

ORGANIZATIONAL REQUISITES OF SUCCESSFUL IRRIGATION SYSTEM REHABILITATION: CASES FROM NEPAL

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ABSTRACT

This paper describes two irrigation systems in Nepal that have undergone rehabilitation – Sirsia-Dudhaura and Bangeri. The experience of farmer-irrigators and their interaction with authorities of the Department of Irrigation is compared and analyzed according to criteria drawn from the literature of common property resource and collective goods theory. The analysis specifies organizational attributes hypothesized to make for successful and sustainable irrigation system rehabilitation, compares the two cases with regard to them, and notes implications. Bangeri is found to have much greater success with its rehabilitation than Sursia-Dudhaura, and the Bangeri irrigation community also possesses the organizational attributes advanced as important to effective local organization whereas Sursia-Dudhaura does not. The operation of local organizations are a most critical part of any canal rehabilitation.

INTRODUCTION

What kind of local organizations effectively mobilize local people--their knowledge, material resources, and loyalty--and empower them to sponsor and sustain rehabilitated irrigation works as partners with central state irrigation bureaucracies? What kind of organizations provide vehicles for meaningful participation in irrigation development, and also constitute viable links between central government ministries and local social-ecological niches in the countryside? What attributes do effective local irrigation organizations have that distinguish them from organizations which can be expected to fail in these respects?

It is the purpose of this paper to address these questions employing lessons learned from the study of local irrigation organizations (Freeman, 1989); most specifically, the ideas will be illustrated by materials drawn from a comparison of

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two irrigation systems in Nepal².

THEORY

Importance of Local Organization

A tradition of inquiry has emerged (Bromley, 1992; Cernea, 1985; Freeman, 1989; Korten and Alfonso, 1983; Lam, 1998; Montgomery, 1974; Ostrom, 1990; Ostrom, Gardener, and Walker, 1994; and Tang, 1992), representatives of which have contended that local quasi-public non-governmental organizations are essential to any vision of productive, equitable, socially and ecologically sustainable democratic development. This is so because properly-designed and managed local organizations:

1. Are uniquely able to administer centrally supplied resources (e.g., money, canal water, etc.) to specific needs in particular socio-ecological niches.
2. Unite the general knowledge of central tendencies across large administrative units, commanded by occupants of central ministries, with the local knowledge of site-specific particulars that associates with local citizens.
3. Provide a form of social organization that insures that, in some "fair share" way, all prospective beneficiaries contribute to provide the collective good or common property resource, that each contribution be matched by a "fair share" contribution from each other member, and that, in return, members in good standing receive a "fair share" portion of the benefit stream(s). Attributes of public goods and common property resources have been discussed in a well developed literature (Olson, 1965; Mueller, 1979; Frohock, 1989; Ostrom, 1990: 29-55)³. Social organizations defeat "free riding" and make possible the provision

²This paper draws heavily for its case material from my report to His Majesties' Government of Nepal (Freeman, 1992).

³The terms, "collective good" and "common property resource" represent closely related, but distinguishable, concepts. Whereas a private good produces benefits which can be captured by the investor-owner, a public or collective good is one which an investor cannot capture any greater share of the benefit than can a non-investor (non-excludability), and consumption of some portion of the benefit does not reduce the portion available for another party (non-rivalness of consumption). Examples would include street-lighting, flood control projects, national defense, smoke abatement in an airshed. A common property resource is taken to be one in which the criterion of excludability is fulfilled for some easily

and operation of a canal network.

4. Provide viable arenas for meaningful citizen democratic participation. Citizens practice democracy as members, leaders, and employees of appropriately designed local organizations, implementing public and quasi-public organizational business in ways responsive to agendas of state ministries and local citizen-members.

To examine the argument more closely, the discussion now turns to the world of irrigated agriculture.

Organizing For Water Control

Irrigation water, to be productive, must be controlled. It must arrive at the crop root-zone in the proper amount and at the required time to fulfill crop consumptive needs and soil leaching requirements. Water coming too soon, too late, too much, or too little relative to crop and soil requirements is of low, or even negative, value. Irrigation water control, in turn, is dependent upon the quality of irrigation organization (Freeman, 1989). If water gets to the plant root zone at the proper time, and in the proper amount, it is because people have organized collectively to perform tasks beyond the capacity of individuals, and beyond the scope of private consumer markets. Individuals can enter marketplaces to buy private goods such as seeds, fertilizers, and farm implements, but no farmer anywhere in the world can order up a quantity of water control in the local shop, place it in a cart, and take it back to the farm. Water control is provided only by effective farmer organization linked to upstream central supply bureaucracies and downstream member irrigators who represent water demand.

