villagers can enter the forests to remove dead trees. By not allowing free access, cutting of living trees can be controlled. In addition, the panchayat supports planting of large numbers of private fodder trees and successfully lobbied for a rural electrification project to reduce the need for wood to provide interior lighting. Moreover, households have stopped using open pit fires for cooking in favor of more efficient open raised mud ovens.

However, detailed field studies (Acharya, 1984) showed that the resource management practices were partly achieved at the expense of less well organized neighboring communities. Since all the forests around Madan Pokhara were so well protected, its villagers frequently take wood from the forest of a village panchayat about one half hour's walk away. This is not protected because the leadership of Bandi Pokhara panchayat is weak. Also, more openly, Madan Pokhara villagers have reduced their grazing demands on their forest by arranging to graze approximately half their livestock in other communities where grazing regulations are relatively lax.

LESSONS: Although local government can be an effective institution for forest management, NRM activities by units of local administration may be necessary to prevent well-organized villages from taking advantage of villages with weaker LID. This also suggests the need to deal with forest management at the locality or sub-district level, not just at village level.

KOREA: Village Forestry Associations

The tradition of community-supervised common forests goes back a long time in Korean history. Private ownership of forested land was first recognized in 1910, though village forests were not recognized until 1951. Then in 1961, a system of four levels of forest was established (national, provincial, district or county, and village forests), with Village Forestry Associations responsible for the lowest level, covering more than 2 million acres by 1978.

The law required all land with more than a certain slope to be planted with trees. If any private forest owner did not comply or did not manage his land acceptably, the VFA could plant it or take it over (with the owner getting 10% of any subsequent sales from his land). That the government saw this program as both important and sensitive is indicated by the fact that the VFAs were set up by the Home Ministry, and the army was mobilized at the time in case there was opposition from disgruntled owners. The VFA manages both planting and caretaking, having two teams, one for patrolling the forest and the other serving as a fire brigade.

The VFAs might almost be considered an arm of local administration, except their heads are elected by a meeting of all household heads in the village, and the management is undertaken, within government guidelines, for community benefit (Ahn, 1978; FAO, 1982).

LESSONS: The Forestry Associations in their form and operation usefully combine features of local administration and local (membership) organization. They build on local traditions of community management of natural resources rather than impose a wholly new set of norms and practices. They reinforce a sense of village ownership and responsibility for forest resources. Moreover, they mobilize a great deal of local leadership, now in conjunction with the Saemaul Undong movement (see Annex of Report No. 7).

INDIA: Chipko Movement

The hilly area in the state of Uttar Pradesh where Chipko got its start is inhabited mostly by a tribal population. The initial organization was a labor co-operative, formed with the help of an outside organizer, to get income for males by taking road-building contracts. Earnings were then invested in setting up a wood products cooperative. But members found their supply of trees threatened by timber merchants who got permits to cut the forest by bribes or who simply moved in without a permit.

When members protested and threatened to block the saws and bulldozers, government officials in collusion with the merchants used a ruse to trick them out of the forest. Even so, the saw crews that came surreptitiously to cut the trees were thwarted by the village women, who had understood the trick and fastened themselves to the trees. ("Chipko" is a local word meaning "clinging.") The struggle widened as the initial leadership got other communities to join in the resistance, and the government had to support them publicly.

There are now Village Forest Councils covering a large area and undertaking significant planting activities. When the Councils first discussed this, the men spoke for fruit trees, and the women for fuel and fodder sources. The compromise was to plant both kinds of trees. The involvement of villagers in reforestation has given them legitimacy in the eyes of the wider community, and they have set an example for local-level social forestry elsewhere (Mishra, 1980; Agrawal and Anand, 1982).

LESSONS: Both the form and objectives of local institutions can change and evolve over time and with experience. The contribution of an outside catalyst was important, though it was crucial for leadership of the organization to pass into local hands. The legitimacy gained by Chipko from reforestation activities has helped to "institutionalize" it by gaining national recognition and support.

RANGE MANAGEMENT

KENYA: Turkana Organization

The Turkana pastoralists in Kenya have a very loose tribal organization. Livestock movements are decided by the awi, which is a collection of families and their livestock. This is the basic unit of organization, operating quite independently to take advantage of available resources. There are loose informal organizations known as adekars, which are groups of awis, but these are transient and cohere only on a seasonal basis. The adekar might look attractive as an indigenous institution to work with and through, because it has larger scale than the awi. But it could not function in any decision-making or coordinating role. Neither could the overarching tribal organization, which serves to resolve disputes not handled at lower levels, but it is not an institution which could "manage" the rangeland resources because it has not sufficient knowledge or standing (D. Sandford, 1981).

