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COMMUNITY PARTICIPATION AND LOCAL ORGANIZATION FOR SMALL-SCALE IRRIGATION

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COMMUNITY PARTICIPATION AND LOCAL ORGANIZATION FOR SMALL-SCALE IRRIGATION

Barbara D. Lynch
Cornell University
Ithaca, NY 14853

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EXECUTIVE SUMMARY

Because of their limited size and more accessible technology, small-scale irrigation projects present opportunities for farmer involvement in investment, design, and operation and maintenance. In fact, the success of small projects is often dependent upon this involvement. This study, based on a review of small-scale irrigation experiences in Asia, Latin America, and, to a lesser extent, sub-Saharan Africa, looks at forms of local organization and participation, the impact of contextual variables on the local irrigation organization potential, desirable characteristics in local organizations, and agency roles in encouraging participation and local organization.

FORMS OF PARTICIPATION AND LOCAL ORGANIZATION

Participation in irrigation activities takes different forms and occurs in association with one or more project phases including initiation and planning, construction, system operation and maintenance, and repair. Participation may be empowered or unempowered, the former implying a role in decision making and control, the latter a contribution without control. Participation occurs on an individual basis through informal networks and via local organizations. Participation may be direct or indirect.

Local organizations range along a continuum from very informal to highly formal. Informal organizations are often associated with indigenous irrigation systems, while formal organizations are linked with bureaucratic appendages. The scope of these organizations may be confined to irrigation activities or they may be multidimensional organizations with several civic, economic and/or religious functions. Finally, they may differ according to the source of their authority, the groups to whom they are accountable, and their memberships and clienteles. In general, local organizations in smaller, isolated, and more egalitarian communities will be more likely to derive their authority from the community, while local organizations in areas that are integrated into the national society will more frequently derive their authority from the state or an interest group constituency.

THE CONTEXT OF PARTICIPATION

The physical environment, community social structure, and regional and national economic and political structures will have a pronounced impact on levels and forms of participation and on the effectiveness of local organizations. These factors should be taken into account in designing strategies for participation in and local organization for small-scale irrigation.

The physical environment can affect participation and organization in the following ways:

1. High demand for water relative to supply encourages the elaboration of organizational forms that allow tight control over water distribution, rapid mobilization of labor for maintenance and repair, and conflict management. Abundant water in the absence of intervening variables will be conducive to greater individualism and lower levels of control.

2. Where water supply fluctuates widely on a seasonal or intermittent basis, institutions for water control may be latent or manifest depending upon need.

3. In communities located in fragile mountain environments, institutions designed to maintain a complex agricultural/pastoral calendar will exist, but this calendar leaves relatively little time for participation in irrigation activities.

4. Hazards such as landslides and flooding promote higher levels of management intensity.

5. Hydrologic factors do not determine patterns of participation or local organizations, but certain types of organizations may be associated with different water sources.

Local social structure must be taken into account if strategies for encouraging participation in small-scale projects are to succeed. Elements of the social structure most likely to affect the potential for local organizational capacity are

1. The history of irrigation and irrigation institutions in the project area, including reasons for current management problems;

2. Property rights in land, water, and in the irrigation system, and the potential impact of redistribution of these rights as a result of project development;

3. Community homogeneity or diversity, and the extent to which a local organization is likely to be able to mediate among diverse class, ethnic, gender, or sectoral interests; and

4. Patterns of local resource mobilization—including incentives and sanctions for participation in local public works projects and conflicting demands on irrigators' time—determine the likelihood that labor and other local resources will be available for project development and for irrigation O&M.

The national economic and institutional context within which both community and irrigation agency operate may constrain participation. Where past performance of development agencies has been poor, communities may be unwilling to commit local resources to project management or construction. Where economic policies have had an erratic effect on agricultural prices, farmers may be reluctant to make contributions toward a system that promises increased cash crop production, but not necessarily corresponding increases in income.

1. Assessments of local organizational capacity for small-scale irrigation must consider (a) the importance of sources of income outside of irrigated agriculture in the project area, (b) the likelihood that input and product prices will justify increased attention to irrigation on the part of water users, and (c) local capacity for system management given existing household production strategies.

2. Institutional factors promoting or discouraging the development of local organizations for irrigation include agency behavior, agency and national goals, and water laws. Agency and farmer goals for irrigation are likely to differ. While this divergence may discourage participation in some settings, in others it may strengthen the capacity of a local organization to press its claims in a bureaucratic setting.

Elements of agency behavior likely to have an adverse effect on the development of local organizations for irrigation include unwillingness to involve farmers in initial phases of project development, pressures to disburse funds quickly, overcentralization, inadequate field staff support, and failure to deliver inputs in a timely manner.

Water laws may stifle participation and local organization if they are overspecified, but investment of local organizations with state authority may enable them to resolve conflicts that would be insurmountable at the local level.

THE LOCAL ORGANIZATION: APPROPRIATE ROLES AND CHARACTERISTICS

Three key characteristics that local organizations must have if they are to succeed in managing small-scale irrigation systems are

1. Accountability to constituents within the community and to the agency or agencies undertaking irrigation development. If a local organization is to be responsive to water user needs, users must have some leverage over the bahavior of organization leaders, whether in the form of payment, selection, or removal. But local organizations must also be accountable to agencies. The latter are unlikely to assist communities where there is little expectation that loans will be repaid or that system infrastructure will be maintained by the irrigators.

2. Ultimately, an organization will be judged on its ability to carry out a series of irrigation tasks—water acquisition, water allocation, system maintenance, resource mobilization, and conflict management.

3. In the context of externally assisted programs, local organizations must be able to interact with development and regulatory agencies. This may necessitate incorporation or registration, acquisition of financial management and grant writing skills, and the ability to press local claims in the bureaucracy, either directly or through mediating channels.

AGENCY ROLES IN ENCOURAGING LOCAL ORGANIZATION AND PARTICIPATION

The agency role in irrigation project development is often a critical factor in the success or failure of local organizations and participation efforts. Effective local participation will depend upon the agency's understanding of local factors relevant to irrigation and upon agency style and behavior.

1. A baseline study is critical for achieving an understanding of social and cultural factors relevant to irrigation project development. Studies should focus on community-level variables—stratification, capacity of existing organizations, leadership, and diverse interests in irrigation development. Such studies will not only help planners with design, but will aid in site selection.

2. Three elements of agency style will affect participation and organizational formation. (a) If the agency has a construction orientation, it may neglect social factors, if it has a service orientation it is more likely to build on existing local capacities. (b) The learning process approach will help bridge the gap between community and agency and overcome skepticism about government projects. In addition, involvement of water users in the earliest phases of project development builds local capacity and support for the project. (c) The community organizer may be a salesman, a broker, or a facilitator and resource person. The first often saddles communities with schemes in which they have little interest, the second creates continuing dependency of lcoal organizations upon agency representatives, while the third type helps build local capacity not only to operate and maintain the irrigation system but to interact with outside contractors and government agencies.

Government agencies may be able to promote participation by sponsoring legislation guaranteeing a group's water rights, by supplementing local resources through grants and loans, by offering technical services to the community, and by resolving local conflicts through the introduction of water distribution schedules or through the reallocation of property rights. To build effective local organizations for small-scale irrigation projects, it is necessary to identify existing institutions that will promote project goals and to help them adapt to the new tasks that they will have to perform.

A. INTRODUCTION

Small-scale irrigation projects present a set of opportunities for community involvement in investment, system layout, operation, and management. Because of their relatively small size, these projects can often be managed by local organizations. The simpler technology of small diversion and storage systems may permit operation, maintenance, and some design change to be carried out by workers with general skills (e.g., masons and carpenters) and with local or readily available materials and tools. While pump technology may be more complex, shallow tubewells, dug wells, and traditional lifting devices are often controlled by individuals, families, or small groups. Finally, the presence of irrigation structures, roles, and institutions within a community is usually an indication that human resources are available for system rehabilitation, extension, or upgrading.

Small-scale projects not only present opportunities for community involvement, but their success is likely to depend upon it. Because small-scale irrigation projects tend to involve a number of widely scattered sites, it is costly for governments to invest in extensive feasibility studies at each site. Thus, development agencies would be well advised to rely, to a large extent, on information already available in the community. This information often includes some rough data on soils, climate, crop water needs, and the availability of building materials. In addition, it includes knowledge of legal and customary property rights in the water source, to irrigation water, and in existing irrigation facilities; of usufruct and ownership rights in land affected by the project; and of field boundaries. Finally, information about labor availability on a seasonal or permanent basis is likely to be available only at the community level.

The community can also be an important source of human resources. Agency costs are often matched by local contributions of labor for construction, maintenance, and system repair. Furthermore, the expense to an agency of administering many small systems at the local level after construction has been

completed may be reduced if responsibility for water scheduling operation and maintenance, and supervision of water delivery remains within the community. Finally, it may be expected that, in addition to their own information, labor, and administrative talent, many communities will be able to make contributions in the form of cash, tools, and local building materials.

The ability and willingness of the community to take project responsibility will depend on three factors: a high level of community participation in different phases of project development; the existence of (or potential for) local organizations capable of carrying out irrigation tasks that can best be performed at the local level; and agency policies and behaviors supporting, or, at a minimum, tolerant of local control.

Clearly, there are many reasons for encouraging local participation in irrigation projects, and in particular, participation in a local organization designed to carry out irrigation-related tasks. It must be noted that each set of actors in the irrigation development process—the community and the irrigation agency or agencies charged with project implementation—will have its own reasons for encouraging participation. The agency's primary goals in most instances are (1) securing a local contribution in cash, labor, and materials for the project; (2) ensuring that the community will pay water charges and repay loans; and less often (3) transferring responsibility for system O&M and for enforcement of rules to the community.

The community on the other hand is likely to have some distinctly different reasons including (1) securing agency contributions of cash, materials, equipment, and technical expertise for irrigation system development, upgrading, or rehabilitation; and (2) exerting control over all aspects of the planning and development process.[1] Both agency and community are likely to agree on the value of participation and local organization for managing conflict and for providing system planners and technicians with the location-specific information

needed to achieve a satisfactory result.

In planning for community participation, all these goals must be kept in mind and the areas of goal compatibility emphasized. It must also be remembered that the costs of participation for community members can be high. Where irrigators cannot gain a measure of control, they will be less likely to give priority to irrigation organization activities. It is also to be expected that they will want to commit only the minimum in time and other resources necessary to maximize their own benefits from participation and from the irrigation project itself.

B. COMMUNITY, PARTICIPATION, AND LOCAL ORGANIZATION: SOME DEFINITIONS

Before turning to an examination of factors affecting participation and local organization for small-scale irrigation system management, it is necessary to set out some definitions. Without attempting an analysis of the many connotations of these terms in the sociological literature, this paper will offer working definitions of the terms community, participation, and local organization in the context of irrigation development. In addition, various dimensions of these three concepts relevant to the following discussion will be outlined.

The Community

The concept of community may become extremely fuzzy in the context of irrigation development because a system's beneficiaries (or, more broadly, the land and population affected by it) may or may not be coterminous with a village, a jurisdictional unit, or with the range of an ethnically homogenous or socially cohesive group. Furthermore, the term community is laden with normative content and implies a cohesiveness, harmony, and congruence of goals often lacking in many localities. It is not the purpose here to refine the definition of community,

based on an exhaustive study of the literature, but rather to make a rough, working definition of local units or groups relevant to water management.

The community of irrigators

Coward (1979:5) argues that "for purposes of irrigation organization the critical unit is the irrigation community composed of field neighbors and not the village community composed of residential neighbors; though in some instances the two groups may be one and the same." In his study of Tihingan, Geertz (1980) finds a sharp distinction between the hamlet (bandjar) and the subak or irrigation society. Both are geographical and social entities with distinct boundaries and customs. The subak is comprised of field neighbors, the hamlet residential neighbors. While residential neighbors are often field neighbors, land in a subak may be owned by residents of a number of hamlets. Maass and Anderson (1978) totally disassociate irrigation community membership from a land base by defining irrigation community as a group with rights in common to a water source organized to use that water. Thus, as Hunt (1983) indicates, an irrigation community may be a residential community, it may be a community of field neighbors, or it may be an organized group comprised of holders of common water rights in a given source.

It is often assumed that the interests of irrigators within the locality of a small irrigation system will be substantially similar, with major conflicts occurring between head-enders and tail-enders. This is likely to be the case where all members of the irrigation community are using water for the same purpose. In small-scale systems, irrigators are likely to be growing a complex mix of subsistence and commercial crops, each with its own schedule of water needs. Water requirements for maize, for example, are substantially different than those for sugar cane, rye grass, or alfalfa. Small-scale irrigation program developers will have to take these differing and sometimes competing needs into account if they are to elicit community contributions and if they are to ensure the development of competent local organizations to carry out O&M tasks.

The community of water users

The community must be defined not only with reference to irrigation, but in terms of the population drawing water from the same system. Other uses include power generation, fish culture, forestry, livestock, industrial use, and domestic use. Where an entire residential community depends upon irrigated agriculture for its livelihood, this distinction may not be critical.

Within agriculture, water use may not be limited to canal irrigators, but will extend to users of runoff and groundwater recharge. Meinzen-Dick (1983b) found that in Tamil Nadu, because of the high cost of well water, users willingly contributed toward the maintenance and cleaning of canals designed to distribute tank water. On the other hand, because groundwater recharge was greater when tanks were partially refilled at frequent intervals, while tank irrigation was most efficient when tanks were filled completely, tank and well irrigators (the latter a subset of the former) had a conflict of interest, despite their common interest in the acquisition of water by the cultivators' association. Finally, a definition of community may need to take into account users of the system and its infrastructure as well as its water (e.g., use of silt in Tamil Nadu tanks for brick-making).

The delineation of irrigation or water user community boundaries, both aerially and in terms of who participates, will vary widely even within regions, but it is important that existing definitions be taken into account in project planning and that planners be aware of the possible outcomes of different ways of delineating community boundaries.

Participation

Participation is a very general term referring to any form of involvement on the part of the community in one or more aspects or phases of irrigation. It

includes such varied activities as offering information to planners about physical and social conditions relevant to system design, contributing labor and hand tools for construction, maintenance and repair, passively receiving information from field agents, and making key decisions about project planning, water allocation, and O&M procedures. Uphoff (1984) defines participation as an individual act: irrigators may purchase pumps or construct channels for their own use, community members may gain expertise as construction workers (as in the Netherlands Program 13 small-scale irrigation projects in Peru), or learn mechanical skills that enable them to make decisions about design, rehabilitation, or choice of hardware. Individuals often participate in collective activities. These may be ad hoc—a spontaneously formed group (or mob), a gossip circle, etc.—or institutionalized. Institutionalized participation occurs when individuals fill roles in kinship networks, reciprocal and communal labor arrangements, rituals, and celebrations—all of which directly affect small-scale irrigation system performance in a number of cases in diverse geographical settings. Participation may also occur within the more formalized collective context of a local organization (see below).

Participation and project phases

Although in recent years, the need for community participation in preconstruction as well as construction and post-construction phases of irrigation system development has been noted (see, for example, Bagadion and Korten, 1980; Korten, 1980; Siy, 1982), all too often agencies assume that participation will begin after construction when a system is turned over to the community.

Participation may occur in one or more phases of irrigation project development—the initial request for assistance, planning and design, construction, water allocation, system operation and management, and repair or rehabilitation. It is perhaps a truism that support for a project will be greater if the request for assistance comes from the irrigation or water user community rather than from the

agency or from a small group of local notables. An agency's role may also be facilitated by local participation in early stages of project development. Leon (1983) finds that the short-term nature of CARE's small-scale irrigation in Bolivia necessitates preconstruction participation because agencies are not in a position to collect sufficient hydrologic and climatic data. He also suggests that local informants often make a useful contribution to the design process by pointing out landslide prone areas, etc.

Mayson (1984) is even more emphatic about the utility of farmer participation in the initial phases of project development. He notes in his discussion of the Khon Kaen University-New Zealand small-scale irrigation project that "the large majority of all projects constructed have resulted from direct approaches to the project personnel by farmers and generally have resulted from interest generated by previous successful projects in the area." Mayson sees this as an indication of a preliminary planning process already undertaken at the village level. As in Bolivia, farmers play an important role in the design process:

> The farmers decide where the weirs are to be built and to what levels the water is to be controlled. At this early stage of planning the farmers already know where the water will flow and how it will be managed. They know this because of the management techniques used in past years (Mayson 1984:4).

According to Mayson, the advantages of high levels of farmer involvement at early stages of the project are the increased likelihood that project costs will be reduced by farmers' willingness to contribute labor and cash for system construction and the fact that, as a result of farmer planning, physical improvements in the systems are less likely to produce severe management problems.

Some small-scale projects depend heavily upon the mobilization of local labor for construction. Leon (1983), echoing Korten's learning process approach, suggests that participation in construction allows irrigators to gain practical knowledge and to "see which are the parts that require most care and maintenance." "This stage," he concludes, "is at the same time a stage of training for the community."

Community participation may be enlisted in the process of allocating water rights and establishing water delivery schedules. In other cases, an irrigation agency may offer or impose its own allocation schedule based upon the provisions of a national water law or upon agency procedures. An example of the latter is the strict allocation of water on an hours per hectare basis found in many Latin American countries. In some cases, the external imposition of allocation procedures has facilitated the tasks of local irrigation leaders (Lynch, 1983); in others, rationalization has heightened conflict by effectively depriving small holders and landless peasants of their water rights (Lees, 1974; Millon and Diaz 1961).

