WORKING PAPER 52

REVITALISATION OF IRRIGATION TANKS IN RAJASTHAN: AN APPROACH

K V Raju
Tushaar Shah

INSTITUTE FOR SOCIAL AND ECONOMIC CHANGE
2000

Institute for Social and Economic Change (ISEC) is engaged in interdisciplinary research in analytical and applied areas of the social sciences, encompassing diverse aspects of development. ISEC works with central, state and local governments as well as international agencies by undertaking systematic studies of resource potential, identifying factors influencing growth and examining measures for reducing poverty. The thrust areas of research include state and local economic policies, issues relating to sociological and demographic transition, environmental issues and fiscal, administrative and political decentralization and governance. It pursues fruitful contacts with other institutions and scholars devoted to social science research through collaborative research programmes, seminars, etc.

The Working Paper Series provides an opportunity for ISEC faculty, visiting fellows and PhD scholars to discuss their ideas and research work before publication and to get feedback from their peer group. Papers selected for publication in the series present empirical analyses and generally deal with wider issues of public policy at a sectoral, regional or national level. These working papers undergo review but typically do not present final research results, and constitute works in progress.

REVITALISATION OF IRRIGATION TANKS IN RAJASTHAN: AN APPROACH[1]

K. V. Raju[2]
Tushaar Shah[3]

Abstract: *This paper assesses the socio-ecological importance of irrigation tanks, organisational capabilities of the department and local non-governmental organisations on the rehabilitation of irrigation tanks in Rajasthan. The paper has been divided into two sections: the first section provides the background of irrigation tanks, and justification for their pivotal role; the second section describes the approach that we have evolved to rehabilitate these tanks in Rajasthan. Interestingly, both the donor agency and the government of Rajasthan evinced a keen interest in the proposed approach.*

Section I

Background

Rajasthan has 4600 minor irrigation tanks many of which are several decades old. They help capture, conserve and store what little rainfall the region receives. In the process they also help reduce soil erosion by cutting off the pace and momentum of run-off water. They provide low-cost flow irrigation and help recharge groundwater aquifers which are a stable and reliable

---

1. *This paper based on a larger study, supported by the Swedish International Development Agency, was carried out in Rajasthan during 1998-99. Authors are thankful to SIDA, and Government of Rajasthan for extending support during the study period.*

2. *Associate Professor, Institute for Social and Economic Change, Bangalore. Email: kvr88@hotmail.com*

3. *Leader, Program on Policy, Institutions, and Management, International Water Management Institute, Colombo. Email: t.shah@cgiar.org*

source of irrigation and domestic water supply in areas surrounding them. Tank and aquifer storage together provide some protection against risks arising from the vagaries of rainfall. In a year of high rainfall, such as the 1996 monsoon, tanks significantly reduced the threat and damage of flash floods. In contrast, in years of lower than normal rainfall, tanks and aquifer storage directly fed by tanks provide some protective irrigation. Unlike large reservoirs which take land in the submergence areas away from other uses, tank-beds are used for storage and cultivation. Farmers grow rabi, and sometimes, summer crops in tank beds after they are emptied. As a result, tanks are efficient in land-use. Finally, tanks concentrate silt and minerals contained in rain water run-off in the tank beds and farm lands that constitute the command area and thereby make the soil fertile. Overall, tanks enliven the aquatic environment in their surroundings, sustain local agricultural economies, and serve as an important anchor for cohesive local communities.

Irrigation Development Context

Total surface water available in Rajasthan is 15.86 MAF (million acre-feet). The state has therefore to depend on water from inter-state river basins for development. Rajasthan has been allocated 14.50 MAF water from various inter-state river basin agreements. Till 1995-96, the potential created through major and medium irrigation projects was 23 lakh ha; through minor projects 3.7 lakh ha; and groundwater about 36 lakh ha. The irrigated area is 63 lakh ha, with a cropped area of 170 lakh ha. The ultimate potential of surface irrigation has been estimated as 47 lakh ha, including 40.5 lakh ha from major and medium projects and 6.5 lakh ha from minor projects.

Groundwater, i.e., replenishable groundwater resources in all river basins, is estimated at 10.64 MAF. The average groundwater available for irrigation is 8.875 MAF and the net irrigation draft is 5.375 MAF. The ultimate groundwater irrigation potential is estimated at 2.9 m ha. The irrigation potential created till December 1994 is 1.807 m.ha.

The working group on irrigation for the ninth Five Year Plan (1997–2002) in Rajasthan has identified water availability as: utilisable surface water resources both internal and through present interstate agreements to be 27.81 MAF and groundwater resources to be 10.64 MAF. The tentative non-agricultural demand till the year 2045 for drinking, livestock, industries, and other uses to be met from surface water resources has been assessed as 5.05 MAF. The balance surface water of 22.76 MAF is estimated to irrigate 47 lakh ha (at 0.6 meter water depth). The ultimate irrigation potential from groundwater resources has been estimated as 29.13 lakh ha. The combined ultimate irrigation potential through surface and groundwater will be 76.13 lakh ha from existing internal and external resources and 119.83 lakh ha from existing internal, external, and future external resources. This is against the available cultivable area of about 256 lakh ha in the state.

Minor Irrigation Tanks in Rajasthan

Rajasthan has 4600 minor irrigation projects with a cultivable command area of 6.3 lakh ha; of these 3.7 lakh ha is the designed area for annual irrigation (referred to as 'potential created'). Another 3.2 lakh ha falling in the minor irrigation commands also receive irrigation from these projects. Most of these projects involve building of small dams to create a reservoir or a tank; hence these are also commonly called minor irrigation tanks. Typically, these have earthen dams with a pucca overflow structure and one or more sluices. From each of the sluices a canal takes-off, mostly unlined, but often provided with pipe outlets irrigating chaks of various sizes. A large number of these tanks (nearly 50 per cent of the total) were built before independence. Some built by the *Rajahs* and *Jagirdaars* are over 100 years old. Some are new and were constructed by the Irrigation Department, either using plan funds or under famine relief and similar schemes. However, all these tanks — old and new — have uniformly fallen into disrepair. The tank beds are silted and have reduced their storage capacity. The canal systems too need repairs.