Characteristics of Effective Local Water Organizations

What are the characteristics which define effective local water user organizations (WUO's) which make it possible for citizen-members to democratically and equitably provide water control for agricultural productivity? Researchers have been investigating the question of what constitutes WUO effectiveness in many cultures for years, and debates about issues continue (cf. Maass and Anderson, 1986; Freeman, 1989; Lam, 1998; Ostrom, 1990; Ostrom, Schroeder, and Wynne, 1993, Tang, 1992). On the basis of literature review and empirical field research

defined "outsiders" but is not fulfilled for "insiders" in a resource consuming community. Furthermore, there is considerable rivalness of consumption--i.e., water applied to the field of farmer X, is not available to farmer Y. Yet, in common property resources there must be joint action to provide, and divide, the resource if the resource stream is to be sustained (See Ostrom, 1990: 30-33).

(Freeman, 1989: 24-59), I assert that a few variables are strategic--i.e., small changes in them may have large consequences in effectiveness of local organization. The strategic variables and their relationships are depicted in Figure 1 and are synthesized as follows:

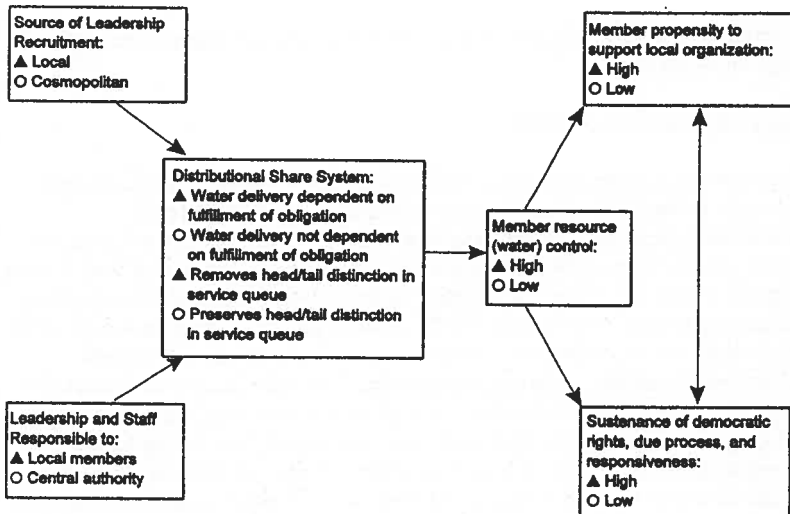


Figure 1. Strategic Variables in Organizational Analysis

1. What kind of people will lead the local WUO by virtue of their election/appointment to membership on the governing board, council, or irrigation committee, and what kind of people must be hired by that representative body of the irrigators to do the daily staff work of the organization? The answer is clear and has two aspects:

a. It is important (Freeman, 1989:26-27) that members of the local organizational board be local citizen-irrigators who are elected in democratic ways representing various reaches of the local canal system. The rejected option is to fill leadership and staff positions with "cosmopolitans" who are employed on national or regional labor markets far exceeding the scope of the local community, placed on the payrolls of central ministries, and who are appointed by higher

authority to the local organization for specified periods of time--usually in two or four year rotations.

b. Leaders and staff must be fully accountable to the local organization member-irrigators as distinguished from looking upward to the central bureaucracy for definitions of success and failure. This is so because central bureaucracy staff, however well trained in various disciplines relevant to irrigation and however well intentioned, will virtually never develop: 1) the required site-specific local knowledge to operate the share system effectively; 2) the local social capital necessary to deal with the innumerable local conflicts and problems that must be dealt with by irrigators who spend their lifetime in the local community. The educated cosmopolitan outsider who serves in district, provincial, or national offices has an important role to play, but that role is not on the irrigation committee or staff of the local WUO. WUO's must provide a protected social space where farmers in possession of detailed local knowledge can administer their water share distributional systems, knowing they will bear the consequences of their decisions in terms of both cost and benefit.