Studies of indigenous irrigation systems in Indonesia, Tamil Nadu, Nepal, Ecuador, and Chile (Duewel, 1983b; Meinzen-Dick, 1983a; Martin and Yoder, 1983; Cornick, 1983; Siy, 1982; Lynch, 1978) show that locally adapted allocation procedures are often more flexible than those normally suggested by agencies. Rules may not apply or may not be apparent during periods of water abundance, only to be enforced during times of scarcity, whether seasonal or extraordinary. In Andean South America, maize areas often receive preferential treatment in periods of drought. In Quimiag, a highland Ecuador community, "valuable potato fields and even pastures may be lost as water is directed to maize crops belonging not only to regular water users, but to those too weak or poor to possess water under less critical conditions" (Cornick, 1983:140). This kind of flexibility would be very difficult to imitate at the agency level and can only be built into the allocation procedures through a process involving local participation.

Like construction, system operation and maintenance often requires contributions of local labor, tools, and often cash or in-kind contributions. In addition, it is usually expected that communities will assume responsibility for management of operation and maintenance activities as well. Some agency programs, like the CARE mini-riego programs in Bolivia, ONAHA (Office National des Aménagements Hydro-Agricole) in Niger, the NIA (National Irrigation

Administration) in the Philippines, and Plan MERIS in Peru carry out training programs for community leaders so that they will be able to take over these functions. Other programs are designed with the assumption that the agency will assume a major role in system management as in Himachal Pradesh, India (Coward, 1983b). Probably, a majority of programs assume that the community will be responsible for system management, but do not incorporate this assumption into the planning process or provide programs for management training.

Empowered or unempowered participation

Just as the timing of participation varies from program to program, the quality of that participation is highly variable, with different implications for system success. Participation may be either empowered or unempowered. Empowered participation is that that can direct the course of project development and/or determine operation and management procedures. Unempowered participation occurs when a contribution is exacted in the form of labor, cash or materials, but is not accompanied by decision making responsibility.

The Farmer Land Improvement Associations (FLIA) organized to construct, control, and maintain irrigation systems in Korea present an extreme case of unempowered participation. According to Steinberg et al. (1980:G-6),

> . . . farmers have little to say in their operation nor can they demure from participating in them. They cannot change from paddy production to any other crop or take land out of production for non-agricultural use without government approval. To call the FLIA a type of cooperative is cant. It is a centrally controlled mechanism to extract payment for water delivered. It functions well on engineering and construction, but it is not a product of consensual choice. Villagers have no idea of how the charges are calculated. Even at the local level, the well-being of the villagers seems beyond bureacratic ken.

The Thana Irrigation Pump Program as implemented in Nabagram, Bangladesh is an example of the coexistence of empowered and unempowered participation in the same system (Ahmed, 1977; Coward and Ahmed, 1979). In this system, full

responsibility for all management decisions lies with cooperative members—a subset of irrigators—but all villagers with irrigated lands are obliged to contribute labor for canal cleaning and repair. Thus, formal participation by those villagers who are not cooperative members is limited to fee payment and a labor contribution.

Participation may also be unempowered when participants have formal decision making responsibilities, but the climate in which these are exercised is so constrained as to make them meaningless. This typically occurs when irrigators commit themselves to a time schedule for construction only to find that the donor agency is unable to provide promised parts at the appropriate time. Project participants at the community level may view this as a diminution of their control over events, and their enthusiasm for the project is likely to be replaced by skepticism.

Direct and indirect participation

The second important distinction is between direct and indirect participation. Community members participate directly in irrigation projects when they contribute labor for construction or maintenance, when they participate in the decision making process through referenda at general meetings, or when they evaluate system performance. They participate indirectly by electing representatives to a local organization that in turn makes policy decisions. Indirect participation also takes place when the community hires ditchtenders or technicians to supervise water delivery or to take responsibility for equipment maintenance.

Local Organization

While a strong case can be made for encouraging individual participation of

informal groups in all phases of system development; local organizational development is crucial if agencies and communities are to productively interact once a project is initiated, and perhaps even more crucial if a community is to forward proposals and requests for assistance through appropriate government channels. Local organizations are frequently a prerequisite for obtaining credit for irrigation development as in the case of the NIA projects in the Philippines.

Uphoff (1984) offers a continuum of formality and informality in irrigation organizations, moving from a "most informal" category where roles, rights, and duties are not necessarily delineated explicitly but are based on commonly shared assumptions about what is customary or usual, to a "most formal" category where roles, rights, and duties are standardized and codified in laws and regulations and sanctioned by the state.[2] This most formal pole, he argues, leaves least room for flexibility.

Local organizations associated with indigenous systems[3] tend to approach the "most informal" pole while organizations associated with large-scale projects are more likely to be "most formal." AID's Policy Paper on Local Organization in Development (1984) distinguishes six types of local organizations—local government, local administration, voluntary associations, political parties, private enterprise, and informal indigenous organizations. The last is distinct from the first five in that it lacks legal status in the national society in the form of legislative definition, written charters, contracts, etc.

Of course, even within a highly formalized and bureaucratic setting there are embedded informal definitions of roles, rights, and duties, permitting a certain amount of flexibility. A major problem for small-scale irrigation systems has been the formalization of local organization as a result of agency involvement. Standardization of procedures and recognition by the state are not necessarily prerequisites for effective local organizations for small-scale irrigation, yet formalization is often a prerequisite for obtaining credit for construction or

securing ownership rights in an irrigation system. Formalization can reduce flexibility and a community's capacity to adapt to changing environmental and social factors, but conversely, may strengthen the community in the face of obstructionist but powerful minorities.

Thus formalization of existing local irrigation organizations may be necessary and even desirable. How then can one give existing local organizations official status without eroding their flexibility, responsiveness, and accountability to their constituents? Is it possible to incorporate into new irrigation organizations some of the more desirable characteristics of informal organizations? March and Taqqu (1982:139) suggest the borrowing of features of informal associations in the elaboration of appropriate associational models—the creation of organizations analogous to or containing the best features of existing informal associations, but with the structural capacity to work with bureaucratic agencies.[4]

> Appropriate associational models would be based on those associations found in any given community that fulfilled the basic criteria for development suitability . . . capable of active strategies, purposively economic or political, and equitable in patterns of redistributing resources and power. Rather than tapping those associations themselves, either through leaders or as groups, development may best proceed by creating new analogous associations, 'appropriate' as vehicles for planned change because they both meet the planners' criteria for suitability and are familiar to participants. For example, one feature of informal associations that is promising, if difficult to replicate, is the mutual responsibility among their members. Fashioning mutual responsibilities between local-level development organizations and the personnel of the next level of organization may be one of the best ways of ensuring devolution in development. Administrators, in other words, must be made to depend not just on their superiors but more importantly upon their local constituencies in some of the same ways that informal leaders owe service to their followers.

Single and multidimensional local organizations

Local organizations charged with carrying out irrigation tasks may be special purpose or multipurpose. Special purpose organizations include interest groups

(e.g., irrigation associations, Chamber of Commerce), local governmental institutions, and cooperative organizations (rotating credit associations, cooperatives, formal labor-exchanging groups). Organizations with multidimensional functions are often associated with legitimacy based on custom rather than law and include civic-religious hierarchies, groups with combined religious and social functions, and fraternal organizations with political and social functions. The varayoc, the traditional civic-religious hierarchy charged with supervising canal cleaning and the maintenance of boundaries between production zones in the vertically oriented communities of the Peruvian Andes, is an example of a multipurpose institution, as are subaks in Bali (Isbell, 1978; Mitchell, 1976; Geertz, 1980). Irrigation, cultivation, land distribution, ritual, and livestock management activities are inextricably interwoven in the case of the Chipayas systems on the Bolivian altiplano. All of these activities are coordinated by the alcalde (mayor) for each ayllu; decisions are made by consensus in assemblies of the entire adult male population of the ayllu (Wachtel, 1976).

A somewhat similar pattern is in evidence on the western slopes of the Rift Valley in Kenya. Here lands are communally owned by clans and held in vertical strips to provide access to three distinct ecological zones. As with the Chipayas, irrigated agriculture is but a single component of a subsistence system that includes pastoralism, hunting, and foraging as well as irrigated agriculture. All residents may use furrow water freely for livestock watering and domestic use, but irrigation water rights are tied to land rights and linked to clan membership, participation in clan water allocation meetings, and fulfillment of labor obligations for canal (furrow) maintenance. In more secular environments, local governments may assume responsibility for coordinating communal irrigation activities.

Hunt and Hunt (1976:132-34) see this combination of irrigation and other functions in a single institution or role and the "imbeddedness" of irrigation decision functions within larger political organizations as one form of

centralization.[5] A complementary form of centralization is defined as the connectedness of the irrigation organization to the "apex," the degree to which local decisionmaking is responsive to or conditioned by decisions made at higher levels of political authority (e.g., state, department, nation).

Esman and Uphoff (1984) suggest that on the whole, multifunctional organizations are more effective than single-purpose ones, yet Uphoff (1984) finds that specialized water management organizations appear to be more prevalent than the former. A possible reason for this is suggested by Downing (1974) in his review of a Zapotec system and its organization. In this case, responsibility for water allocation is vested in the síndico, the second highest official in the municipality's civil-religious hierarchy. According to Downing (1974:117),

> Criteria for selection of a síndico does not include water administration abilities or irrigation experience. The past two síndicos in Díaz Ordaz have considered water administration a nuisance and readily admitted they poorly understood the irrigation system beyond their own duties.

There may then be a trade-off between the benefits offered by the integration or combination of irrigation decisionmaking with other local roles and the costs of dependence upon local officials who have little time for irrigation matters and are not chosen for their irrigation expertise.

Irrigation district boundaries are often drawn in accordance with topographic or hydrologic criteria. The likelihood that these boundaries will coincide with civil or parochial jurisdictions is not great. However, in some cases administrative and political boundaries reflect preexisting hydrologic units, as they often do in the Andes. Conversely, hydrologic units may be designed to coincide with preexisting political jurisdictions as in Java (Duewel, 1983b) and in the Chipayas system discussed above (Wachtel, 1976).

Authority, accountability, and representation

A third axis along which local organizations may be grouped is the source of

authority. While a local organization may be responsible for a wide range of irrigation tasks—from allocating water, imposing sanctions, and borrowing money, to carrying out maintenance and repair activities—it may have considerable flexibility in making irrigation policy at the local level or it may be constrained severely by national law, agency regulations, and specific project conditions. It may be an autonomous decision making body or an appendage of the bureaucracy like the centrally-controlled Farm Land Improvement Associations in Korea (Steinberg, 1980).

While there are no hard and fast rules for predicting the characteristics of local organizations in a given context, in smaller more isolated egalitarian communities, local organizations will probably derive their authority from the community-at-large. In contrast, in communities with stronger ties to the state and market, local organizations will frequently derive their authority from the state or from an interest group constituency (e.g., unions, cooperatives, landowner groups, political parties, religious groups).

The fourth and fifth categories under which local irrigation organizations may be classified are their memberships and clientele. Water user associations are usually groups of irrigators, but they may not include all irrigators in the community. Association members may feel a responsibility to serve the interest of groups not represented in the association's rolls, or they may take advantage of their membership to pursue personal interests at the expense of community interests. Further, the water user association may represent a broad clientele of irrigators but not the interests of the community as a whole.

These typological distinctions are important because the success of a project may depend upon proper definition of the community and identification of those who may expect to benefit from project development, those who will be expected to make contributions of land, cash, materials, and labor for its execution, and those who are most likely to feel resulting adverse economic, environmental, or

social impacts. Because small-scale projects so often call for substantial community contributions, particularly in the post-construction phases, both the substantive nature of participation and its phasing must be considered. In addition, planners must consider the extent to which a cultivator's commitment of time and other resources to a project are linked to rights in the system, in its water, and in the land served by it. They must also assess the degree to which community and individual contributions to small-scale systems are accompanied by increased power, control, and authority on the part of those making the contributions. Finally, contributions are more likely to be forthcoming if they guarantee the participant an equitable share in the project's benefits or at least a share proportional to the contribution.

Finally, the identification and/or creation of appropriate local organizations for small-scale system management may mean the difference between a project's ultimate success or failure and may determine to what extent the benefits of a project are equitably distributed. If an existing local organization lacks authority or legitimacy in the eyes of the irrigators and others asked to make contributions to the system, it may not be able to apply sanctions against theft or failure to comply with system rules. If it is a defensive or conservative group endeavoring to protect a community or a portion of its members from what are often devastating consequences of integration, it may be unable to work with a development agency, contractors, or other external groups (March and Taqqu, 1982:ch. 3).

A local organization may be designed to promote the interests of a specific class or ethnic group at the expense of others in a water user community, or it may be structured to achieve consensus, sometimes in the face of significant class differences within the community. The former type is not only likely to subvert a project's equity goals, it may be ill-equipped to mobilize resources from the larger community or secure compliance with regulations without resorting to expensive coercive measures.

C. THE CONTEXT OF PARTICIPATION

Participation in and local organization for small-scale irrigation development are affected by three key components of the system's environment: the physical environment; structure of the community; and the regional and national economic and political context. Aspects of all three components will have a pronounced effect on defining the appropriate strategies for participation and organization. Furthermore, both the physical environment and the regional/national economic and political context will play an important role in shaping local social structures as they affect small-scale irrigation.

The Physical Environment

Martin and Yoder (1983:2) postulate that the amount of organization required for irrigation tasks "and the formality of the organization is, to a large degree, a function of how much labor must be mobilized to maintain the system to capture and deliver the available supply of water as needed." This statement draws attention to the role physical constraints and environmental variables play in the evolution of organizational forms for small-scale irrigation system management.

Three environmental factors may be singled out for their potential impact on irrigation organization: water availability; susceptibility to natural hazards such as earthquakes, landslides, flooding, etc.; and hydrological variables calling for different types of technological response. These factors should <u>not</u> be thought of as <u>determining</u> particular organizational forms, but rather as three among many variables that must be taken into consideration in looking at existing and potential irrigation organization.

<u>Water availability</u>

Relative water scarcity, either permanent or on an intermittent or seasonal

basis, is likely to produce more elaborate forms of organization for water management.[6] This means that small-scale systems in communities where the demand for water routinely exceeds the supply will have to have tighter allocation schedules and controls on demand, more assured turnout of labor for maintenance and repair, and more vigilant controls against theft and misuses of water. Where water supply fluctuates widely from year-to-year within a single system, there is often a repertoire of organizational behavior called into play in time of drought.

In the Chilean Norte Chico, for example, the turno—a rotational system of water delivery—takes the place of demand scheduling and permanent canal flow during periods of drought (Aschmann, 1974). Similarly, in Tamil Nadu, tank waters are rotated at the field level when the supply is low (Meinzen-Dick, 1983a). Cornick (1983:160) reports the emergence of regulatory institutions in Quimiag irrigation systems during periods of drought.

> Access to water is competitive and relatively unregulated during years of normal rainfall. But when drought occurs and the subsistence of small farmers is threatened, the social order requires that water be regulated and redistributed equitably to sustain small farm subsistence production. During this period, collective needs override individual concerns for cash production.

In addition, Cornick (1983) and Lynch (1978) found allocational rules guaranteeing water to drought-sensitive corn crops during dry periods in both Ecuador and northern Chile.

In northern Thailand, the response to a water shortage along a canal or muang is a request for intersystem rotation. The water user's association submits an official letter to provincial authorities presenting the case for closing upstream floodgates and allowing water to flow into the system with a short fall. Provincial authorities give the leader of the canal association a letter authorizing the request (Sirivongs, 1983). Thus, requests to adopt an intercommunal rotation during periods of drought are made by local leaders with authority vested in them by provincial authorities in the form of an official document.

The complex canal irrigation systems of the inner huerta of Valencia exhibit a number of management and organizational changes in periods of scarcity. For many of the canals a rotation system of delivery is used both during periods of abundance and scarcity; the frequency of turns varies with the abundance of water. Similarly repartition by means of proportioning structures and control gates takes place both during the wet and dry periods. However, there are some significant changes from wet to ordinary dry periods: water is rotated among canals; surplus water is delivered to needy farmers at the discretion of canal officers in consultation with water users on the affected laterals; and water is denied to those without water rights.

Changes in organizational rules are more profound during periods of extreme scarcity. As in the case of northern Thailand, procedures for allocation of water among canals served by the same river are changed under the supervision of national government authorities. Rotations are established for right and left bank canals and for upstream and downstream irrigation systems. In addition, as in the case of Ecuador and Chile, preference is given for high value crops, and water may be denied to other crops. More stringent controls against waste are also introduced (Maass and Anderson, 1978).

Changes in operational rules and organizational intensity also occur within a given system as it moves from wet season to dry season or from a primary planting season to a secondary planting season. Duewel (1983a) found that in a Javanese system, the use of irrigation water is only minimally supervised while common irrigators (ulu-ulu) control distribution during dry periods. A similar transition can be seen in the valley of Oaxaca when the síndico, or officer in charge of water allocation, declares a shift from riparian rights to prior appropriation of water (Downing, 1974). Water is allocated to sections or to irrigators either according to time or as a share of water impounded behind a diversion dam. The síndico has the power to decide on the most equitable method of appropriation. According to

Downing, the shift to prior appropriation is a response to increased conflict over water and the síndico's interest in reducing the number of cases brought before him in his juridical capacity.

Seasonal variation in management intensity also occurs in the Central Sierrra of Peru. In Quinua, political leaders assume responsibility for water distribution during the planting period just prior to the rainy season when demand is most likely to exceed supply. At other times, water is allocated informally by irrigators (Mitchell 1976:39). Martin and Yoder (1983:9-10) record a similar intensification of management during the short period of land preparation for maize planting in the Chherlung irrigation system in Nepal.