The operation and maintenance (O&M) of the minor irrigation systems are the responsibility of the irrigation department, which has several thousand engineers and an even larger number of local staff such as *mistrys*, *beldaars* and *mates*. However, the department's budget has not kept pace with the size of its staff as well as the O&M needs of the tanks. As a result, today, over 95 per cent of the budget allocated to the minor irrigation directorate gets spent on establishment costs – mostly staff salaries – leaving little or nothing for the tanks.

Justification

Current Status of Minor Irrigation Tanks

A Socio-ecological Marvel: In many ways, Rajasthan's tanks, even in their present decrepit state, are a socio-ecological and economic marvel. They perform many useful functions, six of which are particularly notable.

- They help capture, conserve and store what little rainfall the region receives and in the process reduces soil erosion by reducing the pace and momentum of run-off waters.

- They provide low-cost flow irrigation.

- They help recharge groundwater aquifers which provide a stable and reliable source of irrigation and domestic water supply as well for livestock, in areas surrounding them.

- Tank and aquifer storage together provide some protection against risks arising from the vagaries of rainfall. In a year of high rainfall, such as the 1996 monsoon, tanks significantly reduced the threat and damage of flash floods. In contrast, in years of lower than normal rainfall, tanks and aquifer storage directly fed by tanks provide some protective irrigation.

- Unlike large reservoirs which take land in the submergence areas away from other uses, tank-beds are used both for storage and cultivation; farmers grow rabi – and, sometimes, summer crops in tank beds after they are emptied. As a result, tanks are efficient in landuse.

- Tanks concentrate silt and minerals contained in rainwater run-off in tank beds and farmlands that constitute the command area and make the soil fertile.

Overall, tanks enliven the aquatic environment in their surroundings, sustain local agricultural economies (including fisheries), and serve as an important anchor for cohesive local communities.

Above all, tanks provide all these valuable benefits virtually free of cost. Neither their present users nor the government has made any capital investment to construct many of the tanks. A large number of the state's minor irrigation tanks – around 2200 according to the MI Directorate – have been there for a long time; some of them for well over a century. The erstwhile *Rajahs* and *Jagirdaars* built most of these. The Government of Rajasthan has constructed some more in recent decades. However, neither the old nor the new tanks have received any significant resources for repair and maintenance. Finally, unlike groundwater irrigation and lift irrigation schemes, tank systems use no energy; the flow irrigation they provide is almost free.

State of Disrepair

Years of disrepair, neglect and lack of proactive management have hit the overall productivity and efficiency of tanks. Major consequences of these are described below:

Siltation of Tankbeds: Almost all tanks have suffered from silt build-up in the bed, particularly near the dam. As a result, their storage capacity has declined. Siltation has occurred partly because of natural processes and partly because tankbed farmers find siltation beneficial. Siltation tends to get concentrated near the sluice gates and often blocks the gate partially and/or raises the sill level enlarging the dead storage. Significantly, as elsewhere, siltation reduces the permeability of topsoil and impedes groundwater recharge.

Inefficiencies in the Distribution System: There are inefficiencies in the canal systems. Sluice gates in many systems are in complete state of disrepair. In many tanks, water keeps leaking out continuously creating waterlogging conditions. A major problem is the planning and execution of cross-drainage works. These are often poorly designed and executed, resulting in wastage of water and damage to structures. Most tanks have only kuchcha canals. After years of siltation, the carrying capacity of canals has also gone down. On many systems, particularly old ones, there are no outlets. Frequent cuttings have made the canal walls weak. On farm development (OFD) work, as a rule, is of poor quality or non-existent. The consequence of all these is an inefficient distribution system. Seepage rates during conveyance are high, and water takes a long time to reach the tail-end field. Tail-enders hardly manage to get one irrigation when head-reach farmers get three.

Gradual Expansion of the Command Area: Despite all these distribution problems, the actual area served by many tanks has increased far beyond the design command. This is because: the ends of the canals get extended by the farmers on the fringe of the design command. In initial years, they are viewed as unauthorised encroachers; over the years, they get established as part of the official command. In old tanks, many fields inside the official command were left fallow and therefore excluded from the design command. With growing pressures of population and commercialisation, the owners of these fields began irrigating these fields. Then there are traditional well-water irrigators inside the command; some of them deliberately opted out in the initial stages to evade assessment for irrigation fees. Finally, there are up-lying lands within the command where gravity flow cannot reach; many of these have dug small ponds which they fill with tank water and then lift it to irrigate their up-lying fields using diesel pumps and long flexible pipes.

***Petta* (tank-bed) cultivation:** Tank-bed cultivation is practised extensively in all tanks. The legality of tank-bed cultivation is a confused issue. In new tanks built on acquired lands, the practice is to give erstwhile owners right to cultivate for three years after acquisition; thereafter cultivation rights in the submerged area is either auctioned or allocated usually to original owners. Moreover, even when the government acquires land, acquisition is not compulsory. Many farmers refuse to sell land to the government and retain ownership rights. Tank-bed cultivators want the tank emptied by end-September; command area farmers, especially those near the head, want the tank to hold water so that they can get three irrigations. Tank-bed farmers loathe the idea of raising the tank bund; command area farmers love it. Tank-bed farmers are probably a strong interest group in tank management.

Catchment Encroachment: Over the years, the growing profusion of all manner of water harvesting and storage structures upstream and downstream of the tanks have reduced the incoming water. With this, the free catchment available to the tanks has declined and so has rainwater runoff. Though the Irrigation Act empowers the state to prohibit such structures above a certain size in the catchment of existing tanks, no move has been made so far to check the growth in such structures. Decades ago, when some of the existing tanks were built, the bulk of their catchment area was uninhabited and water demand in the catchment area was probably negligible. With that scenario, it was probably appropriate to capture and assign the rainfall precipitation of a vast catchment area to serve a small group of families. However, that is no longer the case today; and there seems no ground on which one can justify preventing the new communities upstream from capturing some of their own rainfall for their use. The profusion of small *johads*, *pals*, and ponds is a part of the ethic: "rain falling on your roof stays in your house; rain falling in your field, stays in your field; rain falling in your village stays in your village."

