Locally-Managed Irrigation Systems: Suggestions for Management Transfer

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IRRIGATION DEVELOPMENT

FOOD PRODUCTION CAPACITY worldwide has increased dramatically since the introduction of management responsive crop varieties. Irrigation is possibly the most important management input making this possible. Irrigation not only allows land with low productivity under rainfed conditions to produce at much higher levels, but also enables a sequence of two or even three crops a year to be grown in the same field in suitable climates. Construction of irrigation works in many countries has been a major infrastructure development enterprise since the 1950s.

Generally, construction of new irrigation works is the responsibility of a government agency. This facilitates central planning and financing, especially when foreign donors are involved. It simplifies contracting for construction and it also makes appropriation of land and water rights easier in some cases. While centralized planning and control of the process for creating new irrigation works is efficient, centralized management of operation and maintenance of the completed works has not always achieved the desired results.

The economic internal rate of return computed during planning and design of new irrigation works has often not been achieved. Farmers frequently refuse to pay sufficient water use fees to cover operation and maintenance expenses and seldom contribute much toward the cost of the capital investment. Since the better sites are already developed, new irrigation systems constructed in the future will have even greater difficulty achieving viable returns on investment. The current assessment in some countries, particularly in Asia, is that the most economical advancement in irrigated agriculture can be achieved by improving the performance of existing systems rather than by building new ones (Kikuchi 1992).

Transferring management responsibility to the local level is viewed as a solution to the problems of low productivity, the inability to pay for operation and maintenance or recovering the capital investment. Locally-managed systems have been studied for the last several decades to try and understand the characteristics that irrigators find important for effective irrigation delivery and how these might be incorporated into agency-built and managed systems. Those embarking on a program for transferring management of agency-built and operated systems to users need to understand the impact the evolution process has had on these characteristics. This will assist in identifying ways to reproduce the desirable characteristics.

LOCALLY MANAGED IRRIGATION

Throughout history there has been a parallel investment in irrigation development to that of the centralized state. Individual cultivators and groups of farmers, often sponsored by local rulers or large landlords, also constructed irrigation systems. Some of these systems date back hundreds of years and have well-established institutions for managing operation and maintenance. Though these systems are generally small in size, their vast number collectively makes them a significant factor in agricultural production in many countries. Numerous case studies over the past fifteen years have documented the achievements of locally managed systems. Effective irrigation delivery through intensive management with few demands for government assistance has established some locally managed systems as the model for agency systems.

Possibly the most important feature distinguishing locally managed systems from those managed by agencies is what Hunt (1989) calls the "charter of authority." The charter of authority refers to the source of legitimacy for the authority to govern the system. The person or group that holds the charter of authority has ultimate control in shaping the way the system operates. Holders of the charter of authority create or confirm the institutions that shape the system.

In many locally managed systems the farmers hold the charter of authority and manage the irrigation enterprise. Martin et al. (1986) used the term "farmer-managed" for systems where cultivators governed the irrigation enterprise including control of access to water from a natural source. Some systems have many, but not all of the characteristics of farmer-managed systems. Irrigation districts in the western United States, for example, include all land that could potentially be irrigated in their tax base, in some cases even land occupied by municipalities. This gives non-irrigating property owners the right to participate in the management of the irrigation districts. Lansing (1987) determined that the priests in the temple system play an important role in managing irrigation in Subaks of several watersheds in Bali,

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Indonesia. Local government is technically in control of small irrigation systems in Java. Though many local officials are farmers, some operate other businesses. The term locally managed irrigation system is used in this paper to encompass all farmer-managed and other systems where the charter of authority is with the local community.

Locally managed systems have several attractive features. The most obvious is that in many countries they have drawn on few public resources for their creation and to a large extent are self-supporting in their continued operation. There is also evidence that some locally managed systems achieve higher production than agency managed systems in the same environment (Pradhan 1994). In a locally managed system the leaders come from the local area, do much of their business there, and intend to stay there. The leadership is committed, in one way or another, to the local scene and the outcome of the irrigation enterprise. Organization in these systems comes about in the broadest sense to coordinate the flow of resources necessary to accomplish irrigation delivery in a way that could not be done individually. Coordination is necessary because of the complexity and interrelatedness of the many tasks that must be performed.