2. At the very heart of any effective WA is a functioning water share distribution system (Freeman, 1989:27-33) (See Figures 1 and 2). For farmers in successful water cultures around the world, the idea of a water share organizational agreement is two sided: a share confers upon each member of the irrigation community a legitimate access to water within the arranged rules and tools; and it confers an obligation to contribute an agreed upon "fair share" of the costs of managing water in the system. The concept of a water share distribution system unites two essential aspects of organizational operations - resource

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- I. Distributional Shares Involve:
- A. A right to a proportion of benefit — e.g. water
 - B. An assessment obligation to pay costs of organizational provision of the benefit.
- II. Share/Benefit Share/Cost
- | | |
|----------|----------|
| 1/100 | 1/100 |
| 1/300 | 1/300 |
| 1/1000 | 1/1000 |
| 1/10,000 | 1/10,000 |
- III. Members vote their shares in conduct of organizational business.
- A. Member X – owns 9 shares out of 100; votes 9 shares.
 - B. Member Y – owns 7 shares out of 100; votes 7 shares.
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Figure 2. Concept of Distributional Share

acquisition for operations and maintenance and water allocation along the canals; and delivery of a stream of organizational benefits such as water under control. The specifics of water share arrangements may vary considerably from locale to locale (Freeman, 1989: 27-28), but three considerations are always important in successful WUO's:

- a. Does getting the water service to the field depend directly upon the irrigator paying his/her share of the local system management cost, or is water delivery divorced from fulfillment of the irrigator's cost obligations? Where payment and dividend are tightly connected, it is possible for farmers to successfully organize. Where payment and delivery of the benefit are divorced, farmers will not pay, local resources will not be mobilized, management will suffer, and water control will be diminished to unacceptable levels for many organizational members.
 - b. Are water volumes received roughly proportionate to shares of system costs paid? This is essential to equity. Farmers will not be willing to give loyalty to systems, and be supportive of democratic procedures, where at least rough equity is not served--i.e. where members receive benefit streams disproportionate to their investment in the organization.
 - c. Does the quality and quantity of organizational service depend on position in the membership queue? As irrigation water flows from head to tail positions, irrigators farther downstream are more vulnerable to water losses due to leaks, seepage, evaporation, non-routine breakdowns, and the self interested manipulations of upstream irrigators. Head-tail issues become divisive if the share system allows inequitable advantage for head irrigators, since head irrigators are uninterested in investing their resources on behalf of those less well located. However, it is possible to organize the head-tail distinction out of the irrigation community by creating an interest common to all users. This can be achieved by measuring water volume delivered to the field gate. If water is distributed by volume, "head" farmers will feel the pinch of poorly performing canals (which take longer to deliver to the tails) because heads cannot obtain their next delivery until tails are served. Thus all farmers become interested in reducing the loss or "shrink" of poorly performing canals. By organizing the flow of benefits and losses so that all members, regardless of position in the dividend queue, will share equally in the system, an organizational life of much higher quality is achieved that provides a basis for general membership loyalty and active democratic participation.
3. What do irrigators do when they organize? They collectively organize a board or council which employs staff to operate and maintain the water share distribution system. Operation and management means exactly this. If members do not have a workable share system, they may constitute a pressure group to

obtain funds from a higher agency but they cannot be an irrigation organization because they then have no appropriate rules and tools for controlling and dividing water. What does the irrigation board or council discuss? It discusses the share system and how to keep it implemented in day-to-day operations. What is maintenance all about? It is about how to do what must be done to keep the share system operative. Maintenance activity, divorced from a viable share system, has no justification. Maintenance of facilities is hard work, costs money, and is of no intrinsic interest to citizen-farmers unless a viable share system assures a payoff--in this case, water under acceptable control. How about conflict resolution and management? Conflicts emerge out of problems with the share system and are resolved by getting the share system to work on behalf of the farmers. Conflicts among irrigators can only be resolved in terms of rewarding those who support the share system, punishing those who violate it (by local leadership/membership denying the offender her-his share of the benefit stream), or possibly reforming share system defects so that it no longer generates grievances.