The Recharge Factor: Except in areas with problematic hydro-geology including impermeable soils, recharge of wells was by far the most valuable benefit farmers associated with tanks. In most tank command areas, conjunctive use of surface and groundwater operates; pump irrigation markets are extensive and vigorous in the neighbourhood of tanks. Pump irrigation sells at Rs 35–40/hour from 5 hp diesel pumpsets; pipes are leased out to water buyers by well owners at Rs 20/100 ft/day. At Rs 500–700/irrigation/ha, purchased groundwater is indeed expensive irrigation compared to Rs 175/ha for 2–3 flow irrigations from a tank. Groundwater is the mainstay of the farm economy in tank-surrounds because it offers reliability, timeliness and control that flow irrigation from tanks do not. In areas with water table aquifers, the relationship between the tank storage level and water level in wells is visible and direct. In many tanks, farmers describe the relationship with a high level of accuracy.

***Extensive* vs *Intensive* Irrigation:** Minor irrigation tanks have emerged as some of the finest examples one can find of *extensive* irrigation that spreads a given quantum of available water over as large an area as possible thereby maximising the productivity per cubic foot of available water rather than per acre of land, as should be done in a water-scarce region like Rajasthan. This has happened not so much by design or planned action but by default. 'Unauthorised' expansion in the command area is one reason. Giving only one or two flow irrigation but wetting a larger area is another. The use of tank-bed for *petta* cultivation is the third factor promoting extensive irrigation. The acquifer recharge through all-round seepage a 'loss' that promotes costly but dependable groundwater irrigation is the fourth factor that promotes *extensive* irrigation.

Socio-Ecological vs Techno-Economic Perspectives: The techno-economic perspective dominates the thinking of irrigation departments. It tends to view tanks as pure gravity-flow irrigation systems; with the primary function to provide flow irrigation. It tends to view officially recognised command area farmers as its sole identified group or customers; judging the success or failure of a tank system in terms of its performance in providing gravity flow irrigation to the command area farmers. It treats tank-bed farmers to be outside its purview, taking note of the dependence of groundwater users on the recharge from tank but does not include them either as beneficiaries of the system or as its customers. This is why no irrigation fees are applied either to tank-bed cultivators or well irrigators. The techno-economic perspective is also unsympathetic or, at best, agnostic towards water users upstream as well as downstream. It treats upstream water harvesters as a nuisance and tends to be oblivious to the interests of downstream users, whose catchment is truncated by the tank. Contrasting the techno-economic perspective with a socio-ecological perspective leads to a different understanding of the role tanks play in the lives of the people around them. It may also result in a radically different notion of the kind of rehabilitation that will enhance the relevance and overall social value of tanks. It will also produce new insights to the strategy of management turnover that is best likely to make sense given the diverse interests and varied stakeholder groups.

Policy and Legal Environment in Rajasthan

In recent years, Rajasthan has displayed exemplary dynamism in water resources management. Water scarcity is posing a major problem to the state's agricultural and industrial development and improving the quality of life. The political and administrative leadership has begun to look for sustainable solutions to its water resource problems in full earnest. The current thrust is on two aspects: water harvesting programmes through participatory watershed management, and rehabilitating and modernising the rather vast irrigation infrastructure. On both fronts, the state has taken major initiatives to involve farmer participation. The Rajasthan Watershed Development Programme has been widely acclaimed for the strides it has made in eliciting farmer participation. A similar thrust is being imparted to irrigation management through several externally supported programmes being processed now. These will infuse new and substantial resources in the upgradition of this infrastructure. The World Bank supported Water Resources Consolidation Project (WRCP) of around Rs 1800 crore will extend participatory irrigation management to a number of major, medium and few selected minor irrigation projects after their rehabilitation. A similar project supported by KFW supports the construction of new minor irrigation tanks. The current project proposes an investment of Rs 612 crore in rehabilitation and modernization of 1198 large tanks over a period of 10 years. Increasing farmer participation is the cornerstone of all these new projects.

There is strong commitment to participatory irrigation management at the top levels of Rajasthan administration. The new State Water Policy (1998) emphasizes promoting beneficiary participation in all aspects of water planning and management, with particular emphasis on water user associations (TUAs) to manage and maintain irrigation systems, physically and financially. To facilitate a congenial environment for promoting improved water management through TUAs, the irrigation department has formulated a strategy for their creation in the state.

The state government has already initiated changes in the policy and legal framework to facilitate user participation in irrigation management. The revised Irrigation Act clearly supports TUA formation and encourages TUAs to carry out various functions through amended legal provisions. There is an on-going debate on the registration of TUA's. Some of the confusion arises because of the lack of clarity about why farmer participation in irrigation management is needed.

The strategies for creating TUAs (Government of Rajasthan, 1998b) include the following: Creation of TUAs is seen to be the key action in revamping the existing irrigation management systems in Rajasthan. It needs to be preceded by a number of legal and administrative measures. Once created, TUAs will have to be given sufficient autonomy and authority. The successful formation of TUAs depends on a number of legal, cultural, sociological, and administrative issues. To overcome these difficulties, there is a need for extensive training of not just TUAs but also all irrigation management personnel. The strategy paper also provides guidelines for the successful formation and subsequent functioning of TUAs in Rajasthan. The new water policy (Government of Rajasthan, 1998a) promises to: "provide legal support for the formation of TUAs and handing over to them the distribution of water for irrigation and the maintenance of canals" and "provide in the law for an effective participation of farmers in the planning and decision-making processes which involve users and public authorities, and a continuous two way flow of information between the users and public authorities".

A Water Users Association Policy Plan Paper prepared by the Irrigation Management Training Institute (1993) lists the following reasons in support of its policy of favouring TUAs: a) the utilisation of potential created has remained far below the expectations because of lack of farmers' involvement; b) irrigation is a socio-technical process which combines organisational and material elements; c) systems managed entirely by the government agencies are impractical to operate successfully, because of inadequate operational staff and lack of concern for the users' need. This has resulted in inequitable distribution, unpredictable and unreliable supplies, effecting irrigation efficiency considerably; c) until now, irrigation bureaucracy has played an autocratic role, posing as if they are concerned about irrigation supplies to farmers. A crucial factor the paper ignores is the financial crunch the irrigation department faces. Irrigation revenue has been steadily declining. But the expenditure has been mounting with a major portion going for wages and salaries. Less than one-fifth of the allocated budget is available for actual maintenance works; so it has become inevitable to ask farmers to maintain the structures.