CHARACTERISTICS OF SUCCESSFUL LOCALLY MANAGED SYSTEMS

The irrigator's goal is to have timely access to his share of the irrigation supply and to accomplish uniform water application to his or her fields. Acquiring water from a source, allocating the supply among eligible users, and then physically moving the water from the system intake to the field outlets are supporting tasks that make field application possible. When more than a few irrigators share the same source their activities must be coordinated and disciplined.

The successful operation of most locally managed systems has been the result of a systematic, unified effort of many persons. This has required them to organize and define roles for leaders, appoint leaders, make decisions, keep accounts and records, devise methods of communication, and monitor the results of each other's activities. The inevitable conflicts must be managed and appropriate discipline applied when free riding or shirking (using water without taking responsibility for costs) has taken place. Performance, while perhaps far from optimum, has been adequate to sustain, and in many cases even improve, irrigation delivery in many thousands of locally managed systems around the world.

Because locally managed systems evolved with their focus on the irrigator's goal of water delivery to the crop, the systems represent tremendous diversity in how they are organized and in the rules they apply to accomplish their tasks. The irrigators craft their institutions by trial and error to achieve successful operation and maintenance. In general, locally managed systems have well-defined membership and specialized roles and they practice decentralized, representative decision making.

Management Skills Developed during Construction

The construction and evolution of locally managed irrigation systems has almost universally been dependent on the skills, knowledge, and labor of the group of prospective irrigators. This has had an important consequence. The construction and improvement activities give the group a valuable exercise for building the institutions necessary for successful management of operation and maintenance. The enthusiasm that is generated for planning and implementing construction helps the group overcome differences. Differences are often settled in mass meetings where discussion is open to all and compromise is agreed upon, understood, and acceptedIn the process of meeting to discuss and plan the construction, irrigators also define the structure of their organization, learn to make decisions as a group, define roles, handle conflicts, and establish procedures for keeping records. Leaders who demonstrate that they are capable and trustworthy during construction are often assigned leadership positions for managing operation and maintenance of the completed system. Possibly most important, rules are developed for mobilizing contributions from members. Achieving reasonable equity in dividing the benefits of the system among all who share responsibility for operation and maintenance is the key element to success in continuing to mobilize labor and other resources for maintenance.

Clearly Defined Irrigation Allocation Rules

Irrigation allocation and irrigation distribution are two tasks sometimes undertaken almost simultaneously. Irrigation allocation refers to the "within system" water rights. Those are the rules that govern how each member of the system gains entitlement to use the irrigation supply and how the supply is to be apportioned in time and space among the members. Irrigation distribution is referred to as the method and means of physically delivering the irrigation supply, i.e., by continuous distribution or by timed rotation, or through pipes and sprinklers, etc. The allocation rules determine the duration of application or quantity of water to be delivered to each irrigator. The objective of irrigation management is to deliver irrigation according to the allocation rules.

In some cases, the allocation rules include definition of the irrigation system boundaries--which fields or which individuals have access to the irrigation supply--in effect identifying within-system water rights (Coward 1990). In many cases the rules determine the geographical and temporal distribution of the water. The rules may simply define the order for moving the irrigation supply among distributory canals and irrigators. In some systems the rules include explicit quantification of the withdrawal allowed from the main canal by a branch canal or by an individual irrigator from the branch canal. The quantification may be volumetric or, as is more often the case in locally-built systems, a percentage of the total discharge determined at some designated location according to some specified basis. The bases used for allocating the irrigation supply are also diverse.