> All of the water distribution for maize land preparation is supervised directly by the mukhiya. All requests for water must be made to him, and as nearly as possible he assigns water deliver in the order which requests are received.

Water allocation shifts from a demand to a rotational pattern during the brief period of high water demand and low supply.

In her study of the Harani-Malinao-Tugmad system in Camarines Sur (Philippines), de los Reyes (n.d.:12-13) found a seasonal shift from adherence to folk norms to formal associational rules.

> . . . during the wet season, when water is relatively abundant, the association personnel generally allow the folk rules to govern the HMT distribution system. However, when the physical delivery network breaks down, the association intervenes to assure a more equitable water distribution.
>
> In the dry season, on the other hand, the officials and the water tender tend to exercise their authority more rigidly and more frequently. During this period, the watertender closes upstream take-off points at more regular intervals . . . to allow more water to flow downstream and with more predictable regularity.

Variation in rainfall, coupled with variation in water demand, produce different organizational forms—not only in different communities, but within a single community from wet year-to-dry year and from times of peak need and lowest supply to less critical periods throughout the growing season.[7]

Why should this chameleon-like variation in organizational visibility occur? Duewel (1983a:42) gets at the heart of the matter in his analysis of community irrigation in the Dopo Mountain watershed of central Java:

> A fundamental organizational concern of the Dopo communities regarding the management of irrigation centers around the need to carefully match private interests with social goals. This results in an irrigation policy (or strategy) in both the mountains and lowlands that tightens social control over individual petani (farmer) actions only when necessary, and relaxes it when irrigation conditions change. To the extent possible, individuals and small self-regulating groups are encouraged to take their own initiative to perform agricultural and irrigation tasks that do not require direct involvement by desa (village) irrigation authorities and water delivery specialists.

Thus, individual action is preferable when physical conditions make it possible; collective action is necessary when group labor is required or when the supply of water is low in relation to demand. Collective behavior for its own sake is not a goal, but it becomes necessary to maintain social harmony under dry conditions. To leave irrigation decisions to individuals when water supply is plentiful, either by distinguishing between wet period and dry period procedures or by declining to enforce uniform procedures during periods of abundance, gives an irrigation organization or institution more credibility in the community over the long run.

There are two lessons to be learned from these patterns. First, local organizations for small-scale irrigation must be flexible enough to interfere minimally in periods of abundant water supply, yet they must be able to impose and enforce strict distribution procedures when water supply is inadequate to meet irrigation needs. As Yoder and Martin (1983:2) caution,

> Although when one first observes a community irrigation system, it may appear that there is no organization and, depending on the time of year, that the system is in complete disrepair, if one asks the right questions of the right people, some form of organization can always be identified. And what in the winter might look like a system in complete disrepair will look quite different at the beginning of the monsoon rice season after the annual cleaning and maintenance has been done.

Second, a rapid appraisal of local organizational capacity may be misleading if it is

made during a period of relative abundance when distributional rules are not being enforced.

Hazard-prone regions

Different ecosystem types will contribute to specific cultural adaptations. Of particular concern for small-scale irrigation programs are fragile, hazard-prone, mountain environments, in part because mountain irrigation systems tend to be small, in part because irrigation may be a valuable tool in preventing further land degradation, and finally because the effects of uncontrolled development can be disastrous for their populations.

Participation in and organization of mountain systems are of interest because of the importance of communal management of pasture and agricultural lands, because of the flexible net of kinship, friendship, and other associational ties, and because social differentiation often is less pronounced than in areas of more intensive cultivation (Guillet, 1983). These characteristics should facilitate the process of organization to perform irrigation tasks.

In addition, the instability of the mountain landscape is also likely to foster participation. P. Pradhan (1984:5) finds that in Nepali community irrigation systems, a Jhara or compulsory labor party is summoned by community irrigation leaders when landslides wash away intakes or block canals during the cultivating season. He finds a positive correlation between maintenance requirements and organizational strength in these systems.

> Where the maintenance is frequent and ever continuing, we find the irrigation committee very strong and formal. Where much repair and maintenance is not frequently required, the organization is not that strong and formal.

On the other hand, these fragile ecosystems may also call for elaborate scheduling of a variety of agricultural tasks in a range of vertical zones. This means that (1) while irrigated agriculture may be a critical component of the

subsistence system, it is only one of many components, and (2) participation in irrigation activities must be scheduled so as to minimally interfere with other equally critical agricultural and pastoral tasks, often carried out at a great distance from the irrigation system and its associated fields. According to Guillet, (1983) it is precisely this need for elaborate scheduling and the integration of a wide variety of activities that encourages the high level of community organization so frequent in mountain areas, but paradoxically, the same need may sharply limit the amount of time individuals have available to devote to operation and management of their irrigation systems. This is particularly true where mountain populations do not have access to a full range of ecological niches and must meet their subsistence and supplemental income needs through seasonal migration out of the region (Favre, 1977).

Thus, while small-scale irrigation projects may have major beneficial effects on mountain communities in terms of improved nutrition, protection from risk, and land rehabilitation, and while a strong foundation for communal participation and local organization is likely to exist in these communities, project planners must make sure that demands on labor, organizational time, and materials are carefully integrated into the complex schedule of existing economic activities. To understand subsistence patterns and their timing for a given community, local information is essential. Once again, in a context where irrigation agencies cannot afford the luxury of a long-term anthropological analysis, participation by the community of water users will be essential in supplying this information.

Hydrological factors

Hydrological factors may also influence participation and local organization. Of these factors, the source of water is perhaps the most important. Where an aquifer is relatively close to the surface, dug well, pump, and pot irrigation are viable options. Sometimes, it is sufficient to strip away soil at the surface to bring

crop root zones close to the water table, as on the coast of Peru and northern Chile (Soldi, 1982; Wright and Benema, 1965). Where the aquifer is deeper, technological choices include river and stream diversion, diversion and storage, or deep well pump combinations. Murray-Rust (1983) finds that in Bangladesh, where the water table is frequently high, farmers have tended to purchase their own shallow tubewells and to operate them at less than capacity rather than to use cooperative facilities. Meinzen-Dick (1983a) shows that where wells and tanks irrigate the same fields in Tamil Nadu, the wells tend to be owned privately and the water sold, while tank water is communally managed.

Pump irrigation has had a variety of implications for irrigation organization and participation in Bangladesh. Blair (1974) and Murray-Rust (1983) both note a tendency for newly created irrigation associations to be controlled by existing elites or influential farmers, often undermining both equity and efficiency considerations. In contrast, the PROSHIKA low-lift pump projects (Bangladesh) are designed to take advantage of the potential of pump systems for separating land and water rights. These projects were designed to enable groups of landless people to acquire low-lift pump and shallow tubewell systems and to sell water to landowners and cultivators (Wood, 1982). While these programs may not be universally successful, they have allowed a far broader participation in water management and have permitted the creation of flexible organizational structures capable of responding to changing management needs.

Organization at the supracommunity or watershed level may be required where a number of communities share water from a river with wide seasonal variation in flow. Such organizations exist in Bolivia, where water user associations representing a number of communities activate a turnout schedule during the dry season, allocating the entire river's flow first to one community and then to another (Sejas, 1983, personal communication).. Similarly, intercommunal organization is required to control the waters of the Tinau River in the Rupahdehi

District of Nepal. The five community irrigation systems sharing water from the canal established a percentage basis for water sharing. A committee, consisting of a representative from each of the member systems was formed to oversee distribution, resolve intercommunal conflicts, and to seek outside support (Pradhan, 1984). Duewel (1983b) also reports intercommunity coordination to allocate river waters during the dry season in the small mountain irrigation systems of Central Java.

In conclusion, some physical factors may have a pronounced impact on local participation and organization:

1) High demand for water relative to supply is likely to encourage the elaboration of associational and organizational forms that allow tight control over water distribution, rapid mobilization of labor for maintenance and repairs, and conflict management. An ample relative water supply will be conducive to greater individualism and lower levels of control;

2) Where water supply fluctuates widely on a seasonal or less regular basis, institutions for water control may be manifest or latent depending upon need;

3) Where communities are located in mountain environments, institutions designed to maintain a complex agricultural/pastoral calendar (e.g., sectoral fallowing) and to minimize risk to individual households will tend to be present, but patterns of extensive exploitation of a number of ecological zones reduce the time available to individuals for participation in irrigation-specific activities. In addition, landslides and flooding will require higher revels of management intensity in hazard-prone regions;

4) Finally, while hydrological factors do not determine patterns of participation or local organization, certain types of organization may be associated with different types of water sources—individual ownership with shallow tubewells, associative groups with deep tubewells, communal management with diversion and storage, and intercommunal coordination in the basin of a river with periods of low flow.

Local Social Structure

Strategies for incorporating participation and local organization into small-scale irrigation projects must take cognizance of local social structure if they are to have the desired effects of eliciting community contributions of information, labor, and other resources for system construction and further of achieving the acceptance of local responsibility for water allocation, O&M, system supervision, and loan repayment. However, not all aspects of social structure are equally relevant to irrigation development. The following discussion will concentrate on those factors most likely to affect the nature of participation and local organization: property rights in land, water, and in the irrigation system itself; community experience with irrigation, agriculture, and with the local ecology; community organizational and associational history; and community homogeneity or heterogeneity.

History of irrigation and agriculture

In many communities targeted for small-scale irrigation project assistance, irrigation systems and associated institutions already exist to some degree. Other communities may consist of experienced cultivators with an intimate knowledge of their environment, but who, in the past, have depended on rainfed agriculture. At the other extreme are resettlement communities whose inhabitants have had no experience with agriculture in the region, let alone irrigation.

It is important to understand what Underhill (1983) calls the "novelty factor" in project development and its implications for local organizational capacity. What has been the community's experience with irrigation? To assess the novelty factor and to determine how it relates to participation, action-researchers must ask the following questions as part of their preliminary community assessments:

1. Does an irrigation system exist in the community? Agencies often overlook the existence of indigenous systems.

2. Is it working well or poorly? Why?
3. What are the local groups and institutions relevant to irrigation system operation and maintenance?
4. If there is no irrigation, is there a tradition of agriculture in the community or is agricultural colonization very recent?
5. If there is no irrigation, do potential beneficiaries have experience with agriculture in similar environments?
6. If there is no irrigation, do potential beneficiaries have experience with crop production strategies similar to the ones to be introduced with the irrigation project?

Because indigenous irrigation systems often use unlined canals and temporary diversion structures, project planners may overlook or dismiss them. However, if they serve more than one farmer, they will be associated with irrigation institutions, rules, and modes of participation.

i. **Where local irrigation institutions are generally adequate.** In these cases, project success may depend upon the extent to which the design maintains existing irrigation institutions and builds on their strengths. Drawing on the examples of the small-scale projects in the Philippines and the sederhana program in Indonesia, Coward and Levine (1978:7) ask

> How can assistance be provided (or received) while still maintaining a viable degree of local control over the irrigation system? For example, the introduction of sophisticated irrigation structures into traditional systems may serve to make them more dependent upon the outside bureaucracy. In contrast to the bamboo and stone weir of the traditional system, the concrete weir may require financial resources, masonry skills and other prerequisites not available within the local community

They also question whether the reorganization of local irrigation institutions according to standardized formats in order to receive financial assistance (as in the case of Philippine small-scale systems receiving state aid) is necessary or desirable.

Latin America offers several examples of the problems encountered when indigenous institutions are ignored in the course of agency interventions. Millon and Diaz (1961) trace increased conflict in a small Mexican system to the introduction of new water allocation procedures by the national Secretariat of Hydraulic Resources in 1959. Prior to that date, the local junta governing water allocation in the community of Atlatongo maintained sufficient flexibility to recognize both the needs of small cultivators and the differential water requirements of specific crops and soil types. The new water regulation tied water allocation directly to the amount of land that a cultivator owned or held ownership of use rights to. This bureaucratization of allocation procedures had serious drawbacks in comparison to the system that it replaced—one characterized by roughly proportional allocation subject to alteration by the local organization. Under the old system, according to Millon and Díaz (1961:508), "no one with water rights, however small his holdings, received water for so short a period that it is of no practical benefit to his land." With the elimination of this discretion on the part of the local organization, smallholders suffered extreme hardships, and the level of conflict over water in the community increased markedly.

In San Pedro de Atacama, a similar process of standardization of water rights and allocation procedures resulted in inadequate and infrequent water deliveries to downstream fields planted in annual crops, with heavier applications to orchards on alluvial soils that had only modest water needs. Rigidities in the water allocation system resulting from application of the national water law not only contributed to a reduction in the total cultivated area in the oasis by delivering too little water to downstream fields, but may have impeded changes in cropping patterns in response to market conditions (Lynch, 1978).

In several Latin American countries, investment of state funds in existing small-scale systems—whether in the form of new structures, technical advice, or contributions—has been accompanied by the replacement of traditional irrigation

traditional irrigation organizations with water users' associations deriving their authority from the state rather than from the community. This transfer of authority over water allocation decision making sometimes results in the appropriation of communal property for the use of a special interest group of irrigators. Lees (1974:86) warns that "if this group is smaller than the whole community, the introduction of a distinction based on inequality will undermine the ideal through which the community is integrated—its public and communal activities, resources, and officials."

ii. **Where an existing system is inadequate.** If an existing system is functioning well, a planning agency would be well advised to preserve to the greatest extent possible the design of existing irrigation works and institutions. If, on the other hand, a system has deteriorated rapidly or cannot meet existing irrigation needs, it is necessary to examine the existing system to discover the causes of failure before suggesting corrective measures.

One cause of irrigation system deterioration or dysfunction may be the decline in prestige and power of traditional local authorities. In Quinua, a Peruvian highland community, the dissolution of the varayoc, or traditional prestige hierarchy responsible for water allocation decision making, resulted in the devolution of responsibility for water distribution to ad hoc groups of irrigators assembled at distribution points. According to Mitchell (1976:35), "this acephalous method of distribution has resulted in a considerable increase in fighting. There are many arguments and people are sometimes physically assaulted."

Cornick (1983) paints an equally anarchic picture of water distribution in the Quimiag Agua del Pueblo system in highland Ecuador: the population of water users is not clearly defined, no water distribution schedule is followed, but water is allocated on a first-come-first-served basis. This method is costly both in terms of man-hours spend on control and water losses resulting from the frequent

shunting of the water supply from one canal to the other. Where traditional authority is eroded to the point where it can no longer ensure adequate system management, an agency may have to take steps to vest authority in a local organization.

In the Peruvian altiplano community of Cahualla, for example, distributional chaos had once been the rule as it was in Quinua and Quimiag. During the administration of the current president of the water user association, a water distribution schedule was developed by two officials of the Dirección de Aguas. This schedule established a timetable for water delivery from the main canal starting from the head-end. According to the president of the irrigation society, the same standardization of water allocation that had exacerbated conflict in Atlatongo alleviated it in Cahualla (Lynch, 1983). Before introduction of the new schedule, "el más macho, más guapo riega más" (the most macho, most handsome irrigated most).

In the case of Cahualla, this disorganized situation may have been less a result of institutional decline than a function of increasing pressure on the land. The number of irrigators in this mountain agricultural community had increased from about 50 to 115 within the twelve-year tenure of the current irrigation association president. It is likely that increasing demand for water rendered what had once been adequate local irrigation institutions ineffective. In this case, a timely agency intervention helped to ease tensions by imposing an allocation system upon the community.

A traditional organization may have the capacity to carry out tasks at the local level, but may be unable to mobilize the local or agency resources needed for extension, rehabilitation, or upgrading. An agency may be able to help the community to set priorities, to work with its available resources, and to effectively process its demands through government channels.

The potential for system control by indigenous irrigation organizations may be weakened if there is a disjuncture between the capacity of the organization and

the technology proposed or in place. For example, water demand may exceed the capacity of existing allocation procedures or physical structures to meet them. A project may call for the extension of water rights to a new set of beneficiaries, although traditional irrigation institutions may be designed to exclude this group from meaningful participation (Blair, 1974; U. Pradhan, 1982). System maintenance may call for participation by a local labor force no longer available, or changing crop water requirements may require changes in organizational procedures. Finally, changes in social and political structures at the supra-community level may lead to a decline of indigenous political and religious institutions and weaken the authority of local irrigation leaders.

iii. **Where irrigation is new.** Irrigation may be introduced into a community with a long history of rainfed agriculture and/or pastoralism. As in communities with irrigation systems, agencies stand to benefit from farmer participation in the earliest stages of project planning. Despite their lack of familiarity with irrigation, experienced dry farmers may be expected to have a wealth of site-specific information about climate, hydrology, and soils. They will also know where field boundaries lie and who has rights to the land and water to be affected by the system. F. Korten (1982) found that Central Luzon farmers were able to suggest canal layouts that would avoid penalizing any one household excessively.

Such may not be the case for resettlement communities where colonists lack experience with agriculture not only in the particular site, but possibly in the type of ecosystem. For example, the new settlements on the eastern slopes of the Andes of Ecuador, Peru, and Bolivia are often transplantations of farmers from high mountain valleys and the altiplano, with little knowledge of jungle soils, soil nutrient retention, or hydrologic regimens. The rapid transition away from forest-fallow agriculture that accompanies resettlement will require a heavy commitment of technical assistance in new irrigation projects.

Thus, information that can be contributed by the community will be far less in newly settled areas than in areas where irrigation is introduced into an established farming community. A second difference between the two may be the existence in established communities of reciprocal and communal labor institutions and associational ties that may be adapted to irrigation system needs. Conversely, new settlements may have heterogeneous populations with few common social institutions. An exception to this generalization are settlement communities such as the Israeli kibbutz, which maintain cohesion through a shared ideology and/or religious beliefs.

