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The Conditions for Collective Action:

Land Tenure and Farmers' Groups in the Rajasthan Canal Project

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This Gatekeeper Series is produced by the International Institute for Environment and Development to highlight key topics in the field of sustainable agriculture. Each paper reviews a selected issue of contemporary importance and draws preliminary conclusions of relevance to development activities. References are provided to important sources and background material.

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EXECUTIVE SUMMARY

Rising costs per hectare of new irrigation development have been a major factor in the recent worldwide decline in the rate of irrigation investment. This has been matched by increasing concern, among both governments and multilateral donor agencies, about the poor performance of existing irrigation schemes. One common perception of the cause of this problem is that farmers are not sufficiently involved in the design and management of these programmes. Consequently, there has been an upsurge of enthusiasm for water users' organisations. The complete or partial transfer of irrigation management to water users has come to be regarded as a panacea by irrigation engineers and planners.

However, farmers or water users are often seen as an undifferentiated category. This paper describes how such a perception ignores tenure-based differences among farmers. These differences influence strongly the prospects of the formation and success of farmers' organisations and ultimately of irrigation management transfer. The poor integration of irrigation and conventional agricultural development inhibits a complete understanding of these issues.

Drawing on detailed case study material from two contrasting areas in the Rajasthan Canal Project, the paper examines five key irrigation tasks to show how farmers cultivating land under short-term share and fixed-rent tenancies experience serious limitations in evolving organisations for increasing their control over local irrigation management.

While the conditions inherent in most large-scale irrigation projects (settler farmers with diverse origins, farming backgrounds and experiences cultivating land under different tenurial conditions) make the prospects for the formation of user groups appear bleak, the process could be enhanced by:

- relaxing restrictions on tenancy contracts;
- emphasising the training of stakeholders for institution building;
- establishing tradable water rights, and making membership of water users' associations open to cultivators with water rights and not conditional on land ownership; and
- state-initiated creation of an enabling environment for the devolution of powers within the irrigation bureaucracy.

THE CONDITIONS FOR COLLECTIVE ACTION: LAND TENURE AND FARMERS' GROUPS IN THE RAJASTHAN CANAL PROJECT

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In 1995 the world's net irrigated area was 230 million hectares (mha), of which 143 mha were in Asia (Vermillion and Johnson, 1995). Although the total irrigated area grew by 43 percent from 100 mha in 1966, the rate of growth has declined sharply since 1980. This has paralleled reduced lending for irrigation by international donors. During the 1980s total public expenditures for irrigation for many countries also declined significantly (Rosegrant and Svendsen, 1993). The increasing real costs per hectare of new irrigation development has been a major contributory factor for the decline in the rate of irrigation investment. Irrigation has a strategic importance to global agricultural production which is disproportionate to its geographical spread. Of the 868 mha of arable land under production in the South, almost 20 per cent is irrigated (FAO, 1990). More than 30 percent of all food production between 1987 and 1989 was grown on irrigated land, including, significantly, almost 46.5 percent of all grains (Yudelman, 1993). In short, agricultural output per hectare is substantially higher on irrigated than on non-irrigated land (Guijt and Thompson, 1994).

Current high costs for developing new irrigated land have fuelled increasing concern amongst both governments and multilateral donor agencies about the poor performance of existing irrigation schemes. One common perception of the cause of this problem is that the farmers are not sufficiently involved in the design and management of these programmes. This has created considerable enthusiasm for participatory planning, delegation of day-to-day management responsibility to local communities, and creation of water users' organisations for better cooperation and conflict resolution. Complete or partial transfer of irrigation management to water users has become the latest panacea (Box 1). Whether or not these hopes will be realised, it is certainly true that farmers' organisations are an important precondition for the success of irrigation management transfer.