Land area is a common basis for allocating the irrigation supply. Often, the rule is to share the available water supply equally over the entire culturable command area (CCA). In such a case, each irrigator is entitled to receive the fraction of the irrigation supply that is represented by his or her landholding to that of the entire CCA. In some cases, these rules are modified to accommodate differences in soils. Sometimes, the allocation rules are based on the investment made in constructing the system. In such cases, irrigators are entitled to a fraction of the irrigation supply that is proportional to their investment in the system.

Most locally managed irrigation systems have carefully established the irrigation allocation rules so that the rules determine and control access to the irrigation resource. Almost universally in locally managed systems, the entire group of irrigators or their representatives must meet to plan and approve changes in the rules themselves and to decide which rules should be applied to the current water supply and demand situation. In agency-managed irrigation systems the agencies sometimes has authority to modify the irrigation allocation based on water supply conditions without consulting the irrigators. In effect, they simultaneously change the allocation rules and irrigation delivery practice causing uncertainty for the irrigators.

In many locally managed systems all irrigators know exactly how much of the irrigation supply they are entitled to receive and precisely when it is to be delivered. When water is in critical demand relative to supply they monitor actual irrigation delivery and compare it to their entitlement to decide if the system, and by implication its manager, is performing as expected or if they need to initiate action to bring change. Support for system managers and the irrigators' willingness to provide maintenance labor and pay fees that are assessed are directly related to the irrigators' perception of fairness in irrigation delivery relative to the irrigation allocation.

Highly Variable Water Distribution Practices

The irrigation distribution activity involves moving the controlled irrigation supply acquired from a concentrated source and spreading it over the system's command area according to the agreed upon allocation plan. From its origin in a river or reservoir the flow is divided into smaller streams until the rate of discharge is appropriate for field application. Numerous methods have been devised by irrigators in locally managed systems to accomplish this task. Operation of the distribution system shifts from one mode to another depending on the season and crop being irrigated or even within a season if the available irrigation demand and supply characteristics change. An important benefit of local management is the ability to respond quickly to changes in either the irrigation supply or demand by carrying out maintenance to improve the irrigation supply or modifying distribution procedures to better accommodate the existing situation.

While the design and layout of hydraulic structures in the irrigation system are important determinants of methods and limitations in delivering the irrigation supply according to predetermined plans and rules, success or failure is generally determined by the level of management skill and discipline under which the system operates. In locally managed irrigation systems the irrigators are frequently able to overcome limitations of deficient physical infrastructure by investing in more intensive management.

If the irrigators are satisfied that the irrigation supply is sufficient for all their fields they may construct few, if any, permanent structures and instead use rocks and earth to divide and direct the flow. This informal distribution is preferred because it offers maximum flexibility. A farmer with sandy soils or fields located where canal losses are high can generally take extra water without receiving complaints from other farmers. When more control is necessary and structures are installed, the system becomes more rigid providing little opportunity for taking extra water without infringing on other's rights. In systems without distribution structures, monitoring of irrigation delivery is generally accomplished by each farmer determining if his own fields are receiving adequate irrigation. After structures such as proportional dividers are installed, the delivery system must also be monitored to ensure that the irrigation supply is divided correctly and unauthorized tampering with the delivery is controlled.

When the irrigation supply is not sufficient for simultaneous distribution to all fields, the entire supply is directed to one or more segments of the system while the others wait their turn. This rotational distribution can be done among farmers at the lower level of the system or the rotation can be among branch canals leading from the main canal. By

timing the delivery and assuming a constant supply for the period, the irrigation distribution can be matched to each irrigator's allocated entitlement.

While locally managed systems are not successful in eliminating conflict, they manage conflict by establishing rules that provide flexibility and equity in operation. During the irrigation season distribution procedures are changed in response to changes in the irrigation supply and crop needs. While the preference is to deliver water continuously in response to requests, when the demand is greater than the supply distribution procedures are modified, sometimes on a daily basis, to better match the irrigation allocation. Many factors, from loss in filling a dry canal to inconvenience of irrigating during the night are considered while changing procedures.