The presence or absence of an irrigation tradition does not determine whether or not participation or local organization can be effective. Rather, agency strategies for encouraging community participation must take into account the existence of irrigation institutions, their history, and whether or not they are adequate to deal with a community's particular irrigation problems. Also, an agency cannot expect the same informational return from participation in a recently resettled community as it can from a community with a long history of irrigated agriculture, or at least agriculture in the same environment. Finally, the fact that this information is absent in some communities does not mean that participation in all phases of project development will not have a payoff for the agency as well as for the community.

The engagement of a broad spectrum of the community in all phases and aspects of irrigation development not only heightens commitment to the system, but is part of what D. Korten (1980) identifies as the "learning process approach" to development projects. This process of community involvement produces an increased capacity at the local level to cope with future demands placed on the system whether by population growth, changing cropping patterns and water requirements, or by hydrologic and climatic changes.

Property rights in land, water, and the irrigation works

> The issue of distribution of collective project benefits is frequently embedded in the structure of property rights systems. Collective projects on communal land can fail if they do not take account of distributive mechanisms in traditional collective property institutions, especially where adaptive property norms exist for the collective management of common resources (West, 1983:48).

All changes in an irrigation system imply changes in existing property rights (Coward, 1983c, 1985). These rights may be vested in a community, an individual or in the state, and may be ownership or use rights. These include the right of a community to a particular water source, the right to land required for tanks, dams, or canals, rights to lands within the community to be appropriated for irrigation facilities, rights to irrigated lands, rights in irrigation works or physical structures, and finally, rights to irrigation water.

In some communities, water and land rights are inextricably bound, in others they are not. The differential allocation of water to crops in Ecuador, Chile, or Java is one form of separation of land and water rights. In traditional systems in the Valley of Oaxaca in Mexico and in the externally funded and conceived Sukomajri Project in Haryana (India) a different type of separation is found. Here, sharecroppers and landless peasants, who are not irrigators but members of the community in a more general sense, have water rights despite the fact that they do not own land. These farmers gain access to a share of local agricultural production by trading their water rights to landowners in return for a share of the irrigated crop (Lees, 1974; Seckler, 1980). In other cases, irrigation turns, or rights to water for a specified time period, are allocated as payment for labor on canals or for other forms of communal service (Nunberg, 1983; Lees, 1974).

In other indigenous systems, labor contributions to system operation and maintenance entitle irrigators to both land and water rights. In the Chipayas system, for example, moist lands in drained tank beds recently fertilized by pigs

are allocated to heads of households who have participated in the maintenance of the main canal (Wachtel, 1976). In Kenya's traditional diversion systems, clans may exchange rights to irrigation water and irrigated land for maintenance work on the canal or furrow, for nonirrigated land, or for other goods (e.g., livestock) (Ssennyonga, 1983).

Water rights are often codified. The Chilean water code, for example, specifies that domestic water use takes precedence over use for irrigation. Where rights are customary, they are often harder for the outsider to understand. But, in both cases an understanding of existing property rights and how the project expects to change them is essential in the early stages of project development. U. Pradhan (1982) attributes serious problems with an attempt to provide water from a Nepalese diversion system to a new group of users to the fact that project developers (in this case, the district panchayat) did not take into account the unwillingness of upstream water users to relinquish historical rights to irrigation water gained as a result of a fifty-year investment of money, time, and labor in canal building and maintenance.

Standardization of water delivery procedures, even without the redistribution of water rights to new groups of cultivators, may result in a reallocation of water rights, with a secondary effect on use rights to irrigable lands. In the case of Atlatongo cited above, the redistribution of water rights on a strict hours per hectare basis effectively curtailed the usufruct rights of smallholders, thus intensifying conflict over water use in the community.

Irrigation development is sometimes accompanied by the creation of new rights—in water, in the system itself, and sometimes in land. Coward (1985:2) refers to irrigation development as "a property-creating process." For example, the Sukhomajri Tank Project in Haryana (India) created new water rights as a result of a decision to use a tank for irrigation as well as for soil conservation purposes (Seckler, 1980). These rights were distributed equally among all families,

irrespective of land holdings, and the rights could be freely transferred. The effect of this broad distribution of rights to irrigation water should have been greater participation in irrigation tasks and commitment to the success of the system among all classes as well as improved distribution of project benefits, but the impact of the innovation has yet to be studied.

In Bangladesh, agency-funded pump irrigation projects have created rights to water and to the water delivery system. Early data for the Thana Irrigation Program (Blair, 1974) suggest that the concentration of these new rights in the hands of local elites not only undermined equity concerns, but had a negative impact on efficiency. The early pump projects were dependent on heavy subsidies, and the goal of local responsibility for management was never achieved. In contrast, the more recent PROSHIKA low-lift pump projects in the same country have deliberately assigned rights in subsurface water and the delivery system to landless groups (Wood, 1984). The planned attempt to broaden the distribution of wealth through the allocation of new rights to both water and irrigation facilities is a relatively recent phenomenon. The impacts of these pioneer projects on equity and production and system sustainability need to be systematically studied.

Small-scale irrigation projects not only create new rights, but in some cases redistribute them in order to provide access to irrigable land. Moris et al. (1984) describe the procedures used by ONAHA (Office National d'Aménagement Hydro-Agricole) in Niger:

> . . . a survey team is sent into the area to determine who owns what, how much, etc. Land within the perimeters is then divided up between farmers on the basis of such factors as previous ownership (of land within the perimeter), amount of total land owned and presently farmed, family size and needs, etc.

A striking feature of the ONAHA small-scale projects is that control over the allocation of use rights in irrigable lands appears to be vested in the cooperatives introduced into the communities with the irrigation schemes.

The ONAHA experience is somewhat reminiscent of the zanjeras of

Ilocos Norte (Philippines). Historically, the zanjeras were farmer-created associations designed to reclaim unirrigated lands through group rehabilitation and irrigation efforts—-some were initially established in the eighteenth century. The fruit of these efforts was the allocation of property rights in land to the zanjera, which in turn assigned an atar or share to its members. The atar may be construed as an usufruct right to irrigated lands conditional upon continued contributions of labor and materials for irrigation system O&M (Siy, 1982). The atar as a property right also entitles the shareholder to a portion of the system's water supply. (Coward and Siy, 1983).

Like the ONAHA cooperatives, some zanjeras have retained the right to confiscate the lands of delinquent members. Siy (1982:54) concludes that the linking of land rights to contributions to irrigation O&M is a key factor in the longevity of the zanjera systems:

> . . . the equitable sharing of benefits, costs and risks, institutionalized in the distribution of land, contributes to the long-term stability of the organization by affecting a conjunction of interests, by promoting consensual decision making, and by limiting internal conflict. Collective action is difficult enough to achieve; maintaining it is even more problematic, particularly in the context of irrigation where water, a resource in great demand, can easily be appropriated, controlled, or wasted by a few. Again, the distribution of landholdings has resulted in aligning individual objectives with group objectives as far as operation and maintenance of the irrigation system is concerned.

In conclusion, small-scale irrigation projects inevitably change the distribution of land and water rights. If these changes are made without understanding the structure of rights in place, a number of problems may arise. The water source identified in the design process may be unavailable if it does not belong to the beneficiary community. Negation of historical water or land rights may reduce levels of support for a project or generate intracommunal conflict. The transfer of property rights in water or in an irrigation system from the community to the state may weaken support for a project or reduce the contribution the community has traditionally made to a project. Vested interests,

either sectoral or class, may resist attempts to alter the distribution of property rights or coopt project benefits so as to prevent their redistribution.

Finally, as Coward (1985:5) notes, property rights in water and in an irrigation system are often a reflection of a history of prior investments of cash and labor in system development:

> . . .collective social action in (traditional or indigenous irrigation) systems is based on property relations. That is, that these irrigation groups formulated principles of action and acted out irrigation tasks in ways that reflected prior and continuing investments in their hydraulic property. It is this relationship of co-property holders that legitimizes and activates their solidarity.

Ongoing system maintenance, he argues, is largely dependent upon the continuing reflection of the investment process in property rights in the irrigation system. When irrigation development is accompanied by a transfer of rights from those who are expected to contribute to system maintenance to a governmental unit, Coward suggests that irrigators are less likely to feel responsible for maintenance.

This does not mean that an agency should avoid tampering with existing rights even at the price of project abandonment. The Sukhomajri and PROSHIKA projects appear to be creating new rights in water and consequently addressing equity concerns without provoking resistance through the denial or forced sharing of rights traditionally allocated to a small group. The experience of the ONAHA perimeters suggests that efforts to achieve equity through the redistribution of rights in irrigated lands may be successful. The vesting of responsibility for land distribution in the cooperative rather than in the agency may have been a critical element in this success.

Community homogeneity versus diversity

The ability of local organizations to mobilize the local resources and support required for small-scale system construction, operation, and maintenance will depend upon the ability of the organization to build local consensus in support of

irrigation activities. This ability is often related to both the homogeneity of the water user population and to the ability of the water user association to reduce frictions within a community that stem from a diversity of local interests.

Heterogeneity within the water user population may reflect class or ethnic cleavages within the community, gender, or other intrahousehold differences in water needs and in control over decision making, diverse sectoral interests, and, finally, a lack of congruence of hydraulic and political boundaries. While this heterogeneity is not necessarily an inhibiting factor in small-scale irrigation development, failure to recognize the divergent interests within a community may ultimately weaken the potential for effective participation in water management.

The distribution of costs and benefits from irrigation development often accentuates differentiation within a community, and consequently increasing conflict. In such situations, local organizations may be unable to effectively mobilize local resources. The results of inequitable distribution of the costs and benefits of irrigation are all too often inefficiency, corruption, theft of water and construction materials,[9] and reluctance to contribute labor or cash for system maintenance and repair.

i. <u>Class cleavages</u>. Three critical problems often associated with small-scale irrigation projects are (1) reduced community solidarity and increased stratification as a result of project development, (2) poor project performance in communities where power and wealth are concentrated in the hands of a small elite; and (3) the failure of irrigation projects to achieve stated social goals. The successful resolution of these problems depends on an accurate assessment of the nature and depth of class cleavages within the community, the extent to which a small-scale project is supported only by a narrow elite within the community, and the ways in which a project might inadvertently contribute to the concentration of wealth in the hands of a small group or in widening the gap between poor and wealthy water users.

The association between high levels of participation, effective organization, and egalitarianism or class homogeneity within the community of irrigators appears in a variety of cultural settings. Mayer (1977) explains how the major extension of the irrigation system in a Peruvian community with a somewhat parallel tradition of land allocation was accomplished without disruption of existing patterns of participation. In the same department (Junin), Nunberg (1983:28) found that among Plan MERIS subprojects, irrigators' committees tended to be strongest in the more egalitarian, homogenous, and isolated peasant communities while

> In highly stratified communities, committees might even become pawns in local power struggles. . . . informants in La Huaycha reported that larger landowners were able to intimidate or hoodwink small farmers into relinquishing their turn for water in exchange for negligible favors. This was possible not only because the small farmer did not perceive the value of his water rights but also because the local Irrigators' Committee was subject to the dominant power structure within the community, which afforded special privileges to affluent farmers.

Plan MERIS has required that members of committees associated with the subprojects be resident farmers. Nunberg suggests that in those cases where most cultivators are renters, as in Mantaro Valley subprojects, the committees' inability to effectively regulate water use stems from the fact that the groups that they represent lack political power. Even where elites are unable to control irrigation groups, the power of a more broadly representative group is restricted by the social structure.

Hutapea et al. (1979) draw a similar comparison between the subak of Bali and the Sragen dharma tirta in Central Java on one hand and the traditional Javanese ulu-ulu system[10] and the Brebes dharma tirta (also in Central Java) on the other. Hutapea et al. (1979:169) argue that a critical element in the success of subak water management in Bali has been the fact that "socioeconomic differences among members of a subak are relatively small," and village solidarity is strong. The dharma tirta water management system, introduced into Java in 1968 and formalized in 1971, is based in part on concepts derived from the subak

and in part on Javanese customary law. The central principle of the dharma tirta model is "mutual cooperation in the pursuit of individual and community welfare" (Duewel, 1981:5). This principle is the basis for cooperative labor for construction, for fee payment, and for water rotation.

Hutapea et al. (1979:172) found that the dharma tirta system worked well in the Sragen system, where there was "little disparity in the size of landholdings among farmers and leaders." The Brebes irrigation system, although blessed with an ample water supply, served sugar cane estates and onion producers at the expense of village rice farmers. The introduction in 1974 of a dharma tirta system did not bring about desired changes in cooperation for construction and operation or in water management. The authors conclude (1979:173)

> . . . that the most fundamental problem in water management may have been the existing power structure within the village and the consequent inequitable allocation of water among competing groups, rather than inadequate terminal infrastructure or outdated water allocation procedures.

As noted above, the existence of pronounced maldistribution of wealth in Bangladesh has also contributed to the failure of participation in government-sponsored, small-scale tubewell programs.

In summary, in highly stratified communities or irrigation systems, positions of power within the irrigation system are likely to be occupied by wealthier and more powerful elements within the community. Even where water user associations are deliberately designed to represent the interests of all cultivators, their effectiveness is often limited by powerful vested interests. For this reason, project implementors concerned with equity may prefer to work with egalitarian communities of smallholders (Leon, 1983; Hutapea et al., 1979). Egalitarian communities may be defensive in that they maintain their cultural integrity through separation from the national society and economy (Aguirre Beltran, 1979); more often they are united by shared poverty, having access only to poorer quality lands. In the former case, the process of intervention for any form of development

becomes problematic; in the latter, returns to investments in irrigation development are likely to be low owing to the impoverished resource base.

An alternative solution for developers working in highly stratified communities is to establish new rights in water and to distribute these in a way that promotes equity, but without immediate and drastic alteration of the rights of existing elites. Three examples of innovative experiments can be found in South Asia.

(1) The PROSHIKA low-lift pump projects in Bangladesh were designed to allow groups of landless to acquire low-lift pump and shallow tubewell technology and to sell water to landowners and cultivators (Wood, 1982; Turnquist and Coward, 1985). While these programs have not been universally successful, they have allowed a far broader participation in water management and have permitted the creation of flexible organizational structures capable of responding to changing management needs.

(2) The Sukhomajri Tank Project in Haryana (India), sponsored by Ford Foundation, was an offshoot of an erosion control effort. The decision to use waters stored behind a soil conservation dam for irrigation created new rights in water that were equally distributed among all families within the command area, irrespective of land holding size, but dependent upon a payment to the Water User's Association (Seckler, 1980).

(3) The Naigaon experiment in Maharastra State (India) is run by a voluntary trust agency in a poor region with low rainfall. The Gram Gourav Pratisthan (GGP) completed twenty-one pump lift projects as of May, 1981. Twenty-seven additional projects were in process at that time. While distribution of rights to the highly subsidized pump systems is not entirely equitable,[11] the GGP projects discourage co-optation of the projects by wealthy farmers by (1) prohibiting the use of lifted water for sugar cane, and (2) by allocating water on the basis of family size rather than landholding. The underlying

principles behind these projects have been water conservation and "protective" irrigation, that is, provision of sufficient water to meet the subsistence needs of each family in the project. Some irrigation groups are predominantly or entirely composed of members of lower status castes, thus reproducing at the system level the benefits of the egalitarian community. One irrigator group for a project under construction at the time of Chambers' report was entirely composed of women.

These three approaches to mitigating the negative impacts of stratification on small-scale irrigation development and organization are relatively new and experimental. While they hold considerable promise, there is concern about their sustainability over time and their replicability. Turnquist and Coward (1985) raise questions about the sustainability and replicability of the PROSHIKA and Sukomajri projects, emphasizing that the PROSHIKA projects have required a strategy of intensive fieldwork on the part of agency staff. Chambers (1981), addressing the issue of replicability in his evaluation of the Naigaon experiments, lists the dedication and commitment of GGP directors and their direct involvement in project development as the first precondition for the success of these projects.

A second precondition relevant to this discussion is the fact that the projects have been developed in "an environment in which larger farmers have generally already got their own wells and pumps and are therefore not interested in joining, dominating and exploiting the groups" (Chambers, 1981:9). Despite the fact that the Naigaon projects are designed to promote equity, Chambers is apprehensive about the ability of wealthier farmers to draw down the water table by digging wells to pump-irrigate sugar cane outside of the command area of the project systems. Thus, attempts to circumvent the power of elites in highly stratified societies may fail as in the case of the Mantaro Valley Plan MERIS water user associations; they may depend upon intensive, long-term fieldwork by project

directors and/or staff—efforts that may be neither sustainable nor replicable; and finally, project sustainability may be directly related to the acquiescence or disinterest of local elites.

ii. Gender differences. In assessing the differential impacts of small-scale irrigation development on men and women, it is necessary to look at the distribution of benefits from the system within the household, at the extent to which women are expected to participate in decision making, and at the ways in which they are expected to contribute labor and other resources to system construction, operation, and maintenance.

Women are often charged with collecting water for domestic purposes, including not only cooking and sanitation, but also other activities such as washing wool for textile production. Changes in the availability of water for domestic use as a result of irrigation system improvements may either burden women with added chores or release their time for other activities (Stanbury, 1981). The introduction of irrigation systems often brings dramatic increases in land values and a shift in patterns of ownership of irrigated lands. According to Cloud (1982:5),

> In African systems, where women still have independent access to land through traditional use rights, there is evidence that they lose access when irrigation is introduced unless specific measures are undertaken to preserve it. This is important for efficiency as well as equity reasons because women in many African systems are independently responsible for provision of parts of the family food supply.