In summary, heart of a water users' organization is its share distribution system, and all important organizational activities center upon it. Small changes in the water share distributional system have big consequences for irrigation water control, productivity, and equity, and willingness to democratically participate. When water is effectively controlled through a viable share system, it makes for effective organizations which earn the support of members, and in turn makes possible participation in a civic democratic community.

Viewed in this light, one now sees how effective WUO's become the centerpiece of disciplined and productive farmer participation, democratization, accountability, productivity, and social equity.

CASES

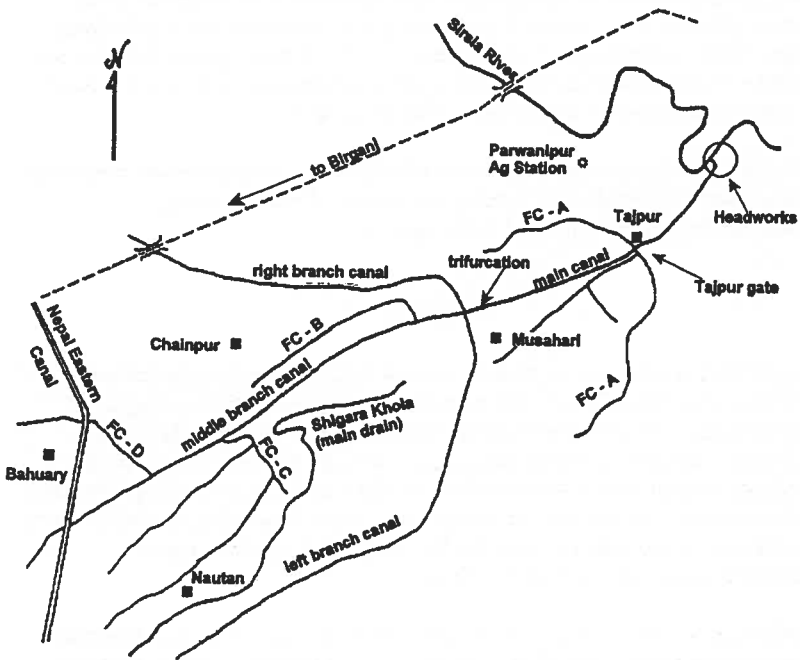
The discussion now turns to specific cases of local water user organizations (WUO's) observed in Nepal. The purpose is to take the abstract concepts discussed above to the world of Nepali irrigation. One system – the Sirsia-Dudhaura – has good potential but does not have the organizational attributes necessary to make it an effective vehicle for democratic social development. The second system – the Bangeri – has been successfully functioning nearby for three generations. Observation reveals that the Bangeri has the attributes of a successful organization as outlined above.

Total irrigated area in Nepal is estimated to amount to about 1,000,000 hectares. This represents about 38% of the cultivated area of the nation (Rana, 1989: 6). The Government of Nepal Department of Irrigation (DOI) accepts responsibility for administering roughly 300,000 hectares of irrigated land in Nepal, of which

about 260,000 hectares are in agency assisted joint-managed systems such as Sirsia-Dudhaura. Farmer managed systems such as Bangeri amount to about 700,000 ha.

Sirsia-Dudhaura — Failure in Organizational Design

This irrigation system has been the subject of much investigation, policy discussion, and USAID/ DOI investment. No attempt will be made here to give a full physical, agronomic, or organizational description of the system; that has been done by others (Laitos, *et. al*, 1985). Suffice to say that Sirsia-Dudhaura is one of the older government managed systems in Nepal as DOI constructed the original headworks, one main and five branch canals with USAID assistance between 1953 and 1957. A high quality government-installed pucca headgate diverts water from the Sirsia River to the main canal, then the flow is to two channels at Tajpur, and on to three branch canals at a trifurcation structure (See map, Figure 3). The Sirsia portion of the system was originally designed to command 1,400 ha. (Laitos, et al., 1985:11) and it came to incorporate an already existing



Source: Laitos, et al., p. 3

Figure 3. The Sirsia Irrigation System

Dudhaura system irrigating about 650 ha. fed by flows from the Dudhaura River. The water allocation system is to rotate water from head to tail of the main canal and five secondary channels. In the Sirsia portion of the system, groundwater use was reported to be insignificant.