Often, in agency managed systems irrigation allocation and distribution are used synonymously to refer to irrigation delivery. Emphasis is placed on the action of moving the water without evaluating the underlying rules that regulate distribution. It is sometimes thought that the power of a central authority is necessary to enforce efficient irrigation delivery. However, when irrigators do not support the decision made by agency staff due to lack of communication or for other reasons, there is seldom enough staff available to enforce the rules. As a result, system performance suffers. In many locally managed systems both the allocation rules and the distribution procedures are explicit and understood by all irrigators. They participate in deciding when and what changes are necessary in the distribution procedures and they accept the consequences of not complying with the rules in effect.

Ability to Mobilize Resources

An outstanding characteristic of successful locally managed systems is the ability to contribute labor and other essential resources to keep systems maintained and operating. The emphasis is on making structures functional and durable but at the lowest cost possible. Coward and Martin (1986) reported that the values of resources mobilized in a number of locally managed systems in Nepal, the Philippines, and India (Tamil Nadu) were all substantially higher than the fees collected from farmers in most irrigation systems managed by government irrigation agencies in the same countries.

Labor is the primary resource contributed by irrigators in most systems. Paying cash in lieu of labor is generally an option. Cash, assessed on the same basis as irrigation allocation, is raised to purchase non-local supplies like cement, wire, and pipe. Stones and forest products acquired locally are used for maintaining diversions and for building conveyance and control structures. Bullock carts or other equipment are requisitioned for hauling materials in some systems. Finally, local expertise and knowledge are a vital resource in successful construction and maintenance.

Organizational Structure Tailored to Needs

The Purpose for Organizing

It is often expected that the organization to manage a system with a scarce water supply will be more structured than that of systems in which the water supply was relatively abundant. This is true of farmer organizations within large irrigation systems which are jointly managed by an irrigation agency and farmer organizations. When the agency carries out all activities, including maintenance, required to deliver water to a certain level within the system, the only responsibility left for the farmers' water-user organization is to maintain the lower level canals and distribute water among the fields. In such cases the irrigation distribution is the most important activity and will likely dominate the structure of the organization.

In locally managed surface systems diverting water from streams, activities other than irrigation distribution often determine the organizational structure. Mobilization of labor for maintenance is a dominant activity in hill systems in Nepal and the task with the most influence on the organization in that environment (Martin and Yoder 1988). Systems where large amounts of labor are mobilized to maintain the headworks and main canal, which capture and convey water to the command area, have more highly structured and formal organization than systems where less labor is mobilized. This is true irrespective of the amount of irrigation supply available. Where floods destroy the diversion in the rainy season and landslides on unstable hill slopes disrupt irrigation delivery, organization to maintain the system for water acquisition--getting the water to the command area--is more important than distribution of the irrigation supply among users. However, strong organization for irrigation acquisition also has a positive influence on distribution.

If members of an irrigation organization are required to invest a significant amount of labor, and sometimes cash, in order to acquire irrigation, they want to be certain that others who receive water contribute their share as well. Hence, organizations that mobilize a large amount of resources tend to keep written attendance records, to enforce sanctions for missing work, and to audit accounts. The organizations' rules and minutes of meetings tend to focus on the issues surrounding the mobilization of resources, e.g., how much labor and cash members must contribute, the fines for not attending work, and circumstances under which one is excused from work. The main functions of the elected officers

are to organize and supervise the maintenance work on the system, keep accurate records of members' contributions, and enforce sanctions for failure to contribute as required.

There is a relationship between the need to mobilize resources to acquire water and the effectiveness of distribution of the water. When extensive labor and cash are required for maintenance, all irrigators must contribute or the system will fall into disrepair. Farmers in advantageous locations cannot take all the water and deny the less advantaged farmers their share or those discriminated against will refuse to contribute to maintenance. This interdependence among the farmers in systems requiring a high level of resource mobilization is a key factor affecting the equitable and efficient operation of the system. Where few resources are needed to keep the irrigation supply flowing, the farmers at the head-end can do the work by themselves and are less concerned with keeping the tail-end farmers satisfied.