LESSONS: The basic unit of range management is the family or group, which is small and only loosely knit with others because of the need for mobility and flexibility. Some higher-level institutional links can be useful but more in a negotiating or advisory role than an authoritative one.

BOTSWANA: Range and Livestock Management Project

The Range and Livestock Management Project was to develop socially acceptable and economically viable groups of small stockholders which would utilize improved range and livestock techniques. The approach was to fence in large areas which would be managed by the groups along classic three-paddock lines -- "Texas ranches for groups," as they were informally referred to.

Although the project had been designed as an experimental one, to do research and establish what would work, it changed course to concentrate on implementing a dozen such ranches. This target was reduced to three, and the project was finally "phased out after having managed to get only one ranch, with 15 members, off to a very shaky and problematic start" (Odell and Odell, 1980).

LESSONS: Importing organizational models from the West into pastoral environments is not likely to be successful. Group ranches in Kenya and Tanzania have encountered similar difficulties (Hoben, 1976). Even when a project is designed for experimentation (recognizing that the knowledge base for action is limited), there are great pressures to convert it into one for implementation, seeking to "run" before one really knows how to "walk."

BOTSWANA: Small Dams Groups

The Ministry of Agriculture at first built small catchment dams without regard to how they would be managed, or by whom. This was unsatisfactory, so no more were constructed without first identifying a group of local residents who would accept this responsibility. Officials would get a group to sign an agreement in return for which they were "given" a dam to manage according to rules set by government.

The traditional water use norms were such that the groups found it very difficult to exclude anybody who wanted to use the water, especially since the groups had not invested any of their own resources in creating the water source, a criterion which was traditionally recognized as creating rights over water use.

The government thought these groups were ineffective because they did not meet regularly, did not collect the prescribed watering fee per animal, and did not regulate use of the dams year-round. Closer examination established, however, that the groups did function as actively as necessary during those months of the year when the dams were needed as water sources. At other times, people and animals were elsewhere, exploiting ephemeral water sources or were back in the main villages during the height of the dry season where deep wells gave them assured water. The small dams could not and should not have been expected to give year-around water supply.

Moreover, the prescribed fee was more than needed to maintain the dams, and collecting it would have created a fund that was itself something to be managed and open to disputes. It was simpler and sufficient if members gave their labor or special contributions whenever these were needed to preserve the water facility (Roe and Fortmann, 1982).

LESSONS: Government investments cannot override established norms and conventions at the local level, especially in an area as sensitive as water or grazing rights. It is not reasonable to expect that people will accept and sustain patterns of behavior that are inconsistent with technical and ecological relationships. Nor should financial arrangements be prescribed without a proper investigation of the economics of the activity. Creating cash funds is frequently a source of mistrust and conflict and should be avoided where other methods of resource mobilization are feasible. The capacity of rural people to organize and manage local resources quite informally and successfully in Botswana is documented by Willett (1981) and Brown et al. (1982).

UPPER VOLTA: West Volta Livestock Project

This project was hardly more successful than the project reported above in Botswana. After two years, not one group ranch of the six envisioned had been created. The Fulani pastoralists did not trust the government's purpose since it was seen as representing the interests of sedentary agriculturalists.

One problem was that the project ignored the existing Cattle Owner's Union, made up of Fulani herders. This is one of the few formal local organizations we have found reported among pastoralists. It was bypassed in project planning with predictable unfortunate results (Gooch, 1979).

LESSONS: Again, where local organizations of users exist, they should be consulted and involved in project management. When there are conflicting interests, as between herders and agriculturalists, these need to be sorted out. Organizational mechanisms need to be established so project staff can work with pastoralists directly. A current USAID Range and Livestock Project in Niger is seeking to work more closely and collaboratively with pastoralists (Wall, 1983).

BOLIVIA: Highland Community Management

There is much erosion visible in the highlands of Bolivia, and the fact that livestock are extensively grazed there appears to explain the phenomenon. There are strong traditions in the highlands of community problem-solving, so it appears that the indigenous local institutions are failing in their resource management responsibilities. However, much of this erosion is "natural," due to the kind of soils found there, exacerbated by the topography and rainfall.