However, the literature on water user's organisations generally refers to the water user without specification or analysis. The literature assumes that the owner of the land is also the owner of the water, the farm operator and the person who physically transfers water from the system canals to his own fields (Hunt, 1989). This perception tends to ignore significant differences between farmers based on tenurial arrangements. Yet agriculture in many countries is typically characterised by the existence of a variety of agrarian contracts. A landowner may lease his land to another party or become an employer by hiring workers. Land tenancy and labour employment contracts thus become alternative ways of exploiting resource endowments in an agrarian economy. By limiting itself to only owner-cultivators, the large body of irrigation management literature remains silent on the impact of agrarian

Box 1. Irrigation Management Transfer

Irrigation Management Transfer (IMT) is known by several names. It is called privatisation in Bangladesh, responsibility system in China, turnover in Indonesia, self-management in Niger, commercialisation in Nigeria, disengagement in Senegal, and participatory management in Sri Lanka. IMT may be partial or total, and may involve large- or small-scale systems. The IMT programmes of Bangladesh, Indonesia, Nepal and Senegal provide examples of total transfer of small-scale systems. Those of China, India, the Philippines and Sri Lanka illustrate the transfer of the distributary levels of large-scale systems, with responsibility for main canals being left in government hands. Columbia, Madagascar and Mexico have launched programmes to transfer management to water users' associations, with farmers gradually increasing their share of responsibility, starting at field level, then moving to the distributary and finally to the main canal levels (Vermillion, 1994).

contracts on farmers' organisations, that are so crucial for successful transfer of irrigation management.

This paper examines whether (and if so how) insecurity of land tenure has hindered the formation of effective water users' associations. Findings are based on a case study of two clusters of *chaks*[1] on the large-scale, bureaucratically managed Rajasthan Canal Project[2] in India.

Existing Research

There is little integration of the irrigation literature with that relating to conventional agricultural development. The irrigation literature is largely concerned with illustrating the poor water management practices in various regions of the world, and with suggesting organisational solutions to these problems. Many authors have argued for increased participation of water users in the management of large-scale systems (Uphoff, 1985,1986; Freeman and Lowdermilk, 1985; Coward and Uphoff, 1986; Lowdermilk, 1986; Bottrall, 1981). However, such studies usually ignore the differential abilities of farmers to participate that result from insecure tenurial arrangements.

Farmers' land tenurial arrangements have been excluded from mainstream debates largely because successful cases of farmers' organisations tend to be based on systems which are often small, homogenous and owner-cultivated. Successes have had one, or several, of the following characteristics:

- Small, indigenous and traditional irrigation systems. Mostly known from the anthropo-

1. A chak is the smallest area irrigated by a water outlet.

2. Although the Rajasthan Canal was renamed Indira Gandhi Nahar in 1984, the original name is preferred by the author for its location-specificity.

logical literature, these systems operate, and have operated for centuries, without centralised bureaucracies, without engineers, and most importantly, with farmers doing all the work (Hunt, 1989). It is no wonder then that they are attractive to study.

- *Small projects*. Social scientists have exhibited a marked preference for studying small irrigation projects (Van der Meer, 1980; Coward, 1976; Maass and Anderson, 1978) which tends to create an exaggerated impression of the organisational virtues of small systems. It is generally agreed that a successful water users' association has to be small in size. Size is referred to by both Coward (1977) and Bottrall (1981). Plusquellec and Wickham (1985) suggest from their understanding of the Nong Wai scheme in Thailand that 50-60 hectares with 20-25 farmer-members represents the maximum size of primary service area for effective irrigation management. Uphoff (1986) prefers small-unit areas of about 20 hectares, with populations of around 20.

- *Owner cultivated, socially homogenous villages*. The evidence in Wade's classic study (Wade, 1979) comes from a district in which agricultural land *"is mostly managed by the owner; there is little absentee ownership or tenancy"* and where *"it is common for a village to have two or three large landlord families, each of whom may hold over 100 acres"*. Kottapalle (Wade, 1988) has been a settled village for several generations. None of these conditions hold in large settlement projects.