Effective organization is more difficult to maintain in a system where irrigation distribution rather than water acquisition is the primary activity. All farmers in a system face the same incentives for water acquisition but not for distribution. When water is scarce the farmers at the head-end have an incentive to break the rules and take more than their allotted share. However, if they are dependent on the tail-end farmers for assistance with irrigation acquisition, it is easier for the organization to enforce equitable irrigation distribution.

Levels of Organization

Different levels of irrigation operation are established at points in a canal where water is divided into smaller branches. The lowest operational level is established when a canal serves fields. The main canal level conveys the irrigation supply from the source. If fields are irrigated directly from the main canal the system is operating at a single level. Small, farmer-built systems sometimes have only a single level. Most systems, however, have two or more levels. Frequently, there are levels of decision making, resource mobilization, communication, and conflict management that constitute organizational levels parallel to the operational levels of the system.

Decision Making

Irrigators in locally managed systems find it important to provide all members with an opportunity to meet regularly to discuss problems, approve plans, and determine policies. This allows sharing of information and makes it easier to hold leaders accountable. However, it is difficult for a large body to exercise responsibility. Having committees in addition to an assembly combines the strengths and compensates for the weaknesses of each mode of decision making.

Uphoff (1986), in discussing membership and decision making in irrigation organizations, observed that the structure of decision making and the way members become involved in it are important design features. Studies of local rural organizations not involved in irrigation suggest that the best structure is one with an assembly of all members who meet periodically, supplemented by one or more committees, possibly an executive committee, which can exercise more direct and active leadership.

Accountability

Most employees and appointed officials of locally managed systems are also irrigators and long-term members of the community. There is social pressure for them to do their work honestly. Terms of officials are kept short, generally not more than one or two years, so that persons who do not perform well can be removed at the end of their normal term without being disgraced. In many systems, officials are reappointed many times if their work is satisfactory. Most systems can terminate officials immediately for fraudulent behavior. Local control over the appointment of officials makes it easy to hold them accountable for their actions.

Accounts and Records

Accounting is a tool used for monitoring transactions of cash, labor, skills, and materials--the resources most frequently mobilized. Accounts do not necessarily need to be written but they must be acceptable to those who have the authority for operating the system. Practices in locally managed systems range from not keeping any accounts to detailed written records requiring signatures that can be verified.

In systems with only a few members it is not necessary to keep written accounts. If shirking and free riding take place all members are generally aware of it and can take collective action. In larger systems, especially where considerable resources are used for maintenance each year, written accounts are kept. Labor attendance and financial accounts are the most common records kept. The accounts are typically checked by an audit committee appointed by the members and reports are given to the members at meetings. Keeping the records and accounts available for inspection by all members is an important characteristic that builds trust.

Communication

Successful irrigation operation requires that farmers have information about the current status of the irrigation supply and are informed about future prospects. Effective system management requires a two-way flow of information among the operational staff and also between the staff and irrigators. Communication is greatly simplified in locally managed systems because the staff are generally also irrigators. However, the investment made by locally managed irrigation systems in setting up channels of communication highlights the importance irrigators place on adequate flow of information.

The open atmosphere for sharing information in locally managed systems is essential for building a level of cooperation necessary for effective system operation and maintenance. Most meetings are open to all members, not only to receive input but also to facilitate communication. In larger systems and where members do not all live in proximity, persons are often hired as messengers to deliver instructions. The temporary nature of structures and often difficult terrain make many systems vulnerable to failure. Effective monitoring and rapid communication enable timely response to emergencies.

Conflict and Sanctions

Successful locally managed systems generally have rules to control shirking and free riding. If water is taken out of turn or from an illegal outlet, graduated sanctions are applied that take into account the extent and damage caused by the infraction. Verbal warnings at meetings called specifically to deal with an infraction and other forms of public disclosure put strong social pressure on members living in proximity to each other. The nature of the conflict determines options for managing it. Most conflicts among members are handled internally. However, it is not unusual for authorities from the local government to be asked to intervene in disputes among systems.