In old tanks especially, ownership of the submerged land is ambiguous. In a few cases, records exist about the ownership of these lands. Originally, the land must have belonged to *Jagirdaar's*. However, private use rights have been established and defended by farmers over several decades. In effect, thus, these farmers are treated as owners of *peta* land.

This vast beneficial potential of MI tanks, however, is in great danger; already, the productive capacity of most tanks has been reduced to a fraction of the potential because of long neglect and disrepair. Almost all tanks have suffered from silt build-up in the bed, particularly near the dam. As a result, their storage capacity has gradually declined. Equally dysfunctional are the inefficiencies in the canal systems. Sluice gates in many systems are in a complete state of disrepair; in many, water keeps leaking out of them continuously creating water logging conditions. Cross-drainage works are often poorly designed and executed resulting in wastage of water and damage to structures. Most tanks have only kuchcha canals; few have a portion of the main canal/s lined. After years of siltation, the carrying capacity of canals has also been reduced. Despite all these distributional problems, the actual area served by many tanks have slowly increased far beyond the design command owing to gradual regularisation of unauthorised irrigators on the fringe of the design command. A major factor that, over the years, has gradually reduced the water income in tanks has been the growing profusion of all manners of water harvesting and storage structures in both upstream and downstream minor irrigation tanks.

What the tanks need most is rehabilitation. However, from the overt symptoms of disrepair and maintenance problems, it would be a great folly to believe that the answer lies in technical or engineering rehabilitation. With technical rehabilitation which cannot address the root-problem, in a few years, the tanks will relapse into a similar present day state of decline. What they need is 'management rehabilitation'—which will focus not only on fixing the technical/physical problems but also on instituting social and organisational processes that will impel the users to take the responsibility for managing them on a viable and sustainable basis. A closer scrutiny suggests that the default by the irrigation department in maintenance works is only a part of the reason for their decline.

An even more important reason is the dysfunctional social dynamic around the tanks. On many old systems where there are no outlets, it is farmers who make cuttings to divert the flow to their fields. Similarly, while natural factors are important, siltation of tank beds has occurred also because tank-bed farmers find siltation beneficial; it makes the soil fertile; it reduces the period over which their land remains submerged and, in some tanks, gives them time to take a rabi as well as a summer crop using soil moisture and groundwater irrigation. Petta cultivators like siltation in the tank-bed; command area farmers do not. Petta cultivators want the tank emptied by end-September; command area farmers want the tank to hold water so that they can get three irrigations. Petta farmers have no interest in the rehabilitation, particularly of the canal system; command area farmers have a strong interest in it. Petta farmers loathe the idea of raising the tank bund; command area farmers love it. Petta farmers are probably a strong interest group in tank management; else, it is difficult to understand the logic of the fascinating practice of inundation irrigation one finds in Alwar. Any intervention to improve the working of tanks can ignore, only at its own peril, the criticality of these behavioural dimensions. A successful programme of tank rehabilitation has to work on this invidious dynamics and create a socio-technical system that is able to align the interests of all users with the sustainability of the tank through a robust, self-managing tank-users' organisation.

The difficulty in designing a project aiming at management rehabilitation (in contrast to a technical rehabilitation) is that there are no known models of sustainable farmer participatory irrigation management. We reviewed several experiments in participatory irrigation management. There is a great deal to learn from these experiments; they show that when managed with moderate level of competence, proactive resource management does produce powerful livelihood and environmental impacts. However, the sustainability of these is an issue in all the experiments. A typical problem is the lack of a goal-focus. All NGOs managing natural resource programmes catalyse local level organisations; however, these have tended to be loose, and dependent on continual external resource support. This has important lessons for conceptualising the approach to tank rehabilitation.

Section II

The Approach

Project Design

Tanks are an integral and precious component of Rajasthan's socio-economic fabric and its aquatic environment. Tanks must receive the importance they deserve, as well as the management and resources they need so desperately. Rehabilitating tank systems requires focus on the interaction among social, technical, and environmental variables. The project needs to take a broader conception of minor irrigation tanks as socio-ecological constructs rather than just as flow-irrigation systems; it needs to assess the wider impact of proposed rehabilitation work on the entire array of its stake-holders who include, besides the command area farmers, *petta* cultivators, groundwater users, downstream water harvesters, fish-culturists, pastoralists and other non-agricultural users, including domestic users, and women. Similarly, investment in rehabilitation needs to be assessed and justified on grounds of multifarious economic, social and environmental benefits and dis-benefits that rehabilitation is likely to produce.

The Project needs to generate information and analyses on a variety of technical, socio-economic, and ecological relationships such as evaporation losses from surface and groundwater storage, recharge rates under different conditions, the pattern of water input in different structures in a watershed under varying rainfall regimes, and so on. The project design also needs to explicitly recognise conflicts of interests between various groups of stake-holders — such as between head and tail reach farmers in the command, command area farmers and petta cultivators, tanks users and downstream water harvesters, irrigators and fish-farmers. Rather than flossing over these conflicts of interests, the project needs to explore a variety of approaches to minimise or eliminate such conflicts to create win-win strategies around which all stakeholder groups can rally.

Rehabilitation of each tank need not be viewed as a one-shot event; an ABC analysis of sorts needs to be done with farmer participation to evolve a medium or long term programme of rehabilitation beginning with low-cost-high-pay-off repair works and building up to more expensive items of engineering.

For effective implementation of the programme, we believe

- TUAs should be formed first and should be involved in the planning of rehabilitation

- Actual rehabilitation work should be undertaken by the TUA with the support and guidance of the irrigation department

- TUAs should be enabled to acquire technical competence to manage the head-works, which should be turned over in one go along with the distribution system.