The marginalization of women as landowners is also apparent in the irrigated lands of the Peruvian sierra, where, in some cases, privatization of land holdings and commercialization of agriculture has usually been accompanied by increasing male ownership. Bourque and Warren (1981) suggest that the designation of the key irrigation task of opening irrigation channels to allow water to flow onto the fields as an exclusively male function limits women's access to water resources. What does this circumscription of the woman's role mean for small-scale system management?

In the Andes, women continue to contribute fully to irrigation system construction and maintenance. Bourque and Warren (1981) point to women's labor in preparing meals for men irrigating and in transporting materials to and from fields in Mayobamba. Women work side by side with men in the construction of canals and small reservoirs in community projects in the Department of Puno (Lynch, 1983), although they do not appear to participate in formal decision making roles in local irrigation organizations. According to Weil (1983:5), Plan MERIS small-scale irrigation projects in the departments of Junin and Cajamarca have had little positive impact on

> . . . minifundista women who do not have the time, resources, or the assistance to dig an access canal to their plots. A widespread view among this group is that the benefits obtainable from irrigation are not sufficient to justify the explicit or implicit costs of digging an access canal.

This is particularly true in those cases where women's main source of income is off-farm employment.

Where women are expected to make a substantial de facto contribution to small-scale system development, it would be well to ask if the quality of this contribution can be maintained in the absence of formal participation in irrigation decision making. In Cajamarca Plan MERIS projects, for example, despite the large number of women heads of farm households owing to migration, Nunberg (1983) finds that women tend to be underrepresented on irrigators' committees. A recently established irrigation panchayat associated with the Dahod Tank Irrigation Project in Madya Pradesh, India included no elected women, and, despite the fact that they "were aware of the organization and were eager to get involved" (Stanbury, 1984: 31), area women felt that even if they were represented on the panchayat, they would lack voice.

The impact of restricted participation on equity and on the ability of women to perform other agricultural and domestic chores should be examined. Formal leadership roles may fall to women where male outmigration is pronounced, and

women's domestic and agricultural chores tend to be very time consuming. Deere (1977) finds that in Cajamarca with the increasing decapitalization of agriculture, a combination of extreme minifundismo, or fragmentation of land holdings, and male outmigration has emerged. In this impoverished setting, women not only shoulder a heavy workload, but are accorded relatively high status and bear responsibility for irrigation. Similarly, in the Chilean Norte Grande, seasonal and long-term male outmigration restricted the labor supply available for farm- and system-level irrigation tasks and placed a very heavy demand on the time of women heads of households. Here the critical gender issue is that of time. Can women as small farm managers devote additional time to irrigation activities? Where women are expected to play major decision making roles in irrigation management and manage irrigation water at the farm level, the additional burden should be assessed.

In summary, whether or not women play formal roles in irrigation management, they frequently make substantial contributions to system construction, operation, and maintenance. They are more likely to share not only in the benefits of a project as well as its costs if they participate formally or informally in system planning and management. Limits to women's ability to participate in irrigation activities due to other commitments must also be gauged. Where they are already deeply involved in on-and off-farm productive activities in addition to their domestic chores, the benefits to introducing irrigation or to increasing water management intensity must be assessed in the light of foregone activities.

iii. Sectoral diversity. In communities with small-scale irrigation systems, irrigation activities are often only a single component of a household production strategy. Such a strategy may have other water-using components, including milling, livestock production, fish production, power generation, and textile

preparation. In addition, household production strategies often make competing demands on irrigators' time. A small-scale project is likely to have differential impacts on households and individuals depending on the competing uses of their time and on the degree to which they stand to benefit from a community emphasis on irrigation. For example, a landowner whose holdings are concentrated in the potential or anticipated command area is more likely to benefit from project development than a community member whose holdings are largely on unirrigable land or one who derives most of his income and wealth from livestock production or off-farm activities.

Different economic activities, both at the local and at the regional levels, will have varying water needs. Multiple uses of irrigation water are common in small-scale systems in the Andes. Wachtel (1976) shows the successful complementarity of pig raising and quinoa cultivation in the Bolivian Chipayas systems. An even more elaborate complementarity of crop and livestock production, domestic use, and game management is associated with the traditional qochas (small water storage systems) near Pukara (Puno), Peru (Flores and Flores, 1983). In this part of the altiplano, water sources are few and distant. Shallow depressions lined with furrows are allowed to fill with rain water. As ponds, they attract game and wild fowl. When they are drained by means of canals to fill other qochas, they can be planted in tuber/grain rotations. During the fallow period before they are allowed to refill, they are devoted to pasture. Domestic and livestock uses of irrigation water also appear to be complementary in the traditional "furrow" systems of Kenya's Kerio Valley. In these systems, access to irrigation water is open to all domestic and livestock use by households residing near the furrows. Lower down in the system, the same water is used for irrigation (Ssennyonga, 1983).

Fish management may also be incorporated into a multiple-use irrigation strategy. The tanks of Tamil Nadu are stocked annually, and fishing rights

auctioned to the highest bidders. Tank associations are in some instances able to gain revenues for system management from the reauctioning of fishing rights (Meinzen-Dick, 1983a). A Programa 13 project in Collini (Puno) is incorporating a trout hatchery into a diversion system extension and improvement project. Other small-scale projects in the Andes have incorporated small penstocks and chutes for power generation (Lynch, 1978).

The building of complementary uses into an irrigation system may be a key to securing high levels of participation in a system where not all those expected to make contributions can expect to benefit from more reliable or more efficient water delivery to irrigated fields. Where the interests of divergent water user groups cannot be reconciled, conflict is likely. A classic example is the aggravation of conflict between illegally operating flour and olive millers and farmers in a community in Southern Spain. Both depended upon control of flow from the same source for their livelihood (Pitt-Rivers, 1961). There are also many examples of destruction of canal walls by livestock.

Not only will there be diverse and sometimes divergent sectoral interests in the use of irrigation water within the community, there may also be divergent interests in the use of the system itself. Tank beds in Tamil Nadu are used not only for water storage and fish culture, but for brickmaking and tree cultivation (Meinzen-Dick, 1983a). In the Dahod Tank Irrigation system in Madhya Pradesh, a village pond is used for the cultivation of singarda (a plant which grows in standing water.) According to Stanbury (1984), income from this crop goes to members of the particular caste responsible for its cultivation. Use of pond water for pump irrigation may have an adverse impact on this group as well as on users of water for domestic purposes. Use of small storage tanks in Peru and Bolivia for crop production and grazing has been noted above. In San Pedro de Atacama, concrete watering troughs for livestock were built into several secondary canals. Here, too, the incorporation of diverse economic interests in the system into the planning and

organizational process may be a necessary first step toward keeping intracommunal conflict at the manageable level. Chambers (1983:8-9) looks at diverse economic interests in an irrigation system as "resource opportunities," and suggests that attention to alternative uses of canal systems may yield benefits more easily and "establish preconditions for other developments."

Morfit (1983) describes a conflict in one of Indonesia's Sederhana Project systems between irrigation and the area's use for disposal of refuse from a local market. In this case, there was overlap between the population of irrigators and the population of market vendors. Nonetheless, rubbish was routinely thrown into a canal near the market site. The water users' association, lacking authority over the market, dug a rubbish pit that resolved the problem until the pit filled, at which point use of the canal for rubbish disposal resumed.

Morfit is pessimistic about the ability of local organizations or community organizers assisting them to resolve conflicts where these extend beyond the mandate of the local organization or where certain types of inequity are inherent in the system itself. He suggests that organization and system size may be inversely correlated with the capacity to manage conflict. This point of view is echoed by Steinberg (1983:56) who notes that

> Smaller irrigation systems often have the advantage of management that is intimately cognizant of local problems and can mediate its own disputes. Peer pressure under these circumstances is more likely to produce equitable distribution of water and more effective participation in group-required operations and maintenance, as well as less reliance on outside corruption. The obverse of this strength is that in hierarchical societies, individuals with greater social prestige or economic power may be able to manipulate more effectively the local system to their advantage. It should be noted, however, that community-based systems that include disparate village, clan or communal groups may find polarization between these elements.

Where these diverse interests cannot be reconciled, an irrigation project may benefit only a small segment of its target population. In this case, project support is likely to be low, levels of conflict high, and the mobilization of local resources

difficult without coercive measures. Where particular interests are deeply entrenched, it may be difficult if not impossible to plan a sustainable irrigation project based on local contributions without external intervention to alter the structure of property rights in the system, in water, or in irrigated land.

Conversely, if community cohesion is strong despite divergent interests, it may be possible to create or to utilize institutions designed to foster consensus-building through the representation of these interests and through the distribution of benefits to as broad a group of water and system users as possible. Participation by the diverse interest groups within a community in all phases of project development may minimize the need for external intervention, either to condemn and appropriate land and water for a project or to indemnify losers.

Patterns of local resource mobilization

As was noted at the outset of this paper, small-scale, community-managed irrigation projects are attractive to development agencies because they offer the possibility of magnifying a small external investment by adding local contributions in the form of cash, management skills, labor, local building materials, and equipment. However, some communities appear better "preadapted" to this type of communal enterprise than others. Such communities have a high level of cohesion, a history of organization for such communal projects as roads, churches, schools and other public works, and/or a highly organized agricultural production system. This "preadaptation" consists of the existence of local leaders and their ability to solicit local contributions to public works projects in the form of cash, labor, and time devoted to system management activities.

Examples of such communities include some of the *ejídos* of Mexico and some of the *comunidades campesinas* in the Andean region. Organization for agricultural production may include communal management of pasture land, determining rotations on agricultural lands, allocating parcels, and controlling

water allocation. Where an irrigation system includes portions of distinct agricultural or residential communities, organization may be more difficult and conflict more frequent (U. Pradhan, 1982; Hutapea et al., 1979), although this is not always the case.[12]

While it is frequently understood that communities and their leaders will differ in their ability to mobilize leadership or financial resources for irrigation activities, it is often assumed that LDC rural regions contain reserves of labor ready and eager to be tapped for construction, maintenance, and system management. There are two problems with this assumption: first, surplus labor may be costly or unavailable either seasonally or on a long-term basis; and second, communities will vary in their capacity to mobilize labor for public work projects and the ways in which they mobilize that labor.

The problem of labor availability and the costs and benefits of increased participation in water management have been noted earlier in our discussions of the impacts of hazard-prone environments and of gender differences on participation and organization for water management. At the core of this problem is the distinction between water and water management as agricultural inputs made by Barker et al. (1984). As they argue for the Asian case, "At the farm and system level, the use of management to offset water shortage comes at a real economic cost." The cost of increased management for double-cropping or for irrigation may not be justified by the benefits.

The case of Plan MERIS projects in Junín and Cajamarca is illustrative. McKean (1983:12) found that small farmers tended not to construct tertiary canals to reach their land:

> . . . the anticipated benefit of gaining access to the irrigation was often perceived to be insufficient to outweigh the perceived costs of securing their neighbor's acquiescence, digging the tertiary canal and sacrificing time which could be used to earn cash income from employment off the farm. One minifundista who launders clothes for extra income stated, "I have no one to help me and it isn't worth the time and trouble."

In their assessment of Asillo, a Puno irrigation project, Castillo et al. (1963) suggest that low levels of farmer interest and participation were due to the system's dubious value during the dry season with its nightly frosts, to a reduction in acreage as a result of canal placement, to the hazard posed by canals to livestock, and to the fear on the part of local cultivators that the introduction of irrigation would increase land and water taxes (a fear that later proved to be justified in the case of water). Thus, the anticipated returns to the Asillo project were less than the perceived costs. Where off-farm income is an important source of livelihood, and, more specifically, where the returns to increased water management are low relative to the cost, the outlook for widespread participation in irrigation system operation and maintenance is likely to be poor.

Conversely, where added inputs of water management can and do make a substantial difference in the well-being of a large segment of the community, either through risk minimization, increased subsistence production, or cash crop production, levels of participation will be high, and a viable system of local resource mobilization usually exists for annual maintenance tasks, repairs, and system upgrading. These mobilization systems take a number of forms and have distributional implications.

Forms of participation in construction and maintenance activities in both traditional and modern systems have been described for a wide variety of cases. In systems throughout the world, maintenance of system headworks and main canals is usually undertaken by a group representing the entire population of the community of irrigators. Community-wide participation in maintenance typically annually occurs for a short period of time,[13] and irregularly happens following major natural disasters.

In Andean South America, canal cleaning is accompanied by ritual activities and feasting. Canal cleaning ritual in Chuschi (Isbell, 1978) includes a procession of stations at various points along the system where offerings are made. The

procession is accompanied by musicians and led by members of the local (traditional) civic-religious hierarchy or varayoc.[14] The association of festive meals and ritual with irrigation system maintenance is also characteristic of the zanjeras of the Philippines. Siy (1982: 50) suggests that the provision of free food and drink to workers "is perhaps the strongest positive incentive for the regular attendance of members." The position of cook for these feasts is elective; the cook is exempted from maintenance tasks other than meal preparation. Each zanjera has a patron saint and holds an annual pamisa——a religious and social celebration that includes both a mass and feasting.

In other systems, canal cleaning is a purely civic activity. Gray (1963), for example, shows that among the Sonjo of Tanzania, maintenance activities are supervised by a council of elders (wenamiji), a body with power over but without direct responsibility for religious activities. The organization of a labor force for canal cleaning does not appear to be attached to religious ritual. Similarly, in highland Ecuador (Quimiag), a general minga, (labor party) is called by the parish council for maintenance activities, but canal cleaning has no religious element (Cornick, 1983). In northern Chile (San Pedro de Atacama), canal cleaning is also a civic activity, but is supervised by a special-purpose irrigators' association president rather than a more generalized political leader.

The nature of the labor contribution will also vary. In some settings, each household is required to supply one active male (e.g., Chuschi) (Isbell, 1978); in others, the labor contribution is tied to the amount of water received or land irrigated (e.g., San Pedro de Atacama, Chile) (Lynch, 1978); and the Ilocos coastal lowlands, Luzon, Philippines (Coward and Siy, 1983); in other systems, all able-bodied men are called upon to participate in yearly maintenance activities (Gray, 1963).

In the Central Andes, where communal labor traditions are strong, small-scale irrigation activities often take the form of the minga or ayni. In its classic

form, each community member, or a representative of each household (often an adult male), is required to participate in maintenance activities in order to receive benefits from irrigation.

Walter (1983) notes that in the Peruvian Sierra all irrigators are assigned an equal number of work days, no matter how large or small their holdings. But, in a major canal construction activity in the department of Junin, wealthier community members contributed money for alcoholic beverages, tobacco, cocoa, and music rather than labor. In other Andean communal systems, labor requirements are often met through the use of hired labor or cash payments. In a small system in the department of Puno, irrigators hired day labor to fulfill their communal labor obligations, paying them partly in cash and partly with food-for-work aid allocated to the community. The use of hired labor or cash payments in lieu of participation also occurred in San Pedro de Atacama. Here, too, irrigators facing unusual constraints (e.g., widows with young children) were often excused from labor obligations. Thus, participation in yearly canal cleaning and maintenance in gravity systems is widespread, usually involving at least one member of each household in the community of irrigators and requiring supervision by either a general purpose local organization, such as a civic-religious hierarchy (Peru), a local government unit (Tanzania, Ecuador), or a special-purpose irrigation association (Chile; zanjera in Ilocos Norte)..

Participation in maintenance of secondary and tertiary canals and structures is usually limited to a smaller group of irrigators. Here, the form of labor requirements varies. According to Duewel (1983b), in Javanese systems, farmers are responsible for cleaning and maintaining the stretch of ditch immediately upstream from their field. The incentive to perform maintenance tasks is unimpeded flow of water into one's own fields. Similar incentives operate in the Quinua system, but here irrigators are responsible for cleaning the entire canal upstream from their fields. This places a far heavier burden on downstream

irrigators than on upstream cultivators.[15] In San Pedro de Atacama, canal maintenance is carried out by canal associations for each lateral. Each association hires a ditchtender (celador), who, among his/her other functions, inspects canals and mobilizes a labor force when needed for cleaning or repairs. In Quimiag, responsibility for cleaning and maintenance of secondary and tertiary canals is assigned to the neighborhood or barrio within which particular canal segments lie. Where tractors and other vehicles do damage to the system, responsibility for repairs lies with the household using them. In some cases, fines are levied for failure to perform maintenance tasks; but at this level of organization public pressure and personal incentive usually suffice to ensure participation. Local organizations may or not play a role in the case of secondary or tertiary canal maintenance. Where they do, they may take the form of either informal associations of field neighbors or formal water user association subgroups.

To summarize, responsibility for carrying out small-scale irrigation system maintenance is usually delegated to the community of irrigators or the community-at-large. Performance of these tasks depends upon a high level of participation by irrigators in periodic labor parties. Because labor mobilization is vital to the continued operation of the system, incentives and sanctions to encourage participation are extremely important. Local organizations perform two functions related to maintenance tasks. The first is to mobilize a labor force in accordance with prevailing custom or association rules and in response to observed needs or traditional schedules; the second is to apply sanctions against nonparticipants. Where irrigators are members of single-purpose irrigation associations, sanctions are likely to take the form of fines for noncompliance. In those communities where local organizations are multipurpose civil or political hierarchies, sanctions include pressure from peers (in the case of Quimiag) or superiors (as in the cases of the Sonjo and Chuschi).[16]

Incentives and sanctions are important to stimulate performance as well as

nominal participation in maintenance activities. If participation in labor parties yields no obvious benefits, community members will likely evade responsibilities, making the enforcement of labor requirements difficult. Such a scenario would contribute to the rapid deterioration of the physical system. The association of annual maintenance activities with rituals or feasts constitutes a collective incentive for participation. They not only bind the community together, but they emphasize the importance of the system to the community's well-being and help to build an emotional commitment to the system on the part of the community-at-large.