After initial construction, the system rapidly deteriorated and remained in an advanced state of deterioration for years. In 1984, an interdisciplinary team funded by USAID, working with the DOI and farmers, conducted a diagnostic analysis (Laitos, et al., 1985). A subsequent rehabilitation effort during 1986-88 improved the physical works and organized farmers at three levels: a) sub-block units (4-5 ha.); b) block units (20-50 ha.); and c) at the system level. Farmer informants expressed satisfaction that the Irrigation Management Project got them involved; they reported that farmer involvement in this work was highly valued by many farmers.

During kharif (summer), crops center on early and late varieties of rice. During rabi (winter) season, farmers focus on wheat, potatoes, maize, mustard, and oilseeds. Sugarcane grows over the course of both kharif and rabi seasons; given the lack of water, larger farmers are reported to plant sugarcane as insurance against drought during rabi given that even 10-20% of potential yield promises sufficient cash to be worth the investment. Informants reported that so many farmers have gone to sugarcane as drought insurance, that local sugarcane mills in the area were operating well over 8 months per year even though they were designed to operate only about 3 months per year. In an especially good year, a farmer can grow early rice, late rice, and rabi wheat. Cropping intensities are generally high (reportedly about 250%) but much land is planted in lower value drought resistant crops during rabi due to the generally insufficient water supply. Farmers and other informants reported that yields diminish as one moves from the head to the tails of the system. All of these factors suggest that water control is seriously problematic in this irrigation system.

Administratively, Sirsia-Dudhaura is under the jurisdiction of the DOI. The District Officer is charged to render technical assistance to privately managed systems in the district, to conduct programs of "river training" (erosion and flood control), to manage district tube-wells, and to manage irrigation water flows in the main and secondary canals of the Sirsia-Dudhaura system. He is assisted by two engineers, one of whom is given responsibility for Sirsia-Dudhaura, one Overseer, a number of Dhalpas (gatekeepers), and a Chowkidar (headgate watchman), all hired by DOI, and paid out of the District Office budget.

How does the system work? Toli (Block) Committees, supposedly working collaboratively with the DOI Engineer, Overseer, and Gatekeepers, decide upon a rotation system to allocate water among the five secondary canals that will serve crop needs in the system. During kharif, if the rains are good and continuous,

there is relatively little stress on the allocation system. However, when monsoon rains are sparse and crop consumptive demand great, much demand for water comes on the system and there is no other allocation method than just to run water in each secondary canal for 4-5 days at a time, then rotate to the next canal or two for a similar period. How many secondary canals can be on at once depends on the river flow at the headgate. Most often the 4-5 day flow period in secondary canals is not sufficient to satisfy demand in either kharif or rabi. Most often it is not. Demand from lower distributaries necessitates a cut-off of water leaving middle and tail farmers without water. Later, on the next general rotation, block committees will try to start the flow of water to the tertiary canals at the point where it had to be stopped many days earlier on the prior rotation. What if head farmers jump in and take water before it gets to those downstream? It happens. Toli committees try to put social pressure on those who abuse up-stream positions to extend their turns, but there is no effective share distribution system to insure equity. Some farmers, in middle and tail locations who are politically weak, have not had water for many seasons and are struggling to improve this situation. Technically, farmers are charged for water without regard for volume received or the timing of the delivery. In fact, virtually no farmer has paid the irrigation fee for at least 5-6 years preceding this author's visit.

There are many water measurement structures situated at appropriate places in the canal network. But there is no clear share system to guide their use; virtually nobody takes the trouble to make measurements. After all, why should they? Without a sense that a given specific quantity, or proportion, of water flow must be delivered to any given point in the canal network, there is little reason to go about the business of measurement. Within the memory of the informants neither farmer nor official has made an attempt to compute river flow at the headgate staff gauge.

What about farmer relationships with DOI? Farmer informants agreed that the most important problem is lack of communication and coordination between farmer leaders at the system level and DOI personnel. Farmers spoke frankly, clearly, and with good will, but they clearly indicated dissatisfaction with DOI management on several counts.

The agency, in the view of most farmers, grossly mismanages resources. It spends far too much money on cars, fuel, badly designed and constructed equipment, and "experts" like me. DOI pays Rs 1,050/month to the headgate watchman and built him a quality pucca house at the headgate site. Yet, he is never around. Even if he stayed on the site, it is not clear that he could do anything really worth doing. It is a small thing to complain about given all the bigger waste, but it irritates farmers when they see this kind of fund mismanagement.