We believe that the irrigation department's presence as a professional support body — which at present is minimal — should be greatly increased after the turnover. World-wide experience indicates that farmers lose interest in organising and taking over management once irrigation systems are brought in a pristine condition. This experience also indicates that the best way of organising water users for management rehabilitation is by involving them in planning and executing engineering rehabilitation. This implies that engineering-rehabilitation and management-rehabilitation should go side-by-side which, in turn, means that many policy level questions must be answered before the rehabilitation work is begun.

In our assessment, the project needs to incorporate lessons learnt from farmers participatory experiments going on in Rajasthan itself. The project needs to forge tri-partite collaboration among the irrigation department, NGOs, and user communities since all of them have complementary roles to play. We believe the project needs to launch a 'learning drive' to generate information and analysis needed to evolve a rehabilitation strategy that views minor irrigation tanks as a socio-ecological system rather than a flow irrigation system. Therefore, the project implementation is envisaged in four phases, spread over 132 months. It will result in complete management rehabilitation of 1198[4] minor irrigation tanks starting with a three year pre-project, pilot and preparatory phases as outlined in Table 1.

A pre-project phase of 12 months should be provided mainly to experiment with a range of models and methods of farmer participatory rehabilitation of 10 tanks in an intensive action research format in five districts carefully selected for the quality of leadership in the department, potential for involving NGOs, research institutions, and for experimenting with a variety of alternatives. The primary output of the pre-project phase will be a detailed project proposal enunciating a project

---

4. *Our larger study was mainly an assessment of the Project Document prepared by the Irrigation Department of the Government of Rajastan entitled 'Rehabilitation Project of Minor Irrigation Tanks to be posed for External Assistance'. The Project Document sets out a ten year programme for rehabilitation of 1198 of the larger minor irrigation tanks in the state. The Document lists nearly a dozen assorted objectives; the key objectives of the Project are: a) to undertake major renovation of the physical structures of 1198 systems through the Department; b) to organise farmers benefitting from the systems into Water User Associations; c) establish on the renovated tanks a management system that assigns greater role to Water User Associations in the operation collection of irrigation fees, and evolving and enforcing norms for water distribution; d) strengthen and modernise the Minor Irrigation Division and its infrastructure.*

Table 1: Suggested Design of the Tank Management Rehabilitation Project

Phases	Duration (months)	Objective
Pre-Project Phase I	12	To implement a programme of action-research on alternative approaches of rehabilitation of 10 tanks in five districts with a view to evolving an appropriate design of participatory tank rehabilitation project in collaboration with research institutions and NGOs.
Pilot and Preparatory Phase II	24	• To test, modify and refine the project design, approach and strategy so evolved in the chosen 50 tanks from 10 districts. • To evolve a system of participatory monitoring of rehabilitation programme and the performance of rehabilitated tanks as socio-ecological constraints. • To redefine the role, competence base and organizational structure of the Minor Irrigation Directorate for tank management rehabilitation. • To initiate a programme for training, reorienting and OD work in the Minor Irrigation Directorate for participatory tank rehabilitation.
Project Period Phase III	36	To undertake and complete participatory rehabilitation of 215 minor irrigation tanks
Project Phase IV	60	To undertake and complete participatory rehabilitation of 923 minor irrigation tanks

goal; strategy, approach and method based on the documentation, and analysis of 10 action research projects.

A 24 month pilot and preparatory phase should follow the pre-project phase to rehabilitate 50 minor irrigation tanks in ten districts. This phase will be used to modify and perfect the approach, evolve suitable monitoring systems, and initiate a programme of organisation development in the irrigation department aimed at retraining the staff for their new role. Verifiable indicators of goal achievement in this phase will include:

- a credible, pre-tested strategy and approach for participatory rehabilitation of minor irrigation tanks;

- a pre-tested system of monitoring and an internal capacity within the irrigation department to instal and operate it;

- an agreed programme of reorganisation and institution building needs within the irrigation department for undertaking the rehabilitation programme, and the initiation of such a programme;

- retraining of core staff engineers in the selected districts for implementing participatory rehabilitation.

Project Phases III and IV will include the project proper; however, the project will be based on substantial amount of experimentation, action research and preparatory work. The bulk of the rehabilitation work proposed in this report however will get completed during these phases. However, the nature of rehabilitation may be different - and deeper and wider - than perhaps envisaged today.

Before a large-scale intervention for tank rehabilitation is undertaken, it is critical to generate, through action experimentation, applied knowledge about and replicable models of how best to implement management rehabilitation. Once it is completed, TUA will take over the responsibility of managing the tank in a sustainable manner. This pilot project which will eventually result in a major programme of tank management rehabilitation is designed to generate such applied knowledge and replicable models.

The Pre-Project and Pilot Phase

The pre-project phase of 12 months is designed to get the collaborations going, evolve management-rehabilitation models to be tried out in the pilot phase, and evolve and pre-test the instruments for research and process documentation. The pre-project phase will lead to the pilot phase in which 2-3 TUA designs and implementation models will be tried and tested, this in turn will result in the formulation of the main project strategy.

The goals of the pilot project thus are to [a] help generate practical models of TUAs that can effectively take over the responsibility of managing tanks in a viable, equitable, and sustainable manner; and [b] develop improved understanding of methods and processes to be used in catalysing TUAs and building their capacities for self-governance and self-management.

In specific terms, the objectives of the project are to:

[a] carry out action research experiments on farmer participatory tank management rehabilitation with 60 tank user communities selected from five districts of Alwar, Bhilwara, Chittorgarh, Ajmer and Tonk. These will include 10 tanks in the pre-project phase covered during the first 12 months and 50 tanks in the pilot phase covering the next 24 months of the pilot project.

[b] establish effective collaboration between implementing and research organisations for effective management of the proposed action research experiments;

[c] generate and document lessons about processes and models of farmer participatory tank management alternatives through establishing appropriate project monitoring systems, participatory research and process documentation by involving competent social and technical researchers in the planning and implementation of the project as collaborating partners;

[d] complete all the groundwork necessary to launch the main project including to:

   i) identify and contract potential action organisations and research institutions that will collaborate in the main project;

   ii) outline and secure changes in the government policy framework necessary for farmer participation in tank management; and

   iii) finalise the strategic plan for the implementation of the main project, complete with a procedure for judging the success or failure of the project.