On the other hand, a common debate in agricultural development relates to the relative efficiencies of resource allocation under owner cultivation, share tenancy and fixed-rent tenancy (Bardhan, 1984; Bell, 1977; Bell and Srinivasan, 1989). This debate, which has occupied many economic theorists, regards irrigation water as just another input along with labour and fertiliser. The impact on agricultural productivity and resource allocation of the peculiar problems of access to water by location (top-end versus tail-end), increase in water supply (through improved maintenance of field channels), reduced uncertainty in water availability (by strict enforcement of rotational schedules), and conflict among water users seem to have largely been bypassed by the vast economic literature on agrarian organisation[3]. This paper seeks to chart the terrain of this apparent 'no-man's land' between irrigation management and agricultural development.

The Rajasthan Canal Project

The command area of the Rajasthan Canal lies in the Thar Desert, 27.8 mha of which lies in India and 16.8 mha in Pakistan. In India, the region is covered by desert soils and sand dunes, and there are no sizeable rivers. The presence of underground water does not compensate for the absence of rivers. Almost everywhere the water table is deep, varying from 60-100 metres below ground level. Sub-soil water is not only deep but generally brackish and unfit for human consumption.

3. Harrington, *et al* (1980), quoted in Moore, *et al* (1983), and Narayana and Nair (1994) seem to be the only exceptions.

The Rajasthan Canal Project constitutes the most ambitious attempt at state-induced development of an economically backward, arid and drought-prone region in India. On completion, the 445 kilometres (km) long Rajasthan Canal will irrigate a culturable command area[4] of about 1.5 mha[5] to support a population of more than 2 million in over 350 completely new villages and towns. The canal system consists of the Main Canal, nine branches, seven lift schemes and twenty-one direct distributaries besides a large number of smaller channels. The basic objective of the project is to utilise Rajasthan's share of the Ravi-Beas waters that became available as a consequence of the Indus Waters Treaty between India and Pakistan in 1960. The project also aims to increase food production, create employment opportunities, raise living standards of local inhabitants, sedentarise nomads, provide drinking water and generally, transform the desert into a granary. An unstated objective is to develop a defence line against a possible attack by Pakistan.

Settlement and Land Tenure in the Canal Command Area

Prior to the construction of the canal, the command area was sparsely populated with an average density of 13 persons per square kilometre (Rajasthan Canal Board, n.d.). To ensure an optimum use of the newly created potential, people were encouraged to settle in the command area on allotted square parcels of agricultural land (6.32 hectares per household). Consequently, a diverse mix of households of different origins, farming backgrounds and experiences from different regions, communities and economic strata have settled in the canal command area. As indicated in Table 1, there are three land-owning groups in the command area now: traditional desert dwellers (the pastoral nomads), selectees[6] (the landless residents of Rajasthan who were allotted land by the government at a subsidised price), and purchasers (those who purchased land at the market price).

Initially land allotments to different household categories were made on a temporary basis. These are renewable annually. Permanent allotments were granted only after amendment of the existing colonisation laws in 1975. After payment of the full price of land in annual instalments, the permanent allottee can become a *khatedar* (legal landholder). *Khatedari* rights are permanent, heritable and transferable. Until *khatedari* rights are obtained, a permanent allottee is a leaseholder with usufructory rights but not the right to transfer it except to legitimate heirs. However, illegal land transactions are common, with landowners leasing land to tenants. The illegal nature of these transactions leads to extreme insecurity of tenure for the tenants.

4. Culturable Command Area (CCA) is the area of culturable land in a command area.

5. This is approximately twice the area of the Gezira Scheme in the Sudan, which is generally regarded as the world's largest irrigation system.