DOI provides nothing of value on a day-to-day Operation and Management

(O&M) basis. Anything worth doing is done by the farmers themselves. The DOI engineer assigned responsibility for Sirsia-Dudhaura is housed at the Rice Research Institute near the headworks, but he does nothing. What can he do? It is unclear what his job description is or should be.

DOI is guilty of lack of "transparency." The government agents expect the farmers to keep their records and activities open for review, but they do not let farmers review government records and operations. Farmers are insulted by this. Control over funds is a source of conflict. There was much that the farmers wished to communicate to me about this but I failed to grasp all of the aspects of this problem. Much was lost in the translation. Farmers made it clear that they think they should have full control of any funds due to them.

The agency, farmer-informants unanimously reported, has no real respect for farmers or farmer leaders. In the informants' view, DOI wants "dummy" leaders who will be quiet, compliant, and continue the pretense that things are going along in an acceptable fashion. Real leaders speaking honestly about problems are not welcome and their election to positions of WA authority are resisted by the DOI. Farmers and their leaders are angered by this. One said: "The agency comes into our territory and does things to us without our permission. They are like a hunter who expects the animal to assist the hunter by helping to steady the gun which is pointed at the hunted."

Sirsia-Dudhaura — An Analysis

The Sirsia-Dudhaura system exhibits problems that are found in many irrigation systems in other countries. It was designed to be constructed, but was not designed to be operated and maintained. Water and money can flow through the system if available from sources above the headworks, but it is not a system which can do proper irrigation--i.e., it cannot control water to serve consumptive need of crops in a way which serves productivity, social equity, or democracy.

The problem is not deficiency of the individual farmers or DOI personnel. They are people of competence and good will who are trying to deal with difficult circumstances as best they can. Problems are:

1. There is no viable water share distributional system worked out which can reconcile supply at the headgate with crop demand. Also a viable share system will specify the details of operations and maintenance which must be accomplished. If it can be agreed that a given fraction of available flows at the headgate must be distributed to particular points then operations and maintenance begins to take on real meaning. Specifically:

- a. There is no compelling connection between payment of water

management charges and delivery of water at the farm gate.

b. There is no effective way of making payment contributions proportional to water payouts.

c. The head-tail distinction is re-enforced, not removed.

2. Without organization of viable rules and tools for operating and maintaining functioning water share system, it is impossible to define meaningful organizational job roles either for farmer leaders or DOI people.

3. Expecting cosmopolitan District DOI staff who rotate in and out of the irrigation area every few years and who are paid by, and responsible to, authorities above them for definitions of good and bad work, who are therefore not fundamentally accountable to farmers, all compounds the difficulty caused by the lack of an effective water share distribution system.

a. What exactly should district staff do? Nobody knows because there is only a badly broken share system being implemented and that is being done as best farmers can. There are no real daily O&M jobs that district staff can do.

b. Given the above it is not surprising that there is no real communication or coordination between DOI staff and farmers.

4. It is, therefore, not surprising that:

a. Many farmers in the middle and tail reaches are farming in virtually dryland conditions and are thereby forgoing increased production of higher yielding and more valuable crops. Production, welfare, social equity, and the practice of democracy are being unnecessarily sacrificed on this system.

b. Lack of effective daily O&M means frequent calls for non-routine and expensive rehabilitation to be funded by the central treasury.

c. Farmers are effectively organized to demand expensive and scarce capital resources to substitute for their own funds and potentially abundant labor--farmer resources which will not be delivered by the inadequate organization now in place. Farmer labor and capital will be forthcoming when improved organizational arrangements provide assurance that they will result in a real payoff meaningful to them--improved water supply and control.

d. Farmers are not effectively organized to irrigate. Individually they are competent and hardworking but collectively are constrained by the lack of

properly organized joint agreements about rules and tools constituting an effective water share distribution system, recruitment of leaders and staff, and unworkable lines of authority.

In sum, the Sirsia-Dudhaura irrigation organization reflects a configuration of variables and relationships that are unsupportive of effectiveness and democracy in the provision of local public goods and/or common property resources. In short, it does not work.