To conclude, various aspects of community social structure will affect the level and nature of local participation in irrigation activities. These must be taken into account in the project planning process. It is not sufficient, however, to attribute all successes or failures of irrigation organizations either to physical constraints or to the nature of the community. It is vital also to consider the role of state and agency behavior in fostering or inhibiting local participation in and organization for irrigation activities.

The National Economic and Institutional Context

Community participation in development projects and the nature of local organizations respond both to the behavior of the agency involved in a specific irrigation project and to the general economic and policy environment within which both agency and community are operating. This community response is rooted in history. Where the past record of development agencies in a region has been characterized by failure to follow through on projects, communities may be unwilling to commit a large share of their resources to a long-term effort and instead will seek aid for smaller projects that can be executed quickly with low levels of community participation. Where agricultural pricing policies have been erratic, communities and households may be reluctant to contribute to a system

that offers a promise of increased production, but cannot guarantee a proportional increase in income.

External factors likely to have an impact on levels of participation and local organization include such economic factors as the cost of agricultural inputs (e.g., fuel and construction materials for irrigation), agricultural product prices, the risks of investment in irrigation for specific crops, and the attraction of alternative employment or household production activities. External institutional factors include the past record of the irrigation agency as well as other development agencies in the region, the nature of water laws, the form of investment in irrigation, the goals of community and agency, and finally, the agency's ability to identify local leaders with a broad base of support and to work with them constructively in all phases of project development.

Economic constraints to participation

In any discussion of the economic barriers to participation in water management, it must be remembered that participation in and organization for irrigation are associated with economic costs in terms of other productive activities foregone and the social costs of building consensus. To these inherent costs of participation must be added other costs associated with irrigation projects—construction materials, fuel for pump systems, land taken out of production for canals and other systems structures, ancillary inputs (improved seed, fertilizer, pesticides) required if irrigation is to achieve its intended benefits, water use fees, and the cost of credit needed to purchase inputs for the system and for irrigated agricultural production.

At what point do these costs associated with irrigation have an impact upon participation and local organization? The Peruvian experience with small- and medium-scale projects in the Sierra offers some insights into these relationships. A headline in a Lima newspaper during one of the most severe droughts in the

nation's recent history reads: "In Taraco, Puno, 200 hectares are not being utilized" (El Comercio, June 27, 1983:A-20). The pump system built in 1968 was idle in part as a consequence of recent gas price increases, in part due to increased per hectare water charges, and also to the relationship between these prices and low product prices for the farmer.

Two divergent solutions to the Puno gasoline pump problem have been offered. A CARE team suggested that, given the high costs of fuel and repairs and operational inefficiencies due to altitude, drought relief projects should emphasize hand pumps to be owned and operated by single households, thus avoiding organizational as well as input costs (Salinas, 1983). A Utah State University consultant suggested that existing pump systems (notably Pirapi and Taraco) be provided with fuel for the 1982-83 growing season, although he does not offer subsidies as a permanent solution (Griffin, 1983). What is clear in these cases, however, is that the role of local organizations is limited when critical inputs for water delivery are too costly to justify their use.

Abandonment of pump systems in Puno as a result of high fuel costs is but one symptom of a more pervasive process of decapitalization of the Peruvian countryside. McKean (1983:2-3) notes the effects of this process on farmers in the Plan MERIS subproject areas:

> One serious limitation to the use of agricultural inputs in conjunction with irrigation by farmers in Peru has been the sharply rising cost of fertilizer, pesticides, and agricultural equipment—all critical inputs in agricultural production. In January 1979, just as agricultural production was getting underway in the first subprojects, the Peruvian government eliminated subsidies on fertilizer purchased for agricultural production. Prior to that time, subsidy payments covered 35 percent of the total cost of fertilizer. In 1979, fertilizer prices jumped an average of 180 percent. By 1980, fertilizer prices were up another 60 percent (USDA, Agricultural Situation Reports).
>
> The world energy crisis, the rising cost of transportation (e.g., of agricultural inputs), the Peruvian government's austerity program, and other factors have contributed to similar rises in the prices of pesticides, and in the replacement and operating costs of agricultural equipment.

> . . . Inevitably, producers have been compelled to limit their use of these inputs, and given their smaller operating margins, the small-scale farmers have been most affected by the price squeeze.

During this period, interest rates for agricultural short- and long-term credit (both production credit and investment loans for on-farm improvements) rose along with input prices.

Increases in the cost of fuel, construction materials, fertilizer, and pesticides on the one hand, and the cost of credit on the other, have not been accompanied by corresponding increases in agricultural product prices. McKean (1983) finds that government price control policies in operation from 1968 to 1980 discouraged production of maize, potatoes, and wheat, while direct subsidies for wheat imports have discouraged production of such domestic substitutes as quinoa. Both price controls and import regulations are part of a deliberate policy to keep urban food prices low. In addition to these policies, marketing structures are also designed to keep farm prices low. According to Matos Mar (1976:251),

> Another element which distorts exchange consists of the intermediaries, to whom the small proprietors must resort when they do not have direct access to the produce market. In some cases, they sell produce "in plant," that is, in the fields themselves, and on other occasions in the Lima Wholesale Market. Both forms place them at a disadvantage, because they commercialize small volumes which allow them no room for bargaining with the wholesalers who impose the prices.

At the same time, according to McKean, (1983) the Agrarian Bank has been less willing to extend credit to small-holders. In this economic environment, the costs of participation in irrigation activities have risen in relation to benefits, especially for small producers. Yet to the extent that project beneficiaries are entirely dependent upon agriculture, the impact of adverse economic conditions on participation might be expected to be small, and farmers would be likely to orient production toward subsistence and to use irrigation to minimize risks. In the Plan MERIS subproject regions—-Cajamarca and Junín—-this has not been the case. Montoya (1982), citing data from the early 1970s, notes that in Cajamarca 35.6

percent of income in small-holder households comes from wage labor and an additional 11.6 percent from commercial activities. Indications are that off-farm income is even more important a decade later. Stein (1983) has found that only 24.3 percent of Cajamarca minifundista gross income comes from farming and livestock raising activities. Similar patterns are evident in the Huancayo area (Long and Roberts, 1978; Mallon, 1983).

The implications of the predominance of mixed household production strategies in the subproject regions for local organization vary. Nunberg (1983) finds high levels of irrigation organization in some small holder communities, but little economic gain as a result of irrigation. In areas where tenants and absentee owners predominate (see above), she finds that water user association effectiveness is constrained by the power of the latter, who are not members of the committees. An example cited by Weil (1983:4) indicates that benefits of irrigation to some small-holders may reduce incentives for participation:

> . . . one woman in the Apata sub-project, in the Mantaro Valley, lives on 1/4 hectare that is irrigated; she also has a second, slightly larger plot that is not under irrigation. She claims that her corn and potatoes are better on this larger, rainfed plot. She also states that the presence of water on the smaller plot has not made a difference since, in her opinion, it was uneconomical to farm it in the first place. However, she was convinced that her husband, who works as a hired hand on other farms, would be able to find more work because of the increase in land under cultivation as a result of irrigation. To provide enough for her family, this woman tends the rainfed farm while her husband works as a temporary laborer. She also tends a small grocery shop and works on the construction of the canals under a food-for-work plan.

In sum, while both husband and wife found employment as a result of irrigation, they have less time to attend to their own irrigated holding, and, by implication, to organizational activities associated with irrigation.

One cannot generalize from the Plan MERIS experience to all small-scale irrigation systems in the Andes, let alone in other parts of the world. However, migration for wage labor is an important factor in the Caribbean, Sahelian and

southern Africa (notably Upper Volta and Botswana), and in parts of Asia. Assessments of local organizational capacity for small-scale irrigation projects must take into account (1) the importance of off-farm employment in household economic strategies in project areas; (2) the likelihood that input and product prices will produce benefits to irrigation sufficient to encourage increased attention to on-farm activities if a reliable source of water is provided; and (3) capacity for participation and local organization, given the predominant balance of on- and off-farm productive activities.

Institutional factors affecting participation and local organization

The economic factors affecting irrigation organization are usually manifestations of government policies at a generalized level. At a more specific level, agency goals, behavior, and water laws are equally likely to elicit or suppress local participation and organization in small-scale projects. While Turnquist and Coward (1985) discuss agency roles, it is useful to briefly note the ways in which agencies may encourage, discourage, or shape local irrigation organizations.

i. **Water laws.** A water law may have direct or indirect effects on irrigation organization. On rare occasions, water laws have provided a legal basis for irrigators' associations while providing considerable latitude for the formulation of these bodies. The 1871 Ceylon water law is an example of this flexibility. According to Uphoff (1983),

> In 1871, the British colonial authorities in Ceylon decided to restore permanently the legal authority of Village Councils, traditional institutions whose powers had been curtailed after Ceylon was subordinated to colonial rule and which had previously managed village reservoirs (tanks) and irrigation. (They had experimented with such restoration of authority over the previous 15 years once it become clear that small-scale irrigation systems scattered throughout the country had deteriorated from lack of maintenance and coordinated operation, and that paddy production was declining as a result). Wisely, the authorities gave villages the option of assigning authority

> over irrigation to their council and a headman. Such flexibility has seldom been shown in most legal provisions for community management of small-scale irrigation systems.

Uphoff goes on to suggest that water laws designed to support the formation of water user associations may tend toward overspecificity:

> The temptation in such a situation is to specify in considerable detail what shall be the new organization's form, leaving little (room) for flexibility or experimentation, but also to prescribe a process of quick, top-down introduction of organizations, to have all areas in compliance with the law, with little concern for the internal dynamics of representation of all interests, accountability of leadership, and imposition of sanctions.

The Mexican water law, for example, narrowly specifies organizational forms to be established for systems receiving state aid. Goldring notes that small-scale projects are more likely to succeed where both agency and community perceive state-mandated organizational forms as useful and beneficial. Conversely, among reasons for project failure, (Goldring, 1983a:21) lists "farmers did not like the organization imposed by SAHR (Secretariat for Agriculture and Hydraulic Resources) agents for handling the system."

Closely tied to the issue of flexibility in legislation creating or recognizing water user associations is the issue of accountability. Water laws often require a shift in accountability of a water user association away from the community to the agency or state. Examples of this shift are found in Mexico and in the small-scale systems of Peru. Where a local organization derives its authority from the state, it may find itself in the uncomfortable position of carrying out policies that it has not helped to shape (e.g., levying and collecting water use charges). In Mexico, according to Lees (1974:33),

> . . . the state purchases the right to intervene in the internal affairs of a village and to bring about change in village organization by installing irrigation devices for the villagers, who would otherwise not be obliged to pay any attention to the national law.

In other words, the state may demand changes in social organization at the village level as a quid pro quo for the delivery of government irrigation services.

Lees (1974) cites the case of a village where a government-installed dam silted up after a single year. The villagers maintained their traditional water control institutions on the premise that since the government did not fulfill its promise of water delivery, the village was not under obligation to conform to the water law. Failure to deliver services constituted a loss of legitimacy for the application of the Mexican water law to local irrigation.

A shift in authority from community to the state may be helpful in certain instances. This shift, if properly executed, may allow an organization to resolve conflicts or to reallocate water without polarizing the community. Thus, while an overspecified or authoritarian water law may stifle participation and local organization, investment of local organizations with state authority may enable them to resolve problems that would be insoluble at the community level.

ii. Agency Goals. Divergences between agency and community goals for irrigation development and their possible consequences are discussed at length in this paper and elsewhere. Of interest here is the impact that this may have on local organization for irrigation. Svendsen (1983:17) contrasts agency and farmer interests in irrigation and notes their implications for organization:

> Robinson (1982) . . . advances three critical goals which are shared by system officials and farmers but with distinctly different sets of priorities attached to them. National Irrigation Administration (NIA) officials in the Philippines he argues, value irrigation fee payment rates most highly, followed by a strong interest in maximizing the area served and, implicitly, equalizing water distribution within the system.
>
> Farmers, on the other hand, value high yields above all else. They have a major interest in the convenience and security provided by an ample water supply and are little concerned about the total area the system covers. Fee payment is obviously not of interest to the farmer if water can be had anyway.

Svendsen goes on to argue the futility of assuming that, given these differences, farmers will organize to carry out an agency's goals:

> It may well be asking them to voluntarily organize themselves into groups to link up with the hierarchical structure of the irrigation bureaucracy to further goals, such as increased fee collection and possible reduced water deliveries, that are actually counter to their interests.

Farmer interests may also come into conflict with an agency's technical goals for reasons not directly connected to irrigation. Morfit (1983) cites disagreements in the HPSIS project between local water user associations (P3As) and the Indonesian Department of Public Works over the construction of new on-farm works. In one case, farmers prevented the construction of a drainage canal fearing that it would take too much land out of production. Morfit suggests that this resistance to technical directives is an indicator of the limits of community management and the need to give greater scope to technical decision making (although farmers may have been right from a cost-benefit standpoint).

While there is little reason to assume that the goals of irrigation agencies and their intended beneficiaries will often coincide, this does not necessarily mean that for this reason farmer organizations will or should be weak. Nunberg (1983:26), describing the irrigation committees formed to manage Plan MERIS subprojects, writes

> . . . in addition to serving a regulatory function, they also acted as interest mediators and articulators, airing complaints and registering them through petitions to higher authorities such as the Plan MERIS office. In one case, a commission of irrigators appealed directly to the Ministry of Agriculture to resolve a problem regarding a blocked intake on a main irrigation canal.

Because small-scale irrigation systems are dependent upon local cooperation in an organized form, a local organization may often be in a good position to assert local needs. Drawing once again upon the Peruvian case, strong local organization at the subcommunal level in the Puno community of Ccotos enabled farmers to bring about major changes in system design to meet the needs of those with fields at higher elevations.

The problem here is one of definition. The fact that an agency and a community do not have mutual goals need not mean that local organizations will fail, nor does the existence of goal conflict lessen the legitimacy of either set of goals. Yet, such conflict is sometimes defined as failure or proof that "the maximum amount of community management possible is always best. . . (this view) may be just as mistaken as the view that the community can never be relied upon to know what is in its best interests" (Morfit, 1983:15). Conversely, goal conflict strengthens a local organization's ability to press its claims in a bureaucratic setting. This strength may be vital for the system's eventual success and sustainability. It is important to make sure that both agency and community goals are represented in the development process and that mechanisms are available for their reconciliation.

iii. Agency behavior. Levels of community participation in development projects and the nature of local organization vary both with the behavior of specific agencies involved in irrigation projects and with the general bureaucratic environment within which both agency and community operate. Because this local response is to past experience, changes in agency behavior may be slow to produce desired community organizational responses. This has been a source of frustration for development personnel in the past. But the NIA experience in the Philippines (F. Korten, 1982; Isles, n.d.) has shown that careful attention to participation in all phases of project development, to decentralizing decision making, and to building community support for and capacity to carry out small-scale projects can help overcome the effects of past bureaucratic experience. On the basis of results from the NIA-Ford Foundation pilot project at Laur (Nueva Ecjica), Bagadion and Korten (1980:8-9) identify four agency capacities essential for effective work with communal irrigation systems:

(1) The capacity to develop effectively functioning irrigation associations;

(2) The capacity to work with a farmer association on a partnership basis in planning and constructing the system;

(3) The capacity to carry out fair and rational contractual procedures with the farmers; and

(4) The capacity to plan technical and institutional work in a coordinated way with adequate time allowed for effective work at each stage.

Examples of problems with small-scale projects resulting from the lack of these agency capacities are legion; a few will be cited here for illustrative purposes.

In the Indian state of Himachal Pradesh, the Irrigation and Public Health Department (IPH), a branch of the State Department of Public Works, carries out several types of small-scale projects: remodeling of community diversion systems (kuhls), construction of new small- and medium-scale diversion schemes, and construction of small- and medium-scale lift schemes. Coward (1983d) finds that rather than developing irrigation associations, the IPH will provide assistance to community kuhls only if the community turns over responsibility for system management to the agency. In addition, he finds little indication of local participation in project development beyond the initial request. The result of this agency style, according to Coward, (1983d:16) is that "resources previously (or potentially being invested by the community in maintaining its kuhl are now replaced by the state's resources and the level of recurring costs is increased for an indefinite period." Moreover, he argues that these policies will reduce incentives for both project and neighboring communities to sustain existing local organizations.

In accordance with Peruvian water law, Peru's Plan MERIS project called for Irrigator's Committees and Commissions to manage subproject systems. These organizations exist in all subproject areas, appear to be indigenous and representative, and, wherever possible, are built upon existing irrigation organizations in order to provide continuity. Although all committees were elected by water users, they showed varying degrees of autonomy from the agency. In

some cases, vigilantes (water masters) were selected from the communities; in others, they were appointed by Plan MERIS and were paid by the government.

According to Nunberg (1983),

> In some cases where the vigilante was government appointed, the goal seemed to be to provide a transition to local control, but in other situations, the presence of a public . . . vigilante to oversee local water distribution is likely to continue. The vagueness of future arrangements made sustained community involvement in the irrigation program more uncertain.

Thus, while Plan MERIS has had a good record with regard to recognizing, legitimating, and even strengthening local water user associations, upon occasion like the Himachal Pradesh IPH, it too has had a tendency to facilitate dependency through the continued presence of the state at the local level.