6. This term is borrowed from Stanbury (1987).

Table 1. Typology of Household Categories on the Rajasthan Canal Project

Feature	Original	Selectee	Purchaser
Origin	Natives of the area	Mostly from within Rajasthan	Mostly from outside the state
Traditional Occupation	Pastoralism and intermittent farming	Variety of caste-based occupations	Agriculture
Caste Background	A mixture of castes	Lower castes	Dominant agricultural caste groups
Landownership prior to the Canal	Dryland with usufructory rights; almost no private property	Landless	Landowners
Experience of Irrigated Agriculture and Farm Management	None	A few with experience of agricultural labour and tenancy	Experienced farmers
Terms of land allotment	Subsidised rate; low interest; easy repayment	Subsidised rate; low interest; easy repayment	Land purchase at market price

Case Studies

Two clusters of settlements within the Rajasthan Canal command area were selected for a comparative study. Each cluster consists of three contiguous *chaks.*

Cluster VI

VI is located on the Gharsana Minor in Sri Ganganagar district and lies about 15 km from the new market town of Gharsana. The topography is remarkably flat, soils are sandy loam, groundwater is scarce and brackish, and average annual rainfall is about 250 mm. The three *chaks* of VI irrigate 624 ha of agricultural land and double-cropping is common. The warabandi (water turn) rotational schedule is used to ration water among farmers.

Wheat is the predominant rabi crop while cotton is commonly grown in the *kharif* season[7]. Agriculture in these *chaks* is characterised by intensive use of the HYV package, reflecting a strong market-orientation. Most of the owner-cultivators own tractors, although there is a high level of indebtedness to local grain merchants and traders.

7. The drier *kharif* season lasts from May to November, the wet rabi season from November to April/early May.

Cluster V2

V2 is located further downstream on the Katak Minor in Bikaner District. In many ways it is in the middle of the desert. Located 45 km from Bajju, a small town, and about 100 km from the district headquarters of Bikaner, V2 is very isolated. Though the canal has stimulated some economic activity in the region, people from V2 have to travel to either Bajju or Bikaner for even basic necessities. The village abadi (residential area) is as yet unrecognised by the Command Area Development Authority (CADA) and hence is not eligible for infrastructural facilities. There is no electricity, no primary school, no primary health centre and no roads. A diggi (open-air tank for storage) has been constructed for drinking water which only fills when there is water in the distributary. The chaks are surrounded by undulating terrain. Intensive sand movement and sand storms in summer seriously limit the Kharif harvest as the (open) watercourses are often filled with sand.

Most of the foodgrain output (in rabi) is for domestic consumption. With natural hazards affecting water supply during the kharif season dependence on the market is minimal.

The comparative features of households in the two clusters are summarised in Table 2. The widespread prevalence of short-term land contracts, dependence on hired labour, and a heterogeneous social structure are distinctive features of VI. For example, 66% of holdings are tenanted. The V2 cluster, on the other hand, is characterised by owner-cultivation, use of family labour and a well-knit extended kinship social structure. In this cluster only 13% of holdings are tenanted. However, in both clusters there is considerable uniformity in landholding size across the various household categories, which is a common feature of most large settlement projects.

Table 2. Comparative Features of Study Villages

Feature	**V1**	**V2**
Number of households	105	72
Social structure	A variety of caste groups: 32% Jat Sikhs and 25% Muslims	Dominated by Sodha Rajputs (66% of households)
Average landholding size *(ha)*	5.97	5.98
Extent of tenancy *(as % of total households renting out entire land)*	70	5
Single-year tenancies (as *% of total tenanted holdings)*	52	27
Non-cultivating landowners non-resident in village (as *% of total non-cultivating landowners)*	79	40
Labour use	Family + Hired	Family + Exchange

Irrigation Organisation

A closer look at five key 'irrigation tasks' essential in any local irrigation organisation, helps to assess how farmers in the two clusters organise and manage these tasks. The aim is to explore whether there is a causal linkage between agrarian contracts and collective action.

1. *Water allocation/distribution*. The irrigation system in VI is bureaucratically managed. The tasks of water allocation and distribution are centralised with the Irrigation Department and a *pakki warabandi* (formal water turn) schedule is in operation. The duration of the turns are determined by the *nahar patwari* (the lowest level canal official) in proportion to each fanner's irrigable (or command) area. Farmers have a minimal role in allocation or distribution of water. As with most *warabandi* systems in north-west India, the the location of the farm on the watercourse determines which day of the week a farmer has access to water. The amount of water each farmer receives depends on the level of supply in the main channel serving his[8] watercourse (Reidinger, 1974). Once fixed, the turn remains relatively immutable. In that sense a *pakki warabandi* schedule is self-regulatory, and carried out with little outside interference.