Project Assumptions.

The central issue to plan the project is the design of TUA. As reviewed earlier, the experience with creating user organisations, especially in gravity flow systems, is still formative. It is yet to yield firm design principles which will ensure that the user organizations will be capable of self-governance and self-management. The project will be in jeopardy unless it begins with valid assumptions about the design principles that need to be followed to catalyse participatory user organisations. Designing energetic member organizations involves understanding their working through focusing on the interactions between their three constituent sub-systems: members, the governance structure (board or management committee) and the operating system which provides the services. User organizations succeed when their design ensures high levels of:

a) Goal Cohesiveness: Members are somehow able to ensure that, in all decision making the governance structure is cohesive around the goal to promote members' immediate, direct, and common interests;

b) Governance Effectiveness: the governance structure (management committee) is able to 'govern' the operating system such that the goals of members get served;

c) Member-need Responsiveness: the operating system is able to devise new and innovative ways to strengthen the loyalty and allegiance of members to the user organisation.

Extensive research in member organisations in various fields suggests that robust self-governing user organisations achieve high levels of goal-cohesiveness, governance effectiveness, and member-need responsiveness by satisfying the following four design principles:

Member-Centrality of the Goal: Members give their allegiance and loyalty to a user organisation only to the extent that it serves their interests. If the purpose is non-central or non-immediate for members, the organisation generally proves still-born unless externally propped up. If its purpose is non-central to members, people do participate but will withhold their support as soon as selective inducements in the form of subsidies, wage labour and other give-aways are withdrawn.

Goal-Cohesive Governance: Most boards/ management committees of induced user organisations tend to be powerless, divisive, and pursue agenda that have vague or no relationship with any members stake in the organisation. Often boards/management committees do not genuinely represent member interests or are dominated by outside agencies. It also happens that, once elected/ nominated, members have no or ineffective mechanisms to hold a non-performing board accountable. Training and education for effective board development can help promote member-centred governance, but the design features that are really critical include: [a] election of all or most members of the governance structure by members; [b] stake-based voting rights and representation; [c] members' rights of recalling non-performing boards/ members; and [d] board/management committee (and not the catalyst organisation) as the custodian of the decision making authority of the general body.

Get the Right Operating System: The operating system is the vehicle through which the user organisation serves members. It has to be so designed that it can generate high rewards for collective action. Operating systems which successfully add value, often invent new methods of organising resource-system or getting tasks performed or service delivered compared to the existing methods. The operating system for a successful user organisation creates unique member allegiance propositions that provide members strong and continuing reasons to offer their loyalty and allegiance to the organisation and comply with the established behavioural norms.

Secure and Retain Member Faith and Allegiance: The user organisation fails when the members desert it. On the contrary, a user organisation becomes increasingly stronger as it amasses the allegiance and loyalty of a growing membership. Even when well designed, a user organisation has to be launched carefully since adverse member expectations formed from early experience take a long time to undo. The operating system thus has to create positive member expectations at the start and meet them so that members develop faith in its capacity to deliver. Virtuous cycles of this type strengthen member allegiance and faith in the user organisation which is the sure formula for its success and centrality.

The action research approach of the pre-project and pilot phase is designed to test these and competing assumptions about how to build robust, self-governing user organisations. However, there are a number of auxiliary assumptions many of which will surface only as the action research proceeds. These may be about the time frame involved and resources needed to complete the management rehabilitation of a typical tank; the sequence in which different activities have to be carried out; the group processes and conflict resolution mechanisms that are conducive to organisation building; ways to deal with conflicts of interests articulated by different user-groups; equity and gender issues, and so on. Launching the main project based on untested and unverified a priori assumptions may lead to failure of the project. By building in a pre-project and pilot phase with strong emphasis on the 'learning process' approach will help evolve a project strategy with high chances of success.

The pre-project phase is aimed as an open exploration phase to generate additional alternative testable assumptions and hypotheses through action research. on a total of 10 tanks, two each from five districts. In each district, management rehabilitation will be undertaken on one tank by the minor irrigation directorate and on the other, by NGO. The pre-project phase will smoothly merge into the pilot phase because all it will involve is to extend the pre-project activity level five-fold; moreover, the short pre-project phase will have given the initial partners some experience in managing their collaborations. In addition, the experimentation with the first 10 tank communities will have generated new hypotheses and assumptions which the pilot phase can be designed to test. Learning about how best to operationalise the four design principles outlined earlier will be a key consideration in the design and management of the pilot phase which will require that high quality wisdom and analytical capability is brought to bear on understanding, analysing, and documenting the lessons learnt from the pre-project and the pilot phase. A leading research institution will be a collaborating partner with both these action organisations during the pre-project phase; in the pilot phase, more research institutions will be involved. While in the pilot phase, starting in year 2, it would be desirable to involve a number of NGOs and research institutions.

The NGO action organizations that might be involved in the pilot phase could be: a) Tarun Bharat Sangh, Alwar; b) PRADAN, Alwar; c) Sewa Mandir, Udaipur; d) Sahyog, Chittorgarh; e) PIDO, Dungarpur. Besides highly rated individual researchers/consultants, following research institutions will be invited to participate in the pilot phase: a) Institute of Development Studies, Jaipur; b) Central Arid Zone Research Institute, Jodhpur; c) Irrigation Management and Training Institute, Kota; d) Institute of Rural Management, Anand; e) Gujarat Institute of Development Research, Ahmedabad.

The pre-project phase will be planned and implemented as an action research intervention by action and research collaborating partners with equal emphasis on planned action interventions and participatory learning, research, and documentation. This can be categorised in eight action items each of which will entail a cluster of activities. The sequence in which different action items need to be taken up in working with a typical tank community is suggested in Table 2.

We also expect that, since several action items can be taken up simultaneously, the overall programme of management rehabilitation of a tank can be completed in nine months as suggested in Table 3. Each of these items represents a set of assumptions to be tested and verified before the main project is planned.