The Bangeri System — An Organizational Success

This community of irrigators has been functioning for three generations and their records established that there are approximately 300 irrigation households which work a total of 400 ha., 300 ha. of which are irrigated (See Figure 4).

Water of the Bangeri river is captured by an earthen barrage about 100 meters

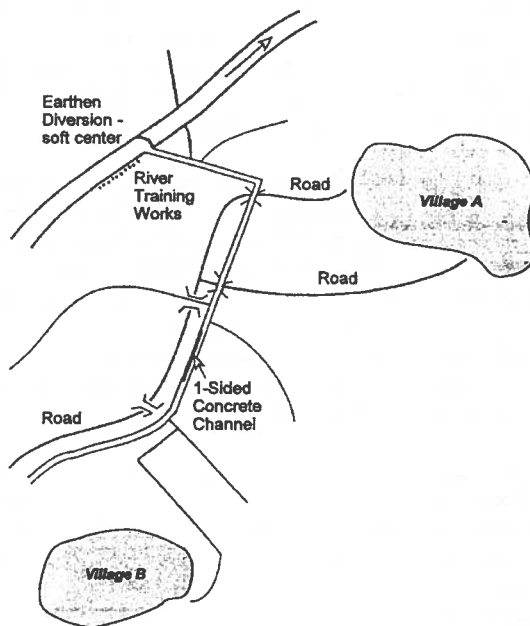


Figure 4. The Bangeri Irrigation System

long and constructed by farmers to create a head of water at the inlet of the main canal 1 meter deep. The technology employed in this barrage is virtually identical to others in this region of Nepal—large stones provide a hard core for the ends of the weir while a softer earthen center section will give away to high river flows. This saves the side sections and leaves a hard bund fragment which continues diverting water into the canal during periods of high water. Farmers reported that they may have to re-build this barrage as many as 7 times a year. The Deputy Chairman reported that farmers were quite capable of mobilizing as much as 900,000 Rupees (Rs) worth of labor in a 30 day period. Unfortunately, these farmers have the lowest intake on the river due to a combination of low river flows during rabi (winter) season and high demand for water by the four farmer managed systems above them. This means that the Bangeri main canal generally fails to capture a full one meter head of water at the barrage.

The main canal is 2 km. long; total length with secondary canals (See Figure 4) is 6 km. The command area is divided into 9 zones within each irrigators select a leader who represents them on the system Irrigation Committee. The largest farm on the system is 10 ha.; the smallest is 0.1 ha. with an average farm size of 1.0 ha.

The Irrigation Committee (i.e., Board of Directors), composed of the 9 zone representatives, elects a Chairman, Deputy Chairman, a Secretary for record keeping, and a Treasurer for fund management and accountability. The Bangeri Irrigation Committee operates and maintains a clearly defined and viable water share distribution system. This is how it works:

1. Prior to the beginning of rabi irrigating season each year, the Irrigation Committee estimates the total funds required to control water in the system for the next year—rabi and kharif. They must fund a variety of items such as barrage work, hire a landless laborer for a chowkidar (Rs 700/mo. plus 300 kilos of rice/yr for night work, plus Rs 30/month for flashlight and batteries), brick, mortar, and bank loan payments. Like such systems in many countries, no money is appropriated for Irrigation Committee Members who serve voluntarily at no cash cost to the system. This year (1992) the Irrigation Committee estimated a total need of Rs 28,000 for water management.

2. The total annual cost includes a loan payment to the Agricultural Development Bank in the amount of Rs 20,000. The loan was taken out several years ago to finance improvement of a leaky main canal (See Figure 4) by putting in a one-sided concrete bank. Also the loan funded purchase of better gates to the secondary canals, and 13 culverts where roads crossed canals. The Farmers secured technical assistance and support for the loan approval from the District Office; although the District Officer had final approval authority, the improvements were designed according to farmer wishes and they are satisfied with what was done. Given that they were going to be responsible for paying

back the cost of improvements, farmers wanted to make each Rupee go as far as possible--hence the single sided concrete portion of the main canal as an alternative of a two-sided concrete ditch.

3. The costs of securing water control are then assigned to water shares; which are determined by amount of land to be irrigated, independent of what crop is grown. Farmers allocate costs to units called bighas. Since that is a complicated computation, I will employ hectares. The farmers agreed that, given 300 irrigated hectares in the system, and given a total appropriation of Rs 28,000, each irrigated hectare would be assessed Rs 93.33. Of this, Rs 30 was payable in labor equivalent.