A second, and perhaps more serious problem with Plan MERIS, has been its failure to work in cooperation with farmers during planning and construction phases. In part because Plan MERIS efforts were concentrated in Lima and field staff were few, widely scattered, and with extremely limited resources, Nunberg (1983) found that community inputs into the planning process were minimal, and that this pattern continued into the construction phase. The results, she argues, have been reduction in participation in the post-planning phases, high levels of community conflict over canal construction and location, and a failure to strengthen local management capacity. In both cases, the capacity of the agencies to foster and to work with farmer organizations was weakened by their construction rather than service orientation and by excessive centralization of planning. In the case of the Plan MERIS projects, the inability of the project to adequately support field staff also made it more difficult to engage in an interactive planning process.

Even where overcentralization and a construction orientation do not inhibit local participation in small-scale projects, particularly in the planning and design phases, funding procedures may act as constraints. Pressures to disburse funds and,

hence, complete construction within a given timeframe, may act as an impediment to local participation. Coward (1983a) identifies this problem in the Philippines NIA attempt to introduce farmer participation into the earliest stages of project development. A closely related problem is the timeliness of disbursement of funds and building materials. Failure to supply needed materials or funds in time to make use of local labor that is only available on a seasonal basis not only results in project delays, but can produce a pervasive feeling of disillusionment and skepticism among potential beneficiaries—feelings that make the task of remobilization more difficult.

Economic and institutional factors, including those enumerated above, are bound to have an impact on local participation and organization for small-scale irrigation. The magnitude of economic constraints—input and product prices, credit, and competing sources of employment—cannot be overemphasized. Farmers cannot afford to invest in irrigation improvements and in the complementary inputs and improved seeds required to make these investments pay unless crop values justify the investment. Nor can they afford to devote time to system management and maintenance if their time is better invested in off-farm labor or other production activities. As D. Korten (1984:1) points out, "Farmers cannot be organized to manage a resource which is not available to them, or which does not meet an immediate need."

Even where improved irrigation can be shown to meet an immediate need, agency behavior may inhibit or encourage participation and local organization. Involvement of irrigators in planning and construction phases may reduce levels of conflict, promote understanding of goals, and increase local skills. But this type of involvement depends upon the existence of trained field staff willing and able to devote a lot of time to listening to community needs and helping local associations to articulate these to the agency.

D. THE LOCAL ORGANIZATION: APPROPRIATE ROLES AND CHARACTERISTICS

Previous sections of this paper have considered the dimensions of participation and local organization in irrigation and the physical, social, and national economic and institutional factors likely to have a direct impact on the nature of participation and local organization in a given irrigation system. This section will examine the characteristics that local organizations must have and the roles that they need to fulfill if they are to succeed in managing small-scale systems effectively.

Accountability

The legitimacy of a local irrigator's organization will depend in part upon that organization's accountability to its constituents within the community and in part upon its accountability to the agency promoting project development. Agencies often attempt to create local organizations solely accountable to themselves. The prime example of this type of organization is perhaps the Farm Land Improvement Association (FLIA) responsible for supervising small-scale irrigation activities in Korea. The FLIA sets and collects payments for water use, establishes allocation schedules, and is responsible for maintenance activity. It is controlled by and is in fact part of the government bureaucracy. According to Steinberg (1980:20), "The role of the farmers was to attend, if they wished, FLIA and farmer's cooperatives meetings to receive information and instructions." All accountability in these organizations is upward to the bureaucracy.

Morfit's (1983:22) assessment of the Sederhana Project P3As, or Water User Associations, is similar:

> . . . The establishment of the P3A in systems throughout Indonesia is the result of a government program, with government funds and procedures. Although in most places there were indigenous traditional water users organizations, the P3A within the framework of the Sederhana Irrigation

> program in general and within the framework of HPSIS is specifically a government creation. The COs, selected, trained and paid by government agencies are also a product of government decisions rather than local initiatives. It is not surprising, therefore, to find that government agencies often look upon the P3A as a part of their extension service network, with the function of assisting the government in achieving its production targets or other development goals.

In this case, the community organizers (COs) have apparently tried to avoid an extensionist role, and have often found themselves in an intermediary role, presenting the position of the local water users association (P3A) to the irrigation department.

At the other extreme, local organizations associated with indigenous systems are often accountable only to irrigators or to the community at large. Such organizations would include the varayoc of Peru (where they still function), the zanjeras of the Phillipines, the subak of Bali, or the clan networks governing the systems Ssennyonga (1983) describes in the Rift Valley of Kenya.

Thus, there appears to be an association of accountability downward with purely indigenous systems and an inverse correlation between government involvement and accountability to water users. The problem then is how to build accountability into small-scale irrigation projects. Coward (1976:100) calls for a recognition "of the potential of indigenous organizational arrangements for water management," suggesting that traditional irrigation roles be expanded to include interactions with project officials without altering patterns of accountability. This is not always easy (Coward, 1976:102):

> Often, in the process of linking agrarian organizations with central government activities, an attempt is made to use existing leadership roles while shifting leader accountability from the local community to the field agents of the central government. In so doing, the nature of the relationship between leader and constituents is significantly altered—sometimes precluding the effective performance of the leader.

What then are the prerequisites for accountable leadership in small-scale projects? Coward (1984) suggests three elements that are critical for ensuring accountability

of an irrigation organization to water users: (1) small-scale; (2) local selection of organization leaders; and (3) direct compensation of leaders by the water users served.

To argue that irrigation organizations must be accountable to their constituents is not to deny the importance of accountability to government agencies. Accountability upward may be a prerequisite for obtaining state or agency aid. Coward (1983a) cites the example of Philippine assistance to indigenous systems in the form of loans. In order to ensure loan repayment, the government has required that every indigenous system receiving funds formally organize in accordance with rules drawn up by the Philippines Securities and Exchange Commission. While these rules may appear redundant and possibly destructive of local initiative where effective irrigation organizations already exist, it would be unreasonable to expect a government to relinquish its power to attach whatever strings necessary in order to protect its investment.

In sum, there must be a balance between accountability to the water users and accountability to funding or construction agencies. If a local organization is to be responsive to farmers and other water user needs, farmers must have some leverage over behavior of the organization's leaders, whether in the form of payment or selection and removal. The Korean FLIA systems may be an exception, but by and large, where this accountability is missing, small-scale systems will tend to have serious production as well as equity problems. If a local organization is an appendage of the bureaucracy, its range of functions will be constricted, especially if leadership roles are occupied by outside-oriented people who lack community support. On the other hand, agencies are unlikely to provide irrigation assistance to communities where there is little expectation that loans will be repaid, that investments will pay off, or that system infrastructure will continue to be maintained by the irrigators.

But this is only one dimension of accountability. Local organizations are

responsible to competing constituents at the local level. An irrigators' association may have to balance the interests of upstream and downstream users, hill and valley land cultivators, producers of different crop mixes, as well as interests based on gender, ethnicity, class, and type of water use (e.g., domestic, industrial, livestock).

One way to look at the question of accountability is to ask who are the potential beneficiaries of a project and who is being asked to shoulder its major costs or obligations. Howes (1984) discussion of the cooptation of benefits from a deep tubewell financed by the BADC in Bangladesh illustrates the potential for concentration of benefits in the hands of a small kin group within a community and the simultaneous distribution of costs of fuel and other fees to a far larger group whose benefits are more ephemeral.

This case illustrates a second approach to the issue of accountability within a community of irrigators: the relationship between class and/or land tenure and the form of participation in irrigation activities. Two major participatory roles may be distinguished—participation as labor and participation in management. Ideally, in a small, community-managed irrigation system, all irrigators will contribute their labor and tools to system construction, maintenance, and repair. They will also serve as members of the irrigator's association and will take turns as leader, or, at least, participate in the leadership selection process.

This is unlikely where irrigated lands are not actually cultivated by the owner or his household, but by sharecroppers, tenants, or landless laborers. Nor is it likely where women make major labor contributions to irrigation system construction and maintenance, but are not represented in local organizations. At the extreme, participants in construction and maintenance activities may find themselves excluded from participation in system management, and their interests neglected by a water users' association.

The equity implications of this scenario are obvious, but it has efficiency

implications as well. In a small improvement project in a puna irrigation system undertaken by the Puno Dirección de Aguas, labor was not performed by the potential beneficiaries of the system but by day workers who were paid by the irrigators in cash and in food allotments assigned by a Peruvian agency to communities in conjunction with projects involving community labor (Lynch, 1983). Because the wage-food package was inadequate and, perhaps more important, because those engaged in construction activities could not expect to share in the benefits of the new system, absenteeism was high, and progress on the main canal and small reservoir far slower than expected.

The same problem is manifested in a more subtle form in the Mantaro Valley of Junín. A zone of intensive commercial production for national markets, the Huancayo area exhibits remarkable variations in land tenure, even on holdings of two hectares or less. Influential landowners in this region have tended to translate their labor obligations into cash contributions for food, cocoa, and music or payments to day laborers; landless laborers, tenants, and poorer landowners shoulder the burdens of participation in construction and maintenance activities (Mallon, 1983:Ch.VII; Winder, 1978). Some Thai systems make an explicit distinction between water users who have made financial investments in irrigation system development and those who contribute labor to system maintenance. The former are usually landowners and are given an active management role in return for their investments; the latter——usually tenants or sharecroppers——pay for water through participation in canal cleaning and repair work crews (Tan-kim-yong, 1983). Landowners have property rights in the system as well as its waters, while other water users have rights only to irrigation waters.

To summarize, accountability within the context of the community means the ability of a local organization to recognize competing interests in the irrigation system and its water and to steer a course of action that will neither favor nor disadvantage any particular group to such a degree that equity, production, income, or efficiency concerns are undermined.

Ability to Perform Irrigation Tasks

Ultimately, an irrigation organization will be judged on its ability to carry out a series of tasks related to irrigation. Coward (1983b) lists three specific tasks—water acquisition, water allocation, and system maintenance. To these he adds the more general tasks of resource mobilization and conflict management. In a further refinement of task definition, Uphoff (1984) distinguishes between participation in resource management and participation in resource mobilization; the former includes tasks involving decision making and the latter the provision of information, labor, funds, and materials for project use. Management and mobilization require different kinds of leadership skills and information, but they are interrelated. Similarly, different tasks present themselves in different phases of irrigation system development, but these too are interrelated. Participation by beneficiaries in project planning is likely to make it easier to mobilize local resources for system construction and later for O&M. The use of local skilled and unskilled labor in system construction will familiarize farmers with problems of design, materials, etc.—knowledge that will facilitate later decision making regarding maintenance and repair.

As was noted earlier, in small-scale projects there is a tendency to expect that local resources will be mobilized either as unskilled labor for construction and/or for day-to-day system operation and maintenance once construction is complete. Often, it is expected that management decisions can be best made at the agency level, while tasks of resource mobilization are best left to the communities themselves. Yet because of the interrelatedness of management and mobilization tasks and of tasks in successive project phases, failure to encourage active participation in one set of tasks may affect performance in another. For example, failure to engage farmers in planning decisions related to system layout in some of the Plan MERIS projects resulted in resistance to projects, conflict over property rights, and lengthy and expensive delays in construction.

In contrast, a central tenet of the NIA pilot projects at Laur has been "no strong organization, no construction" (Isles, n.d.). Adherence to this policy has meant that the NIA was able to work with a farmer committee in selecting the water source, canal and dam location, and the areas to be served by the system. Farmers accompanied surveyors in the field, clearing land, securing permission for entry, and advising about property rights along the water courses. This initial and organized farmer participation averted some of the problems experienced by Plan MERIS during the construction phase.

Involvement of farmers in construction activities will also have an impact upon design. The Dutch Programa 13 project in Ccotos (Puno) depended entirely upon the mobilization of a community labor supply for unskilled labor. This labor force received no payment other than the grant for the system and supplemental food-for-work assistance. Full and competitive participation in construction activities, coupled with a strong local organization representing equally powerful geographically-based interest groups within the community, resulted in major design changes increasing the command area of the system (Lynch, 1983). Extension of the system to meet the needs of a larger number of farmers is in turn likely to guarantee fuller participation in operation and maintenance activities.[17]

Just as participation in early phases of project development enhances local capacity to carry out tasks during later phases, participation in decision making or resource management is likely to enhance an organization's capacity to mobilize local resources. As Coward (1983c) argues for the NIA pilot projects at Laur,

> Not only was the agency to build new irrigation structures or expand the service area of a particular community system, but it was also to obtain repayment from the community for a portion of these costs. The NIA recognized that repayment would be made only if the community was satisfied with what it had received and if it could be held legally responsible for the debt.

Or as Uphoff (1984) puts it, "Farmers are more willing to contribute (mobilize) resources when they have had a role in planning (managing) their use."

If, on the one hand, farmer involvement in decision making is a key to the mobilization of local resources for system construction and maintenance, in some instances an organization's ability to perform critical tasks may be enhanced by agency involvement. At the simplest level, an agency may have at its disposal funds and technical expertise that are absolutely essential for the introduction or upgrading of an irrigation system in a particular physical environment. In this case, a key question is how to introduce these resources without discouraging local capacity for carrying out key tasks. Coward (1984) suggests that an indirect investment strategy and a service orientation on the part of an agency may be helpful.

Not all communities or project areas, however, are characterized by social harmony or uniformity of interest. As was noted in the previous section, class cleavages, or divergences of interest based on gender, economic sector, or interest group may be strong enough to limit the effectiveness of a local organization. In this case, an outside agency may be able to play a helpful role in conflict resolution through the imposition of an externally created water allocation schedule or through the exclusion of a powerful elite from membership in an irrigation organization.

Ability to Interact with Agency

In the context of the developed or externally assisted small-scale irrigation sector, local organizations will not be successful unless they are able to interact with development and regulatory agencies. This may necessitate incorporation or registration as an entity responsible for loan repayments, as in the case of the Philippine zanjeras (Coward and Levine, 1978). Beyond this, the local organization may have to develop the capacity to manage its finances in a manner acceptable to funding agencies, to write grant proposals, and to put forth its claims and requests directly to agencies or through mediating channels.

Ironically, communal labor and local self-help traditions are often strongest in relatively egalitarian but closed, corporate communities where resistance to outside intervention is strong. A Latin American discussion group at a 1983 Water Management Synthesis II Workshop on Small-Scale Irrigation Programs concluded that in this type of community, which is generally physically isolated as well as culturally or politically resistant to penetration, a government-sponsored irrigation project is more likely to be harmful than beneficial. Yet, even in communities with a long history of integration into the national economy and society, there may be deep rooted skepticism of government agencies—a skepticism that mitigates against the development of a capacity to work within the existing system. To overcome this requires a willingness on the part of development agencies to understand the roots of this skepticism and to work patiently to overcome it.

E. AGENCY ROLES IN ENCOURAGING LOCAL ORGANIZATION AND PARTICIPATION

This paper has tried to demonstrate that in the context of small-scale irrigation development, the role of the agency will be a critical factor in the success or failure of local organizations. Effective local participation will depend on a proper balance of agency and local organization roles. Agency roles in small-scale irrigation are discussed in detail in Coward and Turnquist (1985); this section will outline components of a small-scale irrigation development strategy that can foster participation and strengthen local organization.

Understanding Local Factors Relevant to Irrigation

It has been widely recognized that the creation of effective local organizations for rural development requires an understanding of social factors in the location that may affect or be affected by a project. For example, AID's Policy Paper on Local Organizations (1984:6) cautions,

> AID should not commit major resources without some understanding of how particular development activities are going to be received or perceived by the local organizations and people who are to administer and utilize them.

Coward (1984:8) identifies the lack of understanding of local social structure as a key reason for agency failure and argues that it is essential to determine the nature of existing irrigation organizations, to look at the tasks they perform and assess their ability to perform these, to identify local factors that support local institution building, and finally, to gain an understanding of local property rights in land and water.

It is one thing to understand the need for social as well as physical baseline data. It is quite another to suggest a methodology for collecting these data within the typical irrigation development context. It would be tempting to recommend that any small-scale irrigation project be preceded by a thorough social science baseline investigation. The massive and carefully planned survey may yield quantities of data based on careful sampling techniques and amenable to statistical analysis, but these data may be obsolete by the time analysis is completed. The lengthy enthographic study is an attractive alternative, in that it is designed to gather descriptive data on variables of interest to the irrigation project planner—ecological factors, cropping and local resource use patterns, demography, social structure, and cultural factors. Yet much of the information that would be collected in such a time consuming effort is already available to the community and will be shared if there is full participation in all phases of project development. Still, an agency will need to know something about the community before making decisions about whether or not to invest and with which individuals or groups they should be negotiating.

Since the appearance of Chamber's 1980 discussion of the biases of baseline data collection efforts,[18] refinement of rapid rural appraisal techniques has been a subject of increasing concern to the development community. In a later discussion of RRA and irrigation projects (1983), he offers the following general guidelines:

1. Appraisal teams should be small (2-7 outsiders), represent engineering, agricultural science, and social sciences;

2. Team members should have interdisciplinary skills. Rapid rural appraisal should be guided by, but not bound by a check list of key problems;

3. A variety of potential informants and documentary materials should be tapped for information;

4. A preliminary visit may be helpful to secure documents, identify informants, arrange logistics, and identify some key issues on basis of discussions with project staff;

5. RRA should be of approximately two week duration and be guided by a planning matrix showing information needed, and who, where, and how it will be gathered.

In conclusion, he sees open-mindedness, experience, and a learning attitude on the part of team members as prerequisites for success.