Table 2: Sequence of Work with a Typical Tank Community

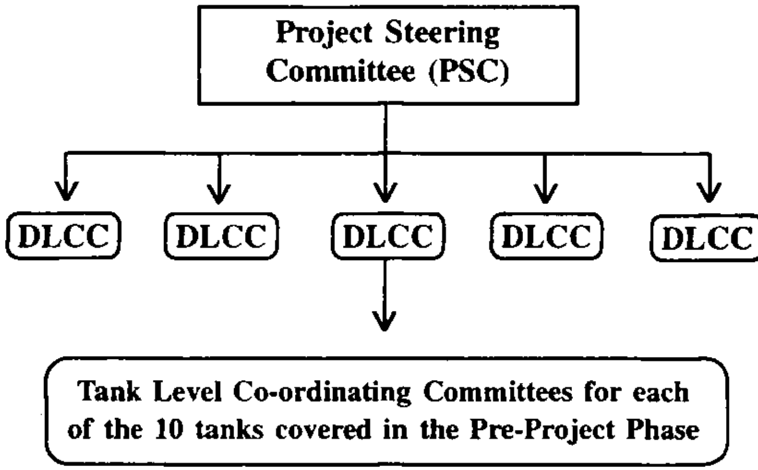
Action Item	Core Task	Estimated Time Required	Responsibility Center/Lead Institution	Parallel Activity
1	Base-line Socio-economic Study	2 months	Research Institution	
2	Base line Technical Survey	2 months	Action Institution	
3	Participatory Planning of Technical and Management rehabilitation resulting in registration of a user Organization and election of its Management Committee	3 months	Action Institution	Process documentation by Research Institution
4	Technical Rehabilitation: Distribution system	3 months	User Organisation with support from Action Organisation	Process documentation and feed back by research Institution
5	Technical Rehabilitation: tank	3 months	User Organisation with support from Action Organisation	Process documentation and feedback
6	Establishment of a new Management System complete with water-charge levy policy, norms for distribution, operating manual, maintenance policy.	9 months	User Organisation with support from Action Organisation as well as Research Instition	Process Documentation and feedback by Research Institution
7	Pre-withdrawal Participatory Assessment	1 month	Research Institution	
8	Management Rehabilitation Workshop	12 days (10 days preparation days workshop)	Action Organisation Research Institution	

The action organisation and the research institution will work together as co-equal and independent partners. Each will deploy a team of three professionals with separate lines of command; but each will have a well-defined 'event-responsibility' as outlined in Table 2. As soon as the TUA is formed and its management committee elected, a tank-level coordinating committee (TLCC) will be formed with the chairman of TUA, the action team leader and research team leader as members. The TLCC will be responsible for the tank management rehabilitation programme for that particular tank.

Similarly, in each district, a district level coordinating committee (DLCC) will be chaired by the chief engineer; team leaders of action team as well as research team in each tank will be represented on the DLCC. DLCC will meet every month to review the progress, analyse the lessons learnt and do trouble-shooting. At the project level, there will be a project steering committee (PSC) chaired by the Director (Minor Irrigation); its members would include representatives of partner NGOs, research institutions and the chief engineers of the districts concerned and a SIDA representative. PSC will be in overall charge of the project. The project management organisation can be represented as:

Table 3: Time-framework for Completing Management Rehabilitation in a Typical Tank

Action Item	M 1	M 2	M 3	M 4	M 5	M 6	M 7	M 8	M 9	M 10	M 11	M 12
1. Socio-economic study	✓	✓										
2. Study of Technical Alternatives	✓	✓										
3. From Tank Users' Association	*	*	✓	✓	✓							
4. Technical Rehabilitation of Distribution System				*	*	✓	✓	✓				
5. Technical Rehabilitation of Tank									✓	✓	✓	
6. New TUA Management System			✓	✓	✓	✓	✓	✓	✓	✓	✓	
7. Pre-withdrawal Participatory Assessment											✓	✓
8. Management Rehabilitation Workshop												✓



An important objective of the pre-project phase is to secure a realistic understanding of the resource requirements in tank management rehabilitation work. Since a good deal of similar work is done on smaller water harvesting structures in watershed programmes, we suggest that funding norms, as well as procedures used for the Integrated Watershed Development Programme (IWDP) are used with appropriate modification. To start with they could be used to support tank management rehabilitation work in the Pre-project phase. Since IWDP does not provide explicitly for an action research component, separate costing would be needed for compensating research institutions participating in the pre-project phase.

Outputs of Pre-Project and Pilot Phase

Key outputs expected from the pre-project and pilot phase are as follows:

- 60 minor irrigation tanks with management rehabilitation completed, and their management turned over to local TUAs;

- Experience gained to establish participatory planning, management and governance systems, for water charge collection systems, instituting new norms for appropriation, distribution and use of water, to reconcile conflicting interests of different groups, and to operate tanks as viable, sustainable socio-ecological systems;

- Realistic assessment available of the resources, effort, competencies and skills needed to manage a large programme of tank management rehabilitation;

- Confident assessment available of alternative designs of TUAs in terms of their viability, robustness, equity and sustainability;

- Understanding of the changes needed in the government policy framework to make a large programme of farmer participatory tank management rehabilitation successful;

- A corpus of valuable quantitative and qualitiative information and analyses based on a formal monitoring system, process documentation and impact-evaluation studies besides workshop reports and field notes generated by participating research institutions;

- All conditions created for the launch of a full-scale project based on a carefully devised, experience-based strategy with high chances of success;

- Project Steering Committee (PSC);
- District Level Coordinating Committee;
- Tank Level Coordinating Committees for each of the 10 tanks covered in the pre-project phase.

Reference Material Used:

Brewer, J, S Kolavalli, A H Kalro, Gopal Naik, S Ramanarayan, K V Raju, R Sakthivadivel (1999) *Irrigation Management Transfer in India: Policies, Processes and Performance.* A collaborative study by Indian Institute of Management, Ahmedabad, India and International Irrigation Management Institute, Colombo, Sri Lanka. New Delhi: Oxford and IBH Publishing Co Pvt. Ltd.

Government of Rajasthan (1994) *Proposals for Transfer of Operation and Maintenance of Kishangarh Irrigation Tank and Canal System to Water Users' Association on Pilot Basis under Agriculture Development project*, Jaipur: Chief Engnieer's Office.