The V2 *chaks* are an example of a jointly managed system. Water is allocated by the Irrigation Department to Katak minor according to a pre-determined priority status. But once water is available in the channel, its further distribution is managed by the farmers themselves and the *nahar patwari* has no role. There is an informal farmers' organisation in each of the three *chaks* which decides the duration and turn of each farmer. All farmers in a *chak* are group members and appoint a senior farmer as a *mehrab* (common irrigator) to oversee water distribution. He receives extra water for performing this service.

Unlike the formal water schedule of VI, the duration of water in V2 depends on the farmer's plot size and each farmer's labour contribution towards maintenance of field channels and structures. Farmers can increase their turn (to a maximum of 12 hours) by increasing their labour contribution. Failure to contribute labour elicits a fine of Rs 50 (= US$ 1.60), thus ensuring clearance of field channels. As in the VI system, the turn depends primarily on the location of the farm on the watercourse. But water distribution begins each time with the farmer succeeding the one who had it last, irrespective of the day of the week. This ensures a more equitable distribution of water over an entire season.

2. *Observance of the warabandi schedule*. Farmers adhere strictly to the *warabandi* schedule in V1. All the same, there are occasional conflicts especially during times of water scarcity and often at night. Individual farmers (almost always owner-cultivators) have tended to capitalise on the mismatch between the 8-day channel rotation schedule and the 7-day *warabandi* rotation[9]. The rich and powerful farmers lobby the Irrigation Department to ensure that, when their channel has first priority, the *warabandi* schedule begins from the

8. While there are a few women-headed households, there are no women farmers or tenants within the project.

9. The channel-rotation schedule allows one extra day for filling in addition to the 7-day *warabandi* rotation. This results in a total of 8 days for each channel rotation.

day of the week they have their turn. This means they can get water twice in the same turn, on the first day (albeit with unpredictable flow) and the eighth day (with full flow).

By comparison, the *warabandi* schedule in V2 is characterised by an air of informality. Although farmers adhere to their respective schedules, the latter are not immutable. There have been numerous cases when one farmer has given his turn to another, if the latter had a more pressing requirement.

3. *Maintenance of field channels and structures.* The minor channel is desilted once at the start of every season by the farmers in VI. The watercourses are desilted more often (at least twice a season). Most farmers contribute labour, although there were numerous examples of free-riding by powerful land-owners.

As mentioned above, the informal farmer groups in the V2chaks have made water distribution contingent upon field channel maintenance. Periodic clearing of sand from the watercourse is a major task during the summer season and is organised by the farmers' collective. No cases of free-riding have been reported in V2.

4. *Liaison with Irrigation Department*. Information is a major problem in both VI and V2. There is a dearth of information about irrigation schedules. Farmers rarely have prior information of the number of waterings they will receive in a particular season, their channel's priority status, or when they will next receive water. This uncertainty about water supply makes precise crop and water management difficult, if not impossible.

The VI *chaks* have the benefit at least of being located near an Irrigation Department office. Some of the more enterprising farmers occasionally go to the Irrigation office to ask about their channel's turn. This is the only source of information for the entire cluster. The Irrigation Department claims to give wide publicity to the channel priority status through newspaper advertisements and posters. However, these efforts have had little impact in an area with low adult literacy. The V2 *chaks* are even more remote than V1. The Irrigation Department makes no special efforts to spread information about the watering schedule and V2 is too far from the office for the farmers to seek information from the officials. Instead, the farmers rely on informal village networks to get the required information.

5. *Conflict resolution*. All canal irrigation systems experience occasional water shortages, which inevitably leads to conflict. There is no local organisation in VI to mediate such conflicts. Furthermore, insecure tenure (and a largely illegitimate status[10]) prevents farmers from taking recourse to official mechanisms of conflict resolution, such as the Irrigation Department and the local courts. Box 2 illustrates the precarious existence of VI tenants, which contrasts with V2, and highlights the importance of security of tenure.