The first task of a baseline study or appraisal is to determine whether or not an indigenous (or agency-sponsored) irrigation system actually exists. If this is the case, Yoder and Martin (1983) suggest that attention be directed to the following aspects of irrigation:

1. Organization—tasks, degree of formality, seasonal visibility;

2. Allocation of water rights;

3. Water distribution methods;

4. Operation and maintenance activities;

5. Ways in which local organizations mobilize resources; and

6. Local organizational capacity for conflict management.

Is the system working well or badly? If the latter, the causes of problems—whether social, physical, or a combination of the two—must be understood if solutions are to be found. It is also important to know how the design of the system in place affects irrigation organization and the distribution of benefits from the system and how land and water rights as well as rights in

irrigation infrastructure are structured.[19]

In her assessment of communal gravity systems in the Philippines, de los Reyes (1980) lists five additional types of data highly useful or essential for project planners:

1. the person or group entrusted with overseeing system operation;
2. the organizational setup of the irrigation association if one exists;
3. rules and practices associated with the allocation and distribution of water in the system;
4. roles related to system maintenance and activities involved in system maintenance;
5. conflicts related to the use of water and procedures observed in the resolution of irrigation disputes.

In addition to these items, it would be useful to know to what extent physical facilities and organizational forms can be preserved.[20]

A second key element in a baseline study is an analysis of local social structure as it relates to irrigation. This is a prerequisite for determining the extent of local support for a given project and the likelihood that a broad spectrum of potential beneficiaries will be willing to make substantial local contributions to project development. As Bagadion and Korten (1980) note with reference to the Philippine experience,

> . . . there are often conflicting views among (irrigation association) members as to the desirability of NIA assistance, since it may bring them differential benefits; farmers with easy access to water may be relatively satisfied with the present situation (and resent paying for new construction costs) while others downstream may be very keen on improvements to obtain a more reliable water supply.

Careful analysis of divergent interests in irrigation systems permits an agency to reallocate rights in water and in the system in order to broaden the distribution of benefits and the basis of project support as in the case of the Naigaon experiments in Maharastra and the Sukomajri Project in Haryana.

It is important to understand not only the possible patterns or distribution of project benefits, but what groups within the community will be expected to make the most substantial labor and cash contributions. It is frequently the case in Andean systems that poorer families must draw household labor away from more remunerative activities for work on canals, while wealthier farmers hire day laborers or contribute cash in lieu of their labor. This makes it difficult to mobilize a force of able-bodied adult workers, creates conflict, and slows down construction.

In sum, rather than concentrating on such aggregate socioeconomic data as age, education, and income levels, baseline studies should focus on community level variables such as stratification, capacity of existing irrigation organizations, leadership capacity, and the nature of interests in irrigation development. This type of study should not only help planners to design projects that will encourage full participation and local contributions, but will aid in site selection by identifying those communities where factionalism will not threaten participation and where a broad spectrum of the population will stand to benefit from irrigation development.

Agency Style, Participation, and Organizational Formation

Previous sections of this paper have shown how agency behavior and the record of past agency performance may affect participation and local organization for small-scale irrigation. Several elements of agency performance may be singled out because of their impact:

Construction versus technical assistance

The design and construction of physical infrastructure is the overwhelming concern of most irrigation agencies. Agency behavior appropriate to this role does not always foster local participation. A construction-oriented agency is likely to

be preoccupied with putting a physical system in place in a limited time period. This preoccupation will produce impatience with the slow process of organization formation, negotiation, and consensus building. Where systems are designed in agency offices, there will be a reluctance to build upon existing infrastructure or to alter design to meet local production, organizational, or political needs. As was noted above, the construction bias has exacerbated conflict and reduced participation in early project phases in the Plan MERIS subprojects and has resulted in the demise of local organizational capacity in the small gravity systems of Himachal Pradesh.

Coward (1984:25) suggests as an alternative a service role for the agency. The agency would provide technical assistance to irrigator's groups, to cooperative organizations, and local governments and would perform the following functions:

> Provision of financial assistance in the form of grants or subsidized loans;
>
> Technical assistance in designing and constructing facilities;
>
> Technical assistance with regard to improved system management;
>
> Assistance in the formation or strengthening of a local water users' group;
>
> The regional coordination and regulation of water allocation between systems, as in a watershed, along a particular stream, or for a designated groundwater area.

According to Coward, bureaucratic reorientation to perform these service functions will require changes in measures of staff success and retraining staff in more participatory approaches in the field.

Learning process versus extension approach

Responsibilities for small-scale irrigation development are frequently divided between a public works or construction-oriented irrigation agency that designs and supervises system construction and an extension-oriented agency of an agriculture ministry or department. The agriculture agency is then charged with dissemination

of information on organizational formation or capacity building along with advice on credit, crop choices, and other inputs. As Coward (1984:25) notes, the problem with this approach is that "extension agents are formally trained to disseminate information rather than to organize farmer groups." An additional problem is that the extensionist is often placed in the patronizing position of telling the farmer what to do, rather than the evaluative one of assessing organizational problems and working with local groups to resolve these.

D. Korten outlines a very different agency approach—one which simultaneously builds agency and community capacity to develop innovative responses to problems as they occur. The learning process approach, according to Korten, is a bottom-up capacity building process that includes continuous interaction between agency personnel and the beneficiary population from the earliest stages of project development. This approach requires agencies with a well developed capacity for responsible and anticipatory adaptation—agencies that (1) "embrace error"; (2) "plan with the people"; and (3) "link knowledge building with action" (Korten, 1980:498).

The advantages of this approach are twofold. On the one hand, an agency's willingness to learn about local needs and problems and to work with the community to address these will help to bridge the gap between community and agency, and overcome the skepticism about government projects so prevalent in rural areas. On the other, engagement of the community and the encouragement of participation in the earliest phases of project development builds local capacity for irrigation management and helps build the local support required if much needed local resources are to be mobilized in the construction and later project phases.

The role of the community organizer

Many small-scale projects involve the use of promoters, catalysts, or

community organizers to guide and foster participation. These agents perform widely differing roles. In some cases they may be little more than salesmen for specific programs or system designs. Goldring (1983b) interviewed a Oaxaca project promoter whose task was to enter a community, to inform residents about an impending project, and to conduct "labores de convencimiento" (efforts to convince people) until at least half of the potential water users showed their willingness to sign an agreement both to support system development and to commit themselves to contributing labor and cash to the project. She found that the job of the promoter was not to reach a negotiated settlement about design, timing, and contributions, but rather to obtain ratification for a predesigned project. The promoter as salesman attempts to generate support for and create an organization compatible with a particular project type.

A second possible role for the community organizer in small-scale projects is that of intermediary or broker between the local organization and the government. Despite the fact that they are hired, trained, and paid by Indonesian government agencies, the community organizers for the Sederhana HPSIS projects, have been used by local water user associations as advocates for the community in government agencies. According to Morfit (1983), the COs have been successful in presenting themselves as something other than a bureaucratic presence in the community, they have in the process made themselves indispensable precisely because they have assumed a brokerage function.

Wood (1979) sees the assumption of a brokerage role by community organizers or village-level workers as a function of their incorporation into the project community. This incorporation is accompanied by progressive alienation from the agency that typically offers little support in the field or prospect for advancement, and at the same time by increasing dependence upon local elite families. According to Wood, in the Kosi project context,

> The VLW (village level worker) becomes an errand boy, a broker, for certain families, committing himself to their

> aspirations, and integrated into the value-system of the locality. . . . But he also occupies a position in the emerging class relations of the region—tied to the interest of the rich peasant/emergent capitalist farmer classes.

Thus, the brokerage role presents two distinct problems: the continuing dependence of a local irrigation organization on the services of the agency at a time when the agency's personnel should be concentrated elsewhere, and the potential for cooptation of the community organizer/broker by local elites.

A third possible role for the community organizer is that of resource person or facilitator—an outsider enlisted by the community to help it to establish its irrigation priorities, to build organizations in order to carry out new functions related to project development, and to help translate the felt needs of the community as a whole into viable proposals for outside support. To a great extent, this was the role of the COs at Laur. Alfonso (1980) describes their role in detail:

> A key feature of the Laur experiment was the fielding of community organizers (COs) among the client farmers. The objective was to assist the farmers to strengthen their association and to prepare them to undertake their roles in planning, constructing, and eventually operating the systems. The community organizers lived among the farmers assisting them to mobilize their members to participate in common activities, to express their sentiments and opinions during meetings and assemblies. They were instrumental in training the leaders of the association to insure that they were responsive to the needs of the members. They acted as facilitators in the meetings between the association and the technical staff of the NIA. The mission of the COs was to assist the farmers in developing a viable, self-reliant association.

Rather than handing out a blueprint for irrigation management and asking for approval, or allowing themselves to become permanently embedded in a brokerage role, the Laur COs engaged farmer organizations in all aspects of the project development process—including surveying, determining canal layout, bidding out work, and supervising delivery and quality of materials—thereby building capacity within the beneficiary community to take control not only of resource mobilization and system management at the local level, but of its interactions with outside contractors and government agencies.

In conclusion, an agency may be able to promote participation and local organization in ways that cannot be duplicated by the unassisted local community. It may be able to sponsor legislation guaranteeing irrigation water rights from a particular riverine or groundwater source to a community, thus enabling it to protect this right in the courts against outside incursions. Through the judicious use of loans and grants, it may be able to supplement local resources to fill critical needs. Third, it may be in a position to offer services to the community—technical assistance, extension information, and training in specific water management skills. Finally, in certain instances, it may also be able to break deadlocks within a community and defuse conflict through the introduction of allocation schedules or through the reallocation of rights in water, the irrigation system, and in irrigated land.

However, an agency can only hope to perform these functions if at the same time it succeeds in developing and/or recognizing existing local capacity for water management. Cernea (1981), in a plea to operationalize verbal commitments on the part of international donor agencies to strengthening local organization in development projects, points to two common fallacies. The first is the perception of grass-roots, production-oriented organizations as traditional remnants and impediments to modernization. The second is the idealization of traditional organizations and cultural institutions coupled with an inattentiveness to the need for these forms to change as new demands are placed upon them.

However, as AID's Policy Paper on Local Organization (1984:9) notes, even "ineffectiveness in itself is not an argument against enlisting local organizations in development initiatives; they may in fact, be no more ineffective than alternative national organizations or ad hoc project units." To build effective local organizations for small-scale irrigation projects, it is necessary to identify existing institutions that will promote project goals and to help them to adapt to new tasks that they will have to perform. It is equally important to know when local

institutions and power structures constitute an obstacle to the achievement of project goals. Of ultimate concern, however, is that these goals are consistent with those of most, if not all, of those whose lives and livelihoods will be affected by the small-scale irrigation project.

NOTES

[1]Control is not necessarily equivalent to management. Water users may wish to delegate management responsibilities to a government agency, but it is likely that they will wish to exercise control over management decisions no matter who makes them.

[2]Informal and formal participation refer to the degree to which participation occurs within a context of explicitly defined organizational structures. Informal and formal organizations refer to the degree to which a local organization is incorporated into the state or other bureaucratic entity. Informality does not imply simplicity in either the case of participation or organization, but rather a certain flexibility that results from the absence of a written or explicit organizational charter and mandate.

[3]I use the term indigenous systems to refer to community or local irrigation systems that have been constructed and operated largely without government or donor agency assistance. I have deliberately avoided using the word "traditional" because it implies antiquity, the force of custom, and often technological backwardness or lack of sophistication. Indigenous systems may be new or old, customary or innovative. What is common to them is that they depend upon locally available cash, materials, labor, and engineering, construction, and management skills.

[4]March and Taqqu (1982) note that informal associations tend to operate through direct personal communication and interaction, that they have flatter hierarchies and more diffuse structures than formal associations, and that their asymmetries of authority or power tend to be masked by face-to-face relationships. Their legitimacy derives from the acquiescence of their constituency rather than from legal recognition. These characteristics lend to informal associations a flexibility in leadership, membership, and purpose that March and Taqqu see as the chief reason for their utility for development planners.

[5]Hunt and Hunt (1974:134) define embeddedness as a condition in which "the roles directly connected with irrigation are usually combined in a person(s) who controls a number of other powerful roles integral to other parts of the economic and political institutions."

[6]Relative water scarcity refers not to climatic conditions, but to the relationship between supply and demand for water. Demand will depend upon soils, crop needs, and the number and needs of water users dependent upon a single source. The basis for determining relative scarcity would be the use of the relative water supply ratio:

$$\frac{PPT + Q}{ET + SP} = RWS = \frac{1}{EFF}$$

where PPT = precipitation, Q = irrigation deliveries, ET = evapotranspiration, SP = seepage and percolation, and EFF = efficiency (Svendsen, 1983:4). Where this ratio is less than 1, a condition of relative water scarcity exists. The lower the ratio, the greater the need for water management until a point is reached where increased management has an insignificant impact on agricultural production.

[7]Periods of peak demand do not always coincide with periods of lowest moisture. Downing (1974) argues that shifts to more intensive forms of water management in Díaz Ordaz (Oaxaca) is coincident both with the part of the maize life cycle when water needs are most critical (moisture-sensitive period) and a period of low or decreasing rainfall. Similarly, Ssennyonga (1983: 105) notes that in the indigenous furrow systems of the Kerio Valley, Kenya, the system of rotation established at monthly meetings "is relaxed when the demand for water is very low, i.e., during the peak of the rainy season and during the dry season since most users grow only one crop annually."

[8]Cornick (1983:148) cites the following rule of thumb for Agua del Pueblo distribution: "El más bravo lleva, allí se acaba." The strongest takes the water; there it runs out.

[9]Goldring (1983b) notes the frequent removal of small steel turnout gates for use as comales or tortilla griddles.

[10]For comprehensive discussions of traditional Javanese systems, the role of the ulu-ulu, and the incorporation of traditional irrigation roles into the Dharma Tirta systems, see Deuwel (1976, 1981, 1983a, 1983b).

[11]Chambers (1981:4) lists the following negative points on equity:

1. no landless family has acquired any water rights (although "in concept" this is possible).

2. a family with less than one-half acre per member in practice receives less water per member than one with one-half acre or more per member.

3. some poor families may find it difficult to raise the cash. However, I was told that all who wanted to were usually able to subscribe.

4. the poorer families may be those least willing to take risks, and therefore most cautious about subscribing. They may hedge their bets by making only a modest contribution, thus losing a major future benefit.

5. the question can be asked whether less poor farmers lend money to those who are poorer in order to gain their water rights. I did not come across any hint of this, but would not expect to on such a visit.

6. the range of acreage-equivalent water rights does vary quite widely.

[12]The Program 13 small-scale project in the community of Ccotos (Puno), Peru is an interesting example of the latter. Here lands belonging to members of neighboring communities are interspersed with comuneors' parcels. Although these outside landowners do not participate in decision making, they do contribute labor for canal construction.

[13]Annual canal cleaning is timed to coincide with dry weather and a slack period in the agricultural calendar.

[14]According to Mitchell (1976:37) "the irrigation festival is the most conservative fiesta in Quinua, Ayacucho, Peru., as it probably is elsewhere in the Sierra." It does not involve the parish church or priest. Mitchell suggests that its conservatism is maintained through the institutionalized punishment of officials who neglect part of their traditional role in the ritual. Isbell (1978:165) interprets a similar irrigation ritual in Chuschi, also in Ayacucho department, as a codification of "the critical information for successful agricultural exploitation of the vertical Andean environment into emotionally charged synthetic rituals."

[15]In the case of Quinua, this unequal distribution of labor requirements may be offset by the fact that downstream water requirements are higher due to lower rainfall and cloud cover. Also, higher value crops are grown at lower elevations, so the value of water is greater to the downsteam user.

[16]It cannot be assumed, however, that even in communities with traditions of communal labor obligations, that participation in irrigation activities will be equitable or based on general community consensus. Mallon (1983) shows a process of commodification of communal labor occurring in the Central Andes. During the 1920s and 1930s, community members who migrated on a long-term basis tended to translate their labor obligations into cash payments to the community. At the same time, highly productive communal lands were alienated, payments for use of remaining communal lands introduced, and communal labor used in public works projects designed to benefit wealthier community members disproportionately or to directly benefit commercial enterprises in return for a reciprocal service to the community. She writes,

> . . . the public works projects of the thirties did not turn out to be the cheerful and progressive collective enterprises that district officials wished them to be. A partial explanation is simply that the household's relationship to the community had always been double edged: peasants usually weighed the costs of furnishing free labor time to the community against the benefits accruing from community membership (p.295).

The lesson here is that a communal labor contribution to an irrigation system is likely to be perceived as onerous if the benefits of irrigation accrue only to a wealthier subset of the community. This appears to be the case in some of the Plan MERIS subproject regions. It would be useful to examine patterns of labor mobilization and participation in system O&M to test whether or not a tradition of communal labor will be sufficient in itself to bring forth community contributions to irrigation systems.

[17] In this case, water was to be drawn from Lake Titicaca and did not constitute a limiting factor.

[18] These biases include the "tarmac bias" or the tendancy of professionals to work in urban areas and to confine their travels to areas adjacent to good roads; the likelihood that informants will be drawn from local elites; the invisibility of the poor, the infirm, and women in project areas; and, finally, the increased likelihood that a development team will be in a project area during the dry season.

[19] Coward (1985:13) suggests that the baseline study look at the pattern of hydraulic property rights in the project area and consider how these rights "reflect a pattern of prior investment," and that property analysis become an integral part of project planning.

[20] Young (1984) suggests the use of informant interviews to gather community-level data. This may prove a useful tool for rapid assessment. A major methodological problem with this approach is the identification of a small number of informants in a given community who represent a broad spectrum of interests.

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