Government of Rajasthan (1997) *Agricultural Statistics-Rajasthan:1995-96*, Jaipur, Yojana Bhawan.

Government of Rajasthan (1997a) *Rehabilitation Project of Minor Irrigaiton Tanks to be Posed for External Assistance*, Director, Minor Irrigation Schemes, Irrigation Department, Jaipur.

Government of Rajasthan (nd) *Rajasthan Irrigation and Drainage Act, 1954*, Jaipur: Department of Irrigation.

Mishra, Anupam (1993) *Aaj Bhi Khare Hain Ralab*, Delhi: Gandhi Peace Foundation.

Mishra, Anupam (1995) *Rajasthan Ki Rajat Bunden*, Delhi: Gandhi peace Foundation.

Raju K V and Tushaar Shah (1999) *Rehabilitation of Minor irrigation Tanks in Rajasthan: Project Document (Draft for Discussion)*, for Swedish International Development Agency, New Delhi.

Singh, Rajendra (1995) *Lok Parampara Se Mila Rasta,* Bhikampura: Tarun Bharat Sangh.

Shah, Tushaar and K V Raju (1998) *Rajasthan Minor Irrigation Tank Rehabilitation Project: Socio-Ecological and Organisational Assessment (Draft for Discussion),* for Swedish International Development Agency, New Delhi.

Tarun Bharat Sangh (nd) *Jalagan Vikas ke Ayam,* Bhikampura: Tarun Bharat Sangh.

Recent Working Papers

HANUMAPPA
nomics of Bivoltine Silkworm
ring in Karnataka

HANUMAPPA
al Amenities Spread in Rural Karnataka

HANUMAPPA &
ANANTHARAMAN
nomics of Silk Industry: Micro and
ro Issues

HANUMAPPA
-Climatic Regional Planning
quacy of the Strategy

ILATA RAO
Economic Reforms and
istrial Development
Karnataka Experience)

ILATA RAO
alisation payments in Canada

OHNSON SAMUEL AND
INGARAJU
ants to Bangalore

AHADEVA
elopment and Change Under Integrated
l Development Project

UTHARAYAPPA
genous Health Care System in
ataka: An Exploratory Study

NADKARNI AND GOVINDARU V
ody's Child: The Economic and
utional Aspects of Soil Conservation
dia

NADKARNI
nomics and Ecological Concern

NADKARNI
and Management of Common Lands:
rds an Environmentally
d Strategy

NINAN AND
KSHMIKANTHAMMA
ainable Development:
Case of Watershed Development in

K N NINAN
Poverty and Income Distribution in India

K N NINAN
Economics of Shifting Cultivation

M PRAHLADACHAR AND
K GAYITHRI
Industrial Potential in Karnataka

M PRAHLADACHAR AND K GAYITHRI
Electronics Industry: Status and Prospects

M PRAHLADACHAR
Some Aspects of Ground Water Resource
Development and Management in
Karnataka

PRAKASA RAO V L S THIMMAIAH G
MAJUMDAR H K AND SESHAIAH S
District Planning Officers Training
Programme

RAMESHWAR TANDON
Asian Debt Scenario for the Late 1980s

V M RAO, H G HANUMAPPA AND S
ERAPPA
Karnataka Dry Land Agriculture: Some
Policy Issues

P H RAYAPPA AND M LINGARAJU
Demographic Transition in the South: A
Regional Perspective

P H RAYAPPA
Right to Work

S N SANGITA AND VAIDYA VIBHAVATHI
Ethics in Superior Civil Services in India:
With Special Reference to Recruitment and
Training

T R SATISH CHANDRAN
Fiscal Discipline and Fiscal Consolidation
at the Central and State Levels: Problems
and Prospects

T R SATISH CHANDRAN
Economics of Power Generation:
Issues and Choices

N SIVANNA
The Public Distribution System in Karnataka: A Study of Its Organisation and Management Aspects

SUKHPAL SINGH AND VINOD VYASULU
Fundamental Theoretical Contributions

G THIMMAIAH
The Political Economy of Populist Programmes

G THIMMAIAH
Economic Liberalisation in Agricultural Sector

B P VANI AND VINOD VYASULU
Growth, Variability, Instability and Production Behaviour of Rice Crop in Karnataka: A District Level Analysis

VINOD VYASULU
Tariffs and All That: On Some Conundrums in Railway Economics

VINOD VYASULU
Management of Poverty Alleviation Programmes in Karnataka: An Overview

VINOD VYASULU AND D RAJASEKHAR
The Rural Credit System in the 1990s

VINOD VYASULU
On Choosing Environmentally Sound and Self-Reliant Technologies; Reflections on Indian Experiences

SYED AJMAL PASHA
Uncultivated Lands: Institutional Aspects of their Use and Management in Karnataka

S N SANGITA
Effective and Responsive Government Karnataka: An Action Plan

M GOVINDA RAO
Intergovernmental Transfers in Selected Countries

K MATHIYAZHAGAN
People's Choice of Health Care Provide Policy Options For Rural India

SUPRIYA ROYCHOWDHURY
The State in Comparative Politics : A Critique

M GOVINDA RAO
Principles of Intergovernmental Transfe s Have the Finance Commissions Follow : Them?

M GOVINDA RAO
InterGovernmental Fiscal Arrangement In A Transitional Economy : A Look At Vietnam

SYED AJMAL PASHA
Forest use and Management A Comparative Perspective from India and Canada

S AMANULLA, B KAMAIAH
Indian Stock Market : Price Integration and Market Efficiency

ALLEN ROY, S AMANULLA, B KAMA A
Indian Stock Market : A Test of A Semi-Strong form of Efficiency

---

PRICE : Rs.30-00

INSTITUTE FOR SOCIAL AND ECONOMIC CHANGE
Prof. V. K. R. V. Rao Road, Nagarbhavi, Bangalore - 560 072, India
Phone : 0091-80 - 3215468, 3215519, 3215592 ; Fax: 0091-80 - 321700
Grams: ECOSOCI, Bangalore - 560 040
E-mail:kvraju@ isec.kar.nic.in