10. Although landowners without *khatedari* rights cannot rent out their land, this rule is easily flouted by bribing the revenue officials.

Box 2. The Importance of Secure Tenure

A weir was constructed just below the outlet in 1975 after farmers had protested to the Irrigation Department about low pressure in their watercourses. Recently, farmers from chaks further downstream got together to reduce arbitrarily the weir's height and increase the water flow. There was considerable noise in V1 but little action. As one tenant farmer said, *"Obviously, they (the downstream farmers) did it in collusion with the Irrigation Department after paying them hefty bribes. So one can't expect any justice from the Department. We neither have money nor 'status' to file a case in court. We do not own the land and official records do not carry our name. We will have to ask the landowner, who does not stay here, to file the case on our behalf. But he won't be interested.. he does not want to get involved. Whom does one go to?"*

A similar situation but with a different outcome highlights the difference between V1 and V2.

About six years ago the V2 chaks were not getting full water flow in their watercourses. The farmers, most of whom are owner cultivators, got together and decided to construct an additional 8-inch diameter outlet at the mouth of the minor canal to increase water flow. The local canal officials protested and reported the illegal construction to their officers at Bikaner. The matter went right up to the canal minister who intervened and ordered his department to regularise the construction. The additional outlet still remains and provides increased flow to V2. The minister may have decided in the favour of the farmers with an eye on votes but the fact is that the farmers cooperated to achieve a common good. This case is recounted with pride and contributes towards ensuring future collective behaviour.

Conditions for the Formation of Farmers' Groups

What precisely is the link between insecurity of tenure and collective action? This paper corroborates Wade's hypothesis (Wade, 1979) that a corporate approach to irrigation is a response to water scarcity. Clearly, the conditions in V2 indicate a high degree of uncertainty in water supply and to that extent a 'corporate' organisation (albeit a loose and informally constituted one) seems a justifiable response. But what about VI? There is considerable scarcity and uncertainty of water but there is no local organisation to articulate farmers' concerns. While scarcity and riskiness of the resource is a necessary condition for the formation of farmers' groups, it is not a sufficient one.

The key question seems to be: given the scarcity and uncertainty of a resource, what factors will enable farmers to act collectively? While there have been numerous discussions in VI in the past about forming a *chak samiti* (a hydrologically-based association), the issue of membership is an impediment. Who should be eligible for membership? Nearly 80 percent of the landowners operating their farms through tenants are non-resident in VI. Should the landowner or the cultivator be the member of the *chak samiti*? For a non-resident landowner without *khatedari* rights who has rented out his plot of land, the tenant's

membership of the organisation will be a tacit acknowledgement of an illegal situation which no landowner is willing to risk. All attempts to constitute a formal water users' association have failed and the tenant farmers are reconciled to a limited participation in local management of irrigation, with the consequences outlined above.

Classification of the five key irrigation tasks (see above) into 'simple' and 'complex' categories is revealing. 'Simple' tasks, which provide immediate and tangible benefits, include maintenance of field channels and structures, liaison with the Irrigation Department for information and water extension, and ensuring a strict adherence of the *warabandi* schedule. Almost every farmer understands the linkage between these simple tasks and increased crop productivity, and is willing to cooperate and make them possible. A comparison between VI and V2 along these lines (Table 3) indicates that farmers in both clusters perform or are willing to perform the 'simple' tasks.

'Complex' tasks, on the other hand, are those which require greater effort to get the group together and which result in long-term benefits. Water allocation, water distribution, and conflict resolution belong to this category. These are more 'political' tasks requiring a formal organisation with a charter of authority, and an accountable leadership. As is evident from Table 3, the complex tasks in VI are performed by an external agency because of constraints in formation of a *chak samiti*, whereas in V2 they are performed by the farmers' association.