4. Assessments, due each January, are reviewed and adopted by the Irrigation Committee members and then by the general assembly of irrigators. If not paid by March, a 5% surcharge is levied to the assessment. All funds are deposited in the organization's bank account in a nearby town. There is total "transparency" among the farmer members.

5. Since part of the assessment is contributed labor for maintenance, irrigators are called out by the Irrigation Committee when needed. If a farmer does not wish to work on the job to be done, he or she contributes Rs 30/day to the Irrigation Committee which employs a laborer plus a tip of Rs 2/day for breakfast.

6. Costs paid are tightly connected to the delivery of water, and just like a bank savings account--no deposit, no withdrawal. When asked if there are delinquent farmers who wish to get water without paying, the answer was that there are always a few. "They come crying, 'my crops are dying, give me water.' We give it to them, but they pay." Sometimes in a really serious case, all of the farmers are called together in a general assembly of irrigators to put pressure on the delinquent--when the social pressure gets intense, the laggard pays the amount owed.

a. Before the first seasonal irrigation, the Irrigation Committee inspects the whole command area and make a preliminary assessment of water consumptive needs.

b. The Committee decides priorities of fields and farmers according to crop--top priority is given to vegetables, then wheat, oilseeds, maize, etc. Sugarcane was one of the lowest priority crops, and viewed as a hedge against drought.

c. Depending on the quantity of river flow, 2-5 secondary canals can be served with a sufficient head of water. Water is rotated not simply head to tail, but modified by: 1) crop consumptive needs; and 2) the Irrigation Committee's

best judgement as to how to keep from losing water unnecessarily in wetting dry ditch bottoms.

There is much fine toothed local knowledge that goes into these calculations which escaped discussion and my notes. Farmers were agreed that their number one problem is lack of sufficient water at the headgate. If they had a better water supply in rabi they would shift from sugarcane, mustard, and lentils to higher value vegetable crops.

Bangeri — An Analysis

There are problems in the Bangeri system-- the most notable is insufficient water supply, but farmers could also use improved water measurement and control structures to help administer their share system. However, these farmers are organized to control water in a way that serves productivity within their constraints, maintains a rough but effective distributional equity, and embodies authentic democratic political control in the community of irrigators. Nobody pays for water that is not delivered; nobody takes water without contributing an approximate "fair share" to the cost of managing it. The share system succeeds in uniting cost and benefit, but it struggles with the head-tail problems which, while not eliminated, are kept within acceptable bounds. No matter where the irrigator is positioned in the queue, s/he can be confident that by fulfilling their organizational obligation, by paying their share assessment, they will receive an acceptable water delivery dividend.

The management authority administering the water share distributional system is composed of local people having detailed local knowledge who are accountable to the irrigation community. DOI personnel make no pretense of involving themselves in the daily operation and maintenance of the share system. They are kept in their proper place--providers of technical assistance in the design of improvements and in obtaining outside financial help.

Bangeri represents an effective and democratically responsive irrigation organization, rather than being more fitted for lobbying the central bureaucracy for resources than for the work of irrigation and agricultural production as is the case in Sursia-Dudhaura. The farmers at Bangeri are empowered to control water. Their organization provides them with a vehicle for productivity, equity, and the daily practice of local democracy.

CONCLUSION

Why do some local organizations earn the support and loyalty of their memberships, successfully empower people within democratic frameworks to

provide themselves with essentials of local infrastructure, and provide crucial linkages between central government bureaucracies and local people? Why do others fail in these tasks?

In sum, the argument here has contended that the difference lies in the configuration of a few strategic variables. Small changes make for large differences in organizational outcomes. The critical variables have to do with recruitment of leaders and staff (local/cosmopolitan), configuration of responsibility (are citizen-leaders accountable to the agendas of authorities above or to irrigators below?), and the design of the resource share distribution system in a way which unites delivery of the organizational benefit stream to member fulfillment of obligation and delivery quality service without respect to position in the service queue.

Likewise, irrigation system rehabilitation is not simply a technical matter of interest to those who design and construct physical works; it is most importantly a process which must address those social organizational considerations that all too often account for degradation of the physical works in the first instance.

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