SUGGESTIONS FOR MANAGEMENT TRANSFER PROGRAMS

The desire to improve the performance of agency-built systems and the relative success of local management have prompted programs for transferring management from agencies to the local level. In some cases it is suggested that the agency operate and maintain the system similar to a rivercourse from which many locally managed systems acquire their irrigation supply. In others it is expected that the entire system become locally owned and managed. The following suggestions for management transfer programs are grounded in the lessons learned from the study of locally managed systems.

Use System Rehabilitation as Training for Management

Locally managed systems have built their institutions through a slow iterative process that has involved much trial and error. Outside agents, facilitators such as irrigation organizers, can assist this process and help reduce the errors. However, they cannot provide a blueprint that is likely to be adopted. Groups choose remarkably different rules and procedures to accomplish the same task even when they face the same local conditions. A self-governing group that is part of the process of developing its rules is more likely to have its members abide by them. The facilitator can stimulate group action and present alternatives but the irrigators must decide and adopt their own solutions.

Activities that require a group to grapple with making collective decisions and carrying out actions that require disciplined behavior are important in the process of institution building. Construction activities provide this experience and are ideal because they mirror many of the actions required for successful system maintenance. Command area development and other system rehabilitation activities should be built into a management transfer program. However, rather than completion of specific construction activities, *the primary goal must be to enable the irrigators to build their institutions*, i.e., the rules and procedures necessary to manage the construction and ultimately govern the system.

This requires a major shift in the focus of the irrigation agency from planning and implementing a construction activity to helping irrigators organize to do their own planning and construction. The role of agency engineers should be to support the planning process by presenting alternative designs. Instead of the agency hiring contractors to do the construction, the irrigators should be required to either do the work themselves or establish their own contract if technical expertise beyond their capacity is required. For management transfer to be effective the irrigators must become the primary actors in their system and the agency staff facilitators.

As in locally managed systems, planning and carrying out a construction activity will require that the irrigators find a way to make and implement decisions. They will need to identify and appoint or elect leaders. They will need to have meetings to discuss ideas and find solutions. In large systems where it is not practical for all irrigators to meet in a mass meeting they must devise methods for representative decision making. This may require a multiple level

organization based on the hydrologic layout of the command area. The irrigators will need to establish rules for mobilizing labor and keeping records that are acceptable to all, including the agency that is assisting them. They will need to find ways to enforce their rules by monitoring compliance and applying sanctions.

Irrigators will question what they will get in return for their active involvement in the management transfer. They can answer this question for themselves while crafting their irrigation allocation rules. The allocation rules will need to be acceptable both to the majority of irrigators and to the agency. To be acceptable they must be able to show how they will deal with changes in water demand and the uncertainty that will exist in the irrigation supply each season.

The process of using construction as a management training tool will be slow and difficult, requiring the correction of many mistakes. As the irrigators replace errant leadership and adjust their rules to achieve necessary control they will gain the type of experience that has enabled the success of locally managed systems.

In addition to providing management training, irrigators should be involved in all construction activities for other reasons as well. Based on their observation of local conditions over many seasons, they have ideas about the priority of improvements that need to be made. When irrigators contribute to the cost of improvements they help control unnecessary expenditure (WECS/IIMI 1990). Possibly most important, irrigator involvement in the construction activities is a property forming activity that enables them to claim "real ownership" rather than a "sense of ownership." Ownership is an important factor in fostering irrigator responsibility for operation and maintenance (Ambler 1992).

Be Prepared to Transfer the Charter of Authority

Though the number of examples of management transfer is growing, few detailed studies have been done to document the changes and illustrate the essential ingredients for success. The limited experience available suggests that escape from the social environment of the agency bureaucracy may not be easy. Tang (1992) argues that participation of farmers in bureaucratic irrigation systems will succeed only if both the organizational problems of the bureaucratic machinery and the structure of incentives facing irrigators are corrected.