Table 3. Organisation of Irrigation Tasks in Study Villages

	V1	V2
Task	**Task performed by**	
Simple		
Observance of warabandi schedule	Farmers, but leakages occur	Farmers
Channel maintenance	Farmers, but reluctance by purchaser households	Farmers
Liaison with Irrigation Department	Some individual farmers	None
Complex		
Water allocation	External agency	Farmers' association
Water distribution	External agency	Farmers' association
Conflict resolution	External agency, if at all	Farmers' association

Conclusions and Policy Recommendations

Prospects for the formation of farmers' groups for local management of irrigation tasks on large settlement projects seem to be rather bleak. Most large settlement projects are characterised by diversity of origins, farming backgrounds, and experiences of settler farmers[11]. Such farmers come from different regions, communities and economic strata, and practise cultivation on the settlement project under different tenurial conditions. Cultivation through tenants is a dominant reality on such projects. While resource allocation may be equally efficient under conditions of owner cultivation and tenancy, there is clear evidence of limited or non-participation of tenants in water users' associations. This adversely affects irrigation performance and utilisation of irrigation potential.

Farmer participation in irrigation development and operations is important, not only for effective operation and maintenance of irrigation systems, but also to optimise resource use and increase productivity and profits (Wijayaratna, 1984). However, the literature to date provides only fragmentary evidence of precise gains from farmer participation in irrigation management[12]. Two systematic comparisons, in the Philippines and Sri Lanka, of benefits and costs where farmer organisations were introduced to improve irrigation management suggest economic rates of return in excess of 50 percent (Uphoff, 1986). Additional intangible benefits not included in these calculations are i) reduced damage to physical structures by farmers and animals, ii) reduced conflicts over water, and iii) yield increases attributable to more reliable water distribution at the field level.

What policy changes can support the successful formation of water user groups?

- *Relax restrictions on tenancy*. Tenancy on the Rajasthan Canal Project is as widespread as it is illegal. The above evidence shows that formation of effective and sustainable farmers' groups is problematic when land tenancy contracts are restricted. Thus, legal restrictions on tenancy should be relaxed to give greater security of tenure to those leasing land, and thus facilitate the formation of cultivators' groups.

- *Increase emphasis on training*. There should be a greater emphasis on training of farmers' groups (of both owners and tenants) to demonstrate the benefits of local communities undertaking key irrigation tasks. Training would also provide farmers with elementary skills of institution building and organisational management, thus ensuring a high level of competence and commitment in the execution of their responsibilities. Local NGOs, in association with the Irrigation Department, can contribute by providing training inputs and working in partnership with both owner-farmers and tenants toward institution building.

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11. The heterogeneity of settler farmers on Sri Lanka's Gal Oya and Kirindi Oya irrigation projects have been commented upon by Harriss (1984), Ostrom (1990) and Uphoff (1985).

12. However, Isham, *et al*. (1995) and Narayan (1995) both present strong statistical evidence that increasing participation improves project performance.

- *Establish tradable water rights and encourage markets in these rights.* Tradable water rights are rights to use water that can be transferred all or in part, separately from the transfer of land (Rosegrant, et al, 1995). Every cultivator on a chak, irrespective of his tenurial status, should hold a tradable right to water in proportion to the plot size. Membership of water users' associations should be open to cultivators with water rights, as is the case with in Chile's water codes (Rios Brehm and Quiroz, 1995), and not be conditional on land ownership. This would enhance the formation of farmers' groups, increase control of actual water users over water resources, and ensure better access to water by improving the water users' bargaining power relative to the public irrigation bureaucracy for timely and efficient service.

- *Create an enabling environment for devolution of powers*. In the long-term, the state should create an enabling environment for the devolution of powers within the irrigation bureaucracy. This could be encouraged by devolution of powers from the centre to the lower levels of government to establish participatory village-level institutions with a clear charter of authority and responsibilities, a sound legal framework, and the power to raise financial resources. These institutions can then also undertake responsibility for water resource management and work as 'multi-functional organisations' (Wijayaratna, *op. cit.*). The recent interest in transfer of irrigation management functions to water users' groups should be viewed within the overall trend of reduced role of government in public sector management.

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