On closer examination, the erosion is not a threat to people's basic subsistence food system, and the animals grazed are the major insurance for families during years of crop failure. During dry years, there is thus reason to keep animals on the ranges or pastures for a longer time, increasing the extent of overgrazing. However, the degradation due to grazing is not established. Most of the fields where animals graze longest are those which are fallow and due to be cultivated the next year. Grazing all the stubble off does no harm if the field is to be planted to crops in a short while, and the additional manure from longer grazing improves soil fertility (LeBaron et al., 1979).

LESSONS: The specific physical, social and economic conditions of an environment need to be examined carefully before making a judgment about resource management or mismanagement. The existing strategy of resource use is heavily influenced by the prevailing factors of risk. Without understanding this, and the methods local institutions have devised to cope with risk, there is little chance that NRM practices or institutions will be changed by outside intervention.

WATERSHED MANAGEMENT

INDIA: Mahi-Sukhsar III Watershed Management Project

In principle, the watershed management projects set up in the state of Gujerat are quite participatory, to achieve contour bunding, terracing and gully plugging in catchment areas. An initial economic survey by project staff brought them in close contact with the farmers, and it was envisioned that the extension staff would work under the elected district panchayat.

However, in practice, the panchayats were not involved in the appraisal and approval stages of the project. The implementation team which was to have included two progressive farmers was never formed, and execution work was entrusted solely to a soil conservation officer. Administrative blockages constrained his interactions with and support from the government system, and his lack of linkages at the local level meant there was limited communication and cooperation in support of the program. It could not be determined how capable the panchayat would have been of taking more responsibility for the planning and implementation because it was never given a definite role (Jayaraman, 1980).

LESSONS: Fine sounding provisions for working with and through local institutions that get put into project documents in the planning stage frequently get left out in the rush for implementation. While it may be thought that consultation and participation will slow progress, in fact impedances within the bureaucracy are at least as great, and inputs from local institutions may be one of the best ways to overcome such barriers.

JAMAICA: Two Meetings-Pindars River Project

This integrated rural development project serving small farmers in two highly erodible watersheds was intended to introduce soil conservation measures along with improved agricultural production. The project design provided for farmer participation through Development Committees, but these were set up only after implementation began. Applications for and approvals of the (highly subsidized) soil conservation treatments were handled directly through the extension service (LA) with no role for the committees (LO).

When farmers put in bench terraces as advised, the runoff from their fields created even more of an erosion problem for their downhill neighbors, who then had to do something or suffer the consequences. This was hardly conducive to farmer cooperation. These piecemeal efforts at soil conservation understandably produced little improvement.

The program was made even more ineffective by trying to "buy" cooperation. Farmers who put in terraces because of the subsidies were not willing to maintain them without further payment, because there was no individual or collective commitment to the program. Persons were mostly trying to get as much income as they could from it.

No significant role was provided for local governments in the area because the project was planned just for farms in the two watersheds, and LG boundaries did not correspond to these hydrological lines. Neighbors used to working together might find themselves separated by the project, with one eligible for subsidies and the other not (Blustain, 1982).

LESSONS: It is not reasonable to expect local organizations to take root when they have no particular function. The Development Committees were not involved in planning the project, and they did not approve activities (though they could propose things like improving roads or capping a spring). The technology being introduced was "individualistic" in that it did not require "collective adoption" (West, 1983). It would have made sense for all the farmers on a hillside to plan soil conservation measures jointly. This would have given the LOs a real role, but the project did not take this approach.

KENYA: Machakos Integrated Development Project

This project included eleven components over an area of 14,000 square kilometers of semi-arid area. Soil conservation measures, focused on subcatchment areas averaging 7 square kilometers, were a major part of the project. Plans were formulated by project staff and presented to farmers who were asked to contribute through improved practices on their individual farms (shambas) and through collective action in their local area. Activities included terracing, digging cut-offs, afforestation and pasture rehabilitation.

It was found that farmers' receptivity to soil conservation measures was closely related to how well households succeeded in crop production. Hence soil conservation efforts should have been closely coordinated with attempts to increase production. Although project papers called for decentralized decision making (decentralized to the district level), numerous implementation problems arose due to delays in taking action in the district offices. Delays in payment to laborers, in procurement of hand-tools and lack of promised counterpart personnel contributed to reduced effectiveness in the soil conservation program. Moreover most farmers did not see themselves as being involved in a collaborative effort (Meyers, 1981).

LESSONS: Decentralization efforts which moved the center of decision-making from Nairobi to the district level did not accomplish day-to-day coordination of soil conservation and crop production activities. To achieve effective coordination, truly "local" institutions (at the locality, community and group levels) are needed, since as Meyers says, at this level "it is much easier to grasp and act upon concrete possibilities."

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