Without giving the irrigators an important voice in all of the management affairs of the system it is unlikely that they will agree to taking major responsibility for managing even the lower segments. Modifying the charter of authority to give the irrigators full control of parts of the system and representation for decisions at all levels is one incentive that can be offered. However, the implications of modifying the charter of authority to give partial or full control to the irrigators are far reaching. Changes will be required in both policies and procedures. For example, collection and use of irrigation use fees may require changes in national policy and new legislation.

Irrigation-use fees are often proposed as the mechanism for funding operation and maintenance and for recovering the capital investment made by the government in constructing the system. Changing the charter of authority to give irrigators responsibility for system management requires modification in the way the water-use fees are handled. Otherwise the irrigators will have little incentive to become involved. While the capital repayment portion of fees should go to the government, fees collected for operation and maintenance should be held locally and under the control of the irrigators. These funds should be used to pay the actual expenses incurred for operation and maintenance of the system, including the cost of involved agency staff.

An important factor in successfully transferring the charter of authority to the irrigators will be an increase in the information available. For example, the financial accounting for the system, including accounts for the collection and expenditure of the water use fees, will need to be open for public inspection with periodic full reports to the irrigators.

Modify Design of Structures for Easy Monitoring

Universally, irrigators in locally managed systems have devised ways to monitor the irrigation delivery for comparison to the allocation. Designing for a great deal of flexibility to allow high efficiency in irrigation delivery may be counterproductive. There is danger that flexibility will overwhelm the ability to monitor and will create conflicts that reduce rather than increase effectiveness and efficiency in irrigation delivery. In a management transfer project it can be expected that irrigators will request redesign and remodeling of structures to allow accurate monitoring that is easily understood.

It will be an engineering challenge to find ways to accommodate such requests if structures were originally designed for variable flow delivery. In locally managed systems irrigators have shown preference for using proportional dividing structures. They avoid underflow gates as a means of adjusting flows because they have no method of calibrating them. Where gates are necessary they should be designed to operate either fully open or closed to give on or off conditions.

Locally managed systems have demonstrated that they have the ability to implement complex rules sequentially to match changing conditions within a cropping season. Management transfer programs do not need to emphasize simplicity. However, allocation rules must be widely agreed to--therefore, known to all irrigators--and all possible effort

must be made to ensure irrigation delivery according to the rules. Locally managed systems are successful under difficult conditions when results follow directly from the irrigators actions, i.e., when cause and effect are clear and easy to understand. As stated by Levine and Coward (1989), "... decisions should be based upon the **probabilities** of effective implementation, not on **possibilities**. Modern irrigation experience has more than its share of systems designed on the basis of possibilities that were not realized."

Arrange Visits to Locally Managed Systems

One way to tap into the accumulated experience of locally managed systems is to take irrigators from management transfer projects to visit these systems. Such farmer-to-farmer training visits expose irrigators to the issues other groups have dealt with and the solutions they have found useful (Pradhan and Yoder 1989).

Farmer-to-farmer training visits have proven beneficial in initiating changes in organization and operational rules. Groups of farmers from a system receiving improvements were taken on a tour of a series of locally managed irrigation systems. Farmers from the systems being visited were proud to show visitors their system and explain how it is operated and maintained. A facilitator leading the tour interjected questions when necessary to encourage a dialogue that identified the rules in use for all activities from attending meetings to sanctions for stealing water.

By visiting a number of irrigation systems that are using different approaches to overcome problems similar to those faced by the visitors in their own system, discussion can be stimulated about available options. Farmers exchanging information with other farmers is an effective training mode because of their similar backgrounds and interests. The necessary level of trust can be reached quickly and extended discussions take place that reveal weaknesses, as well as strengths, of the organizations visited.

In addition to exposing irrigators to an array of options for the multitude of tasks they will need to perform for successful management, farmer-to-farmer visits also provide encouragement for change. Locally managed systems often have inferior irrigation works with few permanent structures and unlined canals. However, their ability to show the impact of good system management on production and cropping intensity are a clear demonstration of the benefits that irrigators are striving to achieve and of the increased food production that the government wants to promote.

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